TELANGANA STATE POWER GENERATION CORPORATION LIMITED (TSGENCO)

5X800 MW TSGENCO YADADRI TPS (STAGE 2)

PART 1

TECHNICAL SPECIFICATION

FOR

VENTILATION SYSTEM

(MAIN EQUIPMENT- AWU & UAF)

SPECIFICATION NO.: - PE-TS-417-554-A004 (REV 00)

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT

PLOT NO.-25, SECTOR-16A,NOIDA, INDIA

	TITLE: 5X800 MW YADADRI STAGE 2 TPS TECHNICAL SPECIFICATIONS FOR VENTILATION SYSTEM (MAIN EQUIPMENT-AWU&UAF)	SPECIFICATION No: PE-TS-417-554-A004	
		SECTION	
		REV. 00	DATE: AUG 23
		SHEET : 1 OF 2	

CONTENTS

This Technical specification consists of two sections:

SECTION - I

SECTION - II

SECTION-I

SUB-SECTION-A

INTENT OF SPECIFICATION

1.0 INTENT OF SPECIFICATION

1.1 The specification covers supply comprising design (i.e. preparation and submission of drawing /documents including "As Built" drawings and O&M manuals), engineering, manufacture, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles, fill of lubricants, chemicals, reagents and consumables required for pre-commissioning, commissioning , performance testing and till one year of operation after handing over, mandatory spares along with spares for erection, start-up and commissioning as required, forwarding, proper packing, shipment and delivery at site, supervision of erection & commissioning, supervision of trial run at site and Performance guarantee / Functional / Demonstration tests at site, training of customer/client O&M staff, operation and maintenance of the system till handing over and handover in flawless condition to BHEL's customer of **VENTILATION SYSTEM (Main Equipment-AWU & UAF)with mandatory spares** as per details in different sections / volumes of this specification and various pre award agreements for **5X800 MW YADADRI TPS TELANGANA.**

1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve the contractor of the responsibility of providing such facilities to complete the supply, erection and commissioning, performance and guarantee/demonstration testing of **VENTILATION SYSTEM(Main Equipment-AWU & UAF).**

1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to highest standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgement is not in full accordance herewith.

1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing. Similarly, the extent of supply also includes all items required for completion of the system and not withstanding that they may have been omitted in drawings / specifications or schedules.

1.5 The general term and conditions, instructions to tenderers and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.

1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under SEC-II of the specification **within 10 days of receipt of tender documents.** In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser / Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.

1.8 Deviations, if any, should be very clearly brought out clause by clause along with cost of withdrawal in the enclosed schedule (in Sec – II); otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification. If no cost of withdrawal is given against the deviation, it will be presumed that deviation can be withdrawn without any cost to BHEL/its customer.

1.9 In the event of any conflict between the requirements of two clauses of this specification documents or requirements of different codes and standards specified, Sub-Section - C shall prevail over Sub-section – D, however more stringent requirement as per the interpretation of the owner shall apply.

1.10 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.

1.11 For definition of word like Contractor, bidder, supplier, vendor, Customer/ Purchaser Employer, consultant, please refer relevant clause of NIT.

SECTION: I

SUB-SECTION: B

PROJECT INFORMATION

YADADRI THERMAL POWER STATION

PROJECT INFORMATION

1	Name of the Project	YADADRI Thermal Power Station
2	Station Capacity	5X800 MW (Coal based)
3	Owner	Telangana State Power Generation Corporation Limited (**TSGENCO**)
4	Site Location	Site is located 7 km from the NH5.
5	Latitude	*16° 42*'20.40 N
6	Longitude	79° 34'41.56 E
7	Nearest Town	30 Km Miryalaguda
8	Nearest Railway Station	6.5 Km Damercherla
9	Nearest Airport	130 Kms (Vijayawada)
10	**Site Conditions**	
	Ambient Temperature	
	Daily minimum (average)	10°C
	Daily maximum (average)	47°C
	Design Ambient Temperature	50°C
	Ambient temperature (performance)	38°C
	Relative Humidity for design / efficiency	48-84 %
	Annual rainfall, mm	600 mm
	Plant Elevation above MSL	85 m above MSL
	Mean Wind Speed	44 m/s
	Wind Pressure	As per the latest revision of IS 875/1987
	Seismic co-efficient	Zone-III as per IS- 1893 (Part-IV)

जलवायवी सारणी
CLIMATOLOGICAL TABLE

BACK

स्टेशन : नलगोंदा
STATION : Nalgonda

अक्षांश LAT. 17°03' देशांतर LONG. 79°16' समुद्री तल माध्य से ऊंचाई HEIGHT ABOVE M.S.L. 227 मीटर METRES

प्रक्षणों पर आधारित BASED ON OBSERVATIONS 1975-2000

माह / MONTH		स्टेशन का सतह दाब / STATION LEVEL PRESSURE	वायु तापमान / AIR TEMPERATURE										आर्द्रता / HUMIDITY		मेघ की मात्रा / CLOUD AMOUNTS		वर्षा / RAINFALL						
			माध्य / MEAN						चरम / EXTREMES														
			शुष्क बल्ब DRY BULB	नम बल्ब WET BULB	दैनिक अधिक नम DAILY MAX	दैनिक न्यून तम DAILY MIN	माह में उच्चतम HIGHEST IN THE MONTH	माह में निम्नतम LOWEST IN THE MONTH	उच्चतम HIGHEST	दिनांक और वर्ष DATE AND YEAR	निम्नतम LOWEST	दिनांक और वर्ष DATE AND YEAR	सापेक्ष आर्द्रता RELATIVE HUMIDITY	वाष्प दाब VAPOUR PRESSURE	समस्त मेघ ALL CLOUDS	निम्न मेघ LOW CLOUDS	मासिक योग MONTHLY TOTAL	वर्षा के दिनोंकी संख्या NO. OF RAINY DAYS	वर्षसहित सबसे नम महीने का योग TOTAL IN WETTEST MONTH WITH YEAR	वर्षसहित शुष्कतम महीने का योग TOTAL IN DRIEST MONTH WITH YEAR	24 घंटोंकी सबसे भारी वर्षा HEAVIEST FALL IN 24 HOURS	दिनांक और वर्ष DATE AND YEAR	माध्य पवन गति MEAN WIND SPEED
		एच.पी.ए hPa	डि. से °C	डि. से °C	डि. से °C	डि. से °C	डि. से °C	डि. से °C	डि. से °C		डि. से °C		प्रतिशत %	एच.पी.ए hPa	आकाश के अष्ठमाश Oktas of sky		मि.मि. mm		मि.मि. mm	मि.मि. mm	मि.मि. mm		कि.मी. प्र. घं. Kmph
जनवरी JAN	I	989.9	21.3	19.3	30.8	18.4	33.8	16.1	36.0	17 1998	14.4	7 1992	82	21.2	2.0	1.8	13.5	0.4	155.7 1978	0.0	55.4	11 1978	
फरवरी FEB	I	988.0	23.6	21.5	33.5	20.7	36.5	18.0	39.0	26 1980	15.4	5 1988	82	24.1	3.0	2.5	7.2	0.5	14.0 1999	0.0	49.2	20 2000	
मार्च MAR	I	985.8	26.2	23.7	37.3	22.8	40.9	19.9	42.0	14 1983			80	27.4	1.7	1.4	6.5	0.4	88.5 1981	0.0	43.6	13 1981	
अप्रैल APR	I	983.6	29.2	25.5	39.6	25.5	43.0	22.4	44.5	30 1991	14.6	15 1987	73	29.7	2.1	2.0	17.6	1.0	65.6 1981	0.0	40.6	24 1981	
मई MAY	I	980.8	31.9	26.3	41.2	28.2	44.8	23.5	46.1	26 1984			63	29.7	2.7	2.5	27.0	1.4	94.3 1991	0.0	49.0	5 1981	
जून JUN	I	978.2	29.8	25.7	37.6	27.2	42.6	23.4	46.3	2 1998	21.8	12 1991	71	29.9	5.1	4.4	65.9	3.5	48.2 2000	0.0	81.7	12 1991	
जुलाई JUL	I	978.8	27.7	24.7	33.9	25.5	37.3	23.2	39.2	7 1992	22.0	2 1992	77	28.6	6.3	5.8	124.6	6.0	176.7 1977	36.8 1979	99.2	24 1977	
अगस्त AUG	I	979.6	27.1	24.3	32.8	25.0	35.4	22.8	37.5	25 1979	22.0	2 1981	78	28.2	6.1	6.0	133.0	6.7	189.0 1998	33.2 1979	88.2	14 1977	
सितम्बर SEP	I	982.0	27.4	24.4	33.6	24.9	36.4	22.8	38.5	23 1987	21.6	8 1989	77	28.3	4.9	4.2	145.5	5.8	393.1 1991	20.3 1984	152.2	21 1991	
अक्तूबर OCT	I	985.3	26.6	23.8	33.1	23.7	36.2	21.4	36.5	1 1987	19.2	28 1980	78	27.2	4.0	3.7	104.3	3.8	333.1 1981	4.2 1984	109.2	6 1987	
नवम्बर NOV	I	987.9	24.2	21.0	31.1	21.2	33.5	17.9	35.5	7 1996	14.6	27 1981	75	22.6	3.2	2.6	48.1	2.8	66.8 1991	1.1 1981	163.5	4 1987	
दिसम्बर DEC	I	990.3	21.7	18.6	30.0	18.6	32.2	15.7			12.6	16 1993	73	19.4	2.7	2.3	3.8	0.3	3.1 1987	0.0	3.1	10 1987	
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	983.9	26.7	23.4	34.8	23.7	44.3	15.9	46.3	2	12.6	16	75	26.6	3.7	3.2	696.8	32.5	631.7	631.7	163.5	4	
	II								6	1998	12	1993							1982	1982	11	1987	
वर्षोंकी सं NUMBER OF YEARS	I	19	19	19	19	19	21	22	19		19		19	19	18	17	20	20	16	16	23		
	II																						

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : नलगोंदा
STAION : Nalgonda

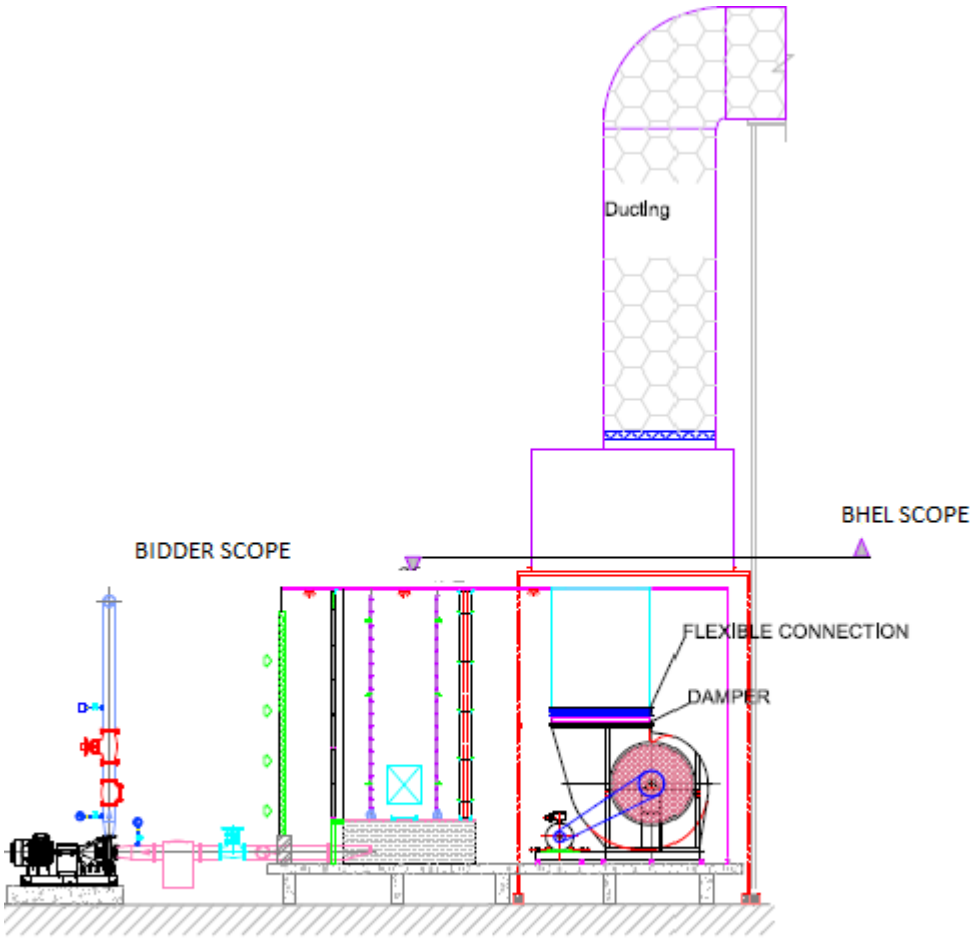
माह / MONTH	मौसम परिघटना — के साथ दिनों की संख्या / WEATHER PHENOMENA — No. OF DAYS WITH						पवन — पवन की गती के साथ दिनों की संख्या (कि. मी. प्र. घं.) / WIND — No. OF DAYS WITH WIND SPEED (Km. p. h.)				पवन — पवन की दिशा के दिनों की संख्या का प्रतिशत / PERCENTAGE No. OF DAYS WIND FROM										मेघ — मेघ मात्रा (सभी मेघ) सहित दिनों की संख्या - अष्ठमांश / CLOUD — No. OF DAYS WITH CLOUD AMOUNT (ALL CLOUDS) OKTAS					मेघ — निम्न स्तरी मेघ मात्रा सहित दिनों की संख्या - अष्ठमांश / No. OF DAYS WITH LOW CLOUD AMOUNT OKTAS						दृश्यता — दृश्यता सहित दिनों की संख्या / VISIBILITY — No. OF DAYS WITH VISIBILITY				
	वर्षण 0.3 मि.मि.या अधिक / PFT 0.3 mm Or more	ओले / HAIL	गर्जन / THUNDER	कुहरा / FOG	धूल भरी आंधी / DUST STORM	चंड वात / SQU ALL	62 या अधिक / 62 Or more	20-61 / 20-61	1-19 / 1-19	0 / 0	उ / N	उपू / NE	पू / E	दपू / SE	द / S	दप / SW	प / W	उप / NW	शांत / CALM	0	ले-2 / T-2	3-5 / 3-5	6-7 / 6-7	8 / 8	0	ले-2 / T-2	3-5 / 3-5	6-7 / 6-7	8 / 8	कुहरा 8 / FOG 8	1 कि.मी. तक / UP TO 1 Km.	1-4 कि.मी. / 1-4 Kms.	4-10 कि.मी. / 4-10 Kms.	10-20 कि.मी. / 10-20 Kms.	20 कि.मी. से अधिक / OVER 20 Kms.
जनवरी JAN	0.5	0.0	0.0	0.0	0.0	0.0	0	0	29	2	0	30	3	39	3	4	0	11	10	25	0	2	1	3	25	0	2	1	3	0	0.6	6.7	21.3	2.3	0.1
							0	0	31	0	0	29	10	51	3	1	0	4	2	25	2	3	0	1	27	1	2	0	1	0	0.0	1.8	3.1	24.1	1.9
फरवरी FEB	0.6	0.0	0.0	0.0	0.0	0.0	0	0	28	0	1	26	1	55	3	5	0	7	2	18	1	3	2	4	21	1	2	1	3	0	0.1	7.8	18.0	1.7	0.5
							0	0	28	0	1	19	7	64	3	2	0	2	2	22	1	4	1	0	24	1	3	0	0	0	0.0	0.4	4.2	21.2	2.2
मार्च MAR	0.7	0.0	0.1	0.0	0.0	0.0	0	1	30	0	1	25	1	55	3	5	0	9	1	23	2	3	1	2	25	1	3	1	1	0	0.0	3.8	24.1	2.9	0.3
							0	1	30	0	2	12	5	69	1	4	0	5	2	26	1	2	1	1	27	1	2	1	0	0	0.0	0.3	4.4	24.2	2.1
अप्रैल APR	1.1	0.0	0.0	0.0	0.0	0.0	0	0	29	1	0	20	1	46	4	18	0	8	3	20	2	4	2	2	21	1	4	2	2	0	0.0	3.0	21.5	4.3	1.1
							0	0	30	0	1	11	2	65	3	8	0	8	2	21	1	5	2	1	22	1	4	2	1	0	0.0	0.4	3.8	24.3	1.5
मई MAY	1.8	0.0	0.0	0.0	0.0	0.0	0	0	31	0	1	14	0	27	3	21	3	30	1	19	2	5	2	3	21	2	4	1	3	0	0.0	3.1	22.5	3.4	1.9
							0	0	31	0	1	20	2	29	2	19	2	24	1	6	2	18	3	2	20	2	5	2	2	0	0.0	0.6	3.6	24.4	2.4
जून JUN	4.5	0.0	0.0	0.0	0.0	0.0	0	1	29	0	1	2	0	6	0	36	8	47	0	5	1	5	4	15	7	1	4	3	15	0	0.0	4.7	20.2	3.1	2.0
							0	1	29	0	2	5	0	7	0	43	6	35	2	2	1	4	4	19	3	1	5	4	17	0	0.0	1.1	5.2	21.4	2.3
जुलाई JUL	7.1	0.0	0.1	0.0	0.0	0.0	0	1	30	0	1	1	0	1	0	43	10	44	0	2	1	3	5	20	4	1	2	3	21	0	0.0	4.3	23.1	1.9	1.6
							0	0	31	0	0	3	0	3	0	40	9	43	2	1	0	3	4	23	1	1	3	4	22	0	0.0	1.7	4.7	22.4	2.2
अगस्त AUG	7.7	0.0	0.0	0.0	0.0	0.0	0	1	30	0	1	1	0	2	0	32	8	55	1	2	1	5	3	20	3	1	4	2	21	0	0.0	4.1	22.8	2.5	1.6
							0	0	31	0	2	4	0	2	0	26	8	57	1	0	0	1	2	28	1	0	1	2	27	0	0.0	2.8	3.9	22.7	1.6
सितम्बर SEP	6.6	0.0	0.0	0.0	0.0	0.0	0	0	29	1	1	6	0	11	1	29	4	42	6	4	1	6	4	15	5	1	4	3	17	0	0.0	3.2	20.9	3.6	2.3
							0	0	29	1	4	17	1	10	0	25	6	31	6	1	0	2	3	24	2	0	2	2	24	0	0.0	1.3	4.5	22.2	2.1
अक्तूबर OCT	3.9	0.0	0.0	0.0	0.0	0.0	0	0	29	2	1	29	4	16	1	15	2	23	9	18	1	5	2	5	21	0	3	2	5	0	0.1	3.7	22.4	3.8	1.1
							0	0	30	1	2	37	6	26	1	7	2	12	7	22	1	3	2	3	23	1	3	1	3	0	0.1	1.5	3.9	23.6	2.0
नवम्बर NOV	3.3	0.0	0.0	0.0	0.0	0.0	0	0	26	4	3	33	7	18	2	4	0	19	14	16	1	4	3	6	21	1	2	2	4	0	0.0	8.8	17.8	2.9	0.4
							0	0	28	2	2	38	11	24	2	6	1	8	8	20	1	3	2	4	22	1	2	2	3	0	0.1	3.7	5.3	17.6	3.4
दिसम्बर DEC	0.4	0.0	0.0	0.0	0.0	0.0	0	0	29	2	3	46	3	22	1	2	1	14	8	21	1	4	1	4	23	1	3	1	3	0	0.1	6.8	20.8	3.3	0.0
							0	0	30	1	1	55	7	28	1	1	0	3	4	23	2	3	1	2	24	2	2	1	2	0	0.0	4.6	3.3	21.9	1.1
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	33.3	0.0	0.1	0.0	0.0	0.0	1	5	346	13	1	19	2	24	2	18	3	26	5	205	13	48	29	70	238	11	37	22	57	0	0.8	60.1	255.4	35.6	13.0
							1	3	355	6	1	21	4	33	1	15	3	19	3	238	14	39	26	48	257	14	34	20	40	0	0.1	20.1	49.9	269.9	25.0
वर्षोंकी सं NUMBER OF YEARS	22						22				22									21					21						22								

SECTION: I

SUB SECTION – C1A

SPECIFIC TECHNICAL REQUIREMENT FOR VENTILATION SYSTEM

1.0 INTRODUCTION



TYPICAL SCOPE (REFER APPROVED DOCUMENT IN DRAWING SECTION FOR DETAILS)

TABLE 1

Sl no.	Equipment	Make already approved	Document number/Remarks
1	Air Washer and its accessories	Advance Ventilation	DATA SHEET & GA FOR AIR WASHER & UAF ALONGWITH FAN AND PUMP AIR WASHER LAYOUT ALONG A ROW AND B ROW P&ID
2	UAF and its accessories	Advance Ventilation	
3	Pumps for above UAF and Air washers	Flow more	
4	Centrifugal Fan for AWU/UAF	Advance Ventilation	
5	Associated Piping	As per approved drawings	
6	Pre Filters	Puromatic	DATA SHEET & GA FOR PRE AND FINE FILTERS
7	Differential pressure transmitter	Honeywell	DATA SHEET FOR INSTRUMENTS FOR VENTILATION SYSTEM INSTRUMENT SCHEDULE WITH TAG NUMBER
8	Pressure transmitter for pump	Honeywell	
9	Pressure transmitter for Fan	Honeywell	
10	Level Transmitter for AWU tank	Honeywell	
11	Flow meter in make up line	Instrumentation Engineer	
12	Humidistat (for LT,HT and Boiler MCC) /Temp cum humidity sensor	Siemens	
13	Temperature Gauge	GIC	
14	Pressure Indicator	GIC	
15	Temperature Indicator	GIC	
16	Motors	LHP	DATA SHEET FOR MOTOR FOR FAN AND PUMPS
17	Valves	Bankim /Leader/Siemens (for Motorized valve)	DATA SHEET & GA FOR VALVES AND STRAINER
18	Strainer	DS Engg	

Above drawings/ Quality plan to be followed are already approved and are placed at drawing section of this Specification.

Basic engineering of Ventilation system such as Heat load, P&ID ,Fan & pump capacities of equipment have already been finalized with customer for Powerhouse and ESP / FGD Building.
Equipment /Layout drawings for specific makes of respective equipment (as per Table 1) have been finalized and are attached of this specification. In case bidder finalizes these makes, bidder is not required to submit these drawings/documents afresh. However, bidder shall be required to endorse the documents attached during detail engineering.

Further, it may be noted that bidder has the option to choose different makes (other than those for which drawings/ documents have been attached in the specification) for these items from the list of makes of sub vendor items attached at Sub Section E
In such a scenario, Bidder will have to submit Engineering document for such items in line with details mentioned in respective equipment GA/documents attached at Appendix 1.
However, any data which is proprietary in nature or standard for the model offered by OEM or not specifically insisted in this tender specification of the respective equipment may be updated/ modified suitably.

Above Major Items/ equipment are under Bidder scope of supply.
Bidder shall check and match required material and supply as per shipping/packing list. In case any mismatch /shortfall in receipt of material is noticed by BHEL the same shall be brought to Bidder notice for redressal without any financial /delivery implication to BHEL. After receipt of the material, storage & preservations including ward and watch of the material issued to them by bidder shall be under BHEL scope. Loss/ damaged material received, if any, shall be made good by bidder without any commercial impact to BHEL.

Civil Requirements

Bidder to note that civil details have already been finalized based on attached mechanical drawings and are under various stages of construction by BHEL. Bidder to supply air washers/UAF and its associated systems such as pumps, piping, Valves strainer etc considering these Civil inputs for powerhouse and ESP/FGD building(Refer Air washer layout in drawing section for reference). Any change required by bidder in these civil facilities during erection shall be carried out by bidder themselves.

S. No.	Equipment	Civil Foundation Details	Foundation Scope
Containerized Air washer with pump (outside AWU)			
a.	280000 CMH	AWU with Fan 8500x8500 mm Pump 2050 x950x350 mm	BHEL

UAF with pump (For ESP and FGD buildings)			
b.	100000 CMH	UAF 4000x300x625(Ht)mm UAF Fan 2606x2536x600mm Pump 1800 x950x300mm	BHEL

Electrical & Control Requirements

Bidder to note that electrical and C&I details have already been finalized based on attached mechanical drawings. Feeder details of motors and tentative BOQ of instruments to be supplied for the system is indicated in the table below.

S.No	Items	Motor rating (Kw)	Configuration W-working S- Stand by
1.	Centrifugal fan (140000 CMH / 85 mm WC SP)	55	24 W
2.	Centrifugal pump (min 310 CMH / min 30 m head)	45	12 W+12 S
1.	Centrifugal fan (100000 CMH / 60 mm WC SP)	30	5 W
2.	Centrifugal end suction pump (min 77 CMH / 30 m head)	15	5 W+ 5 S

For scope matrix of Electrical items between BHEL & vendor, please refer Scope matrix table at Electrical section of this specification

BOQ of Instruments to be supplied (Typical)

Instrument type	Tentative qty
Differential pressure transmitter	34
Pressure transmitter for pump	68
Pressure transmitter for Fan	58
Level Transmitter for AWU tank	34
Flow meter in make up line	17
Humidistat (for LT,HT and Boiler MCC)/Temp cum RH Sensor	20
Temperature Gauge	51
Pressure Indicator	68
Temperature Indicator	34

Bidder to refer approved P&ID for detailed instrument requirement

Specific Points to be taken care by bidder:

1) Bidder to provide Site Erection drawing, Shipping list , packing list, Assembly drawing, Piping drawing etc to enable Equipment erector at site for ease in erection after award of contract.
2) Any material shortfall observed during due course of erection shall be replenished by bidder with no financial/commercial implication on BHEL.
3) If equipment supplied is found to be inefficient during operation. Bidder shall set right the same with no commercial or delivery implication on BHEL.
4) Drain piping to nearest drain around shall be supplied by bidder
5) Bidder shall supervise in erection, commissioning (including Electrical and Control part) and PG test (approved document for the same is attached in drawings section.)
   Any item/ equipment not specifically mentioned in this tender but required for successful erection, commissioning and successful PG test of the its system shall be in bidder's scope of supply.

2.0 SPECIFIC REQUIREMENTS

2.1 Design Criteria for Ventilation system:

Outdoor conditions shall be considered as follows: -

	Summer	**Monsoon**	**Winter**
DBT (°C)	42.7	30.9	15.7
WBT (°C)	26.5	26.3	13.6

i) 10% margin shall be considered while sizing the equipment.

ii) All equipment shall be designed for continuous duty.

iii) All ventilation system shall operate on 100% fresh air.

iv) The air washer shall have minimum 90% saturation efficiency and UAF shall have 60% saturation efficiency.

v) Air Velocity through different system equipment should be maintained as follows:

a. Intake Louvers (except for AWU/UAF Units): 2m/s through face area (Max.)

b. Exhaust Louver: 2m/s through face area (Max.)

c. Volume Control dampers: 10m/s through face area (Max.)

d. Back Draft dampers: 5m/s through face area (Max.)

e. Moisture eliminators and Intake Louvers for AWU/UAF Units: 2.5m/s through face area (Max.)

f. Supply Air Grills: 6m/s through face area (Max.)

vi) Motor rating for centrifugal fans with backward curved blades and axial flow fans shall be minimum 115% of the fan power at duty condition. Motor rating for Pump motor shall be minimum 115% of pump power at duty condition.

4. EQUIPMENT AND SERVICES PROVIDED FOR VENTILATION SYSTEM:

4.1 AIR-WASHERS

a) Four (4) Nos. Packaged type Air washer units (AWU), each having a capacity of min. 2,80,000 m3/hr with 85 mm WC static pressure for each T.G. building considered. In total, 12 nos. air washers each of min. 2, 80,000 m3/hr. capacity for all 3 units shall be provided.

b) Fan shall be 4 no. Top discharge on A row side(for 2 Air washers) and 4 no. side discharge on B row side(for 2 Air washers)) for Each power house .Pl refer GA for details

b) Each air washer comprises of:

(i) Two (2) no. (2 x50% duty) Centrifugal fan backward inclined, DIDW Type, complete with electric drive motor, drive Pulleys, V-belt, belt guards, cushy foot mountings, slide rails, removable drain plug, and other accessories etc. and filter back wash arrangement.

(ii) Two (2) nos. (2 x 100 % duty) Back pull out / Horizontal Split Casing type centrifugal pumps for circulation of water shall be considered. Pump suction shall be provided with pot strainer with by-pass valves, inlet and outlet pressure gauge and filter back wash arrangement.

A spray nozzle system consisting of two banks spray system each connected to individual headers, flow regulating valves (Globe valve at Pump outlet) for controlling flow to spray

header. Nozzles shall be of stainless steel, pressure drop across nozzle shall be 1.4 - 2.4 Kg./sq.cm.

For details refer approved drawing provided

c) Moisture eliminators of die-extruded PVC construction.

d) Automatically cleanable type Stainless Steel mesh filters complete with SS / Aluminum frame continuously flooded with water by double bank of spray header with Stainless Steel water spray nozzles spraying water over the filters in the direction of airflow.

e) Air filters (SS-316) complete with fixing frame.

f) Intake louver with frame & bird screen (of GI Construction).

g) All valves, pipes, nuts & bolts, pipe hangers, supports, internal fittings and supports including ball float valves for makeup water connection, Low-level Switch with Alarm, quick-fill connection with valve, drain piping with valve up to the nearest drain point and overflow connection with siphon.

h) Inspection door and marine lights with ladder for different section and cat walks as required.

i) Drain pipe with siphon, marine light in each section.

j) No masonry Room shall be provided for the Air washer units including its accessories. All accessories including centrifugal Fans shall be placed inside a double skin sheet metal casing. However, the water circulating pump sets shall be located outside this AWU casing which shall be provided with canopy.

k) Double skin panel (inside and outside) shall be fabricated using (24 G) galvanized steel, with 25 mm. thk. Polyurethane insulation in between GSS channels. Outside skin shall be pre-plasticized & inside sheet shall be plain GI.

n) Efficiency of centrifugal fan and pump shall not be less than 70%.

o) For further details of Air Washer Units, refer Section-I, Sub-Section-C2A for Customer specification and P & ID for Air washer system and UAF's (Annexure-B) of this specification.

p) Electrical feeder suitable for following motor rating shall be provided for Air washer equipment. Bidder to ensure that motor rating is not more than the rating mentioned below.

4.2 UAF- Unitary Air Filtration

One (1) no. Sheet metal type Unitary Air Filtration system (UAF) having adequate capacity and static pressure shall be placed at roof of each ESP Control bldg. and 2 no. at roof of each FGD MCC cum Control Bldg stage 2.

Fan shall be 1 no. side discharge on Roof of ESP /FGD building row side for Each UAF .Pl refer GA for details

One (1) no. UAF comprises of:

a) One (1) No. (1X100%) Centrifugal fan backward inclined, SISW type, complete with electric drive motor, drive Pulleys, V-belt, cushy foot type mounting, belt guards, slide rails, removable drain plug and other accessories etc. Both inside and outside of surfaces of all parts of the fans shall be spray galvanized.

b) Fresh air intake louver with bird screen of GI construction.

c) Two (2) Nos. (2 x100 % duty) Back pull out / Horizontal Split Casing type centrifugal pumps for circulation of water. Pump system shall be provided with pot strainer with by-pass valves, inlet and outlet pressure gauge with isolating cock, fitting and accessories, complete with makeup water plumbing with hangers/supports, float valve, internal fittings and supports, over flow connection and drain connection with valve and siphon and filter back wash arrangement. Each Pump motor set shall be provided with canopy.

d) Automatically cleanable type Stainless Steel mesh Filters complete with SS / Aluminium frame continuously flooded with water by one bank of spray header with Stainless Steel water spray nozzles spraying water over the filters in the direction of airflow.

e) Moisture eliminator sets of die-extruded PVC construction.

f) GI sheet metal casing with inspection window, ladder and catwalk, water tank, flexible connection piece with tank.

g) UAF chamber of sheet metal (2mm MS) construction with 3mm thick MS tank etc. Both the casing & the water tank shall be of epoxy painted from inside & outside and shall be complete with all valves, pipes, nuts and bolts, pipe hangers, supports, internal fittings and supports, suction pipe connection with coarse strainer, Low Level switch with alarm, make-up water connection with ball float valve, overflow

connection with siphon, drain connection with valve, quick fill connection with valve etc.

h) Intake louver with frame & screen (of GI Construction)

i) Inspection door with ladder, marine light and cat walk in the spray chamber.

j) Efficiency of centrifugal fan and pump shall not be less than 70%.

k) Each Air washer/UAF unit shall have one local control panel located near each air washer/UAF unit for its control. For further details of please refer Section-I, Sub-Section C2A.

l) For details of Unitary Air Filtration, refer Section-I, Sub-Section-C2A for Customer specification and approved P & ID for Air washer system and UAF's drawing section

5.4 AIR WASHER

a) Moisture Eliminators plates: 100% virgin PVC die-extruded construction of minimum finished thickness of 2 mm.

b) Moisture Eliminator Frame: 22 SWG GI sheets and GI angle of adequate strength. ft sleeve: EN - 8 or eqv.

c) Distribution plates: 18 G GSS to have 50% free area.

d) Tank: Black MS for sheet metal Air washer (6mm) thk (Epoxy paint both inside and outside of tank). Min depth -800mm

e) Piping: MS Heavy class (Galvanized) to IS: 1239 Part I or IS: 3589 depending on size.

f) Suction Screen for Water: SS (40 mesh size 2 nos for each air washer)

g) Spray and flooding nozzles: SS

5.5 UNITARY AIR FILTERATION

a) Eliminators plates: 100% virgin PVC die-extruded construction of minimum finished thickness of 2 mm.

b) Top Surface of the UAF shall be thermally insulated with 13 mm thick thermal insulation made of Aluminium foil faced closed cell elastomeric Nitrile Rubber (of density min. 40 Kg/CuM) / XLPE (of density min. 33 Kg/CUM) or equal having a thermal conductivity not exceeding 0.035W/MK. The insulation shall have self-extinguishing & non-dripping properties against fire attack. Insulation shall be covered with metal sheet of min 18 SWG.

c) Tank: M.S. 3mm thick (Epoxy Paint) both inside and outside of tank.

d) Casing: M.S. 2mm thick (Spray galvanized or two coats of epoxy paint).

e) Distribution plates: 18 G GSS to have 50% free area.

f) Piping: MS Heavy class Galvanized to IS: 1239 Part I / IS 3589 depending on size.

g) Suction Screen Water: SS.

h) Spray and flooding nozzles: SS.

i) Banks: Single bank type (along the air flow), spraying water over the filters.

5.6 AIR FILTERS

5.6.1 PRE FILTER

a) Filter Media: The filter media shall be of High Density Poly Ethylene

b) Efficiency: efficiency shall be about 90% down to 10-micron size particles when tested in accordance with BS: 6540 / ASHRAE – 52-76.

c) Allowable pressure drop: Initial pressure drop – Not to exceed 6.0 mm WC at rated flow. Final pressure drops- Up to 10 mm WC.

d) Frame Work 18 G GSS. Filter mounting frame shall be GI angle iron frame of adequate thickness.

e) Size – 610 x 610 mm (Approx.)

f) **SS FILTER** (for Air washer / UAF units) The filters shall be washable/cleanable type construction of SS 316 wire netting with three or more layers of wire mesh of different mesh sizes stitched together and held in a SS / Al frame of adequate thickness but not less than 18 SWG for Al and 20 SWG for SS suitable for long use in an industrial plant. The filter when flooded shall have a filtration efficiency of 90% down to 10 microns. The filter mat shall be weaved with SS wire of 0.16mm diameter providing an aperture of max 0.025mm

g) The pressure drop across the filter shall be restricted to 8 mm of WG in clean condition and 12 mm of WG in dirty condition.

5.7 WATER FILTER FOR UAF

As per clause no. 5.6.1(F)

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5.8 VALVES:

a) Valves shall have full sizes port and suitable for horizontal and as well as vertical installation.

b) Valves for regulating duty shall be of globe type suitable for controlling throughout its lift.

c) Gate, Globe and stop check valves shall have bonnet back seat to facilitate easy replacement of packing with the valves in service.

d) All safety / relief valves shall be so constructed that the failure of any part does not obstruct the free discharge.

e) Manual gear operator shall be provided for valves of size 250 NB and above.

f) All valves with rising stem shall have position indicators.

g) All valves shall be provided with locking arrangement.

h) All water line valves shall be of cast iron body for sizes 65 NB and above conforming to IS: 14846 and Gun metal construction for sizes less than 65 NB conforming to IS: 778. Cast iron parts shall conform to IS: 210 Gr. FG 260.

Tentative BOQ of valves (Pl refer approved P&ID for valve requirement of Air washer and UAF)

S.NO	SIZE	Valve	Total qty STAGE2
1	40	GATE VALVE	68
2	100	GATE VALVE	5
3	125	GATE VALVE	10
4	200	GATE VALVE	12
5	250	GATE VALVE	24
6	100	GLOBE VALVE	10
7	200	GLOBE VALVE	24
8	100	CHECK VALVE	10
9	200	CHECK VALVE	24
10	125	POT STRAINER	10
11	250	POT STRAINER	24
12	100	MOTORZIED BUTTERFLY VALVES	10
13	200	MOTORZIED BUTTERFLY VALVES	24

5.9 CENTRIFUGAL PUMP

a) Pump shaft: EN-8 as per ES-900

b) Casing: Cast iron to IS: 210 GR. FG-260.

c) Shaft Sleeve: SS 316/ Bronze as per IS-318.

d) Base plate: Carbon steel as per the IS-2062 Gr.B.

e) Bolt and nuts: M.S. (Epoxy painted / Galvanized).

f) Type of seal: Mechanical

For further details of individual equipment listed at Sl.no 4 & 5, kindly refer attached customer specification Section-I, Sub-Section-C2A for Customer specification.

7.0 PLANT CONTROL FOR EVAPORATIVE COOLING AND VENTILATION SYSTEM

1. Refer approved Control philosophy in drawing section for details

2. The operation of the Ventilation plant and associated Air washers/UAF shall be done from the PLC based control System which is common with air conditioning system (PLC shall be part of the air conditioning system package).

   - PLC based controls in the ventilation system is provided only for the air washers of the powerhouse building and UAF for ESP control building and FGD MCC cum control building.

2. Air washer units shall be started/stopped by initiation from air conditioning system PLC and the starting/stopping of fans and pumps shall be automatic upon such initiation.

3. There shall be inter-locking of the Fire dampers & AWU/UAF with the PLC panel of the air conditioning system (part of air conditioning system package) and the fire alarm panel (part of fire protection and detection system package).

4. The operation of the pumps shall be interlocked with the low level of water in the sump. High level of the sump shall be annunciated. The standby pump shall be started automatically when the working pump is stopped/tripped.

5. Miscellaneous control requirements

   a. Separate emergency local stop push button shall be provided for each pump, fans etc. of ventilation system by BHEL

8.0 ACCEPTANCE TEST

Temperature test at the out let of Air washer & UAF. Both DB and WB temperature shall be measured by measured by sling psychrometer which will have accuracy of +/-0.5% with at least count of 0.5 deg C. This will be carried out for 24 hrs. Continuously and readings will be taken every one hours interval. Standby equipment should be changed over during these 24 hours. This test shall be carried out during summer. The format for recording the readings is enclosed at drawing section

Performance test of the Ventilation system shall be carried out at site after proper installation. The site test shall include performance testing of equipment for 72 continuous hours in summer or monsoon and 24 continuous hours in winter. Bidder, as may be required to carry out site tests shall arrange all instruments, tools etc.

The following measurements are also to be done prior to the acceptance of the plant by the client:

01. Air Quantity measurement to be taken at the Inlet Louver to establish the Equipment capacity in line with the specification requirement.
02. Power consumption to be measured for each equipment to establish the total Guaranteed Power consumption.
03. Measurement of Noise and Vibration for different Equipment.
04. Establishment of the saturation efficiency for all the Air Washer and Unitary Air Filtration Units.
05. Design dry bulb temperature and relative humidity of conditioned air

Instruments required for performance testing of various equipment / system of the package shall be arranged by Vendor at site. All calibrated instruments to be used for the tests at manufacturer's works/site shall be arranged by the bidder. Any Electrical/C&I items and accessories like junction box, glands etc. shall be included by vendor in his scope.

Bidders shall guarantee to maintain specified inside design conditions during summer, monsoon and winter and also even if the internal equipment load varies from 100% to 25%.

Besides the system performance as above, bidder shall guarantee major technical parameters of various equipment's as per design basis / details furnished.

9.0 GENERAL

9.1 Basis of design, all calculations including heat load calculations for all seasons, equipment selection criterion, layout drawings/ schemes/G.A. dwg and documents like data sheet/ technical particulars etc. are subject to Customer approval during detail engineering stage.

9.2 All drawings and documents shall be computer based.

9.3 All commissioning spares & consumables for trouble free operation shall be provided.

9.4 Quality Requirements in the Technical Specification are indicating minimum requirements for inspection and testing. Vendor shall note that quality plan is subject to Customer & BHEL approval during detail engineering stage.

9.5 Indicative list of makes is enclosed elsewhere in the specifications; however, this equipment's / items shall be subject to Customer & BHEL approval during detail engineering Stage.

9.6 Instruments required for performance testing of various equipment / system of the package shall be arranged by Vendor at site.

9.7 Instrument for testing shall be calibrated by Ventilation plant supplier before taking up testing.

9.8 Inserts or any support arrangement for fixing ducting, fans, piping etc. shall not be provided by BHEL except for supporting structure mentioned in exclusion. Necessary supports may be taken from nearest structure / walls / roofs / floors etc. by Vendor.

9.9 Drain piping for ventilation equipment shall be supplied to the nearest drain by bidder.

9.10 Tools & tackles as required for regular maintenance shall be supplied by Vendor.

9.11 Temperature gauges shall be provided with thermo wells and fixing arrangement.

9.12 Pressure gauges shall have provision for air venting. Three way valves shall be used which shall have air venting provision.

9.13 Matching sockets / stubs (weld type) for flow switches and other instruments shall be supplied.

9.14 Tender drawings enclosed form the part of specification and the bidder shall check the space requirements.

9.15 The drawings/ documents submitted by vendor shall be complete in all respects with revised drawing submitted incorporating all comments. Any incomplete drawing submitted shall be treated as non- submission with delays attributable to vendor's account. For any clarification/discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL / Customer's place any number of time as per the requirement for across the table discussions/ finalizations/ submissions of drawings.

9.16 Bidder to note that the P&ID shows only the bare minimum requirement of valves and instruments. Any instrumentation & valves as required for the completion of the system in line with technical specification shall be provided by bidder during detailed engineering without any commercial implication.

9.17 All the equipment of Ventilation system shall be designed for continuous duty for continuous operation of 24 hours a day.

9.18 All codes and standards shall be as per contract specifications.

9.19 All chemical, regents, lubricants and consumables such as grease etc. required for pre-commissioning, commissioning, performance testing and till one year of operation after handing over shall be provided.

9.20 Vendor to furnish drawings / documents as per the drgs. /documents submission schedule given in the contract.

9.21 All electrical equipment shall be suitable for the power supply fault levels and other climatic conditions indicated in project information / synopsis enclosed with the specification and Section-I, Sub-Section-C3 of the technical specification.

9.22 The bidder's proposal shall be for equipment in accordance with the Tech. Specification.

9.23 In the event of any conflict between the requirements of two clauses of this specification documents or requirements of different codes and standards specified, the more stringent requirement as per the interpretation of the owner shall apply.

9.24 Bidder to note that BHEL reserve the right for drg/doc submission through web based Document Management System. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Bidder to ensure proper net connectivity at their end.

9.25 Besides the system performance as above, bidder shall guarantee major technical parameters of various equipment as per design basis / details furnished.

9.26 The guarantee tests shall cover but not limited to the following rated parameters for smooth operation of ventilation system.

- Design dry bulb temperature and relative humidity of conditioned air, Auxiliary power consumption, Vibration and noise level etc.
- Performance test of the Ventilation system shall be carried out at site after proper installation. The site test shall include performance testing of equipment for 72 continuous hours in summer or monsoon and 24 continuous hours in winter. Bidder, as may be required to carry out site tests shall arrange all instruments, tools etc.
- All calibrated instruments to be used for the tests at manufacturer's works/site shall be arranged by the bidder. Any Electrical/C&I items and accessories like junction box, glands etc. shall be included by vendor in his scope. Only those items shall be provide free of cost which are categorically listed in the Electrical scope sheet of technical specification.

9.27 Though its endeavoured to provide accurate BOQ. Nevertheless, Instrument /Valve BOQ mentioned in tender are indicative. Any other items(instruments) required for completion of job of system shall be supplied by bidder without any commercial impact and shall be deemed to be included in bid.

10.0 EXCLUSIONS

Items of works listed below are excluded from scope of the Ventilation plant supplier.

10.1 Construction of foundations for Ventilation equipment’s i.e, air washer unit and UAF along with pumps.

11. ELECTRICAL

For electrical requirements of system, refer Electrical Section-I,

12. CONTROL AND INSTRUMENTATION -

For controls and instrumentation of Ventilation system, refer C&I Section-I,

Services to be provided by the bidder

1.1 Detailed Erection and commissioning procedure shall be submitted by successful bidder for carrying out the erection and commissioning at site by BHEL.

1.2 Scope of Supervision for Erection & commissioning: Tentatively following visits shall be planned by site team which shall be as follows: -

a) One visit for supervision for erection of AWU/UAF with accessories
b) One visit for Supervision of commissioning of AWU/UAF with accessories
c) One visit for Supervision of Trial run/PG Test
d) Any additional visit as per requirement of BHEL site office during erection of equipments.

Note: Bidder shall be informed at least 10 days in advance for the requirement of visit at site. Visiting team shall consist of one expert of bidder.

Instructions for storage and preservation of its equipment same shall be provided to BHEL during handing over

Training to customer's O&M staff at site during visit for supervision of E&C and maintenance services.

SECTION: I

SUB-SECTION: C 2A

CUSTOMER SPECIFICATION-TECHNICAL REQUIREMENT

VOLUME: IIID

SECTION-II

TECHNICAL SPECIFICATION FOR VENTILATION SYSTEM

CONTENTS

VOLUME: IIID

SECTION - II

VENTILATION SYSTEM

1.00.00 **INTRODUCTION**

1.01.00 The purpose of the system is to provide ventilation for different areas of 1X800 MW Supercritical Thermal Power Plant (Stage –VII, Unit #12 at Kothagudem Thermal Power Station, Telangana) to achieve the following :-

i) Acceptable working environment.

ii) Scavenging out structural heat gain and heat load from various equipment, hot pipes, lighting etc.

iii) Dilution of air polluted due to generation of obnoxious & hazardous gaseous/aerosol contaminants like acid/chemical fumes, dusts etc.

1.02.00 Evaporative Cooling System with Air Washer Units (AWU) shall be adopted for the ventilation of the following areas of Power House Building:

i) TG Hall

ii) MCC, Switchgear rooms and cable spreader rooms

iii) Battery Charger Rooms

1.03.00 Mechanical Dry Ventilation System with either Supply or Exhaust Fans shall be provided for the following areas of the Power House Building:

i) Battery Rooms

ii) Elevator Machine Rooms

iii) Toilets

1.04.00 Mechanical Dry Ventilation System with Exhaust Fans shall be provided for the following areas of Mill Bay:

i) Coal Conveyor Tripper floor

1.05.00 Similarly evaporative cooling system with Unitary Air Filtration Units (UAF) shall be provided for the ventilation system for the MCC / Switchgear Rooms and other non-AC areas of the following areas:

i) Non-AC areas of ESP Control Building

ii) Ash handling electrical / control building.

iii) CHP control building

1.05.00 Dry Ventilation System with either Supply or Exhaust Fans shall also be provided for the following Auxiliary Buildings:

a) DG and Compressor House
b) Ash slurry pump house
c) HFO & LDO forwarding pump house
d) CW treatment building
e) DM Plant building
f) DM, service and potable water pump house
g) Non-AC areas of Chemical House
h) CPU Regeneration Building
i) Switch yard control building
j) CW Pump House
k) AHP Compressor Building
l) Non-AC areas of Service Building
m) Silo Utility-cum-HCSD Pump House
n) Vacuum pump house
o) Ash water pump house
p) Clarified water pump house
q) Centrifuge building
r) Store Building

2.00.00 **SYSTEM DESCRIPTION**

2.01.00 Evaporative cooling system by adopting Air Washer Unit (AWU) is to be provided for the ventilation of Power House Building. Cooled and filtered air from Air Washer Units should be distributed by means of ducting to the TG building near various heat sources like turbo-generator, condenser, boiler feed pump, HP & LP heaters, oil coolers etc. The quantity of air exhausted should be kept lower than the quantity of air supplied (usually 60-65% of the supply air is exhausted) in such a way that a little over pressure is maintained inside the hall. This will reduce infiltration of outside hot and dusty air.

On the basis of net heat gain and assumed temperature rise, the supply air quantity for TG hall is to be worked out. This air quantity will be supplied from four (4) AWU - two (2) being placed on B-C bay at De-aerator floor and two (2) being located outside A row of Power House building. Such division and location area is decided to achieve effective air distribution with fewer amounts of duct work and less pressure drop in fans with no cross-over of ducting across A-B bay.

The Air Washer Units will primarily serve TG hall and the electrical areas like MCC Room, Switchgear Room and Cable Spreader Room. The washed air supplied to MCC / Switchgear / Cable Spreader Rooms will be exhausted outside through gravity dampers / exhaust fans (usually 60-65% of the supply air is exhausted to maintain a little overpressure inside the room). Fire dampers (Motorized) shall be provided in the supply air ducting / fans leading to all electrical rooms (MCC, Switchgear etc.).

The supplied air in the lower level of TG hall after taking the heat load of TG bay rises through different openings to the upper floors and is then finally exhausted by means of Roof extractors placed over the roof of TG Hall. Some quantity of air leaks out through various leakage areas due to the overpressure maintained inside the TG Hall.

All these Air Washer Units shall be of package type construction enclosed in sheet metal casing to avoid the problem of water seepage and also to reduce load on building structure. Sump of AWU to be made out of sheet metal / masonry construction with anti-corrosive paintings. All accessories (except water circulation pumps with drive motors, strainers and some portion of piping) shall be placed inside the AWU casing.

Roof extractors are to be provided with rain water protection cover.

While developing the layout, all fresh air ventilation louvers shall be considered 1000 mm from floor level and directed downwards at an angle. Ventilation fans on AB bay roof shall be kept staggered and shall not be near the centerline of turbo generator set.

2.02.00 Exhaust (pull type) ventilation system is adopted for the Battery Rooms by providing Bifurcated type axial flow exhaust fans (1R+1S) of spark proof construction and with flame proof motors and fusible link type fire dampers. In the event of failure of any of the battery room exhaust fans, the second fan will be put into operation to take care of the ventilation need of this Battery Room. All the parts of this system coming in contact with acid fumes shall be epoxy painted. The air discharge from the Battery Room shall be taken to a high level (around 1M above TG Building Roof Level) through an exhaust duct (MS Epoxy painted). In case routing of such exhaust duct is not feasible, the steel parts in a radius of around 5M from the discharge end of the Battery Room Exhaust Fans shall have to be painted with acid resistant epoxy resin based paint. Intake Air for the battery room shall be drawn from the adjacent TG hall through manually operated louver shutter provided in the Battery Room.

A negative pressure shall be maintained inside the Battery Room to prevent leakage of acid fumes and other hazardous gases outside the Battery Room.

2.03.00 Coal conveyor tripper floor of the Mill Bay shall be ventilated by means of Roof Extractors. Air intake louvers should be provided at lower level for air entry to the coal tripper floor.

2.04.00 Pressurized Ventilation system shall be provided for the Elevator Machine rooms with the help of wall mounted Fan-Filter Units. Air will be exhausted through Back Draft Dampers.

2.05.00 Exhaust Ventilation system shall be provided for the Toilets by installing wall mounted type exhaust fans. Air will enter the toilets through door grilles.

2.06.00 In the MCC/ switchgear room of ESP, AHP & CHP Control Building, washed and filtered air supply will be provided by the Unitary Air Filtration Unit due to the reasons that the this building is located in a very dusty zone and heat load of this Building is high.

2.07.00 Ventilation provision for Auxiliary Buildings in various locations shall be done as follows:

Sl. No.	**Building**	**Ventilation System**
1.	Electrical MCC/Switchgear areas of ESP Control Building.	Washed and filtered air supply from Unitary Air Filtration Unit (UAF) and exhausting it by back Draft Dampers.
2.	Electrical MCC/Switchgear areas of AHP Control Building.	Washed and filtered air supply from Unitary Air Filtration Unit (UAF) and exhausting it by back Draft Dampers.
3.	Electrical MCC/Switchgear areas of CHP Control Building.	Washed and filtered air supply from Unitary Air Filtration Unit (UAF) and exhausting it by back Draft Dampers.
4.	DG and Compressor Building	For DG area air entry through intake louvers for radiator cooling (in case of air cooled DG) will serve the purpose of ventilation. For water cooled DG, exhaust ventilation will be provided by wall mounted exhaust fans and air entry through inlet louvers. For Compressor area wall mounted Supply air Fan Filter Units and air exhaust through Back Draft Dampers. For the associated Electrical room, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers.
5.	DM Plant building	Wall mounted Exhaust Fans for Plant area and Chemical Storage area and fresh air entry through Inlet Louvers.

6.	Ash Slurry Pump house	Wall mounted supply fans for the pump area. Hot air will be exhausted through wall mounted louvers. For the associated Electrical room, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers.
7.	HFO & LDO Forwarding Pump house	For pump area, wall mounted Exhaust fans of spark proof construction with flame-proof motors and fusible link type fire dampers and fresh air entry through Inlet Louvers. For the associated Electrical room, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers.
8.	CW Treatment Building	Wall mounted Exhaust Fans and fresh air entry through Inlet Louvers.
9.	DM, Service & Potable Water Pump House	Wall mounted supply fans for the pump area. Hot air will be exhausted through wall mounted louvers. For the associated Electrical room, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers.
10.	Chemical House	Wall mounted Exhaust Fans for Plant area and fresh air entry through Inlet Louvers. For the associated Electrical room, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers.
11.	CPU Regeneration Building	Wall mounted Exhaust Fans for Plant area and fresh air entry through Inlet Louvers.
12.	Switch Yard Control Building	For battery room, wall mounted Exhaust fans of spark proof construction with flame-proof motors and fusible link type fire dampers and fresh air entry through Inlet Louvers. For the associated Electrical room, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers.

13.	Store Building	Wall mounted Exhaust Fans and fresh air entry through Inlet Louvers.
14.	CW Pump House	Wall mounted supply fans for the pump area. Hot air will be exhausted through wall mounted louvers. Alternatively, evaporative cooling system may be considered for pump area. For the associated Electrical room, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers.
15.	AHP Compressor Building	For Compressor area wall mounted Supply air Fan Filter Units and air exhaust through back draft dampers. For the associated Electrical room, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers.
16.	Service Building	For Electrical rooms, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers. Exhaust Ventilation system shall be provided for the pantries by installing wall mounted type exhaust fans. Air will enter through door grilles / inlet louvers. Exhaust Ventilation system shall be provided for the stores by installing wall mounted type exhaust fans. Air will enter through door grilles / inlet louvers.
17.	Silo Utility cum HCSD Pump House	Wall mounted supply fans for the pump area. Hot air will be exhausted through wall mounted louvers. For Electrical rooms, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers.
18.	Vacuum Pump House	Wall mounted supply fans for the pump area. Hot air will be exhausted through wall mounted louvers.
19.	Centrifuge Building	Wall mounted Exhaust Fans and fresh air entry through Inlet Louvers.

20.	Ash Water Pump house	Wall mounted supply fans for the pump area. Hot air will be exhausted through wall mounted louvers. For the associated Electrical room, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers.
21.	Clarified Water Pump house	Wall mounted supply fans for the pump area. Hot air will be exhausted through wall mounted louvers. For battery room, wall mounted Exhaust fans of spark proof construction with flame-proof motors and fusible link type fire dampers and fresh air entry through Inlet Louvers. For the associated Electrical room, Pressurized ventilation with wall mounted fan filter units and air exhaust through back draft dampers.
22.	Toilets (For all areas)	Exhaust Ventilation system shall be provided for the Toilets by installing wall mounted type exhaust fans. Air will enter the toilets through door grilles.

N.B. **Above requirement is tentative only based on the current Plot Plan. Final requirement of ventilation will be decided during detail engineering when the list of buildings will be finalized and layout drawing of each building will be frozen.**

2.08.00 In general, for a particular area / room ventilation equipment / systems shall be selected in multiple modules and therefore no idle stand-by equipment has been envisaged. However, for the Battery Rooms one idle stand-by fan unit shall be provided in consideration of their locations and hazardous spreading of acid fumes in case of failure of running fan.

3.00.00 **SCOPE OF SUPPLY**

3.01.00 **Equipment**

Equipment sizing is to be done on the basis of heat load and number of air changes. The higher of the sizes arising out of these requirements should be considered. Selection of fan duty conditions is to be supported by back-up calculations, to be enclosed with bid.

3.01.01 Centrifugal Fan unit each complete with:

a) Fan impeller (backward curved) with casing and supports and required steel frame / supporting structure, if any.

b) Electric drive motor of suitable rating considering at least 15% margin over the shaft power consumption.

c) Drive Pulleys, V-belt, belt guards, slide rails etc.

d) Dampers at fan outlet and flexible connection (Rubberized Canvas) with matching flanges.

e) Vibration isolators (rubber in shear type / neoprene rubber pad), foundation bolts and nuts.

f) Removable drain plug with the fan casing.

NB: These Centrifugal fans also cover those required for Air Washer and Unitary Air Filtration Units.

3.01.02 Wall mounted axial flow fans each complete with:

a) Fan impeller of cast alloy aluminium construction (LM-6 Grade) with blades of aerofoil design.

b) Electric drive motor of suitable rating considering at least 15% margin over the shaft power consumption including motor brackets.

c) Vibration Isolators.

d) Short duct (wherever required).

e) Coned inlet and grouting framework, if any.

f) Rain protection cowl with bird-screen made of GI, Foundation Bolts etc.

g) Dry filters including fixing framework for fan filter unit (wherever required).

h) Back draft dampers, wherever specified.

i) Protective wire netting inside the room, wherever required.

N.B. For Toilets, Pantries, Stores requiring small capacity fans, Propeller type fans are acceptable.

3.01.03 Roof mounted axial flow fan (Roof Extractor) each complete with:

a) Fan impeller of cast alloy aluminium construction (LM-6 Grade) with blades of aerofoil design.

b) Electric drive motor of suitable rating considering at least 15% margin over the shaft power consumption including motor brackets.

c) Vibration Isolators.

d) Short duct mounting (if required) having inspection door and base with proper water sealing arrangement.

e) Grouting Frame.

f) Fan casing of heavy gauge sheet steel construction.

g) Rain protection hood / cowl with bird screen and disconnection switch, foundation bolts etc.

3.01.04 Sheet metal type Air washer Units (AWU), each complete with:

a) Air Intake Louver with bird screen of GI construction.

b) Automatically cleanable water flooded stainless steel mesh filters cleaned by one bank of spray header with stainless steel water spray nozzles spraying water over the filter in the direction of air flow and one more bank of spray header with stainless steel water spray nozzles spraying water opposing the air flow.

c) Two numbers Horizontally Split casing / back pull-out type Centrifugal pump sets (one running and one standby) complete with drive motor for circulation of water through the above spray header banks and provided with pot type suction strainer with bypass valves, inlet and outlet pressure gauges and filter back wash arrangement.

d) Moisture eliminator sets of die-extruded PVC construction.

e) Inspection doors with ladder and marine lights for different sections and cat walks as required.

f) All valves, pipes with fittings, nuts and bolts, internal fittings and supports, including ball float valves for make-up water connection, quick-fill connection with valve, drain piping with valves up to the nearest drain point, and overflow connection with siphon.

g) Double inlet Double width Centrifugal fan with electric drive motor, drive pulleys, v-belt, belt guards, cushy foot mountings, removable drain plug and other accessories as required. Both inside and outside surfaces of all parts of the fan shall be spray galvanized. The fan with drive motor shall be placed inside casing of AWU.

h) Air washer casing shall be sheet steel fabricated construction with adequate stiffeners, bracings etc. (duly spray galvanized / painted with epoxy resin based paint from inside and outside) covering all components of the Air Washer Unit including Centrifugal Blowers, but excluding the water circulating pump sets.

Top Surface of the AWU shall be thermally insulated with 13 mm thick thermal insulation made of Aluminium foil faced closed cell elastomeric Nitrile Rubber (of density min. 40 Kg/CuM) / XLPE (of density min. 33 Kg/CUM) or equal having a thermal conductivity not exceeding 0.035W/MK. The insulation shall have self extinguishing & non-dripping properties against fire attack.

Air Washer Sump made of sheet metal construction / masonry construction and duly painted with epoxy resin based paint both from inside and outside. The sump shall be complete with make-up water connection with float valve, quick fill connection with isolating valve, drain connection with valve, overflow connection with siphon and coarse strainer chamber and low level switch.

NOTE: Bidder will indicate make up water requirement for the equipment offered by them.

3.01.05 Unitary Air Filtration (UAF) units each consisting of:

a) Air Intake Louver with bird screen of GI construction.

b) Automatically cleanable type Stainless Steel mesh Filters complete with SS / Al. frame continuously flooded with water by one bank of spray header with stainless steel water spray nozzles spraying water over the filter in the direction of air flow.

c) Two (2) nos. (one no. working and one no. stand-by) Centrifugal mono-bloc pumps for circulation of water. Pump system shall be provided with pot strainer with by-pass valves, inlet and outlet pressure gauges and filter back wash arrangement.

d) Moisture eliminator sets of die-extruded PVC construction.

e) UAF chamber & sump shall be of sheet metal construction. Both the casing and water sump shall be duly spray galvanized / painted with epoxy resin based paint from inside and outside and shall be complete with all valves, pipes, nuts and bolts, pipe hangers, supports, internal fittings and supports, suction pipe connection with coarse strainer, make-up water connection with ball float valve, quick fill connection with isolating valve, drain connection with valve, overflow connection with siphon and low level switch.

Top Surface of the UAF shall be thermally insulated with 13 mm thick thermal insulation made of Aluminium foil faced closed cell elastomeric Nitrile Rubber (of density min. 40 Kg/CuM) / XLPE (of density min. 33 Kg/CUM) or equal having a thermal conductivity not exceeding 0.035W/MK. The insulation shall have self extinguishing & non-dripping properties against fire attack.

f) Interconnecting G.I. piping between pump and UAF Spray Header / Sump complete with necessary supports and supporting structures etc.

g) Inspection door with ladder, marine lights and cat walk in the spray chamber.

h) Single inlet single width Centrifugal fan complete with electric drive motor, drive pulleys, V-belt, belt guards, slide rails and other accessories etc. Both inside and outside surfaces of all parts of the fan shall be spray galvanized.

i) GI connection piece between the centrifugal fan and UAF casing.

3.01.06 GI sheet steel fabricated ducting including the following:

a) GI sheet metal (180 Grade) duct as per IS 655. Minimum duct thickness shall be 1 mm (20 G).

b) Damper with control arrangement at each branch off and whatever necessary.

c) All supply air grilles and diffusers made of powder coated MS sheet (20 SWG) / extruded aluminium with volume control dampers and supporting frames as required at site.

d) Supports and hangers including anchor bolts as required.

e) Sealing compound and jointing gasket for ducts.

f) Flexible connections of rubberized canvas.

g) The exposed portion of the ducting shall be thermally insulated with 13 mm thick thermal insulation made of Aluminium foil faced closed cell elastomeric Nitrile Rubber (of density min. 40 Kg/CuM) / XLPE (of density min. 33 Kg/CUM) or equal having a thermal conductivity not exceeding 0.035W/MK. The insulation shall have self extinguishing & non-dripping properties against fire attack.

h) Motorized Fire Dampers with supply and Fusible Link type Fire Dampers with exhaust air duct / path (wherever applicable).

Motorized fire dampers will be provided in the supply air ducts and supply air openings leading to all the electrical areas (MCC and Switchgear Rooms, cable spreader rooms of Power House as well as ESP, AHP & CHP control buildings).

The signal from smoke detectors / thermal sensors including potential free contact at the fire panel shall be sent to operate the supply air fire damper. In case of fire / power failure, the damper actuator shall be de-energized to close the damper and respective fan motor shall be tripped in case of fire.

Power supply for the motorized dampers shall be arranged from Bidder's respective Local Starter cum Control Panels (LSCP) for AWU / UAF unit. The fire dampers shall be electrically operated motorized type (rated 240V ± 10% volt, 50 ± 5% HZ AC). The damper shall be suitable for electrical opening and closing for their automatic operation and manual testing purpose with the help of bypass Push Buttons. The damper actuators shall be spring return type. The damper shall be interlocked with respective motors of ventilation system.

Fusible Link type Fire Dampers are to be provided with Exhaust duct / path wherever applicable.

h) Back draft dampers will be provided at the air outlet areas where pressurized ventilation has been envisaged.

3.01.07 All drive motors.

3.01.08 Local Starter Cum Control Panels (LSCP) for AWU and UAF units.

3.01.09 Local Starter Panels (LSP) for Ventilation fans except AWU and UAF units.

3.01.10 Power and Control Cabling and Grounding details.

3.01.11 Installation of all equipment supplied by bidder.

3.01.12 Anchor bolts, nuts and bolts and loose fitting as would be necessary for erection and commissioning.

3.01.13 One complete set of tools and tackles.

3.01.14 One set of recommended spare parts for trouble free operation of the system together with mandatory spare parts as specified.

3.01.15 Cleaning protection and painting as specified herein.

3.01.16 The above clauses specify the equipment for general guidance only. Any other equipment and/or material necessary to ensure safe and satisfactory erection, commissioning, operation and maintenance shall also be included in the scope of the specification.

3.01.17 Grounding of all drives and equipment required for Power House Ventilation system as per Main Plant Package, Technical Specifications, and relevant volume for Electrical Works.

4.00.00 **CONTROL PHILOSOPHY**

4.01.00 Ventilation fan motors

All ventilation fan motors except Air Washer / UAF Units shall be controlled from Local Starter Panel / Switch to be provided near each fan.

4.02.00 Air Washer / UAF Units

Each Air Washer / UAF Unit will have one Local Starter cum Control Panel (LSCP) located near each Air Washer / UAF Unit for it's control.

a) Humidity Control (applicable for Air Washer)

To protect the equipment located in the ventilation space (mainly for the MCC/ Switchgear Room) from effects of high humidity, the control device using humidistat is interlocked with a two-way actuator operated control valve to be mounted on the header of that spray bank which is not connected with the filter washing. Humidity beyond 60% RH in these ventilated spaces shall automatically close the two-way valve. The valve may be opened automatically at about 50% RH. However, manual over-ridding facility shall be provided for this humidistat controlled valve. Minimum two (2) nos. Humidistat shall be provided for each Air Washer Unit.

Relative humidity inside the ventilated areas shall also be displayed digitally on the LSCP.

b) AWU / UAF Unit Sump Water Level Control

The water sump of each Air Washer / UAF Unit shall be provided with a low level switch which will initiate an alarm & will trip the pump, in case water level falls below a pre-determined mark. At the delivery pipe of each pump a pressure switch will be provided along with pressure indicator.

c) Following indications are to be provided in Local Starter-cum-Control Panel for Air Washer / UAF Units.

I. FAN RUNNING.

II. FAN STOP.

III. PUMP – 1 RUNNING (FOR SPRAY SET ARRANGEMENT).

IV. PUMP – 1 STOP (FOR SPRAY SET ARRANGEMENT).

V. PUMP – 2 RUNNING (FOR SPRAY SET ARRANGEMENT).

VI. PUMP – 2 STOP (FOR SPRAY SET ARRANGEMENT).

VII. FAN MOTOR OVER LOAD TRIP.

VIII. PUMP - 1 MOTOR OVER LOAD TRIP.

IX. PUMP - 2 MOTORS OVER LOAD TRIP.

X. RH HIGH.

XI. RH LOW.

XII. SUMP WATER LEVEL LOW.

XIII. Relative Humidity

Provision of alarm (audio-visual) for Trip of any motor & low water level in the sump shall also be kept in the Local Starter cum Control Panel.

d) Motorized Fire Dampers

Motorized Fire Dampers are to be installed in the ventilation supply air ducting / with the supply air fans leading to electrical rooms like various MCC Rooms, Switchgear Rooms and Cable Spreader Rooms. These dampers shall be operated with the help of signal from smoke detectors / thermal sensors through zone fire panel. Motors shall remain energized in normal condition to effect opening of dampers. In the event of fire, the motors will be de-energized and the damper will close due to spring action.

In case of fire, all the motorized fire dampers provided in the supply air duct will close and the relevant fan motors will be tripped at the same time. The signals for this operation will come from zone fire panel.

In case of fire in the TG Hall or in the electrical rooms, all the supply fans of AWUs shall be stopped automatically with the sense from smoke detectors / thermal sensors through zone fire panels.

5.00.00 **DESIGN CRITERIA**

5.01.00 The design outside condition are taken from the Meteorological Station at Khammam nearest to the Kothagudem Thermal Power Station shall be considered as follows:

Summer: 42.6 Deg. C (DB), 26.6 Deg. C (WB)

Monsoon: 30.9 Deg. C (DB), 25.8 Deg. C (WB)

Winter: 20.8 Deg. C (DB), 18.4 Deg. C (WB)

5.02.00 **Inside Design Condition**

The desired condition inside the ventilated space has to be maintained by selecting proper type of Ventilation System.

5.02.01 In dry type forced (mechanical) Ventilation System where the ambient air is drawn and distributed inside the building/room and then exhausted, the average design condition inside the space to be ventilated is to be restricted about 3℃ higher than the ambient (outside) dry-bulb temperature. Relative humidity will depend upon moisture content of ambient air.

5.02.02 In the areas ventilated by evaporative cooling units, the inside dry bulb temperature will be restricted to 5ºC less than the summer ambient temperature (DB). This temperature will occur only for a few hours of some days in peak ambient condition and will prevail near the roof level where the hot air along with some solar heat load through roof will be exhausted out by roof extractors /wall mounted exhaust fans/louvers/back draft dampers.

5.02.03 Inside condition of TG hall and other electrical areas like switchgear room, MCC room of Power House building will be made reasonably dust free by adopting flooded type filter in the Air Washer Units. Moreover some amount of over pressure will be maintained inside the TG hall and electrical areas, and dust infiltration will be prevented thereby. For this system to work effectively, the rolling shutters should be kept closed. In some dry type mechanical ventilation, dry type washable metallic filter shall be adopted where cleanliness requirement is of importance. Here also some amount of over pressure will be maintained by using back draft damper to prevent the ingress of dust.

5.02.04 Auxiliary buildings should be ventilated generally as mentioned earlier. Areas not covered in these places but require ventilation should also be ventilated.

5.02.05 The following minimum air change rates are to be maintained for the areas indicated below.

Building / Area	**Air Change / Hour**
TG Hall	6
Cable Spreader Room	5
Electrical Room like MCC Room, Switchgear Room in the TG Building	15
Oil Room	20
Battery room	20
Elevator Machine Room	15
Mill building – coal bunker area	30
Non AC areas of ESP, AHP & CHP control building	15
Chemical House	20
DM plant	10
HFO & LDO forwarding pump house	20
Stores	5
DG area	10

Building / Area	Air Change / Hour
Compressor house	15
Switchyard Control Building (Non AC area)	15
Pump Houses –pump area	10
Electrical Rooms associated with the pump Houses	15
Electrical Rooms for all Auxiliary Buildings	15
Toilets	20
Pantries	20

Note:

The fan capacities shall be decided on the basis of the actual Heat Load and specified temperature rise or specified minimum air change rate, whichever is higher.

6.00.00 **DESIGN AND CONSTRUCTIONAL REQUIREMENT**

6.01.00 **General**

6.01.01 All equipment shall be heavy-duty type suitable for installation in heavy industries and long period of uninterrupted service.

6.01.02 The equipment shall be designed to permit interchangeability of parts and ease of access during inspection, maintenance and repair.

6.01.03 All parts subject to substantial temperature changes shall be designed and supported to permit free expansion or contraction without resulting in leakage, harmful distortion or misalignment.

6.01.04 All electrical and mechanical equipment shall be designed and manufactured so that no damage will result from transportation, storage, installation and operation of the equipment with the climatic conditions to which it will be subjected.

6.01.05 All materials used shall conform to the specification and shall be new and first class in all respects.

6.01.06 Anchor bolts, nuts and seating steel work shall be supplied with the equipment. Only hexagonal nuts shall be used for holding down the equipment, with proper lock nuts. All bolt holes shall be spot faced for nuts. In specific cases where not necessary, spot facing may be omitted.

6.01.07 Casting and welding shall conform to their respective specifications and shall be free from flaws and objectionable imperfections, machined true and in a work-man like manner.

6.01.08 Proposal for repair or any similar operations involving the plugging, welding, boring or addition of metal to the original castings, shall be submitted to the Purchaser/Consulting Engineer and approval shall be received before any such work is carried out. Drawings showing details and locations of such modifications shall be submitted to the Purchaser/Consulting Engineer for his records.

6.01.09 The separate pieces of equipment shall be marked with unit number. The assembly drawing shall indicate part number of each equipment and unit number for easy correlation.

6.02.00 **Centrifugal and Axial Flow Fans**

6.02.01 Centrifugal fans shall be SISW/DIDW as mentioned in the Specification. The design shall be in general end suction and upward/downward/inclined/ horizontal discharge type as demanded by the system/installation need. All centrifugal fans are coupled to the drive motors with V-belts. Puller holes should be provided on fan impellers and pulleys for ease of extraction from fan/motor shaft. Fan/motor shafts should have threaded centre holes for fixing pushers and locking the impeller/pulley axially on fan/motor shaft.

6.02.02 All Roof extractors / supply fans and wall mounted exhaust/supply fans are of direct drive axial flow type. Roof extractors/supply fans shall have multi-bladed impeller with a short duct casing while wall mounted exhaust/supply fans shall have coned inlet suitable for free discharge of air.

6.02.03 The centrifugal fans and axial flow fans shall be capable of withstanding the stresses which may be experienced during normal operation under the condition which it is required for and during over speed test.

6.02.04 It is desirable that all centrifugal fans shall be designed to operate within 9% and 25% of system throttling line.

6.02.05 All the fan units shall be reasonably noise and vibration free in operation and therefore of reasonably low speed. RPM of axial flow fans shall be restricted within 1000 to reduce their noise level excepting roof extractors for which RPM shall be restricted to 1500. Outlet air velocity of all fans shall be restricted within 12 m/s.

6.02.06 Casing for centrifugal and axial flow fans shall be reasonably leak proof.

6.02.07 The first critical speed of the rotating assembly shall be at least 25% above the operating speed.

6.02.08 Fan wheels shall be statically and dynamically balanced according to AMCA standard. Fans of 5 HP and above sizes must be dynamically balanced.

6.02.09 Impeller

a) The blades of the centrifugal fan impeller for all units shall be backward curved unless otherwise specifically mentioned. The blades of the impeller shall be die formed aerofoil or laminar type. They shall have self-cleaning and non-overloading characteristics, and shall be welded to the back plate and shroud, if any. The fan wheel shall be statically and dynamically balanced.

b) The axial flow fan impeller shall be cast in one piece, finished all over and are fully balanced both statically and dynamically. Finally the assembled rotor shall be dynamically balanced. All axial flow fan impeller shall consist of high efficiency aerofoil section blades. Puller holes should be provided on fan impellers and pulleys for ease of extraction from fan/motor shaft. Fan/motor shafts should have threaded centre hole for fixing pushers and locking the impeller/pulley axially on fan/motor shaft.

6.02.10 Casing

a) Centrifugal fan casing shall be of welded construction and provided with flanges on inlet and outlet sides for duct connection. Mounting legs welded to the casing shall be provided. Plummer blocks should preferably be not supported on the bracings/stiffeners of casing sidewalls.

b) Axial flow fan casing for roof extractors/supply fans and their components shall be suitable for outdoor installation. The casings will be provided with flanges at inlet and outlet. All nuts & bolts associated with it shall be of zinc or cadmium plated with proper baking to remove hydrogen.

Easily removable inspection cover having galvanized fly nut shall be provided. The inspection covers shall be located such that the grease nipple for all bearings and also motor terminals are easily accessible through the cover. It is however, preferred that provisions will be there for greasing the fan bearings from outside the fan casing.

Suitable motor brackets as per manufacturer's standard for both roof and wall exhausters/supply fans shall be fitted. The brackets shall be designed to provide rigid mounting for motors.

6.02.11 Bearing

Centrifugal fan shaft shall be mounted on self-aligning, heavy-duty spherical roller bearing of adequate capacity and life. In no case the life of the bearings shall be less than 40,000 hours. Centrifugal fans for air washers installed in the T.G. Building, should have minimum bearing life of 100,000 hours. Bearings shall be grease lubricated and provided with fittings for lubrication from outside. The bearings shall be located in an easily accessible location to facilitate maintenance.

6.02.12 Roof extractors/wall mounted fans (if located on the exposed wall) shall be provided with hood for protection against rain and other contingencies. It must ensure no dripping of rainwater under any circumstances and will have low-pressure drop of air. The hoods shall be provided with a heavy gauge expanded metal bird screen. Axial flow fans should be fitted with protective screens from inside of room.

Rain protection cowls will be designed to suit wall mounted exhaust/supply fans for protecting fans from rain. The cowls will be provided with bird screen of heavy gauge expanded metal netting.

A typical sketch enclosed herewith shows arrangements for both roof extractors and rain protection cowl. Any other approved design for the hoods and cowls can be considered. Grouting frames for the cowls if required shall be included in the supply along with nuts and bolts.

6.02.13 Coned Inlet

Wall mounted exhaust fans shall be provided with coned inlet made of M.S.

6.02.14 Inlet Screen

Inlet screen shall be manufactured of min. 14 SWG galvanized wire knitted in 1" square mesh. Suitable flanges to protect the edges of the screen shall be provided.

6.02.15 Vibration Isolator

Double deflection rubber in shear or rubber in compression type vibration isolators shall be provided with each centrifugal fan and each axial flow fan. Rubber bushes, washers, wherever needed for the vibration isolators shall be included in the supply. Sufficient number of such isolators shall be provided to ensure isolation of foundation from vibration of the equipment.

6.02.16 Fans For Special Application

Fans for battery room, oil rooms and fuel stores shall be of spark proof construction. These axial flow type fans shall be bifurcated type construction with motor away from air stream. Motors for these fans shall be of flameproof construction.

All fans for special application shall have all accessories as mentioned in the Specification.

6.02.17 Fan Drive

a) Centrifugal fans shall be provided with V-belts and sheaves. All belts shall be sized with minimum 1.5 service factor. All V-belt drives shall be equipped with removable guards that do not impede the air flow to the fan inlet. There shall be a minimum of two belts per drive. All pulleys should have threaded puller holes for the ease of their extraction.

b) All direct drive axial flow fan impellers shall be directly mounted on extended motor shaft.

6.02.18 Materials of Construction

The following materials shall be used for the construction of various parts:

a)	Centrifugal fan impeller	:	MS sheet (IS-2062) duly spray galvanized
b)	Axial flow fan impeller	:	Cast Aluminium Alloy (LM-6 Grade)
c)	Fan shaft	:	EN-8 as per BS-900 or equivalent
d)	Fan Scrawl	:	Heavy gauge M.S. (IS-2062)
e)	Fan supports, frames and	:	M.S. of adequate thickness (IS-Structure.- 2062)
f)	Coned inlet for wall mounted exhaust fans / Supply fans	:	M.S. (IS-2062)
g)	Dampers	:	M.S. of heavy gauge (IS-2062)
h)	Flexible connections for fan inlet and outlet	:	Plastic impregnated canvas with M.S. flange & cleats.
i)	"V" pulleys	:	G.I. multi-grooves (IS-210, Gr.20)
j)	"V" belts (Matched sets)	:	Reinforced rubber of appropriate section.
k)	Slide rails	:	C.I. or M.S.
l)	Connection pieces	:	Galvanized iron according to supplier's design.
m)	Bolts and Nuts	:	GI or cadmium plated unless otherwise specified.
n)	Rain protection cowls, hoods And casing for roof Exhausters/wall exhausters/ Supply fans	:	Aluminium or hot dipped galvanized after fabrication from M.S.
o)	Vibration isolating pad washers & bushes, if any.	:	Hard synthetic rubber of Hardness 40° shore.

6.03.00 **Air Washer Units**

6.03.01 General

I. Air washer shall be of sheet metal type construction. The air washer unit is a complete system comprising air washer internals, casing, Masonry Sump (tank), associated pumps and fans.

II. The air washer unit shall be designed as Two Banks water spray system type units. Ambient air is sucked by the centrifugal fan unit / units successively through the Air Intake Louver with Bird Screen of GI construction, automatically cleanable type Stainless Steel mesh Filters complete with SS / Aluminium frame continuously flooded with water through Stainless Steel water spraying Nozzles from one spray bank header and another bank of spray header with Stainless Steel water spraying Nozzles spraying water in the opposite direction of air, Die-extruded PVC moisture eliminators and finally delivered to the duct system with Supply air Grilles for distribution. Properly hinged air tight epoxy painted inspection doors of suitable sizes shall have to be provided in each sheet metal Air Washer.

III. The Air Washer Units shall be suitable for running with clarified water.

IV. The air washer units shall be designed for a saturation efficiency of 90%.

V. All the equipment for the air washer units shall have to be accommodated as per space availability. But within the space allotted the equipment design and location may be modified to suit the supplier's standard equipment.

VI. The various sections of the unit shall be bolted with suitable gasket to avoid leakage of water. All the sections of the units shall be Epoxy painted from inside and outside to prevent corrosion/ weathering damage. The nuts and bolts used for jointing the sections shall also be galvanized. All in side and out site parts of the fan shall be spray galvanized except the fan shaft that shall be of epoxy painted.

6.03.02 Filter Section

The Filter section consists of a set of Stainless Steel (SS-316) mesh filter modules mounted on a ladder type SS / Aluminium framework of not less than 16 G thick and quick release mechanism for easy dislodgement of the filter modules. The filter material shall be weaved with SS wire of 0.16 mm dia. providing an aperture of max. 0.025 mm. Such filters are continuously flooded with water spray from double bank spray header system in the direction of airflow. The water will be collected in a masonry tank and will be re-circulated by means of the said pump.

The filter module size shall not be more than 610 mm x 610 mm.

The pressure drop across the filter shall be restricted to 8 mm of WG in clean condition and 12 mm of WG in dirty condition. The face velocity across the filter shall not exceed 2.5 m / sec.

6.03.03 Spray Arrangement

I. There will be two bank water spray system each bank is having a number of branches with spray nozzles. The Spray nozzles shall be made of Stainless Steel and shall be of hollow-cone type with an orifice dia. of 6 mm. Supplier shall confirm the layout of the nozzles on the vertical face. The nozzle arrangement shall ensure good spray distribution and fine break-up of water across the air stream.

II. The water header and piping shall be of G.I. One pot strainer with very fine mesh brass screen shall be fitted preferably in the suction line of all the pump sets. The strainer should have a by-pass line.

III. Water from the washer chamber tank shall be taken through a primary screen type water filter fitted in an accessible position in the tank. The filter screen shall be manufactured of S.S netting in a S.S. Frame.

IV. All accessories like valves, drain valves, fittings, pipe support, hangers, etc. shall be included in the supply. These will be manufactured according to the supplier's standard.

V. The Contractor shall use the regular type fittings / bends for piping as per IS-1239. Spacing and location of hangers shall conform to the preferred engineering practice. All materials for anchoring the hangers with reinforced concrete work or building structural beams and columns shall be furnished by the Tenderer.

VI. All drain pipes will use "Tee" fitting instead of elbows or bends. "Tee" fittings should be installed such that the plugs can be removed and any section of the pipe can be cleaned. Drain valve will be located at the lowest point of the pipelines. If necessary, more than one drain valve will be installed to facilitate complete drainage from pipe. The make-up piping including all valves, bends, fittings, supports etc. shall be supplied by the Tenderer.

6.03.04 Pumps

The water spray will be generated with the help of a Horizontal Split Casing / back pull out type Centrifugal Pump-Motor set and associated Medium Class GI piping with all fittings and supports.

Details on pumps are furnished under separate clauses.

6.03.05 Moisture Eliminator Sets

I. Moisture eliminator sets used for the air washer units shall be vertical and die-extruded PVC construction.

II. Face velocity of air for the PVC Eliminator sets shall not exceed 2.5 m / sec.

III. Eliminators shall be manufactured in suitable sizes for easy handling, erection and replacement whenever necessary.

IV. Moisture Eliminator shall have bends at 30^0 with the direction of airflow and shall have 2 effectively hooked edges for trapping the carry over of water. The catcher should face the direction of airflow.

V. The Moisture Eliminators shall be fixed rigidly in their proper position and spacer shall be provided to maintain the proper gap.

VI. Holding frame for the PVC Eliminators shall be of G.I. angles of adequate strength for support.

VII. Eliminator plates shall be of die-extruded PVC having at least three (3) bends and shall be provided with suitable drip tray and draining facility.

6.03.06 CENTRIFUGAL FANS

Details of fans are furnished under separate clauses.

6.03.07 CASING & TANK

The equipment shall be located within the sheet metal fabricated casing as specified in the other part of the specification with adequate stiffeners, bracings etc duly epoxy painted / spray galvanized from inside and outside. The overflow pipe connected with masonry water tank must be terminated with a siphon, to avoid leakage of air into the air washer chamber. All air washer internals coming in contact with moist air shall be epoxy painted. All inside and outside parts of the fans shall be spray galvanized whereas the shaft shall be epoxy painted. Provision of Marine lights shall be kept in both the Filter and Fill section.

Top Surface of the AWU shall be thermally insulated with 13 mm thick thermal insulation made of Aluminium foil faced closed cell elastomeric Nitrile Rubber (of density min. 40 Kg/CuM) / XLPE (of density min. 33 Kg/CUM) or equal having a thermal conductivity not exceeding 0.035W/MK. The insulation shall have self extinguishing & non-dripping properties against fire attack.

This air washer contain the sheet metal / masonry sump (tank) shall be connected with the Filter section and shall be complete with make-up connection with float valve, quick fill connection, drain connection with valve and overflow connection with siphon. The tank shall be of epoxy painted / spray galvanized from inside and outside.

6.04.00 **UNITARY AIR FILTRATION UNIT**

6.04.01 Unitary Air Filtration Unit is a complete system comprising UAF internals, casing, tank, associated pumps and fan.

6.04.02 The UAF units shall be designed for a saturation efficiency of 60%.

6.04.03 Unitary Air Filtration Unit shall have in general one set of air intake louver, one set of automatically cleanable type Stainless Steel mesh Filters with continuous water spraying arrangement over the surface of it to clean the filters and PVC die-extruded Moisture Eliminator sets after the above water flooded filters to eliminate the carry over of moisture. Suitable stainless steel grid shall be used inside both the filters and eliminators for reinforcement.

6.04.04 Water will be re-circulated by means of mono-bloc pumps.

Details on pumps are furnished under separate clauses.

6.04.05 The unit shall be self-enclosed by MS casing duly painted with epoxy resin based paint / spray galvanized. The casing front shall be provided with the air intake louvers with bird screen of GI construction. Water with the dirt will be collected in the MS sump duly painted with epoxy resin based paint and bled off to the drain in small quantity.

Top Surface of the UAF shall be thermally insulated with 13 mm thick thermal insulation made of Aluminium foil faced closed cell elastomeric Nitrile Rubber (of density min. 40 Kg/CuM) / XLPE (of density min. 33 Kg/CUM) or equal having a thermal conductivity not exceeding 0.035W/MK. The insulation shall have self extinguishing & non-dripping properties against fire attack.

6.04.06 The drain pan shall be provided with overflow pipe terminating to the nearest drain point .The unit may be installed indoor or outdoor as shown in drawings. Suitable rain protection sheds of sheet metal construction shall be provided for the motors installed outdoors.

6.04.07 One backward curved Centrifugal Fan Motor unit shall be used for conveying the air. All parts of the fan for this system coming in contact with moist air shall be spray galvanized except the fan shaft, which shall be epoxy painted.

Details of fans are furnished under separate clauses.

6.04.08 Velocity through any section of UAF unit shall not exceed 2.5 M/Sec. except for Inlet louver for which the face velocity shall not exceed 2 M/Sec.

6.05.00 **WATER PUMP**

6.05.01 Each water circulating pump set shall be of horizontal split casing / back pull out type centrifugal type, directly coupled to electric drive motor and mounted on a common base plate. However, pumps having motor of 5 HP or below can be of mono-block construction.

The pump shall be complete with casing, impeller, renewable type wearing rings, shaft, shaft sleeve, bearings, stuffing box, cowlings, base plate etc. as applicable. The design pressure for the casing shall not be less than 16 bar for Air Washer pump sets.

6.05.02 The pumps will operate under flooded suction and shall have radial suction and vertical discharge.

6.05.03 Pump head-capacity characteristics shall be gradually rising from operating to shut-off point without any zone of instability. The pump BHP flow characteristics shall preferably be non-over loading type beyond rated capacity point.

Pump shall be rated for continuous operation.

6.05.04 Operating speed of the pump shall preferably be not more than 1500 RPM. Vibration isolators of efficiency 90% (approx.) shall have to be provided for each pump set.

6.05.05 Material of the pump sets shall preferably be as follows (all material shall be of tested quality):

a)	Casing	-	Cast iron, Grade-FG200 as per IS-210
b)	Impeller and wearing rings	-	Bronze
c)	Shaft	-	EN-8 as per ES-900
d)	Shaft sleeve	-	Bronze as per IS-318

6.05.06 The pump bearings and the shaft shall be sized adequately to take the maximum possible unbalance loads occurring due to all mechanical and hydraulic reasons. Bearings should have a minimum life of 40000 hours of operation.

6.05.07 Pump and drives shall be directly coupled though a flexible coupling. Suitable coupling guard shall be provided for each pump.

6.05.08 Each pump shall be complete with the following accessories:

- Pot type strainer at inlet complete with screen, drain arrangement etc. All pot type strainers shall have easily removable top cover for access to the filter cartridge. The filters shall be fitted with fine mesh copper or brass wire strip.

- 150mm dia dial type Pressure Gauges, one each at the suction and discharge side of the pump set. The pressure gauge of the pump sets will be connected with a siphon and a two position brass cock.

- Butterfly type isolating valves, one each at suction and discharge side of the pump.

- Non-return (check) valve at the discharge side of the pump set.
- Base plate, coupling, coupling guard, anti-vibration mountings and foundation bolts.
- All integral piping required for sealing, cooling, casing, drains and vent connections.

6.05.09 The design of the pumps shall conform to the relevant IS Code, Standards of Hydraulic Institute of U.S.A. or approved equivalent.

6.05.10 Pump motor will be selected on the basis of 15% margin over the shaft power consumption or more than the limit load of the pump which ever is higher. For other electrical particulars of the motor refer detailed specification of the motors.

6.05.11 Major rotating components of the pumps like impellers, balancing drums etc. shall be individually balanced statically and finally each pump shall be dynamically balanced.

6.05.12 The critical speed of the pump shall be at least 20% above the operating speed.

6.05.13 All pumps and motors shall be aligned properly, and bolted and doweled to a common base frame.

6.06.00 **WATER PIPING**

6.06.01 Water piping for 150 NB or below GI-Heavy Class conforming to IS-1239, Part-I. For higher sizes black steel pipe, heavy grade conforming to IS-3589, Fe 410 grade shall be supplied. Drain water piping shall be of M.S. heavy grade.

6.06.02 The piping shall be so designed that the water velocity through the piping shall not exceed 2.5 m/sec and also the piping friction drop shall be limited to 4 m per hundred meter of pipe length. Pipe sizes, if indicated in tender drawings shall be followed.

6.06.03 The pipes shall be of plain end in case of M.S. Pipes (i.e., suitable for welded connections) as far as possible.

6.06.04 Counter-flanges for connecting to flanges on valves or equipment shall be made of IS-2062 or superior and shall preferably be slip on type, suitable for welding on the piping in case of M.S. Piping.

6.06.05 All bolts and nuts for flange connection shall be hexagonal carbon steel type as per IS-1363 and with the material and other requirements as per IS-1367. All threaded valves shall be provided with nipples and flanged pairs on both sides to permit flanged connections for ease of removal / replacement of valves.

6.06.06 Bends, fittings fabricated at site is not acceptable. The Contractor shall use the standard fittings / bends, as per IS-1239, Part-II.

6.06.07 Spacing and location of hanger shall conform to preferred engineering practice. Hangers and supports shall be made up of structural steel sections. The design of the hangers and supports shall provide for suitable protection to insulation on the pipes, wherever applicable. All materials for anchoring the hangers with reinforced concrete work or building structural beams and columns shall be furnished by the Bidder. The supports within the plant room shall be of structural / pipe supports from the floor and is to be provided by the Contractor.

6.06.08 The flanged joints for water line will use canvas, impregnated rubber gasket. Compressed fiber gaskets shall be used with flat face flanges and raised face slip-on flanges. Spiral wound gaskets shall be used with raised face flanges, except for raised face slip-on flanges. Gaskets containing asbestos are not acceptable.

Gaskets shall be suitable for the design pressures and temperatures: -

i) Compressed Fiber Gaskets: Compressed fiber gaskets shall be in accordance with ANSI B16.21, and materials shall be suitable for a maximum working pressure of 40 bar and a maximum working temperature of 400° C. Gaskets shall be dimensioned to suit the contact facing. They shall be full faced for flat face flanges and shall extend to the inside edge of the bolt holes on raised face flanges. Gaskets for plain finished surfaces shall be not less than 1.6 mm thick and for serrated surfaces shall be not less than 2.4 mm thick.

ii) Spiral Wound Gaskets: Spiral wound gaskets shall be constructed of a continuous stainless steel ribbon wound into a spiral with non-asbestos filler between adjacent coils. The gasket shall be inserted into a steel gauge ring whose outside diameter shall fit inside the flange bolts properly positioning the gasket. The gauge ring shall serve to limit the compression of the gasket to the proper value. Compressed gasket thickness shall be 3.3 mm ±0.1 mm.

iii) Ring Joint Gaskets: Ring joint gaskets shall be octagonal in cross section and shall have dimensions conforming to ANSI B16.20. Material shall be suitable for the service conditions encountered and shall be softer than the flange material.

iv) Rubber Gaskets: Rubber gasket materials shall be cloth inserted sheet rubber and shall conform to ANSI B16.21. They shall be full face and 1.6mm thick.

The material should be able to withstand adequate strength in compression without damage. Pipe lines should be such installed that any equipment or valves can be removed by disconnecting flange bolts and nuts union joints. If necessary, a short piece joint to be installed for easy removal. All threads for screwed joints should be properly made. The threads will be covered to make a leak proof joint. Pipes passing through any building structure will pass through a pipe sleeve. The thickness of pipe sleeve will be not less than the thickness of the passing pipe itself. A rubber grommet or such other material will protect pipes entering any equipment.

6.06.09 All drain pipes will use 'tee' fitting instead of elbows or bends. 'Tee' fitting should be such installed that the plug can be removed and any section of pipe can be cleaned. Drain valves will be located at lowest point of pipelines. If necessary, more than one drain valve will be installed to facilitate complete drainage from pipe.

6.06.10 Water filling valve and air vent shall be installed on the highest point of pipeline. If necessary, more than one valve is to be installed for satisfactory operation or maintenance of the plant. Location of instruments, fittings, fixtures shall be as in single line flow diagram. Location / sizes of air vents are also indicated.

6.06.11 Piping arrangement and alignment shall be as per layout.

6.07.00 **VALVES & ACCESSORIES**

6.07.01 General

Water line gate valves shall conform to IS: 778-1984 for smaller sizes and IS: 780-1984 for larger sizes. Those shall be designed for working pressure of 16 Kg/Sq.Cm. The valves shall be I.S.I. marked and of reputed make. Alternatively water type, butterfly valve can be offered. Those valves shall be manufactured and tested conforming to BS: 5155 and AWWA C504.

Note: Butterfly type valve can be offered in the range 80 mm N.B. up to and including 150 mm N.B.

6.07.02 Gate Valves

Those shall be non-rising stem of following material of construction.

Up to 65 mm dia	:	Brass body and Brass internals, Screwed Ends
Valve rating	:	Class - 2
75 mm dia and above	:	CI Body and high tensile brass internals, Flanged Ends
Valve ratings	:	PN 1.6

6.07.03 Wafer Type Butterfly Valves

These valves shall be of single piece ribbed steel construction and of flange less wafer type. Discs shall be of high duty iron with epoxy coating or electrolytic nickel plating.

Material specification : Body IS-210 FG 260 CI or cast steel to suit working pressure of 16 Kg/sq. cm.

	Disc	:	Epoxy coated / EN plated FG 260 CI or AISI 316 SS.
	Seat	:	Nitrile rubber bonded on bakelite hard back.
	Top Shaft	:	EN 8 Carbon steel or AISI 304 SS.
	Bottom shaft	:	AISI 410
	Body seal	:	SS AISI 304 L
	Disc seal	:	Nitrile rubber / EPDM / Vitron
	Bearings	:	Phosphor Bronze
	Gear unit	:	Worm type
	Bottom cover	:	CI IS 210 GR FG 260/CS IS 2062 GR B
	Bolting (Internal)	:	SS AISI 304
	Bolting (External)	:	CS IS 1367 GR 8.8

6.07.04 Globe Valves

Those shall be Straight type and with following material of construction.

Up to 65 mm dia	:	Brass body and Brass internals Screwed Ends
Valve rating	:	Class - 2
75 mm dia and above	:	CI Body and Flanged Ends high tensile brass internals
Valve ratings	:	PN 1.6

6.07.05 Check Valves

These shall be swing check type with following material of construction.

Up to 65 mm dia	:	Brass body and Brass internals, Screwed Ends
Valve rating	:	Class - 2
75 mm dia & above	:	CI Body and Flanged Ends high tensile brass internals
Valve ratings	:	PN 1.6

6.08.00 **DUCT WORK**

6.08.01 Duct Fabrication

I. General

a) Velocity of air in any section of the supply duct shall not exceed 12 M / Sec.

b) The construction of ducts and sheet metal thickness for ventilation duct shall conform to IS: 655 / ASHRAE / SMACNA as far as applicable, unless otherwise stated here. However, minimum duct thickness shall be 1 mm (20 G).

c) The general layout of the ducting location and number of air grilles and diffusers etc. shall conform to the specific requirements of individual areas of application so as to ensure proper air distribution of all the zones. The same shall be subject to approval by the Purchaser / Consultant.

d) All duct work for supply of air inclusive of accessories such as damper, vanes, access doors etc. shall be fabricated from G.I. sheet of 180 grade as per IS-277. The ductwork shall be properly reinforced to prevent sagging, buckling or vibration. Interior of all ducts shall be smooth and free from obstruction. All duct sections shall be cross broken.

e) Suitable drain point with water trap shall be provided for all washed air duct routing at suitable places, preferably just after Air Washer Units.

II. Joints

a) All longitudinal joints for the ducts will be Pittsburgh Lock seam type.

b) Transverse joints for the low-pressure ducting shall be continuous around the four sides, the corner closure are required. The type of transverse joints shall be as follows:

Large side mm	Type of transverse joints
Up to 600	25 mm wide pocket, drive or S-slip
601 - 1000	85 mm wide, bar s-slip or pocket slip
1001 - 2250	40 mm x 40 mm x 6 mm M.S. Angle connection.

c) The low-pressure ducting work shall be provided with intermediate transverse bracing continuous around the four sides between the joints according to the following sizes:

Large side mm	Bracing
0 - 450	None
451 - 1500	40 mm x 40 mm x 6 mm angle 1200 from joints.
1501 and above	40 mm x 40 mm 6 mm angle 600 mm from joints.

d) RIVETING AND SEALING

All joints, slips and seams shall be made secure by reverting on centers not exceeding 150 mm. All transverse stiffeners and all reinforced bar slip joints shall cross at corners and be riveted. All bar slip joints and angle iron bracing shall be riveted on centers not exceeding 75 mm.

e) All construction joints and duct seams shall be reasonably sealed with bitumastic cold emulsion or equivalent vapour seal.

III. HANGERS AND SUPPORTS

a) All ductwork shall be provided with adequate hangers or supports to ensure rigid support and to prevent vibration. Spacing of duct supports shall not exceed 3 m centers.

b) Hangers shall be suspended from the building steel with provision for necessary auxiliaries, or by special steel members, or by an inch anchor / expansion bolts, or by hooks fixed to the embedded plates provided in the ceiling.

c) Hangers for all ducts shall be trapeze type with the shelf construction from 35 mm x 35 mm x 5 mm angle iron and hung by two steel rods each of not less than 10 mm dia. for ducts, with larger side less than 2250 mm while for those greater than 2250 mm shall be with 50 x 50 x 5 angles and rods not less than 16 mm dia.

d) All hangers and supports shall be as per drawings / specifications. When vertical ducts pass through floor slab, they shall be supported by means of collars, constructed of steel structural angles securely fastened about the girth of the duct and bitumastic compound between the horizontal leg of the supporting angle and the floor.

IV. ACCESS DOORS

a) All main ductwork shall be accessible throughout using tight fitted hinged access doors. Doors shall have to be cemented on sponge rubber gaskets. Angle joints shall be provided with felt or rubber gaskets for leak-tightness of the joints.

b) Access doors / panels are to be provided near each fire damper.

c) In case access doors are to be installed in the insulated ducts, the access door panel should be suitably insulated, such that it can be operated without damaging the duct insulation.

6.08.02 FLEXIBLE CONNECTION

Rubber impregnated canvas or equal flexible connections of at least 150 mm length shall be provided at each connection between ductwork and fan units to isolate vibration.

6.08.03 VOLUME CONTROL DAMPER

I. SPLITTER DAMPER

Splitter dampers in branch take off shall be provided. Damper blades shall be minimum 16 SWG thick. Alternatively catcher shall be provided in right angle tee of ducts.

II. OPPOSED MULTIPLE LOUVER DAMPER

Opposed multiple louvers dampers shall be provided at the fan outlets and wherever mentioned in the drawings, specification and fan schedule. Each blade of the dampers shall be provided with bronze, gunmetal or nylon bearing at each end of its spindle. The spindle with bearing shall be mounted in a strong structural framework. Operating lever with fixing device for keeping the damper at the desired position shall be fitted for the manually operated dampers.

Operating level will be fixed on an indicator to show the percentage of opening of the damper in all cases except for the application with grilles and nozzles.

Velocity across the dampers shall not exceed 10 m/sec. Damper blades at fan outlet shall be made up of 16 gauge M.S.

III. GRAVITY OPERATED DAMPER

Gravity operated back draft dampers are needed to protect the back flow of air wherever specified. These dampers shall be designed such as not to allow infiltration of air from outside while forced ex-filtration by the fan will be achieved through the above dampers. The louvers of the dampers shall be freely mounted on the spindles to allow the damper to open with the pressure developed by the fan. The dampers shall be provided with flanges at inlet. The damper blades shall be made of aluminium and the frame shall be of CRCA sheet duly galvanized / Aluminium.

6.08.04 GRILLES & DIFFUSERS

I. Design of grilles and diffusers shall be such as to create desired throw and spread of air and shall be approved by the Purchaser / Consultant.

II. All diffusers and grilles shall be made up of powder coated sheet steel / extruded aluminium with finish painting. Design of all diffusers and grilles shall be made by the Contractor matching with the lighting and other fittings and to be approved by the Purchaser / Consultant. Each supply air diffusers shall be fitted with opposed blade damper, built-in vanes and louvers arranged as per manufacturer's std. design.

III. Side throw type supply registers shall have two sets of adjustable louvers with opposed blade dampers. The front of louvers shall be horizontal to provide horizontal deflection and the rear set of vertical louvers shall adjust vertical deflection. The dampers shall have horizontal opposed blades regulated by an operating lever in the frame. All wall type exhaust / return air grilles shall have one set of louvers in the front. The louvers shall be fitted such as to remain in position by friction grip. All supply air grilles shall have one set of opposed multiple louver damper at the inlet. The dampers shall be gang operated and will have a device to keep the dampers fixed in one position.

IV. The grille frame and louvers shall be manufactured of at least 20 SWG GI sheet and 22 SWG MS. respectively. No grilles should, by any chance, make any rattling sound during continuous operation.

V. All grilles/diffusers shall be fitted with suitable gasket to prevent air leakage and shall match the decor of the space.

6.09.00 **DRY FILTER**

The filter media shall be designed to hold dust and prevent it from being dislodged by vibration or other cause and passing through filter.

The filter media shall be of High Density Poly Ethylene. The filter shall have G.I. frames of adequate thickness but not less than 18 SWG suitable for long use in an industrial plant. The filters may be in panels of sizes about 610 mm x 610 mm for easy handling of the same. The face velocity of air across the filters shall not exceed 2.5 m/sec. The efficiency shall be about 90% down to 10

micron size particles. Allowable pressure drop during clean and dirty conditions shall be 6 mm WG and 10 mm WG respectively.

6.10.00 **THERMAL INSULATION**

6.10.01 The exposed portion of the ducting shall be thermally insulated with 13 mm thick thermal insulation made of Aluminium foil faced closed cell elastomeric Nitrile Rubber (of density min. 40 Kg/CuM) / XLPE (of density min. 33 Kg/CUM) or equal having a thermal conductivity not exceeding 0.035W/MK. The insulation shall have self extinguishing & non-dripping properties against fire attack.

6.10.02 Top Surface of the AWU & UAF shall be thermally insulated with 13 mm thick thermal insulation made of Aluminium foil faced closed cell elastomeric Nitrile Rubber (of density min. 40 Kg/CuM) / XLPE (of density min. 33 Kg/CUM) or equal having a thermal conductivity not exceeding 0.035W/MK. The insulation shall have self extinguishing & non-dripping properties against fire attack.

6.11.00 **Electrical items shall consist of**:

I. DRIVE MOTORS

- All exhaust fan motors shall be designed for a minimum of 55 Deg C ambient temperatures. Supply air fan motors shall be designed for a minimum of 50 Deg C ambient temperatures.
- Motor rating for centrifugal fans with backward curved blades and axial flow fans shall be minimum 115% of the fan power at duty condition. Motor rating for Pump motor shall be minimum 115% of pump power at duty condition.
- Insulation of motor windings shall be class 'B'. In case of substitution by class F insulation, the temperature rise shall be limited to class B temperature rise as per IS: 325.
- Motors rated 30 KW and above shall be provided with 240V space heater.
- Motor T.B. shall be suitable to receive the cables as detailed elsewhere in the specification.
- Motors rated 250 watts and up to 160 KW shall be suitable for 415V±10%, 3-Phase, 50Hz±5% AC.
- Motors rated below 250 watts shall be fed with 240 V, single phase, 50 Hz. AC supply.
- Motors rated above 125 KW shall be fed by Air Circuit Breaker.
- All motors shall be suitable for D.O.L starting.

- All motor enclosures located indoors shall conform to the degree of protection IP-55 unless otherwise specified. Motor for outdoor or semi-outdoor service shall be weather-proof construction.

II. Local Starter cum Control Panels (LSCP) for AWUs and UAF Units

- Local Starter Cum Control Panel shall be provided for each Air-washer Units in and for each UAF unit.
- Each Air Washer / UAF system will have one LSCP located near each Air Washer / UAF Unit. These LSCPs shall house all electrical devices for power and control purposes of Air Washer/ UAF Unit loads, (Fan Motors, Pump Motors, Fire dampers etc. and other controls.)
- This LSCP shall house incoming MCCB for incoming power supply, outgoing MCCB/MCB with power contactors, auxiliary contactors, thermal overload relays, Start-Stop push buttons, and indication lamps for incoming power supply, ON/OFF/TRIP indication lamps, terminal block, wiring for fan and pump motors, motorized fire dampers and controls
- Stop P.B. shall be pressed to latch and turn to release type.
- Control Voltage at LSCP shall be 240V, 1Ph, 50HZ. Necessary control transformer shall be provided in LSCP.
- For Motors rated 30KW and above, Ammeters shall be provided in LSCP.
- For all motors having long starting time, the thermal overload relays shall be provided with saturable core current transformer to avoid spurious tripping during starting of the motor, the current transformer will have linear characteristics up to approximately twice the setting current.
- The panel shall be wall/floor mounted.
- By-pass P.B. for manual testing of fire-dampers for Air washer system from remote shall be provided in this panel.
- Power supply to 240V motorized Fire Dampers shall be fed from respective LSCP through MCB and Contactors.
- Audio-visual Annunciations with common hooter, Accept, Reset PB for Trip of any motor & low water level in the sump shall be provided in LSCP.
- Potential free contact for 'Air Washer/UAF Trouble' Group Annunciation in each LSCP for AW / UAF system. Remote Group Annunciation in each LSCP shall be provided by the contractor for Purchaser's use.

- 10% spare annunciation facia shall be provided over and above the annunciations as listed and / or recommended by the bidder, spare facia shall be equipped with all devices as provided for the active facia.

- Lamps shall be LED type.

- 1 module of each type and rating as spare shall be provided in each LSCP.

III. Local starter Panels for ventilation fans except AWUs and UAF Units

- 415V, 3 phase, 4 wire, 50Hz Local Starter Panel shall be provided at each auxiliary building for feeding ventilation fan motors. For Power House Building and Auxiliary buildings grouping of fan motor starter in each Local Starter Panel will depend on the number of ventilation fans, their motor ratings and locations.

- Local Starter Panel shall also house incoming MCB for incoming power supply, outgoing MCB with power contactors, auxiliary contactors, thermal overload relays, Start-Stop push buttons, and indication lamps for incoming power supply, ON/OFF/TRIP indication lamps, terminal block, wiring for fan motors, etc.

- Emergency Stop P.B. shall be pressed to latch and turn to release type and provided for each fan.

- The LSPs shall be suitable for cable entry from top and suitable mounting arrangement. The LSPs shall be front wired and front connected and their enclosure shall be dust and splash proof, conforming to degree of protection of IP-54.

IV. All 240V, 1ph fans (below 0.25KW motor rating) will be operated by switches located near the individual fans. Power supply to the fans through their switches shall be arranged from their nearest Distribution board.

V. Cabling and Grounding.

All power and Control Cabling and Grounding will be provided for the ventilation system.

7.00.00 SPECIAL TOOLS

The Bidder shall furnish a complete set of all special tools, wrenches, etc. with necessary tool boxes as required for erection, maintenance, overhaul or complete replacement of any equipment supplied under this specification. The Bidder shall enclose a list of such tools.

8.00.00 **TESTING & INSPECTION AT MANUFACTURER'S WORKS**

8.01.00 The minimum quality assurance plan / test of various components of Ventilation System are listed below. However, Bidder shall conduct any other tests/ inspection required at the manufacturer's works to ensure that the equipment being supplied shall conform to the requirement of this specification and other applicable standards and codes. The detail of checks to be carried out in various stages of manufacturing and erection of various items of the system shall be submitted for Purchaser's approval in the form of quality assurance plans, field quality plans and procedures.

The items covered under the scope of supply and erection shall be of Purchaser's approved makes. Bidder has to ensure that the proposed bought out makes have proven track record and meet the qualification criteria mentioned elsewhere in the spec. Bidder is to submit the proposal of sub vendors of bought outs for Customer's approval along with their offer and no deviation with regard to approved sub vendors shall be acceptable to the Purchaser.

Material tests like physical, chemical test on various components being used shall be done as per relevant standards. Manufacturer's test certificates shall be submitted for all those tests for the review and approval of Purchaser.

All raw materials including the bought out shall be subjected to bidders inspection/ TC review as per their procedure / approved QAP for total compliance. The same shall not be limited to mechanical, physical, electrical, operational, aesthetic and functional checks, but shall confirm to the best engineering practice and strict adherence to the specifications and standards. Bidders QAP shall indicate all such tests and procedures.

The in process checks for various components shall confirm to the bidder's internal procedures which shall confirm to best manufacturing practices, national and international standards. QAP shall reflect all such tests/ standards and procedures in detail.

Internal test records / test reports shall be produced to Purchaser as required.

All panel mounted components/items like circuit breakers, switches, contactors, relays, push buttons, isolators, fuses, terminal blocks etc. shall be type and routine tested as per relevant IS/ international standards including special tests as applicable.

Type test certificates for Degree of Protection (of various items as applicable) as per the required degree specified elsewhere in the specification shall be submitted for Purchaser's review and approval.

Further to verify compliance to degree of protection on routine basis, following shall be carried out:

1. For IP-5X - It shall not be possible to insert a thin sheet of paper under gaskets and through enclosure joints.

2. For IP-4X - It shall not be possible to insert a one mm dia steel wire in to the enclosure from any direction without force.

8.02.00 **Routine Tests**

8.02.01 Centrifugal Fan

a. 20% DPT of welding on fan hub, blades, casing and impeller as applicable.

b. UT of fan shaft (if dia. >= 50 mm) shall be carried out.

c. 100% DPT of the fan shaft after machining shall be carried out.

d. All rotating parts shall be statically & dynamically balanced as per IS 1940 Gr. 6.3 or better as applicable.

e. All centrifugal fans shall be subjected to free run test to check the temperature rise, noise, vibration, current drawn during testing.

f. Fans shall be performance tested with job motor (if required) as per relevant IS for airflow, static pressure, speed, efficiency, power consumption, noise and vibration.

8.02.02 Axial Flow Fan

a. Acceptance tests and routine test shall be carried out as per IS: 3588.

b. Dynamic balancing of the rotating part shall be carried out as per relevant standards.

c. NDT of the fans blade/impeller shall be carried out as per relevant standard as required.

d. Complete fan shall be performance tested with job motor (if required) as per relevant IS for airflow, static pressure, speed, efficiency, power consumption, noise and vibration.

8.02.03 Centrifugal Pump

a. Non-destructive examination as follows:

i. Impeller/wearing ring/shaft sleeve/Casing/diffuser: MPI/DPT.
ii. Shaft, Couplings and other active components: UT (If shaft dia. >= 50 mm) and DPT.
iii. Fabricated Pump components: DPT on welds.

b. Hydrostatic test at two times the bowl discharge pressures at rated capacity or 1.5 times the shut off head whichever is greater.

c. Dynamic balancing of assembled rotor to grade 6.3 or better as per IS0–1940.

d. Performance test with job motor as per Hydraulic Institute Standards over entire operating range at rated speed, including vibration and noise measurement.

e. Strip test after performance test (if required).

8.02.04 Air Distribution System & Air Filter

a. Functional test of fire damper along with actuator shall be done.

b. Filters shall be tested for pressure drop, efficiency and dust holding capacity and test certificates hall be submitted for review.

c. All ductwork shall be carefully examined to determine their performance with the specification with respect of dimensions, materials, marking, workmanship and other requirement.

d. After completion, all main ducting shall be checked for air leakage/ tightness by smoke test method for leakages (at site). Leakages if any shall be made good by bidder.

8.02.05 Pipe and Fitting

a. All pipes shall be hydrostatic pressure tested (UT/ECT are allowed as alternative) at tube mill as per relevant Std.

b. All mother pipes used for fittings shall be subjected to hydraulic or ultrasonic test at tube mill.

c. Non-destructive examination of welds shall be carried out in accordance with the relevant design/manufacturing codes.

d. All welds shall be subjected to a visual examination and DPT.

8.02.06 Valve

a. Hydraulic pressure tests shall be carried out on each valve to check body and bonnet strength. Seat leakage shall also be carried out as per approved drg. /data sheet. Check valve shall also be tested for leak tightness test at 25% of specified seat test pressure.

b. Functional and dimensional testing and wear travel, seat contacts, smooth opening & closing shall be carried out on each valve.

8.02.07 Insulation

a. Insulation material shall be tested for all mandatory tests as per relevant standards/ specification.

b. Thermal conductivity test (only for thermal insulation) shall be done once in six months for the insulation material manufactured during six

months period for the same density, outer dia. and thickness of material as per IS: 3346 or equivalent standard. However if such tests have been carried out by the bidder on similar item which is not older than six months in a third party laboratory, test reports shall be submitted for review.

8.02.08 Air Washer Unit

a. Dimensional check shall be carried out after a complete assembly as per the approved drawing/data sheet.

b. Each component of the AWU & UAF shall be tested separately as per the inspection requirement mentioned herein above and relevant standard.

c. Performance and functional test after a complete assembly shall be carried out with job motor at site if supplied in knock down condition.

8.02.09 Electric Motor

Every motor shall be routine tested as per IS: 325 to the extent necessary to establish that it is identical to the type tested motor.

8.02.10 Local Starter cum Control Panel / Local Starter Panel

a. Operation under simulated service condition to ensure accuracy of wiring, correctness of control scheme and proper functioning of equipment.

b. All wiring and current carrying parts shall be subjected to HV/IR test as applicable.

c. Primary current and voltage shall be applied to all instrument transformers.

d. Routine tests shall be carried out on all equipment such as instrument transformers, meters, contactors, switch fuse unit etc.

e. The tests shall include wiring continuity tests, insulation tests, and functional tests to ensure operation of the control / protection / metering of individual equipment.

f. All switches, meters, and other devices shall be tested and calibrated in accordance with relevant IS standards.

g. Dimensional checks, bill of material check for quantity & make, painting checks shall also be carried out.

8.02.11 Cable Tray and Galvanizing Structure (if applicable)

Material check, Dimensional Check, Zinc coating thickness as per IS: 3203, IS: 4759 and Mass of zinc coating as per IS: 4759 & IS: 6749 including Adhesion

test and Uniformity of Zinc coating as per relevant IS shall be conducted on cable tray and accessories.

8.02.12 Gauges, Switches, Instruments, etc.

Accuracy, calibration, repeatability, material, dimension, functional tests and other checks as applicable shall be checked.

8.02.13 Painting

Painting of all surfaces shall be checked for shade, surface finish, uniformity, coating thickness (DFT) and adhesion test/peal off test.

9.00.00 **FIELD TEST**

9.01.00 **Type Tests**

Bidder should have performed the applicable type tests as per the IS / applicable standards on various components of each type and rating. Reports not older than five years shall be submitted to this effect. All such type test reports shall be subjected to the approval of Purchaser. In case the bidder has to carry out these type tests, all such tests shall be done at bidder's risk and cost within the schedule specified herein. No deviation in this regard is acceptable.

9.02.00 **Field Test**

Overall performance of the ventilation system shall be tested after complete installation at site. This test shall be carried out to determine whether the plant meets the performance requirements specified here in and shall include measurements of all parameters under various outside conditions and establishment of correct supply of equipment. All testing and calibrating instruments required for this purpose shall be supplied by the contractor.

10.00.00 **PERFORMANCE GUARANTEE, TOLERANCE, PENALTY AND TEST RECORD**

10.01.00 The Tenderer shall have to guarantee the performance of individual equipment. The Tenderer shall also guarantee maintenance of the inside conditions and the minimum air changes as indicated under "design criteria".

10.02.00 The test shall be conducted at the manufacturer's works / site in accordance with the specification and if the shop / site performance tests indicate the failure of the guaranteed performance for the equipment concerned, it would be necessary for the manufacturer to make good the deficiency at its own cost by incorporating the necessary modification, alteration and replacement.

10.03.00 The additional test required to show the effect of such alteration shall be performed by the manufacturer at no expense to the purchaser.

10.04.00 **TEST RECORDS**

The certificates and records of all tests shall be submitted to the purchaser / Consultant for approval. The manufacturer shall maintain records of all tests required in the specification during manufacturing, erection and commissioning. A list of records shall be submitted to the purchaser on completion of the job. The purchaser shall be able to obtain certified copies of such records at any time.

11.00.00 SPECIAL CLEANING, PROTECTION & PAINTING

11.01.00 Internal surface of all parts shall be cleaned to remove loose scales and dirt. The external surface of the motor and end-shield shall be sand blasted to remove all rusts, scale etc. All sharp edges shall also be removed. Welding rods, studs & other foreign objects shall be removed prior to final assembly. Excess oil and grease shall be removed by wiping.

11.02.00 All shop finished parts shall be painted with two (2) coats of rust preventing paint. One (1) coat of synthetic enamel final paint shall be applied over and above the rust proof paint before despatch of material.

11.03.00 All surfaces coming in contact with corrosive fumes / gases during exhaust ventilation system, e.g., that in the battery room shall be painted with chlorinated rubber paint or suitable epoxy paint.

11.04.00 All equipment shall be boxed / crated or otherwise protected for shipment. Dry nitrogen desiccant and other protections shall be provided as may be necessary.

12.00.00 DOCUMENTS, DATA TO BE FURNISHED WITH TENDER PROPOSAL

Besides submitting the enclosed Technical Proposal Particulars Sheets duly filled in, the proposal shall also include the following drawings, curves and information wherever applicable:

12.01.00 Preliminary equipment layout drawings for Air Washer and UAF units, as well as preliminary ducting layout drawing.

12.02.00 Characteristic curves of each type of centrifugal and axial flow fans.

12.03.00 Characteristic curve of each pump.

12.04.00 Descriptive and illustrative literature / catalogues / leaflets on each of the equipment and components offered.

12.05.00 Sectional drawings for air diffusers and grilles, as applicable.

12.06.00 An experience list about supply of similar plant and equipment. The list shall indicate the salient technical parameters in each case, the status of execution and the scope of approx. value of the work undertaken by the bidder.

12.07.00 A comprehensive write-up and / or brochure on details of manufacturing and testing facilities in the shop of the manufacturer.

12.08.00 Any other relevant data and particulars as needed.

12.09.00 Guaranteed motor input power requirement for each and every equipment.

13.00.00 **POST AWARD DOCUMENTS, DATA TO BE FURNISHED**

13.01.00 Particulars of drawings, data and documents

13.01.01 Design Calculation supporting sizing of Ventilation equipment.

13.01.02 Equipment layout and sectional drawings of

a. Air Washer Unit.
b. UAF Unit.

13.01.03 Schematic flow and instrumentation diagram of the complete system indicating the limits of supply and erection.

13.01.04 Ducting layout drawing including sectional views indicating the details of duct sizes, duct joints, duct insulation, duct supports, diffusers, grilles, dampers etc for various floors of Power House Building, ESP, AHP & CHP Control Building and other auxiliary buildings, as applicable.

13.01.05 Layout drawings showing the roots of water pipe line with details of hangers, supports etc.

13.01.06 Outline drawings incorporating all principal dimensions, civil foundation drawings and weight etc. and also sectional drawings incorporating data of material of construction wherever applicable for following equipment:

a. Air Washer Units
b. UAF Units
c. Centrifugal Air Blower with the Drive Motors
d. Centrifugal Pump sets with Drive Motors for circulation of water
e. Fan Filter Units, Supply Fans and Exhaust Fans with drive Motors
f. Roof Extractor fans with Drive Motors
g. Supply Air Grilles / Diffusers
h. Fire Dampers
i. Back Draft Dampers

13.01.07 Technical Catalogues and data sheet for each Equipment and instrument

13.01.08 Drawings and data sheets for Dry Panel Type Filters.

13.01.09 Location details of all wall mounted type Axial Flow Fans.

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SECTION-I

PERFORMANCE GUARANTEES

1.00.00 **PERFORMANCE GUARANTEES, PERFORMANCE/ACCEPTANCE TESTS & LIQUIDATED DAMAGES FOR SHORTFALL IN PERFORMANCE**

1.01.00 The Bidder shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment covered in this specification. The guarantees are categorised as:

a) Those which attract liquidated damages, as listed below (Category-"A"). The Bidder shall furnish signed declarations in the manner prescribed in the bid proposal schedules for these guarantees.

b) Those which do not attract liquidated damages, as listed below (Category-"B"). This guarantee list indicated in this section is not exhaustive and the Owner reserves the right to call upon the Bidder to demonstrate any parameter, operation, etc. of any equipment as specified and as required to meet the duty conditions.

1.02.00 The guaranteed parameters shall be without any tolerance values. The Bidder shall demonstrate all the guarantees covered in various volumes and sections of this specification during Performance/Acceptance test. In case during tests it is found that the equipment/system has failed to meet the guarantees, the Contractor shall carry out all necessary modification to make the equipment/system comply with guaranteed requirements. However, if the Contractor is not able to demonstrate the guarantees, even after the modifications within ninety (90) days of notification by the Owner, the Owner will at his discretion :

i. reject the equipment and recover the payment already made or accept the equipment only after levying liquidated damages as identified in this section for those guarantees which are covered under category "A".

OR

ii. reject the equipment and recover the payment already made or accept the equipment only after assessing and deducting from the contract price an amount equivalent to the deficiency of the equipment/system as assessed by the Owner, for those guarantees which are covered under Category-B.

1.03.00 All guaranteed parameters shall necessarily be quoted by the Bidder based on the established proven results obtained from similar units in successful operation. Evidence for this shall necessarily include the test codes used, acceptance test results, accuracies of various instruments used for the performance test, details of tolerances, if allowed, etc. While quoting the guaranteed parameters, the Bidder shall keep in view the requirements

specified in the specification especially regarding the reliability, operability and maintainability of the equipment proposed. The Owner reserves the right to evaluate the parameters quoted by the Bidder based on his experience and published material available.

1.04.00 The liquidated damages shall be calculated prorata for the fractional parts of the unit unless stated otherwise.

1.05.00 The turbine generator, boiler, auxiliaries, and all other plant equipment and system shall perform continuously without the noise level (individual or collectively) exceeding the values specified in respective equipment specification over the entire range of output and operating frequencies.

1.06.00 **Performance/Acceptance Tests**

1.06.01 The performance/acceptance tests for various equipment and systems shall be carried out as specified under the respective equipment specifications and those specified below shall be specifically applicable. All the guarantees shall be tested together as far as practicable.

1.06.02 In case of systems with stand-by equipment the liquidated damages for non-performance will be levied for normal operating number of equipment only. However, for this purpose all the equipment including standby equipment shall be tested and average values arrived at.

1.06.03 For instrument inaccuracies during PG Test, refer subsequent clauses of this section.

1.06.04 For Total Auxiliary Power Consumption, the transformers listed under the respective clauses, shall be taken together for purposes of guarantee and not individually.

2.00.00 **START-UP, INITIAL OPERATION, RELIABILITY RUN AND PERFORMANCE TESTS**

For the purpose of Taking over of the Plant, the following activities shall have to be completed successfully.

i) Mechanical Completion
ii) Preliminary Operation
iii) Initial Operation
iv) Reliability Operation
v) Trial Operation
vi) Performance Guarantee Tests

2.01.00 **Mechanical Completion**

(a) Mechanical completion is defined as the state of readiness of works and completeness of Field Quality checks under the scope of contract to undergo the pre-commissioning checks, followed immediately thereafter by commissioning including preliminary operation, initial operation, reliability operation, performance tests including unit characteristics tests for functional or operational occupation of the

works.

(b) Mechanical completion shall be deemed to occur when the contract erection/installation/construction and Field Quality check works are completed as per specifications for all equipment / systems including standby. It also include but not limited to the following:

(i) all installation/erection and Field Quality checks duly carried out and individual protocol viz. erection, FQA (Field Quality Assurance) and commissioning protocol to be signed.

(ii) all defects/deficiencies notified by the Purchaser during installation/erection rectified to the satisfaction of Purchaser which, in the opinion of the Purchaser, will not affect the safe operability and maintainability of the works, and

(iii) the contract works, in the opinion of Purchaser, subject to sub-clause (ii) above, being fit, sound, safe and operable for undertaking the pre-commissioning checks, preliminary operation, initial operation, reliability operation and performance tests including unit characteristics tests followed by subsequent commercial operation without interruption for reason of defect/deficiency or unfulfilled obligations of the Contractor in the erection/installation work.

2.02.00 **Specific Requirements of Mechanical Completion**

(a) Mechanical completion in different disciplines shall be determined based on the following characteristics, signifying the readiness of the works/plants and systems for undertaking the pre-commissioning checks and subsequent preliminary operation, initial operation, reliability operation and performance tests including unit characteristics tests as applicable to the contract works:

(i) All plant construction/installation in various disciplines, as detailed under (b) below and as applicable to the contract are completed including aesthetic and workmanship and safety aspects, with all installation/construction checks as per specification, relevant codes, standards and practices ensuring conformity to contract and meeting any applicable statutory requirements.

(ii) All contractual obligations up to the stage of completion of construction / installation are fulfilled to the satisfaction of the Purchaser.

(b) All contract works or otherwise ready to be taken into service, or for functional or operational occupation save pre-commissioning/ commissioning checks, preliminary operation, initial operation, reliability operation, performance tests, unit characteristics tests are to be carried out as per approved commissioning procedure submitted by the contractor including but not limited to the following:

(i) Areas inclusive of all roads, accesses, structures, housings, platforms, walkways, stairs, ladders, safe approach to equipments, safety/ protective guards, covers, hand rails and such items of work are constructed as per specification and approved for use.

(ii) Drains, sewers, waste disposal channels, vents, chutes, ducts and such works are constructed and connected to treatment and other disposal systems.

(iii) Equipment and piping in different systems/disciplines with all appurtenances, auxiliaries and accessories along with supporting structures, hangers, mounts, etc., are erected/ installed, supported, anchored, aligned, grouted and adjusted for operating conditions.

(iv) Electrical power supply, control, communication and lighting equipment along with control panels, control desks, switchgear, local starters and such accessories along with protective systems, interlocks and integral and auxiliary systems are permanently installed, aligned and adjusted, with megger, continuity and specified installation checks duly carried out.

(v) Cables are laid, routed, supported, dressed, clamped, tagged, ferruled and terminated with clamp terminals designated and all continuity and megger checks duly carried out.

(vi) Safety/relief valves are calibrated and set to operating conditions and tried out. All safety systems are installed, calibrated, checked and accepted.

(vii) Plant identification numbers, colour codes, tags, nameplates are duly mounted / painted/affixed.

(viii) All painting, lining and insulation works are completed with specified checks to the satisfaction of the Purchaser.

2.03.00 **Other Prerequisites for Mechanical Completion**

The Contractor shall also meet the following prerequisites for mechanical completion:

(a) Submit a compilation of all reports of shop tests, material tests and various stage inspection establishing total compliance to contract specification in manufacturing items of supply of contract.

(b) Submission of a certificate by the Contractor in a format agreed by the Purchaser that the contract works have been designed, selected, manufactured, furnished and installed under the full responsibility of the Contractor.

(c) All erected plants, structures, equipment and systems are maintained and preserved in sound condition and are fit and sound to undertake

pre-commissioning checks and 'tests before commercial operation' for operational and functional occupation immediately thereafter.

(d) All areas and constructed works are cleared daily upto the satisfaction of the Owner of all construction materials, temporary works, debris, rubbish water and all such impediments to render the contract works safe, sound and operable.

(e) All safety features and safety equipment are functional.

(f) Fire prevention and fire extinguishing system in all fire prone areas are to be made functional.

(g) Any specific statutory approvals pre-requisite to commissioning of the plant are duly obtained.

2.04.00 **Preliminary Operation**

Preliminary operation shall mean all activities undertaken as part of commissioning after mechanical completion upto commencement of initial operation and shall include mechanical and electrical checkouts, calibration of instruments and protection devices, commissioning of sub/supporting systems covered under the contract.

2.05.00 **Initial Operation**

Initial operation shall include all operations undertaken as part of commissioning after completion of preliminary operation upto commencement of reliability operation. It shall be the first integral operation of the complete BOP integrated with Boiler, Turbine Generator package covered under the contract and shall include first light up / initial equipment rolling, equipment stretch-out, dry-out no-load / partial load /full loads runs for mechanical / electrical tryout and gathering of operational data, calibration, setting and commissioning of controls systems; and shutdown inspection and adjustment after running trails of the plant under the contract.

During initial operation each and every activity wise commissioning protocols are to be jointly signed by the Purchaser and Contractor commissioning team.

The auto loop control tuning shall continue upto the commencement of 72 hour full load operation of trial run.

The initial operations shall include operation of unit as a whole under normal operating conditions for twenty four (24) consecutive hours at the 100% TGMCR load or twelve (12) consecutive hours for two (2) consecutive days at the 100% TGMCR load unless otherwise agreed to by the Purchaser or restricted by system load conditions. The completion of initial operation will be certified in writing by the Purchaser.

2.06.00 **Reliability Operation**

(a) After the initial operations, the plant shall be on reliability operation. During the reliability operation, the Contractor will be allowed to make

minor adjustments as may be necessary, provided that such adjustments do not interfere with or prevent the commercial use of the plant or result in significant reduction of output. The duration of the reliability operation of plant shall be spread over a period of thirty (30) days. The maximum number of interruption attributable to Contractor shall be of four (4) numbers each not exceeding four (4) hours duration. In case either the number of interruptions, attributable to the Contractor, exceeds four (4) or the duration of any of the four (4) interruptions exceeds four (4) hours the reliability test shall be repeated.

(b) For the period of reliability operation, the time of actual operation shall be counted. In case the duration of actual continuous operation of any of the above modes is discontinued for reasons, which are not due to Contractor's fault or negligence, that particular test would be deemed to have satisfied the reliability operation test. However, should the test be discontinued due to Contractor fault, the test shall be restarted for that particular case.

(c) Should any failure (other than of an entirely minor nature) due to or arising out of faulty design, materials, or workmanship (but not otherwise) occur in any item of the plant, sufficient to prevent commercial use of the plant, the reliability test period of thirty (30) days shall recommence for that item after the defect has been remedied by the manufacturer/Contractor. The onus of proving that any failure is not due to faulty design, materials and workmanship will lie with the Contractor.

(d) A 'reliability operation' report comprising observations and recordings of various parameters measured in respect of the 'reliability operation' shall be prepared and submitted to the Purchaser. This report, besides recording the details of various observations during 'reliability operation' shall also include the dates of start and finish of the reliability operation and shall be signed by the representatives of both the parties. The report shall have recordings of all details of interruptions that occurred, adjustments made and any repairs carried out during the 'reliability operation'.

Also a punch list is to be prepared during the reliability test and the defects are to be rectified by the contractor before commencement of 72 hour operation at full load during trial operation.

(e) Should any failure or interruption occur in any portion of the tests due to or arising from faulty design, materials, workmanship, omissions, incorrect erection, or inadequate instructions by the Contractor's supervisors, sufficient to prevent safe commercial use of the plant, the reliability operation test at the particular load shall be considered void and the reliability test shall recommence after the Contractor has remedied the cause of the defect.

(f) During the reliability operation all the equipments, Raw/ DM water system and sub-systems, control loops, interlocks and protection including switchyard installations will be in service and change over to standby equipments are to be done on running condition of the unit.

(g) The 'reliability operations' shall be considered successful, provided that each item of plant can meet the above requirements.

(h) Upon the completion of 'reliability operations', as soon as practicable, or at such time as may be otherwise agreed to by the parties concerned, the Contractor shall notify in writing to the Purchaser that the Plant is ready for performance tests.

2.07.00 **TRIAL OPERATION:**

1. On completion of erection of any major items along with its auxiliaries, the same shall be thoroughly inspected by the Contractor together with the TSGENCO's Engineers for correctness and completeness and acceptability for pre-commissioning tests. Though the TSGENCO's Engineers associate themselves with such inspection, the responsibility for declaration for correctness, completeness and acceptability shall rest with the Contractor and the pre-commissioning tests and inspections shall be carried out after such declaration. The pre-commissioning tests to be performed at site as well as necessary documentation and formats for the protocols to be signed during and after the tests shall be prepared by the Contractor taking into account relevant Indian/International/ Manufacturers standard as applicable and finalized by the TSGENCO sufficiently in advance through mutual discussions. On conclusion of satisfactory pre-commissioning tests of each individual equipment, the trial operation of the unit shall start consistent with parameters of the technical specifications.

2. The duration of trial operation shall be for 14 days during which period the unit shall be run from half to full load or any other load cycle mutually agreed to during which period the unit shall run at full load for 72 hours continuously. However, if required, the Purchaser and the Contractor may mutually agree for economical load operation for 48 hours continuously. Any interruption caused by the Contractor up to 24 hours will not effect the period of 14 days indicated above. In case of such interruption occurring for more than 24 hours, the above period shall be extended correspondingly. During the above trial operation the standby auxiliary equipment shall also be run for a minimum period of more than 72 hours during which period the equipment shall run at its rated capacity for a minimum period of 24 hours. Further the above trial operation shall be carried out in full fledged manner with the associated instruments and controls. The unit is deemed to be commissioned on successful completion of the above trial operation.

3. A document shall be prepared on the results of trial operation. This document besides recording of the details of the various observations during the trial run will also include the date of start and finish of the trial operation and will be signed by the representative of both the parties. The document of the trial operation shall have log sheets and all adjustments, repairs, interruptions etc., shall be recorded therein. If any major adjustment is carried out which has been changed from the initial operation value, then the reason for it is to be furnished in the

report in detail.

The Purchaser and the Contractor will observe the plant overall reliability and shall test the equipment runback, rundown, auto start of equipments, CMC function and its reliability, complete automation of the plant system etc.

4. The readiness of the unit for the trial operation shall be intimated by written notice to the TSGENCO after mutual discussions. After receipt of such notice if the trial operation could not be performed or could not be completed due to any reasons not attributable to the Contractor and if the situation continues, the Contractor shall be absolved of the responsibility for the delay and the plant shall be deemed to have been taken over by the TSGENCO at the end of 60 days after the Contractor's notifications of readiness of the same.

5. The trial operation shall be carried out in compliance with relevant manufacturer's standards and/or relevant Indian/International standards and manufacturer's operation directions before starting them.

6. Defects which are minor in nature and do not endanger the safe operation of the plant, shall not be considered as reasons for not taking over the plant by the TSGENCO. These defects shall be listed in the above mentioned documents and shall be rectified by the Contractor in accordance with the agreement made in this respect.

2.08.00 **Performance Tests**

(a) PG test notification to be given by the contractor to the purchaser after COD. The performance tests shall be conducted at site on all major systems by the Contractor. The Contractor's commissioning Engineers shall make the entire plant ready for such tests and assist the Purchaser in operation during the tests. The test shall be commenced after the 'Plant/Equipment' has attained stable operation at the end of 'reliability operation'. The date of commencement of the performance tests shall be as soon as practicable on completion of the 'reliability operation' or as may be mutually agreed upon between the Contractor and Purchaser.

Final trail operation shall be carried out for a period of seventy two (72) hours at 100% TGMCR before 'taking over'.

(b) **Independent Inspector**

The Purchaser reserves his right to appoint an independent inspector at his own cost as his representative to discuss the test programme, to approve the instrumentation, to witness the tests and to analyze the test results.

(c) The tests shall be binding on both the parties of the contract to determine compliance of the 'plant'/'equipment' with the performance

guarantees.

(d) The performance tests shall be carried out to prove the guarantees. The purpose of the performance tests is to check whether the plant meets the guaranteed performances.

(e) The performance test procedure, the instrumentation to be installed, the instrument accuracy classes, including the definition of the calculation method to be used, the areas of responsibility and the items which specifically require preparation and agreement shall be submitted by the Contractor for review and approval during detail engineering phase. The schematics identifying the guarantee test instrumentation shall be submitted along with procedure. It shall be ensured that necessary test points and spool pieces are installed during the detail-engineering phase and also identified in process and instrumentation drawings. Code of the PG test is to be fixed up during detail engineering stage. The Contractor shall furnish detail test programme during detail engineering stage.

(f) The performance test instruments shall be of precision type with instrument accuracy limits as required and defined in the applicable performance test codes such that measurement uncertainty does not exceed the values agreed to by the Contractor in the Schedule of Performance Guarantees.

(g) All test instrumentation for the performance tests as required shall be supplied by the Contractor on loan basis. All costs associated with the supply, calibration, installation and return of the test instrumentation are deemed to have been included in the contract price. The test shall be in accordance with those specified or as per agreed performance test codes. Batch calibration shall not be accepted.

(h) Any special equipment, tools and tackle required for successful completion of the performance tests shall be provided by the Contractor.

(i) It is Contractor's responsibility to co-ordinate for carrying out the performance tests. The duration of the test shall be in accordance with the agreed test codes. All other tests to prove the guarantees as indicated in the Contractor's offer shall also be conducted.

(j) The plant parameters during the performance test shall be adjusted as far as practicable to the guaranteed performance test conditions. The tests shall be conducted to provide guaranteed parameters as defined in the contract.

(k) Category-B tests are to be completed before Category-A PG test. Protocols are to be signed jointly by the Purchaser and Contractor for each Category-B test.

(l) **Reporting of Test Results**

(a) Within two weeks after the conclusion of the performance test,

the Contractor shall submit ten (10) copies of test reports to the Purchaser stating whether the plant passed or failed such test(s), accompanied by sufficient test data and calculations to demonstrate the level of performance attained with respect to each of the tested parameters.

(b) The report(s) shall include as a minimum, the following:-

(i) Scope

(ii) Various guaranteed parameters & tests as per the contract.

(iii) Codes/standards used

(iv) . Description of the test procedures

(v) Full schematic diagrams with indication of test instruments locations and identification tags of same.

(vi) Instrumentation details and calibration.

(vii) Duration of test, frequency of readings and number of test runs

(viii) Test logs and summary of test readings used for performance calculations.

(ix) Full set of correction curves.

(x) Computation of test results.

(xi) Sample calculation

(xii) Performance calculation

(xiii) Computations to prove measurement uncertainty is within acceptable limits.

(xiv) Acceptance criteria

(xv) Any other information required for conducting the test

(xvi) Conclusions of performance tests.

(m) Within fifteen (15) days of receipt of such test report(s), the Purchaser shall submit a notice to the Contractor stating either:-

(i) That Purchaser concurs with the information provided in the test report(s), or

(ii) That Purchaser disputes some or all of the information provided

in the Contractor's test report(s), the areas being disputed, and the levels of performance being disputed.

(n) If Purchaser concurs with the information in the Contractor's test report(s), the Purchaser shall, within fifteen (15) days of receipt of the test report, provide a written notice to the Contractor accepting the results of the tests.

(o) If Purchaser disputes any or all of the results contained in the Contractor's test report(s), the Contractor and Purchaser shall meet within fifteen (15) days of the receipt of the Purchaser notice at a mutually acceptable location to review and discuss the dispute.

All the category-B test results are to be computed and to be submitted along with the PG test report for detail study by the Purchaser.

2.08.00 **Notice of Tests**

The Contractor shall issue 21 days notice to the Purchaser of the date after which he will be ready to commence the tests and the Contractor shall commence the tests promptly thereafter.

2.09.00 **Delayed Tests**

(a) If the tests could be carried out but are being unduly delayed by the Contractor, the Purchaser may by notice inform the Contractor to conduct the tests within 14 days after the receipt of such notice. The Contractor shall conduct the tests on such days within that period as the Contractor may fix and of which he shall issue notice to the Purchaser.

(b) If the Contractor fails to conduct the tests within such notice period, the Purchaser may himself proceed with the tests. All tests so conducted by the Purchaser shall be at the risk and cost of the Contractor and the cost thereof shall be deducted from the contract price or charged to the Contractor. The tests shall then be deemed to have been conducted by the Contractor and the test results shall be binding on the Contractor.

(c) **Facilities for Tests on Completion**

Except where otherwise specified, the Contractor shall provide and bear costs for these items, as may be required to carry out the tests on completion.

(d) **Retesting**

If the plant fails to pass the test (which in the case of performance tests means not achieving the acceptable limits), the Purchaser may require such tests to be repeated on the same terms and conditions save that only reasonable notice of the date and time of such tests shall be required to be given by the Contractor to the Purchaser.

(e) **Disagreement as a Result of Tests**

If the Purchaser and the Contractor disagree on the interpretation of the test results, each shall give a statement of his views to other within 14 days after such disagreement arises. The statement shall be accompanied by all relevant evidence.

3.00.00 SCHEDULE OF GUARANTEES WHICH ATTRACT LIQUIDATED DAMAGES [CATEGORY-A]

Sl. No.	Plant/ System	Parameter for Performance Guarantee	Liquidated Damages
3.01.00	**Plant**		
3.01.01	Efficiency of steam generator	Efficiency of the steam generator at 100% & 80% TMCR while firing the Design coal at rated steam parameters, rated coal fineness and rated excess air. **(Refer Note-1 for estimation of weightage factor.)** Design coal shall be blended coal (50% imported coal + 50% indigenous coal).	As per Volume-I.
3.01.02	Steam generating capacity	Steam generating capacity in T/hr of steam at rated steam parameters at superheater outlet (with any combination of mills working) with the coal being fired from within the range specified.	As per Volume-I.
3.01.03	Turbine Cycle Heat rate	Turbine Cycle Heat rate in kcal/kWh under rated steam conditions, design condenser pressure with zero make up at 100% & 80% of rated load **(Refer Note-1 for estimation of weightage factor.)**	As per Volume-I.
3.01.04	Output	Continuous output (MW) of 100% TMCR at Generator terminals under rated steam conditions at Turbine Inlet (247 kg/cm^2(a), 565°C, 593°C) and CW temperature of 33°C with 0% make-up with excitation power deducted	As per Volume-I.
3.01.05	Condenser Pressure	Condenser pressure in mm Hg (abs) under VWO conditions, 3% make up, design CW temperature and CW flow.	As per Volume-I.

Sl. No.	Plant/ System	Parameter for Performance Guarantee	Liquidated Damages
3.01.06	Total Auxiliary Power Consumption	The total auxiliary power consumption for all the auxiliaries of boiler, turbine Generator and turbine cycle equipments required for continuous unit operation at 100% and 80% of rated load under rated steam conditions and at design condenser pressure with 0% make-up. **(Refer Note 1, 2, 3 & 4 for the basis of computation of Auxiliary power)**	As per Volume-I.
3.01.07	Cooling Tower Cold Water Temperature	Cooling tower cold water at 100% TMCR under rated steam conditions and at design condenser pressure.	As per Volume-I.

Note :

1. The weightage factor shall be estimated considering the following:

   a) 80% rating for 2000 hrs in a year,

   b) 100% rating for 6300 hrs in a year.

2. For computation of Auxiliary Power, output measured at Generator terminals minus sent out power measured downstream of Generator Transformer, applicable Losses (No load loss + Load loss+ auxiliary loss for coolers) for Standby Transformers, Unit Transformers and Bus duct losses shall be considered.

3. The equipment for auxiliary power consumption to be considered by the bidder shall include the equipment as per Annexure-C of Volume-I as minimum.

4. Power consumption for Fire Pumps, Sump Pumps, Elevators, EOT Cranes shall not be considered in the Auxiliary Power consumption estimate.

5. Heat Rate of TG Cycle : Maximum 1850 Kcal/kwh with Steam Turbine driven BFP.

6. Steam Generator Efficiency : Not less than 85%

7. Auxiliary Power Consumption shall be limited to 6% with Steam Turbine driven BFP and NDCT.

8. Normal Availability of the Plant : 98% (2% forced outage)

9. Plant Reliability : Minimum 95%

10. The condenser pressure measurement while conducting the guarantee tests for Cl Nos 3.01.03, 3.01.04 and 3.01.05 above shall be measured at 300 mm above the top row of condenser tubes.

4.00.00 **SCHEDULE OF GUARANTEES WHICH DO NOT ATTRACT LIQUIDATED DAMAGES FOR VARIOUS EQUIPMENT WHICH INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING [CATEGORY-B]:**

4.01.00 **Steam Generator**

4.01.01 Capacity in T/hr of steam at rated steam parameters at superheater outlet (with any combination of mills working as per Owner's discretion) and the coal being fired within range specified, corresponding to 100% BMCR at 33°C CW temperature.

4.01.02 Efficiency in percentage at 100% & 80% TMCR and 27°C ambient air temperature and 60% RH with zero make-up, condenser vacuum of 77 mm Hg(a) or better while firing the Design coal at rated steam parameters at Superheater and Reheater outlet and rated excess air and with any combination of mills working as per Owner's discretion. Design coal shall be blended coal (50% imported coal + 50% indigenous coal).

4.01.03 Air heater air-in-leakage after 3000 hrs. of operation from taking over date. To be demonstrated.

4.01.04 NOx emission

NOx emission from the unit – shall not be more than 365 ppm or 750 mg/Nm^3 (equivalent NO_2) at the ESP outlet at 6% excess oxygen.

4.01.05 Mill capacity at rated fineness.

4.01.06 Gas tightness efficiency of Guillotine dampers.

4.01.07 No fuel oil support shall be required above 30% of BMCR.

4.01.08 Performance characteristics of pumps, fans, etc. viz; capacity, head developed etc.

4.01.09 Capabilities of all drives.

4.01.10 Margins on fans. Through operation of single fan at a time.

4.01.11 Equal load sharing of pumps/fans while running in parallel shall be demonstrated.

4.01.12 Run back capabilities.

4.01.13 Ramp/sudden load change withstand capability.

4.01.14 Life of mill wear parts

4.01.15 Furnace Exit Gas Temperature

The Bidder shall demonstrate by direct measurements that the Furnace Exit Gas Temperature (FEGT) at the specified location does not exceed the

specified maximum temperature of BMCR. The test equipment to be used for this demonstration shall be latest, state of the art, to the approval of Owner.

4.01.16 Flue Gas Temperature

The Bidder shall also demonstrate that the flue gas temperature at the entry and exit of various boiler heating surfaces and also the variation across the cross section perpendicular to gas flow do not exceed the values considered for the pressure parts design.

4.01.17 Steam Temperature Imbalance

The Bidder shall guarantee and demonstrate that at SH and RH outlets (in case of more than one outlet) the temperature imbalance between the outlets does not exceed 10°C.

4.01.18 SH/RH Attemperation System

The Bidder shall guarantee and demonstrate that the spray water flow to SH attemperation system does not exceed the value considered for design (to be indicated in the bid) while maintaining the rated SH outlet steam temperature at BMCR. The Bidder shall also guarantee and demonstrate that the RH temperature is maintained at the rated value without any spray water requirement, for the secondary attemperation system, at all loads for which the specified RH steam temperature is required to be maintained at the rated value.

4.02.00 **Electrostatic Precipitator**

4.02.01 Pressure drop across the electrostatic precipitator.

4.02.02 Collection efficiency and outlet dust concentration shall be as per cl. no. 3.01.00 of Section-II in Volume-II-B.

4.03.00 **Turbine Generator**

4.03.01 Turbine Generator-Set Capability

The steam turbine generator unit shall be capable of delivering continuously at generator terminals the output as indicated by the Bidder in the following heat balances detailed out elsewhere with equipment specification submitted alongwith the bid.

a) Output corresponding to top HP heaters out of operation.

b) Output corresponding to all HP heaters out of operation.

c) Output corresponding to VWO flow, at rated steam conditions with condenser CW temperature 33°C & condenser of vacuum 77 mm HgA or better with 0% make-up.

d) Output corresponding to overpressure operation of the boiler-turbine-generator set, at rated main steam and hot reheat steam

temperature with condenser CW temperature corresponding to Condenser vacuum of 77 mm HgA or better with zero percent make-up.

4.03.02 Operating Frequency Range

As per the stipulations of Cl. No. 7.06.00 Vol. II-C, Section-I.

4.03.03 Constant Pressure and Sliding Pressure Operation

The constant pressure operation and sliding pressure operation from 30% turbine MCR to VWO condition of the unit in conjunction with the steam generator, HP-LP bypass system and instrumentation & control system shall be demonstrated.

In sliding pressure mode of operation, during quick load increase the idle control valve (s) must respond rapidly to pick up 20% of operating load, so that immediate increase of boiler pressure is not required. The load response capability shall be demonstrated in steps of 5 %.

Change-over from constant pressure mode to sliding pressure mode and vice-versa shall also be demonstrated.

4.03.04 Start-up, Loading, Unloading and Shutdown Capabilities

Start-up, loading, unloading and shutdown characteristics and startup time and loading capabilities for the steam turbine generator and steam generator both operating as a unit for cold start conditions (greater than 36 hours shutdown), warm start conditions (between 8 and 36 hours shutdown) and hot start conditions (less than 8 hours shutdown) under constant pressure and variable pressure mode and suitability for cyclic operation as indicated by the Bidder in the offer and accepted by the Owner shall be demonstrated ensuring the parameters of vibration, differential expansion, etc.

4.03.05 Vacuum Pulling time

Vacuum pulling time from condenser at atmospheric pressure to rated vacuum compatible to start Steam Turbine

4.03.06 Sudden Total Loss of External Load

On occasions, the steam turbine generator system may experience sudden total loss of all external load. Under these conditions, the steam turbine generator unit shall not trip on overspeed but shall continue in operation under the control of its speed governor to supply power for the plant auxiliary load station transformers, while staying within the prescribed permissible limits of steam metal temperature mismatch, exhaust hood temperature, absolute and differential expansion, vibration and eccentricity acceptable to the Owner.

4.03.07 Capacity with Reduced Hydrogen Pressure

Generator shall be capable of operating at reduced capacity at reduced generator hydrogen pressure in accordance with values furnished by the Bidder in his proposal and accepted by the Owner.

4.03.08 HP/LP Bypass Capabilities

i. HP/LP bypass capacity and capabilities under various modes of operation shall be demonstrated.

ii. Condenser performance with HP-LP Bypass operating at rated conditions.

4.03.09 Lube Oil Purification System - Capacity and Purity

Lube oil purification system capacity and the purity of purified oil at the outlet of the centrifuge and the outlet of the polishing filter, shall be demonstrated. If purity check is not possible at site, this shall be carried out at Vendor's works.

4.03.10 Extraction and CRH NRVs

Operation of the valves under turbine trip and high water level in the heaters, shall be demonstrated.

4.03.11 The performance of the condenser, i.e., the back pressure achieved at design CW flow and inlet temp. and cleanliness factors, VWO heat load shall be demonstrated.

4.03.12 Temp. of condensate at outlet of condenser shall not be less than saturation temp. corresponding to the condenser pressure at all loads.

4.03.13 Oxygen content in condensate at hot-well outlet shall not exceed the limit prescribed by HEI over the entire load range and shall be determined according to an internationally approved codes/standard.

4.03.14 When one half of the condenser is isolated, condenser capability shall be demonstrated to take at least 60% T.G. load under TMCR conditions.

4.04.00 **Deaerator**

4.04.01 The dissolved oxygen content in feed-water measured at deaerator outlet shall not exceed 0.005 cc/litre at all loads from no load to VWO condition with 3% cycle make-up with normal pressure and overpressure with incoming condensate presumed to be saturated with oxygen (without any chemical dosing).

4.04.02 Free carbon dioxide in deaerator effluent shall be non-traceable at all loads from zero to VWO with 3% cycle make-up with normal pressure according to ASTM standards.

4.05.00 **Power Cycle Pumps**

Performance of each pump (flow, head, vibration, noise, parallel operation) to be demonstrated.

4.06.00 **Automatic On Line Turbine Testing (ATT) System**

Demonstrated without disturbing normal operation.

4.07.00 **Coal Handling Plant**

Refer Cl. No. 10.00.00 in Volume-IV-A.

4.08.00 **Water Treatment System**

Performance Guarantee of Chemical Feed System shall be in accordance with Cl. No. 8.04.00 in Section-IV, Volume-II-B of the EPC Bid Specification.

Performance Guarantee of Condensate Polishing System shall be in accordance with Cl. No. 8.04.00 in Section-VI, Volume-II-C of the EPC Bid Specification.

Performance Guarantee of River Water Pre-Treatment System shall be in accordance with Cl. No. 8.04.00 in Section-I, Volume-III-C of the EPC Bid Specification.

Performance Guarantee of Demineralisation System shall be in accordance with Cl. No. 8.04.00 in Section-II, Volume-III-C of the EPC Bid Specification.

Performance Guarantee of Circulating Water Treatment System shall be in accordance with Cl. No. 8.04.00 in Section-III, Volume-III-C of the EPC Bid Specification.

Performance Guarantee of Waste Water Treatment System shall be in accordance with Cl. No. 8.04.00 in Section-IV, Volume-III-C of the EPC Bid Specification.

4.09.00 **Instrumentation and Control**

The Bidder shall demonstrate that the Instrumentation and Control system meets all the functional/performance requirements, specified in technical specifications.

4.10.00 **Noise Level**

The Bidder shall demonstrate Noise Level of various plants/equipments/systems as per Clause no. 17.02.00 in Section-IV of Volume-II-A.

4.11.00 **Air Conditioning & Ventilation system**

The rating and performance figures of the AC & Ventilation system & equipment as indicated in the respective technical specification shall be guaranteed by the Bidder. In the event of any deficiencies in meeting the guarantees as indicated in the technical specification after conducting the performance test, the bidder shall put all his efforts to rectify the deficiencies or will replace the equipment / accessories to achieve the specified performance parameters within a reasonable time.

5 x 800 MW YADADRI TPS

SECTION IA

(GENERAL TECHNICAL REQUIREMENT)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
NOIDA-INDIA

GENERAL TECHNICAL REQUIREMENTS

components shall be employed in different pieces of equipment in order to optimize the spares inventory and utilization.

8.00.00 MATERIALS

8.01.00 In selecting materials of construction of equipment, the Contractor shall pay particular attention to the atmospheric conditions existing at the Site and the nature of material/fluid handled. Wherever deviations are taken in respect of materials specified, the reasons shall be spelt out clearly in the proposal.

All materials shall be new, and shall be of the quality most suited to the proposed application.

8.02.00 In as far as is possible; materials shall be in accordance with Indian or international standard specifications and shall be used in accordance with Indian or international codes of practice. Where such standards or codes of practice are not available sufficient information shall be provided to allow the Owner to assess the suitability of the material for the particular application.

All materials used shall have performed lengthy satisfactory service in similar or more arduous conditions to those proposed by the Contractor.

8.03.00 All parts which could deteriorate or corrode under the influence of the atmospheric, meteorological or soil conditions at the Site, or under the influence of the working conditions shall be suitably and effectively protected so that such deterioration or corrosion is a minimum over the life of the plant.

9.00.00 LUBRICATION

9.01.00 Provision shall be made for suitable efficient lubrication where necessary to ensure smooth operation free from undue wear.

9.02.00 Non ferrous capillary tubing shall be used throughout.

9.03.00 Gear boxes and oil baths shall be provided with filling and drain plugs, both of adequate size. An approved means of oil indication including level switches and temperature indication shall be provided.

9.04.00 All high speed gears shall be oil bath lubricated. Low speed gears shall be lubricated by means of soft grease. Removable and accessible drip pans shall be provided to collect lubricant which may drop from operating parts.

9.05.00 All lubrication points shall be conveniently situated for maintenance purposes. It must be possible to carry out lubrication from a gangway or landing and without the removal of guarding or having to insert the hand into it. Where accessibility to a bearing for oiling purposes would be difficult a method of remote lubrication shall be fitted.

9.06.00 The Contractor shall supply grease gun equipment suitable to service each type of nipple fitted.

10.00.00 **LUBRICANTS AND CONTROL FLUIDS**

10.01.00 The Contractor shall provide a detailed and comprehensive specification for all lubricating oils, greases and control fluids required for the entire plant. A sufficient supply of these shall be provided by the Contractor for initial commissioning, first fill and till COD of the unit.

10.02.00 The Contractor shall supply a detailed schedule giving the lubricant testing, cleaning and replacement procedures. All equipment and facilities necessary for the testing, cleaning and changing of lubricants and control fluids shall be provided. The Contractor shall endeavor to reduce the varieties and grades of required lubricants and control fluids to a minimum, matching them where possible to those already in use in the generating station in order to simplify procurement and minimise storage requirements. All lubricants and control fluids shall be of internationally recognised standards and shall be easily obtainable from a large number of Indian suppliers. Bidder shall also indicate the equivalent Indian Standard for the above for easy procurement in future.

10.03.00 No lubricant or control fluid shall have toxic or other harmful effects on personnel or on the environment.

11.00.00 **OPERATION AND MAINTENANCE**

11.01.00 The plant shall be designed and constructed so that operation and maintenance manpower requirements are minimised.

The design and layout shall facilitate inspection, cleaning, maintenance and repair. The importance of continuity of operation is second only to that of safety.

11.02.00 Spare parts for equipment shall be interchangeable with the original components and, so far as possible, be of common design and manufacture.

11.03.00 All similar standard components/parts of similar standard equipment provided shall be interchangeable with one another. Further identical equipments shall be provided for similar duties so that the same are interchangeable with one another in totality and component wise.

11.04.00 All heavy parts (500 Kg and above) must be provided with a convenient arrangement for slinging and handling during erection and overhaul. Any item of plant normally stripped or lifted during periods of maintenance and weighing one tonne or above, shall be clearly marked with its weight.

11.05.00 On completion of commissioning, a complete set of tools for the maintenance of the entire plant shall be provided by the Contractor. This shall include all necessary spanners, special wrenches, extraction equipment and any special tools reasonably required by the Engineer. Tools used during erection and commissioning shall not be accepted except with the specific approval of the Engineer.

11.06.00 All equipment and major valves should be provided with adequate maintenance approach and facility.

12.00.00 PLANT LIFE AND MODE OF OPERATION

The complete plant including all the equipment and systems individually and collectively shall be designed for continuous operation for an economic service life of thirty (30) years under the prevailing site conditions and for the type of duty intended.

The critical components of the Steam Generator, Turbine-Generator and Auxiliary equipment, the life of which is limited by time and temperature dependent mechanisms such as thermal stress, creep and low cycle fatigue, are to be designed considering expected (hot, warm and cold) start-up, shut-down and cyclic load variations.

The allowable stresses shall be reduced so that life expectancy to minimum 2,00,000 hours of operation can be achieved. The Bidder shall discuss this aspect in his technical proposal.

The unit would be operated on base load with cyclic load variation. The load variation is expected to be as per schedule depending on power demand.

The expected start-ups should be considered as minimum
(Based on HPT metal temperature)

Cold start-up (>72 hrs. shutdown)	:	6 per year
Warm start-up (between 10 to 72 hrs. of shutdown)	:	40 per year
Hot start-up (less than 10 hrs. shutdown)	:	160 per year

13.00.00 PACKAGING & MARKING

All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. While packing all the materials, the limitations from the point of view of availability of railway wagon sizes in India should be taken account of. The details of various wagons normally available with Indian Railways for transportation of heavy equipment shall be considered by the Bidder. The Contractor shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.

As per the information available, the dimensions of OD consignment for transportation of the equipment by rail (if any equipment to be handled through rail transportation) are as below :

a)	Width of the Package (from centre-line of rails - 1.6 metres on both sides)	:	3.2 Meters
b)	Height of the package from rail top	:	4.47 Meters

The above indicates the dimensions which can be normally transported on the

wagons without infringement of the "moving gauge". This is however not indicative of the consignment which can be carried out with infringement of "moving gauge" duly authorised and approved by the Indian Railways. There may be difference between the "moving gauge" and the "fixed structure gauge" and consignments infringing the "moving gauge" can be moved after investigation regarding possible infringement with the fixed structures. As the critical fixed structures in each route are different, consignments infringing moving dimensions have to be individually investigated to select a route and also determine the restrictions under which such movement is to be carried out. Such routes selected or other mode of transport envisaged is to be clearly brought out in the proposal wherever transport of over dimensional equipment is involved.

Bidder to consider unloading of material delivered through rail transportation, at near by railway station/ site unloading siding. The subsequent transportation up to project work place shall be considered by road only. All unloading and handling equipment both at railway station siding and at project site shall be arranged by the Bidder. Necessary arrangement to be organized with the railway authority for such purpose shall also be under the scope of services of the Bidder. Bidder may consider entire material delivered up to site through rail transportation only.

The identification marking indicating the name and address of the consignee shall be clearly marked in indelible ink on two opposite sides and top of each of the packages. In addition the Contractor shall include in the marking gross and net weight, outer dimension and cubic measurement. Each package shall be accompanied by a packing note (in weather proof paper) quoting specifically the name of the Contractor, the number and date of contract and names of the office placing the contract, nomenclature of contents and Bill of Material.

For imported equipment and material, suitable port facilities may be used in which case material may be transported from the port by tractor-trailer. Bidder may consider this aspect.

14.00.00 **PROTECTION**

Equipment having antifriction or sleeve bearings shall be protected by weather-tight enclosures. Coated surfaces shall be protected against impact, abrasion, discoloration and other damages. Surfaces that are damaged shall be repainted.

Electrical equipment, controls and insulations shall be protected against moisture and water damages. All external gasket surfaces and flange faces, couplings, rotating equipment shafts, bearings and like items shall be thoroughly cleaned and coated with rust preventive compound as specified above and protected with suitable wood, metal or other substantial type covering to ensure their full protection. All exposed threaded parts shall be greased and protected with metallic or other substantial type protectors.

All piping, tubing and conduit connections on equipment and other equipment openings shall be closed with rough usage covers or plugs. Female threaded openings shall be closed with rough usage covers or forged steel plugs. The closures shall be taped to seal the interior of the equipment. Open ends of

piping, tubing and conduit shall be sealed and taped.

Returnable containers and special shipping devices shall be returned by the manufacturer's field representative at the Contractor's expense.

15.00.00 ENVIRONMENT PROTECTION AND NOISE LEVEL REQUIREMENT

15.01.00 Environment Protection

The plant shall be designed for installation and operation in harmony with the surrounding environment and all measures of pollution control shall be ensured by the Bidder to restrict pollution from the liquid effluent and stack emission within the limits as given below with due consideration of Environment (Protection) Rules 1986 as amended till date.

In case the Ministry of Environment & Forest stipulate any other conditions not specified hereunder while clearing the project shall be complied with the plant by the contractor.

15.01.01 For Liquid Effluent

a) Provision laid down in schedule-I for Thermal Power Plants and also in Schedule-VI. General Standards for discharge of Environmental pollutants Part-A : Effects of Environmental (protection) Rules 1986, as amended till date.

b) Any specific requirement of State Pollution Authorities over and above the above stipulation.

15.01.02 For Air Emission

a) Suspended Particulate Matter i.e. dust burden at chimney outlet - Maximum 50 mg/Nm^3 (with worst coal and one field out at TMCR).

b) NO_x - 365 ppm Max. or 750 mg/Nm^3 (Equivalent NO_2).

c) SO_2 - Concentration based standard 2000 mg/Nm^3. Load based standard 0.2 metric tonne /MWe/day (for first 500 MW and 0.1 metric tonne/MWe/day for rest of the capacity above 500 MW)

In absence of Indian Standard for emission from power plants as on date, for certain gaseous effluents, the internationally accepted World Bank Standard is to be followed. Indian Standard for emission of power plants are under formulation. Should this standard is published before finalisation of the contract, the bidder has to comply the more stringent of the above norm or the new Indian Standard.

The bidder shall include in his scope all necessary equipment and measuring instruments to comply with above requirements. Location and accessibility of the instruments shall be properly coordinated.

DOCUMENT DISTRIBUTION

DISTRIBUTION SCHEDULE

S. No	Description	TSGENCO								CONSULTANT			Equipment Vendor	Remarks
		Director Projects	Director Technical	CE/Civil Thermal Projects Hyd.	CE/ TPC-I, Hyd	CE/ O&M/ KTPS	SE/ Civil KTPS	SE/E&M / KTPS	DE Constr. KTPS	Kolkata	HYD	KTPS		
A	**Letter Of Intent or Contract Documents**	1	1	1	S	1	2	2	1	1	1	1	2	
B	**Vendor Drawings**													
1.	Preliminary	1	1	1	2	1	1	2	2	12	1	-	S	
2.	Return preliminary with comments	-	-	1	2	1	1	1	1	S	1	-	1	
3.	Final and any revision thereof													
	a. Civil	1	1	6+1T	1	1	6+1T	1	-	2+1T	1	1	S	
	b. E&M	1	1	1	6+1T	1	1	6+1T	1	2+1T	1	1	S	
C.	**Design Drawings**													
1.	Preliminary													
	a. Civil	1	1	2	1	1	2	1	1	4	1	1	S	
	b. E&M	1	1	1	2	1	1	2	1	4	1	1	S	
2.	Released for construction													
	a. Civil	1	1	2	1	1	6	1	1	1	1	2	S	
	b. E&M	1	1	1	1	2	1	6	1	1	1	2	S	
3.	Return marked 'As built'													
	a. Civil	-	-	1	-	-	1	-	-	1	1	S	1	
	b. E&M	-	-	-	1	-	-	1	1	1	1	S	1	
4.	As built drawings													
	a. Civil	-	-	1+1T	-	2+1T	5+1T	-	1	1+1T	-	1	S	
	b. E&M	-	-	1	2+1T	2+1T	-	5+1T	1+1T	1+1T	-	1	S	

S. No	Description	TSGENCO								CONSULTANT			Equipment Vendor	Remarks
		Director Projects	Director Technical	CE/Civil Thermal Projects Hyd.	CE/ TPC-I, Hyd	CE/ O&M/ KTPS	SE/ Civil KTPS	SE/E&M / KTPS	DE Constr. KTPS	Kolkata	HYD	KTPS		
D	Progress Report Monthly													
1.	Equipment vendor	1	1	1	2	1	1	2	1	1	1	1	S	
2.	M/s DCPL, Kolkata	1	1	2	2	1	1	2	1	S	1	1	Nil	
E	Test & Inspection Reports													
1.	Equipment manufacturer													
	a. Civil	1	1	1	2	1	1	1	-	11	1	1	S	
s	b. E&M	1	1	-	2	1	-	1	1	11	1	1	S	
2.	M/s DCPL, Kolkata	1	1	-	2	1	-	1	1	S	-	1	-	
F	Instruction Manuals/Data Books													
1.	Equipment manufacturer													
	a. Civil	1	1	1+1T	1	1	6+1T	1	1	2+1T	1	1	S	
	b. E&M	1	1	-	3+1T	1	-	6+1T	2	3+1T	1	1	S	
2.	M/s DCPL, Kolkata	1	1	-	10+1T	1	-	15+1T	-	S	1	1	Nil	
G	M/s DCPL, Kolkata Criteria	1	1	1	8+1T	1	1	2	1	1	1	1	S	
H	Design Calculations	1	1	1	8+1T	1	1	2	1	1	1	1	S	
I	Final consulting Engineering Report	1	1	1	10	1	1	2	1	S	1	1	Nil	

S – Source, T – Transparency & Soft Copy on CD,

TSGENCO : Telangana State Power Generation Corporation Limited

Director, Projects, Hyd : Director/ Projects, TSGENCO, Vidyut Soudha, Hyderabad – 500 082

a) Bidder shall apply in writing to Owner for handing over of the complete Control & Instrumentation System after successful demonstration of tests as specified up to "Availability Guarantee Test".

b) Owner shall take over charge of the C&I system subject to fulfillment of the conditions enumerated hereunder :

i) Site check-list prepared by Owner are fruitfully attended by Bidder and certified by Owner.

ii) Operation/ Instruction manuals are updated to incorporate changes made up to Availability Test Run.

iii) Drawings/ sketches are submitted as per Contract, on as- built basis.

iv) Close loop controls, Binary & Sequential controls should be working on auto and interlocks are demonstrated to be functional.

v) Equipment and system supplied by Bidder are in working condition.

vi) Short supply items, as per Contract, are refurnished by Bidder.

vii) The above conditions are in addition to fulfillment of any/all other contractual obligations of Bidder towards Owner. Partial handing-over of systems /equipments shall not be permissible, except if desired so by Owner in special cases.

11.00.00 TRAINING OF PERSONNEL

11.01.00 Bidder shall include in the proposal training of Owner's personnel of different categories for operation, maintenance and troubleshooting of the supplied equipment. Training courses shall be conducted by experienced personnel of Bidder. Course participants shall receive individual copies of technical manuals at the time the course is conducted. Upon completion of each course, training manuals shall be property of Owner. Bidder shall supply all updates and revisions to the manuals.

11.02.00 Training shall be provided to operating, programming and maintenance personnel. The training shall be conducted at original equipment designer / manufacturer's works. While the exact content and duration of such training shall be guided by Bidder's experience , following gives the basic and minimum requirement of operation and mainteanance , troubleshooting training from Owner's point of view.

11.03.00 PLANT OPEARTION TRAINING

NO.OF PERSONNEL	CATEGORY OF PERSONNEL	SUBJECT	DURATION
12	Control Engineer	Main plant through DDCMIS OS	8 weeks each
16	Control Engineer	PADO System Usage	2 weeks each

	CUSTOMER SPECIFICATION FOR VENTILATION SYSTEM 5X800 MW YADADRI TPS	DOCUMENT NO.: PE-TS-417-554-A001
		REVISION 00 / DATE: FEB 2020

SECTION: I

SUB-SECTION: C 2C

CUSTOMER SPECIFICATION-PAINTING SPECIFICATION

TECHNICAL SPECIFICATION

FOR

PROTECTIVE LINING AND PAINTING

SECTION-XIII

TECHNICAL SPECIFICATION

FOR

PROTECTIVE LINING AND PAINTING

C O N T E N T S

SECTION-XIII

TECHNICAL SPECIFICATION

FOR

PROTECTIVE LINING AND PAINTING

1.00.00 INTENT OF SPECIFICATION

1.01.00 This specification addresses the requirements of all labour, material, and appliances necessary with reference to preparations for lining / painting, application as well as finishing of all lining / painting for all mechanical and electrical equipment, piping and valves, structures etc. included under the scope of this Package.

1.02.00 The Bidder shall furnish and apply all lining, primers including wash primers if required, under-coats, finish coats and colour bands as described hereinafter or necessary to complete the work in all respects.

2.00.00 CODES & STANDARDS

2.01.00 The Bidder shall follow relevant Indian and International Standards wherever applicable in cleaning of surface, selection of lining material / paints and their application. The entire work shall conform to the following standards / specifications (latest revision or as specified).

a) SSPC SP 10 / NACE 2 /	:	Near White Blast Cleaning
b) SSPC PA 2	:	Measurement of dry film Coating Thickness with magnetic gauges.
c) ASTM D 4541	:	Method for pull off strength using portable Adhesion Tester.
d) NACE RP 0274 – 2004	:	High-Voltage Electrical Inspection of Pipeline Coatings
e) NACE SP 0188 – 2006	:	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

f)	NACE RP 0169 – 2002	:	Control of External Corrosion on Underground or Submerged Metallic Piping Systems
g)	AWWA C 210 – 2007	:	Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
h)	IS 3589:2001 Annexure B	:	Steel Pipes for Water and Sewage Specification.
i)	AWWA C222-2000	:	Polyurethane Coating for the Interior and Exterior of Steel Water Pipe and Fittings.
j)	IS 13213 : 2000	:	Polyurethane Full Gloss Enamel (Two pack)

3.00.00 GENERAL REQUIREMENTS

3.01.00 The steel surface preparation prior to actual commencement of coating shall conform to SSPC SP 10 / NACE 2 / Sa2½ (near white metal) with sand blasting.

3.02.00 The contractor shall submit a detailed written description in the form of a manual covering coating equipment, procedures, materials inspection test, and repair etc. to Owner/Consultant for approval.

3.03.00 The contractor shall also provide copies of test reports from NABL approved laboratory (like National Test House, Kolkata) in support of the paint/primer materials to be used shall conform to the specification requirement.

3.04.00 The contractor shall also provide certificates from paint/primer manufacturer mentioning the batch numbers, date of manufacture and shelf life etc. of the materials to be used. In addition to that Manufacturing Quality Plan (MQP) and Field Quality Plan (FQP) shall also be submitted prior to commencement of supply of material and field application.

3.05.00 Paint/coating application work at site shall be done either by paint manufacturer or by their authorized applicator. The authorized applicator shall have proper training & certification from manufacturer. Applicator shall possess all the necessary specialized equipment and manpower experienced in similar job.

3.06.00 Applied coating shall be tested for dry film thickness, holiday (electrical inspection for continuity) and adhesion as per relevant standard such as SSPC PA 2, NACE RP 0274 and ASTM D 4541.

3.07.00 If necessary, the material may be heated and applied by airless spray / plural component spray system.

3.08.00 Manufacturer's specific recommendation, if any, shall be followed during application of lining / paints.

3.09.00 In areas where there is danger of spotting automobiles or other finally finished equipment or building by wind borne particles from paint spraying, a Purchaser approved method shall be adopted.

3.10.00 The colour scheme of the entire Plant, covered under this specification shall be approved by the Purchaser in advance before application.

3.11.00 All indoor and outdoor piping, insulated as well as uninsulated will have approved colour bands painted on the pipes at conspicuous places throughout the system, as approved by Purchaser.

3.12.00 Inside surfaces of vessels / tanks shall be protected by anticorrosive paints or rubber lining as required / specified elsewhere in the specification. External surfaces of all vessels / tanks shall be protected by anti corrosive painting.

3.13.00 For vessels / tanks requiring lining and epoxy painting all inside surface shall be blast cleaned using non-siliceous abrasive after usual wire brushing.

3.14.00 Natural rubber lining shall be provided on the inside of vessels / tanks as required / specified elsewhere in the specification, in three layers resulting in a total thickness not less than 4.5 mm.

3.15.00 Surface hardness of rubber lining shall be 65 +/- 5 deg. A (shore).

3.16.00 After the lining is completed, the vessels / tanks shall not be subjected to any prolonged exposure to direct sunlight in course of its transportation, erection etc. They shall not be stored in direct sunlight. No further lining or burning shall be carried out on the vessel, after application of the lining.

3.17.00 All lining projecting outside of the vessel shall be protected adequately from mechanical damages during shipment, handling storage etc.

3.18.00 Suitable warnings, indicating the special care that must be taken with respect to these lined vessels shall be stenciled on their outside surface with the letters at least 12 mm high.

3.19.00 All insulated piping shall have aluminium sheet jacketing.

4.00.00 EQUIPMENT, MATERIAL AND SERVICES TO BE FURNISHED BY THE BIDDER

4.01.00 After erection at site, the outside surfaces of all equipment having a shop coat shall be given further priming coat and finished coats of paint as detailed in following clauses. However, if the painting system is such that the shop coat and primer coat to be applied at site are not compatible, then shop coat has to be removed from the surface of equipment before application of primer coat with prior blasting.

All factory finished paints shall be touched up at site as required.

All uninsulated piping shall be finished with final paintings after use of proper wash primer and primer. Aluminium sheet jacketed piping need not be painted. Colour bands of Purchaser's approved shade shall however be applied on jacketed piping near walls or partitions, at all junctions, near valves and all other places as instructed by the Purchaser. All structures shall be painted with approved paint.

4.02.00 Surface Preparation

4.02.01 Unless mentioned otherwise, all rust and mill scale shall be removed by blasting to Sa 2-1/2 Swiss Standard before applying the primer.

4.02.02 Special care shall be taken to remove grease and oil by means of suitable solvents like Trichloroethylene or Carbon Tetrachloride.

4.02.03 The minimum degree of surface preparations for all equipment, piping, fittings, valves, structures etc. shall be "Near White" according to Steel Structure, Painting Council-SSPC-SP-10 before application of any primer/paint.

4.03.00 Painting

4.03.01 Specification for application of paints for external surfaces protection of vessels / tanks / equipment / piping / fittings / valves etc. to be installed indoor shall be as follows :

a) Surface preparation shall be done either manually or by any other approved method.

b) Primer Coat shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber based zinc phosphate.

c) Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber based paint pigmented with Titanium Dioxide.

d) Top Coat shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber paint of approved shade and colour with glossy finish.

e) Total DFT of paint system shall not be less than 150 microns.

4.03.02 Specification for application of paints for external surfaces protection of vessels / tanks / equipment / piping / fittings / valves etc to be installed **outdoor** shall be as follows :

a) Surface preparation shall be done by means of sand blasting, which shall conform to Sa 2-1/2 Swiss Standard.

b) Primer Coat shall consist of one coat (minimum DFT of 100 microns) of epoxy resin based zinc phosphate primer.

c) Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 100 microns) epoxy resin based paint pigmented with Titanium Dioxide.

d) Top Coat shall consist of one coat (minimum DFT of 75 microns) of epoxy paint of approved shade and colour with glossy finish. Additional one coat (minimum DFT of 25 microns) of Finish Coat of polyurethane shall be provided.

e) Total DFT of paint system shall not be less than 300 microns.

4.03.03 Specification for application of paints for external surfaces protection of steel pipes and fittings which are **buried underground / laid inside a hume pipe & or submerged Under Water and laid under Pipe Trenches** (in road/rail/pipe or trench crossings) shall be as follows :

External surface of the pipe, fittings, specialties etc. handling raw water/clarified water/filter water shall be painted with one coat of two part chemically cured polyurethane primer of min 50 micron dry film thickness followed by three or maximum four coats of two part solvent less polyurethane to build up coating of dry film thickness of 2000 micron including primer coat.

4.03.04 Specification for application of paints for **internal surface protection of large diameter pipes** (sizes above 600 mm NB and above) if any, shall be as follows :

a) All Internal surfaces of steel pipes, fittings, specialties etc. buried underground or located within pipe trenches shall be given epoxy coating to protect them from (except for drinking water service, where the compatible painting shall be so selected to meet relevant quality standards) corrosion.

b) Internal surface of the pipe should be coated with one coat of two part epoxy primer with not less than 50 micron DFT (dry film thickness) followed by two part polyamide cured solvent less epoxy.

c) The minimum dry film thickness (DFT) of internal lining shall be 600 micron.

4.03.05 Specification for application of paints for protection of **internal surfaces of DM Water Storage Tank(s)** shall be as follows :

a) Primer - One coat of epoxy primer containing high level of Zinc Phosphate anticorrosive pigment. Total Dry Film Thickness (DFT) of primer shall not be less than 125 microns.

b) Finish Paint - Three (3) coats Polyamine HB Epoxy Paint. Total Dry Film Thickness (DFT) of finish paint shall not be less than 125 microns per coat.

c) Total thickness of primer and paint should not be less than 500 microns.

4.03.06 All motors, local push button stations, cable racks, structures used for supports etc. are to be painted with acid proof paint.

4.03.07 The following surfaces shall not be painted - stainless steel, galvanized steel, aluminum, copper, brass, bronze and other nonferrous materials.

4.03.08 No painting or filler shall be applied until all repairs, hydrostatic tests and final shop inspection are completed.

4.03.09 All machined surfaces shall have two (2) coats of water repellant grease after thorough cleaning.

5.00.00 COATING PROCEDURE AND APPLICATION

5.01.00 Surface Preparation :

Pipe shall be blast cleaned by sand. The cleanliness achieved prior to application shall be in accordance with the requirement of SSPC SP 10 / NACE 2 / Sa2½ of ISO 8501 (near white metal)

a) The blast pattern or profile depth shall be 40 to 100 micron and shall be measured by dial micrometer.

b) Before sand blasting is started or during blasting or coating, temperature of the pipe surface should be more than 3°C above dew point temperature. Blast cleaned surface should be primed within 4 hours and shall be protected from rainfall or surface moisture and shall not be allowed to flash rust. If the rust occurs, the surface again to be prepared by sand blasting or wire brushing.

5.02.00 Application of Epoxy Coating

a) Coating shall be applied when

i) When the pipe surface temperature shall be atleast 3°C above dew point temperature.
ii) The temperature of mixed coating material and the pipe at the time of application shall not be lower than 10°C or greater that 50°C.

b) Material preparation shall be in accordance with manufacturer's recommendations.

c) Application of epoxy coating system :

The epoxy coating system shall be applied as per recommendation of the manufacturer and shall be applied by airless spray / plural component spray machine. For more than one coat, the second shall be applied with the time limits as recommended by the manufacturer.

5.03.00 Application of PU Coating

a) PU coating shall be applied when the pipe surface temperature atleast 3°C above dew point temperature (when R.H is more than 85%).

b) Material preparation and application shall be done as per manufacturer recommendation.

6.00.00 TEST REQUIREMENTS :

6.01.00 Measurement of dry film thickness

Measurement of dry film thickness of coating : Coating thickness shall be in the range of ±20% and as per SSPC PA 2.

6.01.01 Apparatus / Instrument:-

The instrument used for dry film thickness may be Type 1 pull of gauges or Type 2 electronic gauges.

6.01.02 Procedures:-

a) Number of measurements:
For 100 square feet (9.29 square meters), five (5) spots per test area (each spot is 3.8 cm) in diameter. Three gauge readings per spot (average becomes the spot measurement).

b) If the structure is less than 300 square feet, each 100 square feet should be measured.

c) If the structure is between 300 and 1000 sq ft, select 3 random 100 square feet test areas and measure.

d) For structure exceeding 1000 square feet, select 3 random 100 square feet testing areas for the first 1000 sq ft and select 1 random 100 square feet testing area for each additional 1000 square feet

e) Coating thickness Tolerance: Individual reading taken to get a representative measurement for the spot are unrestricted (usually low or high readings are discarded). Spot measurements (the average of 3 gauge readings) must be within 80% of the minimum thickness and 120% of the maximum thickness. Area measurement must be within specified range.

6.02.00 Electrical Inspection (Holiday) Test

6.02.01 All the coated / lined pipes shall be tested with an approved high voltage holiday detector preferably equipped with an audio visual signaling device to indicate any faults, holes, breaks or conductive particles in the protective coating.

6.02.02 The applied output voltage of holiday detector shall have a spark discharge of thickness equal to at least twice the thickness of the coating to assure adequate inspection voltage and compensate for any variation in coating thickness. The electrode shall be passed over the coated surface at approximately half the spark discharge distance from the coated surface only one time at the rate of approximately 10 to 20m/min. The edge effect shall be ignored. Excessive voltage shall be avoided as it tends to induce holiday in the coated surface thereby giving erroneous readings.

6.02.03 While selecting test voltages, consideration should be given to the tolerance on coating thickness and voltage should be selected on the basis of maximum coating thickness likely to be encountered during testing of a particular pipe.

The testing voltage shall be calculated by using following formula. (as per NACE 0274 : 2004)

Testing Voltage V = 7900 $\sqrt{T}$ ± 10 percent where T is the average coating thickness in mm.

6.02.04 Any audio visual sound or spark leads to indicate pinhole, break or conductive particle.

6.03.00 Adhesion Pull off Test :

After holiday the coated surface is subjected to adhesion pull off test as per ASTMD 4541.

6.03.01 Apparatus / Instrument: Adhesion tester consists of three basic components:

A hand wheel, a black column containing a dragging indicator pin and scale in the middle and a base containing three legs and a pulling “Jaw” at the bottom and also dollies.

6.03.02 Prepare the test surface :

Once test area is selected, test area shall be free of grease, oil, dirt, water. The area should be flat surfaces and large enough to accommodate the specified number of replicate test.

6.03.03 Prepare Dolly (Test Pull Stub) :

The dolly is a round, two sided aluminium fixture. Both sides of the dolly looks same, however, one side sloped on top surface while flat on bottom surface. As the surface of the dolly is polished aluminium, roughen the same using a coarse sand paper.

6.03.04 Select an adhesive:

Use araldite, a 100% solid epoxy adhesive. This adhesive requires at least 24 hours at room temperature to cure.

6.03.05 Attach the dolly to the surface.

a) Using a wooden stick, apply an even layer of adhesive to the entire contact surface area of the dolly.

b) Carefully remove the excessive adhesive by using a cotton swab. Allow the adhesive to fully cure before performing the adhesion test.

c) Attach the dolly to the coated surface and gently push downward to displace any excessive adhesive.

d) Push the dolly inward against the surface, then apply tape across the head of the dolly.

6.03.06 Adhesion Test Procedure

a) Attach the adhesion tester to the dolly by rotating the hand wheel counter clockwise to lower the jaw of the device.

b) Slide the jaw completely under the head of the dolly. Position the three legs of the instruments so that they are sitting flat on the coated surface.

c) Slide the dragging indicator pin on the black column to zero by pushing it downward.

d) Firmly hold the base of the instrument in one hand and rotate the handwheel clockwise to raise the jaw of the device that is attached to the head of the dolly. The dragging indicator pin will move upward on the black column as the force is increased and will hold the reading. Apply the tension using a moderate speed. Continue to increase the tension on the head of the dolly until (a) the minimum PSI/MPa/Kg/cm² required by project specification is exceeded and the test is discontinued, (b) the maximum PSI/MPa/Kg/cm² of adhesion tester has been achieved and dolly is still attached, (c) The force applied by the adhesion tester causes the dolly to dislodge.

e) Read the scale and record the adhesion value.

6.04.00 Coating Repair

Defective Coating shall be repaired in accordance with the following subsections.

6.04.01 Surface Preparation:

Accessible areas of pipe requiring coating repairs shall be cleaned to remove debris and damaged coating using surface grinders or other means. The adjacent coating shall be feathered by sanding, grinding or other method. Accumulated debris shall be removed by blowing with contaminant free air or wiping with clean rags.

6.04.02 Areas not accessible for coating repair such as interior surfaces of small diameter pipe shall be reprocessed and recoated.

6.04.03 Coating Application :

The coating system shall be applied to the prepared areas in accordance with procedure.

6.04.04 Repair Inspection :

Repaired portion shall be electrically inspected using a holiday detector.

6.05.00 Welded Field Joints

6.05.01 Preparation :

The weld joints shall be cleaned so as to be free from mud, oil, grease, welding flux, weld spatter and other foreign contaminants. The cleaned metal surfaces of the weld joint shall then be blasted or abraded using rotary abrading pads. The adjacent liquid Epoxy / PU coating shall be feathered by abrading the coating surface for a distance of 25 mm.

6.05.02 Electrical Inspection :

After curing the coating system applied to the welding joints shall be holiday tested. Any holidays indicated by the detector shall be marked with chalk to identify the area of repair.

7.00.00 INFORMATION/DATA REQUIRED

The Bidder shall submit complete list of paints and primers proposed, giving detail information, such as, chemical composition, drying time etc. and also unit rates for application of each type of paint along with supply shall be furnished.

SECTION: I

SUB-SECTION: C3

TECHNICAL SPECIFICATION (ELECTRICAL PORTION)

TELANGANA STATE POWER GENERATION CORPORATION LTD
TELANGANA STATE, INDIA

5x800 MW YADADRI TPS

VENTILATION SYSTEM TECHNICAL SPECIFICATION (ELECTRICAL PORTION)

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT,
NOIDA, U.P., INDIA

CONTENTS

NOTE: THE REQUIREMENTS MENTIONED IN SECTION-I SHALL PREVAILAND GOVERN IN CASE OF CONFLICT BETWEEN THE SAME AND THE CORRESPONDING REQUIREMENTS MENTIONED IN THE DESCRIPTIVE PORTION IN SECTION-II.

SPECIFIC TECHNICAL REQUIREMENTS

FOR LV MOTORS (ELECTRICAL)

SECTION-I

SPECIFIC TECHNICAL REQUIREMENTS: ELECTRICAL

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

a) Services and equipment as per "Electrical Scope between BHEL and Vendor".
b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The same shall be provided by the bidder without any extra charge.
c) Supply of mandatory spares as specified in the specifications of mechanical equipment's.
d) Electrical load requirement for VENTILATION SYSTEM.
e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer/BHEL approval without any commercial and delivery implications to BHEL
g) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc. shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.
h) Motor shall meet minimum requirement of motor specification.
i) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.
j) Cable BOQ worked out based on routing of cable listing provided by the vendor for "both end equipment in vendor's scope" shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:

Refer "Electrical Scope between BHEL and Vendor" Annexure - I.

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

3.1 The electrical specification without any deviation from the technical/quality assurance requirements stipulated shall be deemed to be complied by the bidder in case bidder furnishes the overall compliance of package technical specification in the form of compliance certificate/No deviation certificate.

3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc., is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

4.0 List of enclosures:

a) Electrical scope between BHEL & vendor (Annexure –I)
b) Technical specification for motors.
c) Datasheets for motors.
d) Electrical Load data format (Annexure –II)
e) BHEL cable listing format (Annexure –III)
f) Quality plan for motors.

BASIC TECHNICAL FEATURES FOR LT MOTORS

(FOR BHEL–PEM SCOPE PACKAGES)

CUSTOMER:	TELANGANA STATE POWER GENERATION CORPORATION LTD TELANGANA, INDIA 5 x 800 MW YADADRI TPS, NALGONDA
OWNER'S CONSULTANT:	TATA CONSULTING ENGINEERS LTD BANGLORE INDIA
JOB NO. 417 STATUS CONTRACT DISTRIBUTION	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA

DEPT CODE		NAME	SIGN	DATE
I	DRN	HC	s.d.	07.12.17
	DESN	HC	s.d.	07.12.17
	CHD	AS	s.d.	07.12.17
	APPD	PD	s.d.	07.12.17

REV.	DATE	ALTD	CHD	APPD	REMARKS
02	16.08.2018	HC	AS	PD	REVISED IN LINE WITH CUSTOMER COMMENTS DT. 13.08.2018
01					REVISED IN LINE WITH CUSTOMER COMMENTS DT. 19.04.2018

TITLE: BASIC TECHNICAL FEATURES FOR LT MOTORS

DEPT. / SIGN / SCALE

DRAWING NO. PE–DC–417–565–E003

SHEET 1 OF 7 REV. 02

1.0 This document covers the basic technical features of low tension (LT) squirrel cage induction AC motors employed for driving auxiliaries of BHEL-PEM scope packages in **5 x 800 MW YADRADRI TPS.**

2.0 CODES AND STANDARDS

All motors shall conform to the latest applicable standards as listed below;

1) Three phase induction motors: IS: 12615, IEC: 60034
2) Single phase AC motors: IS: 996, IEC: 60034
3) Crane duty motors: IS: 3177, IEC: 60034
4) Energy Efficient motors: IS 12615 or IEC: 60034-30 with Efficiency class IE3

3.0 DESIGN REQUIREMENTS

3.1 **Service Conditions**

The motors will be installed in hot, humid and tropical atmosphere highly polluted at places with coal dust and/or fly ash. For motor installed outdoor and exposed to direct sunrays, the effect of solar heat shall be considered in the determination of the design ambient temperature.
The design ambient temperature shall be 50 deg C.

3.2 Supply system and rated voltage of motors

KW rating	Supply system	Rated voltage of motor
Upto 0.2 kW	240V/415 V	240V415 V
Above 0.2 kW & up to 175kW	415 V	415 V

3.2.1 Supply voltage & variations shall be as follows:-

Voltage variation (AC Supply): (+/-) 10%
Frequency variation : (+) 3% to (-) 5%
Combined V & F variation : 10% (sum of absolute values)

During starting of large motor, the voltage may dr op to 80% of the rated voltage for a period of 60 seconds. All electrical equipment while running s hall successfully ride over such period without affecting system performance.

3.2.2 Motors shall be capable of running continuously at rated output for each of the conditions specified.

3.3 **Motor Rating**

All motors shall be rated for continuous duty. They shall also be suitable for long period of inactivity. LT motor rating at 50 degree C shall have at least 15% margin over the input power requirement of the driven equipment at rated duty point unless stated otherwise in driven equipment specification. The motor characteristics shall match the requirements of the driven equipment so that adequate starting, accelerating, pull up, break down and full load torques are available for the intended service.

3.4 **Starting Requirements**

3.4.1 Motor shall start smoothly and rapidly. Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinat ed with the requirements of driven equipment. The

accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.

3.4.2 Motors shall be capable of starting and accelera ting the load with direct on line starting without exceeding acceptable winding temperature.

The limiting value of voltage at rated frequenc y under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value of 85 (eighty five) percent rated voltage.

3.4.3 Continuous duty LT motors up to 175 KW Output rati ng (at 50 deg. C ambient temperature), shall be Premium efficiency (IE3) as per IEC: 60034-30/ IS: 12615 and the locked rotor current of motors shall as per IS 12615.
However, as per system requirement drives ra ted in the range of 160-210 KW may be considered in either 415V or 3.3 KV

3.4.4 Pump motor subject to reverse rotation shall be designed to withstand the stresses encountered when starting with shaft rotating at 125% rated speed in reverse direction. The motors shall be designed to withstand 120% of rated speed for 2 minutes without any mechanical damage.

3.4.5 The following frequency of starts shall apply

i) Three cold starts in succession with the motor being initially at a temperature not exceeding the ambient temperature.

ii) Two hot starts in succession with the motor being initially at a tem perature not exceeding the rated load temperature.

iii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature (not to be repeated in the second successive hour)

3.4.6 Locked motor withstand time of hot motors at 110% rated voltage shall be as follows:

a) For motors with starting time upto 20 sec.

- at least 3 sec. more than starting time.

b) For motor with starting time above 20 secs but not exceeding 45 secs.

- at least 5.0 sec. more than starting time.

c) For motors with starting time above 45 secs.

- at least 10%. more than starting time.

The starting time of the motor referred above is at minimum permissible voltage. Wherever the above requirements are not complied with, speed switches of approved make & type shall be provided to bypass the locked rotor protection for a pre-selected time during starting of motors. The speed switches shall have one NO & one NC contacts having maximum interrupting capacity of 5 Amps at 240V AC and 0.25 amps at 220 V DC.
Hot thermal withstand curve shall have a margin of at least 10% over the full load current of the motor to permit relay setting utilising motor rated capacity.

3.5 **Running Requirements**

3.5.1 Motor shall run continuously at rated output over the entire range of voltage and frequency variations as given above.

3.5.2 The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75% rated voltage at motor terminals.

3.5.3 The motor shall be designed to withstand momentary overload of 60% of full load torque for 15 second without any damage.

3.6 **Stress during bus Transfer**

3.6.1 The motor may be subjected to sudden application of 150% rated voltage during bus transfer, due to the phase difference between the incoming voltage and motor residual voltage.

3.6.2 The motor shall be designed to withstand any torsional and/or high current stresses, which may result, without experiencing any deterioration in the normal life and performance characteristics.

4.0 SPECIFIC REQUIREMENTS

4.1 **Enclosure**

All motor enclosures for outdoor, semi-outdoor & indoor application shall conform to the degree of protection IP-55 unless otherwise specified. Motor for outdoor or semi-outdoor service shall be of weather-proof construction with canopy. For hazardous area approved type of increased safety enclosure shall be furnished.

4.2 **Cooling**

4.2.1 The motor shall be self-ventilated type, either totally enclosed fan cooled IC 411(TEFC), totally enclosed tube ventilated IC 511(TETV) or closed air circuit air- cooled IC 611(CACA).

4.3 **Winding and Insulation**

All insulated winding shall be of copper. All motors shall have class F insulation but limited to class B temperature rise. Windings shall be impregnated to make them non-hygroscopic and oil resistant.

Tropical Protection

All motors shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.

All fittings and hardware shall be corrosion resistant.

4.4 **Bearings**

4.4.1 Motor shall be provided with antifriction bearings, unless sleeve bearings are required by the motor application. Bearings shall be rated for minimum service life of 40,000Hrs.

4.4.2 Vertical shaft motors shall be provided with thrust and guide bearings. Thrust bearing of tilting pad type is preferred.

4.4.3 Bearings shall be provided with seals to prevent leakage of lubricant or entrance of foreign matters like dirt, water etc. into the bearing area.

4.4.4 Sleeve bearings shall be split type, ring oiled, with permanently aligned, close running shaft sleeves.

4.4.5 Grease lubricated bearings shall be pre-lubricated and shall have provisions for in-service positive lubrication with drains to guard against over lubrication. LT motors 15kW and above shall be provided with external greasing arrangement.

4.4.6 Oiled bearing shall have an integral self-cooled oil reservoir with oil ring inspection ports, oil sight glass with oil level marked for standstill and running conditions and oil fill and drain plugs.

4.4.7 Forced lubricated or water cooled bearing shall be used as per requirement.

4.4.8 Lubricant shall not deteriorate under all service conditions. The lubricant shall be limited to normally available types with IOC equivalent.

4.4.9 Bearings shall be insulated as required to prevent shaft current and resultant bearing damage.

4.5 **Noise & Vibration**

4.5.1 For 415V motors, maximum double amplitude vibrations upto 1500 rpm shall be 40 microns and 15 microns upto 3000 rpm.

4.5.2 The noise level shall not exceed 85db (A) at 1.5 meters from the motor.

4.6 **Motor Terminal Box**

4.6.1 Motor terminal box shall be detachable type and located in accordance with Indian Standards clearing the motor base- plate/ foundation

4.6.2 Terminal box shall be capable of being turned 360 deg in steps of 90 Deg. for LT motors unless otherwise approved.

4.6.3 The terminal box shall be split type with removable cover with access to connections and shall have the same degree of protection as motor.

4.6.4 The terminal box shall have sufficient space inside for termination/connection of XLPE insulated armoured aluminium cables.

4.6.5 Terminals shall be stud or lead wire type, substantially constructed and thoroughly insulated from the frame.

4.6.6 The terminals shall be clearly identified by phase markings, with corresponding direction of rotation marked on the non-driving end of the motor.

4.6.7 The terminal box shall be capable of withstanding maximum system fault current for a duration of 0.25 sec.

4.6.8 Motor terminal box shall be furnished with suitable cable lugs and double compression brass glands to match with cable used.

4.6.9 The gland plate for single core cable shall be non-magnetic type. A suitable cable adopter box shall be provided if the cable size does not allow the direct termination in the main TB.

4.6.10 Minimum clearances to be provided between phase to phase and phase to earth shall be as under-

Voltage Rating of Motor Minimum Ph-Ph & Ph-Earth clearance
0.415 kV : 25 mm

Note: In case it is not possible to maintain these clearances, the live parts shall be totally insulated from earth and other Phases. Adequate clearances shall be provided for cable connections.

4.7 **Grounding**

The frame of each motor shall be provided with two separate and distinct grounding pads complete with tapped hole, GI bolts and washer.
The cable terminal box shall have a separate grounding pad.

4.8 **Rating Plate**

In addition to the minimum information required by IS, the following information shall be shown on motor rating plate:

a) Temperature rise in Deg.C under rated condition and method of measurement.
b) Degree of protection.
c) Bearing identification no. and Type of lubrication, Quantity and frequency/ time interval
d) Location of insulated bearings.

5.0 ACCESSORIES

5.1 SPACE HEATERS

Motor of rating 30 kW and above shall be provided with space heaters, suitably located for easy removal or replacement. The space heater shall be rated 240 V, 1 Phase, 50Hz and sized to maintain the motor internal temperature above dew point when the motor is idle. The minimum cable size for space heater shall be 2.5 sq.mm copper cable.

5.2 DELETED

5.3 INDICATOR/ SWITCH

5.3.1 Dial type local indicator with alarm contacts shall be provided for the following:

Hot and cold air temperature of the closed air circuit for CACA motor.

5.3.2 Alarm switch contact rating shall be minimum 2.0 A at 220V D.C. and 10A at 240V A.C.

5.4 ACCESSORY TERMINAL BOX

5.4.1 All accessory equipment such as space heater, temperature detector, current transformers etc., shall be wired to and terminated in terminal boxes, separate from and independent of motor (power) terminal box.

5.4.2 Accessory terminal box shall be complete with double compression brass glands and pressure type terminals to suit owner's cable connections.

DRAIN PLUG

Motor shall have drain plugs so located that they will drain the water, resulting from the condensation or other causes from all pockets of the motor casing.

5.5 LIFTING PROVISIONS

Motor weighing 25 Kg. or more shall be provided with eyebolt or other adequate provision of lifting.

5.6 DOWEL PINS

The motor shall be designed to permit easy access for drilling holes through motor feet or mounting flange for installation of dowel pins after assembling the motor and driven equipment.

7.0 PAINTING

Colour scheme for motors shall be shade 631 of IS-5.

8.0 TESTING

8.1 Type Tests

For LT Motors, type test reports for type te sts as per IS: 12615/ IEC: 60034 conducted on equipment similar to those proposed to be supplied sha ll be submitted. The type Test should have been conducted within last 5 years from enquiry date.

8.2 Routine Tests

All motors shall be subjected to routine tests as per IS: 12615/ IEC: 60034 in the presence of customer or customer representative.

9.0 **Variable Frequency Drive motor details:**

i) The motor shall be suitable for operation with a solid-state power supply consisting of an adjustable frequency inverter for speed control.
ii) The motor shall be suitable for the current waveforms produced by the power supply including the harmonics generated by the drive.
iii) The Motor shall be designed to operate continuously at any speed over the range 20-100 % of rated speed.
iv) The permitted voltage variation should take into account the steady state voltage drop across the AC drive and all other system components upstream of the motor.
v) Motors required to be transferred to DOL, by-pass mode shall be rated for specified variations in system line voltage and frequency. Starting current of motor in DOL, bypass mode shall be limited to value in motor specifications.
vi) The motor shall be constructed to withstand torque pulsations resulting from harmonics generated by the solid-state power supply.
vii) The motor insulation shall be designed to accept the applied voltage waveform, within the Vpeak and dv/dt limits as per IEC-61800-4.
viii) The drive manufacturer shall be solely responsible for proper selection of the motor for the given load application and the output characteristics of the drive.

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGE : VENTILATION SYSTEM (PART 1) **Rev -00**

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 5x800MW YADADRI STAGE 2

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided at contract stage for all equipment supplied/erected by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) one end equipment in vendor's scope	 BHEL BHEL	 BHEL BHEL	1. For 3a).b) : Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Termination at BHEL MCC/PLC equipment terminals by BHEL. 3. Termination at all Vendor's erected equipment terminals by Vendor.
4	Junction box for control & instrumentation	BHEL	BHEL	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, optical fibre etc.	Vendor	Vendor	Refer C&I portion of specification for scope of fibre Optical cables if used between PLC/ microprocessor & DCS.
6	Cable trays, accessories & cable trays supporting system 100/ 50 mm cable trays/ Conduits/ Galvanised steel cable troughs for local cabling	BHEL BHEL	BHEL BHEL	Local cabling from nearby main route cable tray (BHEL scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs, as per approved layout drawing during contract stage.
7	Cable glands ,lugs and bimetallic strip for equipment supplied by Vendor	BHEL	BHEL	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and control cables.
8	Conduit and conduit accessories for cabling between equipment supplied by vendor	BHEL	BHEL	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Lighting	BHEL	BHEL	

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGE : VENTILATION SYSTEM (PART 1) **Rev -00**

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 5x800MW YADADRI STAGE 2

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
10	Equipment grounding (including electronic earthing) & lightning protection	BHEL	BHEL	Refer note no. 3 for electronic earthing
11	Below grade grounding	BHEL	BHEL	
12	LT Motors with base plate and foundation hardware	Vendor	Vendor	Makes as per customer approved list
13	Mandatory spares	Vendor	-	Vendor to quote as per specification.
14	Recommended O & M spares	Vendor	-	As specified elsewhere in specification
15	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	
16	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation (typical sheet attached in drawing section)Cable and electronic earthing cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Electrical Equipment & cable tray layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish Electrical equipment layout & cable tray layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Cabling arrangement of the same (wherever overhead cable trays, trenches, cable ducts, conduits etc.) shall be decided during contract stage. Electrical equipment layout & cable tray layout drawing shall be subjected to BHEL/ customer approval without any commercial implications to BHEL.
18	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGE : VENTILATION SYSTEM (PART 1) **Rev -00**

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 5x800MW YADADRI STAGE 2

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.
3. Vendor shall indicate location of Electronic Earth pit in their Civil assignment drawing.

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.	VERIFICATION FROM MOTOR DATASHEET (Y/N)	KKS NO
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs						
1 2		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 21	
ANNEXURE-II																				

NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER

2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V

: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

LOAD DATA (ELECTRICAL)					
JOB NO.	417	ORIGINATING AGENCY		PEM (ELECTRICAL)	
PROJECT TITLE	5X800MW YADADRI TPS	NAME		DATA FILLED UP ON	
SYSTEM	VENTILATION SYSTEM	SIGN.		DATA ENTERED ON	
DEPTT. / SECTION	MAUX	SHEET 1 OF 1	REV. 00	DE'S SIGN. & DATE	

1.0	Design ambient temperature	:	50 °C
2.0	Maximum acceptable kW rating of LV motor	:	Above 0.2 kW & below 175 kW will be fed from 415V, however as per system requirement drives rated in the range of 160-210 kW may be considered in either 415V or 3.3. kV with due approval from BHEL/TSGENCO
3.0	Installation (Indoors/ Outdoors)	:	As required
4.0	Degree Of Protection	:	IP55
5.0	Details of supply system		
	a) Rated voltage (with variation)	:	240V, 415V ± 10%
	b) Rated frequency (with variation)	:	50 Hz (Variation: +3% TO –5%)
	c) Combined voltage & freq. variation	:	10% (sum of absolute values)
	d) System fault level at rated voltage	:	50 kA for 1 sec
	e) Short time rating for terminal box	:	50 kA for 0.25 sec
	f) LV System grounding	:	Solidly
6.0	Class of insulation	:	Class 'F',with temp rise limited to class B.
7.0	Minimum voltage for starting (As percentage of rated voltage)	:	80% of rated voltage
8.0	Power cables data	:	Shall be given during detailed engg.
9.0	Earth Conductor Size & Material	:	Shall be given during detailed engg.
10.0	Space heater supply (30KW & ABOVE)	:	240 V, 1Φ , 50 Hz
11.0	Rating up to which Single phase motor	:	Acceptable below 0.20 Kw
12.0	TYPE OF STARTER PROVIDED IN MCC	:	DOL
13.0	Locked rotor current		
	a) Limit as percentage of FLC	:	As per IS-12615
	b) Permissible tolerance, if any	:	As per IS-12615
14.0	Terminal box	:	Suitable to rotate at 90 degrees
15.0	Paint shade	:	Shade 631 of IS-5

S. No.	Description	Data to be filled by successful bidder
A.	**General**	
1	Manufacturer & country of origin	
2	Motor type	
3	Type of starting	
4	Name of the equipment driven by motor & Quantity	
5	Maximum Power requirement of driven equipment	
6	Rated speed of Driven Equipment	
7	Design ambient temperature	
B.	**Design and Performance Data**	
1	Frame size & type designation	
2	Type of duty	
3	Rated Voltage	
4	Permissible variation for	
5	a Voltage	
6	b Frequency	
7	c) Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)	
9	Synchronous speed & Rated slip	
10	Minimum permissible starting voltage	
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	
13	b) At min starting voltage	
14	Locked rotor current as percentage of FLC (including IS tolerance)	
15	Torque	
	a) Starting	
	b) Maximum	
16	Permissible temp rise at rated output over ambient temp & method	
17	Noise level at 1.0 m (dB	
18	Amplitude of vibration	
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	
	c) At 75% load	

S. No.	Description	Data to be filled by successful bidder
	c) At starting	
C.	**Constructional Features**	
1	Method of connection of motor driven equipment	
2	Applicable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Main terminal box	
	a) Type	
	b) Power Cable details (Conductor, size, armour/unarmour)	
	c) Cable Gland & lugs details (Size, type & material)	
	d) Permissible Fault level (kArms & duration in sec)	
7	Space heater details (Voltage & watts)	
8	Flame proof motor details (if applicable)	
	a) Enclosure	
	b) suitability for hazardous area	
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
D.	**Characteristic curves/ drawings** (To be enclosed for motors of rating ≥ 55KW)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

CABLE SCHEDULE FORMAT

ANNEXURE III

UNITCABLENO	FROM	TO	PURPOSE	CABLE SCOPE (BHEL PEM/ VENDOR)	REMARKS	CABLESIZE	PATHCABLENO	TENTATIVE CABLE LENGTH

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

1. For the purpose of clarity, it may please be noted that the information given in regard to the cables to be routed through WinPath as per the system elaborated below is called "Cable List", while the term "Cable Schedule" applies to the cable list with routing information added after routing has been carried out.
2. The cable list shall be entered as an MS Excel file in the format as per enclosed template EXT_CAB_SCH_FORMAT.XLS. No blank lines, special characters, header, footer, lines, etc. shall be introduced in the file. No changes shall be made in the title line (first line) of the template.
3. The field properties shall be as under:
    a. UNITCABLENO: A/N, up to sixteen (16) characters; each cable shall have its own unique, unduplicated cable number. In case this rule is violated, the cable cannot be taken up for routing.
    b. FROM: A/N, up to sixty (60) characters; the "From" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    c. TO: A/N, up to sixty (60) characters; the "To" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    d. PURPOSE: A/N, up to sixty (60) characters; the purpose (i.e. power cable/ indication/ measurement, etc.) to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    e. REMARKS: A/N, up to forty (40) characters; Any information pertinent to routing to be specified here (e.g., cable number of the cable redundant to the cable number being entered). Information in excess of 40 characters will be truncated after 40 characters.
    f. CABLESIZE: A/N, 7 characters exactly as per the codes indicated below shall be specified here. The program cannot route cables described in any other way/ format.
    g. PATHCABLENO: Field reserved for utilization by the program. User shall not enter any information here.
4. One list shall be prepared for each system/ equipment (i.e., separate and unique cable lists shall be prepared for each system).
5. The cables shall be described as per the scheme listed below:

A	NN	A	NNN
|	|	|	|
Cable Voltage Code (see B below)	No. of cores (e.g. 01,03,3H, 07)	Cable code (See C below)	Cable size (e.g. 035,185,2.5, 0.5)

(A) SYSTEM VOLTAGE CODES:
(ac) A = 11KV, B = 6.6KV, C = 3.3KV, D = 415V, E = 240V, F = 110V
(dc) G = 220V, H = 110V, J = 48V, K = +24V, L = -24V

(B) CABLE VOLTAGE CODES:
A = 11KV (Power cables)

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

B = 6.6KV (Power cables)
C = 3.3KV (Power cables)
D = 1.1KV (LV & DC system power & control cables)
E = 0.6KV (0.5 sq. mm. Control cables)

(C) CABLE CODES

PVC Copper

A = Armoured FRLS	B = Armoured Non-FRLS
C = unarmoured FRLS	D = Unarmoured Non-FRLS

PVC Aluminium

E = Armoured FRLS	F = Armoured Non-FRLS
G = unarmoured FRLS	H = Unarmoured Non-FRLS

XLPE Copper

J = Armoured FRLS	K = Armoured Non-FRLS
L = unarmoured FRLS	M = Unarmoured Non-FRLS

XLPE Aluminium

N = Armoured FRLS	P = Armoured Non-FRLS
Q = unarmoured FRLS	R = Unarmoured Non-FRLS

S = FIRE SURVIVAL CABLES
T = TOUGH RUBBER SHEATH
U = OVERALL SCREENED
V = PAIRED OVERALL SCREENED
W = PAIRED INDIVIDUAL SCREENED
Y = COMPENSATING CABLES
I = PRE-FABRICATED CABLES
Z = JELLY FILLED CABLES

6. Once a cable list has been given to PEM for routing, any subsequent changes required in the cable list (which may be in the form of addition of cables, deletion of cables, change of type or size of cable, etc.) must be informed as specific changes (as a separate file MS Excel of the same format as the original file) to the cable list given earlier if the cable list has been routed and cable schedule generated. The routing status of the cable list shall be got confirmed from PEM by the agency that has prepared the cable list before the changes are intimated. In case PEM confirms that the cable list in question has not been taken up for routing, and the revised cable list is acceptable, the same may be sent. Since cable routing through the program involves adding each cable list to the project cable schedule database, the original cable schedule shall not be furnished to PEM with revisions incorporated within.

SECTION: I

SUB-SECTION: C3

TECHNICAL SPECIFICATION (C&I PORTION)

C&I TECHNICAL SPECIFICATION FOR VENTILATION SYSTEM

Table of Contents

SECTION -C

SPECIFIC TECHNICAL REQUIREMENT

1. The bidder shall provide comp lete Instrumentation for control, monit oring and operation of entire Ventilation system. Items not specifically mentioned howe ver requ ired for the c ompleteness of th e system shall be supplied by bidder.

2. A common PLC based control system cum Annunciation panel with solid state annunciation windows along with product integrated microprocessor panel for the chiller unit shall be provided for the operation of Air Conditioning and Ventilation plant.

3. Common PLC for A ir-Conditioning a nd Ventilation System is be ing pro vided a nd P LC shall be supplied by Air-conditioning supplier. PLC based controls in the ventilation system is provided only for the air washers of the powerhouse building and UAF for ESP control building and FGD control building.

4. Supply air fans, e xhaust air fans / roof ex tractor uni ts of each area shal l be pro vided with their lo cal starter panel in BHEL's scope.

5. The v entilation system shall be c ontrolled from this co mmon Air Conditioning sy stem PLC panel. Bidder to fu rnish the list of driv es/motors/fans/pumps et c., Input/output Lists, Instrument list, Control philosophy etc. to be hooked up to the PLC panel and other necessary inputs so that necessary provision and hardware requi rement can be ensured at PLC panel by the AC syste m bidder for des igning and fabrication of its panel.

6. All transmi tters shall be smart t ype and shall ha ve 4-20mA DC sig nal w ith superimposed digital communication (HART). Each Temperature element sha ll be provided with compensating cable, JB/rack & oth er ere ction hardware. All tran smitters sha ll be fitted with a l ocal analog/digital indicator displaying appropriate physical units which may be read clearly from an easily accessible position.

7. Bidder to note that all the transmi tters/instruments supplied by Bidder sh all be ra ck mo unted. The racks shall be preass embled and provided b y Bidder. Also no i nstruments / an alysers & JBs/Ra cks should be
protruding on the walkway.

8. All field i nstruments/motor/pump/blower s hall b e termi nated on J unction box /Local contro l panel in field. A ll ere ction hardware including j unction bo xes/Local control pan el, canopies, s tructural steel , LI E, LIR, system cabinets are in bidder's scope. Number of junction boxes shall be sufficient and positioned in the fie ld to minimize local cab ling and trunk cable. 20% spare terminals s hall be provided in J unction Boxes.

9. Each instrument/ equipment shall have a unique KKS Tag No. Fi eld instru ment specification and respective data sheet are given elsewhere in this specification. Each valve/instrument shall be fitted with a stainless steel or aluminium nameplate indicating the valve/instrument service and reference number in accordance with the approved equipment coding system.

10. Instruments must ha ve separate t apping poi nts. Sharing of the same tapping poi nts for redundant instruments or various different instruments is not acceptable.

11. The s cope of C&I cables and their erecti on & commissioning shall be as per Electrical sc ope sheet defined in Electrical specification.

12. Bidder shall provide Cable Schedule in BHEL excel forma t whic h shall be pro vided during detailed engineering. Also, Cable Interconnections for Complete System shall be in Bidders' scope as per

Electrical scope between BHEL and Bidder.

13. The solenoid operated valves/Dampers/Gates shall have limit switches for open/close feedback. Operating coil voltage of solenoid valve shall be 24 V DC.

14. Instrument installation and accessories required shall be in Bidder's scope. Bidder shall submit 'Instrument Installation Diagram' and same shall be subject to customer approval during detail engineering without any commercial and time implication.

15. All manual valves at pump discharge shall be provided with Open and Close Limit Switches.

16. All the root valves shall be in bidder's scope. Double root valve shall be provided for all pressure tapping where the pressure exceeds 40kg/cm2.

17. Electrical Actuators shall be with integral starter. Datasheets and specifications are given elsewhere in the specification.

18. Redundancy of sensors shall be provided by bidder as given below, irrespective of the instrumentation shown in P&ID:
Two out of three measurements philosophy shall be adopted for all CLCS and Protection for reliability of operation. The control system shall select the median value for the normal control purpose. In case of deviation of one transmitter output from the other two, the same shall be automatically isolated and average output of the remaining transmitters shall be fed to the control and measurement system and the control loop in this case shall be maintained on auto, with an alarm on the operator's work station as well as engineer's station. In case of failure of the two remaining transmitters in circuit, deviation of one transmitter output is more than the preset limit compared to the other transmitter, there shall be automatic bump less transfer to manual and change overs shall have suitable alarms in the operator's work station as well as engineer's station. For signal compensations, separate signals from separate transmitters other than used for measurement & control shall be used. For OLCS all sensors used for the protection shall be triple redundant. All sensors for permissive and interlock shall be dual redundant.

19. The bidder shall provide critical group alarms to be hardwired to plant DCS.

20. All the fire dampers offered by the bidders shall have the necessary provisions to accept the fire signals so as the damper gets closed in the event of fire.

21. Bidder to furnish electrical/ UPS load data in his proposal.

22. Interface of MCC, field instruments, Solenoid valve/actuators etc. with PLC/ DDCMIS based control system shall be as per Drive Control Philosophy enclosed in Section-D.

23. 230 V AC UPS supply/ 415 V AC shall be provided by BHEL at a single point as per 'Electrical scope split sheet' in Electrical portion of the specification. Further distribution to various instruments/Equipment shall be in Bidder's scope. Bidder to include the necessary power distribution board in his scope. Any power supply other than the above, if required for any instrument/equipment has to be derived from the above supply & all the necessary hardware for the same shall be in Bidder's scope.

24. The quantity of instruments for the system shall be as per tender P &ID of the respective system as a minimum, for bidding purpose. However, Bidder shall also include in his proposal all the instruments and devices that are needed for the completeness of the plant auxiliary system/ equipment supplied by the

bidder, even if the same is not specifically appearing in the P & ID and as per detailed specification. During detail engineering if any additional instruments are required for safe & reliable operation of plant, bidder shall supply the same without any price implication.

25. The specifications for instruments mentioned in the specification are minimum requirements. Datasheets of instrument shall be subject to customer/owner approval.

26. The requirements given below are to be read in conjunction with detailed Technical specification enclosed.

27. The equipment shall be of modern, compact design incorporating the latest developments in proven technology. All instruments whether for local indication or remote transmission shall be of good quality and shall have an accuracy and repeatability appropriate to their duty.

28. The make/model of various instruments/items/systems shall be from approved sub-vendor list subject to approval of owner/purchaser. No commercial implication in this regard shall be acceptable. In case of any conflict and repetition of clauses in the specification, the more stringent requirements among them are to be complied with.

29. Generally, equipment shall be supplied from one composite range of measurements and control equipment as marketed by a reputable manufacturer of international standing and shall have a minimum of three years' operational use on similar projects.

30. Drawings/Documents and data to be furnished after award of the contract shall be in line with MDL furnished elsewhere in the specification.

31. The design, manufacture, inspection, testing, site calibration and installation of all C&I equipment and systems covered under this specification shall conform to the latest editions of applicable codes and standards eg. ANSI, ASME, IEEE, ISO, IEC, IGCI, AWS, NFPA, AISC, IGS, SAMA, UBC, UL, NESC, NEMA, ISA, DIN, VDE, IS etc.

32. Bidder shall provide the signal exchange list, to Plant DCS in BHEL prescribed format to be furnished during detailed engineering.

NOTES:

1. All equipment items shall be of latest design with proven on track record from reputed experienced manufacturers of specified type and range of equipment. The make/model of various instruments/items/systems and instrument sub-vendor shall be subject to approval of BHEL/Customer during detailed engineering stage.

2. The above given scope is indicative & minimum. Any item/ equipment not indicated above however required for the completeness of the system is to be supplied by bidder without any technical, commercial and delivery implication to BHEL.

3. Documents of C&I System shall be submitted to end user/owner for approval during detail engineering. Changes, if any, shall be accommodated by the bidder without any price/time implication.

INSTRUMENTATION DATASHEET & CHECKLIST

1.00.00 SPECIFICATION FOR ELECTRONIC TRANSMITTERS

1.01.00 PRESSURE TRANSMITTER

1.	Working Principle	:	Smart (HART Compatible)
2.	Type	:	Microprocessor based, 2 – Wire
3.	Output Signal	:	4-20 mA DC along with superimposed digital signal
4.	Measuring Element	:	Capsule / Diaphragm
5.	Element material	:	SS-316 (Stainless Steel) or better
6.	Static Pressure	:	150 % of maximum span continuously, without affecting the calibration
7.	Turn-down ratio	:	100: 1
8.	Span and Zero	:	Continuous, tamper proof, remote as well locally adjustable with zero elevation and suppression by 100% of span
9.	Enclosure Class	:	IP-65 (Explosion proof for NEC Class-1, Division 1 area)
10.	Output Indicator	:	LCD (Integral indicator of 5 digit display)
11.	Nameplate	:	Tag number, service engraved in SS tag plate
12.	Body	:	SS
13.	Operating Voltage	:	24V DC
14.	Load	:	600 Ohms (min.) at 24 Volts D.C.
15.	Ambient Temperature	:	0 - 50 ^{O}C
16.	Performance:	:	
	i. Accuracy		± 0.075% of Span or better

	ii. Repeatability		± 0.05% of Span or better
17.	Sealing/Isolation	:	Extended diaphragm (Silicon oil/ Flurolub filled) with 5 meters SS armoured capillary for corrosive/viscous/solid bearing or slurry type fluid applications
18.	Accessories	:	a. Universal mounting bracket suitable for 2" pipe mounting b. High tensile carbon steel U-bolts c. Siphon for steam and hot water services d. ½" NPT 2-valve stainless steel manifold, constructed from SS316 bar stock e. Companion flange with nuts, bolts and gaskets f. ½" NPT cable gland g. Handheld calibrator
19.	Adjustment/Calibration/ Maintenance	:	From handheld calibrator/ HART management system

Notes: For primary air/ secondary air/ flue gas applications, DP type transmitters shall be provided for pressure measurement.

LVDT type is not acceptable.

1.02.00 DIFFERENTIAL PRESSURE TRANSMITTER / FLOW TRANSMITTER

1.	Working Principle	:	Smart (HART Compatible)
2.	Type	:	Microprocessor based, 2 – Wire
3.	Output Signal	:	4-20 mA DC along with superimposed digital signal
4.	Measuring Element	:	Capsule / Diaphragm

5.	Element material	:	SS-316 (Stainless Steel) or better
6.	Static Pressure	:	150 % of maximum span continuously, without affecting the calibration
7.	Turn-down ratio	:	100: 1
8.	Span and Zero	:	Continuous, tamper proof, remote as well locally adjustable with zero elevation and suppression by 100% of span
9.	Enclosure Class	:	IP-65 (Explosion proof for NEC Class-1, Division 1 area)
10.	Output Indicator	:	LCD (Integral indicator of 5 digit display)
11.	Nameplate	:	Tag number, service engraved in SS tag plate
12.	Body	:	SS
13.	Operating Voltage	:	24V DC
14.	Load	:	600 Ohms (min.) at 24 Volts D.C.
15.	Ambient Temperature	:	0 - 50 ^{O}C
16.	Performance:		
	i. Accuracy	:	$\pm$ 0.075% of Span or better
	ii. Repeatability	:	$\pm$ 0.05% of Span or better
17.	Sealing/Isolation	:	Extended diaphragm (Silicon oil/ Flurolub filled) with 5 meters SS armoured capillary for corrosive/viscous/solid bearing or slurry type fluid applications
18.	Accessories	:	a. Universal mounting bracket suitable for 2” pipe mounting b. High tensile carbon steel U-bolts

c. Siphon for steam and hot water services

d. ½" NPT 5-valve stainless steel manifold, constructed from SS316 bar stock

e. Companion flange with nuts, bolts and gaskets

f. ½" NPT cable gland

g. Handheld calibrator

19. Adjustment/Calibration/ Maintenance : From handheld calibrator/ HART management system

1.03.00 Displacer Type Level Transmitters

1. Type : Smart (HART Compatible)
2. Stages of operation : Continuous
3. Material :
4. i. Displacer SS-316
5. ii. Suspension wire SS-316
6. iii. Torque tube housing SS
7. iv. Torque tube Inconel
8. v. Displacer chamber SS
9. vi. Transmitter Housing SS
10. Operating Voltage : 24 V DC
11. Transmission : Microprocessor based, 2-wire
12. Output Signal : 4-20 mA DC along with superimposed digital signal
13. Static / overload : Maximum static pressure without

transmitters. The hand held calibrator shall be suitable for all types of transmitters supplied in the package. If one type of hand held type calibrator is not suitable for communicating with all types of transmitters then separate hand held calibrator will be provided.

3.00.00 PROCESS ACTUATED SWITCHES

3.01.00 PRESSURE SWITCH

1.	Type	:	i. Piston for high pressure application ii. Bellow / Diaphragm for low pressure application
2.	Sensing element material	:	SS-316. All other wetted part SS316
3.	Case Material	:	SS
4.	Setter Scale	:	Black graduation on white linear scale. Graduation 0-100% with red pointer for set points
5.	Over range	:	150 % of maximum pressure
6.	Adjustments	: :	a) Internal Set Point b) Differential adjustment
7.	End Connection	:	1/2" NPT bottom connected
8.	Switch configuration	:	Two SPDT (240V, 5A AC/220V, 0.5A DC)
9.	Switch Type	:	Snap acting, shock & vibration proof
10.	Terminal Block	:	Suitable for full ring lugs
11.	Enclosure Class	:	IP-65 (Explosion proof for NEC Class-1, Division 1 area)
12.	Performance	: :	a) Repeat accuracy ± 1.0% b) Accuracy of Setting Indication of ± 1.5%
13.	Ambient temperature	:	0 – 50 Deg.C

14.	Nameplate	:	Tag number, service engraved in SS tag plate
15.	Accessories	:	a) Silicon oil/ Flurolub filled Remote diaphragm seal with SS-316 capillary for corrosive/ viscous/ solid bearing or slurry type fluid applications b) Snubbers for pulsating fluid applications c) Siphons for steam and hot water services d) Retention ring and screws for surface mounting e) 1/2" NPT 2 Valve SS-316 barstock manifold f) ½" NPT cable gland
16.	Applications	:	During Detail Engineering on Owner's approval

3.02.00 DIFFERENTIAL PRESSURE SWITCH

1.	Type	:	i. Piston for high pressure application ii. Bellow / Diaphragm for low pressure application
2.	Sensing element material	:	SS-316. All other wetted part SS316
3.	Case Material	:	SS
4.	Setter Scale	:	Black graduation on white linear scale. Graduation 0-100% with red pointer for set points
5.	Over range	:	150 % of maximum pressure

6.	Adjustments	:	a) Internal Set Point
		:	b) Differential adjustment
7.	End Connection	:	1/2" NPT bottom/ back connected
8.	Switch configuration	:	Two SPDT (240V, 5A AC/220V, 0.5A DC)
9.	Switch Type	:	Snap acting, shock & vibration proof
10.	Terminal Block	:	Suitable for full ring lugs
11.	Enclosure Class	:	IP-65 (Explosion proof for NEC Class-1, Division 1 area)
12.	Performance	:	a) Repeat accuracy ± 1.0% b) Accuracy of Setting Indication of ± 1.5%
13.	Ambient temperature	:	0 – 50 Deg.C
14.	Nameplate	:	Tag number, service engraved in SS tag plate
15.	Accessories	:	a) Silicon oil/ Flurolub filled Remote diaphragm seal with SS-316 capillary Diaphragm seals for corrosive/ viscous/ solid bearing or slurry type fluid applications b) Snubbers for pulsating fluid applications c) Siphons for steam and hot water services d) Retention ring and screws for surface mounting e) 1/2" NPT 5 Valve SS-316 barstock manifold f) ½" NPT cable gland
16.	Applications	:	During Detail Engineering on Owner's

approval

3.03.00 LEVEL SWITCH

3.03.01 FLOAT OPERATED

1.	Float material	:	SS-316
2.	Wetted parts	:	SS-316
3.	Float chamber	:	Stainless steel/Carbon steel, construction welded
4.	Float chamber mounting	:	Side mounted
5.	Fluid connection	:	Side – Side
6.	Fluid connection size	:	1" ANSI RF Flange (rubber line, if required)
7.	Drain	:	½ inch NPT with Plug
8.	Pressure rating of chamber	:	Minimum 1.5 times of design pressure
9.	Repeatability	:	+/- 1.5 mm or better
10.	Switch housing	:	Stainless Steel
11.	Switch housing type	:	IP- 65
12.	Type of switch	:	Snap acting magnetically operated hermetically sealed
13.	Switch configuration	:	2 SPDT (5A, 240 V AC, 0.5A, 220V DC)
14.	Accessories	:	a) Counter flange, nuts & bolts, suitable gasket etc. b) Steel globe type drain valve c) ½"NPT cable gland

			d)	Stainless steel nameplate with alpha-numeric engraved for service and tag
	15. Application	:	During Detail Engineering on Owner's approval	

3.04.00 FLOW SWITCH

1.	Type	:	Paddle /Piston/Disk	
2.	Wetted part material	:	Stainless steel or Hastelloy for acidic application	
3.	End connection	:	a)	Threaded upto 1" line size with integral Tee
		:	b)	Flanged for line size > 1 ½"
4.	Enclosure material	:	Stainless Steel	
5.	Enclosure class	:	IP 65	
6.	Switch configuration	:	2 SPDT (5A, 240 V AC, 0.5A, 220V DC)	
7.	Repeatibility	:	2%	
8.	Cable connection	:	½"NPTF	
9.	Accessories	:	a)	Tee, Counter flange, nuts & bolts, suitable gasket etc
			b)	½"NPT cable gland
			c)	Stainless steel nameplate with alpha-numeric engraved for service and tag

3.05.00 RF LEVEL SWITCH

1.	Type	:	RADIO FREQUENCY
	Sensing probe		
2.	Material	:	SS-316
3.	Mounting	:	Threaded
4.	Application Temperature	:	250°C (Max.)
	Electronic Controller		
5.	Input Supply Voltage	:	240V AC ±10%, 50 Hz.
6.	Relay Output	:	2 SPDT (240V AC, 5A)
7.	Ambient Temperature	:	50 °C
8.	Enclosure Protection	:	IP-66
9.	Enclosure Housing	:	SS
10.	Local LED Indication	:	Normal Level Power On Alarm Level Probe Healthy
11.	Switching Repeatability	:	±0.5%
12.	Accessories	:	Co-axial cable for probe connection to controller SS Tag plate ½" NPT Cable Glands
13.	Application	:	Solid level

3.06.00 CONDUCTIVITY TYPE LEVEL SWITCH

1.	Type	:	Conductivity discrimination
2.	Probe MOC	:	SS-316
3.	Mounting	:	Flanged on external cage
4.	Application Temperature	:	250°C (Max.)
5.	Test Pressure	:	Two times rated pressure

6.	Input Supply Voltage	:	240V AC ±10%, 50 Hz.
7.	Input	:	Four independent channel with selectable switching threshold for water conductivity
8.	Relay Output	:	2 SPDT (240V AC, 5A)
9.	Ambient Temperature	:	50 °C
10.	Enclosure Protection	:	IP-65 (Explosion proof for NEC Class-1, Division-1 area)
11.	Enclosure Housing	:	SS
12.	Local LED Indication	:	HI,LO, HIGH-HIGH, LOW-LOW Power Fault
13.	Accessories	:	a) Interconnecting cable from probe to electronics b) Mounting accessories c) External cage d) Washer & Gasket e) ½" NPT Cable Glands f) SS Tag Plate
14.	Application	:	During Detail Engineering on Owner's approval

3.07.00 TEMPERATURE SWITCH

1.	Type	:	Bimetallic or gas filled
2.	Sensing Element Material	:	SS-316
3.	Bulb Material	:	SS-316
4.	Capillary	:	Stainless Steel armored

approval

4.00.00 **LOCAL INSTRUMENTS**

4.01.00 PRESSURE GAUGE AND DIFFERENTIAL PRESSURE GAUGE

1.	Type	:	Bourdon/Bellows/Diaphragm
2.	Sensing & Socket	:	SS-316
3.	Movement Material	:	SS-316
4.	Case Material	:	Stainless steel. IP-65 (Explosion proof for NEC Class-1, Division 1 area)
5.	Dial Size	:	Generally 150 mm
6.	Scale	:	Black lettering on white in 270 O arc.
7.	Window	:	Shatterproof glass
8.	Range Selection	:	Normal process pressure: 50~70 % of range
9.	Over-range Protection	:	125% of maximum range by internal stop. External stop at zero
10.	Adjustment	:	For Zero adjustment (Micrometer screw external) For Range adjustment (Micrometer screw internal).
11.	Element Connection	:	Argon welding
12.	Process Connection	:	1/2" NPT (M) Bottom for local, back for panel mounting
13.	Performance	:	Accuracy of $\pm$ 1.0 % of span or better
14.	Operating ambient	:	0 - 50 ^{O}C
15.	Safety Feature	:	Blow out disc /diaphragm at the back
16.	Accessories	:	a) Snubbers for pulsating fluid application.discharge b) Stainless steel Diaphragm seals

			for corrosive/ viscous/ solid bearing or slurry type fluid applications
		c)	3-Way SS316 Gauge cock for pressure gauges
		d)	5-valve SS316 manifold from barstock for differential pressure gauge
		e)	Siphons for steam and hot water services
	17. Nameplate	:	Tag number, service engraved in stainless steel tag plate

4.02.00 LEVEL INDICATOR (FLOAT & BOARD TYPE)

1.	Type	:	Float and Board
2.	Float Material	:	SS-316
3.	Float Cable	:	SS-316
4.	Indicator Assembly	:	Epoxy painted Aluminium
5.	Guide wire spring assembly	:	SS-316 (2 Nos.)
6.	Guide Wire Anchor	:	SS-316
7.	Scale Board	:	Anodized Aluminium with engraved marking (Minimum graduation 10mm), mounting brackets and suitable hardware required as per tank height
8.	Elbow Assembly	:	Anodized Aluminium
9.	Flanges	:	RF , ANSI 150 , SS (3 Nos.)
10.	Accuracy	:	± 10 mm or better
11.	Accessories	:	All mounting accessories including counter flange, nuts & bolts, suitable

10.	Test Pressure	:	200% of maximum operating pressure
11.	Scale	:	250 mm nominal length
12.	Graduation	:	Direct reading
13.	Process Connection	:	Flanged (RF) to line size as per ANSI standards (150#)
14.	Tapping	:	D & D/2
15.	Accuracy	:	+/- 2% of full scale reading
16.	Reproducibility	:	Within 0.5% of instantaneous reading
17.	Accessories	:	SS Tag Plate, orifice plate

5.00.00 TEMPERATURE ELEMENTS & ACCESSORIES

5.01.00 RESISTANCE TEMPERATURE DETECTOR

1.	Type		:	Platinum (Duplex), Ungrounded
2.	Platinum (Duplex), Ungrounded		:	100 ohm at 0 ^{O}C
3.	Base		:	Wound on ceramic (anti-inductive)
4.	Wiring		:	3 Wire
5.	Protecting Tube			
	a)	O.D.	:	6 mm
	b)	Material	:	SS-316, Seamless
	c)	Filling	:	Magnesium oxide (Purity above 99.4%).
6.	Response time		:	a) 15 sec. (bare). b) 30 sec. (with thermowell)
7.	Calibration		:	DIN 43760
8.	Accuracy		:	± 0.5%
9.	Head			
	a)	Type	:	IP-65 universal screwed type

	b)	Material	:	Stainless Steel
	c)	Terminal blocks	:	Nickel plated Brass-screw type / silver plated
	d)	Cable connection	:	½" NPT gland and grommet
	e)	Others	:	Terminal head cover with SS chain and suitable gasket. Head of TE to be provided with sufficient space and arrangement to mount head mounted temperature transmitter (as applicable).
10.	Accessories		:	a) Adjustable nipple-union-nipple [1/2" Sch 80 X ½" NPT] with thermowell connection b) Compression fittings/unions c) Flanges etc. (for flanged connections only) d) Thermowell (As specified below)
11.	Thermowell connection		:	½" NPT (M) or 150 RF Flanged
12.	Nameplate		:	Tag number, service engraved in stainless steel tag plate

Note: The specifications for RTDs of winding/ bearing of motor/pump, can be as per their manufacturer standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice. However, the type of RTD shall be Pt-100.

5.02.00 THERMOCOUPLES

1. Type : a) 16 SWG wire of Chromel Alumel) (Type-K)
   b) Duplex
   c) Ungrounded
2. Protecting Tube
   a) O.D. : 6 mm
   b) Material : SS-316, Seamless
   c) Filling : Magnesium oxide (Purity above 99.4%).
3. Response time : a) < 20 seconds for measurement
   b) < 10 seconds for control
4. Accuracy : $\pm$ 1.1^0 C up to 300 ^{0} C & 0.4% of measured temperature range above 300 ^{0}C
5. Head
   a) Type : IP-65 universal screwed type
   b) Material : Stainless Steel
   c) Terminal blocks : Nickel plated Brass-screw type / silver plated
   d) Cable connection : ½" NPT gland and grommet
6. e) Others : Terminal head cover with SS chain and suitable gasket.

			Head of TE to be provided with sufficient space and arrangement to mount head mounted temperature transmitter (as applicable).
7.	Accessories	:	a) Adjustable nipple-union-nipple [1/2" Sch 80 X ½" NPT] with thermowell connection b) Compression fittings/unions c) Flanges etc. (for flanged connections only) d) Thermowell (As specified below)
8.	Thermowell connection	:	½" NPT (M) or 150 RF Flanged
9.	Nameplate	:	Tag number, service engraved in stainless steel tag plate

5.03.00 TEMPERATURE GAUGE

1.	Type	:	Expansion type (Liquid filled system)
2.	Sensing Element Material	:	Bourdon – SS-316
3.	Bulb and Capillary Material	:	SS-316
4.	Capillary Tubing	:	Inner sheath - solid drawn Material copper tube Outer sheath - PVC tube
5.	Movement Materials	:	Stainless Steel / Direct Bourdon tip connection to pointer spindle
6.	Case Material	:	Stainless Steel stove enameled, black finish, threaded bezel ring, clear glass

			cover conforming to IP 65.
7.	Dial size	:	150 mm
8.	Scale	:	Black lettering on white background in 270 Deg.C arc
9.	Over range protection	:	125 percent of FSD
10.	Capillary Glanding	:	1/2" NPT(M) x compression fitting (SS) to suit capillary
11.	Instrument Connection	:	Bottom connection for local mounting, back connection for panel mounting
12.	Process Connection	:	½" NPT (M) or 150 RF Flanged
13.	Extension Neck Length	:	50 mm
14.	Compensation	:	a) Capillary compensation
15.		:	b) Case compensation
16.	Performance	:	a) Accuracy : + /- 1.0 percent of full scale Deflection
		:	b) Repeatability : Less than 0.5 percent of full range
		:	c) Response time: 15 seconds (max.).
17.	Capillary length	:	3.0 meters (local) / 15.0 metres (local panel)
18.	Other features	:	Shatter proof glass
19.	Nameplate	:	Tag number, service engraved in stainless steel tag plate
20.	Accessories	:	SS316 Thermowell

5.04.00 THERMOWELL

1.	Material	:	SS-316
2.	Manufacture	:	Drilled from bar stock, Hex Head, Tapered design (As per ASME PTC 19.3)

3.	Process connection	:	M33x2
4.	Certification	:	Not applicable
5.	Bore concentricity	:	+5% of wall thickness
6.	Identification mark	:	Tag number punched on head
7.	Surface treatment	:	Polish after machining
8.	Element connection	:	½" NPT (M) or 150 RF Flanged
9.	Head	:	Hex
10.	Length of the hex head	:	31.75 mm (min.)
11.	Accessories	:	SS Plug and chain for test thermo wells SS Nameplate, Flange with companion flange & all required accessories for flanged connections.

Note: Wake frequency calculations shall be furnished for all thermowells for approval.

Thermowells shall be designed such that the resonant frequency is above the exciting frequencies generated by vortex shedding in the process fluid.

5.05.00 METAL TEMPERATURE THERMOCOUPLE

1.	Measuring medium	:	Metal temperature
2.	Type	:	Chromel Alumel (Type-K) Duplex, Ungrounded
3.	Insulation	:	Mineral Insulation Magnesium Oxide
4.	Wire gauge	:	16 AWG
5.	Protective sheath	:	SS
6.	Protective sheath diameter	:	8 mm O.D.
7.	Characteristics	:	Special limits of error as in ANSI thermocouple MC 96.01
8.	Accessories	:	½" BSP SS sliding end connector, weld pad, clamps of heat resistant steel

1.	Type	:	Hydrometer Type
2.	Mounting	:	On line
3.	Accuracy	:	+/- 2% of range
4.	Scale	:	Black letter on white scale
5.	End connection	:	PVC flange

9.06.00 DENSITY/ CONCENTRATION METER

1.	Wetted Part		Stainless Steel
2.	Enclosure		Stainless Steel (IP-65)
3.	Power Supply		24 V DC
4.	Output signal	:	4-20 mA DC (isolated) into 600 ohms
5.	Accuracy		±0.001 g/cc
6.	Indication	:	LCD display
7.	Temp. Compensation	:	Integral
8.	Accessories		Mounting hardware, integral amplifier (if required), cable glands, tag plate etc.

10.00.00 **SOLENOID VALVES**

1.	Operating Principle	:	Electromagnetic (noiseless)
2.	Coil voltage rating	:	240 V AC /24 V DC (as required)
3.	Ways	:	2/3/4 way
4.	Port size	:	1/4" NPT all ports
5.	Body	:	SS bar stock
	Trim	:	SS-316
6.	Duty	:	Suitable for continuous energization
7.	Sealing	:	Airtight and leak proof
8.	Ambient Temperature	:	0 - 50 ^{O} C

9.	Fluid Temperature	:	0-150 ^{O} C (approx.)
10.	Coil Enclosure	:	Stainless Steel
11.	Insulation	:	Class-H
12.	Coil Casing	:	IP-65 (Explosion proof for NEC Class-1, Division-1 area)
13.	Mounting	:	On pipe or on panel
14.	Cable Connection	:	½" NPT
15.	Accessories	:	Cable glands, SS Tag plate

CHECK LIST FOR PRESSURE SWITCH

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	V	V	
	1.1 MODEL NO/TAG NO						
	1.2 RANGE						
	1.3 END CONN						
	1.4 NO. OF CONTACT						
2	CALIBRATION			P	V	V	
	2.1 REPEATABILITY						
	2.2 SET POINT ADJUSTMENT						
	2.3 DIFFERENTIAL						
3	OVER PR & LEAK TEST			P	V	V	
4	ELECT. INSULATION/HV TEST	ONE		P	V	V	
5	REVIEW OF TC FOR MATERIALS OF	FOR LOT		V	V	V	
	5.1 SENSOR						
	5.2 MOVEMENT						
	5.3 PROCESS CONNECTION						
	5.4 HOUSING						
6	REVIEW OF TC FOR DEGREE OF PROTECTION	TYPE TEST		V	V	V	
7	REVIEW OF TC OF MICROSWITCH	FOR LOT		V	V	V	

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

1. Quantum of check shall be as below :
   100 % - By Manufacturer
2. Manufacturer to carry out ROUTINE TEST on 100 %.
3. Contractor to provide compliance certificate for tests/checks verifid by contractor and the same alongwith test certificates to be verified by BHEL

STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR TRANSMITTER

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECKS FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	VISUAL.						
	MODEL/TAG No						
2	PROCESS CONNECTION			P	W	V	
3	ACCURACY			P	W	V	
4	REPEATABILITY			P	W	V	
5	HYSTERESIS			P	W	V	
6	EFFECT OF TEMP VARIATION ON ACCURACY			P	W	V	
7	SPAN / ZERO ADJUSTMENT	ONE / TYPE		P	W	V	
8	EFFECT OF SUPPLY VOLTAGE VARIATION			P	W	V	
9	EFFECT OF LOADING (500 OHM METERS)			P	W	V	
10	HIGH PRESSURE TEST	SEE NOTE-1 BELOW		P	W	V	
11	BURN-IN TEST	ONE / TYPE		P	W	V	
12	DEGREE OF PROTECTION			P	W	V	
13	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW		V	V	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

1. Quantum of check shall be as below :
   100 % - By Manufacturer
2. Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
3. When material corelation are not available manufacturer's compliance to be provided.
4. Contractor to provide compliance certificate for tests/checks verifid by contractor and submit the same alongwith test certificates to be verified by BHEL.

STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR PRESSURE & DP GAUGE

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	SENSOR TYPE						
	DIAL SIZE						
	MODEL NO/TAG NO						
	RANGE/SCALE						
	SWITCH CONTACT RATING & NOS.						
	END CONNECTION						
2	CALIBRATION			P	W	V	
	ACCURACY						
	REPEATABILITY						
	SET POINT ADJUSTMENT						
3	OVER PRESSURE & LEAK TEST			P	W	V	
4	OPERATION OF PRESSURE. RELIEF DEVICE	ONE		P	W	V	
5	REVIEW OF TC FOR	FOR LOT		V	V	V	
	MATERIALS OF SENSOR						
	MOVEMENT						
	PROCESS CONNECTION						
	HOUSING						
6	REVIEW OF TC FOR DEGREE OF PROTECTION	TYPE TEST		V	V	V	
7	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW		V	V	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

1. Quantum of check shall be as below :
   100 % - By Manufacturer
2. Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
3. Manufacturer to carry out ROUTINE TEST on 100 %.
4. When material corelation is not available, MFR's compliance to be provided
5. Contractor to provide compliance certificate for tests/checks verifid by contractor and submit the same alongwith test certificates to be verified by BHEL.

STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR LEVEL GAUGE

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS / DRWGS	P	W	V	
	TYPE						
	MODEL/ TAG NO.						
	DAIL SIZE						
	RANGE/SCALE						
	END CONNECTION						
2	DIMENSIONS, PROCESS CONNECTION			P	W	V	
3	ACCURACY			P	W	V	
4	MATERIAL TC FOR	ONE / LOT		P	V	V	
	BODY ISO.						
	VALVE						
	GAUGE GLASS						
5	HYD. TEST	SEE NOTE-1 BELOW		P	W	V	
6	ACCESSORIES AS APPLICABLE			P	W	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

1. Quantum of check shall be as below :
   100 % - By Manufacturer
2. Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
3. Manufacturer to carry out ROUTINE TEST on 100 %.
4. Contractor to provide compliance certificate for tests/checks verifid by contractor and submit the same alongwith test certificates to be verified by BHEL.

STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR ANNUNCIATORS

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	TYPE/ MODEL						
	DIMENSIONS OF HARDWARE						
	MODULARITY						
	SEQUENCE						
	FACIA DETAILS						
2	FUNCTIONAL TEST	100%		P	W	V	
3	IMMUNE TO STEP VARIATIONS IN THE POWER SUPPLY	SEE NOTE-1 BELOW		P	W	V	
4	DEGREE OF PROTECTION FOR ENCLOSURE	TYPE TEST		P	W	V	
5	I/R CHECK	SEE NOTE-1 BELOW		P	W	V	
6	RESPONSE			P	W	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

1. Quantum of check shall be as below :
   100 % - By Manufacturer
2. Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
3. Manufacturer to carry out ROUTINE TEST on 100 %.
4. Contractor to provide compliance certificate for tests/checks verifid by contractor and submit the same alongwith test certificates to be verified by BHEL.

SECTION: I

SUB-SECTION: E

ANNEXURE-I

LIST OF MAKES OF SUB-VENDOR ITEMS

AND INSPECTION PLAN

Sl. No.	Item Description	Vendor proposed for approval
1	AIR WASHER & UAF	Refer makes at declaration by bidder (Section II-Sub Section 6)

PART-B (Sub vendors)

Sl. No.	Item Description	SL. No.	Vendor proposed for approval	
1	HORIZONTAL CENTRIFUGAL PUMPS<=75KW	1	FLOWMORE LTD., GHAZIABAD	Approved
		2	WILO MATHER & PLATT PUMPS LTD., MUMBAI	Approved
		3	KIRLOSKAR BROTHERS LTD., PUNE	Approved
		4	JYOTI LTD., GUJRAT	Approved
2	LT MOTORS(=<55KW)	1	LAXMI HYDRAULICS PVT. LTD., SECUNDARABAD	Approved
		2	BHARAT BIJLEE LIMITED, MUMBAI	Approved
		3	SIEMENS INDIA LTD., CHENNAI	Approved
		4	ABB LTD., SECUNDARABAD	Approved
3	BUTTERFLY VALVES	1	WEIR BDK VALVES-A UNIT OF WEIR, INDIA	Approved
		2	TYCO VALVES & CONTROLS INDIA P LTD., INDIA	Approved
		3	INTER VALVE (INDIA) LTD., INDIA	Approved
		4	DELVAL FLOW CONTROLS PVT. LTD.	Approved
		5	ATAM VALVES PVT. LTD., JALANDHAR	Approved
		6	HAWA ENGINEERS LTD., AHMEDABAD	Approved
		7	MICON VALVES (INDIA), MUMBAI	Approved
		8	SURYA VALVES & INSTRUMENTS MFG CO., CHENNAI	Approved
		9	DEMBLA VALVES LTD., THANE	Approved
		10	FLOWSERVE, CHENNAI	Approved

Sl. No.	Item Description	SL. No.	Vendor proposed for approval	
4	GATE VALVE/GLOBE VALVE/CHECK VALVES	1	A.V. VALVES LTD., AGRA (UP)	Approved
		2	ATAM VALVES PVT. LTD., PUNJAB	Approved
		3	FLUIDLINE VALVES COMPANY PVT.LTD., GHAZIABAD (UP)	Approved
		4	INTERVALVE (INDIA) LTD., PUNE	Approved
		5	LEADER VALVES LTD., PUNJAB	Approved
		6	NITON VALVE INDUSTRIES PVT. LTD., MUMBAI	Approved
		7	STEEL STRONG VALVES (I) PVT. LTD., MUMBAI	Approved
		8	WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD., NEW DELHI	Approved
		9	FOURESS ENGG. INDIA LTD., MUMBAI	Approved
		10	HAWA ENGINEERS LTD., GUJARAT	Approved
		11	MICON VALVES (INDIA) PVT. LTD., MAHARASTRA	Approved
		12	VALTECH INDUSTRIES, MUMBAI	Approved
		13	HAWA VALVES (INDIA) PVT. LTD., MUMBAI	Approved
		14	BANKIM & COMPANY, KOLKATA, WEST BENGAL	Approved
5	PIPE	1	JINDAL (INDIA) LTD., GHAZIABAD/NAGOTHANE/ BELLARY/ BALANAGAR	Approved
		2	SURYA ROSHNI LIMITED, BENGALURU/ KARNATAKA	Approved
6	PR./DP. GAUGES	1	GAUGES BOURDON INDIA, NAVI MUMBAI	Approved
		2	AN INSTRUMENTS PVT. LIMITED, CHENNAI	Approved
7	TEMPERATURE GAUGE	1	GAUGES BOURDON INDIA, NAVI MUMBAI	Approved
		2	AN INSTRUMENTS PVT. LIMITED, CHENNAI	Approved
8	TRANSMITTER-PRESSURE	1	FUJI ELECTRIC, JAPAN/ FRANCE	Approved
		2	EMERSON PROCESS, USA	Approved
		3	HONEYWELL, USA	Approved
9	PR./DP.SWITCH	1	SWITZER PROCESS INSTRUMENTS, CHENNAI	Approved
		2	GAUGES BOURDON INDIA, NAVI MUMBAI	Approved
		3	PRECISION MASS PRODUCTS PVT. LTD., GANDHINAGAR	Approved

Sl. No.	Item Description	SL. No.	Vendor proposed for approval	
	PR./DP.SWITCH	4	TRAFAG CONTROL INDIA PVT. LTD., GURGAON	Approved
		5	BAUMER TECHNOLOGIES (I) PVT. LTD., KOLKATA	Approved
10	JUNCTION BOX	1	SUCHITRA I INDUSTRIES, BANGALORE	Approved
		2	BALIGA LIGHTING EQUIPMENT PVT. LTD., CHENNAI	Approved
		3	DEVI POLYMERS PVT. LTD., CHENNAI	Approved
		4	HENSEL ELECTRIC INDIA PVT. LTD., CHENNAI	Approved
		5	MANISHA COMPOSITEK PVT. LTD., PUNE	Approved
		6	PYROTECH, UDAIPUR	Approved
		7	CHEMIN CONTROLS, PONDICHERY	Approved
		8	K S INSTRUMENTS PVT. LTD., BANGALORE	Approved
		9	ELECTROMECHANICAL, KOLKATA	Approved
		10	KHODAY CONTROL SYSTEMS, BANGALORE	Approved
		11	PRAMMEN INDUSTRIES, PUDDOKOTTAI	Approved
		12	SHRENIK & COMPANY, GUJRAT	Approved
11	CABLE TRAY (UPTO 50MM)	1	RATAN PROJECTS & ENGINEERING CO. PVT. LTD., KOLKATA	Approved
		2	JAMNA METAL COMPANY, NEW DELHI	Approved
		3	APT ENGINEERING WORKS, NEW DELHI	Approved
12	LEVEL GAUGE	1	V AUTOMAT INSTRUMENTS PVT.LTD., NEW DELHI	Approved
		2	PUNE TECHTROL PVT. LTD., PUNE	Approved
13	LEVEL SWITCH (FLOAT TYPE)	1	V AUTOMAT INSTRUMENTS PVT., NEW DELHI	Approved
		2	D K INSTRUMENTS PVT. LTD., KOLKATA	Approved
14	LEVEL INDICATOR	1	V AUTOMAT INSTRUMENTS PVT LTD., FARIDABAD	Approved
		2	PUNE TECHTROL PVT LTD., PUNE	Approved
15	INSTRUMENT FITTINGS	1	PANAM ENGINEERS LTD., MUMBAI	Approved
		2	PRECISION ENGINEERING INDUSTRIES, MUMBAI	Approved
		3	VIKAS INDUSTRIAL PRODUCTS, NOIDA	Approved
		4	AURA INCORPORATED, NEW DELHI	Approved

Sl. No.	Item Description	SL. No.	Vendor proposed for approval	
	INSTRUMENT FITTINGS	5	HP VALVES & FITTINGS (INDIA) PVT. LTD., CHENNAI	Approved
		6	ARYA CRAFTS & ENGG. PVT. LTD., GUJARAT	Approved
		7	PMT ENGINEERS, AHMEDABAD	Approved
		8	PRIME ENGINEERS, MUMBAI	Approved
		9	FLOWTECH, KOLKATA	Approved
16	PAINT	1	BERGER	Approved
		2	ASIAN PAINTS	Approved
		3	KANSAI NEROLAC	Approved
17	THREE WAY VALVE	1	SIEMENS BUILDING TECHNOLOGY, GERMANY	Approved
		2	RAPID CONTROL, DELHI	Approved
		3	BELIMO, MUMBAI (HQ)	Approved
18	GM VALVES (GATE/GLOBE/CHECK)	1	SANT VALVES, PUNJAB	Approved
		2	LEADER VALVES LTD., PUNJAB	Approved
19	AIR FILTERS(PRE FILTERS & FINE FILTERS)	1	SPECTRUM, KOLKATA	Approved
		2	PUROMATIC, OKHLA	Approved
		3	FMI, KOLKATA	Approved
		4	ANFILCO, NEW DELHI	Approved
20	RH SENSOR/TEMP. SENSOR	1	HONEYWELL, TAIWAN	Approved
		2	GENERAL INSTUMENTS, MAHARASHTRA(HQ)	Approved
		3	JOHNSON, SINGAPORE	Approved
		4	SIEMENS, MAHARASHTRA(HQ)	Approved
21	GI SHEET FOR DUCTING	1	TISCO, INDIA	Approved
		2	RASHTRIYA ISPAT NIGAM LTD., INDIA	Approved
		3	ESSAR, INDIA	Approved
		4	JSW STEEL, INDIA	Approved
		5	TATA, INDIA	Approved
		6	SAIL, INDIA	Approved
		7	JINDAL, INDIA	Approved
22	FIRE DAMPER	1	TSC, MUMBAI	Approved
		2	CARRYAIRE, GREATER NOIDA	Approved
		3	SYSTEM AIR(FORMERLY KNOWN AS RAVI STAR), GREATER NOIDA	Approved

Sl. No.	Item Description	SL. No.	Vendor proposed for approval	
23	INSULATION MATERIAL	1	BEARDSELL, FARIDABAD	Approved
		2	K-FLEX, PUNE	Approved
		3	PARAMOUNT, SONIPAT	Approved
		4	ARMAFLEX, PUNE	Approved
		5	SUPREME, MUMBAI	Approved
		6	LLOYDS, SIKANDRABAD	Approved
		7	UP TWIGA, BHILAI	Approved
		8	AEROCELL, GURUGRAM	Approved
24	Y TYPE/POT STRAINER	1	MULTITEX, NEW DELHI	Approved
		2	SANT VALVES, PUNJAB	Approved
		3	DS ENGG, NEW DELHI	Approved
		4	SAROJINI, NEW DELHI	Approved
		5	GRAND PRIX, FARIDABAD	Approved
		6	GUJRAT OTOLIFT, GUJRAT	Approved
		7	BHATIA ENGG, NEW DELHI	Approved
		8	SUNGOV ENGG, CHENNAI	Approved
25	THERMOSTAT/HUMIDSTAT/GEYSERSTAT / AIR STAT	1	HONEYWELL AUTOMATION,USA	Approved
		2	JOHNSON CONTROL, SINGAPORE	Approved
		3	SIEMENS,GERMANY	Approved
26	LEVEL TRANSMITTER (ULTRA SONIC TYPE)	1	ABB, NEW DELHI	Approved
		2	EMERSON PROCESS MANAGEMENT, USA/NAVI MUMBAI	Approved
		3	ENDRESS+HAUSER, GERMANY/INDIA	Approved
		4	FORBES MARSHALL,	Approved
		5	KROHNE MARSHALL	Approved
		6	P&F, INDIA	Approved
		7	SIEMENS MILLTRONICS, CANADA	Approved
		8	VEGA, GERMANY	Approved
27	LEVEL TRANSMITTER (RADAR TYPE)	1	ABB, GERMANY/FARIDABAD	Approved
		2	EMERSON PROCESS, USA/NAVI MUMBAI	Approved
		3	ENDRESS+HAUSER, GERMANY/INDIA	Approved
		4	HONEYWELL, USA/INDIA	Approved

Sl. No.	Item Description	SL. No.	Vendor proposed for approval	
	LEVEL TRANSMITTER (RADAR TYPE)	5	KROHNE MARSHALL	Approved
		6	P&F, INDIA	Approved
		7	K-TEK, USA	Approved
		8	VEGA, GERMANY	Approved
		9	MAGNETROL, BELGIUM	Approved
28	TEMPERATURE TRANSMITTER	1	ABB LTD., HYD	Approved
		2	EMERSON PROCESS MGT (I) PVT. LTD., MUMBAI	Approved
		3	ENDRESS+HAUSER(INDIA) PVT.LTD., MUMBAI	Approved
		4	HONEYWELL AUTOMATION INDIA LIMITED, PUNE	Approved
		5	YOKOGAWA INDIA LIMITED, BANGLORE	Approved
29	PROPELLAR FAN	1	CROMPTON, MUMBAI	Approved
		2	KHAITAN, KOLKATA	Approved
30	PR./DP. SWITCH	1	SIEMENS,GERMANY	Approved

ANNEXURE

Yadadri TPS (5X800MW) approved sub vendor list for Air Conditioning System

Lr.No.CE/TPC/SE-3/EME-11/YTPS(5X800MW)/F.Vendors/D.No. 59 /21,Dt: 20.07.2021

PART-I

Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
1	CHILLED & CONDENSER WATER PUMP (CENTRIFUGAL PUMP)	1	BEACON WEIR LTD., CHENNAI	Approved
		2	BEST AND CROMPTON ENGG LTD., CHENNAI	Approved
		3	FLOWMORE LTD., HARYANA	Approved
		4	FLOWSERVE INDIA CONTROLS PVT. LTD., KOLKATA	Approved
		5	JYOTI LTD., GUJARAT	Approved
		6	KIRLOSKAR BROTHERS LTD., KIRLOSKARVADI	Approved
		7	KISHORE PUMPS, CHENNAI	Approved
		8	KUBOTA CORPN, JAPAN	Approved
		9	MAX FLOW PUMPS INDIA PVT. LTD., GURGAON	Approved
		10	SAM PUMP, TAMILNADU	Approved
		11	WPIL LIMITED, KOLKATA	Approved
		12	WILO MATHER & PLATT PUMPS LTD., MUMBAI	Approved
2	MISC. PUMPS (VERTICAL)	1	BEACON WEIR LTD., CHENNAI	Approved
		2	FLOWMORE LTD., HARYANA	Approved
		3	FLOWSERVE INDIA CONTROLS PVT. LTD., KOLKATA	Approved
		4	JYOTI LTD., GUJARAT	Approved
		5	KIRLOSKAR BROTHERS LTD., KIRLOSKARVADI	Approved
		6	KUBOTA CORPN, JAPAN	Approved
		7	KISHORE PUMPS, CHENNAI	Approved
		8	SAM PUMP,TAMILNADU	Approved
		9	SULZER PUMPS INDIA LTD., MAHARASTRA	Approved
		10	WILO MATHER & PLATT PUMPS LTD., MUMBAI	Approved
		11	WPIL LIMITED, KOLKATA	Approved
3	SUMP PUMPS/ SUBMERSIBLE PUMP	1	AQUA MACHINERIES (P) LTD., GUJARAT	Approved
		2	DARLING PUMPS PVT. LTD., INDORE	Approved
		3	FLOWMORE LTD., HARYANA	Approved
		4	JASCO PUMP PVT. LTD., GUJARAT	Approved
		5	JEE PUMPS (GUJ) PVT LTD, GUJARAT	Approved
		6	MCNALLY SAYAJI ENGINEERING LIMITED, GUJARAT	Approved
		7	SU MOTORS PVT. LTD., MUMBAI	Approved
		8	VARAT PUMP AND MACHINERY PVT. LTD., KOLKATA	Approved
		9	WPIL LIMITED, KOLKATA	Approved
4	LT MOTORS	1	ABB LTD, SECUNDERABAD	Approved
		2	BHARAT BIJLEE LIMITED, MUMBAI	Approved

CHIEF ENGINEER/TPC

ANNEXURE

Yadadri TPS (5X800MW) approved sub vendor list for Air Conditioning System

Lr.No.CE/TPC/SE-3/EME-11/YTPS(5X800MW)/F.Vendors/D.No.59 /21,Dt:20.07.2021

Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	LT MOTORS	3	CG POWER & INDUSTRIAL SOLUTIONS LTD, AHMEDNAGAR	Approved
		4	CROMPTON GREAVES LTD., AHMEDNAGAR	Approved
		5	KIRLOSKAR ELECTRIC CO LTD., BANGALORE	Approved
		6	LAXMI HYDRAULICS PVT LTD., SECUNDERABAD	Approved
		7	SIEMENS INDIA LTD., CHENNAI	Approved
		8	MARATHON	Approved
5	BUTTERFLY VALVE	1	DELVAL FLOW CONTROLS PVT. LTD.	Approved
		2	INTER VALVE (INDIA) LTD., INDIA	Approved
		3	TYCO VALVES & CONTROLS INDIA PVT LTD., INDIA	Approved
		4	WELR BDK VALVES-A UNIT OF WEIR, INDIA	Approved
		5	ATAM VALVES PVT LTD., JALANDHAR	Approved
		6	DEMBLA VALVES LTD., THANE	Approved
		7	FLOWSERVE, CHENNAI	Approved
		8	HAWA ENGINEERS LTD., AHMEDABAD	Approved
		9	MICON VALVES (INDIA), MUMBAI	Approved
		10	SURYA VALVES & INSTRUMENTS MFG CO., CHENNAI	Approved
6	GATE / GLOBE VALVES / NON RETURN VALVE	1	A.V. VALVES LTD., AGRA (UP)	Approved
		2	ATAM VALVES PVT. LTD., PUNJAB	Approved
		3	FLUIDLINE VALVES COMPANY PVT.LTD., GHAZIABAD (UP)	Approved
		4	FOURESS ENGG. INDIA LTD., MUMBAI	Approved
		5	HAWA ENGINEERS LTD., GUJARAT	Approved
		6	HAWA VALVES (INDIA) PVT. LTD., MUMBAI	Approved
		7	INTERVALVE (INDIA) LTD., PUNE	Approved
		8	LEADER VALVES LTD., PUNJAB	Approved
		9	MICON VALVES (INDIA) PVT. LTD., MAHARASTRA	Approved
		10	NITON VALVE INDUSTRIES PVT LTD., MUMBAI	Approved
		11	STEEL STRONG VALVES (I) PVT.LTD., MUMBAI	Approved
		12	VALTECH INDUSTRIES, MUMBAI	Approved
		13	WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD., NEW DELHI	Approved
7	BALL VALVE	1	A.V. VALVES LTD, AGRA (UP)	Approved
		2	AKAY INDUSTRIES PVT.LTD., KARNATAKA	Approved
		3	ATAM VALVES PVT. LTD., PUNJAB	Approved
		4	CHEMTECH INDUSTRIAL VALVES, MAHARASTRA	Approved
		5	DEMBLA VALVES, MAHARASTRA	Approved

CHIEF ENGINEER/TPC

ANNEXURE

Yadadri TPS (5X800MW) approved sub vendor list for Air Conditioning System

Lr.No.CE/TPC/SE-3/EME-11/YTPS(5X800MW)/F.Vendors/D.No. 59 /21,Dt: 20.07.2021

PART-I

Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
1	CHILLED & CONDENSER WATER PUMP (CENTRIFUGAL PUMP)	1	BEACON WEIR LTD., CHENNAI	Approved
		2	BEST AND CROMPTON ENGG LTD., CHENNAI	Approved
		3	FLOWMORE LTD., HARYANA	Approved
		4	FLOWSERVE INDIA CONTROLS PVT. LTD., KOLKATA	Approved
		5	JYOTI LTD., GUJARAT	Approved
		6	KIRLOSKAR BROTHERS LTD., KIRLOSKARVADI	Approved
		7	KISHORE PUMPS, CHENNAI	Approved
		8	KUBOTA CORPN, JAPAN	Approved
		9	MAX FLOW PUMPS INDIA PVT. LTD., GURGAON	Approved
		10	SAM PUMP, TAMILNADU	Approved
		11	WPIL LIMITED, KOLKATA	Approved
		12	WILO MATHER & PLATT PUMPS LTD., MUMBAI	Approved
2	MISC. PUMPS (VERTICAL)	1	BEACON WEIR LTD., CHENNAI	Approved
		2	FLOWMORE LTD., HARYANA	Approved
		3	FLOWSERVE INDIA CONTROLS PVT. LTD., KOLKATA	Approved
		4	JYOTI LTD., GUJARAT	Approved
		5	KIRLOSKAR BROTHERS LTD., KIRLOSKARVADI	Approved
		6	KUBOTA CORPN, JAPAN	Approved
		7	KISHORE PUMPS, CHENNAI	Approved
		8	SAM PUMP,TAMILNADU	Approved
		9	SULZER PUMPS INDIA LTD., MAHARASTRA	Approved
		10	WILO MATHER & PLATT PUMPS LTD., MUMBAI	Approved
		11	WPIL LIMITED, KOLKATA	Approved
3	SUMP PUMPS/ SUBMERSIBLE PUMP	1	AQUA MACHINERIES (P) LTD., GUJARAT	Approved
		2	DARLING PUMPS PVT. LTD., INDORE	Approved
		3	FLOWMORE LTD., HARYANA	Approved
		4	JASCO PUMP PVT. LTD., GUJARAT	Approved
		5	JEE PUMPS (GUJ) PVT LTD, GUJARAT	Approved
		6	MCNALLY SAYAJI ENGINEERING LIMITED, GUJARAT	Approved
		7	SU MOTORS PVT. LTD., MUMBAI	Approved
		8	VARAT PUMP AND MACHINERY PVT. LTD., KOLKATA	Approved
		9	WPIL LIMITED, KOLKATA	Approved
4	LT MOTORS	1	ABB LTD, SECUNDERABAD	Approved
		2	BHARAT BIJLEE LIMITED, MUMBAI	Approved

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Yadadri TPS (5X800MW) approved sub vendor list for Air Conditioning System

Lr.No.CE/TPC/SE-3/EME-11/YTPS(5X800MW)/F.Vendors/D.No.59 /21,Dt:20.07.2021

Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	LT MOTORS	3	CG POWER & INDUSTRIAL SOLUTIONS LTD, AHMEDNAGAR	Approved
		4	CROMPTON GREAVES LTD., AHMEDNAGAR	Approved
		5	KIRLOSKAR ELECTRIC CO LTD., BANGALORE	Approved
		6	LAXMI HYDRAULICS PVT LTD., SECUNDERABAD	Approved
		7	SIEMENS INDIA LTD., CHENNAI	Approved
		8	MARATHON	Approved
5	BUTTERFLY VALVE	1	DELVAL FLOW CONTROLS PVT. LTD.	Approved
		2	INTER VALVE (INDIA) LTD., INDIA	Approved
		3	TYCO VALVES & CONTROLS INDIA PVT LTD., INDIA	Approved
		4	WELR BDK VALVES-A UNIT OF WEIR, INDIA	Approved
		5	ATAM VALVES PVT LTD., JALANDHAR	Approved
		6	DEMBLA VALVES LTD., THANE	Approved
		7	FLOWSERVE, CHENNAI	Approved
		8	HAWA ENGINEERS LTD., AHMEDABAD	Approved
		9	MICON VALVES (INDIA), MUMBAI	Approved
		10	SURYA VALVES & INSTRUMENTS MFG CO., CHENNAI	Approved
6	GATE / GLOBE VALVES / NON RETURN VALVE	1	A.V. VALVES LTD., AGRA (UP)	Approved
		2	ATAM VALVES PVT. LTD., PUNJAB	Approved
		3	FLUIDLINE VALVES COMPANY PVT.LTD., GHAZIABAD (UP)	Approved
		4	FOURESS ENGG. INDIA LTD., MUMBAI	Approved
		5	HAWA ENGINEERS LTD., GUJARAT	Approved
		6	HAWA VALVES (INDIA) PVT. LTD., MUMBAI	Approved
		7	INTERVALVE (INDIA) LTD., PUNE	Approved
		8	LEADER VALVES LTD., PUNJAB	Approved
		9	MICON VALVES (INDIA) PVT. LTD., MAHARASTRA	Approved
		10	NITON VALVE INDUSTRIES PVT LTD., MUMBAI	Approved
		11	STEEL STRONG VALVES (I) PVT.LTD., MUMBAI	Approved
		12	VALTECH INDUSTRIES, MUMBAI	Approved
		13	WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD., NEW DELHI	Approved
7	BALL VALVE	1	A.V. VALVES LTD, AGRA (UP)	Approved
		2	AKAY INDUSTRIES PVT.LTD., KARNATAKA	Approved
		3	ATAM VALVES PVT. LTD., PUNJAB	Approved
		4	CHEMTECH INDUSTRIAL VALVES, MAHARASTRA	Approved
		5	DEMBLA VALVES, MAHARASTRA	Approved

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Yadadri TPS (5X800MW) approved sub vendor list for Air Conditioning System

Lr.No.CE/TPC/SE-3/EME-11/YTPS(5X800MW)/F.Vendors/D.No.59/21,Dt:20.07.2021

Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	BALL VALVE	6	HAWA ENGINEERS LTD., GUJARAT	Approved
		7	HAWA VALVES, MUMBAI	Approved
		8	HITECH VALVES, CHENNAI	Approved
		9	INTERVALVE (INDIA) LTD., PUNE	Approved
		10	JOSHI JAMPALA ENGG PVT LTD., MAHARASTRA	Approved
		11	LEADER VALVES LTD., PUNJAB	Approved
		12	MICON VALVES INDIA, MUMBAI	Approved
		13	MICROFINISH VALVES PVT LTD., KARNATAKA	Approved
		14	SURYA VALVES AND INSTRUMENTS MFG CO., TAMILNADU	Approved
		15	VALTECH INDUSTRIES, MUMBAI	Approved
		16	WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD., NEW DELHI	Approved
8	STRAINER (SIMPLEX BASKET TYPE)	1	BHATIA ENGINEERING CO., NEW DELHI	Approved
		2	FILTRATION ENGINEERS INDIA PVT. LTD., MUMBAI	Approved
		3	GUJARAT OTOFILT, INDIA	Approved
		4	JAY-EESH ENGINEERING COMPANY, MUMBAI	Approved
		5	JAYPEE INDUSTRIES PVT LTD., NEW DELHI	Approved
		6	MICON VALVES(INDIA) PVT LTD., INDIA	Approved
		7	MULTITEX FILTRATION ENGINEERS LIMITED, NEW DELHI	Approved
		8	OTOKLIN GLOBAL BUSINESS LIMITED, MUMBAI	Approved
		9	PROCEDYNE ENGINEERS, INDIA	Approved
9	PIPING MS / GI	1	JINDAL (INDIA) LTD., INDIA	Approved
		2	ASIAN MILLS PRIVATE LIMITED, AHMEDABAD, GUJARAT	Approved
		3	JCO GAS PIPE LIMITED, CHINDWARA	Approved
		4	JOTINDRA STEEL & TUBES LTD. FARIDABAD, HARYANA	Approved
		5	RATNAMANI METALS & TUBES, AHMEDABAD , GUJARATH	Approved
		6	SAIL ROURKELA	Approved
		7	SURYA ROSHNI LIMITED, BENGALURU, KARNATAKA	Approved
		8	WELSPUN CORP LIMITED, ANJAR, GUJARAT	Approved
10	PIPE FITTINGS	1	M/S. N L HAZRA & SON, KOLKATA	Approved
		2	COMFIT & VALVES PVT LTD., MEHESANA	Approved
		3	ARYA CRAFTS & ENGINEERING PVT LTD., GUJARAT	Approved
		4	AURA INC. PHASE. 2, NEW DELHI	Approved

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Lr.No.CE/TPC/SE-3/EME-11/YTPS(5X800MW)/F.Vendors/D.No. 59/21,Dt: 20.07.2021

Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	PIPE FITTINGS	5	BALDOTA VALVE, MUMBAI	Approved
		6	EXCEL HYDRO-PNEUMATICS PVT. LTD., MUMBAI	Approved
		7	FLOWTECH, KOLKATA	Approved
		8	HP VALVES & FITTINGS (INDIA) PVT. LTD., CHENNAI	Approved
		9	METPRESS ENGINEERING WORKS, KOLKATA	Approved
		10	PANAM ENGINEERS LTD., MUMBAI	Approved
		11	PMT ENGINEERS, AHMEDABAD	Approved
		12	PRECISION ENGG INDUSTRIES, GOREGAON, MUMBAI	Approved
		13	PRIME ENGINEERS, MUMBAI	Approved
		14	V.K.INDUSTRIES, BENGALURU	Approved
		15	VIKAS INDUSTRIAL PRODUCTS, NOIDA	Approved
11	ALUMINUM CLADDING	1	BHARAT ALUMINIUM COMPANY LTD., CHHATTISGARH	Approved
		2	HINDALCO INDUSTRIES LTD, MUMBAI	Approved
		3	JINDAL ALUMINIUM LTD, KARNATAKA	Approved
		4	NATIONAL ALUMINIUM COMPANY LTD., ODISHA	Approved
12	STRUCTURAL STEEL	1	JINDAL,RAIGARH , CHHATTISGARH	Approved
		2	RINL, INDIA	Approved
		3	SAIL, INDIA	Approved
13	WATER SOFTENING PLANT	1	BGR ENERGY SYSTEMS LIMITED., ANDHRA PRADESH	Approved
		2	DRIPLEX WATER ENGINEERING INTERNATIONAL PRIVALTE LIMITED, NEW DELHI	Approved
		3	ION EXCHANGE (INDIA) LTD., HARYANA	Approved
		4	SIEMENS LIMITED, HARYANA	Approved
		5	THERMAX LTD., PUNE	Approved
14	ELECTRIC HOIST	1	ALPHA SERVICES, RAJASTHAN	Approved
		2	BRADY & MORRIS ENGG CO LTD., GUJARAT	Approved
		3	CENTURY CRANE ENGINEERS PVT. LTD., HARYANA	Approved
		4	CONSOLIDATED HOISTS PVT LTD, PUNE	Approved
		5	EDDY CRANES PVT. LTD., MUMBAI	Approved
		6	GRIP ENGINEERS PVT. LTD., HARYANA	Approved
		7	HERCULES HOISTS LTD, MAHARASTRA	Approved
		8	LIFTING EQUIPMENTS AND ACCESSORIES, NEW DELHI	Approved
		9	MELTECH CRANES, THANE	Approved
		10	REVA INDUSTRIES LTD., HARYANA	Approved
		11	ROCKWELL HOIST CRANES PVT LTD., NEW DELHI	Approved

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Lr.No.CE/TPC/SE-3/EME-11/YTPS(5X800MW)/F.Vendors/D.No. 59/21,Dt: 20.07.2021

Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	ELECTRIC HOIST	12	TRACTEL TIRFOR INDIA PVT. LTD., HARYANA	Approved
		13	TRANSPADE ENGG PVT LTD., KARNATAKA	Approved
		14	UNIVERSAL HOIST-O-FABRIK, MAHARASHTRA	Approved
15	CHAIN PULLEY BLOCK	1	ARMSEL MHE PVT. LTD., KARNATAKA	Approved
		2	BRADY & MORRIS ENGG CO LTD., GUJARAT	Approved
		3	CENTURY CRANE ENGINEERS PVT LTD., HARYANA	Approved
		4	CONSOLIDATED HOISTS PVT LTD., PUNE	Approved
		5	HERCULES HOISTS LTD., MAHARASTRA	Approved
		6	LIFTING EQUIPMENTS AND ACCESSORIES, .NEW DELHI	Approved
		7	SOUTHERN PLANTAID, TELANGANA	Approved
		8	TRACTEL TIRFOR INDIA PVT. LTD., HARYANA	Approved
		9	TRANSPADE ENGG PVT LTD, KARNATAKA	Approved
		10	UNIVERSAL HOIST-O-FABRIK, MAHARASHTRA	Approved
16	PAINT	1	ASIAN PAINT	Approved
		2	BERGER	Approved
		3	KANSAI NEROLAC	Approved
17	FLOW ELEMENT - ORIFICE	1	ASIAN INDUSTRIAL VALVES AND INSTRUMENTS, TAMILNADU	Approved
		2	GENERAL INSTRUMENTS CONSORTIUM, TAMILNADU	Approved
		3	INSTRUMENTATION ENGINEERS PVT. LTD., HYDERABAD	Approved
		4	INSTRUMENTATION LTD., KERALA	Approved
		5	MICRO PRECISION PRODUCTS PVT. LTD., HARYANA	Approved
		6	STAR MECH CONTROLS (I) PVT.LTD., PUNE	Approved
18	DIFF.PRESSURE GAUGE	1	A.N.INSTRUMENTS PVT. LTD., CHENNAI	Approved
		2	GENERAL INSTRUMENTS(GIC), PANVEL	Approved
		3	WIKA INSTRUMENTS INDIA PVT. LTD., PUNE	Approved
		4	A.N. INSTRUMENTS PVT. LTD., NEW DELHI , INDIA	Approved
		5	BAUMER TECHNOLOGIES, MUMBAI	Approved
		6	GAUGES BOURDON INDIA, NAVI MUMBAI	Approved
		7	GOA STATIC INSTRUMENTS, GOA	Approved
		8	H.GURU INSTUMENTS (SI) PVT.LTD., BANGALORE	Approved
		9	PRECISION MASS PRODUCTS PVT LTD., GANDHINAGAR	Approved

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Lr.No.CE/TPC/SE-3/EME-11/YTPS(5X800MW)/F.Vendors/D.No. 59/21,Dt: 20.07.2021

Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	DIFF.PRESSURE GAUGE	10	SWITZER INSTRUMENTS LTD, MUMBAI	Approved
		11	SWITZER PROCESS INSTRUMENTS, CHENNAI	Approved
		12	WALCHANDNAGAR INDUSTRIES LIMITED, PUNE	Approved
19	PRESSURE GAUGE	1	A.N.INSTRUMENTS PVT. LTD., CHENNAI	Approved
		2	BAUMER INDIA PRIVATE LIMITED, PUNE	Approved
		3	GENERAL INSTRUMENTS(GIC), PANVEL	Approved
		4	WALCHANDNAGAR INDUSTRIES LTD., BAUMER	Approved
		5	WIKA INSTRUMENTS INDIA PVT. LTD., PUNE	Approved
		6	ASHCROFT INDIA PVT LTD. , GUJARAT	Approved
		7	BAUMER TECHNOLOGIES, MUMBAI	Approved
		8	BELLS CONTROLS LIMITED, KOLKATA	Approved
		9	BUDENBERG GAUGE CO LTD, UK	Approved
		10	FORBES MARSHALL (HYD) PVT. LIMITED, HYDERABAD	Approved
		11	GAUGES BOURDON INDIA, NAVI MUMBAI	Approved
		12	GOA INSTRUMENT INDUSTRIES PVT LTD., GOA	Approved
		13	GOA STATIC INSTRUMENTS, GOA	Approved
		14	H.GURU INSTRUMENTS (S.I) PVT. LTD., BANGALORE	Approved
		15	MANOMETER INDIA PVT LTD., THANE	Approved
		16	PRECISION MASS PRODUCTS PVT. LTD., GANDHINAGAR, GUJARAT	Approved
		17	WAREE INSTRUMENTS LIMITED, MUMBAI	Approved
		18	WIKA ALEXANDER WIEGAND GMBH & CO, GERMANY	Approved
20	THERMOWELL	1	BAUMER TECHNOLOGIES INDIA PVT. LTD., VAPI	Approved
		2	DETRIV INSTRUMENTATION, MUMBAI	Approved
		3	GAUGES BOURDON (I) PVT LTD., CHENNAI	Approved
		4	GOA INSTRUMENT INDUSTRIES PVT. LTD., GOA	Approved
		5	NESSTECH INSTRUMENTS PVT. LTD., VAPI	Approved
		6	PYRO ELECTRIC INSTRUMENTS GOA PVT. LTD., GOA	Approved
		7	THERMAL INSTRUMENTS INDIA PVT. LTD., VAPI	Approved
21	TEMPERATURE GAUGE	1	A.N.INSTRUMENTS PVT LTD., CHENNAI	Approved
		2	BAUMER TECHNOLOGIES (I) PRIVATE LIMITED, MUMBAI	Approved
		3	FORBES MARSHALL(HYD) LTD., HYDERABAD	Approved

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Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	TEMPERATURE GAUGE	4	GAUGES BOURDON (INDIA) PVT. LTD., MUMBAI	Approved
		5	GOA INSTRUMENTS INDUSTRIES PRIVATE LTD., GOA	Approved
		6	GOA THERMOSTATIC INSTRUMENTS, GOA	Approved
		7	H.GURU INSTRUMENTS(SOUTH IN DIA) PVT., BANGALORE	Approved
		8	PRECISION MASS PRODUCTS PVT. LTD.	Approved
		9	WIKA INSTRUMENTS INDIA PVT. LTD., PUNE	Approved
22	TRANSMITTER (PRESSURE, TEMPERATURE, FLOW)	1	ABB, GERMANY / BANGALORE	Approved
		2	EMERSON PROCESS, USA/NAVI MUMBAI	Approved
		3	ENDRESS + HAUSER (I) AUTOMATION, INDIA	Approved
		4	HONEYWELL, USA/PUNE	Approved
		5	SIEMENS LTD., INDIA	Approved
23	LEVEL GAUGE	1	CHEMTROLS SAMIL (INDIA) PVT. LTD., POWAI, MUMBAI	Approved
		2	D.K.INSTRUMENTS PVT. LTD., DHAKURIA, KOLKATA	Approved
		3	LEVCON INSTRUMENTS P LTD., KOLKATA	Approved
		4	PUNE TECHTROL PVT. LTD., PUNE	Approved
		5	SBEM PRIVATE LIMITED, PUNE	Approved
		6	SIGMA INSTRUMENTS COMPANY, BHAND, UP	Approved
		7	V.AUTOMAT & INSTRUMENTS PVT. LTD., NEW DELHI	Approved
24	LEVEL TRANSMITTER (ULTRASONIC TYPE)	1	ABB	Approved
		2	EMERSON PROCESS MANAGEMENT	Approved
		3	ENDRESS+HAUSER, GERMANY/INDIA	Approved
		4	FORBES MARSHALL	Approved
		5	KROHNE MARSHALL	Approved
		6	P&F, INDIA	Approved
		7	SIEMENS MILLTRONICS, CANADA	Approved
		8	VEGA, GERMANY	Approved
25	LEVEL TRANSMITTER (RADAR TYPE)	1	ABB, GERMANY / FARIDABAD	Approved
		2	EMERSON PROCESS, USA/NAVI MUMBAI	Approved
		3	ENDRESS+HAUSER, GERMANY/INDIA	Approved
		4	HONEYWELL, USA/INDIA	Approved
		5	KROHNE MARSHAL	Approved
		6	K-TEK, USA	Approved
		7	MAGNETROL, BELGIUM	Approved
		8	P&F, INDIA	Approved
		9	VEGA, GERMANY	Approved
26	PRESSURE SWITCH / DIFF.PRESSURE SWITCH	1	GAUGES BOURDON INDIA, NAVI MUMBAI	Approved

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Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	PRESSURE SWITCH / DIFF.PRESSURE SWITCH	2	PRECISION MASS PRODUCTS PVT LTD., GANDHINAGAR	Approved
		3	SWITZER PROCESS INSTRUMENTS, CHENNAI.	Approved
		4	TRAFAG CONTROLS INDIA PVT LTD., GURGAON	Approved
		5	BAUMER TECHNOLOGIES (I) PVT. LTD.	Approved
27	LEVEL SWITCH (CAPACITANCE TYPE)	1	D.K.INSTRUMENTS PVT. LTD., DHAKURIA, KOLKATA	Approved
		2	LEVCON INSTRUMENTS P LTD., KOLKATA	Approved
		3	NIVO CONTROLS PVT LTD., INDIA	Approved
		4	SBEM PRIVATE LIMITED, PUNE	Approved
		5	V.AUTOMAT & INSTRUMENTS PVT. LTD., NEW DELHI	Approved
28	LEVEL SWITCH (FLOAT TYPE)	1	CHEMTROLS SAMIL (INDIA) PVT. LTD., POWAI, MUMBAI	Approved
		2	D.K.INSTRUMENTS PVT. LTD., DHAKURIA, KOLKATA	Approved
		3	LEVCON INSTRUMENTS PVT. LTD., KOLKATA	Approved
		4	SBEM PRIVATE LIMITED, PUNE	Approved
		5	SIGMA INSTRUMENTS COMPANY, BHAND, UP	Approved
		6	V.AUTOMAT & INSTRUMENTS PVT. LTD., NEW DELHI	Approved
29	LEVEL SWITCH (TOP MOUNTED)	1	CHEMTROLS SAMIL (INDIA) PVT. LTD., POWAI, MUMBAI	Approved
		2	D.K.INSTRUMENTS PVT. LTD., DHAKURIA, KOLKATA	Approved
		3	LEVCON INSTRUMENTS P LTD., KOLKATA	Approved
		4	PUNE TECHTROL PVT. LTD., PUNE	Approved
		5	SBEM PRIVATE LIMITED, PUNE	Approved
		6	SIGMA INSTRUMENTS COMPANY, BHAND, UP	Approved
		7	V.AUTOMAT & INSTRUMENTS PVT. LTD., NEW DELHI	Approved
30	PRESSURE / DIFF. PRESSURE TRANSMITTER	1	ABB LIMITED,GERMANY/INDIA	Approved
		2	BALDOTA CONTROL & (SMAR MAKE) EQUIPMENTS PVT LTD.,INDIA	Approved
		3	EMERSON PROCESS MGT PVT. LTD., USA/ INDIA	Approved
		4	ENDRESS + HAUSER(I) AUTOMATION, INDIA	Approved
		5	FUJI ELECTRIC SYSTEMS CO. LTD., JAPAN/FRANCE/INDIA	Approved

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Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	PRESSURE / DIFF. PRESSURE TRANSMITTER	6	HONEYWELL AUTOMATION INDIA LIMITED, USA/INDIA	Approved
		7	SIEMENS LTD., INDIA	Approved
		8	YOKOGAWA INDIA LIMITED, INDIA/JAPAN	Approved
31	TEMPERATURE TRANSMITTER	1	ABB LIMITED, HYD	Approved
		2	EMERSON PROCESS MGT (I) PVT. LTD., MUMBAI	Approved
		3	ENDRESS + HAUSER (INDIA) PVT. LTD., MUMBAI	Approved
		4	HONEYWELL AUTOMATION INDIA LIMITED, PUNE	Approved
		5	YOKOGAWA INDIA LIMITED, BANGALORE	Approved
32	TEMPERATURE ELEMENT	1	BAUMER INDIA PRIVATE LIMITED, MUMBAI	Approved
		2	DETRIV INSTRUMENTATION AND ELETRI, MUMBAI	Approved
		3	EXOTHERM INSTRUMENTS, THANE	Approved
		4	GAUGES BOURDON INDIA PVT LTD., MUMBAI	Approved
		5	GOA INSTRUMENTS INDUSTRIES PRIVATE LTD., GOA	Approved
		6	INDUSTRIAL INSTRUMENTATION, CHIRANTANI PARK, BANSDRONI, KOLKATA	Approved
		7	OKAZAKI, JAPAN	Approved
		8	PYRO ELECTRIC INSTRUMENTS GOA PVT. LTD., MAPUSA ,GOA	Approved
		9	TECHNO INSTRUMENTS SANTEJ, KALOL, GANDHINAGAR, GOA	Approved
		10	TEMPSENS INSTRUMENTS (I) PVT LTD., UDAIPUR	Approved
		11	THERMAL INSTRUMENT INDIA PVT. LTD.	Approved
		12	TOSHNIWAL INDUSTRIES PVT LTD., AJMER	Approved
33	INSTRUMENT FITTINGS	1	ARYA CRAFTS & ENGINEERING PVT. LTD., GUJARAT	Approved
		2	AURA INC., NEW DELHI	Approved
		3	BALDOTA VALVE, MUMBAI	Approved
		4	EXCEL HYDRO-PNEUMATICS PVT . LTD., MUMBAI	Approved
		5	FLOWTECH, KOLKATA	Approved
		6	HP VALVES & FITTINGS (INDIA) PVT. LTD., CHENNAI	Approved
		7	METPRESS ENGINEERING WORKS, KOLKATA	Approved
		8	PANAM ENGINEERS LTD., MUMBAI	Approved
		9	PMT ENGINEERS, AHMEDABAD	Approved

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Lr.No.CE/TPC/SE-3/EME-11/YTPS(5X800MW)/F.Vendors/D.No. 59/21,Dt:20.07.2021

Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	INSTRUMENT FITTINGS	10	PRECISION ENGG INDUSTRIES, GOREGAON (W) MUMBAI	Approved
		11	PRIME ENGINEERS, MUMBAI	Approved
		12	V.K.INDUSTRIES, BANGALORE	Approved
		13	VIKAS INDUSTRIAL PRODUCTS, NOIDA	Approved
34	VALVE MANIFOLDS	1	ASTEC VALVE & FITTINGS PVT. LTD., MUMBAI	Approved
		2	AURA INC., NEW DELHI	Approved
		3	BALDOTA VALVE, MUMBAI	Approved
		4	EXCEL HYDRO-PNEUMATICS PVT. LTD., MUMBAI	Approved
		5	FLOWTECH, KOLKATA	Approved
		6	FLUID CONTROLS LIMITED, PUNE	Approved
		7	HP VALVES & FITTINGS (INDIA) PVT. LTD., CHENNAI	Approved
		8	METPRESS ENGINEERING WORKS, KOLKATA	Approved
		9	MICRO PRECISION PRODUCTS PVT LTD., FARIDABAD, HARYANA	Approved
		10	PMT ENGINEERS, AHMEDABAD	Approved
35	INSTRUMENT VALVES	1	AURA INC., NEW DELHI	Approved
		2	BALDOTA VALVE AND FITTINGS PVT. LTD., MUMBAI	Approved
		3	BHARAT HEAVY ELECTRICALS LIMITED VALVES, TIRUCHIRAPALLI, TAMILANADU.	Approved
		4	EXCEL HYDRO-PNEUMATICS PVT LTD., MUMBAI	Approved
		5	FLUID CONTROLS LIMITED, PUNE	Approved
		6	HP VALVES & FITTINGS (INDIA) PVT. LTD., CHENNAI	Approved
		7	INSTRUMENTATION LIMITED, PALGHAT	Approved
		8	METPRESS ENGINEERING WORKS, KOLKATA	Approved
		9	PMT ENGINEERS, AHMEDABAD	Approved
		10	PRECISION ENGG INDUSTRIES, GOREGAON(W), MUMBAI	Approved
36	AIR FILTER REGULATOR	1	PARKER HANNIFIN INDIA PVT. LTD., INDIA	Approved
		2	PLACKA INSTRUMENTS INDIA PVT. LTD., CHENNAI	Approved
		3	SHAVO NORGREN(INDIA) PVT. LTD., BANGALORE	Approved
		4	SMC PNEUMATICS, INDIA	Approved
37	PLC VENDOR	1	GE INTELLIGENT PLATFORMS PVT. LTD.	Approved
		2	HONEYWELL AUTOMATION INDIA LTD.	Approved

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Yadadri TPS (5X800MW) approved sub vendor list for Air Conditioning System

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Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	PLC VENDOR	3	ROCKWELL AUTOMATION INDIA PVT., LTD.	Approved
		4	SCHNEIDER ELECTRIC INDIA PVT. LTD.	Approved
		5	SIEMENS INDIA LTD.	Approved
38	PLC SYSTEM INTEGRATOR	1	CAS ELECTRICAL & AUTOMATION PVT LTD (SYSTEM INTEGRATOR FOR ROCKWELL)	Approved
		2	COTMAC ELECTRONICS PVT. LTD. (CHANNEL PARTNER OF M/S SIEMENS LTD), HARYANA	Approved
		3	DELSYS (SYSTEM INTEGRATOR FOR GE FANUC), CHENNAI	Approved
		4	DYNAMIC ENGINEERS (SYSTEM INTEGRATOR FOR ALLEN BRADLEY), NOIDA	Approved
		5	LADDER AUTOMATION SOLUTIONS PVT. LTD. (CHANNEL PARTNER OF M/S HONEYWELL AUTOMATION PVT. LTD.) HARYANA	Approved
		6	ENERGY VENTURES (SYSTEM INTEGRATOR FOR ROCK WELL AUTOMATION)	Approved
		7	PRIME CONTROLS/PUNE (SYSTEM INTEGRATOR FOR GE FANUC)	Approved
		8	SUN INDUSTRIAL AUTOMATION & SOLUTION (SYSTEM INTEGRATOR OF SCHNEIDER.)	Approved
39	OWS / PC	1	DELL	Approved
		2	HP	Approved
		3	IBM-LENOVO	Approved
40	PRINTER (LASER / INKJET)	1	CANON	Approved
		2	EPSON (INKJET ONLY)	Approved
		3	HP	Approved
		4	IBM	Approved
		5	LEXMARK	Approved
		6	XEROX	Approved
41	TFT MONITOR	1	DELL	Approved
		2	HP	Approved
		3	IBM-LENOVO	Approved
		4	SAMSUNG	Approved
42	UPS WITH ACDB	1	DELTA INDIA ELECTRONICS PVT. LTD., CHENNAI	Approved
		2	FUJI ELECTRIC CONSUL NEOWATT PVT. LTD., INDIA	Approved
		3	HITACHI HIREL POWER ELECTRONICS, GANDHINAGAR	Approved

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Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	UPS WITH ACDB	4	VERTIV ENERGY, (FORMERLY M/S EMERSON NETWORK POWER), AMBERNIATH	Approved
43	FIBRE OPTIC CABLE	1	AKSH FIBRE, BHIWADI	Approved
		2	BIRLA ERICSSON, REWA	Approved
		3	D-LINK	Approved
		4	FINOLEX, PUNE/GOA	Approved
		5	HFCL, GOA	Approved
		6	STERLITE	Approved
		7	TERRACOM	Approved
44	DC BATTERY CHARGER	1	AMARA RAJA POWER SYSTEMS LIMITED,	Approved
		2	CHLORIDE POWER SYSTEMS & SOLUTIONS LIMITED, KOLKATA	Approved
		3	EMERSON NETWORK POWER PVT LTD., PUNE	Approved
		4	HBL POWER SYSTEMS LTD., TELANGANA	Approved
		5	STATCON POWER CONTROLS LTD.	Approved
45	JUNCTION BOX	1	BALIGA LIGHTING EQUIPMENT PVT. LTD., CHENNAI	Approved
		2	DEVI POLYMERS PVT. LTD., CHENNAI	Approved
		3	HENSEL ELECTRIC INDIA PVT. LTD., CHENNAI	Approved
		4	SUCHITRA INDUSTRIES, BANGALORE	Approved
		5	MANISHA COMPOSITEK PVT. LTD., PUNE	Approved
		6	PYROTECH, UDAIPUR	Approved
		7	CHEMIN CONTROLS, PONDICHERY	Approved
		8	ELECTROMECHANICAL, KOLKATA	Approved
		9	K.S.INSTRUMENTS PVT. LTD., BANGALORE	Approved
		10	KHODAY CONTROL SYSTEMS, BANGALORE	Approved
		11	PRAMMEN INDUSTRIES , PODDUKOTTAI	Approved
46	ENCLOSURE (LOCAL CONTROL PANEL)	1	C&S ELECTRIC, NOIDA	Approved
		2	CONTROL & SCHEMATICS, HYDERABAD	Approved
47	CABLE LUGS	1	DOWELL	Approved
		2	UML ENGINEERS, KOLKATA	Approved
		3	EXAR INDUSTRIES	Approved
		4	GLOBAL BRASS & ALLOY	Approved
		5	HEX ALLOY (BRASS COPPER & LTD.)	Approved
48	CABLE GLANDS	1	ARUP ENGINEERING	Approved
		2	COMMET	Approved
		3	JAINSON	Approved
		4	SUNIL&CO	Approved
		5	ATLAS METAL INDUSTRIES	Approved
		6	DOWELL	Approved
		7	GLOBAL BRASS & ALLOY	Approved
		8	HEX	Approved

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Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
		9	INDUSTRIAL PRODUCTS	Approved
49	INSTRUMENTATION & CONTROL CABLE	1	CORDS CABLE, RAJASTAN	Approved
		2	DELTON CABLE, FARIDABAD	Approved
		3	INCAB, PUNE	Approved
		4	KEI INDUSTRIES LTD., CHENNAI	Approved
		5	NICCO CABLES, KOLKATA	Approved
		6	PARAMOUNT CABLES,ALWAR	Approved
		7	POLYCAB, DAMAN	Approved
		8	THERMO CABLES, HYDERABAD	Approved
50	CABLE TRAY	1	AMTECH, PUNE	Approved
		2	APT ENGINEERING WORKS, NEW DELHI	Approved
		3	CHEMIN CONTROLS AND INSTRUMENTATION,PONDICHERRY	Approved
		4	GEE DEE PACKAGES PVT. LTD., MYSORE	Approved
		5	INDIA ELECTRICALS SYNDICATE, KOLKATA	Approved
		6	INDIANA GRATINGS, PUNE/MUMBAI	Approved
		7	INDUSTRIAL PERFORATION, KOLKATA	Approved
		8	INNOSPACER ENGINEERING TECHNOLOGIES, BANGALORE	Approved
		9	JAMNA METAL COMPANY, NEW DELHI	Approved
		10	KANADE ANAND UDYOG PVT. LTD., ANDHERI	Approved
		11	M.J.ENGINEERING WORKS PVT. LTD, NEW DELHI	Approved
		12	PATNY SYSTEMS PVT. LTD., SECUNDERABAD	Approved
		13	PRAMMEN INDUSTRIES, PUDDUKKOTTAI	Approved
		14	RATAN ENGINEERING AND PROJECTS, KOLKATA	Approved
		15	RUKMANI ELECTRICAL & COMPONENTS PVT., KOLKATA	Approved
		16	SILVERLINE POWER INFRASTRUCTURE PVT. LTD.	Approved
		17	STEELITE ENGG, MUMBAI	Approved
51	LIMIT SWITCH	1	BETA SYSTEMS ENGINEERING	Approved
		2	GENERAL INSTRUMENT CONSORTIUM	Approved
		3	JOHAN VOLLENBROICH, GERMANY	Approved
		4	PEPPERL+FUCHS (INDIA) PVT. LTD.	Approved
		5	PROTOCONTROL INSTRUMENTS (I) PVT. LTD.	Approved
		6	SIEMENS INDIA LTD.	Approved
		7	APA AUTOMATION, INDIA	Approved
		8	BCH ELECTRIC LTD., SECUNDERABAD	Approved
		9	CONTROL AND AUTOMATION SYSTEMS, INDIA	Approved

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Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	LIMIT SWITCH	10	IFM ELECTRONICS INDIA PVT. LTD., INDIA	Approved
		11	KAYCEE INDUSTRIES LTD., INDIA	Approved
52	ELECTRO MECHANICAL RELAY / AUXILIARY RELAY	1	ABB INDIA LIMITED, BANGALORE / BARODA	Approved
		2	GE T&D INDIA LTD (EARLIER ALSTOM T&D), CHENNAI	Approved
		3	SCHNEIDER ELECTRIC INFRASTRUCTURE LIMITED, CHENNAI	Approved
		4	SIEMENS, MUMBAI	Approved
53	SELECTOR SWITCH	1	ALSTOM	Approved
		2	KAYCEE	Approved
		3	L&T	Approved
		4	SALZER	Approved
		5	SIEMENS	Approved
		6	RECOM,MUMBAI	Approved
		7	SWITRON DEVICES, NASHIK	Approved
54	INDICATION LAMPS	1	ALSTOM	Approved
		2	L&T	Approved
		3	SIEMENS	Approved
		4	STS	Approved
		5	TEKNIC	Approved
		6	C&S ELECTRIC, NOIDA	Approved
55	PUSH BUTTON	1	ALSTOM	Approved
		2	BCH	Approved
		3	L&T	Approved
		4	SCHNEIDER	Approved
		5	SIEMENS	Approved
		6	TEKNIC	Approved
		7	C&S ELECTRIC, NOIDA	Approved
56	CONTACTOR	1	BCH	Approved
		2	L&T	Approved
		3	SCHNEIDER	Approved
		4	SIEMENS	Approved
57	TIME RELAY/CHANGE OVER REI.AY	1	ABB	Approved
		2	BCH	Approved
		3	L&T	Approved
		4	SCHNEIDER	Approved
		5	SIEMENS	Approved
58	VVVF DRIVE	1	L&T-YASKAWA, MUMBAI	Approved
		2	SCHNEIDER, DELHI	Approved
		3	SIEMENS, NASHIK	Approved
59	TRANSFORMERS (CURRENT, POTENTIAL, CONTROL)	1	AUTOMATIC ELECTRIC, LONAVAL	Approved
		2	INDCOIL TRANSFORMERS, THANE	Approved
		3	KALPA ELECTRIKAL, BANGALORE/THANE	Approved

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Sl. No.	Item Description	Sl. No.	Vendor proposed for approval	TSGENCO Remarks for YTPS (5X800MW)
	TRANSFORMERS (CURRENT, POTENTIAL, CONTROL)	4	NEWTEK ELECTRICALS (FOR CURRENT & POTENTIAL TRANSFORMER), AURANGABAD	Approved
		5	PRAGATHI ELECTRICALS, THANE	Approved
		6	PRECISE ELECTRICALS, MAHARASHTRA	Approved
60	MCB	1	L&T	Approved
		2	SIEMENS	Approved
		3	C&S ELECTRIC, HARIDWAR	Approved
		4	Eaton, PONDICHERRY	Approved
		5	SCHNEIDER ELECTRIC, CHENNAI	Approved
61	HOOTERS	1	BEACON	Approved
		2	OSC	Approved
		3	TARGET	Approved

PART-II

Sl. No.	Item Description	Sl. No.	Proposed sub vendor for approval	TSGENCO remarks for YTPS (5X800MW)
1	SCREW CHILLER	1	VOLTAS, VADODRA	Approved
		2	BLUE STAR, WADA	Approved
		3	DAIKIN, NEEMRANA	Approved
		4	KIRLOSKAR CHILLER, SASWAD, PUNE	Approved
		5	CARRIER, GURGAON	Approved
		6	DUNHAM-BUSH, MALAYSIA	Approved
		7	YORK, TEXAS,USA	Approved
		8	TRANE, COLORADO, USA	Approved
2	PRECISION PACKAGE UNITS	1	STULZ, PUNE	Approved
		2	UNIFLAIR, BANGALORE	Approved
		3	EMERSON PROCESS MANAGEMENT, GURGAON / PUNE	Approved
		4	BLUEBOX, MUMBAI	Approved
		5	CLIMAVENETA, BANGALORE	Approved
3	PACKAGE AC UNIT	1	VOLTAS, GUJARAT	Approved
		2	BLUE STAR, WADA	Approved
		3	CARRIER, GURGAON	Approved
4	SPLIT / DUCTABLE SPLIT / CASSETTE AIR CONDITIONER	1	VOLTAS, GUJARAT	Approved
		2	BLUE STAR, WADA	Approved
		3	CARRIER, GURGAON	Approved
		4	LG, INDIA	Approved
		5	HITACHI, INDIA	Approved

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Sl. No.	Item Description	Sl. No.	Proposed sub vendor for approval	TSGENCO remarks for YTPS (5X800MW)
	SPLIT / DUCTABLE SPLIT / CASSETTE AIR CONDITIONER	6	NATIONAL, INDIA	Approved
		7	SAMSUNG, INDIA	Approved
		8	DIAKIN, INDIA	Approved
5	AIR HANDLING UNITS (AHU)	1	ZECO,BAHADURGARH	Approved
		2	EDGETECH, DELHI	Approved
		3	ETHOS, AHMEDABAD	Approved
		4	SYSTEMAIR, NOIDA	Approved
		5	WAVE AIRCON, BHIWADI	Approved
		6	VOLTAS, DADRA	Approved
		7	BLUESTAR, THANE	Approved
6	FAN COIL UNITS	1	ZECO, BAHADURGARH	Approved
		2	EDGETECH, DELHI	Approved
		3	ETHOS, AHMEDABAD	Approved
		4	SYSTEMAIR, NOIDA	Approved
		5	WAVE AIRCON, BHIWADI	Approved
7	AHU FAN (CENTRIFUGAL FAN)	1	CB.DOCTOR, AHMEDABAD	Approved
		2	FLAKT, GREATER NOIDA	Approved
		3	KRUGER, PUNE	Approved
		4	NICOTRA, GREATER NOIDA	Approved
		5	PATEL AIR, AHMEDABAD	Approved
		6	WOLTER, BHIWADI	Approved
		7	ADVANCE VENTILATION, SONEPAT	Approved
		8	SARALA, KOLKATA	Approved
		9.	Pack Plast	Approved
9	AIR FILTER	1	FMI, KOLKATA	Approved
		2	ANFILCO, NEW DELHI	Approved
		3	TENACITY, PUNE	Approved
		4	JOHN FOWLER , BANGALORE	Approved
		5	SPECTRUM, KOLKATA	Approved
		6	AIR TECH, VASAI	Approved
		7	PUROMATIC, OKHLA	Approved
		8	PARKET HANNFFINS, BANGALORE	Approved
10	AXIAL FANS / F.A. FANS	1	FLAKT, GREATER NOIDA	Approved
		2	KHAITAN, KOLKATA	Approved
		3	PATEL AIR, AHMEDABAD	Approved

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Sl. No.	Item Description	Sl. No.	Proposed sub vendor for approval	TSGENCO remarks for YTPS (5X800MW)
	AXIAL FANS / F.A. FANS	4	KRUGER , SINGAPORE/ THANE	Approved
		5	MARATHON , KOLKATA	Approved
		6	CB DOCTOR, AHMEDABAD	Approved
		7	ALMONARD, CHENNAI	Approved
		8	TCF NADI, CHENNAI	Approved
11	INSULATION MATERIAL	1	BEARDSELL, FARIDABAD	Approved
		2	K-FLEX, PUNE	Approved
		3	PARAMOUNT, SONIPAT	Approved
		4	ARMAFLEX, PUNE	Approved
		5	SUPREME, MUMBAI(HQ)	Approved
		6	LLOYDS, SIKANDARABAD	Approved
		7	UP TWIGA, BHILAI	Approved
		8	AEROCELL, GURUGRAM	Approved
12	BALANCING VALVE	1	ADVANCE , UNA (HP)	Approved
		2	CASTLE, DELHI	Approved
13	MOTORIZED BUTTERFLY VALVE ALONG WITH ACTUATOR	1	ADVANCE, UNA (HP)	Approved
		2	BELIMO, MUMBAI (HQ)	Approved
		3	JOHNSON CONTROL, BANGALORE (HQ)	Approved
		4	HONEYWELL, TAIWAN	Approved
		5	HONEYWELL, CHINA	Not approved
		6	SIEMENS, MUMBAI (HQ)	Approved
14	FLOAT VALVE	1	LEADER VALVES LTD., PUNJAB	Approved
		2	G.M. DALUI AND SONS PVT.LTD., KOLKATA	Approved
		3	H.SARKER AND COMPANY, KOLKATA	Approved
15	GM VALVES	1	LEADER VALVES LTD., PUNJAB	Approved
		2	SANT VALVES, PUNJAB	Approved
16	3 WAY MIXING VALVE WITH ACTUATING MOTOR	1	SIEMENS BUILDING TECHNOLOGY, GERMANY	Approved
		2	JOHNSON CONTROL, SINGAPORE	Approved
		3	BELIMO, MUMBAI (HQ)	Approved
		4	HONEYWELL, TAIWAN	Approved
		5	HONEYWELL, CHINA	Not approved
		6	RAPID CONTROL, DELHI	Approved
		7	ALC, INDIA	Approved
17	Y TYPE / POT STRAINER	1	MULTITEX, NEW DELHI	Approved
		2	SANT VALVES, PUNJAB	Approved
		3	DS ENGG, NEW DELHI	Approved

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Sl. No.	Item Description	Sl. No.	Proposed sub vendor for approval	TSGENCO remarks for YTPS (5X800MW)
	Y TYPE / POT STRAINER	4	SAROJINI, NEW DELHI	Approved
		5	GRAND PRIX, FARIDABAD, HARYANA	Approved
		6	GUJRAT OTOLIFT, GUJARAT	Approved
		7	BHATIA ENGG, NEW DELHI	Approved
		8	SUNGOV ENGG, CHENNAI	Approved
18	SIGHT FLOW INDICATORS	1	SIGMA, MUMBAI	Approved
		2	LEVCON INSTRUMENTS P LTD., KOLKATA	Approved
		3	V AUTOMAT & INDUSTRIES PVT LTD., NEW DELHI	Approved
		4	TELLACE, INDIA	Approved
		5	EUREKA INDUSTRIAL EQUIPMENTS PVT LTD., MUMBAI(HQ)	Approved
		6	TATA HONEYWELL, TAIWAN	Approved
		7	TATA HONEYWELL, CHINA	Not approved
		8	BLISS ANAND, GURUGRAM	Approved
		9	SCIENTIFIC DEVICES, MUMBAI	Approved
		10	BK EQUIPMENTS, CHENNAI	Approved
		11	INSTRUMENTATION ENGINEERS, HYDERABAD	Approved
19	GI SHEETS FOR DUCTING	1	TISCO, INDIA	Approved
		2	RASHITRYA ISPAT NIGAM LTD., INDIA	Approved
		3	ESSAR, INDIA	Approved
		4	JSW STEEL , INDIA	Approved
		5	TATA, INDIA	Approved
		6	SAIL, INDIA	Approved
		7	JINDAL, INDIA	Approved
20	FIRE DAMPER (MOTORIZED) WITH SINGLE PHASE ACTUATOR	1	TSC, MUMBAI	Approved
		2	CARRYAIRE, GREATER NOIDA	Approved
		3	SYSTEMAIR (formerly known as RAVISTAR), GREATER NOIDA	Approved
21	GRILL/DIFFUSER /VOLUME CONTROL DAMPER	1	AIR FLOW, GREATER NOIDA	Approved
		2	TSC , MUMBAI	Approved
		3	AIR MASTER, KARNATAKA	Approved
		4	CARRYAIRE, GREATER NOIDA	Approved
		5	SYSTEMAIR (formerly known as RAVISTAR), GREATER NOIDA	Approved
22	STRIP HEATER	1	ESCORTS, CHENNAI	Approved
		2	~~RACOLD, PUNE~~	Approved
		3	DASPASS, NEW DELHI	~~Approved~~

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Sl. No.	Item Description	Sl. No.	Proposed sub vendor for approval	TSGENCO remarks for YTPS (5X800MW)
	STRIP HEATER	4	ALCO, KOLKATA	Approved
		5	HEATCO, KOLKATA	Approved
		6	HOTSET, KARNATAKA	Approved
23	PAN HUMIDIFIER	1	RAPID COOL, NEW DELHI	Approved
		2	HOTSET, KARNATAKA	Approved
		3	ALCO, KOLKATA	Approved
24	RELIEF / PURGE VALVE	1	BRASSOMATIC, MUMBAI	Approved
25	EXPANSION TANK / MAKE UP WATER TANK	1	SINTEX, INDIA	Approved
		2	POLYPLAST CHEMI-PLANTS (I) PVT. LTD., MUMBAI	Approved
		3	DEEPA COMPOSITE INDIA PRIVATE LIMITED, MAHARASHATRA	Approved
		4	FRP COROSEAL INDUSTRIES, ANDHRA PRADESH	Approved
		5	EPP COMPOSITES PRIVATE LIMITED, GUJARAT	Approved
		6	JR FIBREGLASS INDUSTRIES PVT. LTD., MUMBAI	Approved
26	THERMOSTATS / HUMIDSTAT / GYSERSTAT / AIR STAT	1	HONEYWELL AUTOMATION, USA	Approved
		2	JOHNSON CONTROL, SINGAPORE	Approved
		3	SIEMENS, GERMANY	Approved
27	FLOW SWITCH	1	SWITZER, CHENNAI	Approved
		2	LEVCON, KOLKATA	Approved
		3	DK INSTRUMENT, KOLKATA	Approved
		4	KHRONE MARSHALL, PUNE	Approved
		5	SBEM, PUNE	Approved
		6	V. AUTOMATE, NEW DELHI (HQ)	Approved
		7	SIEMENS, INDIA	Approved
28	RH SENSOR/TEMP SENSOR	1	HONEY WELL, TAIWAN	Approved
		2	HONEY WELL, CHINA	Not approved
		3	JOHNSON, SINGAPORE	Approved
		4	SIEMENS, MAHARSTRA (HQ)	Approved
		5	GENERAL INSTRUMENTS, MAHARSTRA (HQ)	Approved
29	BATTERY - NI-CD	1	HBL POWER , HYDERABAD	Approved
		2	AMCO SAFT, BANGALORE	Approved
		3	SAFT, FRANCE	Approved
		4	HOPPECKE, GERMANY	Approved

Note :

The above sub vendor list is approved by customer .Bidder is suggested to consider above approved list for its offer.

However, Bidder can also propose any other make for AWU &UAF . The make approval shall be subjected to customer approval with no commercial /delivery implication on BHEL. Refer sub section 2 for makes of AWU/UAF

Annexure-I

SL. NO.	DESCRIPTION OF THE EQUIPMENT	INSPECTION CATEGORY APPROVED BY TSGENCO
1	Air washer & UAF	I
2	Centrifugal Fans	I
3	Horizontal Centrifugal Pumps **(>75 KW)**	**I**
4	Horizontal Centrifugal Pumps **(<=75 KW)**	**II**
5	LT Motors(=<55KW)	III
6	LT Motors(>55KW)	II
7	Axial Fan/RE fans/Propeller fan	III
8	Butterfly Valves	III
9	Conventional Gate/Globe/Check Valve	III
10	GM Gate/Globe/Check Valve	III
11	Filters (Pre filter & Fine Filter)	III
12	Pipe	III
13	Pipe fittings	III
14	Pr./Dp Gauges	III
15	Temperature Gauge	III
16	Transmitter	**II**
17	Temp /RH Sensor	**II**
18	Flow Indicator	III
19	GI sheet for ducting	III
20	Nozzles	III
22	Pr./DP.switch	III
23	Fire Damper (motorized)with single phase Actuator	**II**
24	Chain Pulley block	III
25	Junction Box	**II**
26	Cable Tray (upto 50mm)	III
27	Local Control Panel	**I**
28	Insulation Material	III
29	Level Gauge	III
30	Level Switch	III
31	Pot Strainer	III
32	Humidistat	III
33	Level Indicator	III
34	Instrument Fittings	III
35	Paint	III
36	Grill/Volume control damper	**II**

NOTE:			
INSPECTION CATEGORY	**QAP APPROVAL BY**	**INSPECTION BY**	**MDCC BY**
I	CUSTOMER/ CONSULTANT	CUSTOMER/CONSULTANT/ CUSTOMER appointed TPIA (Final inspection including document review as per approved QAP)	TSGENCO
II	CUSTOMER/ CONSULTANT	BHEL or BHEL'S TPIA	TSGENCO on submission of TC/IR/documents.
III	BHEL	Testing by vendor s Quality dept. & TCs Shall be submitted to BHEL(*)	BHEL
(*) COC shall be submitted by M/s BHEL For the items/Equipments which are not covered in the above list, BHEL has to submit such items to TSGENCO for Approval.			

SECTION-I
SUB SECTION -E

ANNEXURE-II

MANDATORY SPARE LIST
(Refer Annexure II of Price Schedule)

SECTION: I

SUB-SECTION: E

ANNEXURE-III

PAINTING AND COLOUR SCHEME

(AS PER SECTION C2C)

SECTION-I

SUB-SECTION-E

ANNEXURE-IV

LIST OF TOOLS & TACKLES
(Refer Appendix A of Price Schedule)

SECTION-I

SUB-SECTION-E

ANNEXURE-VI

DRAWINGS / DOCUMENTS SUBMISSION PROCEDURE

(AS PER SECTION C2B)

SECTION-I

SUB-SECTION-E

ANNEXURE-IX

FORMAT FOR OPERATION AND MAINTENANCE MANUAL

Project name :
Project number :
Package Name :
PO reference :
Document number :
Revision number :

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	**COVER PAGE**				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	**INDEX**				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	**DESCRIPTION OF PLANT/SYSTEM**				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
4.0	**COMMISSIONING ACTIVITIES (IF NOT COVERED IN SEPARATE DOCUMENT I.E. ERECTION MANUAL, COMMISSIONING MANUAL)**				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	**OPERATION GUIDELINES FOR PLANT PERSONAL/USER/OPERATOR**				
5. 1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5. 2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5. 3	Do's & Don't of the equipments.				
5. 4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5. 5	Parameters to be monitored with normal values and limiting values				
5. 6	Trouble shooting with causes and remedial measures				
5. 7	Routine operational checks, recommended logs & records				
5. 8	Changeover schedule if more than one auxiliary for the same purpose is given				
5. 9	Painting requirement and schedule				
5. 10	Inspection, repair , Testing and calibration procedures				
6.0	**MAINTENANCE GUIDELINES FOR PLANT PERSONAL**				

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				
6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	**Statutory and other specific requirements considerations.**				
8.0	**List of reference documents**				
9.0	**Binding as per requirement**				

SECTION II

	5X800 MW YADADRI TPS VENTILATION SYSTEM LIST OF DOCUMENTS TO BE SUBMITTED WITH BID	SPECIFICATION No: PE-TS-417-554-A003	
		SECTION : II	
		SUB-SECTION : 2	
		REV: 00	DATE: JUL 2023
		SHEET 1 OF 1	

BIDDER SHOULD SUBMIT THE SIGNED AND STAMPED COPY OF THE FOLLOWING DOCUMENTS:

1. Compliance cum confirmation certificate
2. Un priced format for main package,mandatory spare, Tools and Tackles, Commissioning spare. (mentioning quoted against each item)
3. Complete set of technical specification
4. No deviation certificate
5. **Make Declaration by Bidder**
6. **Guarantee Power Consumption**

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing / stamping this compliance certificate (every sheet) and furnish same with the offer.

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions, other than those mentioned under "exclusion and those resolved as per 'Schedule of Deviations', with regard to same.

b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL / CUSTOMER approval & customer hold points for inspection / testing shall be marked in the QP at the contract stage. Inspection / testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This is within the contracted price without any extra implications to BHEL after award of the contract.

d) All drawings/ data-sheets / calculations etc. submitted along with the offer shall not be taken cognizance off.

e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre-bid discussions, otherwise BHEL / Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.

g) All sub vendors shall be subject to BHEL / CUSTOMER approval in the event of order.

h) Guarantee for plant/equipment shall be as per relevant clause of GCC / SCC / Other Commercial Terms & Conditions

i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities within the scope of work as tender specification. This clause will apply in case during site commissioning, additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account

j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's / Customer's / Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

k) As built drawings shall be submitted as and when required during the project execution.

l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

m) Successful bidder shall furnish detailed erection manual for each of the equipment supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.

n) Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.

o) In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.

	5X800 MW YADADRI TPS VENTILATION SYSTEM PRE-BID CLARIFICATION SCHEDULE	SPECIFICATION No: PE-TS-417-554-A002	
		SECTION : II	
		SUB-SECTION : 4	
		REV. NO. 00	DATE: AUG 2022
		SHEET: 1 OF 1	

PRE-BID CLARIFICATION SCHEDULE

S. NO.	SECTION/CLAUSE/PAGE NO.	STATEMENT OF THE REFERRED CLAUSE	CLARIFICATION REQUIRED

The bidder hereby clarifies that above mentioned are the only clarifications required on the technical specification for the subject package.

Signature: _____

Name: _____

Designation: _____

Company: _____

Date: _____

Company Seal

ANNEXURE-II: DEVIATION SHEET (COST OF WITHDRAWAL)

PROJECT:-

PACKAGE:-

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									
PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE									
NAME				**DESIGNATIONS**		**SIGN & DATE**			

NOTES:

1. Cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
3. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
4. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable. In the absence of same, such deviation(s) shall not be considered and offer shall be considered in total compliance to NIT.
5. Bidder shall furnish price copy of above format along with price bid.
6. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
7. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
8. For deviations w.r.t. Credit Period, Liquidated damages, Firm prices if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VII, will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.
9. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be considered.
10. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
11. Cost of withdrawal is to be given separately for each deviation. In no event bidder should cub cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
12. In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
13. In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.

Make Declaration by Bidder

(To be furnished by the bidder along with the bid)

Project:5x800MW YADADRI STAGE 2

Package: VENTILATION PACAKGE -AWU & UAF

Tender Enquiry Number:

Bidder:

Bidder to provide following details that will be part of the contract:

Sl No (A)	**Name of Item (B)**	**Approved makes (C)**	**Any other preferred make bidder wishes to offer (for which negative price impact is furnished by the bidder in their bid) (D)**
1.	Air washer/UAF	1. SK SYSTEM, DELHI 2. ADVANCE VENTILATION, DELHI 3. DRAFT AIR 4. VENTECH SYSTEMS, GHAZIABAD 5. WOLLAQUE VENTILATION, NOIDA 6. ROOTS COOLING SYSTEM, NOIDA 7. C DOCTOR 8. TAP, CHENNAI 9. PACK PLAST, KOTA 10. APC SYSTEM, KOLKATA	**_____(Specify name of the make) ***

* - Bidder shall provide its bid compliant to above approved makes. However, BHEL shall seek approval of bidder's preferred make of AWU/UAF (as per above table) from customer. In case, preferred make indicated by the bidder at column D above is approved, negative price impact given by bidder in Annexure IV of price format shall be exercised.

Date:

(Bidder's Representative)

Sign & Stamp

5 X 800 MW YADADRI TPS

VENTILATION SYSTEM

GPC ANNEXURE-GUARANTEED POWER CONSUMPTION FIGURES

S.NO. (1)	DESCRIPTION (2)	QUANTITY (WORKING) (3)	QUANTITY (STAND-BY) (4)	Total Guaranteed Power Consumption for Each Equipment at motor input terminal and control panel (5)	TOTAL POWER CONSUMPTION AS GUARANTEED (KW) (6) = (3)*(5)
1	Centrifugal fans for Air washer of power house (Stage II)	24	0		
2	Centriifugal pumps for above air washer fans of power house (Stage I & II)	12	12		
3	Centrifugal Fan for UAF for ESP buildings	3	0		
4	Centrifugal pumps for above UAF of ESP buildings	3	3		
5	Centrifugal Fan for UAF for FGD building (Stage II)	2	0		
6	Centrifugal pumps for above UAF for FGD building (Stage II)	2	2		
				TOTAL (KW)	

Note:

1 Base figure of aux power consumption as per above criterion for Ventilation System (for working drives only) shall be 1921 kW.

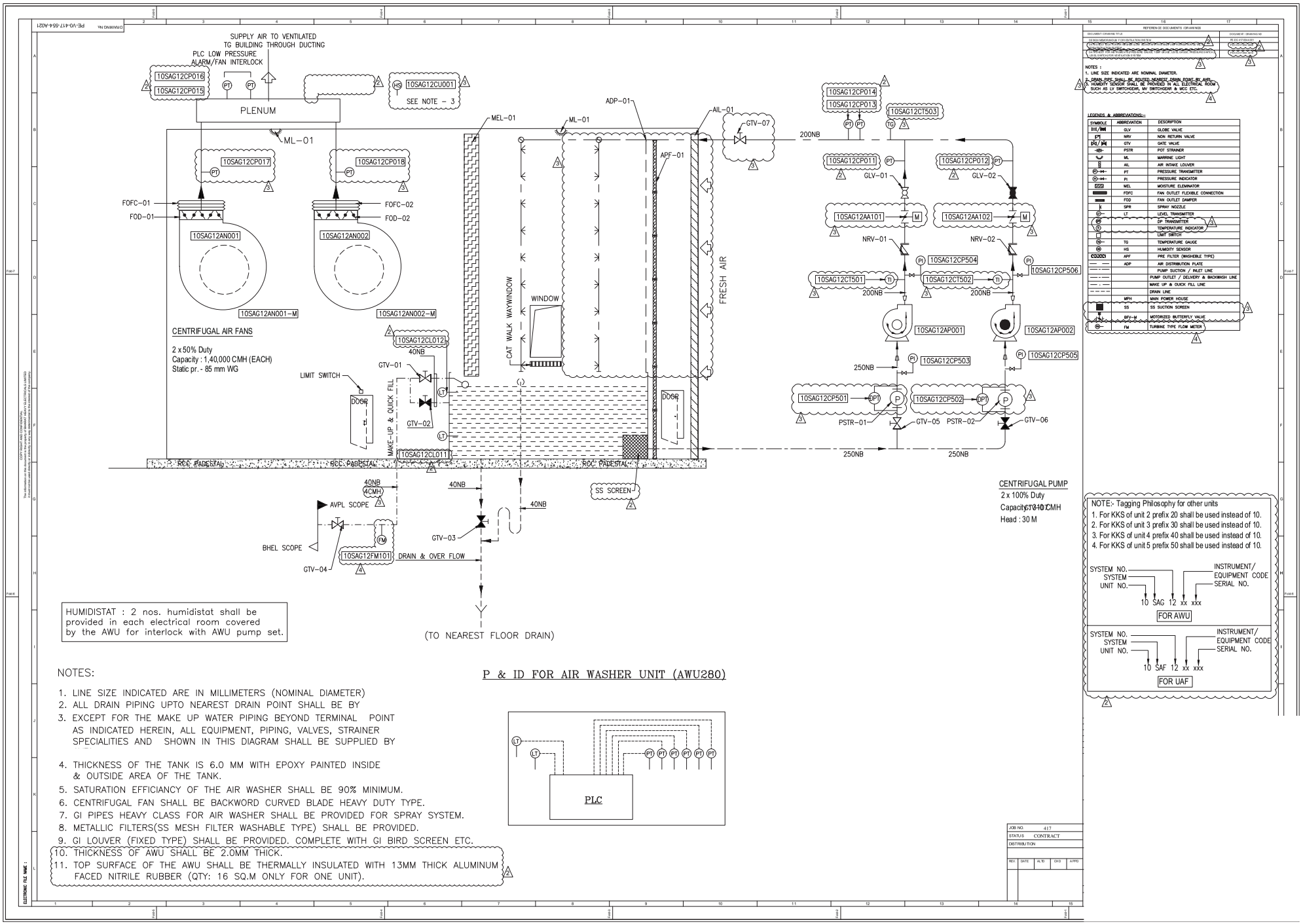
2 Bidder's guaranteed power consumption at motor input terminals (not shaft power)as furnished in guaranteed schedule shall be demonstrated by the successful bidder during performance testing at works/site.

3 The prices quoted by the bidders shall be loaded @ Rs. 2,00,000/- for each one KW increase in consumption from the base figure indicated at Note no 1 above during bid evalaution stage.

4 During actual performance testing at the manufacturing works / site, in case power consumption is noted higher than bidder's quoted guaramtee power consumtion,then penalty @ Rs. 2,00,000/- per KW shall levied on the bidder for the increase in power consumption with respect to "higher of the base figure indicated at note no 1 above and bidders quoted guarantee power consumption".

5 The power consumption indicated above shall be proportionately considered for per unit basis auxiliary power consuption.

Approved PID AWU

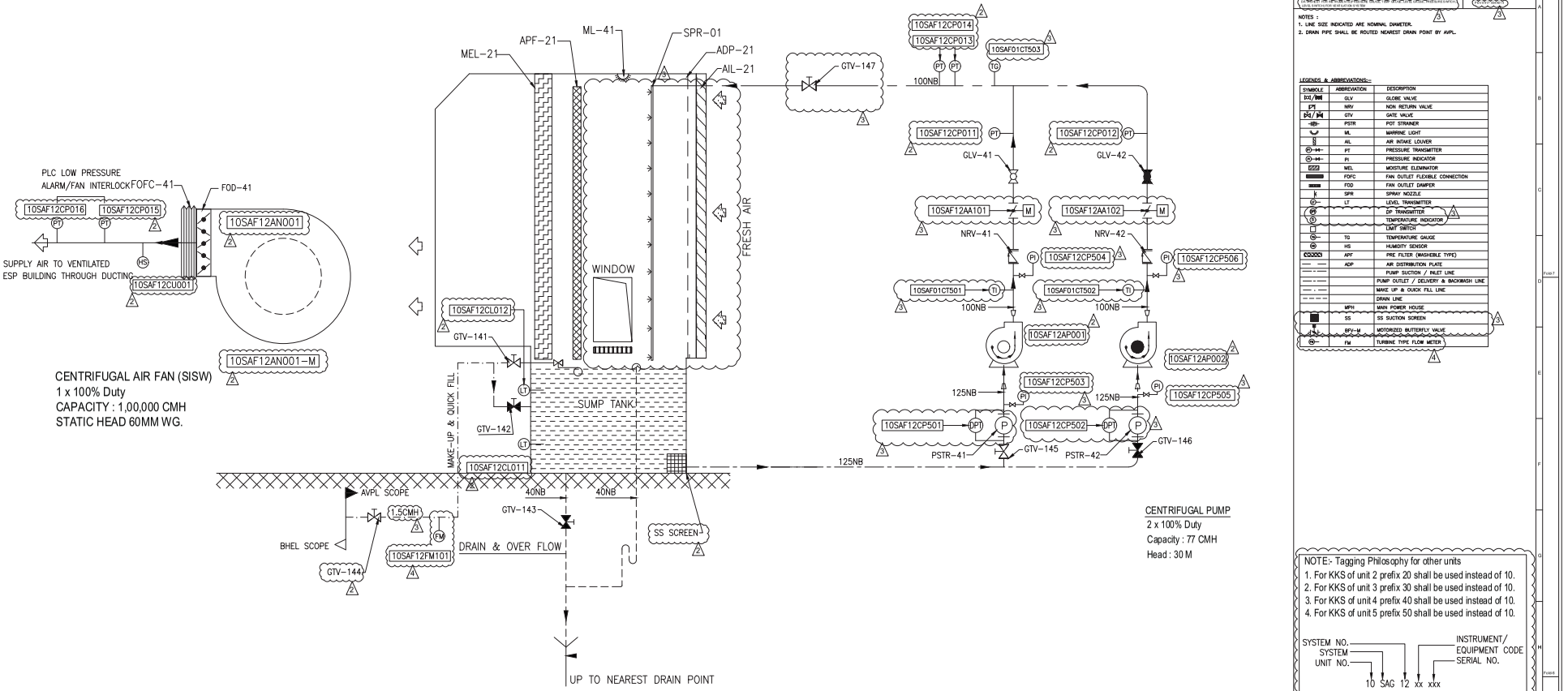


NOTES:

1. LINE SIZE INDICATED ARE IN MILLIMETERS (NOMINAL DIAMETER)
2. ALL DRAIN PIPING UPTO NEAREST DRAIN POINT SHALL BE BY
3. EXCEPT FOR THE MAKE UP WATER PIPING BEYOND TERMINAL POINT AS INDICATED HEREIN, ALL EQUIPMENT, PIPING, VALVES, STRAINER SPECIALITIES AND SHOWN IN THIS DIAGRAM SHALL BE SUPPLIED BY
4. THICKNESS OF THE TANK IS 6.0 MM WITH EPOXY PAINTED INSIDE & OUTSIDE AREA OF THE TANK.
5. SATURATION EFFICIANCY OF THE AIR WASHER SHALL BE 90% MINIMUM.
6. CENTRIFUGAL FAN SHALL BE BACKWORD CURVED BLADE HEAVY DUTY TYPE.
7. GI PIPES HEAVY CLASS FOR AIR WASHER SHALL BE PROVIDED FOR SPRAY SYSTEM.
8. METALLIC FILTERS(SS MESH FILTER WASHABLE TYPE) SHALL BE PROVIDED.
9. GI LOUVER (FIXED TYPE) SHALL BE PROVIDED. COMPLETE WITH GI BIRD SCREEN ETC.
10. THICKNESS OF AWU SHALL BE 2.0MM THICK.
11. TOP SURFACE OF THE AWU SHALL BE THERMALLY INSULATED WITH 13MM THICK ALUMINUM FACED NITRILE RUBBER (QTY: 16 SQ.M ONLY FOR ONE UNIT).

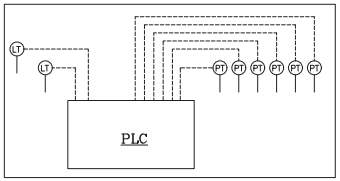
P & ID FOR AIR WASHER UNIT (AWU280)

Approved PID UAF



HUMIDISTAT : 2 nos. humidistat shall be provided in each electrical room covered by the UAF for interlock with UAF pump set.

P & ID FOR UAF SYSTEM (UAF100)



NOTES:

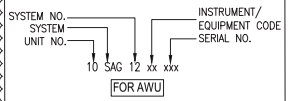
1. LINE SIZE INDICATED ARE IN MILLIMETERS (NOMINAL DIAMETER)
2. ALL DRAIN PIPING UPTO NEAREST DRAIN POINT SHALL BE BY
3. EXCEPT FOR THE MAKE UP WATER PIPING BEYOND TERMINAL POINT AS INDICATED HEREIN, ALL EQUIPMENT, PIPING, VALVES, STRAINER SPECIALITIES AND SHOWN IN THIS DIAGRAM SHALL BE SUPPLIED BY
4. THICKNESS OF THE TANK IS 3.0 MM WITH EPOXY PAINTED INSIDE & OUTSIDE AREA OF THE TANK.
5. SATURATION EFFICIENCY OF THE UAF SHALL BE 60% MINIMUM.
6. CENTRIFUGAL FAN SHALL BE BACKWORD CURVED BLADE HEAVY DUTY TYPE.
7. GI PIPES HEAVY CLASS FOR AIR WASHER SHALL BE PROVIDED FOR SPRAY SYSTEM.
8. METALLIC FILTERS(SS MESH FILTER WASHABLE TYPE) SHALL BE PROVIDED.
9. GI LOUVER (FIXED TYPE) SHALL BE PROVIDED. COMPLETE WITH GI BIRD SCREEN ETC.
10. TOP SURFACE OF THE UAF SHALL BE THERMALLY INSULATED WITH 13MM THICK ALUMINUM FACED NITRILE RUBBER (QTY: 10.5 SQ.M. ONLY FOR ONE UNIT).

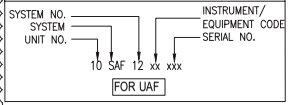
NOTES :
1. LINE SIZE INDICATED ARE NOMINAL DIAMETER.
2. DRAIN PIPE SHALL BE ROUTED NEAREST DRAIN POINT BY AVPL.

LEGENDS & ABBREVIATIONS:-

SYMBOLE	ABBREVIATION	DESCRIPTION
	GLV	GLOBE VALVE
	NRV	NON RETURN VALVE
	GTV	GATE VALVE
	PSTR	POT STRAINER
	ML	MARINE LIGHT
	AIL	AIR INTAKE LOUVER
PT	PT	PRESSURE TRANSMITTER
PI	PI	PRESSURE INDICATOR
	MEL	MOISTURE ELIMINATOR
	FOFC	FAN OUTLET FLEXIBLE CONNECTION
	FOD	FAN OUTLET DAMPER
	SPR	SPRAY NOZZLE
LT	LT	LEVEL TRANSMITTER
DPT	DPT	DP TRANSMITTER
TI	TI	TEMPERATURE INDICATOR
		LIMIT SWITCH
TG	TG	TEMPERATURE GAUGE
HS	HS	HUMIDITY SENSOR
	APF	PRE FILTER (WASHEBLE TYPE)
	ADP	AIR DISTRIBUTION PLATE
		PUMP SUCTION / INLET LINE
		PUMP OUTLET / DELIVERY & BACKWASH LINE
		MAKE UP & QUICK FILL LINE
		DRAIN LINE
	MPH	MAIN POWER HOUSE
	SS	SS SUCTION SCREEN
	BFV-M	MOTORIZED BUTTERFLY VALVE
FM	FM	TURBINE TYPE FLOW METER

NOTE:- Tagging Philosophy for other units
1. For KKS of unit 2 prefix 20 shall be used instead of 10.
2. For KKS of unit 3 prefix 30 shall be used instead of 10.
3. For KKS of unit 4 prefix 40 shall be used instead of 10.
4. For KKS of unit 5 prefix 50 shall be used instead of 10.





JOB NO.	417
STATUS	CONTRACT
DISTRIBUTION	

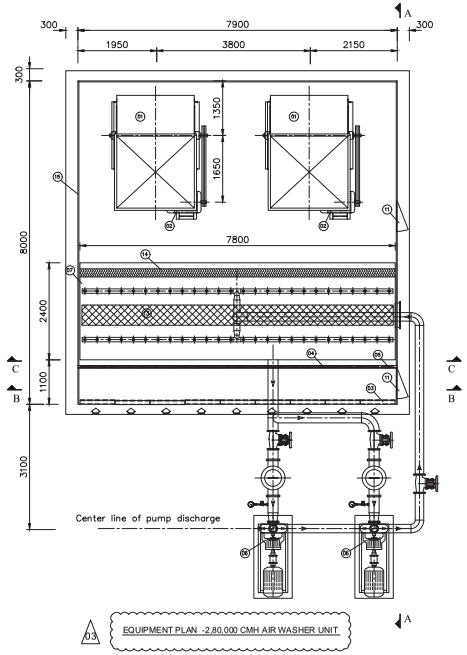
REV.	DATE	ALTD	CHD	APPD

APPROVED GA OF
AWU ,UAF,CENTRIFUGAL FAN
AND PUMPS

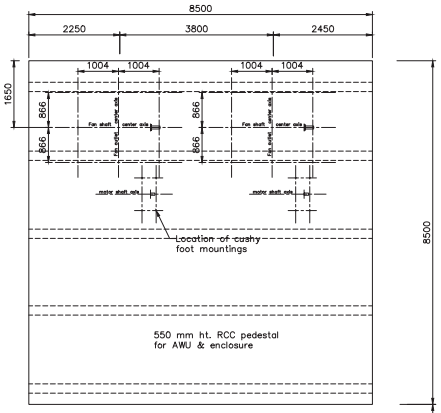
INDEX

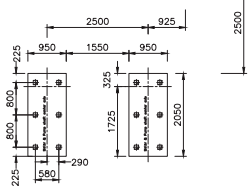
3	Model No.	AWU280	
4	KKS Tag of AWU	10SAG12AH001 TO 10SAG12AH004 20SAG12AH001 TO 20SAG12AH004 30SAG12AH001 TO 30SAG12AH004 40SAG12AH001 TO 40SAG12AH004 50SAG12AH001 TO 50SAG12AH004	
5	Type	Double bank spray on filter screen with Mist eliminators, louvers, distribution plate, filters etc.	
6	Air flow Capacity	280000 CMH	
7	Fan Static pressure	85 mm WG	
8	Pressure drop In Air Washer Unit	a. Across air intake louvers	2 mmWC
		b. Across Filter	7.5 mmWC
		c. AWU Chamber / spray section	20 mmWC
		d. Across Eliminators	3 mmWC
		e. Fan outlet Damper	4 mmWC
		f. Duct & Accessories	35 mmWC
		Sub Total	71.5 mmWC
		Margine 10%	7.15 mmWC
		Total	78.65 mmWC
		Fan Selected For	**85 mmWC**
9	Quantity Offered	Total Qty. - Twenty (20)	
		Unit # 1 - 4 nos. (2 nos. A row side & 2 nos. B-C bay side)	
		Unit # 2 - 4 nos. (2 nos. A row side & 2 nos. B-C bay side)	
		Unit # 3 - 4 nos. (2 nos. A row side & 2 nos. B-C bay side)	
		Unit # 4 - 4 nos. (2 nos. A row side & 2 nos. B-C bay side)	
		Unit # 5 - 4 nos. (2 nos. A row side & 2 nos. B-C bay side)	
10	Location	Ten(10) @ 32.5 M in C-D Bay of Power House & Ten(10) @ 0.00M Outside A row of Power House	
11	Overall Dimension	8000x7900x4900 ht.	
12	Operating Weight of AWU	18,750 kg (each)	
13	Saturation Efficiency of AWU	90 % (min.)	
14	Make up water requirement	4 CMH	
15	Pressure Drop across spray section	15 to 20 mm WC	
16	Material of AWU chamber	MS Epoxy Painted	
17	Thickness	2 mm MS	
18	Painting	Epoxy painted from out side & inside	
Item Description			

1	Water Tank	MS Epoxy Painted (800 mm ht.)
2	Water Mist Eliminator	100% Virgin PVC, die extruded, 3 bend (7800x4050 ht.)
3	No. of Nozzles	2 Nos. bank x 468 (936 nos. in each AWU)
4	Size of Nozzles	3/8" MPT with 4.5 mm orifice
5	Pressure drop through Nozzle	1.4 to 2.1 kg/cm2
6	Capacity of each Nozzle	5.5 LPM
7	Air Pre filter Type	Washable type, Stainless Steel mesh filter complete with SS / Aluminum frame, Box type.
8	Air Pre filter size	610 x 610 x 50 mm - 72 nos. / 600 x 305 x 50 mm - 18 nos.
9	No. of Air Pre filters	10 x 90 nos; 900 Nos. (90 Nos. for each AWU)
10	Cat walk	600x7800
11	Sump strainer	Yes
12	Inspection Door	Yes
13	Marine Light	Yes;Bulk Head
Material of Construction		
1	Air Intake Louver	20G Galvanized Plain Sheet
2	Air Distribution Plate	18G Galvanized Plain Sheet
3	Air Washer Casing / Enclosure	Double skin panel (inside and outside) shall be fabricated using (24 G) galvanized steel, with 25 mm. thk. Polyurethane insulation in between GSS channels. Outside skin shall be pre plasticized & inside sheet shall be plain GI. Top Surface of the AWU shall be thermally insulated with 13 mm thick thermal insulation made of Aluminium foil faced Nitrile Rubber (of density min. 40 Kg/CuM)
4	Water Eliminator	100% virgin PVC, 2mm thk., 3 bend section with supporting comb.
5	Water Spray Nozzle	Stainless Steel
6	Internal & drain Piping	GI Heavy grade as per IS:1239
7	External piping	Heavy grade as per IS:1239 upto 150 NB and MS as per IS:3589 for sizes above 200 NB
8	Water Tank	6 mm thick MS, Epoxy Painted from inside & outside
9	Support Structure	MS sections as per IS:2062
Inspection & Testing		
1	Inspection & Testing	As per Approved ICP cum sub vendor list for ventilation system, doc. No - Lr No. CE/TPC/SE-3/EME-11/YTPS/F.PEM/CAT PLAN/D NO 26/21 Dt 10.03.2021

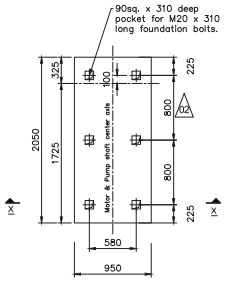


03 EQUIPMENT PLAN -2,80,000 CMH AIR WASHER UNIT

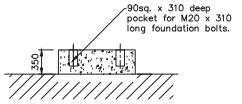




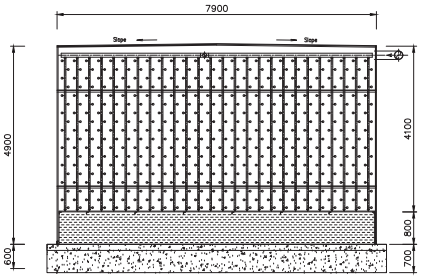
FOUNDATION PLAN -2,80,000 CMH AIR WASHER UNIT



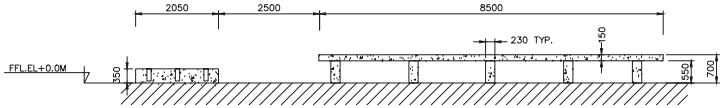
PUMP FOUNDATION PLAN



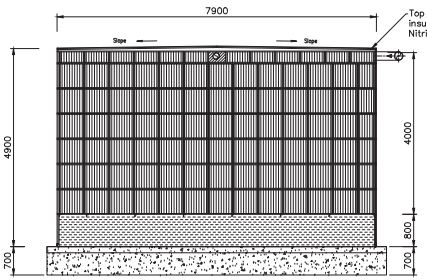
SECTION -XX



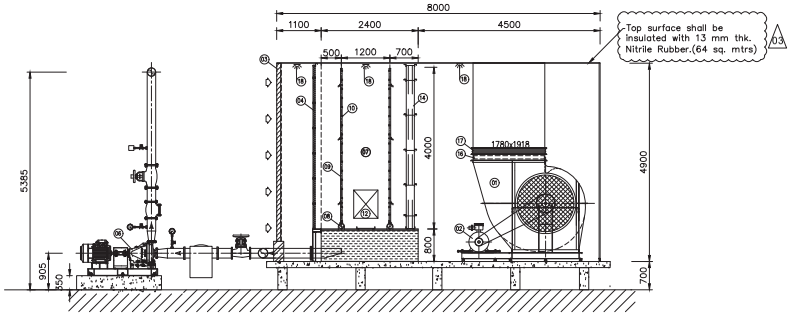
SECTION - B B



FOUNDATION ELEVATION -2,80,000 CMH AIR WASHER UNIT



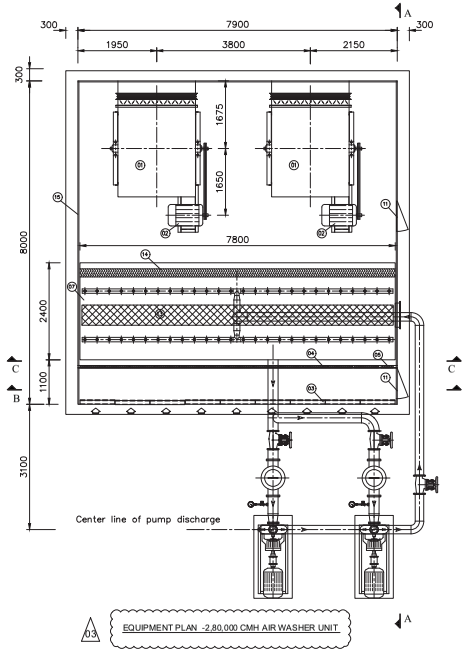
SECTION - C C



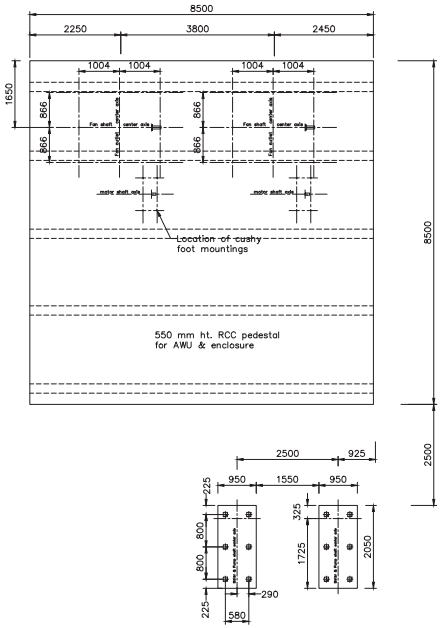
SECTION - A A

FIRST ANGLE PROJECTION

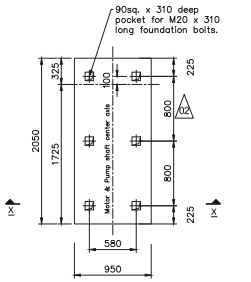
ALL DIMENSIONS ARE IN MM



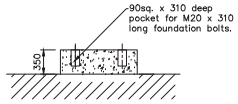
EQUIPMENT PLAN -2,80,000 CMH AIR WASHER UNIT



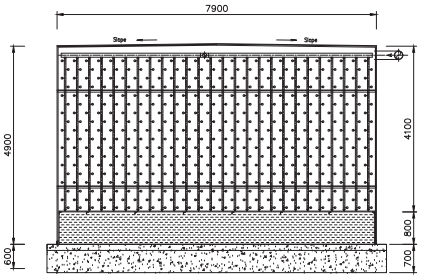
FOUNDATION PLAN -2,80,000 CMH AIR WASHER UNIT



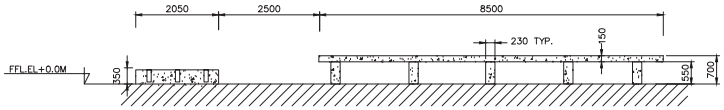
PUMP FOUNDATION PLAN



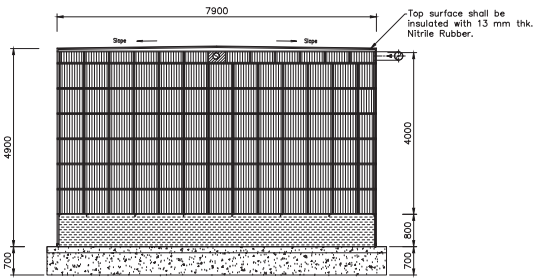
SECTION -XX



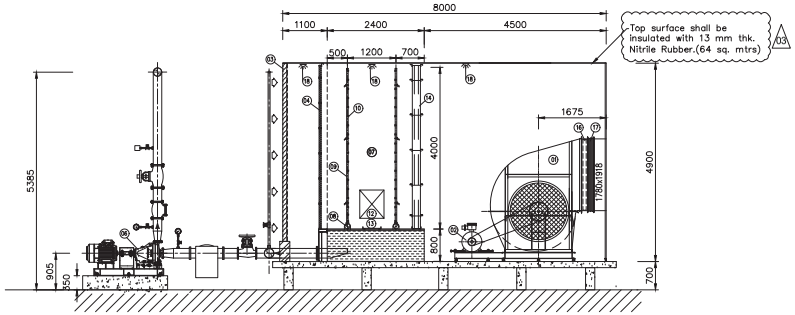
SECTION - B B



FOUNDATION ELEVATION -2,80,000 CMH AIR WASHER UNIT

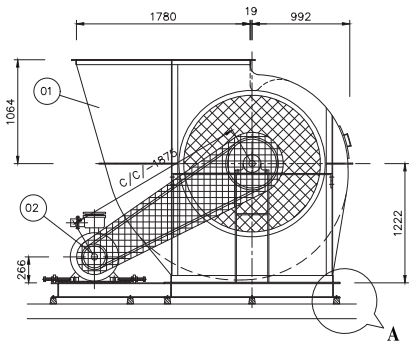


SECTION - C C

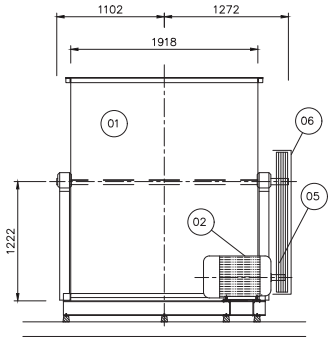


SECTION - A A

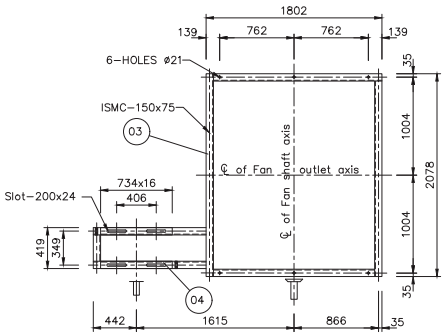
S.No	Item	Unit	Particulars
1	Manufacturer		
2	Model No.		[illegible]
3	Type of fan		Centrifugal (DIDW)
4	Type of fan Blade		Backward Curved/Inclined
5	Quantity	Nos.	Fourty (40)
6	Location		TG Bldg. at El. 32.5 M B-C bay and TG Bldg. at El. 0.00M outside 'A' row
7	Selected Capacity	CMH	140000
8	Static pressure	mmWG	85
9	Impeller Wheel Diameter	mm	1372
10	Rated Speed	RPM	623
11	Critical Speed	RPM	778
12	Class of Construction		Class - I
13	Bearing Type		Double row self aligned Ball/Roller (Bearing life - 100000 Hr. as per IS:3824)
14	Type of fan drive		Belt Drive
15	V - Belts (150% rated power)		SPC-PT5000 mm - 4 nos.
16	Recommended Motor Rating at 50 deg.C	kW	55
17	Motor speed	RPM	1470
18	Vibration Level		As per IS:14694 (2003)
19	Static load of Fan & motor	kg	2200
20	Dynamic load of Fan & motor	kg	3000
21	Material		
	a) Impeller		MS Sheet : IS-2062 (min. 16 swg.)
	b) Casing		3 mm thk. MS
	c) Shaft		EN-8
22	Sound Pressure level at 1 M distance from fan	dBa	≤85
23	Fan Balancing		Dyanamically balanced
24	Painting		Spray Galvanized
25	Direction of Discharge		Refer attached GA drawings
Inspection & Testing			
26	Inspection & Testing		As per Approved ICP cum sub vendor list for ventilation system, doc. No - Lr No. CE/TPC/SE-3/EME-11/YTPS/F.PEM/CAT PLAN/D NO 26/21 Dt 10.03.2021



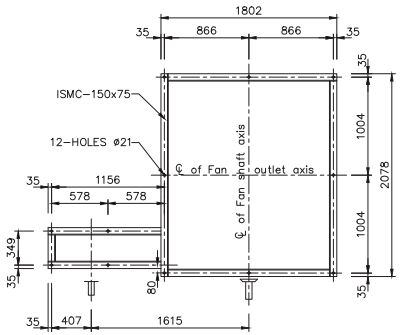
DRIVE END ELEVATION



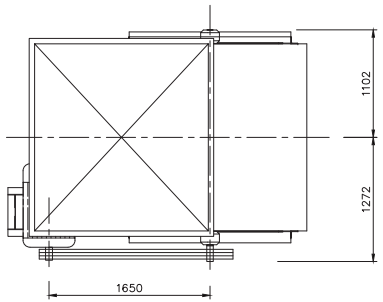
SIDE ELEVATION



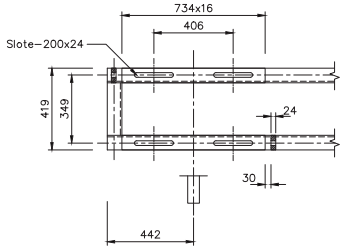
COMMON BASE FRAME (TOP FLANGE)



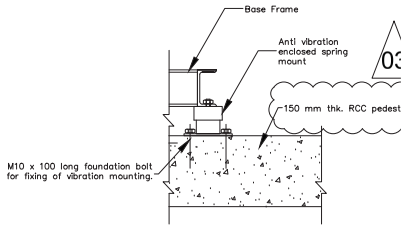
COMMON BASE FRAME (BOTTOM FLANGE)



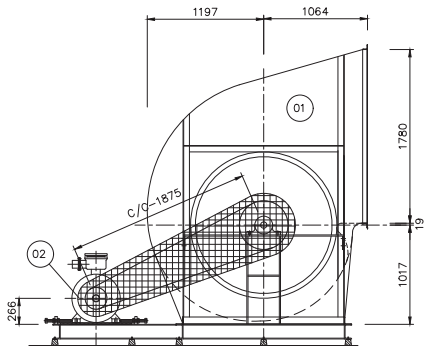
TOP VIEW



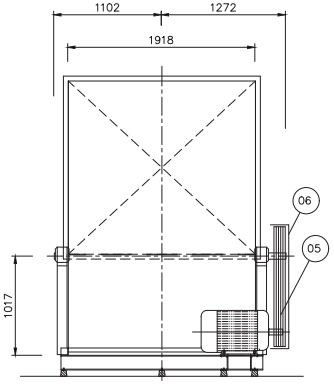
(MOTOR SLIDE RAIL DETAIL)



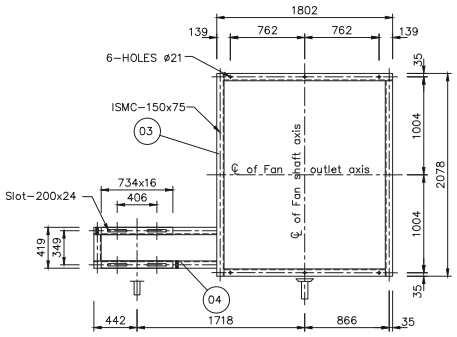
DETAIL - 'A'



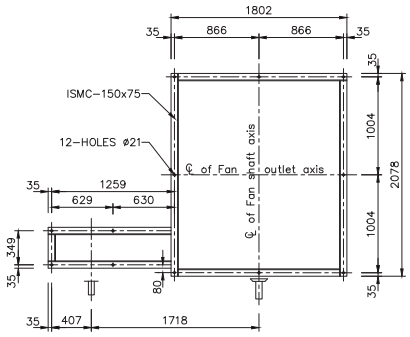
DRIVE END ELEVATION



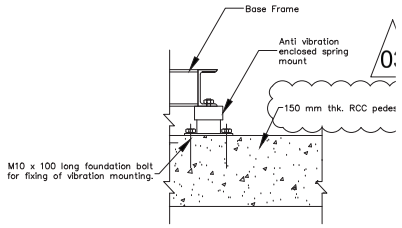
SIDE ELEVATION



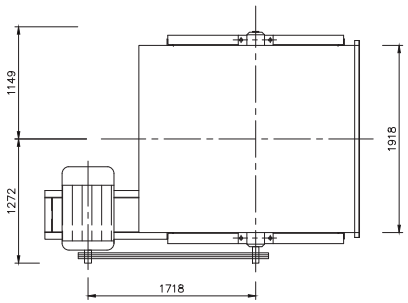
(MOTOR SLIDE RAIL DETAIL)



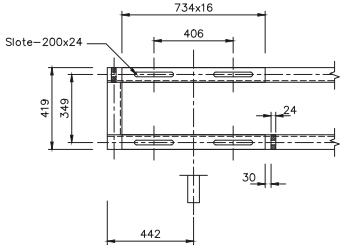
COMMON BASE FRAME (BOTTOM FLANGE)



DETAIL - 'A'



TOP VIEW



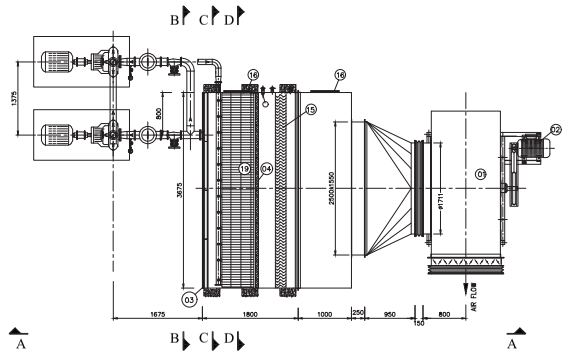
(MOTOR SLIDE RAIL DETAIL)

Outlet Velocity m/sec	Capacity, m^3/h	Static Pressure, Milli Metre of Water Column																		Limit Load	
		6.25		10		12.5		15		20		21.9		25		31.25		37.5			
		RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP
4	40922	181	1.40	206	1.98	229	2.60	250	3.24	270	3.94	288	4.66	306	5.41	338	6.99	368	8.64	160	1.05
4.5	46038	191	1.67	216	2.30	236	2.96	256	3.64	276	4.37	294	5.14	311	5.93	342	7.60	374	9.34	180	1.49
5	51153	201	1.99	224	2.66	245	3.37	264	4.11	282	4.86	299	5.66	316	6.50	347	8.26	376	10.10	200	2.04
5.5	56268	212	2.35	234	3.06	254	3.82	272	4.61	289	5.42	306	6.26	322	7.13	352	8.94	380	10.87	220	2.72
6	61384	224	2.77	244	3.52	263	4.33	281	5.17	297	6.03	313	6.91	328	7.81	358	9.72	386	11.70	240	3.52
6.5	66499	235	3.25	254	4.05	272	4.90	290	5.77	306	6.69	322	7.63	336	8.58	365	10.50	392	12.60	260	4.50
7	71614	247	3.81	266	4.64	283	5.52	299	6.45	315	7.41	331	8.40	345	9.41	372	11.50	398	13.60	280	5.60
7.5	76730	260	4.44	277	5.30	294	6.25	309	7.20	325	8.20	339	9.24	354	10.30	380	12.50	405	14.70	300	6.88
8	81845	273	5.16	288	6.03	306	7.01	320	8.01	335	9.08	349	10.10	362	11.20	388	13.50	412	15.80	320	8.36
8.5	86960	286	5.94	301	6.86	316	7.85	331	8.94	345	10.0	359	11.10	372	12.30	397	14.60	421	17.10	340	10.00
9	92075	299	6.82	314	7.77	328	8.81	342	9.90	355	11.00	369	12.20	382	13.40	406	15.80	430	18.40	360	11.90
9.5	97191	313	7.81	326	8.80	339	9.87	354	11.00	366	12.20	379	13.40	392	14.50	416	17.20	438	19.80	380	14.0
10	102306	328	8.85	339	9.89	352	11.00	365	12.20	378	13.40	390	14.70	402	15.90	425	18.50	448	21.20	400	16.40
11	112537	355	11.30	366	12.40	378	13.60	389	14.8	401	16.10	412	17.50	424	18.80	446	21.60	467	24.50	420	18.90
12	122767	383	14.20	394	15.50	404	16.70	415	18.10	425	19.30	435	20.70	446	22.20	467	25.10	488	28.20	440	21.80
13	132998	412	17.50	422	19.00	431	20.40	441	21.60	451	23.0	461	24.50	471	26.0	489	29.20	509	32.40	460	24.80
14	143228	441	21.60	449	23.10	459	24.40	468	26.0	477	27.30	485	28.80	494	30.50	512	33.60	531	37.10	480	28.20
15	153459	469	26.20	478	27.60	486	29.20	494	30.80	503	32.20	512	33.90	519	35.50	537	38.80	554	42.30	500	31.90

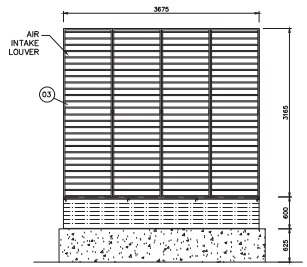
Outlet Velocity m/sec	Capacity, m^3/h	Static Pressure, Milli Metre of Water Column																		Limit Load	
		50		62.5		75		87.5		100		112.5		125		137		150			
		RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP
7	71614	445	18.20	490	23.10	531	28.40	569	33.80	604	39.30	638	46.40	670	51.20	700	57.40	730	64.20	520	35.80
7.5	76730	452	19.40	495	24.50	536	29.80	574	35.50	608	41.20	644	47.20	674	53.50	706	60.30	735	66.60	540	40.10
8	81845	458	20.70	499	26.00	540	31.50	576	37.30	612	43.30	646	49.50	677	55.80	707	62.60	736	69.30	560	44.90
8.5	86960	465	22.20	506	27.30	545	33.20	581	39.20	616	45.30	650	51.80	682	58.40	711	65.00	738	71.80	580	49.70
9	92075	472	23.70	512	29.20	551	35.00	588	41.10	621	47.40	656	54.00	685	60.60	718	67.70	747	75.00	600	55.00
9.5	97191	481	25.30	519	31.00	557	36.90	593	43.30	626	49.70	659	55.10	690	63.40	720	70.70	748	77.80	620	60.60
10	102306	489	26.90	527	32.80	563	38.80	598	45.30	631	52.00	664	58.60	695	66.00	724	73.70	752	80.80	640	66.80
11	112537	507	30.60	544	36.90	578	43.30	612	50.00	644	57.00	672	64.40	705	71.40	734	79.20	761	86.90	660	73.20
12	122767	525	34.60	561	41.30	595	48.20	626	55.40	657	62.40	687	70.30	717	77.60	744	85.80	771	93.70	680	80.20
13	132998	545	39.20	579	47.00	612	53.40	644	61.00	672	68.60	700	76.50	729	84.30	755	92.50	784	101.00	700	87.50
14	**143228**	565	44.10	599	51.60	630	59.20	**662**	**67.10**	690	75.30	718	83.50	744	91.70	770	100.30	796	109.00	720	95.20
15	153459	587	49.90	619	57.50	650	65.50	678	73.90	708	82.10	735	91.00	761	99.60	787	108.20	810	117.60	740	103.40
16	163690	609	56.10	639	64.10	670	72.60	698	80.90	725	89.80	752	99.00	777	108.00	801	117.20	824	126.50	760	112.10
17	173920	632	62.80	661	71.50	690	79.90	718	88.80	744	97.90	769	107.80	796	116.80	823	126.20	842	137.00	780	121.40
18	184151	655	70.50	684	79.20	711	88.40	738	97.70	764	107.20	789	114.80	812	126.60	840	137.00	860	147.00	800	131.00
19	194381	679	79.00	706	87.70	732	97.50	758	107.20	784	116.90	808	128.10	831	137.00	852	147.80	876	158.50	820	141.00
20	204612	704	88.00	730	97.50	756	107.00	780	117.70	805	124.80	828	137.30	851	148.10	875	159.00	896	170.00	840	151.80
21	214846	730	98.00	755	107.50	780	117.00	804	128.10	827	139.00	849	148.80	873	161.00	894	171.20	916	182.50	860	162.70

S.No	Item	Particulars	
3	Model No.	UAF-100	
4	KKS Tag of UAF	10SAF12AH001 20SAF12AH001 30SAF12AH001 40SAF12AH001 50SAF12AH001	
5	Type	Single bank spray nozzles with Mist eliminators, louvers, filters etc.	
6	Air flow Capacity	1,00,000 CMH	
7	Fan Static pressure	60 mm WG	
8	Pressure drop In Air Washer Unit	a. Across air intake louvers	2 mmWC
		b. Across Filter	12 mmWC
		c. AWU Chamber / spray section	15 mmWC
		d. Across Eliminators	3 mmWC
		e. Fan outlet Damper	4 mmWC
		f. Duct & Accessories	15 mmWC
		Sub Total	51 mmWC
		Margine 10%	5.1 mmWC
		Total	56.1 mmWC
		Fan Selected For	**60 mmWC**
9	Quantity Offered	Five (5); each of 1,00,000 CMH	
		ESP Building Unit # 1 - 1 no.	
		ESP Building Unit # 2 - 1 no.	
		ESP Building Unit # 3 - 1 no.	
		ESP Building Unit # 4 - 1 no.	
		ESP Building Unit # 5 - 1 no.	
10	Location	On to the Roof of ESP Building @ 8.50M LVL.	
11	Overall Dimension	As per GA drawing of UAF, enclosed	
12	Operating Weight of UAF	5650 kg.	
13	Saturation Efficiency of AWU	60%	
14	Make up water requirement	1.5 CMH	
15	Pressure Drop across spray section	12 to 15 mm WC	
16	Material of UAF chamber	2 mm thk. MS, Epoxy painted, Top Surface of the UAF shall be thermally insulated with 13 mm thick thermal insulation made of Aluminium foil faced closed cell elastomeric Nitrile Rubber (of density min. 40 Kg/CuM) / XLPE (of density min. 33 Kg/CUM) or equalvent.	

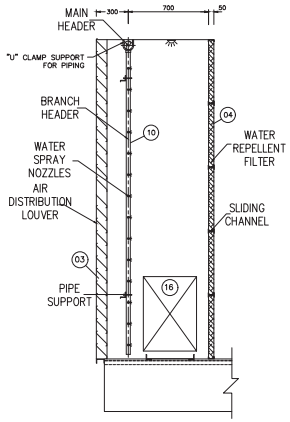
S.No	Item	Particulars
17	Thickness	2 mm thk. MS
18	Painting	Epoxy painted from outside & inside
Item Description		
	Water Tank	MS Epoxy painted (600 mm ht.)
1	Water Mist Eliminator	100% Virgin PVC, die extruded, 3 bend (3675x3165 ht.)
2	No. of Nozzles	1 No. bank x 168 nos. in each UAF
3	Size of Nozzles	3/8" MPT X 4.5 mm orfice
4	Pressure drop through Nozzle	1.4 to 2.1 kg/cm2
5	Capacity of each Nozzle	5.5 LPM
6	Air Pre filter Type	Washable type, Stainless Steel mesh filter complete with SS / Aluminum frame, Box type.
7	Air Pre filter size	610 x 610 x 50 mm-30 nos.
9	Cat walk	600x3600
10	Sump strainer	Yes
11	Inspection Door	Yes
12	Marine Light	Yes; Bulk Head
Material of Construction		
1	Air Intake Louver	20G GI sheet
2	UAF Chember	2 mm thk. MS, Epoxy painted, Top Surface of the UAF shall be thermally insulated with 13 mm thick thermal insulation made of Aluminium foil faced closed cell elastomeric Nitrile Rubber (of density min. 40 Kg/CuM) / XLPE (of density min. 33 Kg/CUM) or equalvent.
3	Water tank	3 mm thk. MS, Inside & outside Epoxy Painted
4	Water Mist Eliminator	100% virgin PVC, 2mm thk., 3 bend section with supporting comb.
5	Water Spray Nozzle	Stainless Steel
6	Internal & drain Piping	GI Heavy grade as per IS:1239
7	External piping	Heavy grade as per IS:1239 upto 150 NB and MS as per IS:3589 for sizes above 200 NB
8	Support Structure	MS sections as per IS:2062;with galvanizing
Inspection & Testing		
1	Inspection & Testing	As per Approved ICP cum sub vendor list for ventilation system, doc. No - Lr No. CE/TPC/SE-3/EME-11/YTPS/F.PEM/CAT PLAN/D NO 26/21 Dt 10.03.2021



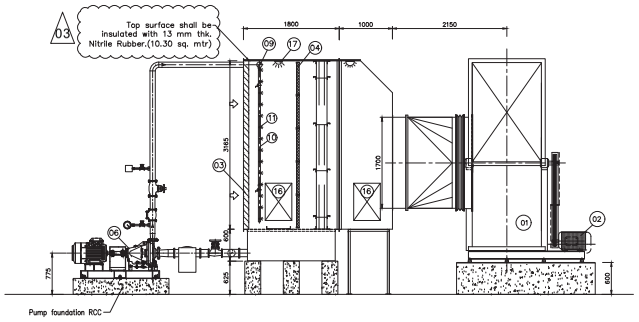
EQUIPMENT PLAN - 1,00,000 CMH UAF UNIT



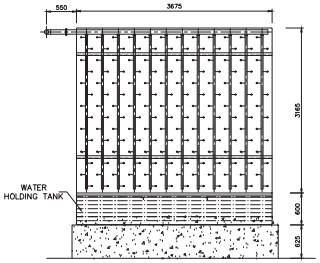
SECTION - B B



DETAIL FOR FILTER & NOZZLES



SECTION - A A - 1,00,000 CMH UAF UNIT



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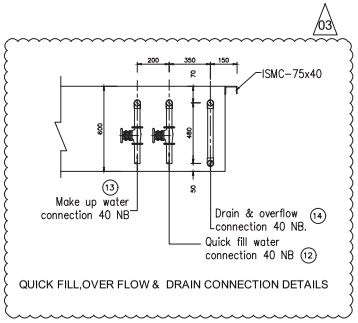
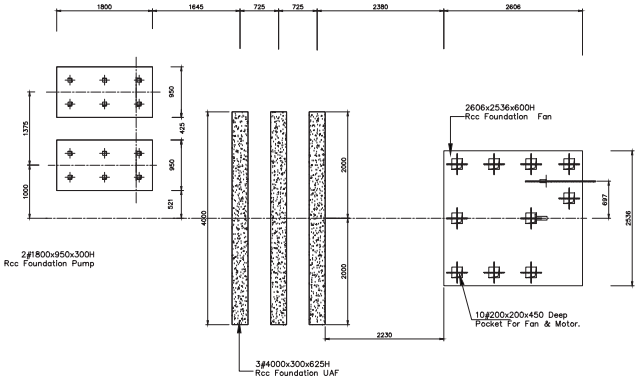
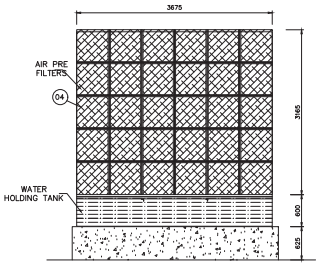


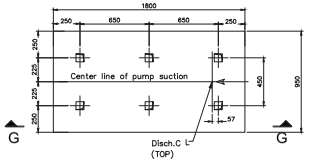
QUICK FILL,OVER FLOW & DRAIN CONNECTION DETAILS



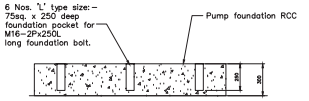
FOUNDATION PLAN - 1,00,000 CMH UAF UNIT



SECTION - D D

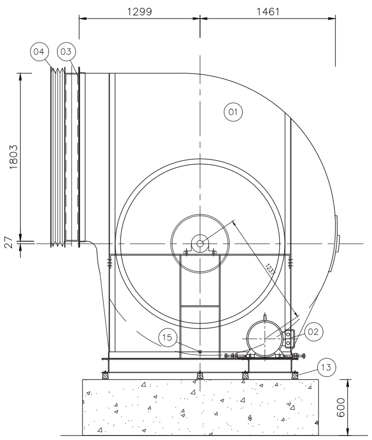


PLAN FOR PUMP FOUNDATION

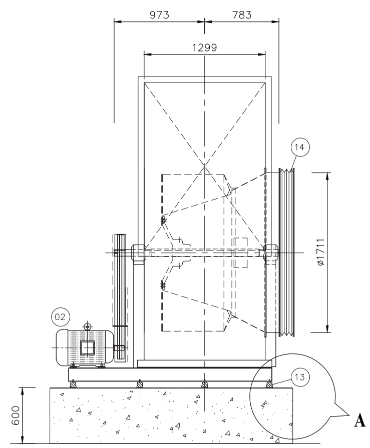


SECTION - G-G

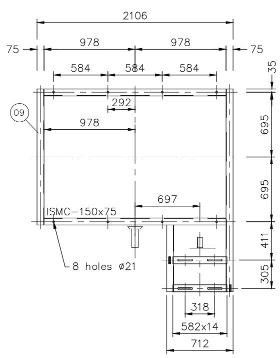
S.No	Item	Unit	Particulars
1	Manufacturer		
2	Model No.		
3	Type of fan		Centrifugal (SISW)
4	Type of fan Blade		Backward Curved/Inclined
5	Quantity	Nos.	Five (5)
6	Location		At the Roof of ESP Building
7	Selected Capacity	CMH	1,00,000
8	Static pressure	mmWG	60
9	Impeller Wheel Diameter	mm	1130
10	Rated Speed	RPM	470
11	Critical Speed	RPM	587
12	Class of Construction		Class - I
13	Bearing Type		Double row self aligned Ball/Roller (Bearing life - 100000 Hr. as per IS:3824)
14	Type of fan drive		Belt Drive
15	V - Belts (250% rated power)		SPB-PT4060 mm - 3 nos.
16	Recommended Motor Rating at 50 deg.C	kW	30
17	Motor speed	RPM	1470
18	Vibration Level		As per IS:14694 (2003)
19	Static load of Fan & motor	Kg.	1840
20	Dynamic load of Fan & motor	Kg.	2760
21	Material		
	a) Impeller		MS Sheet : IS-2062 (min. 16 swg.)
	b) Casing		3 mm thk. MS
	c) Shaft		EN-8
22	Sound Pressure level at 1 M distance from fan	dBa	≤85
23	Fan Balancing		Dyanamically balanced
24	Painting		Spray Galvanized
25	Direction of Discharge		Refer Attached GA drawing
Inspection & Testing			
26	Inspection & Testing		As per Approved ICP cum sub vendor list for ventilation system, doc. No - Lr No. CE/TPC/SE-3/EME-11/YTPS/F.PEM/CAT PLAN/D NO 26/21 Dt 10.03.2021



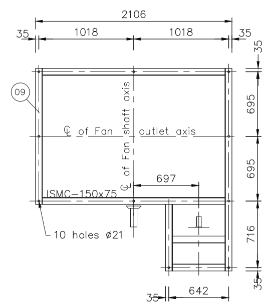
FAN DRIVE END ELEVATION



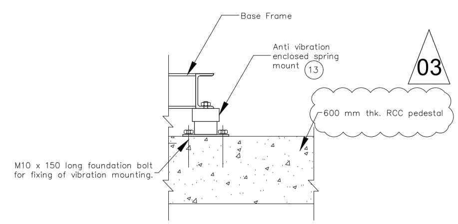
SIDE ELEVATION



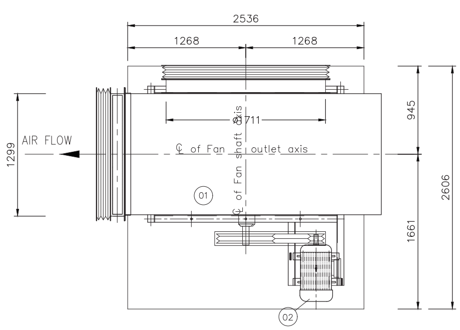
COMMON BASE FRAME (TOP FLANGE)



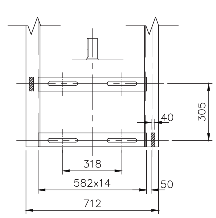
COMMON BASE FRAME (BOTTOM FLANGE)



DETAIL - 'A'



PLAN OF FAN & MOTOR ASSEMBLY



(MOTOR SLIDE RAIL DETAIL)

ELECTRONIC FILE NAME :

SINGLE INLET SINGLE WIDTH CENTRIFUGAL LIMIT LOAD FAN

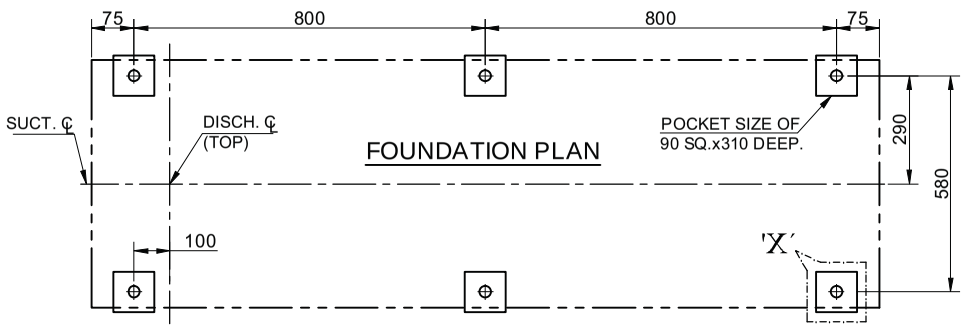
MODEL
AdLL-168

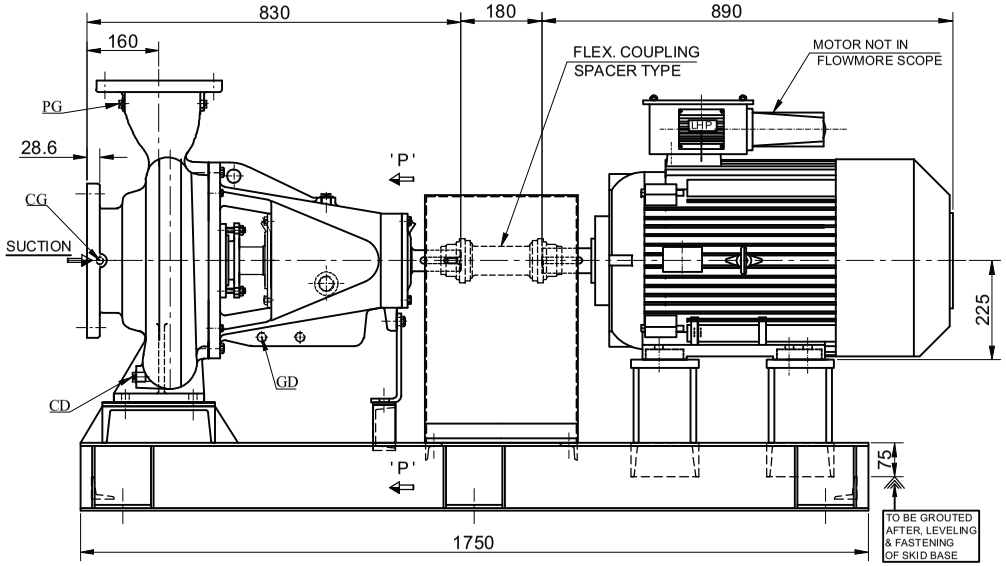
Wheel Diameter : 1676 mm Overall wheel Width : 759 mm Outlet Area : 2.320 Sqm

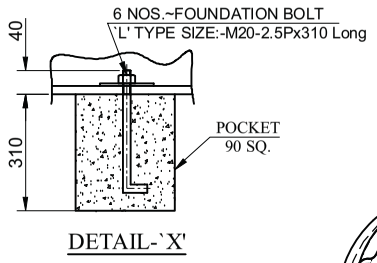
Outlet Velocity m/sec	Capacity, m³/h	Static Pressure, Milli Metre of Water Column																		Limit Load	
		6.25		10		12.5		15		20		21.9		25		31.25		37.5			
		RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP
4	33963	154	1.20	174	1.66	191	2.14	208	2.64	224	3.19	239	3.76	253	4.34	279	5.56	303	6.85	150	1.17
4.5	38208	163	1.44	182	1.94	199	2.47	214	3.02	230	3.58	244	4.17	258	4.80	283	6.11	307	7.46	170	1.71
5	42452	172	1.73	190	2.26	206	2.82	222	3.41	236	4.03	250	4.65	263	5.30	288	6.67	311	8.12	190	2.39
5.5	46699	182	2.07	199	2.63	215	3.25	230	3.86	243	4.52	256	5.19	269	5.86	292	7.29	316	8.81	210	3.23
6	50942	193	2.46	209	3.95	224	3.70	238	4.38	251	5.05	263	5.77	276	6.50	299	7.98	320	9.55	230	4.24
6.5	55189	204	2.93	219	3.53	233	4.22	246	4.93	259	5.65	272	6.40	283	7.16	305	8.75	326	10.36	250	5.43
7	59434	216	3.48	228	4.10	242	4.80	255	5.54	268	6.30	279	7.10	291	7.90	312	9.56	333	11.27	270	6.85
7.5	63679	227	4.07	239	4.73	252	5.46	264	6.23	276	7.02	288	7.86	299	8.70	321	10.40	340	12.21	290	8.50
8	67924	239	4.74	251	5.46	262	6.20	274	6.99	285	7.82	297	8.68	307	9.58	328	11.38	347	13.25	310	10.38
8.5	72167	252	5.56	262	6.25	273	7.00	284	7.82	295	8.65	306	9.65	316	10.50	336	12.40	355	14.33	330	12.51
9	76412	264	6.36	274	7.15	284	7.90	294	8.76	305	9.64	315	10.55	325	11.52	345	13.50	363	15.50	350	14.90
9.5	80658	276	7.30	287	8.10	296	8.96	305	9.77	315	10.65	325	11.65	335	12.63	354	14.65	372	16.80	370	17.70
10	84903	289	8.35	298	9.21	307	10.08	316	10.90	326	11.85	335	12.83	344	13.83	363	15.90	380	18.10	390	20.60
11	93395	314	10.69	322	11.61	331	12.56	339	13.58	348	14.50	356	15.50	364	16.55	382	18.70	398	21.10	410	24.00
12	101886	340	13.20	347	14.40	355	15.55	363	16.55	370	17.65	378	18.70	386	19.70	402	22.00	417	24.50	430	27.60
13	110376	365	16.50	372	17.94	380	19.00	387	20.20	394	21.20	401	22.40	408	23.60	422	25.80	437	28.40	450	31.60
14	118864	391	20.50	398	21.60	405	23.10	411	24.10	418	25.40	425	26.65	432	27.80	444	30.20	457	32.80	470	36.20
15	127356	417	24.90	424	25.60	430	27.60	436	28.70	442	30.00	449	31.30	455	32.60	467	35.20	478	37.80	490	41.00

Outlet Velocity m/sec	Capacity, m³/h	Static Pressure, Milli Metre of Water Column																		Limit Load	
		50		62.5		75		87.5		100		112.5		125		137		150			
		RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP
7	59434	370	14.80	406	18.70	439	22.80	470	27.00	498	31.30	525	35.90	551	40.50	577	45.50	601	50.60	510	46.20
7.5	63679	376	16.00	411	19.90	443	24.20	474	28.60	502	32.60	529	37.70	555	42.50	581	47.60	604	52.60	530	51.80
8	67924	383	17.10	416	21.20	448	25.60	478	30.10	506	34.80	534	39.60	559	44.50	584	49.70	607	54.90	550	57.80
8.5	72167	390	18.40	422	22.60	452	27.20	483	31.70	511	36.50	538	41.60	561	46.60	587	51.90	610	57.40	570	64.60
9	76412	397	19.70	429	24.20	459	28.60	488	33.50	515	38.30	542	43.60	566	48.90	590	54.30	614	59.70	590	71.70
9.5	80658	405	21.10	436	25.80	465	30.40	493	35.30	520	40.40	547	45.70	570	51.10	594	56.60	618	62.40	610	78.90
10	84903	413	22.60	443	27.40	471	32.30	499	37.30	525	42.30	551	47.80	575	53.40	599	59.20	622	65.00	630	87.00
11	93395	429	26.00	459	30.90	486	36.20	514	41.70	538	46.90	561	52.60	586	58.30	609	64.40	631	70.50	650	95.50
12	**101886**	448	29.60	**475**	**34.90**	503	40.40	528	46.20	550	52.10	575	58.00	597	63.90	619	70.10	641	76.30	670	104.60
13	110376	465	33.80	493	39.50	518	45.30	543	51.20	566	57.20	589	63.60	611	70.10	633	76.40	652	82.90	690	114.40
14	118864	485	38.50	510	44.40	536	50.60	560	56.80	581	63.00	605	69.70	625	76.00	646	83.60	666	90.20	710	124.60
15	127356	504	43.60	529	49.90	554	56.00	576	63.00	597	69.50	621	76.30	641	83.20	661	90.70	680	96.90	730	135.80
16	135847	525	49.50	548	56.00	570	62.40	594	69.50	615	76.50	636	83.80	655	90.90	676	98.40	695	106.0	750	146.00
17	144335	546	56.00	568	62.50	590	69.40	614	76.60	632	83.90	654	91.80	671	99.00	692	106.8	711	114.7	770	159.00
18	152825	569	63.40	589	70.20	610	77.00	630	84.50	650	92.00	671	100.00	689	108.0	708	116.3	727	124.2	790	170.80
19	161316	592	71.50	610	78.40	630	85.60	651	93.30	669	101.0	689	109.00	708	117.0	726	126.0	744	134.6	810	184.30
20	169806	614	80.70	632	87.50	652	94.60	670	102.8	689	110.7	708	119.00	726	127.0	744	136.0	760	145.0	830	199.00
21	178298	638	90.5	655	97.60	672	105.00	690	113.3	708	121.5	728	129.20	742	138.0	759	147.0	779	156.1	850	214.00

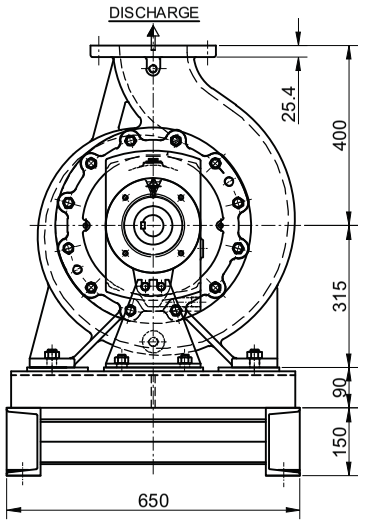
TECHNICAL DATA SHEET AIR WASHER PUMPS		
1	**Pump Details**	**Air washer Pumps**
2	Liquid	WATER
3	Make	Flow More
4	KKS Tag For Pump	For Unit #1:- 10SAG12AP001 to 008 For Unit #2:- 20SAG12AP001 to 008 For Unit #3:- 30SAG12AP001 to 008 For Unit #4:- 40SAG12AP001 to 008 For Unit #5:- 50SAG12AP001 to 008
3	Qty. (Nos)	40
4	Capacity(M3/Hr)	310
5	Head(m)	30
6	Sp.Gr.	1
7	Temp.	Amb
	PUMP SPECIFICATIONS	
8	Pump Model	5625
9	Succ.X Del(mm)	200X150
10	Pump Type	ENDSUCTION
11	Shut of Head	34
12	Effeciency(%)	80
13	Pump Input(kw)	31.65
14	Required Motor(kw)	45
15	RPM	1475
16	Nozzle Orientation	Side Suc X Top Discharge
17	Coupling Type	Spacer
18	NPSHr (M)	2.5
	Motor Specifications	
19	Make	LHP
20	Type	Totally Enclosed Fan Cooled Squirrel Cage
21	Insulation	Class F With Temp. rise limited to class B
22	Power Supply	AC 3 Phase,415 Volt+/-10%,50Hz+/-5%
23	Performance	Confirming to IS 325
24	Protection	IP-55(IS;2148)
	Material Of Construction	
25	Pump Casing	CI IS 210 GR FG 260
26	Impeller	Bronze IS 318 Gr-2
27	Impeller wearing	Bronze IS 318 Gr-2
28	Shaft	EN-8
29	Shaft Sleeve	Bronze as per IS 318
30	Gland Packing	PTFE
31	Base Plate	MS IS2062







DETAIL-`X'



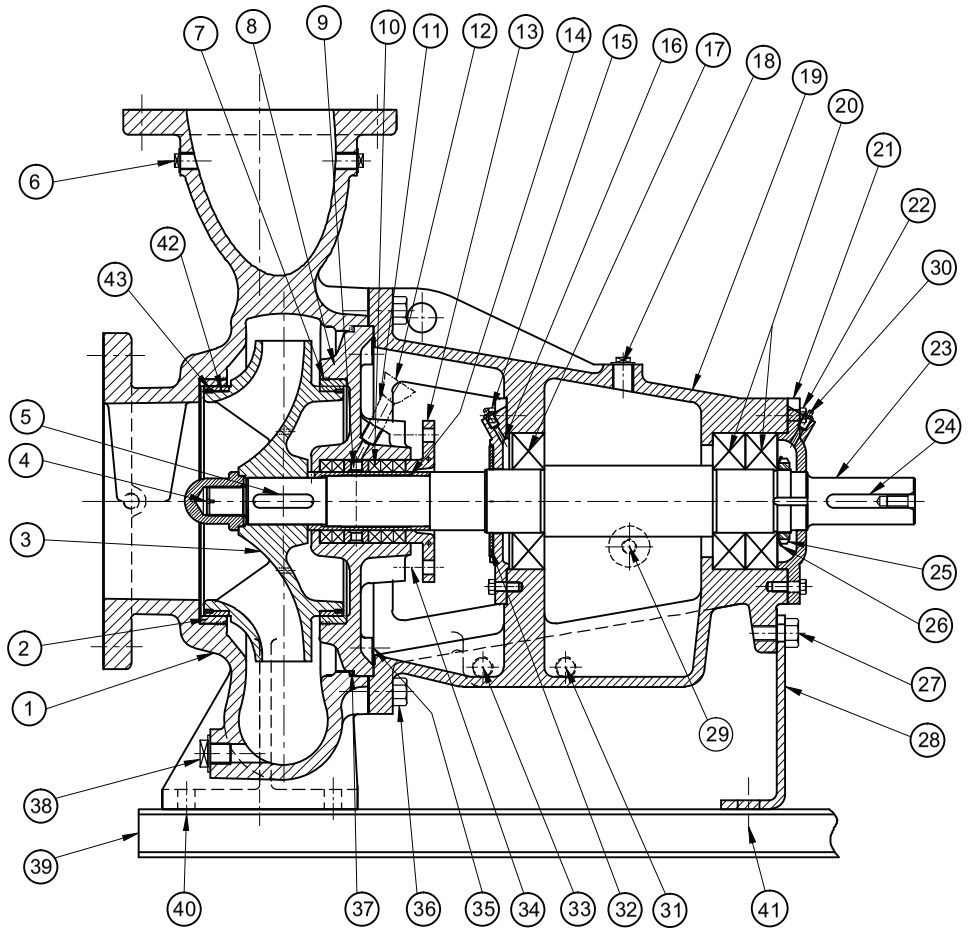
VIEW -'P'-'P'

FLANGE DETAIL AS PER ANSI B16.5, 150 LBS.			
SUCTION:------	200 N.B.	DISCHARGE:----	150 N.B.
FLANGE O.D.:---	343	FLANGE O.D.:---	279.4
P.C.D.:---------	298.4	P.C.D.:---------	241.3
NO. OF. HOLES:-	8	NO. OF. HOLES:-	8
DIA OF BOLTS:-	M20	DIA OF BOLTS:-	M20

PG	PRESSURE GAUGE	3/8" B.S.P
CG	COMPOUND GAUGE	3/8" B.S.P
CD	CASING DRAIN	3/4" B.S.P
GD	GLAND DRAIN	1/2" B.S.P

NOTE:-
1. DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. DIRECTION OF PUMP ROTATION:-COUNTER CLOCKWISE WHEN LOOKING FROM DF
3. STATIC LOAD (Pump Set With Motor) = 860 Kgs. (Approx.),
4. DYNMIC LOAD (Pump Set With Motor) = 1060 Kgs. (Approx.)

MOTOR PARTICULARS		PUMP PARTICULARS (QTY.:- 40 Nos)	
MAKE	-- LHP	FIG.	-- 5625
FRAME	-- 225 S/M	SIZE	-- 200 x150 (8"x6")
POWER	-- 45 K.W.	STAGE	-- SINGLE
SPEED	-- 1475 R.P.M.	SPEED	-- 1475 R.P.M.
VOLTS	-- 415±10%	CAPACITY	-- 310 Cu M /Hr.
PHASES	-- THREE	HEAD	-- 30 Mtrs.
FREQUENCY	-- 50 Hz.±5%	PUMP INPUT (Sp. Gr. 1.0)	-- 31.65 K.W.
TYPE OF CONS.	-- H.S.S.	EFFICIENCY	-- 80%



S. NO.	DESCRIPTION	QTY.	MATERIAL
45	COUPLING GUARD	01	M.S. (FAB.)
44	FLEXIBLE COUPLING (SPACER TYPE)	01	C.I.
43	DOWEL PIN (For Impeller Wearing ring)	04	S.S.-304
42	IMPELLER WEARING RING (Front & Back)	02	BRONZE (IS-318, LTB-II)
41	HEX. HD. BOLT WITH NUT & WASHER	02	M.S. (IS.-1367,Gr.-4.6)
40	HEX. HD. BOLT WITH NUT & WASHER	04	M.S. (IS.-1367,Gr.-4.6)
39	SKID BASE	01	M.S. (Fab.)(IS-2062)
38	PIPE PLUG	01	M.I.
37	`O' RING	01	NITRILE RUBBER
36	HEX. HD. CAP SCREW	12	M.S. (IS.-1367,Gr.-4.6)
35	STUD BOLT WITH NUT	02	M.S. (IS.-1367,Gr.-4.6)
34	STUD BOLT WITH NUT	02	S.S.-316
33	PIPE NIPPLE (Gland Drain)	01	STEEL
32	WATER SLINGER	01	RUBBER
31	PIPE PLUG	01	M.I.
30	GREASE RELEASE FITTING	02	STEEL
29	PIPE PLUG	01	M.I.
28	SUPPORT FOOT	01	M.S. (Plate)
27	HEX. HD. CAP SCREW WITH WASHER	02	M.S. (IS.-1367,Gr.-4.6)
26	BRG. LOCK WASHER	01	STEEL
25	BRG. LOCK NUT	01	STEEL
24	KEY FOR COUPLING	01	EN-9
23	PUMP SHAFT	01	EN-8
22	HEX. HD. CAP SCREW	04	M.S. (IS.-1367,Gr.-4.6)
21	BEARING COVER (D.E.)	01	C.I. (IS-210, FG 260)
20	ANTIFRICTION BEARING (D.E.) (6313 Z-C3)	02	BRG. STEEL (SKF /FAG)
19	FRAME/BEARING HOUSING	01	C.I. (IS-210, FG 260)
18	PIPE PLUG	01	M.I.
17	ANTIFRICTION BEARING (N.D.E.) (6313 Z-C3)	01	BRG. STEEL (SKF/ FAG)
16	BEARING COVER (N.D.E.)	01	C.I. (IS-210, FG 260)
15	HEX. HD. CAP SCREW	04	M.S. (IS.-1367,Gr.-4.6)
14	SHAFT SLEEVE	01	ASTM A276, S.S.-410 (H) (250-300 BHN
13	GLAND HALF	02	CI.(IS-210, FG-260)
12	GREASE CUP WITH N.R.V.	01	STEEL
11	PIPE NIPPLE WITH COUPLING	01	G.I.
10	PACKING PCS.(Champion Make,Style No:- 6094)	05	P.T.F.E IMP. (Non Asbestos)
09	WATER SEAL RING	01	BRONZE (IS-318, LTB-II)
08	BACK COVER/BACK HEAD	01	CI.(IS-210, FG-260)
07	DOWEL PIN (W/Ring to Casing / Back cover)	04	En-8/En-9
06	PIPE PLUG	04	M.I.
05	KEY FOR IMPELLER	01	EN-9
04	IMPELLER NUT	01	STEEL
03	IMPELLER	01	BRONZE (IS-318, LTB-II)
02	WEARING RING CASING (Front & Back Side)	02	CI.(IS-210, FG-260)
01	CASING (VOLUTE)	01	CI.(IS-210, FG-260)

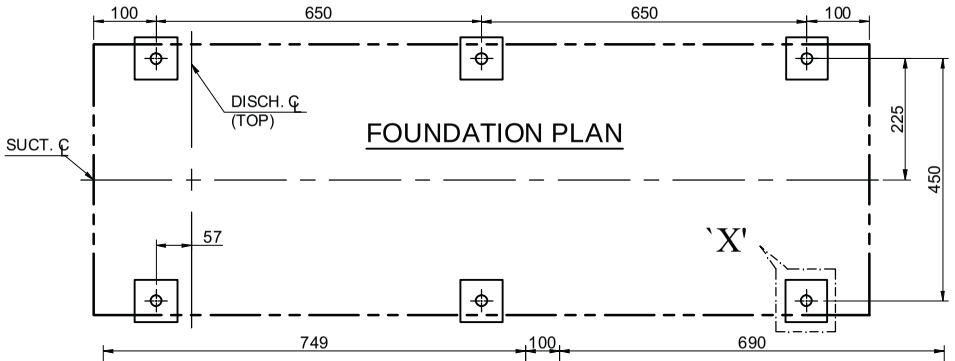
NOTE:-

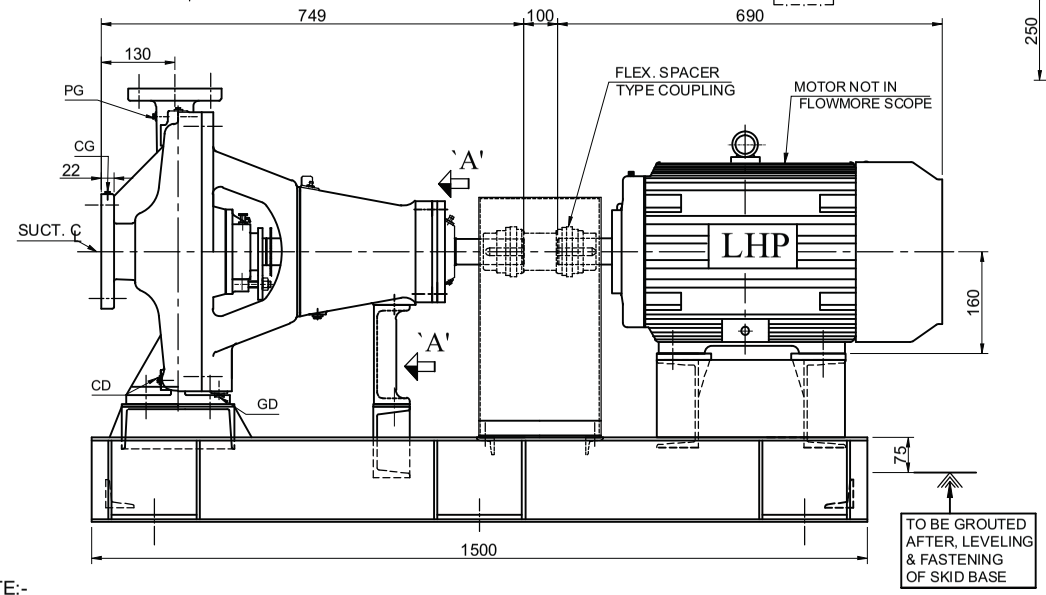
DIRECTION OF PUMP ROTATION:- COUNTER CLOCK WISE WHEN LOOKING FROM DRIVING

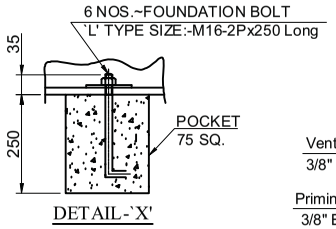
THESE ITEM ARE NOT SHOWN IN THIS DRAWING.

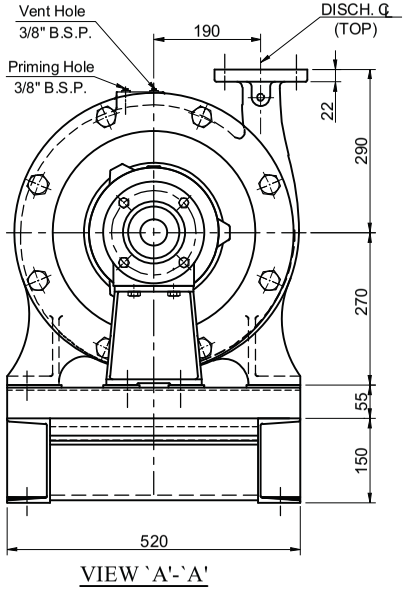
PUMP PARTICULARS (QTY		
FIG.	--	5625
SIZE	--	200x150 (8")
STAGE	--	SINGLE
LUB.	--	GREASE

TECHNICAL DATA SHEET UAF WATER PUMPS		
1	**Pump Details**	**UAF Water Pump**
2	Liquid	Water
3	Make	Flow More
4	Qty. (Nos)	10
5	Capacity(M3/Hr)	77
6	Head(m)	30
7	Sp.Gr.	1
8	Temp.	Amb
9	KKS Tag No.	10SAF12AP001-02, 20SAF12AP001-02, 30SAF12AP001-02,40SAF12AP001-02,50SAF12AP001-02
	PUMP SPECIFICATIONS	
10	Pump Model	F 5523 A
11	Succ.X Del(mm)	75X50
12	Pump Type	ENDSUCTION
13	Shut of Head	41
14	Effeciency(%)	52
15	Pump Input(kw)	12
16	Required Motor(kw)	15
17	RPM	1460
18	Nozzle Orientation	Side Suc X Top Discharge
19	Coupling Type	Spacer
20	NPSHr (M)	4
	Motor Specifications	
21	Make	LHP
22	Type	Totally Enclosed Fan Cooled Squirrel Cage
23	Insulation	Class F With Temp. rise limited to class B
24	Power Supply	AC 3 Phase,415 Volt+/-10%,50Hz+/-5%
25	Performance	Confirming to IS 325
26	Protection	IP-55(IS;2148)
	Material Of Construction	
27	Pump Casing	CI IS 210 GR FG 260
28	Impeller	Bronze IS 318 Gr-2
29	Impeller wearing	Bronze IS 318 Gr-2
30	Shaft	EN-8
31	Shaft Sleeve	Bronze as per IS 318
32	Gland Packing	PTFE
33	Base Plate	MS IS2062







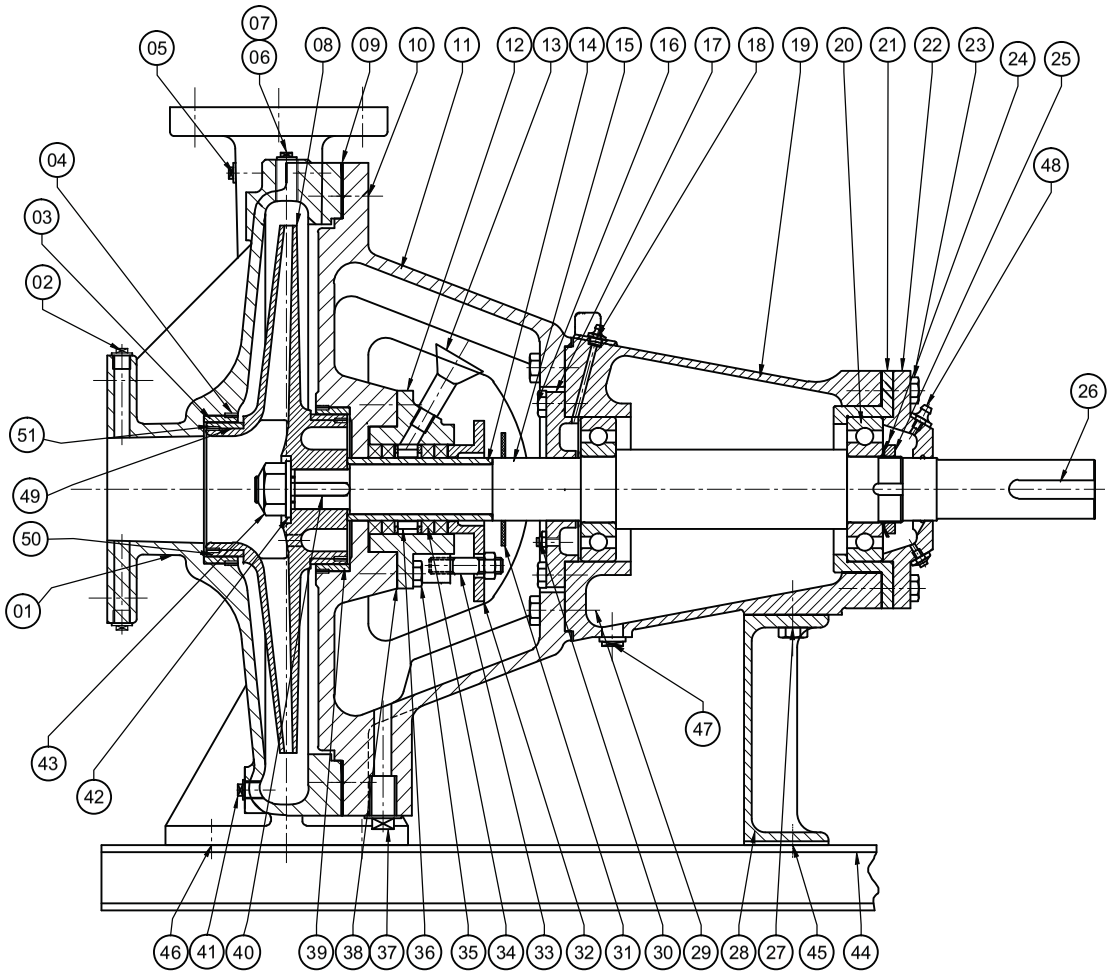


FLANGE DETAILS AS PER ANSI-B16.5-150 LBS.			
SUCTION:------	75 N.B.	DISCHARGE:----	50 N.B.
FLANGE O.D.:---	191	FLANGE O.D.:---	152
P.C.D.:--------	152	P.C.D.:--------	121
NO. OF. HOLES:-	4	NO. OF. HOLES:-	4
DIA OF BOLTS:-	M16	DIA OF BOLTS:-	M16

CD	CASING DRAIN	3/8" B.S.P.
GD	GLAND DRAIN	1/2" B.S.P.
CG	COMPOUND GAUGE	1/4" B.S.P.
PG	PRESSURE GAUGE	1/4" B.S.P.

NOTE:-
1. DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. DIRECTION OF ROTATION:-COUNTER CLOCKWISE WHEN LOOKING FROM DRIVING END.
3. STATIC LOAD (PUMP SET WITH MOTOR) = 430 KGS. (APPROX).
4. DYNAMIC LOAD (PUMP SET WITH MOTOR) = 560 KGS. (APPROX).

MOTOR PARTICULARS		PUMP PARTICULARS (QTY.:- 10 Nos.)	
MAKE	-- LHP	FIG.	-- F5523A
FRAME	-- 160 M/L	SIZE	-- 75x50 (3"x2")
POWER	-- 15 K.W.	STAGE	-- SINGLE
SPEED	-- 1460 R.P.M.	SPEED	-- 1460 R.P.M.
VOLTS	-- 415±10%	CAPACITY	-- 77 Cu. M/hr.
PHASES	-- THREE	HEAD	-- 30 Mtrs.
FREQUENCY	-- 50 Hz.±5%	PUMP INPUT (Sp. Gr. 1.0)	-- 12 K.W.
TYPE OF CONS.	-- H.S.S.	EFFICIENCY	-- 52%



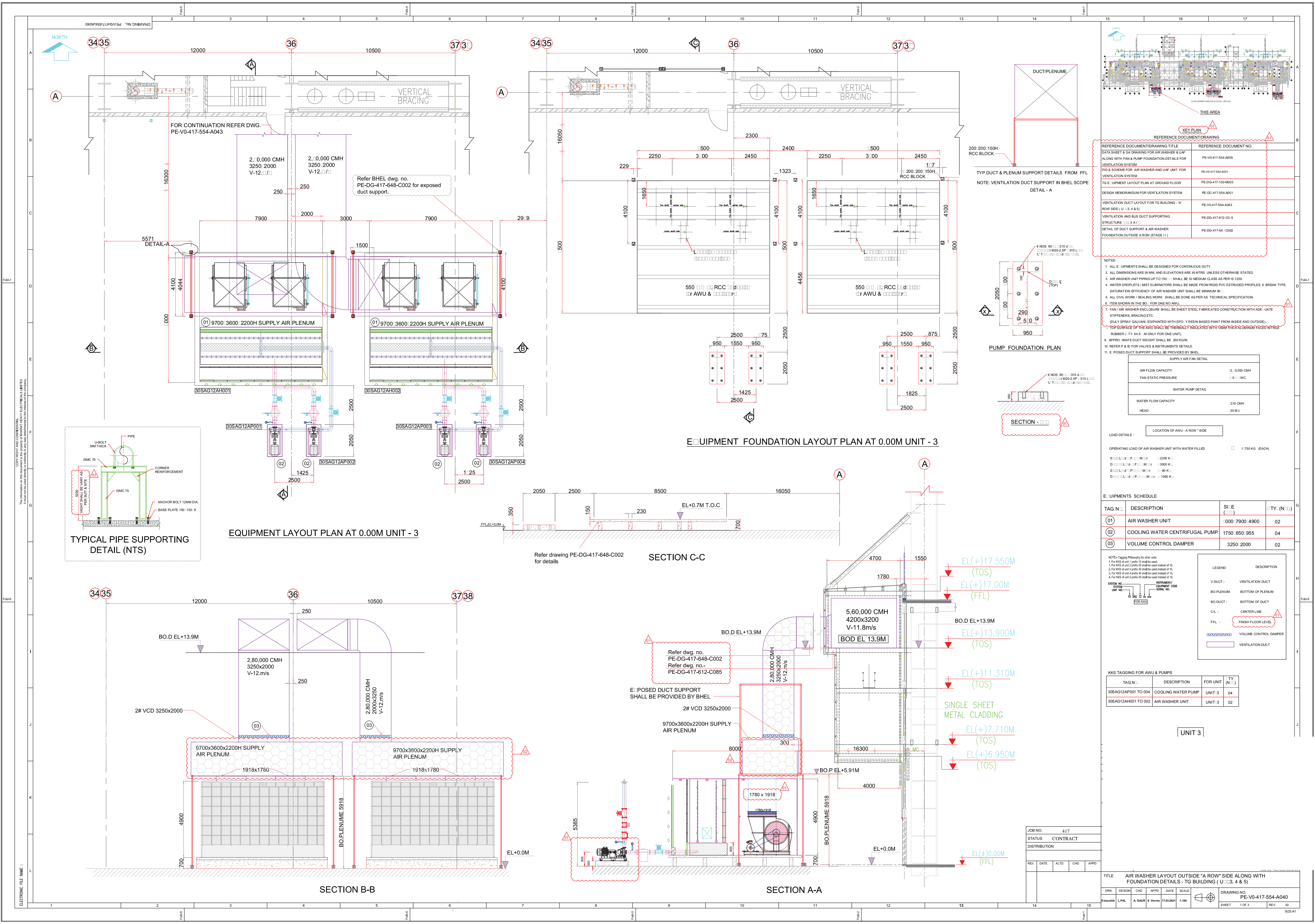
❋	53	COUPLING GUARD	01	M.S. (Fab)
	52	FLEXIBLE COUPLING (SPACER TYPE)	01	C.I.
	51	DOWEL PIN (W/Ring to IMPELLER)	04	S.S.-304
	50	WEARING RING IMPELLER (For BACK SIDE.)	01	BRONZE (IS-318, LTB-II)
	49	WEARING RING IMPELLER (For FRONT SIDE.)	01	BRONZE (IS-318, LTB-II)
	48	GREASE RELEASE FITTING	01	STEEL
	47	PIPE PLUG (Casing drain)	01	M.I.
	46	HEX. HD. BOLT WITH NUT & WASHER	04	M.S. (IS.-1367,Gr.-4.6)
	45	HEX. HD. BOLT WITH NUT & WASHER	02	M.S. (IS.-1367,Gr.-4.6)
	44	SKID BASE	01	M.S. (Fab) (IS-2062)
	43	IMP. NUT (Nylock)	01	STEEL
	42	IMP. WASHER	01	STEEL
	41	PIPE PLUG (Casing drain)	01	M.I.
	40	IMP. KEY	01	EN-9
	39	WEARING RING (For Frame Extn.)	01	C.I. (IS-210, FG. 260)
	38	GASKET	01	RUBBER
	37	PIPE NIPPLE (Gland drain)	01	STEEL
	36	WATER SEAL RING	01	BRONZE (IS:318, LTB-II)
	35	HEX. HD. CAP SCREW	06	M.S. (IS.-1367,Gr.-4.6)
	34	PACKING PCS.(Champion Make,Style No:- 3116)	04	GRAPH. IMP COTTON YARN. (Non Asbestos)
	33	STUD BOLT WITH NUT	02	S.S.-316
	32	PACKING GLAND	01	C.I. (IS-210, FG. 260)
	31	WATER SLINGER	01	RUBBER
	30	GREASE RELIEF FITTING	02	STEEL
	29	HEX. HD. CAP SCREW	04	M.S. (IS.-1367,Gr.-4.6)
	28	FRAME PEDESTAL	01	C.I. (IS-210, FG. 260)
	27	HEX. HD. CAP SCREW	02	M.S. (IS.-1367,Gr.-4.6)
	26	KEY (Pump Half Coup.)	01	EN-9
	25	LOCK NUT (Th. Brg.)	01	STEEL
	24	LOCK WASHER (Th. Brg.)	01	STEEL
	23	HEX. HD. CAP SCREW	04	M.S. (IS.-1367,Gr.-4.6)
	22	BRG. COVER (Thrust)	01	C.I. (IS-210, FG. 260)
	21	BRG. HOUSING (Thrust)	01	C.I. (IS-210, FG. 260)
	20	ANTI FRICTION BEARING (6310Z-C3)	02	BRG. STEEL (SKF/FAG)
	19	FRAME	01	C.I. (IS-210, FG. 260)
	18	GREASE RELEASE FITTING	01	STEEL
	17	BRG. COVER (Inner)	01	C.I. (IS-210, FG. 260)
	16	HEX. HD. CAP SCREW	04	M.S. (IS.-1367,Gr.-4.6)
	15	PUMP SHAFT	01	EN-8
	14	SHAFT SLEEVE	01	ASTM A 276,S.S.-410 (H) (250-300 BHN)
	13	GREASE CUP WITH N.R.V.	01	STEEL
	12	STUFFING BOX	01	C.I. (IS-210, FG. 260)
	11	FRAME EXTENSION	01	C.I. (IS-210, FG. 260)
	10	HEX. HD. CAP SCREW	08	M.S. (IS.-1367,Gr.-4.6)
	09	GASKET	01	RUBBER
	08	IMPELLER	01	BRONZE (IS-318, LTB-II)
	07	PIPE PLUG (Priming)	01	M.I.
	06	PIPE PLUG (Vent Hole)	01	M.I.
	05	PIPE PLUG	01	M.I.
	04	DOWEL PIN (W/Ring to Casing)	04	EN-8/EN-9
	03	WEARING RING (For Volute)	01	C.I. (IS-210, FG. 260)
	02	PIPE PLUG	01	M.I.
	01	VOLUTE (Casing)	01	C.I. (IS-210, FG. 260)

NOTE:-
DIRECTION OF PUMP ROTATION:- COUNTER CLOCK WISE WHEN LOOKING FROM DRIVING END.

❋ THESE ITEM ARE NOT SHOWN IN THIS DRAWING.

PUMP PARTICULARS (QTY.:- 14 N		
FIG.	--	F5523 A
SIZE	--	75x50 (3" x 2")
STAGE	--	SINGLE
LUB.	--	GREASE

APPROVED AWU LAYOUT AND CIVIL DETAILS



REFERENCE DOCUMENT/DRAWING

REFERENCE DOCUMENT/DRAWING TITLE	REFERENCE DOCUMENT NO.
DATA SHEET & GA DRAWING FOR AIR WASHER & UAF ALONG WITH FAN & PUMP FOUNDATION DETAILS FOR VENTILATION SYSTEM	PE-V0-417-554-A009
PID & SCHEME FOR AIR WASHER AND UAF UNIT FOR VENTILATION SYSTEM	PE-V0-417-554-A021
EQUIPMENT LAYOUT PLAN AT GROUND FLOOR	PE-DG-417-100-M003
DESIGN MEMORANDUM FOR VENTILATION SYSTEM	PE-DC-417-554-A001
VENTILATION DUCT LAYOUT FOR TG BUILDING - 'A' ROW SIDE (UNIT 3, 4 & 5)	PE-V0-417-554-A043
VENTILATION AND BUS DUCT SUPPORTING STRUCTURE	PE-DG-417-612-C0 5
DETAIL OF DUCT SUPPORT & AIR WASHER FOUNDATION OUTSIDE A ROW (STAGE II)	PE-DG-417-64 -C002

NOTES:
1. ALL EQUIPMENTS SHALL BE DESIGNED FOR CONTINUOUS DUTY.
2. ALL DIMENSIONS ARE IN MM, AND ELEVATIONS ARE IN MTRS. UNLESS OTHERWISE STATED.
3. AIR WASHER UNIT PIPING UP TO 150 SHALL BE GI MEDIUM CLASS AS PER IS 1239.
4. WATER DROPLETS / MIST ELIMINATORS SHALL BE MADE FROM RIGID PVC ESTRUDED PROFILES 6 BREAK TYPE. SATURATION EFFICIENCY OF AIR WASHER UNIT SHALL BE MINIMUM 90.
5. ALL CIVIL WORK / SEALING WORK SHALL BE DONE AS PER AS TECHNICAL SPECIFICATION.
6. ITEM SHOWN IN THE BO FOR ONE NO AWU.
7. FAN / AIR WASHER ENCLOSURE SHALL BE SHEET STEEL FABRICATED CONSTRUCTION WITH ADEQUATE STIFFENERS, BRACING ETC. (DULY SPRAY GALVANIZED PAINTED WITH EPOXY RESIN BASED PAINT FROM INSIDE AND OUTSIDE). TOP SURFACE OF THE AWU SHALL BE THERMALLY INSULATED WITH 12MM THICK ALUMINUM FACED NITRILE RUBBER (QTY. 64 SQM ONLY FOR ONE UNIT).
9. APPROXIMATE DUCT WEIGHT SHALL BE 250 KG/M.
10. REFER P & ID FOR VALVES & INSTRUMENTS DETAILS.
11. EXPOSED DUCT SUPPORT SHALL BE PROVIDED BY BHEL.

EQUIPMENTS SCHEDULE

TAG.NO.	DESCRIPTION	SIZE	QTY. (NOS)
01	AIR WASHER UNIT	000x7900x4900	02
02	COOLING WATER CENTRIFUGAL PUMP	1750x650x955	04
03	VOLUME CONTROL DAMPER	3250x2000	02

LEGEND

	DESCRIPTION
V.DUCT -	VENTILATION DUCT
BO.PLENUM	BOTTOM OF PLENUM
BO.DUCT -	BOTTOM OF DUCT
C/L -	CENTER LINE
FFL -	FINISH FLOOR LEVEL
	VOLUME CONTROL DAMPER
	VENTILATION DUCT

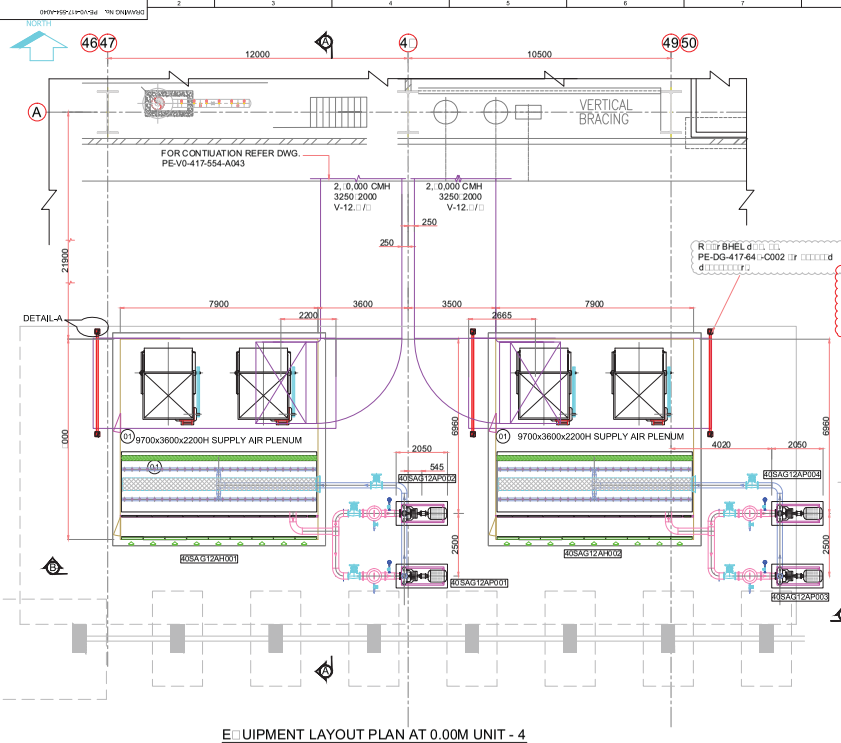
KKS TAGGING FOR AWU & PUMPS

TAG.NO.	DESCRIPTION	FOR UNIT	QTY. (NOS)
30SAG12AP001 TO 004	COOLING WATER PUMP	UNIT 3	04
30SAG12AH001 TO 002	AIR WASHER UNIT	UNIT 3	02

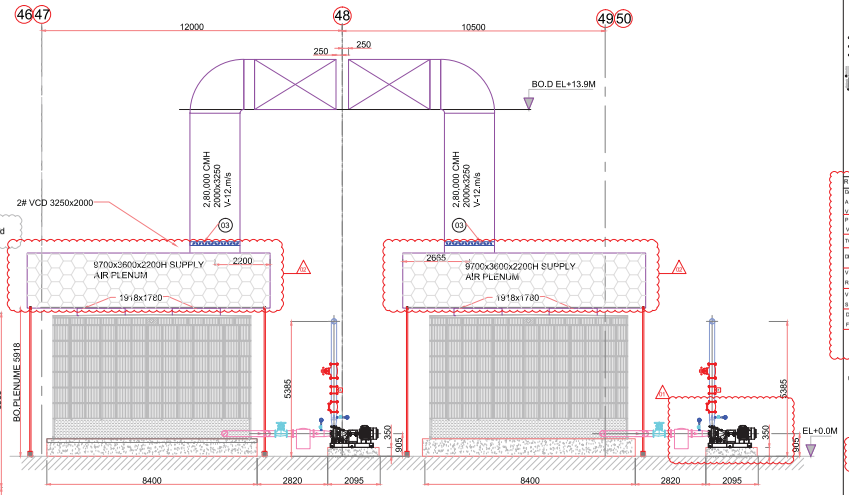
JOB NO. 417
STATUS CONTRACT

TITLE: AIR WASHER LAYOUT OUTSIDE "A ROW" SIDE ALONG WITH FOUNDATION DETAILS - TG BUILDING (UNIT 3, 4 & 5)

DRAWING NO. PE-V0-417-554-A040 — SHEET 1 OF 3 — REV. 02 — SCALE 1:100 — DATE 17.03.2021



E□UIPMENT LAYOUT PLAN AT 0.00M UNIT - 4



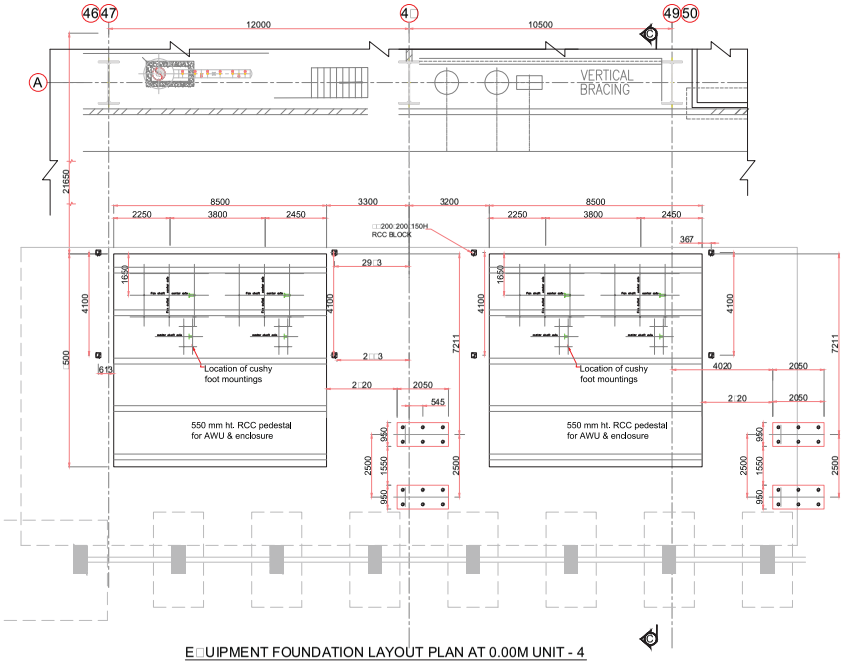
SECTION B-B

TYPICAL PIPE SUPPORTING DETAIL (NTS)

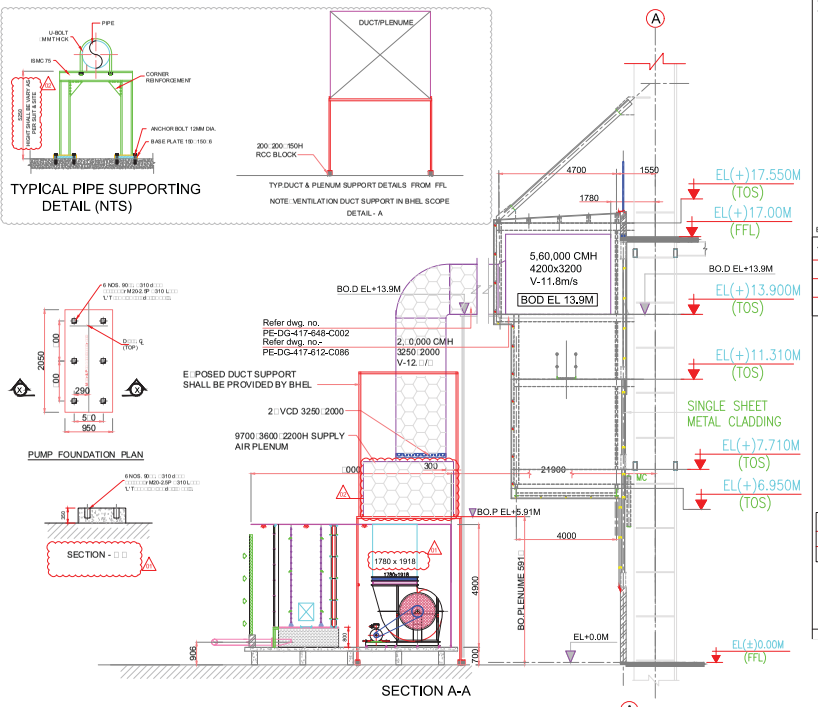
TYP.DUCT & PLENUM SUPPORT DETAILS FROM FFL

NOTE□VENTILATION DUCT SUPPORT IN BHEL SCOPE

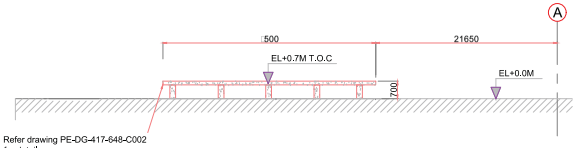
DETAIL - A



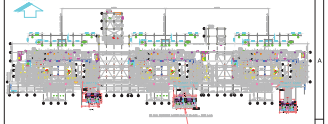
E□UIPMENT FOUNDATION LAYOUT PLAN AT 0.00M UNIT - 4



SECTION A-A



SECTION C-C



REFERENCE DOCUMENT/DRAWING

REFERENCE DOCUMENT/DRAWING TITLE	REFERENCE DOCUMENT NO.
DATA SHEET & GA DRAWING FOR AIR WASHER & UAP ALONG WITH FAN & PUMP FOUNDATION DETAILS FOR VENTILATION SYSTEM	PE-V0-417-554-A009
P&D & SCHEME FOR AIR WASHER AND UAP UNIT FOR VENTILATION SYSTEM	PE-V0-417-554-A001
TG E□UIPMENT LAYOUT PLAN AT GROUND FLOOR	PE-DG-417-100-M003
DESIGN MEMORANDUM FOR VENTILATION SYSTEM	PE-DG-417-554-A001
VENTILATION DUCT LAYOUT FOR TG BUILDING□W ROW SIDE (U□□3, 4 & 5)	PE-V0-417-554-A043
VENTILATION AND BUS DUCT SUPPORTING STRUCTURE □□□ & A□□	PE-DG-417-612-C□ 6
DETAIL OF DUCT SUPPRT & AIR WASHER FOUNDATION OUTSIDE AROW (STAGE I)	PE-DG-417-64□-C002

NOTES :

1. ALL E□UIPMENTS SHALL BE DESIGNED FOR CONTINUOUS DUTY.
2. ALL DIMENSIONS ARE IN MM. AND ELEVATIONS ARE IN MTRS. UNLESS OTHERWISE STATED.
3. AIR WASHER UNIT PIPING UP TO 150□□□ SHALL BE GI MEDIUM CLASS AS PER IS 1239.
4. WATER DROPLETS□MIST ELIMINATORS SHALL BE MADE FROM RIGID PVC E STRUDED PROFILES 6 BREAK TYPE.
5. SATURATION EFFICIENCY OF AIR WASHER UNIT SHALL BE MINIMUM 90□□.
6. ~~ALL CIVIL WORK (SCALING WORK, SHALL BE DONE AS PER M/S TECHNICAL SPECIFICATION.~~
7. ITEMS SHOWN IN THE BOX□□ FOR ONE NO.AWU.
8. FAN□AIR WASHER ENCLOSURE SHALL BE SHEET STEEL FABRICATED CONSTRUCTION WITH ADE□□UATE STIFFENERS, BRACINGS ETC.
9. (DULY SPRAY GALVANI□ED)PAINTED WITH EPO□□Y RESIN BASED PAINT FROM INSIDE AND OUTSIDE).
10. TOP SURFACE OF THE AWU SHALL BE THERMALLY INSULATED WITH 5MM THICK ALUMINUM FACED NITRILE RUBBER(□□TY. 64 S□□M ONLY FOR ONE UNIT).
11. APPRO□IMATE DUCT WEIGHT SHALL BE 250 KG/M
12. REFER P &ID FOR VALVES & INSTRUMENTS DETAILS
13. E□POSED DUCT SUPPORT SHALL BE PROVIDED BY BHEL.

SUPPLY AIR FAN DETAIL	
AIR FLOW CAPACITY	2,□0,000 CMH
FAN STATIC PRESSURE	□5□□WC.
WATER PUMP DETAIL	
WATER FLOW CAPACITY	310 CMH
HEAD	20 M□

LOCATION OF AWU□A ROW□SIDE

LOAD DETAILS□□

OPRATING LOAD OF AIR WASHER UNIT WITH WATER FILLED □□ 1,750 KG. (EACH)

S□□CL□□d□P□□□M□□□□2200 K□□
D□□□CL□□d□P□□□M□□□□3000 K□□
S□□CL□□R□P□□□M□□□□ 60 K□□
D□□□CL□□d□P□□□M□□□□ 1000 K□□

E□UIPMENTS SCHEDULE

TAG.N□□	DE□CRIPTION	SI□E (□□□)	□TY. (N□□□)
01	AIR WASHER UNIT	□00□7900□4900	02
02	COOLING WATER CENTRIFUGAL PUMP	175□□650□955	04
03	VOLUME CONTROL DAMPER	3250□2000	02

NOTE□Tagging Philosophy for other units
1. For 905 of unit 1 prefix 01 shall be used,
1. For 905 of unit 2 prefix 21 shall be used instead of 01,
2. For 905 of unit 3 prefix 31 shall be used instead of 01,
3. For 905 of unit 4 prefix 41 shall be used instead of 01,
4. For 905 of unit 5 prefix 51 shall be used instead of 01,

SYSTEM NO.□□□□□ EQUIPMENT NO.□□□□□ UNIT NO.□□□□□ INSTRUMENT/ EQUIPMENT SERIAL NO.□□□□□
□□□ AREA

LEGEND	DE□CRIPTION
V.DUCT□□	VENTILATION DUCT
BO.PLENUM□□	BOTTOM OF PLENUM
BO.DUCT□□	BOTTOM OF DUCT
CL□□	CENTER LINE
FFL□□	FINISH FLOOR LEVEL
	VOLUME CONTROL DAMPER
	VENTILATION DUCT

KKS TAGGING FOR AWU & PUMPS

TAG.N□□	DE□CRIPTION	FOR UNIT	□TY. (N□□□)
40SA GF12AP001 TO 004	COOLING WATER PUMP	UNIT□4	04
40SA GF12AH001 TO 002	AIR WASHER UNIT	UNIT□4	02

UNIT 4

JOB NO.	417
□TATUS	CONTRACT
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APP

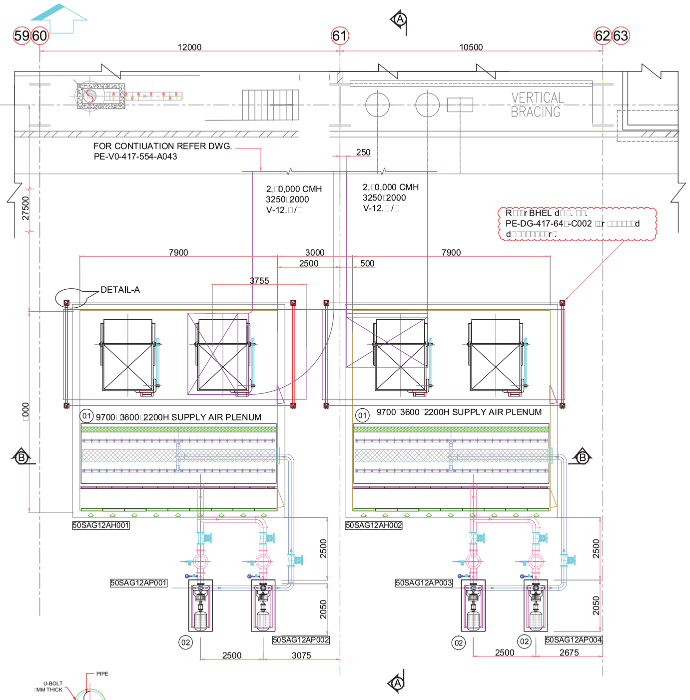
TITLE: AIR WASHER LAYOUT OUTSIDE "A ROW" SIDE ALONG WITH FOUNDATION DETAILS - TG BUILDING (U□□3,4 &5)

DRN	DESIGN	CHD	APP'D	DATE	SCALE
S.kaushik	L.PAL	A.GAUR	S.verma	17.03.2015	1:100

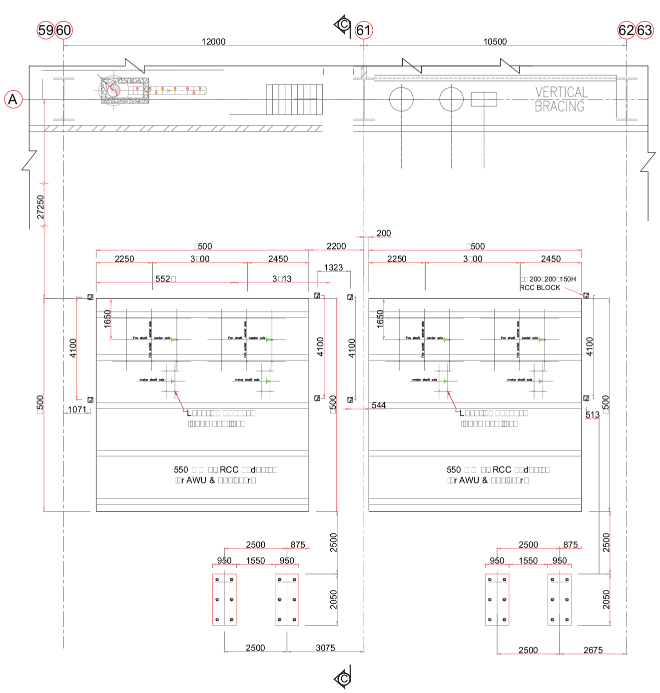
DRAWING NO. PE-V0-417-554-A040

SHEET 2 OF 3 REV. 0

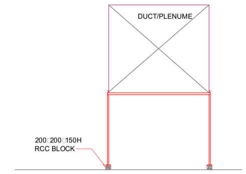
ELECTRONIC FILE NAME :



EQUIPMENT LAYOUT PLAN AT 0.00M UNIT - 5



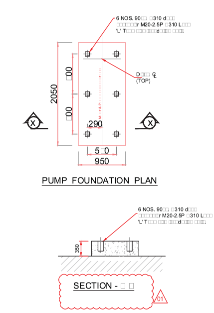
EQUIPMENT FOUNDATION LAYOUT PLAN AT 0.00M UNIT - 5



TYP.DUCT & PLENUM SUPPORT DETAILS FROM FFL

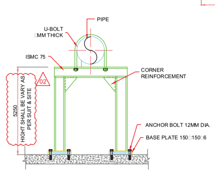
NOTE: VENTILATION DUCT SUPPORT IN BHEL SCOPE

DETAIL - A

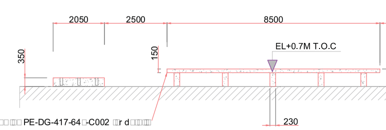


PUMP FOUNDATION PLAN

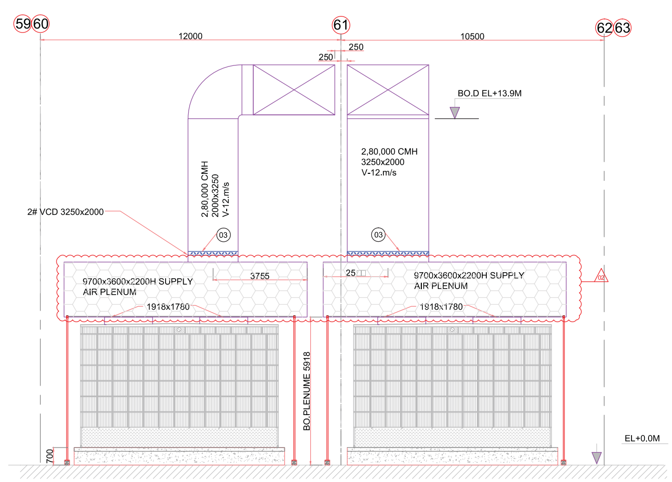
SECTION - X X



TYPICAL PIPE SUPPORTING DETAIL (NTS)



SECTION C-C



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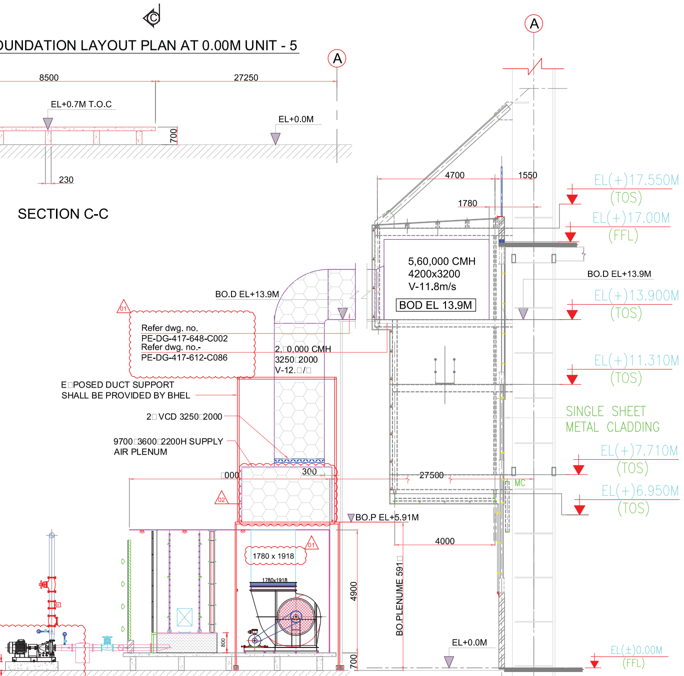

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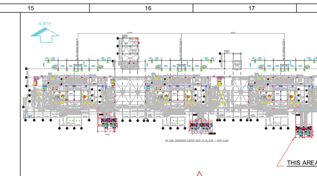

KEY PLAN

REFERENCE DOCUMENT/DRAWING

REFERENCE DOCUMENT/DRAWING TITLE	REFERENCE DOCUMENT NO.
DATA SHEET & GA DRAWING FOR AIR WASHER & UAF ALONG WITH FAN & PUMP FOUNDATION DETAILS FOR VENTILATION SYSTEM	PE-V0-417-554-A009
PID & SCHEME FOR AIR WASHER AND UAF UNIT FOR VENTILATION SYSTEM	PE-V0-417-554-A021
TG EQUIPMENT LAYOUT PLAN AT GROUND FLOOR	PE-DG-417-100-M003
DESIGN MEMORANDUM FOR VENTILATION SYSTEM	PE-DC-417-554-A001
VENTILATION DUCT LAYOUT FOR TG BUILDING - 'A' ROW SIDE (UNIT 3, 4 & 5)	PE-V0-417-554-A043
VENTILATION AND BUS DUCT SUPPORTING STRUCTURE	PE-DG-417-612-C0□6
DETAIL OF DUCT SUPPORT & AIR WASHER FOUNDATION OUTSIDE A ROW (STAGE II)	PE-DG-417-64□-C002

NOTES:

1. ALL EQUIPMENTS SHALL BE DESIGNED FOR CONTINUOUS DUTY.
2. ALL DIMENSIONS ARE IN MM, AND ELEVATIONS ARE IN MTRS. UNLESS OTHERWISE STATED.
3. AIR WASHER UNIT PIPING UP TO 150 SHALL BE GI MEDIUM CLASS AS PER IS 1239.
4. WATER DROPLETS / MIST ELIMINATORS SHALL BE MADE FROM RIGID PVC ESTRUDED PROFILES 6 BREAK TYPE. SATURATION EFFICIENCY OF AIR WASHER UNIT SHALL BE MINIMUM 90.
5. ALL CIVIL WORK / SEALING WORK SHALL BE DONE AS PER AS TECHNICAL SPECIFICATION.
6. ITEM SHOWN IN THE BOX FOR ONE NO AWU,
7. FAN / AIR WASHER ENCLOSURE SHALL BE SHEET STEEL FABRICATED CONSTRUCTION WITH ADEQUATE STIFFENERS, BRACING ETC. (DULY SPRAY GALVANIZED/PAINTED WITH EPOXY RESIN BASED PAINT FROM INSIDE AND OUTSIDE).
8. ~~TOP SURFACE OF THE AWU SHALL BE THERMALLY INSULATED WITH 13MM THICK ALUMINUM FACED NITRILE~~ RUBBER (QTY. 64 SQ.M ONLY FOR ONE UNIT).
9. APPROXIMATE DUCT WEIGHT SHALL BE 250 KG/M
10. REFER P & ID FOR VALVES & INSTRUMENTS DETAILS.
11. EXPOSED DUCT SUPPORT SHALL BE PROVIDED BY BHEL.

SUPPLY AIR FAN DETAIL	
AIR FLOW CAPACITY	2,80,000 CMH
FAN STATIC PRESSURE	5 WC.
WATER PUMP DETAIL	
WATER FLOW CAPACITY	310 CMH
HEAD	30 Mtr.

LOCATION OF AWU - A ROW " SIDE

LOAD DETAILS

OPERATING LOAD OF AIR WASHER UNIT WITH WATER FILLED : 1750 KG. (EACH)

Static Load of Fan Motor : 2200 Kg.
Dynamic Load of Fan Motor : 3000 Kg.
Static Load of Pump Motor : 60 Kg.
Dynamic Load of Pump Motor : 1060 Kg.

EQUIPMENTS SCHEDULE

TAG.NO.	DESCRIPTION	SIZE (MM)	QTY. (NOS.)
01	AIR WASHER UNIT	000x7900x4900	02
02	COOLING WATER CENTRIFUGAL PUMP	1750x650x955	04
03	VOLUME CONTROL DAMPER	3250x2000	02

NOTE:- Tagging Philosophy for other units
1. For KKS of unit 1 prefix 10 shall be used.
1. For KKS of unit 2 prefix 20 shall be used instead of 10.
2. For KKS of unit 3 prefix 30 shall be used instead of 10.
3. For KKS of unit 4 prefix 40 shall be used instead of 10.
4. For KKS of unit 5 prefix 50 shall be used instead of 10.

SYSTEM NO. / SYSTEM / UNIT NO. / INSTRUMENT/EQUIPMENT CODE / SERIAL NO.: 10 SAG 12 xx xxx (FOR AWU)

LEGEND	DESCRIPTION
V.DUCT -	VENTILATION DUCT
BO.PLENUM-	BOTTOM OF PLENUM
BO.DUCT -	BOTTOM OF DUCT
C/L -	CENTER LINE
FFL. -	FINISH FLOOR LEVEL
(hatched symbol)	VOLUME CONTROL DAMPER
(outline symbol)	VENTILATION DUCT

KKS TAGGING FOR AWU & PUMPS

TAG.NO.	DESCRIPTION	FOR UNIT	QTY. (NOS.)
50SAG12AP001 TO 004	COOLING WATER PUMP	UNIT 5	04
50SAG12AH001 TO 002	AIR WASHER UNIT	UNIT 5	02

UNIT 5

JOB NO.	417
STATUS	CONTRACT
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD

TITLE: AIR WASHER LAYOUT OUTSIDE "A ROW" SIDE ALONG WITH FOUNDATION DETAILS - TG BUILDING (UNIT 3, 4 & 5)

DRN	DESIGN	CHD	APPD	DATE	SCALE
D.kaushik	L.PAL	A GAUR	S .verma	17.03.2021	1:100

DRAWING NO. PE-V0-417-554-A040

SHEET 3 OF 3 REV. 02

SIZE-A1

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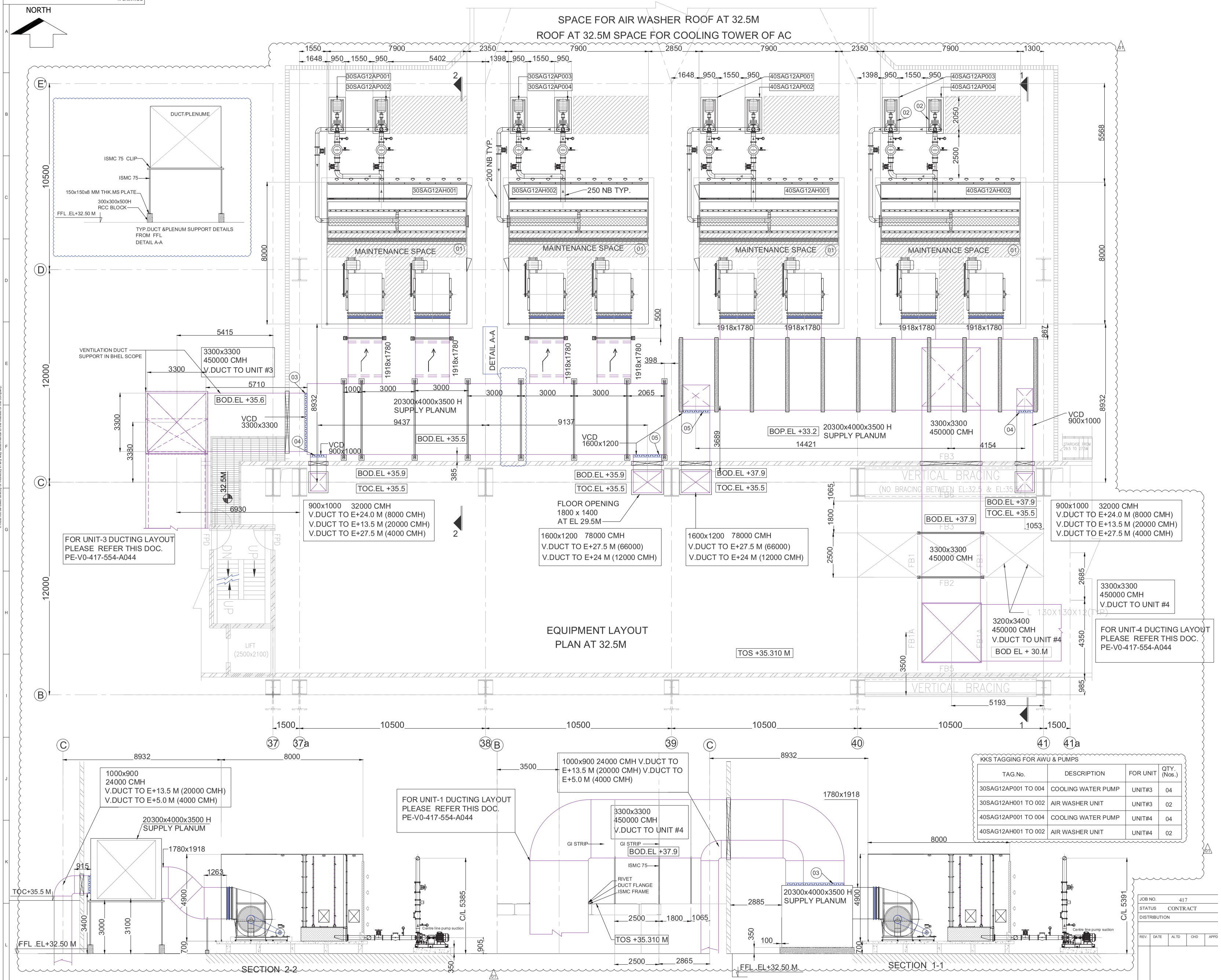

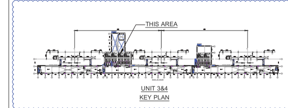

REFERENCE DOCUMENT/DRAWING

REFERENCE DOCUMENT/DRAWING TITLE	REFERENCE DOCUMENT NO.
DATA SHEET & GA DRAWING FOR AIR WASHER & UAF ALONG WITH FAN & PUMP FOUNDATION DETAILS FOR VENTILATION SYSTEM	PE-V0-417-554-A009
PID & SCHEME FOR AIR WASHER AND UAF UNIT FOR VENTILATION SYSTEM	PE-V0-417-554-A021
TG EQUIPMENT LAYOUT PLAN AT MISC FLOORS ABOVE OPERATING FLOOR IN BC BAY	PE-DG-417-100-M006
SCHEME OF AIR DISTRIBUTION IN POWER HOUSE BUILDING, ESP-FGD CONTROL BUILDING.	PE-V0-417-554-A058
VENTILATION DUCT LAYOUT FOR TG BUILDING - 'BC BAY' SIDE (Unit 3, 4 & 5)	PE-V0-417-554-A044
DESIGN MEMORANDUM FOR VENTILATION SYSTEM	PE-DC-417-554-A001

NOTES:

1. ALL EQUIPMENTS SHALL BE DESIGNED FOR CONTINUOUS DUTY.
2. ALL DIMENSIONS ARE IN MM, AND ELEVATIONS ARE IN MTRS. UNLESS OTHERWISE STATED.
3. AIR WASHER UNIT PIPING UP TO 150mm SHALL BE GI MEDIUM CLASS AS PER IS:1239.
4. WATER DROPLETS / MIST ELIMINATORS SHALL BE MADE FROM RIGID PVC ESTRUDED PROFILES 6 BREAK TYPE. SATURATION EFFICIENCY OF AIR WASHER UNIT SHALL BE MINIMUM 90%.
5. ALL CIVIL WORK / SEALING WORK SHALL BE DONE AS PER AS TECHNICAL SPECIFICATION.
6. ITEM SHOWN IN THE BOQ FOR ONE NO AWU,
7. FAN / AIR WASHER ENCLOSURE SHALL BE SHEET STEEL FABRICATED CONSTRUCTION WITH ADEQUATE STIFFENERS, BRACING ETC. (DULY SPRAY GALVANIZED/PAINTED WITH EPOXY RESIN BASED PAINT FROM INSIDE AND OUTSIDE).
8. TOP SURFACE OF THE AWU SHALL BE THERMALLY INSULATED WITH 13MM THICK ALUMINUM FACED NITRILE RUBBER (QTY: 64 SQ.M ONLY FOR ONE UNIT).

01

SUPPLY AIR FAN DETAIL	
AIR FLOW CAPACITY	: 2,80,000 CMH
FAN STATIC PRESSURE	: 85 mmWC.
WATER PUMP DETAIL	
WATER FLOW CAPACITY	: 310 CMH
HEAD	: 30 Mtr.

LOCATION OF AWU - B-C BAY" SIDE

NOTE:- Tagging Philosophy for other units
1. For KKS of unit 1 shall be used 10.
2. For KKS of unit 2 prefix 20 shall be used instead of 10.
3. For KKS of unit 3 prefix 30 shall be used instead of 10.
4. For KKS of unit 4 prefix 40 shall be used instead of 10.
5. For KKS of unit 5 prefix 50 shall be used instead of 10.

UNIT NO. – 10; SYSTEM – SAG; SYSTEM NO. – 12; INSTRUMENT/EQUIPMENT CODE – xx; SERIAL NO. – xxx

10 SAG 12 xx xxx

FOR AWU

LOAD DETAILS :

OPERATING LOAD OF AIR WASHER UNIT WITH WATER FILLED : 18750 KG. (EACH)

Static Load of Fan + Motor : 2200 Kg.
Dynamic Load of Fan + Motor : 3000 Kg.
Static Load of Pump + Motor : 534 Kg.
Dynamic Load of Pump + Motor : 695 Kg.

EQUIPMENTS SCHEDULE

TAG.No.	DESCRIPTION	SIZE (mm)	QTY. (Nos.)
01	AIR WASHER UNIT	8000x7900x4900	04
02	COOLING WATER PUMP	1750x650x955	08
03	VOLUME CONTROL DAMPER	3300x3300	02
04	VOLUME CONTROL DAMPER	900x1000	02
05	VOLUME CONTROL DAMPER	1600x1200	02

LEGEND	DESCRIPTION
V.DUCT -	VENTILATION DUCT
BO.PLENUM-	BOTTOM OF PLENUM
BO.DUCT -	BOTTOM OF DUCT
C/L -	CENTER LINE
FFL. -	FINISH FLOOR LEVEL
	VOLUME CONTROL DAMPER
	VENTILATION DUCT
	MAINTENANCE SPACE

UNIT 3& 4

KKS TAGGING FOR AWU & PUMPS

TAG.No.	DESCRIPTION	FOR UNIT	QTY. (Nos.)
30SAG12AP001 TO 004	COOLING WATER PUMP	UNIT#3	04
30SAG12AH001 TO 002	AIR WASHER UNIT	UNIT#3	02
40SAG12AP001 TO 004	COOLING WATER PUMP	UNIT#4	04
40SAG12AH001 TO 002	AIR WASHER UNIT	UNIT#4	02

JOB NO.	417
STATUS	CONTRACT
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD

DESIGN	CHD	APPD	DATE	SCALE
D.KUMAR	A GAUR	SC	30.10.2021	1:100

DRAWING NO. PE-V0-417-554-A041
SHEET 1 OF 4 REV. 02
(SIZE:A1, 594x841)

DRAWING No. PE-V0-417-554-A041

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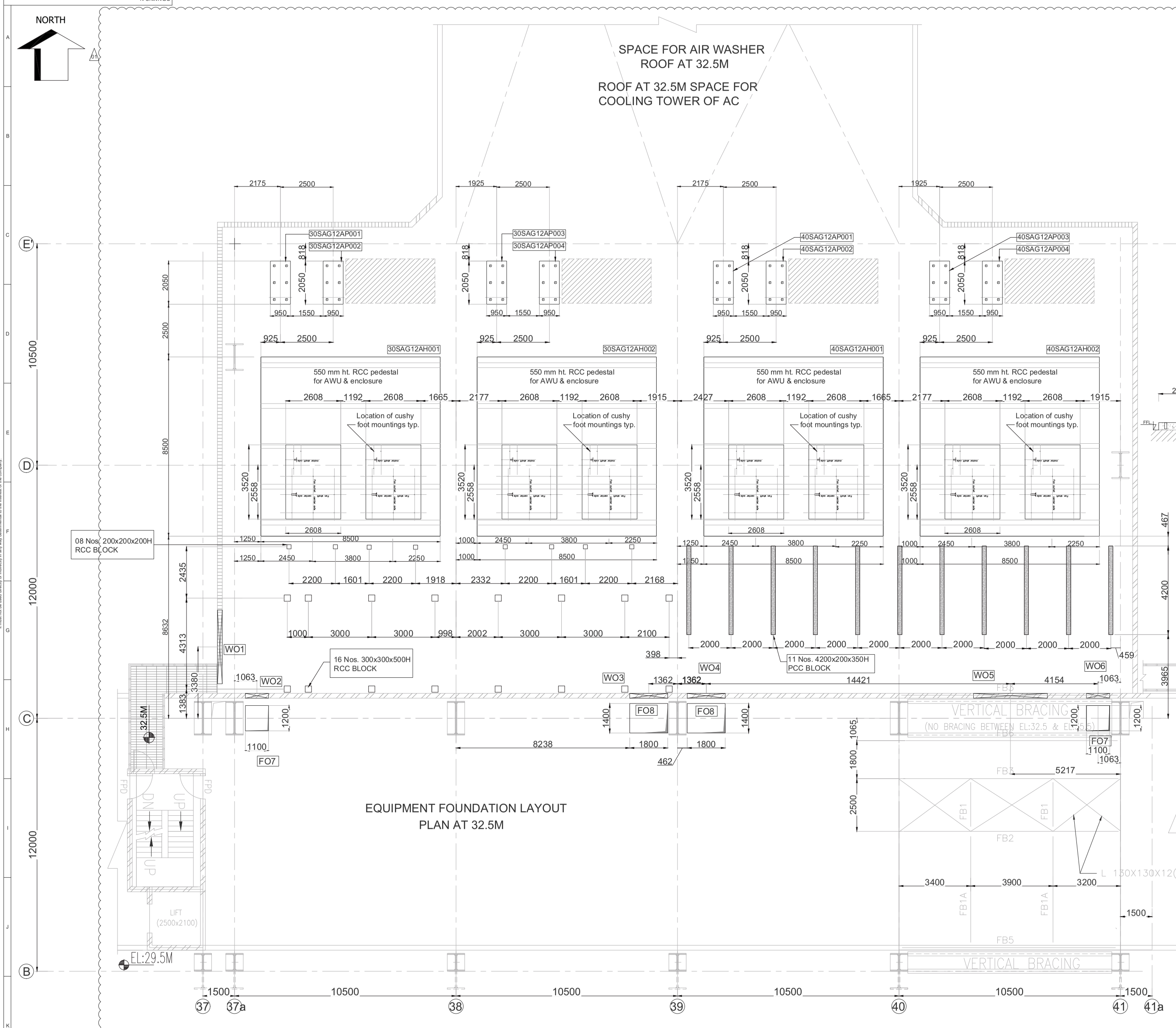
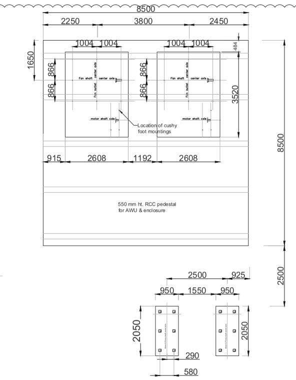
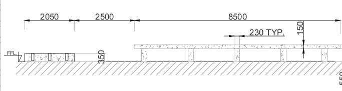


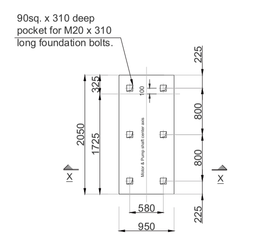
EQUIPMENT FOUNDATION LAYOUT @EL+32.5 M



FOUNDATION PLAN -2,80,000 CMH AIR WASHER UNIT

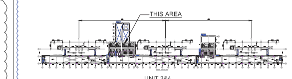


FOUNDATION ELEVATION -2,80,000 CMH AIR WASHER UNIT



PUMP FOUNDATION PLAN

SECTION -XX



UNIT 3&4
KEY PLAN

REFERENCE DOCUMENT/DRAWING

REFERENCE DOCUMENT/DRAWING TITLE	REFERENCE DOCUMENT NO.
DATA SHEET & GA DRAWING FOR AIR WASHER & UAF ALONG WITH FAN & PUMP FOUNDATION DETAILS FOR VENTILATION SYSTEM	PE-V0-417-554-A009
PID & SCHEME FOR AIR WASHER AND UAF UNIT FOR VENTILATION SYSTEM	PE-V0-417-554-A021
TG EQUIPMENT LAYOUT PLAN AT MISC FLOORS ABOVE OPERATING FLOOR IN BC BAY	PE-DG-417-100-M006
SCHEME OF AIR DISTRIBUTION IN POWER HOUSE BUILDING, ESP-FGD CONTROL BUILDING.	PE-V0-417-554-A058
VENTILATION DUCT LAYOUT FOR TG BUILDING - 'BC BAY' SIDE (Unit 3, 4 & 5)	PE-V0-417-554-A044

NOTES:

1. ALL EQUIPMENTS SHALL BE DESIGNED FOR CONTINUOUS DUTY.
2. ALL DIMENSIONS ARE IN MM, AND ELEVATIONS ARE IN MTRS. UNLESS OTHERWISE STATED.
3. AIR WASHER UNIT PIPING UP TO 150mm SHALL BE GI MEDIUM CLASS AS PER IS:1239.
4. WATER DROPLETS / MIST ELIMINATORS SHALL BE MADE FROM RIGID PVC ESTRUDED PROFILES 6 BREAK TYPE. SATURATION EFFICIENCY OF AIR WASHER UNIT SHALL BE MINIMUM 90%.
5. ALL CIVIL WORK / SEALING WORK SHALL BE DONE AS PER AS TECHNICAL SPECIFICATION.
6. ITEM SHOWN IN THE BOQ FOR ONE NO AWU,
7. FAN / AIR WASHER ENCLOSURE SHALL BE SHEET STEEL FABRICATED CONSTRUCTION WITH ADEQUATE STIFFENERS, BRACING ETC. (DULY SPRAY GALVANIZED/PAINTED WITH EPOXY RESIN BASED PAINT FROM INSIDE AND OUTSIDE).
8. TOP SURFACE OF THE AWU SHALL BE THERMALLY INSULATED WITH 13MM THICK ALUMINUM FACED NITRILE RUBBER (QTY: 64 SQ.M ONLY FOR ONE UNIT).

01

SUPPLY AIR FAN DETAIL	
AIR FLOW CAPACITY	: 2,80,000 CMH
FAN STATIC PRESSURE	: 85 mmWC.
WATER PUMP DETAIL	
WATER FLOW CAPACITY	: 310 CMH
HEAD	: 30 Mtr.

LOCATION OF AWU - B-C BAY" SIDE

LOAD DETAILS :

OPERATING LOAD OF AIR WASHER UNIT WITH WATER FILLED : 18750 KG. (EACH)

Static Load of Fan + Motor : 2200 Kg.
Dynamic Load of Fan + Motor : 3000 Kg.
Static Load of Pump + Motor : 534 Kg.
Dynamic Load of Pump + Motor : 695 Kg.

WALL& FLOOR OPENING SCHEDULE

S.NO.	DESCRIPTION	SIZE (mm)	QTY. (Nos.)	Bottom Elevation from (FFL)
WO1	FOR SA DUCT	3500x3500	01	EL.+35.5 Mtr
WO2	FOR SA DUCT	1100x1200	01	EL.+35.8 Mtr
WO3	FOR SA DUCT	1800x1400	01	EL.+35.8 Mtr
WO4	FOR SA DUCT	1800x1400	01	EL.+37.8Mtr
WO5	FOR SA DUCT	3500x3500	01	EL.+37.8Mtr
WO6	FOR SA DUCT	1100x1200	01	EL.+37.8Mtr
FO7	FOR SA DUCT	1100x1200	02	-----
FO8	FOR SA DUCT	1800x1400	02	-----

UNIT 3& 4

JOB NO.	417
STATUS	CONTRACT
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD

TITLE: AIR WASHER LAYOUT FOR"B-C BAY" SIDE ALONGWITH FOUNDATION DETAILS - TG BUILDING (Unit 3, 4 & 5)

DESIGN	CHD	APPD	DATE	SCALE
D.KUMAR	A GAUR	SC	30.10.2021	1:100

DRAWING NO. PE-V0-417-554-A041

SHEET 2 OF 4 REV. 02

(SIZE:A1, 594x841)

ELECTRONIC FILE NAME :

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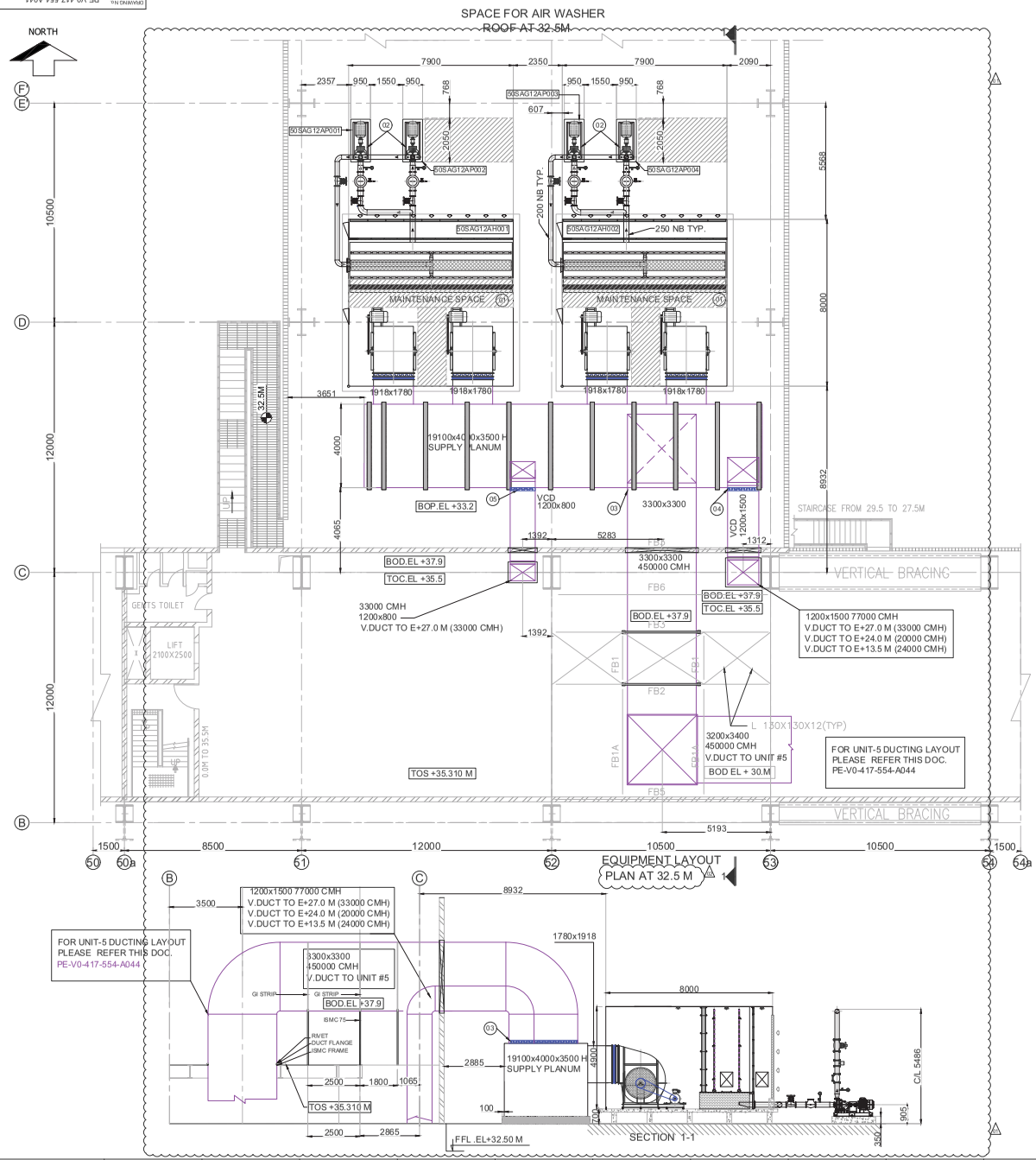
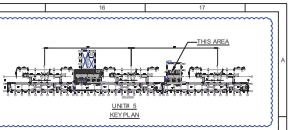


DUCTING BOQ UNIT 1&2

S.NO.	GAUGE	DUCT QTY. (SQM.)	INSULATION QTY. (SQM.)
1.	20	426	2370
2.	18	1944	



REFERENCE DOCUMENT/DRAWING

REFERENCE DOCUMENT/DRAWING TITLE	REFERENCED DOCUMENT NO.
DATA SHEET & GA DRAWING FOR AIR WASHER & UAF ALONG WITH FAN & PUMP FOUNDATION DETAILS FOR VENTILATION SYSTEM	PE-V0-417-554-A039
P&ID SCHEME FOR AIR WASHER AND UAF UNIT FOR VENTILATION SYSTEM	PE-V0-417-554-A051
TG EQUIPMENT LAYOUT PLAN AT MSG FLOORS AND VG STRETCHING FLOOR IN BG BAY	PE-00-417-10-A0006
SCHEME OF AIR DISTRIBUTION IN POWER HOUSE BUILDING, ESP, FGD, CW TG & SWG BLDG.	PE-V0-417-554-A058
VENTILATION DUCT LAYOUT FOR TG BUILDING - BC BAY SIDE (Unit 1 & 2)	PE-V0-417-554-A044
DESIGN MEMORANDUM FOR VENTILATION SYSTEM	PE-DC-417-554-A001

NOTES:
1. ALL EQUIPMENTS SHALL BE DESIGNED FOR CONTINUOUS DUTY.
2. ALL DIMENSIONS ARE IN MM. AND ELEVATIONS ARE IN MTRS. UNLESS OTHERWISE STATED.
3. AIR WASHER UNIT PIPING UP TO 150m m SHALL BE GI MEDIUM CLASS AS PER IS 1239.
4. WATER DROPLETS / MIST ELIMINATORS SHALL BE MADE FROM RIGID PVC ESTRUDED PROFILES 6 BREAK TYPE. SATURATION EFFICIENCY OF AIR WASHER UNIT SHALL BE MINIMUM 90%.
5. ALL CIVIL WORK / DEALING WORK SHALL BE DONE AS PER AS TECHNICAL SPECIFICATION.
6. ITEM SHOWN IN THE BOQ FOR ONE NO AWU.
7. FAN / AIR WASHER ENCLOSURE SHALL BE SHEET STEEL FABRICATED CONSTRUCTION WITH ADEQUATE STIFFENERS, BRACING ETC.
(DULY SPRAY GALVANIZED PAINTED WITH EPOXY RESIN BASED PAINT FROM INSIDE AND OUTSIDE).
8 TOP SURFACE OF THE AWU SHALL BE THERMALLY INSULATED WITH 15MM THICK ALUMINUM FACED NITRILE RUBBER (QTY. 64 SQ.M. ONLY FOR ONE UNIT).

SUPPLY AIR FAN DETAIL	
AIR FLOW CAPACITY	: 2,80,000 CMH
FAN S TATIC PRESSURE	: 85 mmWC.
WATER PUMP DETAIL	
WATER FLOW CAPACITY	: 310 CMH
HEAD	: 30 Mtr.

LOCATION OF AWU - B-C BAY* SIDE

NOTE- Tagging Philosophy for drive units
1. For KKS of unit 1 shall be used 10.
2. For KKS of unit 2 prefix 20 shall be used instead of 10.
3. For KKS of unit 3 prefix 30 shall be used instead of 10.
4. For KKS of unit 4 prefix 40 shall be used instead of 10.
5. For KKS of unit 5 prefix 50 shall be used instead of 10.

SYSTEM NO. / SYSTEM / UNIT NO. — INSTRUMENT / EQUIPMENT CODE / SERIAL NO.
10 SAG 12 AN 001
FOR AWU

LOAD DETAILS :

OPERATING LOAD OF AIR WASHER UNIT WITH WATER FILLED : 18750 KG. (EACH)

Static Load of Fan + Motor : 2200 Kg.
Dynamic Load of Fan + Motor : 3000 Kg.
Static Load of Pump + Motor : 534 Kg.
Dynamic Load of Pump + Motor : 695 Kg.

EQUIPMENTS SCHEDULE

TAG.No.	DESCRIPTION	SIZE (mm)	QTY. (Nos.)
01	AIR WASHER UNIT	8000x7900x4900	02
02	COOLING WATER PUMP	1750x650x955	04
03	VOLUME CONTROL DAMPER	3300x3300	01
04	VOLUME CONTROL DAMPER	1200x1500	01
05	VOLUME CONTROL DAMPER	1200x800	01

LEGEND	DESCRIPTION
V.DUCT -	VENTILATION DUCT
BO.PLENUM-	BOTTOM OF PLENUM
BO.DUCT -	BOTTOM OF DUCT
C/L -	CENTER LINE
FFL. -	FINISH FLOOR LEVEL
	VOLUME CONTROL DAMPER
	VENTILATION DUCT
	MAINTENANCE SPACE

UNIT # 5

KKS TAGGING FOR AWU & PUMPS

TAG.No.	DESCRIPTION	FOR UNIT	QTY. (Nos.)
50SAG12AP001 TO 004	COOLING WATER PUMP	UNIT#5	04
50SAG12AH001 TO 002	AIR WASHER UNIT	UNIT#5	02

JOB NO. 417
STATUS CONTRACT
DISTRIBUTION

REV.	DATE	ALTD	CHD	APP

DESIGN	CHD	APPD	DATE	SCALE
GAUNNA	ASAUR	SD	30.10.2020	1:100

DRAWING NO. PE-V0-417-554-A041
SHEET 1 OF 4 REV. 02
(SIZE:A1, 594x841)

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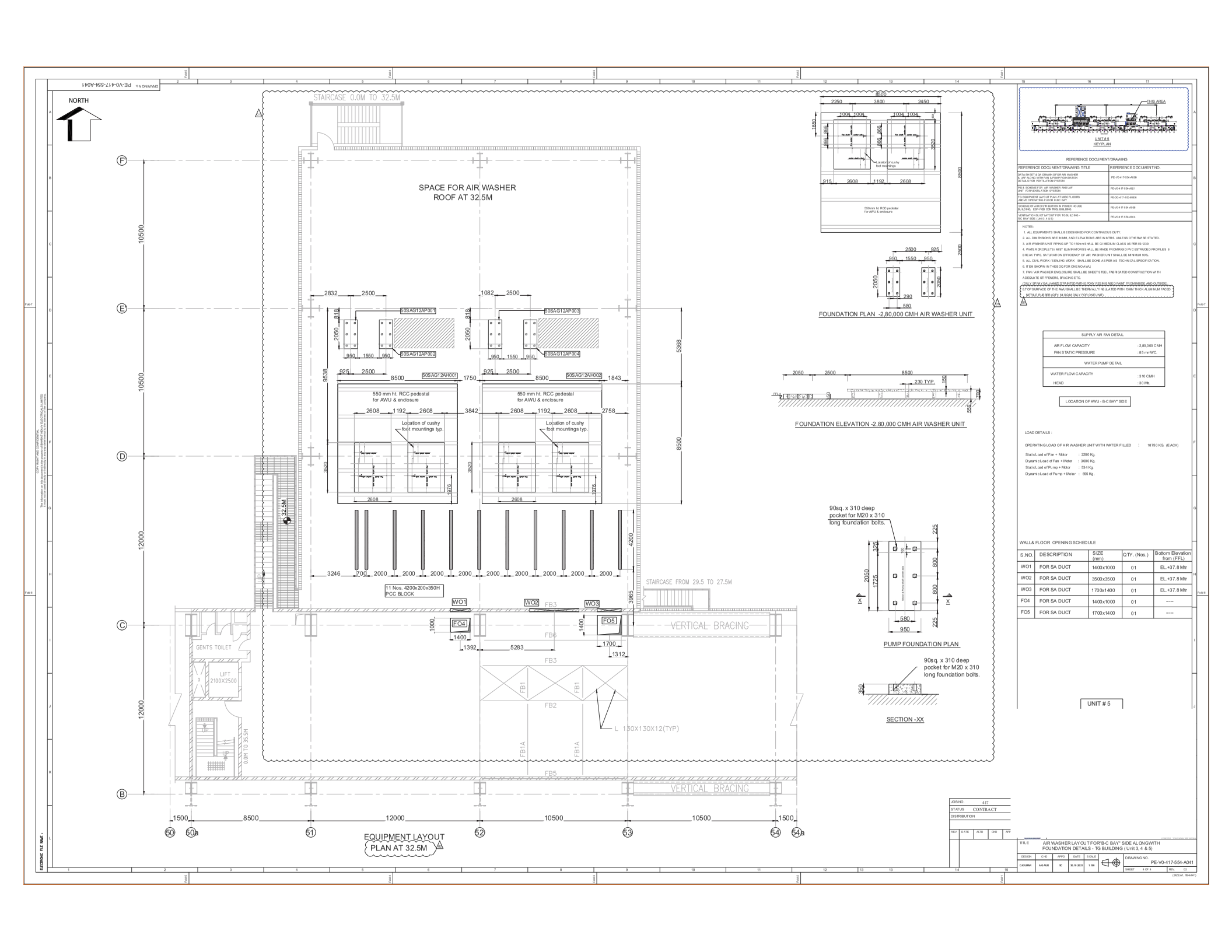


REFERENCE DOCUMENT/DRAWING

REFERENCE DOCUMENT/DRAWING TITLE	REFERENCE DOCUMENT NO.
DATA SHEET & GA DRAWING OF AIR WASHER & UAF ALONG WITH FAN & PUMP FOUNDATION DETAILS FOR VENTILATION SYSTEM	PE-V0-417-554-A009
P&ID SCHEME FOR AIR WASHER AND UAF UNIT FOR VENTILATION SYSTEM	PE-V0-417-554-A021
TG EQUIPMENT LAYOUT PLAN AT MISC FLOORS AND VE DITENTING FLOOR IN BG BAY	PE-00-417-10-A0006
SCHEME OF AIR DISTRIBUTION IN POWER HOUSE BUILDING, ESP, FGD CON TROL BUILDING	PE-V0-417-554-A058
VENTILATION DUCT LAYOUT FOR TG BUILDING - TIC BAY SIDE (Unit 3, 4 & 5)	PE-V0-417-554-A064

NOTES :

1. ALL EQUIPMENTS SHALL BE DESIGNED FOR CONTINUOUS DUTY.
2. ALL DIMENSIONS ARE IN MM. AND ELEVATIONS ARE IN MTRS. UNLESS OTHERWISE STATED.
3. AIR WASHER UNIT PIPING UP TO 150m n SHALL BE GI MEDIUM CLASS AS PER I S 3239.
4. WATER DROPLETS/ MIST ELIMINATORS SHALL BE MADE FROM RIGID PVC EXTRUDED PROFILES 6 BREAK TYPE. SATURATION EFFICIENCY OF AIR WASHER UNIT SHALL BE MINIMUM 90%.
5. ALL CIVIL WORK / DEALING WORK SHALL BE DONE AS PER A S TECHNICAL SPECIFICATION.
6. IT EM SHOWN IN THE DOG FOR ONE NO AWU.
7. FAN / AIR WASHER ENCLOSURE SHALL BE SHEET STEEL FABRICATED CONSTRUCTION WITH ADEQUATE STIFFENERS, BRACING ETC.
   - DOUBLY SKIN CASING MADE OF PRE-PAINTED GI SHEETS WITH EPOXY RESIN BASED PAINT FROM INSIDE AND OUTSIDE.
   - TOP SURFACE OF THE AWU SHALL BE THERMALLY INSULATED WITH 15MM THICK ALUMINIUM FACED NITRILE RUBBER (QTY. AS SUN ONLY FOR ONE UNIT).

SUPPLY AIR FAN DETAIL	
AIR FLOW CAPACITY	: 2,80,000 CMH
FAN S TATIC PRESSURE	: 85 mmWC.
WATER PUMP DETAIL	
WATER FLOW CAPACITY	: 310 CMH
HEAD	: 30 Mtr.

LOCATION OF AWU - B-C BAY" SIDE

LOAD DETAILS :

OPERATING LOAD OF AIR WASHER UNIT WITH WATER FILLED : 18750 KG. (EACH)

Static Load of Fan + Motor : 2200 Kg.
Dynamic Load of Fan + Motor : 3000 Kg.
Static Load of Pump + Motor : 534 Kg.
Dynamic Load of Pump + Motor : 695 Kg.

WALL& FLOOR OPENING SCHEDULE

S.NO.	DESCRIPTION	SIZE (mm)	QTY. (Nos.)	Bottom Elevation from (FFL)
WO1	FOR SA DUCT	1400x1000	01	EL +37.8 Mtr
WO2	FOR SA DUCT	3500x3500	01	EL +37.8 Mtr
WO3	FOR SA DUCT	1700x1400	01	EL +37.8 Mtr
FO4	FOR SA DUCT	1400x1000	01	----
FO5	FOR SA DUCT	1700x1400	01	----

JOB NO. 417
STATUS CONTRACT
DISTRIBUTION

REV.	DATE	ALTD	CHD	APP

TITLE AIR WASHER LAYOUT FOR"B-C BAY" SIDE ALONGWITH FOUNDATION DETAILS - TG BUILDING (Unit 3, 4 & 5)

DESIGN	CHD	APPD	DATE	SCALE
GAUHAR	ASAUR	JD	30.10.2021	1:100

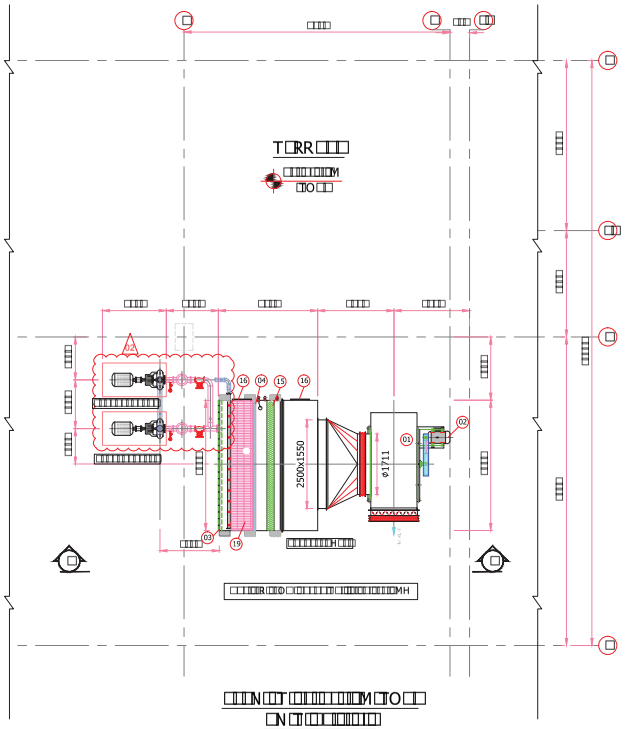
DRAWING NO. PE-V0-417-554-A041

SHEET 4 OF 4 REV. 02

(SIZE:A1, BW-841)

DRAWING NO. PE-V0-417-554-A041

ELECTRONIC FILE COPY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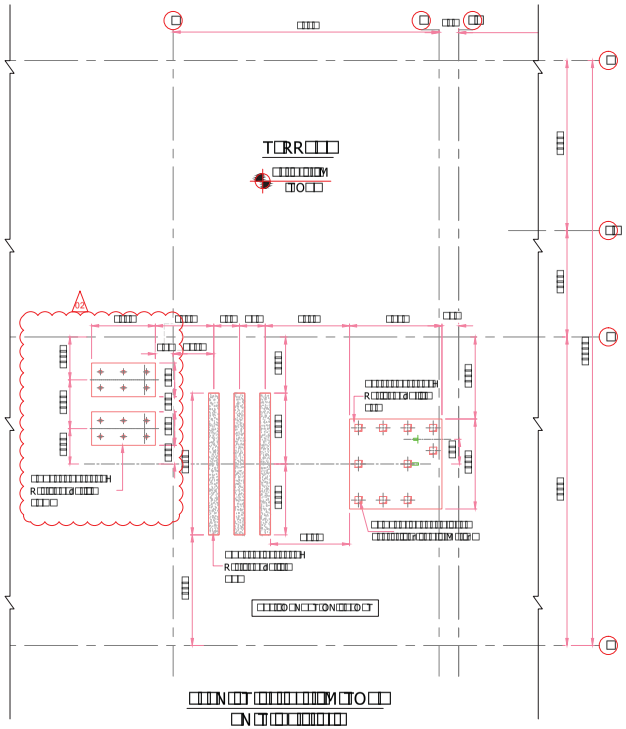

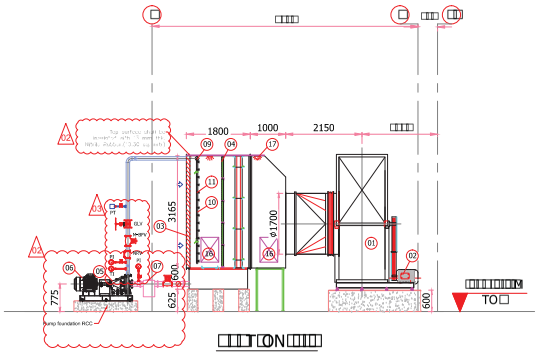
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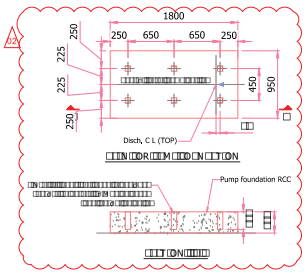
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650
250
225
225
250
450
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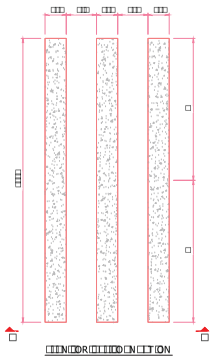
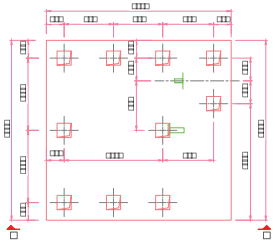
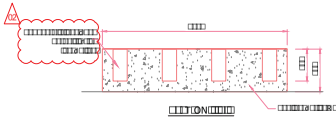
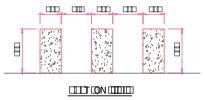
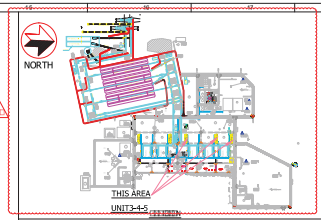
Disch. C.L (TOP)
Pump foundation RCC










NORTH
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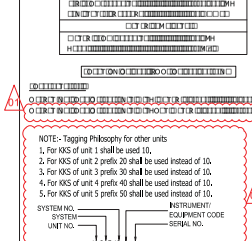
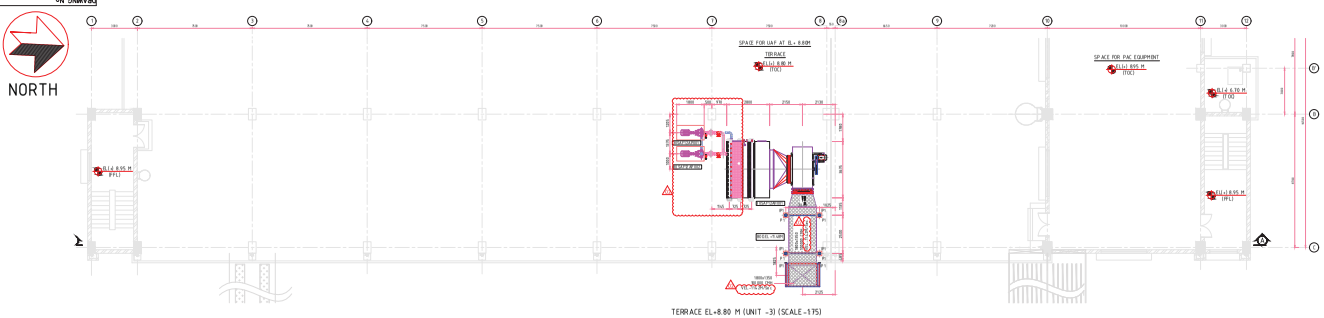
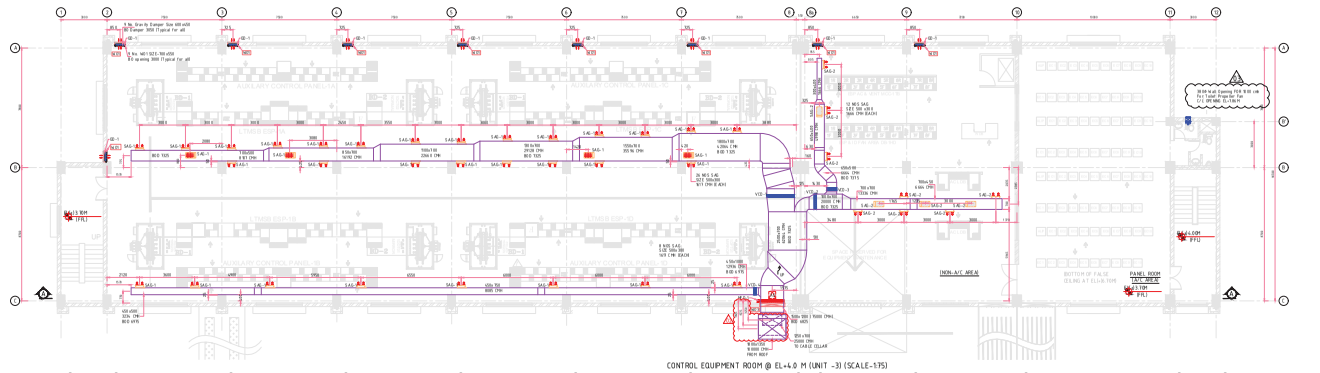
UNIT3-4-5

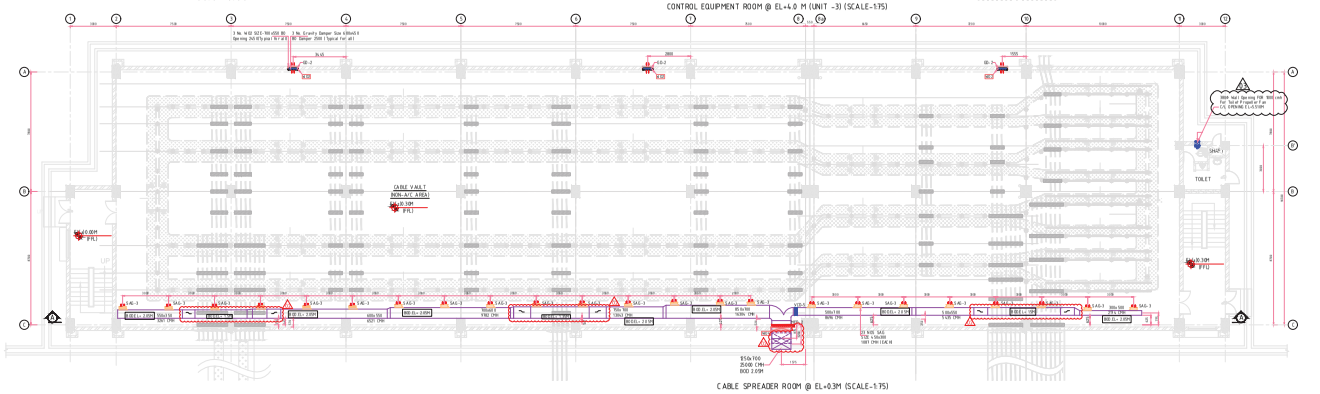

SYSTEM NO.
SYSTEM
UNIT NO.
INSTRUMENT/
EQUIPMENT CODE
SERIAL NO.
10 SAF 12 xx xxx
FOR UAF

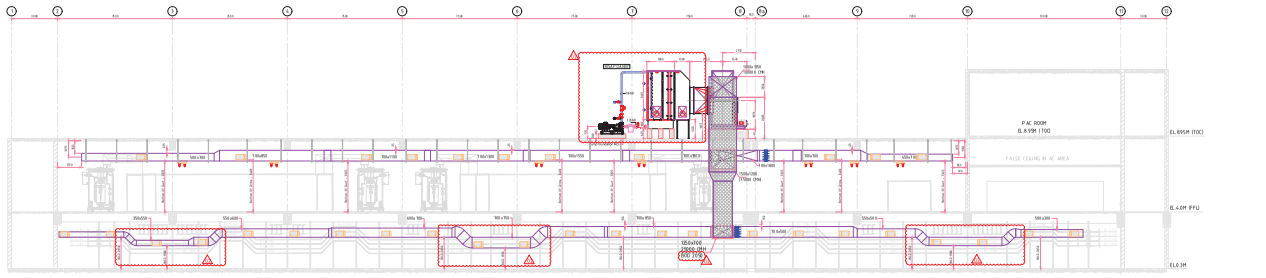
DRAWING No. PE-V0-4-17-554-A045

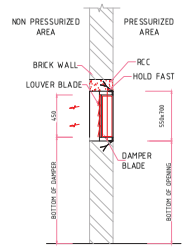
NORTH

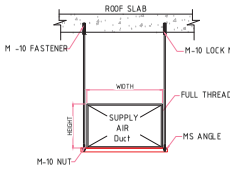


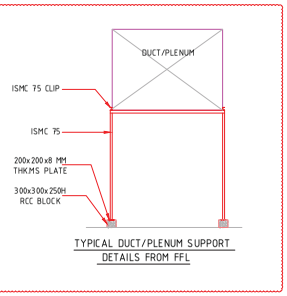


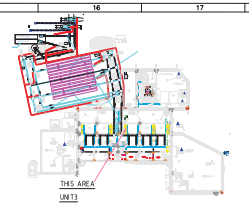












REFERENCE DOCUMENT/DRAWING	
REFERENCE DOCUMENT NO.	REFERENCE DOCUMENT/DRAWING TITLE
PE-V0-4-17-554-A009	DATA SHEET & GA DRAWING FOR AIR WASHER & UAF ALONG WITH FAN & PUMP FOUNDATION DETAILS FOR VENTILATION SYSTEM
PE-V0-4-17-554-A021	P&ID, SCHEME FOR AIR WASHER AND UAF UNIT FOR VENTILATION SYSTEM
PE-DG-4-17-100-E008	ELECTRICAL EQUIPMENT & CABLING LAYOUT IN ESP CONTROL ROOM BUILDING UNIT 1,2,3& & 5
PE-V0-4-17-554-A019	TYPICAL Details DUCT FABRICATION DRAWING / SUPPORT / ERECTION VENTILATION SYSTEM INSULATION OF DUCT / PIPING & EQUIPMENTS
PE-V0-4-17-554-A012	DATA SHEET FOR INSULATION FOR VENTILATION SYSTEM
PE-V0-4-17-554-A042	UAF LAYOUT ALONGWITH FOUNDATION DETAILS ESP BUILDING 1 Unit 3, 4 & 5
PE-DC-417-554-A001	DESIGN MEMORANDUM FOR VENTILATION SYSTEM
PE-DG-4-17-619-C001 TO C004	ESP CONTROL BUILDING ARCHITECTURAL PLAN, ELEVATION & SECTIONS FOR UNIT 1,2,3& & 5
PE-DG-4-17-619-C010	ESP CONTROL BUILDING UNIT- 1 TO 5) GA & RC DETAILS OF ROOF BEAMS
PE-DG-4-17-100-P001	PLOT PLAN

NOTES:

1. ALL DIMENSIONS ARE IN MM & LEVELS ARE IN METER UNLESS STATED OTHERWISE.
2. CONCRETE & MASONRY WORK/WALL CLADDING ARE IN BHEL SCOPE.
3. MINOR MODIFICATION IN DUCT CAN BE DONE AS SUIT AT SITE CONDITION
4. DUCT SUPPORT INSIDE BUILDING WILL BE TAKEN FROM EXISTING SLAB/STRUCTURE TO SUIT AT SITE CONDITION
5. MAXIMUM DUCT LOAD IS 150 KG PER RUNNING MTRS.
6. ALL BOTTOM LEVEL DIMENSIONS ARE GIVEN FROM FINISH FLOOR LEVEL.
7. LOCATION OF UFA & VENTILATION DUCT ROUTINGS ARE DONE AS PER BHEL INPUT DRAWINGS.
8. SPACING BETWEEN TWO SUPPORT/HANGER OF THE DUCT SHALL BE 2.0 M
9. REFER P & ID DRAWING FOR VALVES & INSTRUMENTS DETAILS.
10. TOP SURFACE OF THE UAF SHALL BE THERMALLY INSULATED WITH 19MM THICK ALUMINUM FACED NITRILE RUBBER (QTY. 10.5 SQM ONLY FOR ONE UNIT).

LEGENDS:-

SYMBOLE	DESCRIPTION
SA	Supply Air Grill
VCD	Volume Control Damper
MFD	Motorized Fire Damper
GD	Gravity Damper
WO	Wall Opening
AD	Access Door
INSU	Insulation
SAG	Supply Air Grille
BOD	Bottom of Duct
WO	Wall Opening
VCD	Volume Control Damper
MFD	Motorised Fire Damper
GD	Gravity Damper

NOTE:- Tagging Philosophy for other units
1. For AHS of unit 1 shall be used 16.
2. For AHS of unit 2 prefix 26 shall be used instead of 16.
3. For AHS of unit 3 prefix 36 shall be used instead of 16.
4. For AHS of unit 4 prefix 46 shall be used instead of 16.
5. For AHS of unit 5 prefix 56 shall be used instead of 16.

SYSTEM NO. / SYSTEM UNIT NO. / INSTRUMENT/ EQUIPMENT CODE / SERIAL NO. / FOR UAF

KKS TAGGING FOR UAF & PUMPS

TAG.No.	DESCRIPTION	FOR UNIT	QTY. (Nos.)
30SAP12AP001 TO 002	COOLING WATER PUMP	UNIT#3	02
30SAP12AH001	UAF	UNIT#3	01

WALL OPENING SCHEDULE

S.NO.	DESCRIPTION	SIZE (mm)	QTY.	Bottom Elevation from (FFL)
WO1	For Gravity Damper	700x550	9	EL.+6.70 Mtr
WO2	For Gravity Damper	700x550	3	EL.+2.75 Mtr
WO3	For Supply Air Duct	1650x1350	1	EL.+6.95 Mtr
WO4	For Supply Air Duct	1400x850	1	EL.+19.95 Mtr

BOQ OF SUPPLY AIRGRILLS

S.NO.	DESCRIPTION	SIZE (mm)	QTY.	FLOW (CMH) (Each)
SAG-1	SUPPLY AIR GRILL	500x300	34	1617
SAG-2	SUPPLY AIR GRILL	500x300	12	1666
SAG-3	SUPPLY AIR GRILL	450x300	23	1089

DUCTING BOQ UNIT 3

S.NO.	GAUGE	DUCT QTY SQM.)	INSULATION QTY. (SQM)
1	24	370	126
2	22	240	
3	20	200	
4	18	30	

BOQ OF VOLUME CONTROL DAMPERS

S.NO.	DESCRIPTION	SIZE (mm)	QTY.	FLOW (CMH)
VCD-1	Volume Control Damper	1800x700	1	42084
VCD-2	Volume Control Damper	1000x700	1	20000
VCD-3	Volume Control Damper	650x500	1	6654
VCD-4	Volume Control Damper	450x1000	1	12936
VCD-5	Volume Control Damper	500x700	1	8696

BOQ OF MOTORISED FIRE DAMPERS

S.NO.	DESCRIPTION	SIZE (mm)	QTY.	FLOW (CMH)
MFD-1	Motorised Fire Damper	1500x1200	1	75000
MFD-2	Motorised Fire Damper	1250x700	1	25000

BOQ OF GRAVITY DAMPERS

S.NO.	DESCRIPTION	SIZE (mm)	QTY.	Elevation from (FFL)
GD-1	Gravity Damper	600x450	9	EL.+6.95 Mtr
GD-2	Gravity Damper	600x450	3	EL.+2.8 Mtr

BOQ OF INSERT PLATE

S.NO.	DESCRIPTION	SIZE (mm)	QTY.	REMARKS
IP1	Insert Plate	200x200x8	6	ALL PLATE PROVIDE BY BHEL

RCC BLOCK SCHEDULE

S.NO.	DESCRIPTION	SIZE (MM) (L x W x H)	QTY. (Nos.)	REMARKS
P1	FOR SUPPLY AIR DUCT	300x300x250	4	

JOB NO.	417
STATUS	CONTRACT
DISTRIBUTION	

REV.	DATE	ALTD	CHD

VENTILATION DUCT LAYOUT FOR ESP BUILDINGS (Unit 3, 4 & 5)

DRN	DESIGN	CHD	APPD	DATE	SCALE
N.S	L.PAL	A. GAUR	S.V	02.04.21	1:50

DRAWING NO. PE-V0-4-17-554-A045

SHEET 1 OF 3 REV. 04

(SIZE: A0,841x1189)

ELECTRONIC FILE NAME

TDS OF FILTER

PUROMATIC
Committed to Excellence

Technical Data Sheet

ITEM	PRE FILTER (SS)	ANNEXURE	Page 1 of 6
CUSTOMER	TSGENCO R1	REF	2103092-TDS-A
PROJECT	5X800 MW YADADRI TPS	DATE	09.03.2021
PACKAGE	VENTILATION SYSTEMS	REV	R2
		DATE	10.03.2021

S.No.	Description	Specification
1	Manufacturer	As Per Approved Vendor R1
2	Frame type	Cassette/ Flange
3	Frame material	Al sheet 18 G (1.25 ± 0.12 mm) R1
4	Filter Media	Multiple layers of SS 316 wire mesh (mesh aperature 0.025mm max. and wire Dia 0.16 mm)
5	Media sealing	Epoxy R2
6	Test standard	BS:6540/ASHRAE-52-76/EN779
7	Face velocity	2.5 m/sec
8	Initial pressure drop	≤ 5 mm of WC
9	Final pressure drop	Up to 12 mm of WC R1
10	Average synthetic dust wt. arrestance (Equivalent Efficiency)	65% to 80% (90% down to 10 microns)
11	Aesthetics	Clean external surface, No adhesive on frame
12	Filter cleaning R1	Cleanable type with water spray

S.No.	Overall dimensions (mm) (H X W X D)	Flange Type Filter Face Area (mm)	Rated Flow (CMH)		Qty (Nos) R1
			For Cassette	For Flange	
1	610 X 610 X 50	550x550	3350	2733	PE-V0-417-554-A009 1

NOTE: As per the Test Standard the testing of filters will be done only for Average Synthetic Dust Weight Arrestance .

10/3/21

Puromatic Filters (P) Ltd. ★ 12 DSIDC Scheme-2, Okhla Ph-II ★ Authenticated By New Delhi-20 011-26388013-14

Puromatic Filters Pvt. Ltd.
12,DSIDC,Scheme-2,Okhla Industrial Area
Phase-2,New Delhi-110020,India
Telefax: +91-11-26388013,14,26389158
Email: sales@puromaticfilters.in
filters@puromaticfilters.in
Website: www.puromaticfilters.in

S.No.	ITEM	MATERIAL	QTY.	REMARKS
4.	GASKET	SOFTSPONGE FOAM	1 Set.	
3.	SEALING	EPOXY		
2.	FILTER MEDIA	SS WIRE MESH	1 Set.	
1.	FILTER FRAME	AL. SHEET 18 G	1 No.	

BILL OF MATERIAL

R1

R1

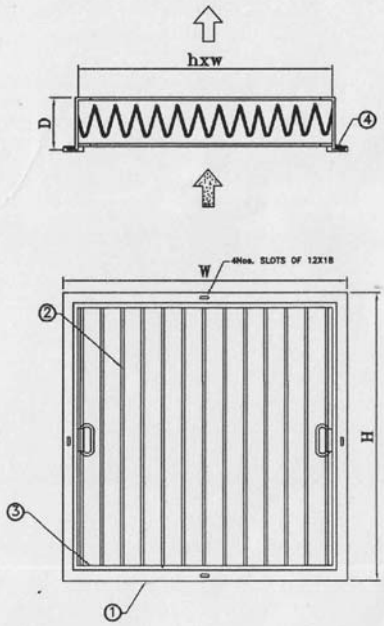
NOTE:-

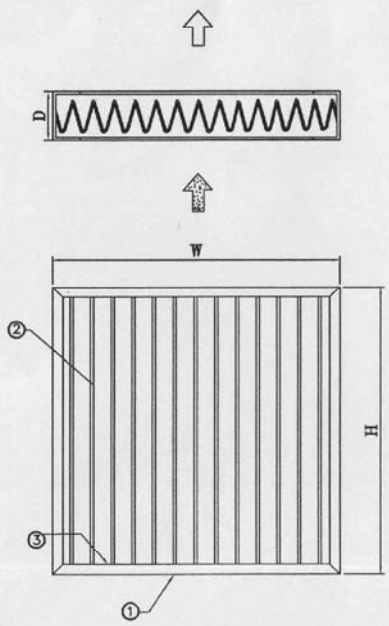
Sheet Thickness: Al. Sheet 18 G - 1.25 ± 0.12 mm

Filter Media: SS 316 Wire mesh, Multiple layers

(Aperture 0.025mm Max wire dia 0.16 mm)

R2





Filter Media (2)

DIMENSIONS FOR CASSETTE TYPE

H±3	W±3	D±2
610	610	50

DIMENSIONS FOR FLANGE TYPE

H±3	W±3	h±3	w±3	D±2
610	610	550	550	50

Puromatic Filters (P) Ltd. * 12, DSIDC Scheme-2, Okhla Ph-II * Authenticated By New Delhi-20 011-26388013-14

PROJECT: 5X800 MW YADADRI TPS	ITEM: PRE FILTER (SS)
PACKAGE: VENTILATION SYSTEMS	TYPE: CASSTTE/FLANGE

PUROMATIC FILTERS PVT.LTD.
12,DSIDC,Scheme-2,Okhla Industrial Area
Phase-2,New Delhi-110020,India
Telefax:+91-11-26388013,14,26389158
Email:sales@puromaticfilters.in
filters@puromaticfilters.in
web:www.puromaticfilters.in
CIN- U74899DL1992PTC048328

ALL DIMENSIONS ARE IN MM.			
DRWN. BY	MD	CHKD. BY	
DRG NO.2103092-GAD-A			
DATE: 09.03.2021			
REV: 01		DATE:10.03.2021	
Sheet No. 2 of 6			

1

Technical Data Sheet

ITEM	PRE FILTER	ANNEXURE	Page 3 of 6
CUSTOMER	TSGENCO R1	REF	2103092-TDS-B
PROJECT	5X800 MW YADADRI TPS	DATE	09.03.2021
PACKAGE	VENTILATION SYSTEMS	REV	R2
		DATE	10.03.2021

S.No.	Description	Specification
1	Manufacturer	As Per Approved Vendor R1
2	Frame type	Cassette / Flange
3	Frame material	GI sheet 18 G (1.25 ± 0.12 mm)
5	Spacers	Al sheet 20 G (0.91 ± 0.08 mm)
6	Filter Media	Synthetic non woven(fire retardant and resistant to moisture, fungi ,bacteria & frost) progressive density filter media having high dust holding capacity at lesser pressure drop with HDPE mesh on air entry side & Al expanded mesh on air exit side.
7	Filter Media Basic Weight/ Thickness	120 ± 10% GSM / > 4 mm
8	Media sealing	Epoxy
9	Test standard	BS:6540/ASHRAE-52-76/EN779
10	Face velocity	2.5 m/sec.
11	Initial pressure drop	≤ 5 mm of WC
12	Final pressure drop	Up to 10 mm of WC R1
13	Average synthetic dust wt. arrestance (Equivalent Efficiency)	65% to 80% (90% down to 10 microns)
14	Aesthetics	Clean external surface, No adhesive on frame
15	Filter cleaning	By compressed air/ water

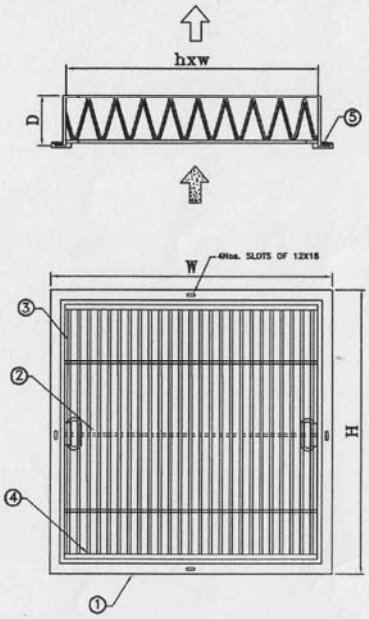
S.No.	Overall dimensions (mm) (H X W X D)	Flange Type Filter Face Area (mm)	Rated Flow (CMH)		Qty (Nos) R1
			For Cassette	For Flange	
1	610 X 610 X 50	550x550	3350	2733	PE-V0-417-554-A008

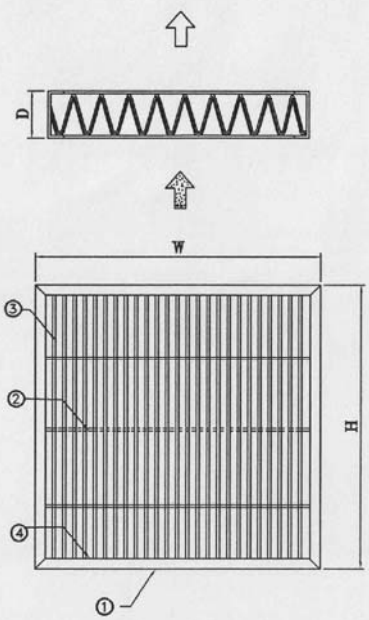
NOTE: As per the Test Standard the testing of filters will be done only for Average Synthetic Dust Weight Arrestance

10/3/21

Puromatic Filters (P) Ltd. ★ 12 DSIDC Scheme-2, Okhla Ph-II ★
Authenticated By New Delhi-20 011-26388013-14

Puromatic Filters Pvt. Ltd.
12,DSIDC,Scheme-2,Okhla Industrial Area
Phase-2,New Delhi-110020,India
Telefax: +91-11-26388013,14,26389158
Email: sales@puromaticfilters.in
filters@puromaticfilters.in
website: www.puromaticfilters.in





S.No.	ITEM	MATERIAL	QTY.	REMARKS
5	GASKET	SOFTSPONGE FOAM		
4.	SEALING	EPOXY		
3.	FILTER MEDIA	SYN. NONWOVEN	1 Set	
2.	SPACERS	AL. Sheet 20 G	As per list	
1.	FILTER FRAME	GI. Sheet 18 G	1 No.	

BILL OF MATERIAL

NOTE:-

FILTER MEDIA : Thickness >4 mm
Basic Weight -120 ± 10% GSM
Sheet Thickness: GI Sheet 18 G -1.25 ± 0.12 mm
AL.Sheet 20 G-0.91 ± 0.08 mm

10/3/21

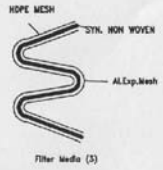
Puromatic Filters (P) Ltd. ★ 12 DSIDC Scheme-2, Okhla Ph-II ★
Authenticated By New Delhi-20 011-26388013-14

DIMENSIONS FOR CASSETTE TYPE

H	W	D	No. of Pleats(± 1)	No. of Spacers
610	610	50	22	3

DIMENSIONS FOR FLANGE TYPE

H	W	h	w	D	No. of Pleats(± 1)	No. of Spacers
610	610	550	550	50	20	3



PROJECT: 5X800 MW YADADRI TPS	ITEM: PRE FILTER
PACKAGE: VENTILATION SYSTEMS	TYPE: CASSTTE/FLANGE

PUROMATIC FILTERS PVT.LTD.
12,DSIDC,Scheme-2,Okhla Industrial Area
Phase-2,New Delhi-110020,India
Telefax:+91-11-26388013,14,26389158
Email:sales@puromaticfilters.in
filters@puromaticfilters.in
web:www.puromaticfilters.in
CIN- U74899DL1992PTC048328

ALL DIMENSIONS ARE IN MM.

DRWN. BY	MD	CHKD. BY

DRG NO.2103092-GAD-B
DATE: 09.03.2021
REV: 01 DATE: 10.03.2021
Sheet No. 4 of 6

Technical Data Sheet

ITEM	FINE FILTER	ANNEXURE	Page 5 of 6
CUSTOMER	TSGENCO R1	REF	2103092-TDS-C
PROJECT	5X800 MW YADADRI TPS	DATE	09.03.2021
PACKAGE	VENTILATION SYSTEMS	REV	R2
		DATE	10.03.2021

S.No.	Description	Specification
1	Manufacturer	As Per Approved Vendor R1
2	Frame type	Cassette / Flange
3	Frame material	GI sheet 18 G (1.25 ± 0.12 mm)
5	Spacers	Al sheet 20 G (0.91 ± 0.08 mm)
6	Filter Media	Synthetic non woven(fire retardant and resistant to moisture, fungi ,bacteria & frost) progressive density filter media having high dust holding capacity at lesser pressure drop with HDPE mesh on air entry side & Al expanded mesh on air exit side.
7	Filter Media Basic Weight/ Thickness	200 ± 10% GSM / > 1.5 mm
8	Media sealing	Epoxy
9	Test standard	BS:6540/ASHRAE-52-76/EN779
10	Face velocity	2.4 m/sec.
11	Initial pressure drop	≤ 10 mm of WC
12	Final pressure drop	Up to 18 mm of WC
13	Average synthetic dust wt. arrestance (Equivalent Efficiency)	>90% (99% down to 5 microns)
14	Aesthetics	Clean external surface, No adhesive on frame
15	Filter cleaning	By compressed air/ water

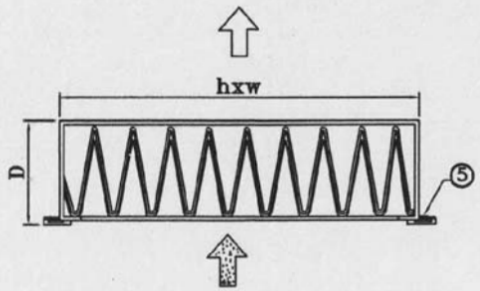
S.No.	Overall dimensions (mm) (H X W X D)	Flange Type Filter Face Area (mm)	Rated Flow (CMH)		Qty (Nos) R1
			For Cassette	For Flange	
1	610 X 610 X 305	550x550	3215	2613	PE-V0-417-554-A008

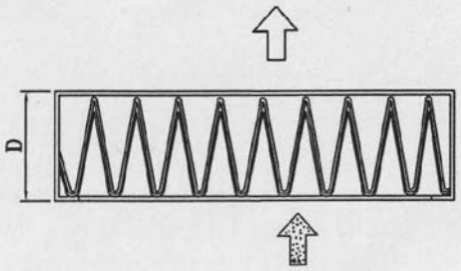
NOTE: As per the Test Standard the testing of filters will be done only for Average Synthetic Dust Weight Arrestance

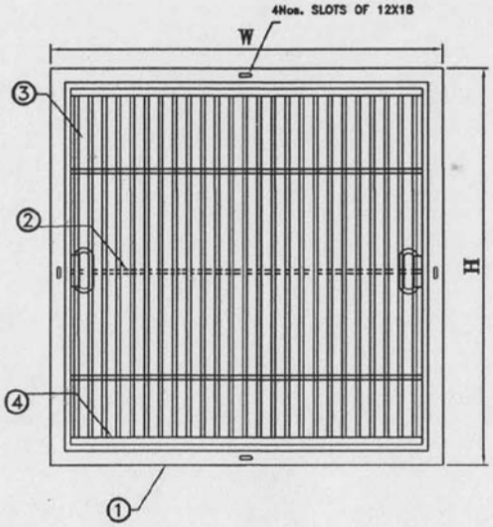
Puromatic Filters (P) Ltd. ★ 12 DSIDC Scheme-2 Okhla Ph-II ★ Authenticated By New Delhi-20 011-26388013-14

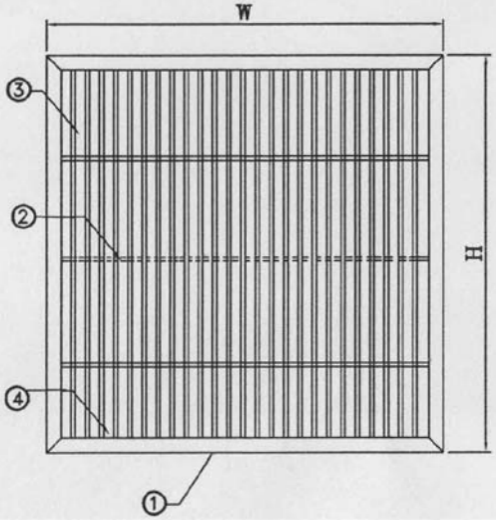
Puromatic Filters Pvt. Ltd.
12,DSIDC,Scheme-2,Okhla Industrial Area
Phase-2,New Delhi-110020,India
Telefax: +91-11-26388013,14,26389158
Email: sales@puromaticfilters.in
filters@puromaticfilters.in
website: www.puromaticfilters.in

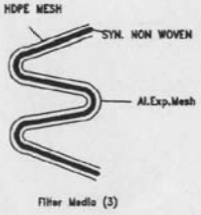
S.No.	ITEM	MATERIAL	QTY.	REMARKS
	BILL OF MATERIAL			
5	GASKET	SOFTSPONGE FOAM		
4.	SEALING	EPOXY		
3.	FILTER MEDIA	SYN. NONWOVEN	1 Set	
2.	SPACERS	AL. Sheet 20 G	As per list	
1.	FILTER FRAME	GI. Sheet 18 G	1 No.	











NOTE:-

FILTER MEDIA : Thickness >1.5 mm
Basic Weight -200 ± 10% GSM
Sheet Thickness: GI Sheet 18 G -1.25 ± 0.12 mm
AL.Sheet 20 G-0.91 ± 0.08 mm

DIMENSIONS FOR CASSETTE TYPE

H^{+3}_{-3}	W^{+3}_{-3}	$D^{\pm 2}$	No. of Pleats(± 1)	No. of Spacers
610	610	305	22	3

DIMENSIONS FOR FLANGE TYPE

H^{+3}_{-3}	W^{+3}_{-3}	h^{+3}_{-3}	w^{+3}_{-3}	$D^{\pm 2}$	No. of Pleats(± 1)	No. of Spacers
610	610	550	550	305	20	3

Authenticated By New Delhi-20 011-26388013-14
Puromatic Filters (P) Ltd. 12, DSIDC Scheme-2, Okhla Ph-II

PROJECT: 5X800 MW YADADRI TPS	ITEM: FINE FILTER
PACKAGE: VENTILATION SYSTEMS	TYPE: CASSTTE/FLANGE

PUROMATIC FILTERS PVT.LTD.
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filters@puromaticfilters.in
web:www.puromaticfilters.in
CIN- U74899DL1992PTC048328

ALL DIMENSIONS ARE IN MM.		
DRWN. BY	MD	CHKD. BY
DRG NO.2103092-GAD-C		
DATE: 09.03.2021		
REV: 01	DATE: 10.02.2021	
Sheet No. 6 of 6		

1.0. The main objectives of the Ventilation System are as per below :

1.1 To effectively remove the hot and stale air from the indoor space of the respective conditioned building.

1.2 To check and verify the designed / guaranteed parameters of the ventilation equipment.

2.0. Demonstration Methodology

The respective set of ventilation equipment and system is checked for the correctness of its mechanical installation and the electrical installation.

Now, the plant and equipments are put ON/started and the preliminary setting/adjusting of air volume control damper is completed. We shall continue for smooth and proper running of the plant equipment for next 30 minutes; before we start the measurement readings/ observations to be noted.

Following operational / performance parameters are to be recorded through the demonstration.

2.1 Current and voltage drawn by motor.

2.2 Bearing temperature of motors, fans and pumps to be measured.

2.3 Pressure develop by pump shall be measured and flow will be taken based on the shop witnessed characteristic curves. Necessary speed correction shall be done.

2.4 The air flow quantity shall be calculated by measuring velocity with help of anemometer / velometer in front of suction filters in a direction perpendicular to filter planes and at 1'' distance from the filter. Air washer room shall be closed while taking reading on Anemometer/Velometer. Velocity shall be measured at 5-7 transverse points across the filters to compute average velocity for flow calculation.

Test Capacity = Inlet suction Area x Average velocity.

2.5 Dry bulb temperature, wet bulb temperature of entering air before the air washer and leaving air just after the eliminators.

2.6 Vibration and noise level of centrifugal fans and associated motors to be measured.

The limit shall be as per QAP/Relevant standard.

2.7 Fan speed by tachometer of class +/-1% accuracy.

2.8 Noise level measurement for all tube axial fans. The limit shall be as per QAP/Relevant standard.

2.9 Auxiliary power consumption.

03. Test Instruments required :

a. Voltage and current shall be measured using tong tester of +/- 1% accuracy class.

b. Bearing temperature to be measured using thermometer of +/- 1% accuracy.

c. Dry bulb / wet bulb temperature shall be measured using sling psychrometer having thermometer of +/- 0.5% accuracy with a least count of 0.5 Deg. C.

d. Air flow of Centrifugal fans to be measured by Anemometer / Velometer.

e. Inclined -Tube Manometer for pressure drop across filters.

f. Calibration certificates for all test instruments shall be submitted.

ADVANCE VENTILATION (P) LIMITED * NFW DELHI *

04. Method of Calculation :

a. Saturation Efficiency % $= \frac{Te - T1}{Te - te} \times 100$

Design saturation efficiency for Air Washer & UAF shall be 90% and 60%

Where,
Te = Dry bulb temperature of air entering the Air Washer.
T1 = Dry bulb temperature of air leaving the Air Washer.
te = Wet bulb temperature of air entering the Air Washer.

Dry bulb & Wet bulb temperature measured by sling physchrometer shall be taken through moving air and continued till thermometer reading becomes steady.

Enclosure : "Record Form" for recording dry bulb/ wet bulb temp.
Note : Saturation (efficiency) measurement shall be done for other Air Washer also.

b. Power Consumption Calculation
Power measurement shall be by 3 phase clam on meter

P = W1 + W2
Whereas
P = Total Power
W1 = Power for Phase - 1
W2 = Power for Phase - 2

c. Vibration of various equipment:
Vibration level shall be measured by vibration level meter.

	Plane - X	Plane - Y	Plane - Z
D.E.			
N.D.E.			

d. Recording of noise of various equipment with the help of noise level meter, noise level shall be <85 db measured at 1.5 mtr. Distance.

OBSERVATIONS AND READINGS:

Bearing Temperature (deg. C)				
Time		FAN # 1	FAN # 2	
	DE			
	NDE			
Bearing Temperature (deg. C)				
Time		PUMP # 1	PUMP # 2	
	DE			
	NDE			
Sound Level (dbA)				
Time		FAN # 1	FAN # 2	
Fan Speed (rpm)				
Time		FAN # 1	FAN # 2	
Pressure drop across the filter (MM WC)				

Sr. No	**Guarantees Power Consumption**	**No. Of Equipment (working)**	**Total KW**
1	Air Washer Fan		
2	Air Washer Pump		
3	UAF Fan		
4	UAF Pump		
	Total :		

01. Outside Atmospheric Conditions :

Dry Bulb Temperature (DBT oa) :

Wet Bulb Temperature (WBT oa) :

02. Temperature conditions noted,
after the air washer / in the fan chamber :
Dry Bulb temperature (DBT a/aw)) :
Wet Bulb temperature (WBT a/aw) :

Designed Saturation efficiency	**90%**

So, Saturation Efficiency = $\frac{\text{DBT oa – DBT a/aw}}{\text{DBT oa – WBT a/aw}} \times 100$

= _____ x 100

= %

03. Air flow rate of evaporative air cooling machine / system.

Average velocity of air on air prefilters = | | | | | | | | = _____ / 12

= M/sec

Filter face area (cross section) = Sq. mts.

So, air quantity handled; CMH =

Designed Air flow rate, CMH	

Current drawn by individual motor of the machine :

Blower # 01, Amps. :

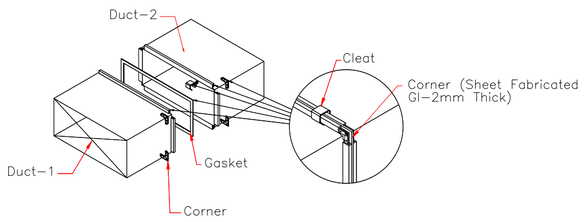
Blower # 02, Amps. :

Pump unit # 01, Amps. :

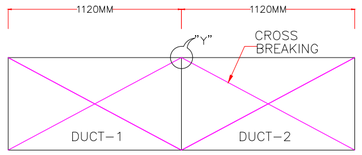
Pump unit # 02, Amps :

Rated current Amps.	
Rated current Amps.	
Rated current Amps.	
Rated supply voltage	415 volts.

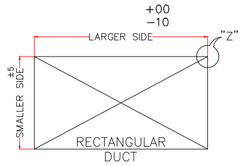
Supply Voltage ; Volts. :



TYPICAL TDF JOINT DETAIL – X
FACTORY FABRICATED DUCTING



DUCT JOINT (TYPE-A)

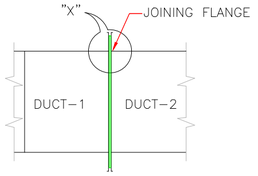


DUCT JOINT (CORNER DETAIL)
(FOR ALL DUCT)

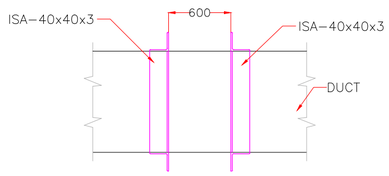
NOTE:–
ALL RECTANGULAR DUCT SHALL BE FLAT ON FACE AND DOUBLE SEAM JOINT (DETAIL–2) ON CORNER OF DUCT

NOTES:

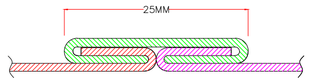
1. DUCT FABRICATION SHALL BE AS PER LATEST RELEVANT BIS/SMACNA STANDARD.
2. ALL FLANGE JOINTS SHALL HAVE 6 MM THK. RUBBER GASKET.
3. GI SHEET FOR DUCT SHALL BE AS PER IS:655 GRD 275 GSM. AS PER IS:277.
4. DUCT SUPPORT TO BE TAKEN PREFERABLY EXISTING ROOF, BEAMS, COLUMNS & WALL BEAMS.
5. DUCT SUPPORT & BRACING ANGLES ARE TO BE PRIMER PAINTED.
6. DISTANCE BETWEEN TWO DUCT SUPPORT ARE 2400 MM MAX.
7. TYPE OF TRANSVERSE JOINTS SHALL BE 40 MM X 40 MM X6 MM M.S. ANGLE CONNECTION.
8. SUITABLE DRAIN POINT WITH WATER TRAP SHALL BE PROVIDED FOR ALL WASHED AIR DUCT ROUTING AT SUITABLE PLACES, PREFERABLY AFTER AIR WASHER UNITS.
9. HANGERS FOR ALL DUCTS GREATER THAN2250 MM SHALL BE WITH 50 X 50 X 5 ANGLES AND RODS NOT LESS THAN 16 MM DIA.



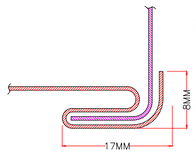
DUCT JOINT (TYPE-B)



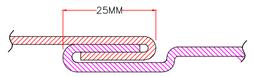
DETAILS OF STIFFENER BRACING



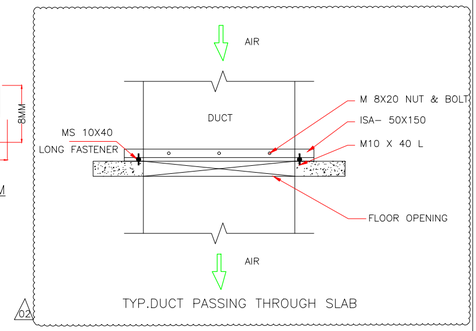
1D DRIVE SLIP
DETAIL–Y



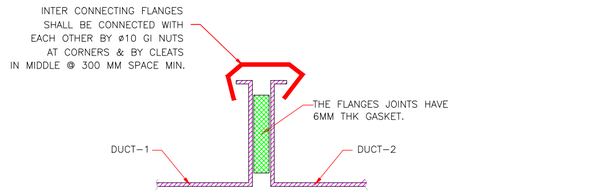
1J DOUBLE SEAM
DETAIL–Z



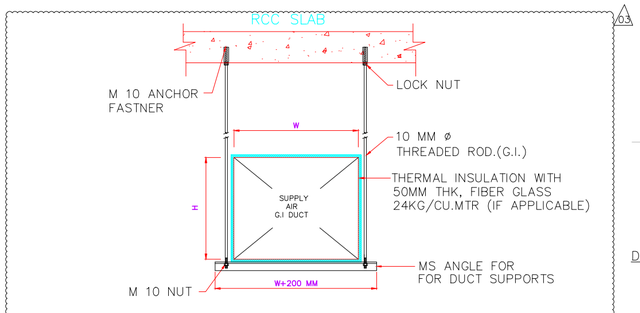
1A GROOVED SEAM
DETAIL–Y



TYP.DUCT PASSING THROUGH SLAB

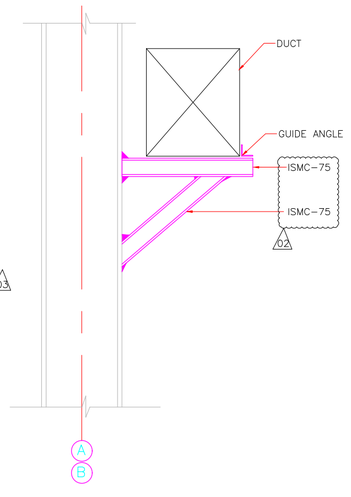


FLANGE JOINT
DETAIL–X

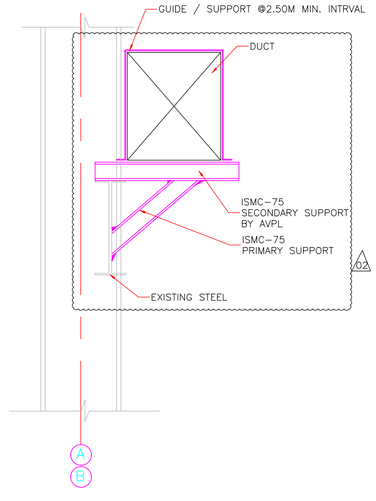


TYPICAL DUCT SUPPORTING ARRANGEMENT FROM CEILING

SCHEDULE OF SUPPORTS			
DUCT SIZE (LONGER SIDE) (MM)	M.S ANGLE SUPPORT	THREADED ROD.DIA (MM)	MAXIMUM SPACING (MM)
UP TO 750 MM	ISA:–25x25x3	10	2000
751 MM TO 1500MM	ISA:–32x32x3	10	2000
1501 MM TO 2200MM	ISA:–40x40x3	10	2000
2201 MM TO ABOVE	ISA:–40x40x5	10	2000

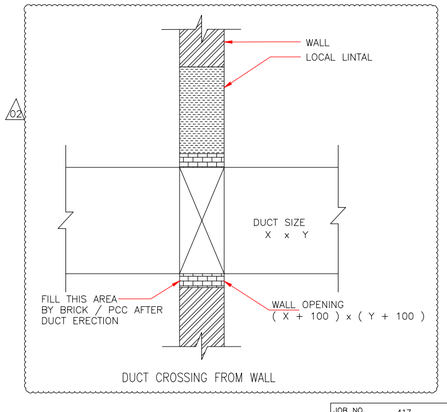


DUCT SUPPORT FROM
BUILDING COLUMN



DUCT SUPPORT BETWEEN COLUMN

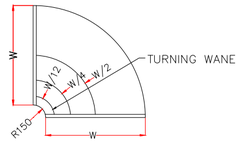
TYP.DUCT & PLENUM SUPPORT
DETAILS FROM FFL



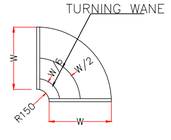
DUCT CROSSING FROM WALL

DETAIL OF DUCT SUPPORT		
LARGER SIDE OF DUCT	ANGLE	ø ROD (M.S)
UPTO 2250	ISA–40x40x6	10
ABOVE 2250	ISA–50x50x6	16

THICKNESS OF DUCT (G.I)	
LARGER SIDE OF DUCT	THICKNESS
UPTO 750	24G (0.63mm)
751 TO 1000	22G (0.8mm)
1001 TO 1500	22G (0.8mm)
1501 TO 2250	20G (1.0mm)
2251 & LARGER	18G (1.25mm)



"W" OVER 1000



"W" OVER 500 UP TO 1000 MM

"W" UP TO 500 MM

JOB NO.	417
STATUS	CONTRACT
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD

CUSTOMER: TELANGANA STATE POWER GENERATION CORPORATION LTD
TELANGANA, INDIA
5x800 MW YADADRI TPS, NALGONDA

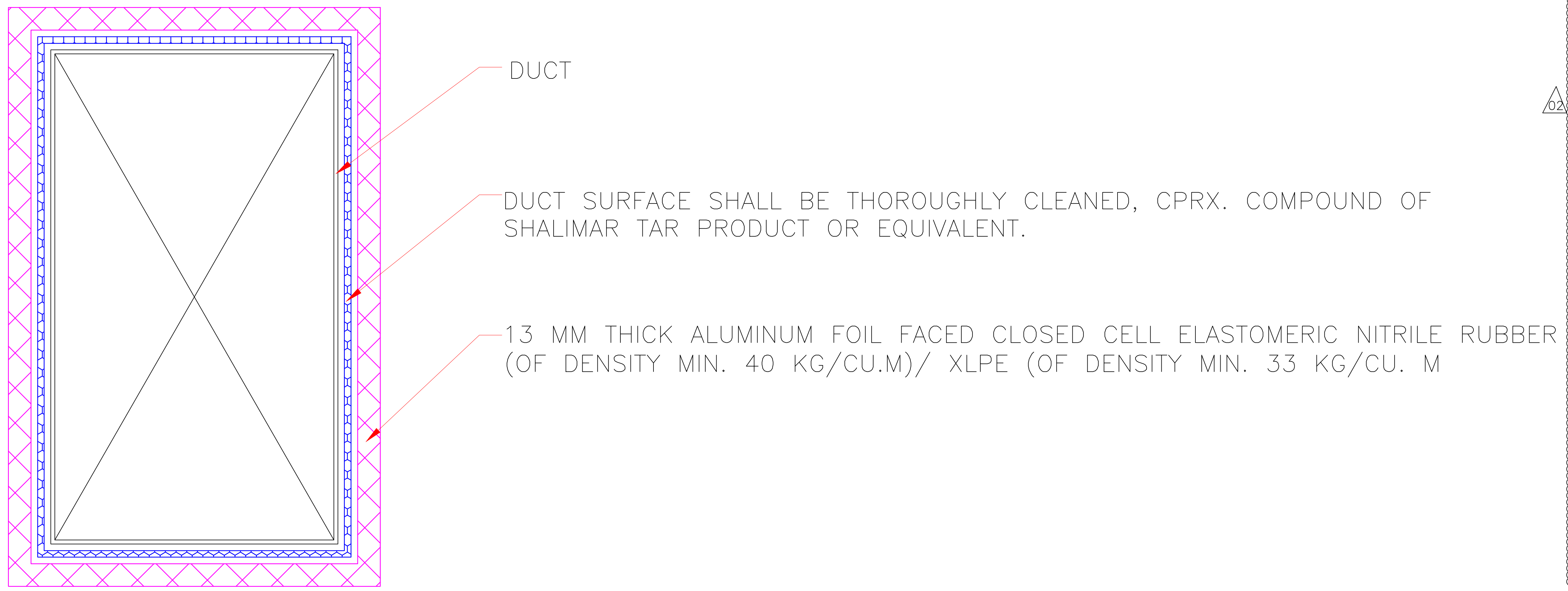
CONSULTANT: TATA CONSULTING ENGINEERS LIMITED
BANGALORE INDIA

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

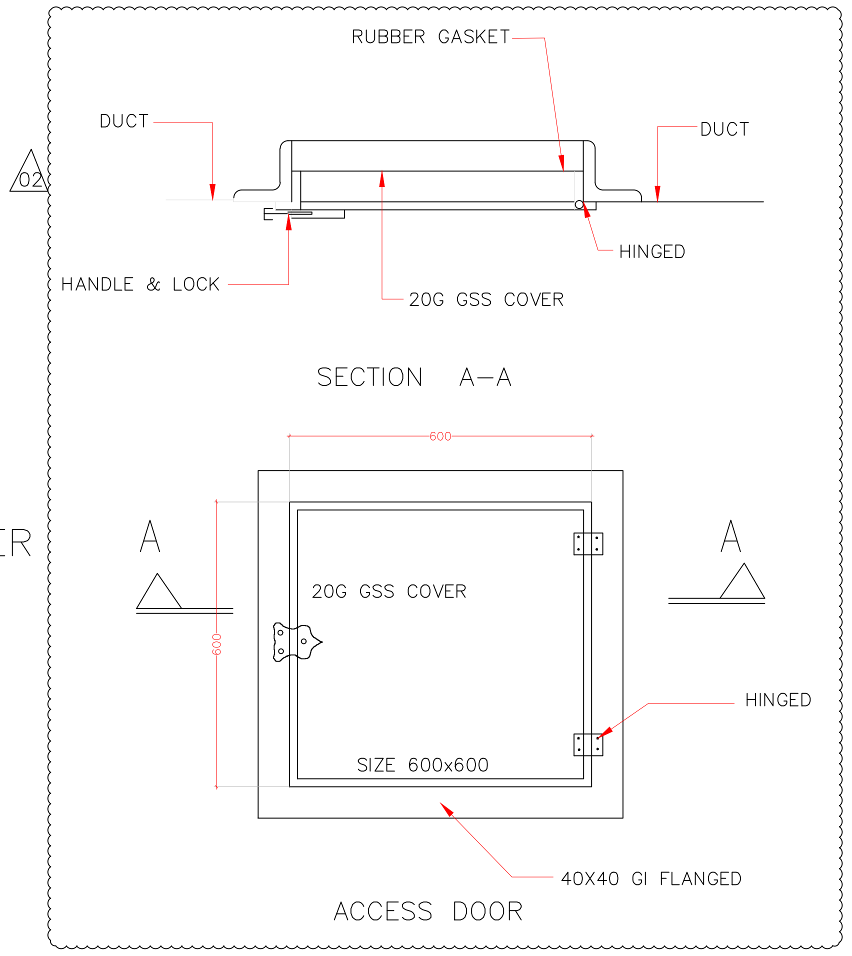
TITLE: TYPICAL DETAILS DUCT FABRICATION DRG/SUPPORT/EREC. FOR VENTILATION SYSTEM. INSULATION OF DUCT/PIPING & EQUIPMENT PIPE ERECTION

DRN	DESIGN	CHD	APPD	DATE	SCALE
U.S	A.GAUR	L.PAL	S.V.	04.01.2020	NTS

DRAWING NO. PE–V0–417–554–A019
SHEET 1 OF 2 REV. 03
SIZE–A2



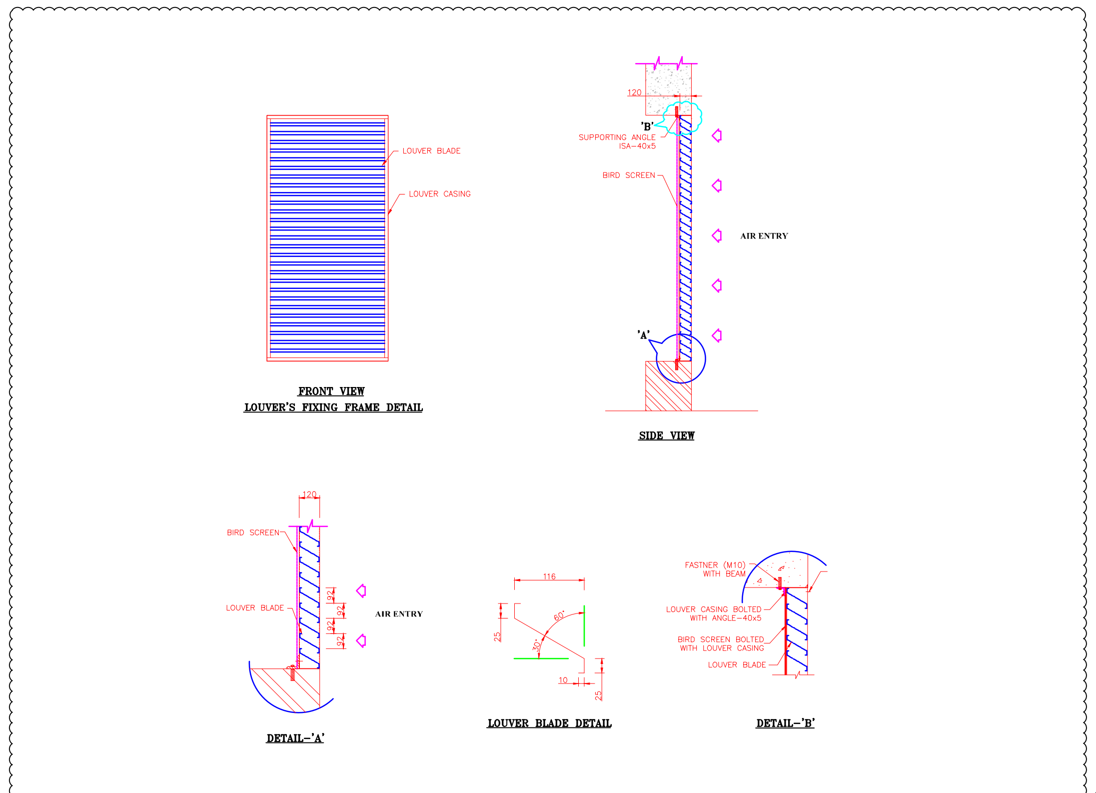
APPLICATION OF THERMAL INSULATION ON SUPPLY AIR EXPOSED DUCT (FOR VENTILATION DUCT OUTDOOR APPLICATION)



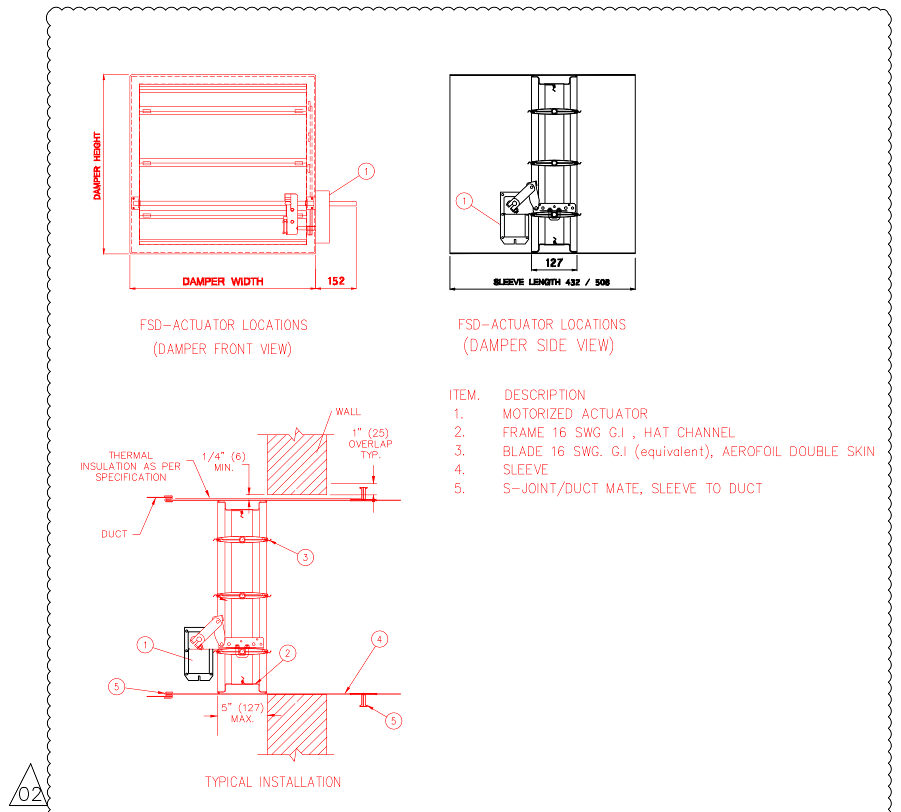
ACCESS DOOR

LEGEND :

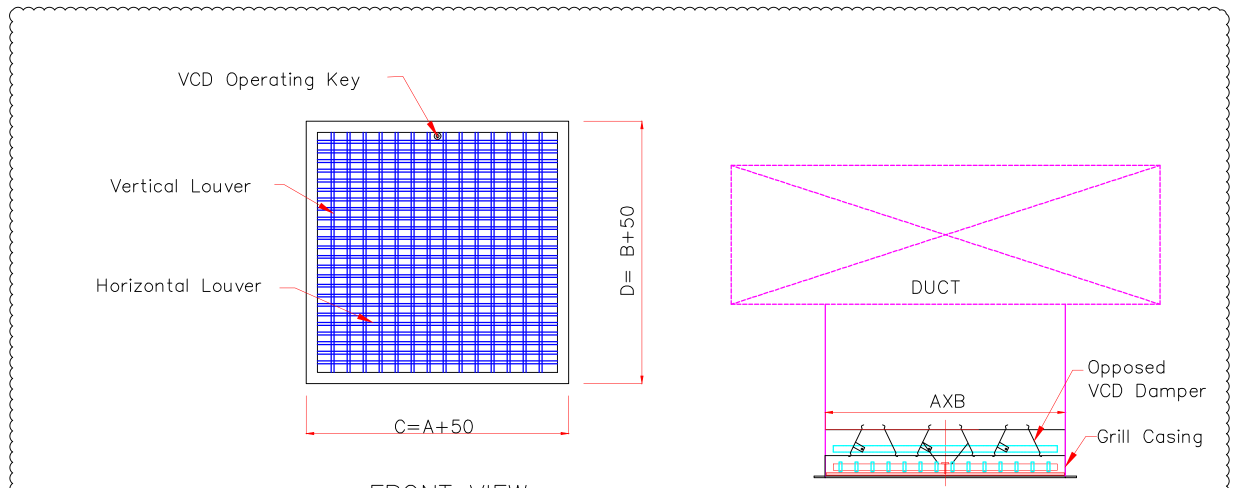
1. CPRX Product
2. Insulation Layer



FIXING DETAILS OF AIR INTAKE LOUVER

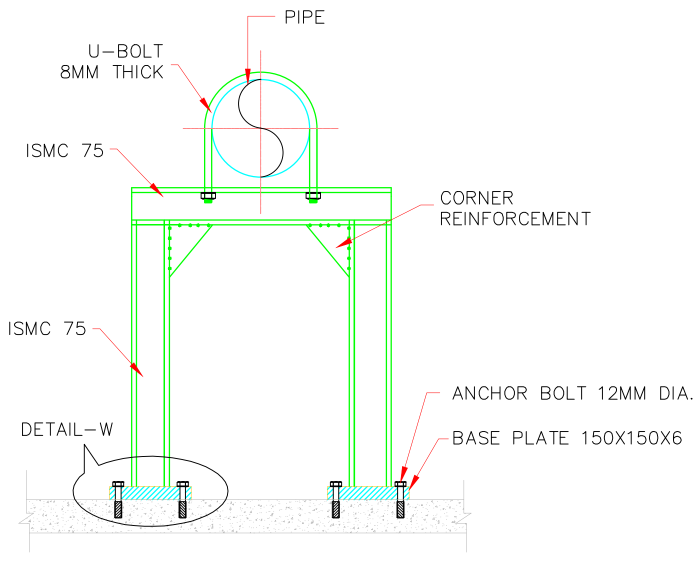


FIXING DETAILS OF MOTORIZED FIRE DAMPER

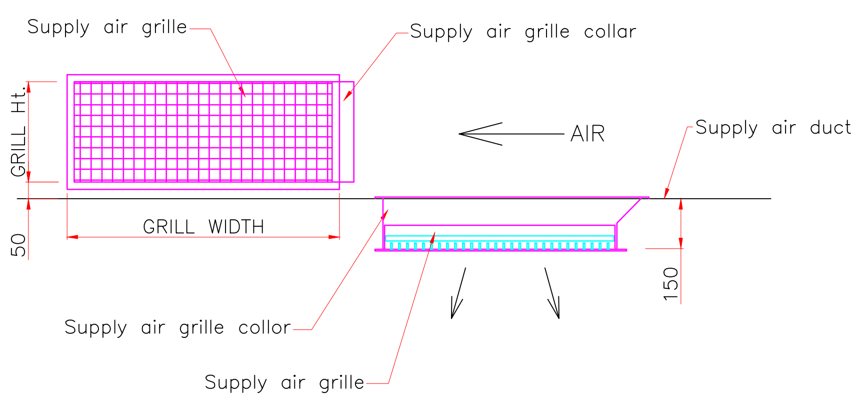


FRONT VIEW
SUPPLY AIR GRILLE

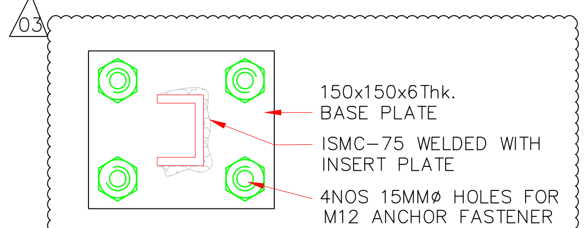
SIDE VIEW



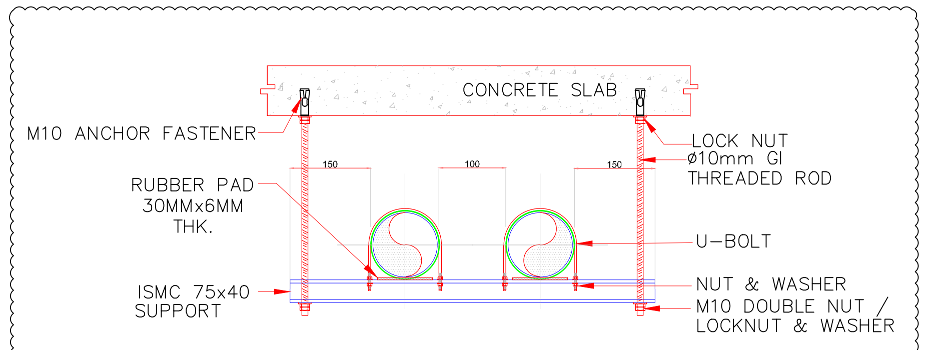
TYPICAL PIPE SUPPORTING DETAIL



FIXING DETAILS OF S.A COLLAR AND GRILL



TYPICAL MS PLATE GROUTED DETAILS
DETAIL–W



SUPPORT DETAILS OF WATER PIPE FROM CEILING (TYPICAL)

CUSTOMER:	TELANGANA STATE POWER GENERATION CORPORATION LTD TELANGANA, INDIA 5x800 MW YADADRI TPS, NALGONDA
CONSULTANT:	TATA CONSULTING ENGINEERS LIMITED BANGALORE INDIA
	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA

JOB NO. 417
STATUS CONTRACT
DISTRIBUTION

REV.	DATE	ALTD	CHD	APPD

TITLE: TYPICAL DETAILS DUCT FABRICATION DRG/SUPPORT/EREC. FOR VENTILATION SYSTEM. INSULATION OF DUCT/PIPING & EQUIPMENT PIPE ERECTION

DRN	DESIGN	CHD	APPD	DATE	SCALE
U.S	A.GAUR	L.PAL	S.V.	04.01.2020	NTS

DRAWING NO. PE–V0–417–554–A019
SHEET 2 OF 2 REV. 03
SIZE–A2

TYPICAL Instrument Schedule
(Stage2 i..e unit 3,4, 5 applicable)

Make of Instrument shall be
as per approved vendor list

Sr. No	Area	Abbr.	KKS Code No.	Instrument_Type	Service	Line size (mm)	Location	Manufacturer /Vendor Name	Instrument Range	PROCESS RANGE	SET POINT/CALIBRATION	Model Number	REF_P&ID_NO
GRID 8,10 -UNIT -1 A ROW SIDE									R3		R3		
1	HVAC	DPT	10SAG12CP019	DPT Diaphragam (Blind Type)	DPT Across Pot Strainer-1 For AWU-1	250	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	10SAG12CP020	DPT Diaphragam (Blind Type)	DPT Across Pot Strainer-2 For AWU-1	250	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	10SAG12CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	10SAG12CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	10SAG12CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Discharge Header For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	10SAG12CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Discharge Header For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	10SAG12CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-1	--	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	10SAG12CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-1	--	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	10SAG12CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-1	--	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	10SAG12CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-1	--	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	TG	10SAG12CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-1	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
12	HVAC	HS	10SAG12CU001	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	0.6	QFM2171	PE-V0-417-554-A021
13	HVAC	HS	10SAG12CU002	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	0.6	QFM2171	PE-V0-417-554-A021
14	HVAC	HS	10SAG12CU003	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	0.6	QFM2171	PE-V0-417-554-A021
15	HVAC	HS	10SAG12CU004	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	0.6	QFM2171	PE-V0-417-554-A021
16	HVAC	FM	10SAG12FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-1	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
17	HVAC	LT	10SAG12CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-1	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKPT03V5-2ACYY-0Y	PE-V0-417-554-A021
18	HVAC	LT	10SAG12CL012	(DP Type)Level Transmitter R3	LT -2 AT AWU Tank For AWU-1	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKPT03V5-2ACYY-0Y	PE-V0-417-554-A021
19	HVAC	PI	10SAG12CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-1	250	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
20	HVAC	PI	10SAG12CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-1	200	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
21	HVAC	PI	10SAG12CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-1	250	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
22	HVAC	PI	10SAG12CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-1	200	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
23	HVAC	TI	10SAG12CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-1	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

24	HVAC	TI	10SAG12CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-1	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
GRID 8,10 -UNIT -1 A ROW SIDE													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**		**PROCESS RANGE**	**SET POINT/CALIBRATION**	**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	10SAG13CP019	DPT Diaphagram (Blind Type)	DPT Across Pot Strainer-1 For AWU-2	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	10SAG13CP020	DPT Diaphagram (Blind Type)	DPT Across Pot Strainer-2 For AWU-2	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	10SAG13CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	10SAG13CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	10SAG13CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Discharge Header For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	10SAG13CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Discharge Header For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	10SAG13CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-2	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	10SAG13CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-2	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	10SAG13CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-2	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	10SAG13CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-2	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	10SAG13FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-2	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	10SAG13CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-2	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKPT03V5-2ACYY-0Y	PE-V0-417-554-A021
13	HVAC	LT	10SAG13CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-2	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKPT03V5-2ACYY-0Y	PE-V0-417-554-A021
14	HVAC	TG	10SAG13CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-2	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	10SAG12CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	10SAG12CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	10SAG12CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	10SAG12CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	10SAG12CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-2	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

20	HVAC	TI	10SAG12CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-2	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
GRID 21,23 -UNIT -2 A ROW SIDE													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**		**PROCESS RANGE**	**SET POINT/CALIBRATION**	**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	20SAG12CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-1	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	20SAG12CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-1	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	20SAG12CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	20SAG12CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	20SAG12CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Discharge Header For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	20SAG12CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Discharge Header For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	20SAG12CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-1	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	20SAG12CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-1	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	20SAG12CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-1	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	20SAG12CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-1	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	20SAG12FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-1	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	20SAG12CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-1	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	20SAG12CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-1	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	20SAG12CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-1	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	20SAG12CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	20SAG12CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	20SAG12CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	20SAG12CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	20SAG12CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-1	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	20SAG12CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-1	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
GRID 21,23 -UNIT -2 A ROW SIDE													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	20SAG13CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-2	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	20SAG13CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-2	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	20SAG13CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	20SAG13CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	20SAG13CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Discharge Header For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	20SAG13CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Discharge Header For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021

7	HVAC	PT	20SAG13CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-2	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	20SAG13CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-2	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	20SAG13CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-2	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	20SAG13CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-2	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	20SAG13FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-2	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	20SAG13CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-2	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	20SAG13CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-2	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	20SAG13CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-2	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	20SAG13CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	20SAG13CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	20SAG13CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	20SAG13CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	20SAG13CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-2	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	20SAG13CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-2	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

GRID 35,37 -UNIT -3 AROW SIDE

Sr. No	Area	Abbr.	KKS Code No.	Instrument_Type	Service	Line size (mm)	Location	Manufacturer /Vendor Name				Model Number	REF_P&ID_NO
1	HVAC	DPT	30SAG12CP019	DPT Diaphagram (Blind Type)	DPT Across Pot Strainer-1 For AWU-1	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	30SAG12CP020	DPT Diaphagram (Blind Type)	DPT Across Pot Strainer-2 For AWU-1	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	HS	30SAG12CU001	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	30SAG12CU002	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	HS	30SAG12CU003	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
6	HVAC	HS	30SAG12CU004	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
7	HVAC	PT	30SAG12CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	30SAG12CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	30SAG12CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Discharge Header For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	30SAG12CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Discharge Header For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	PT	30SAG12CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-1	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
12	HVAC	PT	30SAG12CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-1	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021

13	HVAC	PT	30SAG12CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-1	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
14	HVAC	PT	30SAG12CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-1	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
15	HVAC	FM	30SAG12FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-1	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
16	HVAC	LT	30SAG12CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-1	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
17	HVAC	LT	30SAG12CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-1	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
18	HVAC	TG	30SAG12CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-1	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
19	HVAC	PI	30SAG12CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
20	HVAC	PI	30SAG12CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
21	HVAC	PI	30SAG12CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
22	HVAC	PI	30SAG12CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
23	HVAC	TI	30SAG12CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-1	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
24	HVAC	TI	30SAG12CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-1	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
GRID 35,37 -UNIT -3 AROW SIDE													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	30SAG13CP019	DPT Diaphagram (Blind Type)	DPT Across Pot Strainer-1 For AWU-2	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	30SAG13CP020	DPT Diaphagram (Blind Type)	DPT Across Pot Strainer-2 For AWU-2	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	30SAG13CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	30SAG13CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	30SAG13CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Discharge Header For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	30SAG13CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Discharge Header For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	30SAG13CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-2	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	30SAG13CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-2	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	30SAG13CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-2	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	30SAG13CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-2	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	30SAG13FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-2	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	30SAG13CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-2	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	30SAG13CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-2	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	30SAG13CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-2	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	30SAG13CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	30SAG13CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021

17	HVAC	PI	30SAG13CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	30SAG13CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	30SAG13CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-2	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	30SAG13CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-2	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

GRID47,49 -UNIT -4 AROW SIDE

Sr. No	Area	Abbr.	KKS Code No.	Instrument_Type	Service	Line size (mm)	Location	Manufacturer /Vendor Name				Model Number	REF_P&ID_NO
1	HVAC	DPT	40SAG12CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-1	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	40SAG12CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-1	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	40SAG12CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	40SAG12CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	40SAG12CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Discharge Header For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	40SAG12CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Discharge Header For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	40SAG12CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-1	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	40SAG12CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-1	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	40SAG12CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-1	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	40SAG12CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-1	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	40SAG12FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-1	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	40SAG12CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-1	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	40SAG12CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-1	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	40SAG12CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-1	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	40SAG12CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	40SAG12CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	40SAG12CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	40SAG12CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	40SAG12CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-1	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	40SAG12CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-1	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

GRID47,49 -UNIT -4 AROW SIDE

Sr. No	Area	Abbr.	KKS Code No.	Instrument_Type	Service	Line size (mm)	Location	Manufacturer /Vendor Name				Model Number	REF_P&ID_NO
1	HVAC	DPT	40SAG13CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-2	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021

2	HVAC	DPT	40SAG13CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-2	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	40SAG13CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	40SAG13CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	40SAG13CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Discharge Header For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	40SAG13CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Discharge Header For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	40SAG13CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-2	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	40SAG13CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-2	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	40SAG13CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-2	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	40SAG13CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-2	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	40SAG13FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-2	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	40SAG13CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-2	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	40SAG13CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-2	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	40SAG13CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-2	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	40SAG13CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	40SAG13CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	40SAG13CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	40SAG13CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	40SAG13CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-2	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	40SAG13CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-2	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
GRID 60,62 -UNIT -5 A ROW SIDE													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	50SAG12CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-1	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	50SAG12CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-1	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	HS	50SAG12CU001	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	50SAG12CU002	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	HS	50SAG12CU003	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
6	HVAC	HS	50SAG12CU004	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
7	HVAC	PT	50SAG12CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	50SAG12CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	50SAG12CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Discharge Header For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	50SAG12CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Discharge Header For AWU-1	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021

11	HVAC	PT	50SAG12CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-1	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
12	HVAC	PT	50SAG12CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-1	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
13	HVAC	PT	50SAG12CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-1	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
14	HVAC	PT	50SAG12CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-1	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
15	HVAC	FM	50SAG12FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-1	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
16	HVAC	LT	50SAG12CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-1	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
17	HVAC	LT	50SAG12CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-1	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
18	HVAC	TG	50SAG12CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-1	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
19	HVAC	PI	50SAG12CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
20	HVAC	PI	50SAG12CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
21	HVAC	PI	50SAG12CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
22	HVAC	PI	50SAG12CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-1	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
23	HVAC	TI	50SAG12CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-1	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
24	HVAC	TI	50SAG12CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-1	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
GRID 60,62 -UNIT -5 A ROW SIDE													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	50SAG13CP019	DPT Diaphragm (Blind Type)	DPT Across Pot Strainer-1 For AWU-2	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	50SAG13CP020	DPT Diaphragm (Blind Type)	DPT Across Pot Strainer-2 For AWU-2	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	50SAG13CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	50SAG13CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	50SAG13CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Discharge Header For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	50SAG13CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Discharge Header For AWU-2	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	50SAG13CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-2	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	50SAG13CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-2	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	50SAG13CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-2	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	50SAG13CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-2	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	50SAG13FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-2	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	50SAG13CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-2	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	50SAG13CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-2	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	50SAG13CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-2	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

15	HVAC	PI	50SAG13CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	50SAG13CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	50SAG13CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	50SAG13CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-2	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	50SAG13CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-2	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	50SAG13CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-2	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

GRID 54,50 -UNIT -5 BC BAY													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	50SAG14CP019	DPT Diaphagram (Blind Type)	DPT Across Pot Strainer-1 For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	50SAG14CP020	DPT Diaphagram (Blind Type)	DPT Across Pot Strainer-2 For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	HS	50SAG14CU001	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	50SAG14CU002	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	PT	50SAG14CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2.5kg	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	50SAG14CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2.5kg	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	50SAG14CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2.5kg	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	50SAG14CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2.5kg	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	50SAG14CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	50SAG14CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	PT	50SAG14CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
12	HVAC	PT	50SAG14CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
13	HVAC	FM	50SAG14FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-3	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
14	HVAC	LT	50SAG14CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-3	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
15	HVAC	LT	50SAG14CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-3	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
16	HVAC	TG	50SAG14CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-3	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
17	HVAC	PI	50SAG14CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	50SAG14CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	PI	50SAG14CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
20	HVAC	PI	50SAG14CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
21	HVAC	TI	50SAG14CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-3	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
22	HVAC	TI	50SAG14CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-3	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

GRID 54,50 -UNIT -5 BC BAY													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	50SAG15CP019	DPT Diaphagram (Blind Type)	DPT Across Pot Strainer-1 For AWU-4	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	50SAG15CP020	DPT Diaphagram (Blind Type)	DPT Across Pot Strainer-2 For AWU-4	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	50SAG15CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	50SAG15CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	50SAG15CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Discharge Header For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	50SAG15CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Discharge Header For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	50SAG15CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-4	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	50SAG15CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-4	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	50SAG15CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-4	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	50SAG15CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-4	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021

11	HVAC	FM	50SAG15FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-4	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	50SAG15CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-4	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	50SAG15CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-4	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	50SAG15CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-4	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	50SAG15CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	50SAG15CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	50SAG15CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	50SAG15CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	50SAG15CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-4	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	50SAG15CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-4	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

GRID 11,15 -UNIT -1 BC BAY													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	10SAG14CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	10SAG14CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	HS	10SAG14CU001	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	10SAG14CU002	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	PT	10SAG14CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	10SAG14CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	10SAG14CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	10SAG14CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	10SAG14CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-3	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	10SAG14CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-3	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	PT	10SAG14CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-3	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
12	HVAC	PT	10SAG14CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-3	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
13	HVAC	FM	10SAG14FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-3	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
14	HVAC	LT	10SAG14CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-3	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
15	HVAC	LT	10SAG14CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-3	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
16	HVAC	TG	10SAG14CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-3	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
17	HVAC	PI	10SAG14CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	10SAG14CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	PI	10SAG14CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
20	HVAC	PI	10SAG14CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
21	HVAC	TI	10SAG14CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-3	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
22	HVAC	TI	10SAG14CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-3	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

GRID 11,15 -UNIT -1 BC BAY													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	10SAG15CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-4	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	10SAG15CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-4	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	10SAG15CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	10SAG15CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	10SAG15CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	10SAG15CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	10SAG15CP015	Pressure Transmitter(DP Type)	PT-1 Air Washer Plenum For AWU-4	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	10SAG15CP016	Pressure Transmitter(DP Type)	PT-2 AT Washer Plenum For AWU-4	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	10SAG15CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-4	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT		Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-4	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	10SAG15FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-4	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	10SAG15CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-4	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	10SAG15CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-4	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	10SAG15CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-4	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	10SAG15CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	10SAG15CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	10SAG15CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	10SAG15CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	10SAG15CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-4	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	10SAG15CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-4	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

GRID 11,15 -UNIT -2 BC WAY													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	20SAG14CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	20SAG14CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	20SAG14CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	20SAG14CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	20SAG14CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	20SAG14CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	20SAG14CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-3	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	20SAG14CP016	Pressure Transmitter(DP Type)	PT-2 AT Washer Plenum For AWU-3	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	20SAG14CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-3	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	20SAG14CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-3	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021

11	HVAC	FM	20SAG14FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-3	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	20SAG14CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-3	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	20SAG14CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-3	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	20SAG14CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-3	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	20SAG14CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	20SAG14CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	20SAG14CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	20SAG14CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	20SAG14CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-3	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	20SAG14CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-3	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

GRID 11,15 -UNIT -2 BC WAY													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	20SAG15CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-4	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	20SAG15CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-4	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	20SAG15CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	20SAG15CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	20SAG15CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	20SAG15CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	20SAG15CP015	Pressure Transmitter(DP Type)	PT-1 Air Washer Plenum For AWU-4	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	20SAG15CP016	Pressure Transmitter(DP Type)	PT-2 AT Washer Plenum For AWU-4	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	20SAG15CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-4	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	20SAG15CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-4	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	20SAG15FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-4	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	20SAG15CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-4	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	20SAG15CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-4	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	20SAG15CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-3	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	20SAG15CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	20SAG15CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	20SAG15CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	20SAG15CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	20SAG15CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-4	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	20SAG15CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-4	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
GRID 37,41 -UNIT -3 BC BAY													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	30SAG14CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	30SAG14CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	HS	30SAG14CU001	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	30SAG14CU002	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	PT	30SAG14CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1 For AWU-3	200	MPH Building	FUJI Electric	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	30SAG14CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-3	200	MPH Building	FUJI Electric	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	30SAG14CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header For AWU-3	200	MPH Building	FUJI Electric	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	30SAG14CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header For AWU-3	200	MPH Building	FUJI Electric	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	30SAG14CP015	Pressure Transmitter(DP Type)	PT-1 AT Air Washer Plenum For AWU-3	NA	MPH Building	FUJI Electric	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021

10	HVAC	PT	30SAG14CP016	Pressure Transmitter(DP Type)	PT-2 AT Air Washer Plenum For AWU-3	NA	MPH Building	FUJI Electric	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	PT	30SAG14CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-3	NA	MPH Building	FUJI Electric	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
12	HVAC	PT	30SAG14CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-3	NA	MPH Building	FUJI Electric	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
13	HVAC	FM	30SAG14FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-3	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
14	HVAC	LT	30SAG14CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-3	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
15	HVAC	LT	30SAG14CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-3	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
16	HVAC	TG	30SAG14CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-3	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
17	HVAC	PI	30SAG14CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	30SAG14CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	PI	30SAG14CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
20	HVAC	PI	30SAG14CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
21	HVAC	TI	30SAG14CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-3	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
22	HVAC	TI	30SAG14CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-3	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

GRID 37,41 -UNIT -3 BC BAY													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	30SAG15CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-4	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	30SAG15CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-4	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	30SAG15CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	30SAG15CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	30SAG15CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	30SAG15CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	30SAG15CP015	Pressure Transmitter(DP Type)	PT-1 Air Washer Plenum For AWU-4	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	30SAG15CP016	Pressure Transmitter(DP Type)	PT-2 AT Washer Plenum For AWU-4	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	30SAG15CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-4	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	30SAG15CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-4	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	30SAG15FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-4	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	30SAG15CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-4	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	30SAG15CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-4	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	30SAG15CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-4	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	30SAG15CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	30SAG15CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	30SAG15CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	30SAG15CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	30SAG15CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-4	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	30SAG15CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-4	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
GRID 37,41 -UNIT -4 BC BAY													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	40SAG14CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	40SAG14CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-3	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	40SAG14CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	40SAG14CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	40SAG14CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	40SAG14CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header For AWU-3	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	40SAG14CP015	Pressure Transmitter(DP Type)	PT-1 Air Washer Plenum For AWU-3	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	40SAG14CP016	Pressure Transmitter(DP Type)	PT-2 AT Washer Plenum For AWU-3	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	40SAG14CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-3	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	40SAG14CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-3	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	40SAG14FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-3	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	40SAG14CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-3	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	40SAG14CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-3	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021

14	HVAC	TG	40SAG14CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-3	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	40SAG14CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	40SAG14CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	40SAG14CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	40SAG14CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-3	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	40SAG14CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-3	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	40SAG14CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-3	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

GRID 37,41 -UNIT -4 BC BAY													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	40SAG15CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 For AWU-4	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	40SAG15CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 For AWU-4	NA	MPH Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	PT	40SAG15CP011	Pressure Transmitter(DP Type)	PT AT PUMP -1For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
4	HVAC	PT	40SAG15CP012	Pressure Transmitter(DP Type)	PT AT PUMP -2 For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
5	HVAC	PT	40SAG15CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	40SAG15CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header For AWU-4	200	MPH Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	40SAG15CP015	Pressure Transmitter(DP Type)	PT-1 Air Washer Plenum For AWU-4	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	40SAG15CP016	Pressure Transmitter(DP Type)	PT-2 AT Washer Plenum For AWU-4	NA	MPH Building	Honeywell	0-500mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	40SAG15CP017	Pressure Transmitter(DP Type)	PT-1 AT Outlet Of Centrifugal Air Fan For AWU-4	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	40SAG15CP018	Pressure Transmitter(DP Type)	PT-2 AT Outlet Of Centrifugal Air Fan For AWU-4	NA	MPH Building	Honeywell	0-1000mmwc	0-200mmwc	85mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	40SAG15FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For AWU-4	NA	MPH Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	40SAG15CL011	(DP Type)Level Transmitter	LT -1 AT AWU Tank For AWU-4	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	40SAG15CL012	(DP Type)Level Transmitter	LT -2 AT AWU Tank For AWU-4	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	40SAG15CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-3	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	40SAG15CP503	Pressure Indicator	PI -1 AT PUMP SUCTION AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	40SAG15CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	40SAG15CP505	Pressure Indicator	PI -3 AT PUMP SUCTION AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	40SAG15CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE AWU-4	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021

19	HVAC	TI	40SAG15CT501	Temperature Indicator	TI -1 AT Pump Discharge AWU-4	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	40SAG15CT502	Temperature Indicator	TI -2 AT Pump Discharge AWU-4	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
BHEL - YADRADRI (UAF Unit) UNIT-1 ESP BUILDING													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	10SAF12CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 Of UAF	NA	ESP Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	10SAF12CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 Of UAF	NA	ESP Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	HS	10SAF12CU001	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	10SAF12CU002	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	PT	10SAF12CP011	Pressure Transmitter(DP Type)	PT AT Pump -1 Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	10SAF12CP012	Pressure Transmitter(DP Type)	PT ATPump -2 Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	10SAF12CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	10SAF12CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	10SAF12CP015	Pressure Transmitter(DP Type)	PT-1 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	10SAF12CP016	Pressure Transmitter(DP Type)	PT-2 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	10SAF12FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line For Of UAF	NA	ESP Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	10SAF12CL011	(DP Type)Level Transmitter	LT -1 AT Sump Tank Of UAF	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	10SAF12CL012	(DP Type)Level Transmitter	LT -2 AT Sump Tank Of UAF	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	10SAF12CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge AWU-3	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	10SAF12CP503	Pressure Transmitter(DP Type)	PI -1 AT PUMP SUCTION UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	10SAF12CP504	Pressure Transmitter(DP Type)	PI -2 AT PUMP DISCHARGE UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	10SAF12CP505	Pressure Transmitter(DP Type)	PI -3 AT PUMP SUCTION UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	10SAF12CP506	Pressure Transmitter(DP Type)	PI -4 AT PUMP DISCHARGE UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	10SAF12CT501	Temperature Indicator	TI -1 AT Pump Discharge UAF	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	10SAF12CT502	Temperature Indicator	TI -2 AT Pump Discharge UAF	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
UAF UNIT -2 ESP BUILDING													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	20SAF12CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 Of UAF	NA	ESP Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	20SAF12CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 Of UAF	NA	ESP Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	HS	20SAF12CU001	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	20SAF12CU002	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	PT	20SAF12CP011	Pressure Transmitter(DP Type)	PT AT Pump -1 Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	20SAF12CP012	Pressure Transmitter(DP Type)	PT ATPump -2 Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	20SAF12CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	20SAF12CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	20SAF12CP015	Pressure Transmitter(DP Type)	PT-1 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021

10	HVAC	PT	20SAF12CP016	Pressure Transmitter(DP Type)	PT-2 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	20SAF12FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line Of UAF	NA	ESP Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	20SAF12CL011	(DP Type)Level Transmitter	LT -1 AT Sump Tank Of UAF	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	20SAF12CL012	(DP Type)Level Transmitter	LT -2 AT Sump Tank Of UAF	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	20SAF12CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge Of UAF	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	20SAF12CP503	Pressure Indicator	PI -1 AT PUMP SUCTION UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	20SAF12CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	20SAF12CP505	Pressure Indicator	PI -3 AT PUMP SUCTION UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	20SAF12CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	20SAF12CT501	Temperature Indicator	TI -1 AT Pump Discharge UAF	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	20SAF12CT502	Temperature Indicator	TI -2 AT Pump Discharge UAF	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

UAF UNIT -3 ESP BUILDING													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	30SAF12CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 Of UAF	NA	ESP Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	30SAF12CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 Of UAF	NA	ESP Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	HS	30SAF12CU001	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	30SAF12CU002	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	PT	30SAF12CP011	Pressure Transmitter(DP Type)	PT AT Pump -1 Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	30SAF12CP012	Pressure Transmitter(DP Type)	PT AT Pump -2 Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	30SAF12CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	30SAF12CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	30SAF12CP015	Pressure Transmitter(DP Type)	PT-1 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	30SAF12CP016	Pressure Transmitter(DP Type)	PT-2 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM		Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line Of UAF	NA	ESP Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	30SAF12CL011	(DP Type)Level Transmitter	LT -1 AT Sump Tank Of UAF	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	30SAF12CL012	(DP Type)Level Transmitter	LT -2 AT Sump Tank Of UAF	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	30SAF12CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge Of UAF	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	30SAF12CP503	Pressure Indicator	PI -1 AT PUMP SUCTION UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	30SAF12CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	30SAF12CP505	Pressure Indicator	PI -3 AT PUMP SUCTION UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	30SAF12CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	30SAF12CT501	Temperature Indicator	TI -1 AT Pump Discharge UAF	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	30SAF12CT502	Temperature Indicator	TI -2 AT Pump Discharge UAF	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

UAF UNIT -4 ESP BUILDING													
Sr. No	**Area**	**Abbr.**	**KKS Code No.**	**Instrument_Type**	**Service**	**Line size (mm)**	**Location**	**Manufacturer /Vendor Name**				**Model Number**	**REF_P&ID_NO**
1	HVAC	DPT	40SAF12CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 Of UAF	NA	ESP Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	40SAF12CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 Of UAF	NA	ESP Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	HS	20SAF12CU001	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	20SAF12CU002	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	PT	40SAF12CP011	Pressure Transmitter(DP Type)	PT AT Pump -1 Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	40SAF12CP012	Pressure Transmitter(DP Type)	PT AT Pump -2 Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	40SAF12CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	40SAF12CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	40SAF12CP015	Pressure Transmitter(DP Type)	PT-1 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021

10	HVAC	PT	40SAF12CP016	Pressure Transmitter(DP Type)	PT-2 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	40SAF12FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line Of UAF	NA	ESP Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	40SAF12CL011	(DP Type)Level Transmitter	LT -1 AT Sump Tank Of UAF	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	40SAF12CL012	(DP Type)Level Transmitter	LT -2 AT Sump Tank Of UAF	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	40SAF12CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge Of UAF	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	40SAF12CP503	Pressure Indicator	PI -1 AT PUMP SUCTION UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	40SAF12CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	40SAF12CP505	Pressure Indicator	PI -3 AT PUMP SUCTION UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	40SAF12CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	40SAF12CT501	Temperature Indicator	TI -1 AT Pump Discharge UAF	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	40SAF12CT502	Temperature Indicator	TI -2 AT Pump Discharge UAF	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

UAF UNIT -5 ESP BUILDING													
Sr. No	Area	Abbr.	KKS Code No.	Instrument_Type	Service	Line size (mm)	Location	Manufacturer /Vendor Name				Model Number	REF_P&ID_NO
1	HVAC	DPT	50SAF12CP019	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-1 Of UAF	NA	ESP Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
2	HVAC	DPT	50SAF12CP020	DPT Diaphragram (Blind Type)	DPT Across Pot Strainer-2 Of UAF	NA	ESP Building	Honeywell	0-6 kg /cm2	0 - 1 kg /cm2	0.5 kg /cm2	STD820-E1AC4AS-1-C-AHC-11C-F-11A0-F1,(PT)-0000	PE-V0-417-554-A021
3	HVAC	HS	20SAF12CU001	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	20SAF12CU002	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	PT	50SAF12CP011	Pressure Transmitter(DP Type)	PT AT Pump -1 Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
6	HVAC	PT	50SAF12CP012	Pressure Transmitter(DP Type)	PT AT Pump -2 Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
7	HVAC	PT	50SAF12CP013	Pressure Transmitter(DP Type)	PT-1 AT Pump Outlet Header Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
8	HVAC	PT	50SAF12CP014	Pressure Transmitter(DP Type)	PT-2 AT Pump Outlet Header Of UAF	100	ESP Building	Honeywell	0-6 kg /cm2	0-6 kg/cm2	2kg/cm2	YSTG74L-E1G000-1-C-AHC-11C-B-51A0-F1(PT)-0000	PE-V0-417-554-A021
9	HVAC	PT	50SAF12CP015	Pressure Transmitter(DP Type)	PT-1 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
10	HVAC	PT	50SAF12CP016	Pressure Transmitter(DP Type)	PT-2 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
11	HVAC	FM	50SAF12FM011	Flow Meter (Glass Tube Rotameter Type)	FM AT Makeup Line Of UAF	NA	ESP Building	INSTRUMENTATION ENGINEERS	0-15cmh	0-4cmh	8cmh	1140	PE-V0-417-554-A021
12	HVAC	LT	50SAF12CL011	(DP Type)Level Transmitter	LT -1 AT Sump Tank Of UAF	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
13	HVAC	LT	50SAF12CL012	(DP Type)Level Transmitter	LT -2 AT Sump Tank Of UAF	NA	MPH Building	Honeywell	0-600mm	0 - 500 mmwc	150mmwc	FKCT33V5-2ACYY-AA	PE-V0-417-554-A021
14	HVAC	TG	50SAF12CT503	Temperature Gauge (Bimetallic Type)	TG at Pump Discharge Of UAF	200	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
15	HVAC	PI	50SAF12CP503	Pressure Indicator	PI -1 AT PUMP SUCTION UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
16	HVAC	PI	50SAF12CP504	Pressure Indicator	PI -2 AT PUMP DISCHARGE UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
17	HVAC	PI	50SAF12CP505	Pressure Indicator	PI -3 AT PUMP SUCTION UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
18	HVAC	PI	50SAF12CP506	Pressure Indicator	PI -4 AT PUMP DISCHARGE UAF	NA	MPH Building	GIC	0-6kg/cm2	0-3 KG/CM2	0-6 KG	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L	PE-V0-417-554-A021
19	HVAC	TI	50SAF12CT501	Temperature Indicator	TI -1 AT Pump Discharge UAF	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021
20	HVAC	TI	50SAF12CT502	Temperature Indicator	TI -2 AT Pump Discharge UAF	NA	MPH Building	GIC	0-80 deg C	25-33 deg C	30 deg C	DT-V-15-S4S-C-50-S6S-15NTM- 0~80-DGC TW(TWBT-01-S6S-30-20-11-T15NTF T20NTM-150-50-4-0)	PE-V0-417-554-A021

FGD BUILDING SHALL HAVE 2 NO. UAFAND INSTRUMENTS SHALL BE AS APPROVED PID OF UAF

Name of Project	**TSGENCO -YADADRI TPS 5 x 800 MW AT VEERLAPALEM**
Package	**Ventilation System**
Document Title	**DATA SHEET OF PIPE FOR VENTILATION SYSTEM**

<table>
<tr><th>Sl. No.</th><th>DESCRIPTION</th><th colspan="3">SPECIFICATION</th></tr>
<tr><td>1.</td><td>Make</td><td colspan="3">As per approved Item Catagorisation and Sub Vendor List</td></tr>
<tr><td>2.</td><td>Material</td><td colspan="3">MS Heavy Class Galvanised,MS Black & GI,Seamless Carbon Steel</td></tr>
<tr><td>3.</td><td>Conforming To</td><td colspan="3">IS: 1239 upto 150 NB Pipe IS: 3589
beyond 150 NB and Fe 410 grade 2
IS:4736 for drain piping.</td></tr>
<tr><td rowspan="7">4.</td><td rowspan="7">Thickness</td><td colspan="3">As per IS: 3589 & Fe 410 grade 2</td></tr>
<tr><td>Nominal Pipe (mm)</td><td>Outside Diameter (mm)</td><td>Min Wall Thickness (mm)</td></tr>
<tr><td>200 NB</td><td>219.1</td><td>6</td></tr>
<tr><td>250 NB</td><td>273</td><td>6</td></tr>
<tr><td>300 NB</td><td>323.9</td><td>6</td></tr>
<tr><td>350 NB</td><td>355.6</td><td>6</td></tr>
<tr><td>400 NB</td><td>406.4</td><td>6</td></tr>
<tr><td colspan="4"></td></tr>
</table>

5.	Thickness	As per IS : 1239 GI Pipe Heavy Grade 150 NB or below

Nominal Pipe (mm)	Outside Diameter (mm)		Wall Thickness (mm)
	Max	Min	
150 NB	166.5	163.9	5.4
125 NB	140.8	138.5	5.4
100 NB	115.0	113.1	5.4
80 NB	89.5	88	4.8
65 NB	76.6	75.3	4.5
50 NB	60.8	59.7	4.5
40 NB	48.8	47.8	4
32 NB	42.9	42	4

6.	Thickness	As per IS 4736 MS Heavy (Drain Pipe)

Nominal Pipe (mm)	Outside Diameter (mm)		Wall Thickness (mm)
	Max	Min	
100 NB	115.0	113.1	5.4
80 NB	89.5	88	4.8
65 NB	76.6	75.3	4.5
50 NB	60.8	59.7	4.5
40 NB	48.8	47.8	4
32 NB	42.9	42	4

Sl. No.	DESCRIPTION	SPECIFICATION
7.	Density of pipe	7850 Kg/m3
8.	Pipe sizes	As per approved P & ID : PE- V0- 417-554-A021
9.	Quantity	Refer Air Washer & UAF Layout : PE-V0-417-554-A022/A023/ A024/A025/A040/A041/A042

Note: Tolerance shall be as per IS code : 1239/3589/4736.
Tolerance As per IS 1239/3589/4736=+-10%

Data sheet for Ducts

Sl. No.	DESCRIPTION	SPECIFICATION
01	Application	Low pressure air duct
02	Make	As per Approved Sub- Vendor List
03	Type	GI Sheet, Lock forming quality (LFQ)
04	Grade	Conforming to class 275 of IS : 277
05	Form factors	Conforming to IS : 655
06	Coating	180 GSM
07	Shape	Rectangular
08	Flange type	TDF / TDC, as applicable
09	Gauge wise thickness	0 to 2250 mm – 20 G 2251 to above – 18 G

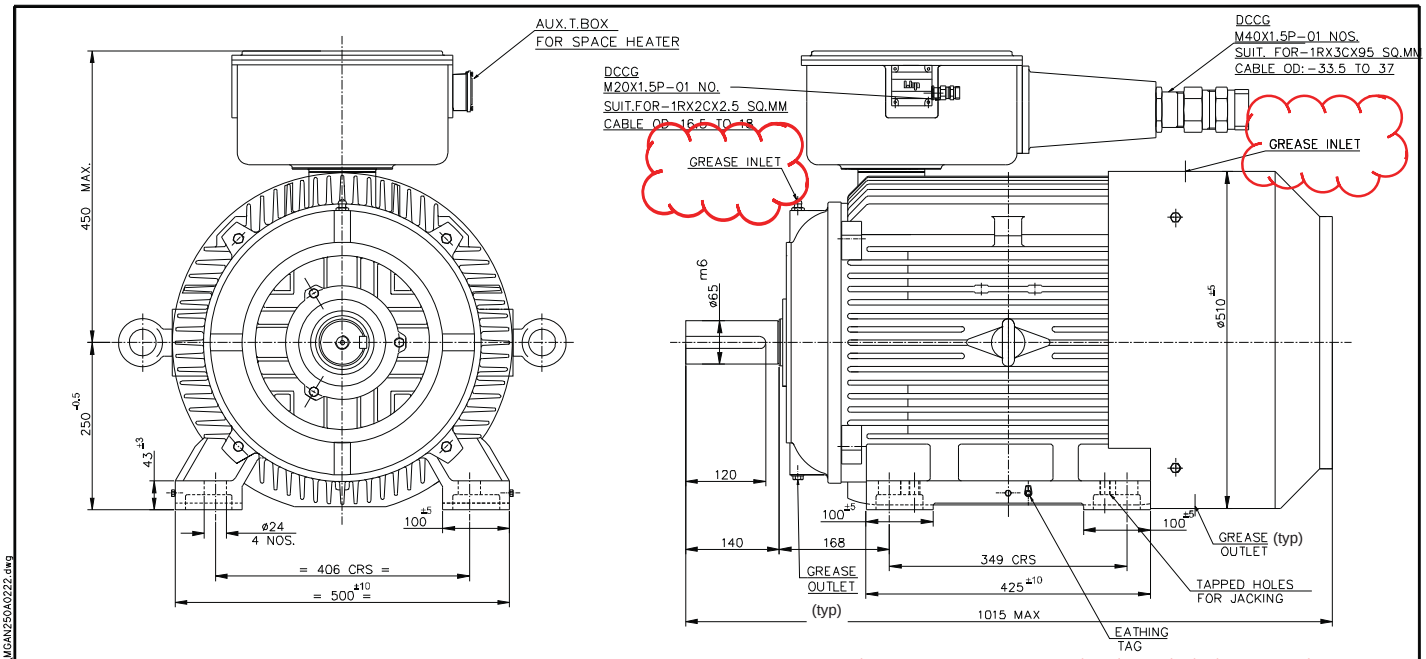
Note: For Battery room MS duct (as per IS: 513) with epoxy paint shall be provided

TYPICAL APPROVED TDS
OF MOTOR

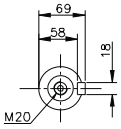
S. No.	Description	Data
A.	**General**	
1	Manufacturer & country of origin	LHPL INDIA
2	Motor type	SQIM
3	Type of starting	DOL
4	Name of the equipment driven by motor & Quantity	AWU FAN
5	Design ambient temperature	50°C
B.	**Design and Performance Data**	
1	Frame size & type designation	250M
2	Type of duty	CONTINUOUS (S1)
3	Rated Voltage	415V
4	Permissible variation for	
5	a Voltage	±10%
6	b Frequency	+3, -5%
7	c) Combined voltage & frequency	10%(ABSOLUTE)
8	Rated output at design ambient temp (by resistance method)	55KW
9	Synchronous speed & Rated slip	1500 & 0.013
10	Minimum permissible starting voltage	353V(85%)
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	2 SEC(LOAD GD^2=MOTOR GD^2)
13	b) At min starting voltage	3 SEC(LOAD GD^2=MOTOR GD^2)
14	Locked rotor current as percentage of FLC (including IS tolerance)	900%
15	Torque	
	a) Starting	215%
	b) Maximum	280%
16	Permissible temp rise at rated output over ambient temp & method	70°C BY RESISTANCE METHOD
17	Noise level at 1.0 m (dB	AS PER I.S.-12065
18	Amplitude of vibration	AS PER I.S.-12075
19	Efficiency & P.F. at rated voltage & frequency	IE3
	a) At 100% load	94.6% & 0.87
	c) At 75% load	93.6% & 0.85

S. No.	Description	Data
	c) At starting	N.A & 0.5
C.	**Constructional Features**	
1	Method of connection of motor driven equipment	DIRECT COUPLING
2	Applicable Standard	IS-12615-2011, IS/IEC 60034-1
3	DOP of Enclosure	I.P.-55
4	Method of cooling	TEFC
5	Class of insulation	CLASS 'F', WITH TEMP RISE LIMITED TO CLASS 'B'……R1
6	Main terminal box	
	a) Type	IP:55
	b) Power Cable details (Conductor, size, armour/unarmour)	AS PER GAD
	c) Cable Gland & lugs details (Size, type & material)	:AS PER GAD
	d) Permissible Fault level (kArms & duration in sec)	50KA FOR 0.25 SEC
7	Space heater details (Voltage & watts)	75W,240V,1PH
8	Flame proof motor details (if applicable)	
	a) Enclosure	TEFC
	b) suitability for hazardous area	
	i Zone	N.A.
	ii Group	N.A.
9	No. of Stator winding	6 LEAD
10	Winding connection	DELTA
11	Kind of rotor winding	SQIM
12	Kind of bearings	DGBB
13	Direction of rotation when viewed from NDE	BIDIRECTIONAL
14	Paint Shade & type	692 of IS-5
15	Net weight of motor	Approx. 687 KG
16	Outline mounting drawing No (To be enclosed as annexure)	ENCLOSED
D.	**Characteristic curves/ drawings** (To be enclosed for motors of rating 1.5KW)	
	a) Torque speed characteristic	ENCLOSED
	b) Thermal withstand characteristic	ENCLOSED
	c) Current vs time	ENCLOSED
	d) Speed vs time	ENCLOSED

NOTE : 1. ALL PERFORMANCE FIGURES ARE SUBJECT TO IEC 60034-1 TOLERANCES.
2. Bearing Lubrication is Pre-Lubricated with external lubrication system.
3. Motor is designed to run at 75% rated voltage for 300 sec.



Note: The motor are supplied with lubricated bearings and also have the provision for external greasing.



SHAFT END DETAILS

SPECIFICATION:-

KW/HP	55/75
POLE	4
BEARING DE SIDE	6314.C3
BEARING NDE SIDE	6214.C3

MATERIAL OF CONSTRUCTION:-

FRAME	CAST IRON
END COVER (DE)	CAST IRON
END COVER (NDE)	CAST IRON
T. BOX	CAST IRON/M.S
T. BOX COVER	CAST IRON/M.S
SHAFT	CARBON STEEL

REV. NO.	DETAIL OF CHANGE	DATE.	INTL.
02			
01			

UNMENTIONED TOLERANCES ARE AS PER IS:2102-1/ ISO 2768-1

LINEAR DIMNS.	OVER & UPTO	0.5-3	3-6	6-30	30-120	120-400	400-1000	1000-2000	
	TOLERANCE	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	
ANGULAR DIMNS.	PERMISSIBLE DEVIATIONS FOR LENGTHS OF THE SHORTER SIDE OF THE ANGLE.								
	OVER & UPTO	0-10	10-50	50-120	120-400	400.....			
	TOLERANCE	±1°	±0°30'	±0°20'	±0°10'	±0°5'			

TITLE

GENERAL ARRANGEMENT DRAWING FOR 250M FRAME FOOT MOUNTED MOTOR(SP)

Laxmi Hydraulics Pvt.Ltd. SOLAPUR
Website : www.lhp.co.in

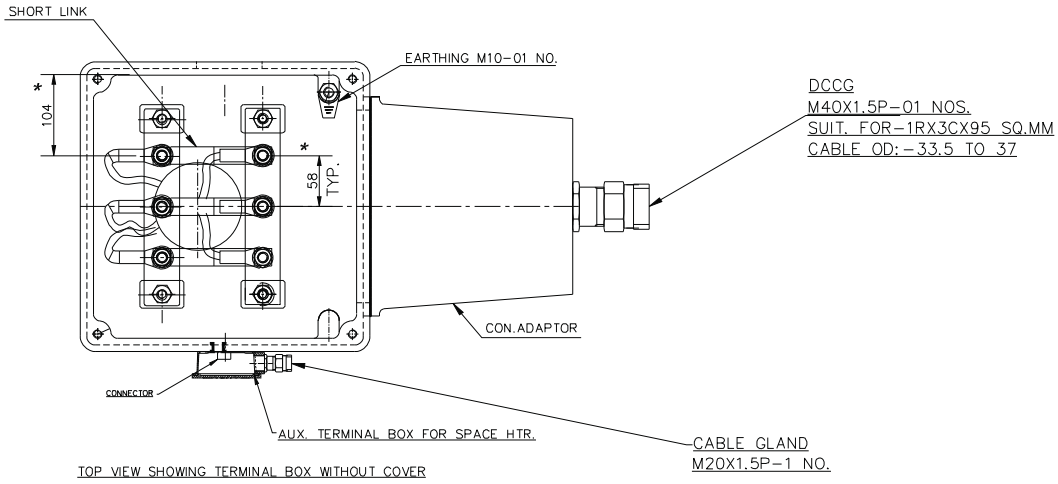
UNLESS OTHERWISE SPECIFIED ALL DIMNS. ARE IN MM. | DO NOT SCALE THE DRAWING.

	NAME.	DATE.
DGN.		
DRN.	VIVEK	28.10.18
CHD.		28.10.18
APPD.		28.10.18

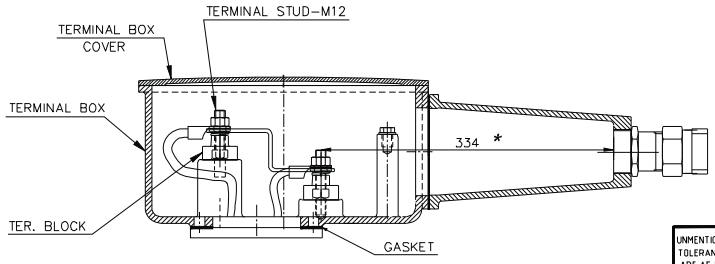
SCALE :--1:1
SHEET NO.:- 01/02

DRG. NO. MGAN250A0222
ISSUE NO. 01 | REV.NO. 00

\\Pnk\d\LHPL DRAWING FILES\DRGS 3\G.A.DWG\MGAN\250\B3\MGAN250A0222.dwg



TOP VIEW SHOWING TERMINAL BOX WITHOUT COVER



NOTE:- * MARKED DIMN.S ARE APPROX..

UNMENTIONED TOLERANCES ARE AS PER IS:2102-1/ ISO 2768-1									
LINEAR DIMNS.	OVER & UPTO	0.5-3	3-6	6-30	30-120	120-400	400-1000	1000-2000	
	TOLERANCE	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	
ANGULAR DIMNS.	PERMISSIBLE DEVIATIONS FOR LENGTHS OF THE SHORTER SIDE OF THE ANGLE.								
	OVER & UPTO	0-10	10-50		50-120	120-400	400.....		
	TOLERANCE	±1°	±0°30'		±0°20'	±0°10'	±0°5'		

TITLE

T. BOX ARRANGEMENT DRAWING FOR 250M FRAME FOOT MOUNTED MOTOR

	NAME.	DATE.
DGN.		
DRN.	VIVEK	28.10.18
CHD.		28.10.18
APPD.		28.10.18

SCALE :--1:1

SHEET:- 2 OF 2

Laxmi Hydraulics Pvt.Ltd. SOLAPUR
Website : www.lhp.co.in

UNLESS OTHERWISE SPECIFIED ALL DIMNS. ARE IN MM. DO NOT SCALE THE DRAWING.

DRG. NO. *MGAN250A0222*

ISSUE NO. 01 REV.NO. 00

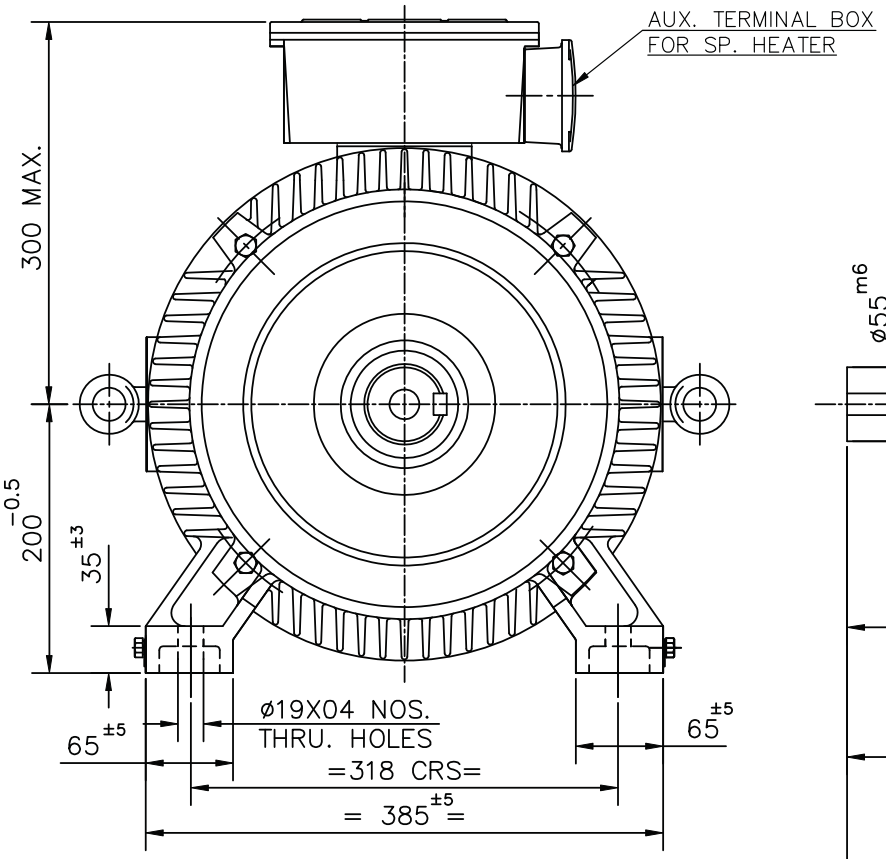
REV. NO.	DETAIL OF CHANGE	DATE.	INTL.
03			
02			
01			

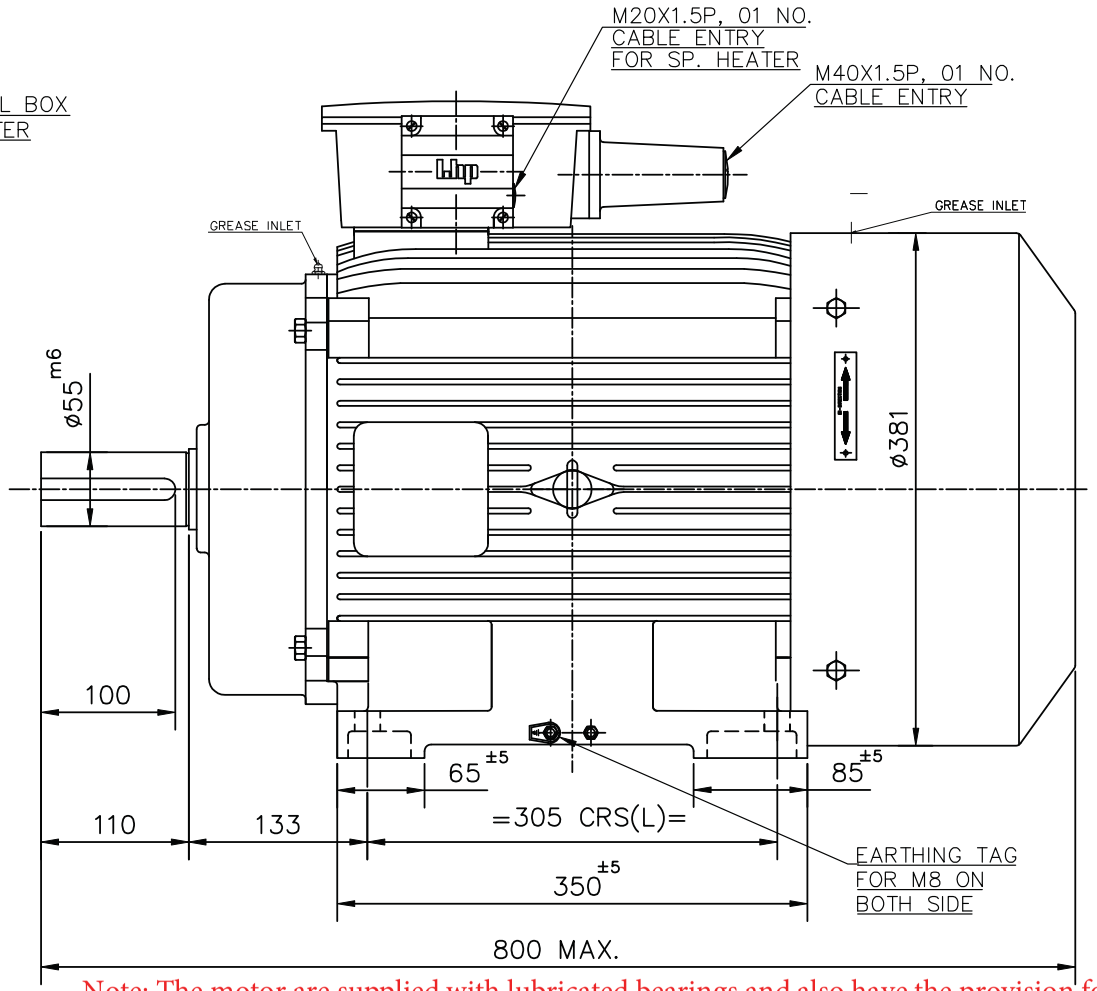
\\Ppk\d\LHPL DRAWING FILES\DRGS 3\G.A.DWG\MGAN 250\B3\MGAN250A0222.dwg

1.00.00	**TDS FOR 30 KW- 4 POLE MOTOR**			
Sr. No.	**Description**	**Unit**	Vendor Data	
1.01.00	Manufacturer		Laxmi Hydraulic Private Limited, India	
1.02.00.	Type and frame size		**IE3** SQIM & 200L	
1.03.00	design code no.		IS/IEC 60034-1, IS 12615	
1.04.00.	Nos. required		Centrifugal fan, Centrifugal Pump/ as per approved Layouts	
1.05.00.	Application		UAF FAN MOTOR	
1.06.00	Specification & Codes		IS/IEC 60034-1	
1.07.00	Capacity for			
	i) for specified climatic conditions (50 Deg C)	kW	30	
	ii) At 40 Deg C ambient	kW	32.1	
1.08.00.	Location for installation			
1.09.00.	Type of enclosure & ventilation		SAFE & TEFC	
1.10.00.	Degree of protection		IP:55	
1.11.00	Type of duty		S1 C	
1.12.00.	No. of phases, frequency & voltage		3Ph,50Hz & 415V	
1.13.00.	Permissible variations in			
	a) Voltage	%	+/-10	
	b) Frequency	%	+/-5	
	c) Combined	%	10 (ABSOLUTE)	
1.14.00.	At rated voltage & frequency			
	a) Full load current	A	51.91	
	b) Full load speed	A	1460	
	c) No load current	A	18.00	
1.15.00.	Minimum permissible voltage during starting	V	332V (80%)	
1.16.00.	Maximum permissible time at minimum permissible voltage during running at full load.	Sec.	300	
1.17.00.	Maximum permissible time at 75% of rated voltage during running at full load.	Sec.	300	
1.18.00.	Whether motor stalls at 70% of rated voltage.		Shall not stall for 1 minute	
1.19.00	Efficiency & power factor			
	Load (% of full load)			
	100		93.6	0.86
	50		92	0.78
	25		90	0.65
	0		-	0.07
	At start		-	0.50
	Duty Point			
1.20.00	Stator winding			
	i) Connection		DELTA	
	ii) Type & nos. of terminals Brought out		6.00	
	iii) Resistance between terminals at 20°C		0.15	
	iv) Resistance per phase at 20°C		0.22	
	v) Inductance per phase		0.007	
	vi) Capacitance per phase		NA	
1.21.00.	Starting current as % of full load current			
	i) With IS tolerance	%	600	
	ii) Without IS tolerance	%	720	
1.22.00	Torque at full load	kgm	20.0	
1.23.00	Break away torque in % of full load torque	%	200	
1.24.0.	Pull up torque in % of full load torque	%	180	
1.25.00.	Pull out torque in % of full load torque	%	240	
1.26.00	Starting time in sec. Without mechanism coupled or Mechanism coupled through hydraulic coupling when it may be presumed that load is transferred to motor shaft only after attaining almost full speed.			
	i) with rated voltage	Sec.	2	
	ii) with 80% of rated voltage	Sec.	3	
	iii) with 110% of rated voltage	Sec.	2	
1.27.00	Starting time in sec. With mechanism coupled through Flexible coupling.			
	i) with rated voltage	Sec.	3	
	ii) with 80% of rated voltage	Sec.	5	
	iii) with 110% of rated voltage	Sec.	2	
1.28.00	Safe stall time (hot motor)			
	i) At rated voltage	Sec.	12	
	ii) At 80% of rated voltage	Sec.	19	
	iii) At 110% of rated voltage	Sec.	10	
1.29.00	Safe stall time (Cold motor)			
	i) At rated voltage	Sec.	27	
	ii) At 80% of rated voltage	Sec.	42	
	iii) At 110% of rated voltage	Sec.	22	
1.30.00	Limiting motor temperature to determine safe stall time	Deg. C	185	
1.31.00	Permissible maximum accelerating time (hot motor)			
	i) At rated voltage	Sec.	3	
	ii) At 80% of rated voltage	Sec.	5	
	iii) At 110% of rated voltage	Sec.	2	
1.32.00.	Permissible maximum accelerating time (cold motor)			
	i) At rated voltage	Sec.	4	
	ii) At 80% of rated voltage	Sec.	6	
	iii) At 110% of rated voltage	Sec.	3	
1.33.00	Insulation			
	i) Class of insulation		F TO B	
	ii) Material & treatment of insulation		VPI	

1.34.00	Whether insulation is suitable for 415 V, 6.6KV, ungrounded system		Suitable for 415V
1.35.00	Temperature rise under normal conditions over 50 deg C ambient temperature		
	i) By resistance method		70
	Degree centigrade over cooling water temp. for CACW motors.	Deg. C	NA
	Degree centigrade over cooling air temp. for CACA motor.	Deg. C	
	ii) By Thermometer method		NA
	Degree centigrade over cooling water temp. for CACW motor.	Deg. C	
	Degree centigrade over cooling air temp. for CACA motor.	Deg. C	
1.36.00	Method of starting		DOL
1.37.00.	Permissible starting duty cycles		2 HOT 3 COLD
1.38.00.	Stator thermal time constant		50/150
1.39.00	Maximum permissible voltage During high speed bus transfer & special design feature.		150%
1.40.00	Time required for voltage to decay down to when driving voltage is removed.		
	i) At 50% of rated voltage	Sec.	0.01
	ii) At 40% of rated voltage	Sec.	0.015
	iii) At 25% of rated voltage	Sec.	0.02
	iv) At 0% of rated voltage	Sec.	-
1.41.00	Method of cooling		TEFC
1.41.01	Details of water cooling system		NA
	i) No. of cooler		NA
	ii) Water requirement per cooler		NA
	iii) Losses removed by cooler		NA
	iv) Max. permissible temperature Of cooling water at inlet		NA
	v) Max. permissible temperature Of cooling water at outlet		NA
	vi) Maximum permissible pressure At water outlet		NA
	vii) Water pressure drop through the cooler		NA
	viii) Temp. of cold air coming Out & entering the machine For permissible cooling Water temperature of 310C		NA
	ix) Temp. rise of air passing through machine at full load.		NA
	x) Air pressure drop through The cooler		NA
	xi) Temp. rise of water through cooler		NA
	xii) Protection against leakage of water		NA
	xiii) Arrangement to ensure the water flow		NA
1.42.00	Bearings		
	i) Number		6312 C3/6112 C3@DE/NDE
	ii) Type		DGBB
	iii) Lubrication system		PRELUBRICATED WITH EXTERNAL LUBRICATION SYSTEM
	iv) Quantity of lubrican reqd. For both the bearings.		-
	v) Life in hours at rated speed		40,000hrs
	vi) Recommended lubricant		GREESE
	vii) Bearing end play		1 mm MAX
	viii) Inlet oil pressure		NA
	ix) Temp. rise of oil		NA
	x) Max. permissible temp. ofBearing		110 DEGREE C
	Xi) Max. permissible temp. of Oil		NA
	Xii) Permissible running time without forced oil at full load & full speed		NA
	xiii) Whether bearings are provided with 4 wire, platinum RTD having 100-ohm resistance at 0 Deg C for remote temp. indication.		NA
	xiv) Whether bearings are provided with local temperature indicator having two adjustable contacts rated for 2A at 240V AC or 0.2A at 220V DC.		NA
	xv) If forced lub oil system provided :		NA
	i) Qty of lubricant required for initial filling.		NA
	ii) Recommended period after which lubricant should be replaced		NA
	iii) Bearing cooling water requirement		NA
	iv) Max. permissible bearing cooling water inlet temp. (permissible)		NA
	v) Max. permissible bearing cooling water outlet temp.		NA
1.43.00.	Terminal designation correspond to direction of rotation (Facing driving end).		BIDIRECTIONAL MOTOR
1.44.00	Terminal boxes with accessories separate terminal boxes provided.		
	i) Main		1 NO
	ii) Space heaters		1 NO
	iii) Winding temp. detectors		NO
	iv) Bearing temp. detectors		NO
	v) Moisture detectors		NO
	vi) Neutral terminals		NO
1.45.00	Main terminal box details		
	i) Type & Nos.		IP:55 & 1Nos
	ii) Fault level permissible for 0.25 sec.	kA	50
	iii) Location		TOP
	iv) Cable gland size & no.		M20X1.5P,1 NO
	v) Direction of cable entry.		FROM NDE
	vi) Gland plate material and thickness		CI/AL & 6 mm MINIMUM

1.46.00.	Space Heater		
	i) Number		1NO
	ii) Location		LHS FROM NDE
	iii) Capacity of each		50W
	iv) Total power requirement	kW	0.05
	v) Voltage.	V	240
	vi) Gland plate material and thickness		CI/AL & 6 mm MINIMUM
1.47.00.	Details of 4 wire platinum RTD having 100 ohm resistance at 0 Deg C for winding temp. detector.		NA
	i) Nos. provided		NA
	ii) Location		NA
1.48.00	Whether CTs for differential protection are provided		NA
	i) If Yes, no. of CTs supplied alongwith motors.C.T. details		NA
	a) C.T. ratio		NA
	b) Knee point voltage		NA
	ii) S.C. withstand capacity		NA
1.49.00	Type of mounting		B3
1.50.00	Shaft orientation		HORIZONTAL
1.51.00	Shaft extension		AS PER GAD MGAN200A0422
1.52.00	Grounding pads size nos. & location		2 X M8
1.53.00	Method of coupling to driven mechanism		
1.54.00	Motor GD2		1.60
1.55.00	Lifting device		EYE BOLT
1.56.00	Weight		
	i) Weight of stator (wound)	kg	160 APPROX
	ii) Weight of rotor (wound)	kg	108APPROX
	iii) Weight of base plate	kg	NA
	iv) Weight of cooler	kg	NA
	v) Net weight of motor	kg	268 Approx. Kg
1.57.00	Shipping dimensions & weight		940x790x790 & 321 kg
1.58.00	Thermometer provided		NO
	i) In cold air path		NO
	ii) In hot air path		NO
	iii) For measurement of oil temp.		NO
1.59.00	Characteristic curves furnished		
	i) Speed vs. current at rated voltage (Yes / No)		Enclosed
	ii) Speed vs. torque at 110%, 100%, 90% and 80% of rated voltage (Yes / No)		Enclosed
	iii) Thermal withstand curve for hot & cold conditions. (Yes / No)		Enclosed
	iv) Efficiency vs. load (Yes / No)		Enclosed
	v) P.F. Vs. load (Yes / No)		Enclosed
	vi) Current vs. time (Yes / No)		Enclosed
	vii) Negative phase sequence curve (Yes / No)		Enclosed
1.60.00	Drawings furnished		
	i) General arrangement of motor (Yes / No)		YES
	ii) Main terminal box showing the method of terminating the incoming cables (Yes / No)		YES
	iii) Instruction manuals (Yes / No)		YES
	iv) Name Plate drawing (Yes/No)		NO
1.61.00	Rotor design as per specification		IS 648
1.62.00	Noise Level	dB	85 dB at 1 m
1.63.00	Vibration Pad (Yes / No)		NO
1.64.00	Drain Hole (two numbers with plug, one on either end of motor at bottom most point. (Yes / No)		NO
1.65.00	Painting shade		692 IS-5
1.66.00	Earthing		
	i) Body (Number & Size)		2 X M8
	ii) Terminal Box (Number & Size)		1 X M8





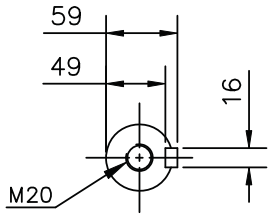
Note: The motor are supplied with lubricated bearings and also have the provision for external greasing.

SPECIFICATION:-

KW/HP	30/40
POLE	4
BEARING DE SIDE	6312 C3
BEARING NDE SIDE	6212 C3

MATERIAL OF CONSTRUCTION:-

FRAME	CAST IRON
END COVER (DE)	CAST IRON
END COVER (NDE)	CAST IRON
T. BOX	CAST IRON
T. BOX COVER	CAST IRON
SHAFT	CARBON STEEL



SHAFT END DETAILS

REV. NO	DETAILS OF CHANGE	DATE	INTL.
2			
1			

UNMENTIONED TOLERANCES ARE AS PER IS:2102-1/ ISO 2768-1									
	LINEAR DIMNS.	OVER & UPTO	0.5-3	3-6	6-30	30-120	120-400	400-1000	1000-2000
		TOLERANCE	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
	ANGULAR DIMNS.	PERMISSIBLE DEVIATIONS FOR LENGTHS OF THE SHORTER SIDE OF THE ANGLE.							
		OVER & UPTO	0-10		10-50	50-120	120-400	400.....	
		TOLERANCE	±1°		±0°30'	±0°20'	±0°10'	±0°5'	

TITLE

GENERAL ARRANGEMENT. DRG. FOR 200L FRAME FOOT MOUNTED (B3) MOTOR

(WITH CON.ADAPTOR & AUX.T.B.FOR SP.HTR.)

Laxmi Hydraulics Pvt.Ltd. SOLAPUR

Website : www.lhp.co.in

UNLESS OTHERWISE SPECIFIED ALL DIMNS. ARE IN MM. | DO NOT SCALE THE DRAWING.

	NAME.	DATE.
DGN.		
DRN.	NVM	10.08.19
CHD.		10.08.19
APPD.		10.08.19

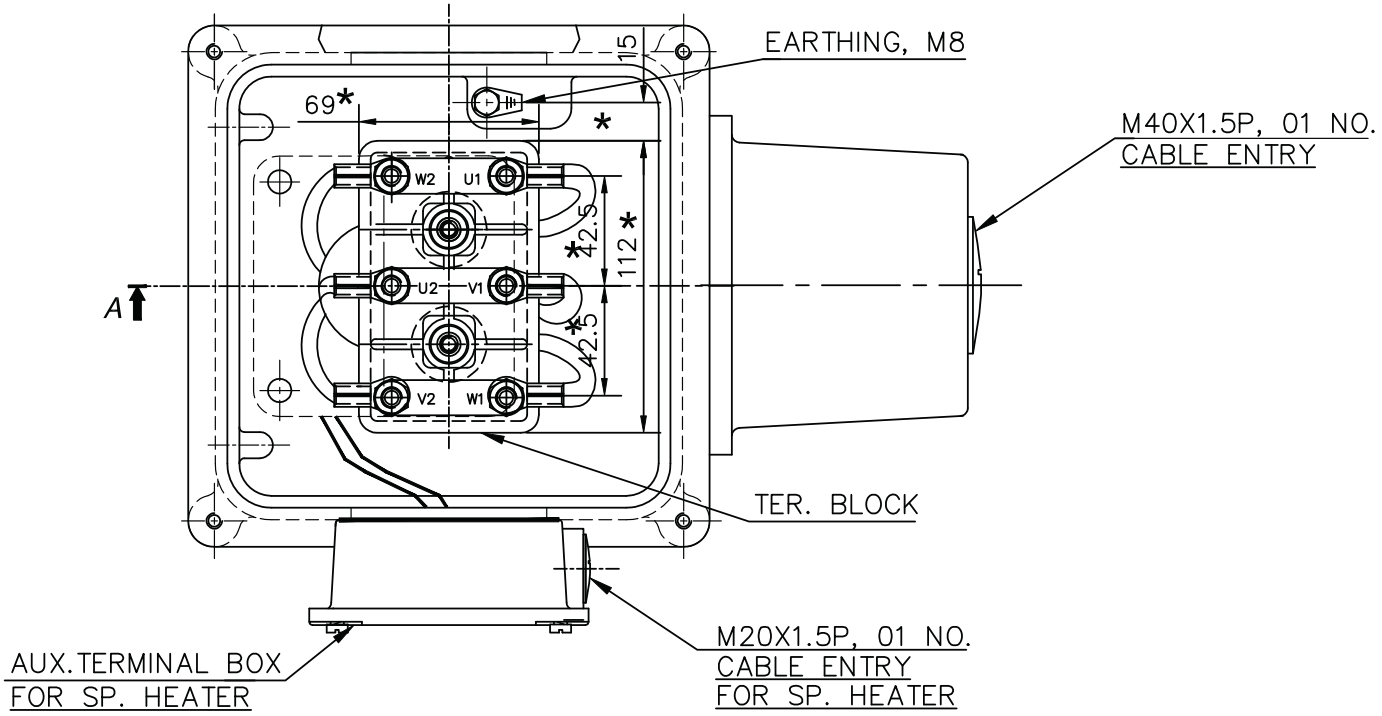
SCALE :--1:1

SHEET NO:- 01 OF 02

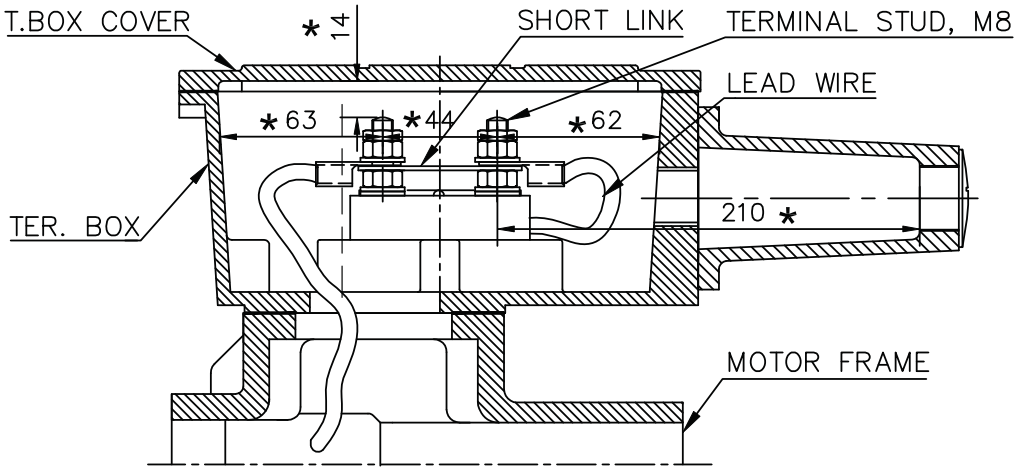
DRG. NO. MGAN200A0422

ISSUE NO. 01 | REV.NO. 00

\\Ppk\d\LHPL DRAWING FILES\DRGS 3\G.A.DWG\MGAN\200\B3\MGAN200A0422.dwg



TOP VIEW SHOWING T. BOX WITHOUT COVER



SECTION A-A

*NOTE:- * MARKED DIM.S ARE APPROX.*

TITLE .

TERMINAL BOX ARRANGEMENT DRG.OF
200L FR.(WITH CON.ADA. & AUX.T.B.FOR SP.HTR.)

	NAME.	DATE.
DGN.		
DRN.	NVM	10.08.19
CHD.		10.08.19
APPD.		10.08.19

UNLESS SPECIFIED ALL DIMENSIONS ARE IN MM.

SCALE :-1:1

Laxmi Hydraulics Pvt.Ltd.
SOLAPUR

DRG. NO. MGAN200A0422

DO NOT SCALE THE DRAWING .

SHEET NO. 2/2

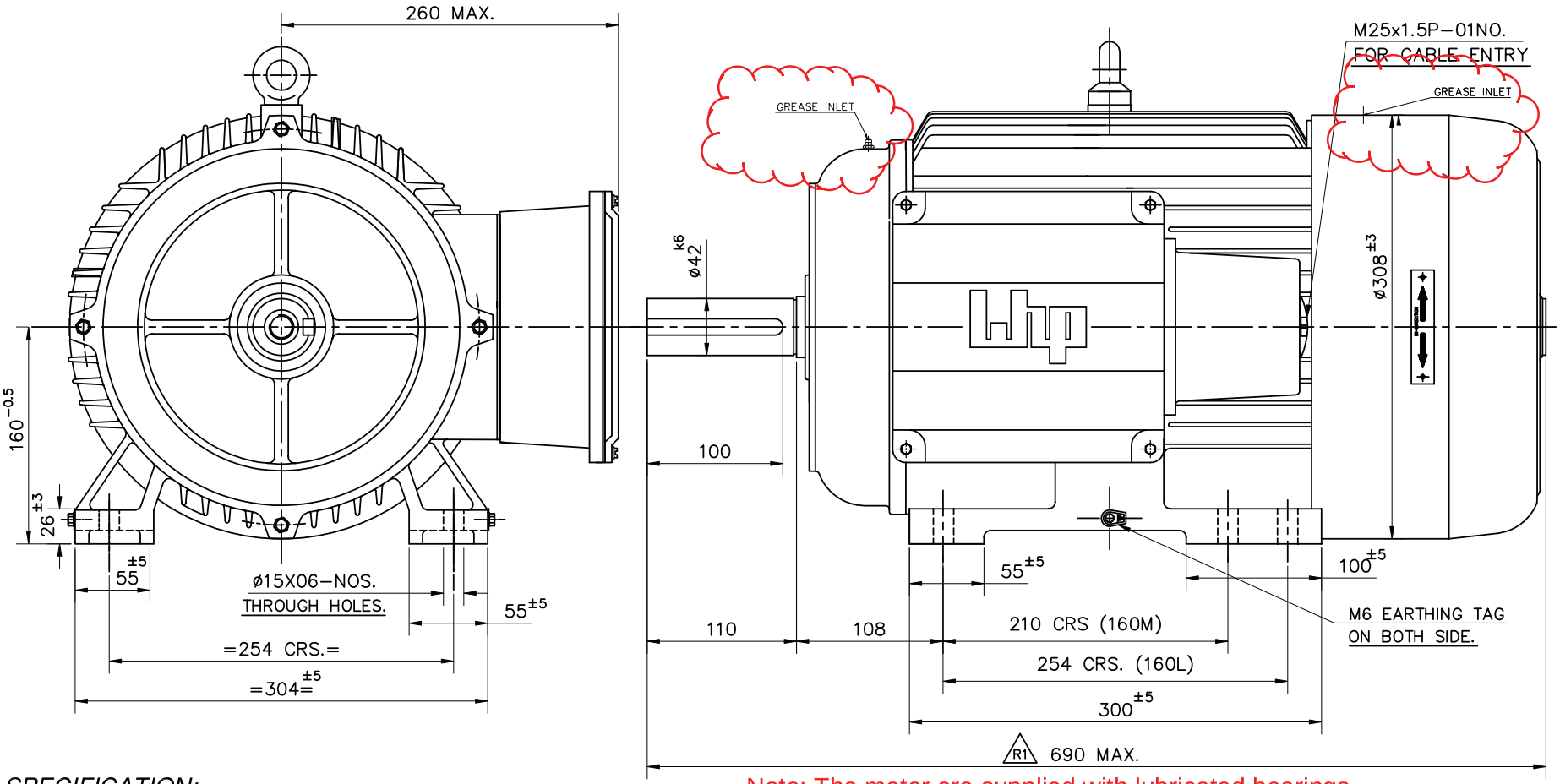
ISSUE NO. 01 REV.NO. 00

\\Pdk\d\LHPL DRAWING FILES\DRGS 3\G.A.DWG\MGAN\200\B3\MGAN200A0422.dwg

1.00.00	**TDS FOR 15 KW- 4 POLE MOTOR**			
Sr. No.	**Description**	**Unit**	Vendor Data	
1.01.00	Manufacturer		Laxmi Hydraulic Private Limited, India	
1.02.00.	Type and frame size		**IE3** SQIM & 160L	
1.03.00	design code no.		IS/IEC 60034-1,IS 12615	
1.04.00.	Nos. required		UAF Pump/ as per approved Layouts	
1.05.00.	Application		UAF PUMP (OUTDOOR)	
1.06.00	Specification & Codes		IS/IEC 60034-1	
1.07.00	Capacity for			
	i) for specified climatic conditions (50 Deg C)	kW	15	
	ii) At 40 Deg C ambient	kW	16.0	
1.08.00.	Location for installation			
1.09.00.	Type of enclosure & ventilation		SAFE & TEFC	
1.10.00.	Degree of protection		IP:55	
1.11.00	Type of duty		S1	
1.12.00.	No. of phases, frequency & voltage		3Ph,50Hz & 415V	
1.13.00.	Permissible variations in			
	a) Voltage	%	+/-10	
	b) Frequency	%	+3% to -5%	
	c) Combined	%	10 (ABSOLUTE)	
1.14.00.	At rated voltage & frequency			
	a) Full load current	A	27.66	
	b) Full load speed		1450	
	c) No load current	A	8.50	
1.15.00.	Minimum permissible voltage during starting	V	332V (80%)	
1.16.00.	Maximum permissible time at minimum permissible voltage during running at full load.	Sec.	300	
1.17.00.	Maximum permissible time at 75% of rated voltage during running at full load.	Sec.	300	
1.18.00.	Whether motor stalls at 70% of rated voltage.		Shall not stall for 1 minute	
1.19.00	Efficiency & power factor			
	Load (% of full load)			
	100		92.1	0.82
	50		89	0.75
	25		85	0.62
	0		-	0.07
	At start		-	0.45
	Duty Point		Pl mention	
1.20.00	Stator winding			
	i) Connection		DELTA	
	ii) Type & nos. of terminals Brought out		6.00	
	iii) Resistance between terminals at 20°C		0.45	
	iv) Resistance per phase at 20°C		0.68	
	v) Inductance per phase		0.014	
	vi) Capacitance per phase		NA	
1.21.00.	Starting current as % of full load current			
	i) With IS tolerance	%	600	
	ii) Without IS tolerance	%	720	
1.22.00	Torque at full load	kgm	10.08	
1.23.00	Break away torque in % of full load torque	%	200	
1.24.0.	Pull up torque in % of full load torque	%	180	
1.25.00.	Pull out torque in % of full load torque	%	250	
1.26.00	Starting time in sec. Without mechanism coupled or Mechanism coupled through hydraulic coupling when it may be presumed that load is transferred to motor shaft only after attaining almost full speed.			
	i) with rated voltage	Sec.	2	
	ii) with 80% of rated voltage	Sec.	3	
	iii) with 110% of rated voltage	Sec.	2	
1.27.00	Starting time in sec. With mechanism coupled through Flexible coupling.			
	i) with rated voltage	Sec.	3	
	ii) with 80% of rated voltage	Sec.	5	
	iii) with 110% of rated voltage	Sec.	2	
1.28.00	Safe stall time (hot motor)			
	i) At rated voltage	Sec.	10	
	ii) At 80% of rated voltage	Sec.	16	
	iii) At 110% of rated voltage	Sec.	8	
1.29.00	Safe stall time (Cold motor)			
	i) At rated voltage	Sec.	22	
	ii) At 80% of rated voltage	Sec.	34	
	iii) At 110% of rated voltage	Sec.	18	
1.30.00	Limiting motor temperature to determine safe stall time	Deg. C	185	
1.31.00	Permissible maximum accelerating time (hot motor)			
	i) At rated voltage	Sec.	3	
	ii) At 80% of rated voltage	Sec.	5	
	iii) At 110% of rated voltage	Sec.	2	
1.32.00.	Permissible maximum accelerating time (cold motor)			
	i) At rated voltage	Sec.	4	
	ii) At 80% of rated voltage	Sec.	6	
	iii) At 110% of rated voltage	Sec.	3	
1.33.00	Insulation			
	i) Class of insulation		F	
	ii) Material & treatment of insulation		VPI	

1.34.00	Whether insulation is suitable for 415 V, 6.6KV, ungrounded system		Suitable for 415V
1.35.00	Temperature rise under normal conditions over 50 deg C ambient temperature		
	i) By resistance method		70
	Degree centigrade over cooling water temp. for CACW motors.	Deg. C	NA
	Degree centigrade over cooling air temp. for CACA motor.	Deg. C	
	ii) By Thermometer method		NA
	Degree centigrade over cooling water temp. for CACW motor.	Deg. C	
	Degree centigrade over cooling air temp. for CACA motor.	Deg. C	
1.36.00	Method of starting		DOL
1.37.00.	Permissible starting duty cycles		2 HOT 3 COLD
1.38.00.	Stator thermal time constant		42/125
1.39.00	Maximum permissible voltage During high speed bus transfer & special design feature.		150%
1.40.00	Time required for voltage to decay down to when driving voltage is removed.		
	i) At 50% of rated voltage	Sec.	0.01
	ii) At 40% of rated voltage	Sec.	0.02
	iii) At 25% of rated voltage	Sec.	0.03
	iv) At 0% of rated voltage	Sec.	-
1.41.00	Method of cooling		TEFC
1.41.01	Details of water cooling system		NA
	i) No. of cooler		NA
	ii) Water requirement per cooler		NA
	iii) Losses removed by cooler		NA
	iv) Max. permissible temperature Of cooling water at inlet		NA
	v) Max. permissible temperature Of cooling water at outlet		NA
	vi) Maximum permissible pressure At water outlet		NA
	vii) Water pressure drop through the cooler		NA
	viii) Temp. of cold air coming Out & entering the machine For permissible cooling Water temperature of 310C		NA
	ix) Temp. rise of air passing through machine at full load.		NA
	x) Air pressure drop through The cooler		NA
	xi) Temp. rise of water through cooler		NA
	xii) Protection against leakage of water		NA
	xiii) Arrangement to ensure the water flow		NA
1.42.00	Bearings		
	i) Number		6309 ZZ.C3/6209 ZZ.C3 @DE/NDE
	ii) Type		DGBB
	iii) Lubrication system		PRELUBRICATED WITH EXTERNAL LUBRICATION SYSTEM
	iv) Quantity of lubrican reqd. For both the bearings.		-
	v) Life in hours at rated speed		40,000hrs
	vi) Recommended lubricant		GREESE
	vii) Bearing end play		1 mm MAX
	viii) Inlet oil pressure		NA
	ix) Temp. rise of oil		NA
	x) Max. permissible temp. ofBearing		110 DEG C
	Xi) Max. permissible temp. of Oil		NA
	Xii) Permissible running time without forced oil at full load & full speed		NA
	xiii) Whether bearings are provided with 4 wire, platinum RTD having 100-ohm resistance at 0 Deg C for remote temp. indication.		NA
	xiv) Whether bearings are provided with local temperature indicator having two adjustable contacts rated for 2A at 240V AC or 0.2A at 220V DC.		NA
	xv) If forced lub oil system provided :		NA
	i) Qty of lubricant required for initial filling.		NA
	ii) Recommended period after which lubricant should be replaced		NA
	iii) Bearing cooling water requirement		NA
	iv) Max. permissible bearing cooling water inlet temp. (permissible)		NA
	v) Max. permissible bearing cooling water outlet temp.		NA
1.43.00.	Terminal designation correspond to direction of rotation (Facing driving end).		BIDIRECTIONAL MOTOR
1.44.00	Terminal boxes with accessories separate terminal boxes provided.		
	i) Main		1 NO
	ii) Space heaters		NO
	iii) Winding temp. detectors		NO
	iv) Bearing temp. detectors		NO
	v) Moisture detectors		NO
	vi) Neutral terminals		NO
1.45.00	Main terminal box details		
	i) Type & Nos.		IP:55 & 1Nos
	ii) Fault level permissible for 0.25 sec.	kA	50
	iii) Location		LHS FROM NDE
	iv) Cable gland size & no.		M25X1.5P, 1 NO
	v) Direction of cable entry.		FRM NDE
	vi) Gland plate material and thickness		CA/AL & 6 mm MINIMUM

1.46.00.	Space Heater		
	i) Number		NA
	ii) Location		NA
	iii) Capacity of each		NA
	iv) Total power requirement	kW	NA
	v) Voltage.	V	NA
	vi) Gland plate material and thickness		NA
1.47.00.	Details of 4 wire platinum RTD having 100 ohm resistance at 0 Deg C for winding temp. detector.		NA
	i) Nos. provided		NA
	ii) Location		NA
1.48.00	Whether CTs for differential protection are provided		NA
	i) If Yes, no. of CTs supplied alongwith motors.C.T. details		NA
	a) C.T. ratio		NA
	b) Knee point voltage		NA
	ii) S.C. withstand capacity		NA
1.49.00	Type of mounting		B3
1.50.00	Shaft orientation		HORIZONTAL
1.51.00	Shaft extension		AS PER GAD
1.52.00	Grounding pads size nos. & location		2 X M6
1.53.00	Method of coupling to driven mechanism		
1.54.00	Motor GD2		0.252
1.55.00	Lifting device		EYE BOLT
1.56.00	Weight		
	i) Weight of stator (wound)	kg	91 APPROX
	ii) Weight of rotor (wound)	kg	60 APPROX
	iii) Weight of base plate	kg	NA
	iv) Weight of cooler	kg	NA
	v) Net weight of motor	kg	151 Approx. Kg
1.57.00	Shipping dimensions & weight		875X650X610 & 181 kg
1.58.00	Thermometer provided		NO
	i) In cold air path		NO
	ii) In hot air path		NO
	iii) For measurement of oil temp.		NO
1.59.00	Characteristic curves furnished		
	i) Speed vs. current at rated voltage (Yes / No)		Enclosed
	ii) Speed vs. torque at 110%, 100%, 90% and 80% of rated voltage (Yes / No)		Enclosed
	iii) Thermal withstand curve for hot & cold conditions. (Yes / No)		Enclosed
	iv) Efficiency vs. load (Yes / No)		Enclosed
	v) P.F. Vs. load (Yes / No)		Enclosed
	vi) Current vs. time (Yes / No)		Enclosed
	vii) Negative phase sequence curve (Yes / No)		Enclosed
1.60.00	Drawings furnished		
	i) General arrangement of motor (Yes / No)		YES
	ii) Main terminal box showing the method of terminating the incoming cables (Yes / No)		YES
	iii) Instruction manuals (Yes / No)		YES
	iv) Name Plate drawing (Yes/No)		NO
1.61.00	Rotor design as per specification		IS 648
1.62.00	Noise Level	dB	85 dB at 1 m
1.63.00	Vibration Pad (Yes / No)		NO
1.64.00	Drain Hole (two numbers with plug, one on either end of motor at bottom most point. (Yes / No)		NO
1.65.00	Painting shade		631 of IS-5
1.66.00	Earthing		
	i) Body (Number & Size)		2 X M6
	ii) Terminal Box (Number & Size)		1 X M6

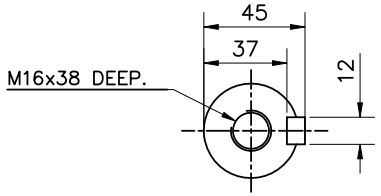


SPECIFICATION:-

kW/HP	15/20
POLE	4
BEARING DE SIDE	6309.ZZ.C3
BEARING NDE SIDE	6209.ZZ.C3

MATERIAL OF CONSTRUCTION:-

FRAME	CAST IRON
END COVER (DE)	CAST IRON
END COVER (NDE)	CAST IRON
T. BOX	CAST IRON
T. BOX COVER	CAST IRON
SHAFT	CARBON STEEL



SHAFT END DETAIL

Note: The motor are supplied with lubricated bearings and also have the provision for external greasing.

PROD.CODE - EB0791

UNMENTIONED TOLERANCES ARE AS PER IS:2102-1/ ISO 2768-1									
	LINEAR DIMNS.	OVER & UPTO	0.5-3	3-6	6-30	30-120	120-400	400-1000	1000-2000
		TOLERANCE	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
	ANGULAR DIMNS.	PERMISSIBLE DEVIATIONS FOR LENGTHS OF THE SHORTER SIDE OF THE ANGLE.							
		OVER & UPTO	0-10	10-50	50-120	120-400	400.....		
		TOLERANCE	±1°	±0°30'	±0°20'	±0°10'	±0°5'		

	NAME.	DATE.
DGN.		
DRN.	SAP	21.03.19
CHD.		21.03.19
APPD.		21.03.19

SCALE :--1:1

SHRT NO - 01 OF 02

TITLE: GENERAL ARRANGEMENT. DRG. FOR 160M/L FRAME FOOT MOUNTED MOTOR (WITH CONDUIT ADAPTOR)

REV. NO.	DETAIL OF CHANGE	DATE.	INTL.
1	TOTAL LENGTH 690 WAS 670	30.06.19	SAP

Laxmi Hydraulics Pvt.Ltd. SOLAPUR
Website : www.lhp.co.in

UNLESS OTHERWISE SPECIFIED ALL DIMNS. ARE IN MM. DO NOT SCALE THE DRAWING.

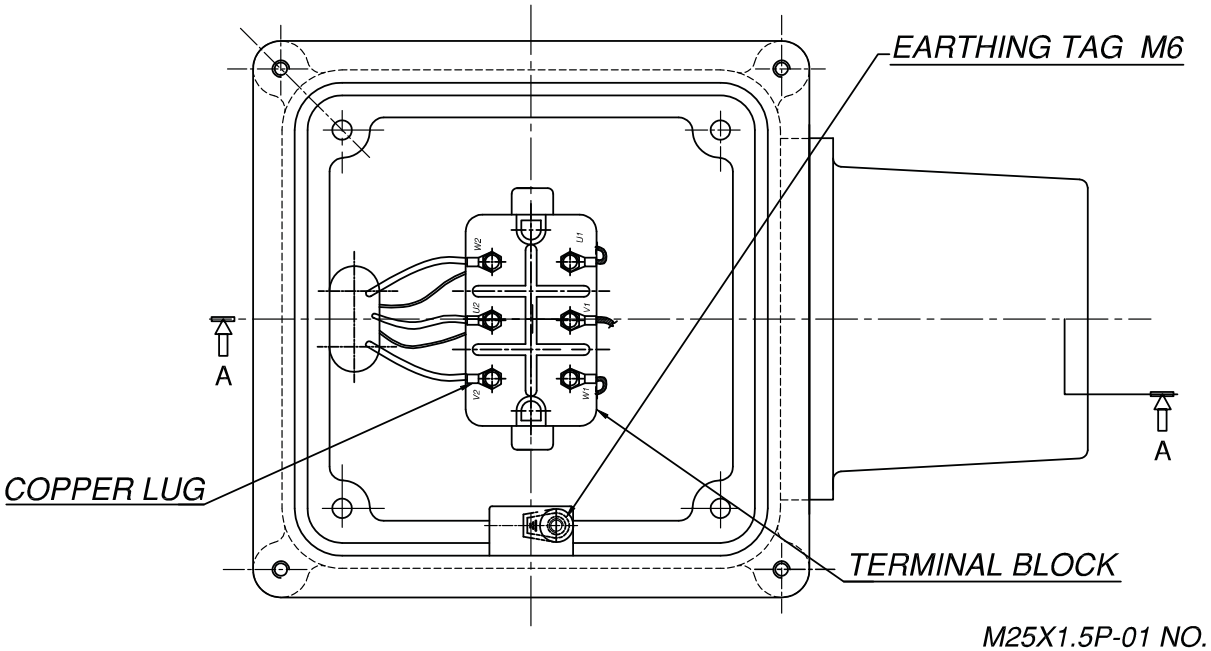
DRG. NO. MGAN160A0685

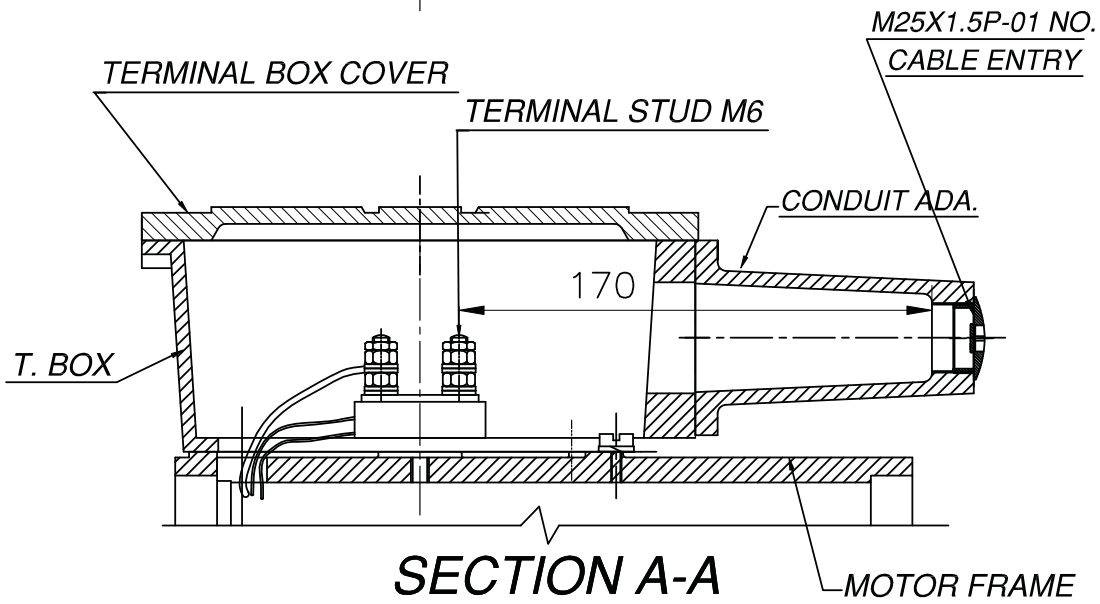
ISSUE NO. 01 REV.NO. 01

LAXMI HYDRAULICS PVT. LTD, SOLAPUR

TERMINAL BOX ARRAANGEMENT FOR 160 FRAME

(WITH CONDUIT ADAPTOR)





SECTION A-A

PROD.CODE - EB0791

SHEET : 2 OF 2

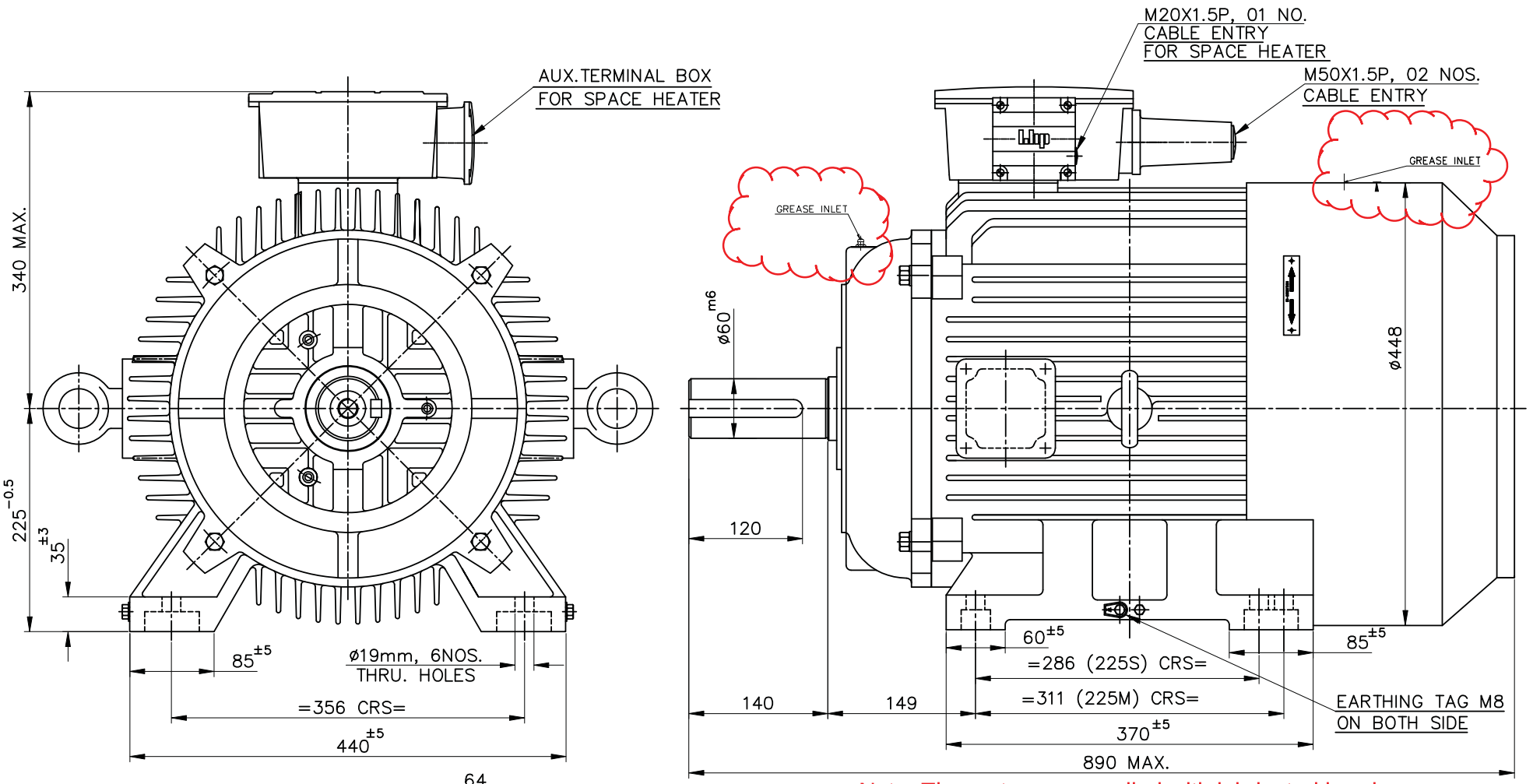
ISSUE.NO.–01	REV.NO.–01	DATE–19.03.19	DRG.NO.–MGAN160A0685
CHD.BY.– SAP	CHD. BY.–		APPD.BY.–GRM

	TDS FOR 45 KW- 4 POLE MOTOR			
1.00.00				
Sr. No.	**Description**	**Unit**	Vendor Data	
1.01.00	Manufacturer		Laxmi Hydraulic Private Limited, India	
1.02.00.	Type and frame size		**IE3** SQIM & 225M	
1.03.00	design code no.		IS/IEC 60034-1,IS 12615	
1.04.00.	Nos. required		AWU Pump/ as per approved Layouts	
1.05.00.	Application		Air washer Pump (OUTDOOR)	
1.06.00	Specification & Codes		IS/IEC 60034-1	
1.07.00	Capacity for			
	i) for specified climatic conditions (50 Deg C)	kW	45	
	ii) At 40 Deg C ambient	kW	48.1	
1.08.00.	Location for installation			
1.09.00.	Type of enclosure & ventilation		SAFE & TEFC	
1.10.00.	Degree of protection		IP:55	
1.11.00	Type of duty		S1	
1.12.00.	No. of phases, frequency & voltage		3Ph,50Hz & 415V	
1.13.00.	Permissible variations in			
	a) Voltage	%	+/-10	
	b) Frequency	%	+3% to -5%	
	c) Combined	%	10 (ABSOLUTE)	
1.14.00.	At rated voltage & frequency			
	a) Full load current	A	75.61	
	b) Full load speed		1480	
	c) No load current	A	34.00	
1.15.00.	Minimum permissible voltage during starting	V	332V (80%)	
1.16.00.	Maximum permissible time at minimum permissible voltage during running at full load.	Sec.	300	
1.17.00.	Maximum permissible time at 75% of rated voltage during running at full load.	Sec.	300	
1.18.00.	Whether motor stalls at 70% of rated voltage.		Shall not stall for 1 minute	
1.19.00	Efficiency & power factor			
	Load (% of full load)			
	100		94.2	0.88
	50		92.5	0.72
	25		89	0.58
	0		-	0.08
	At start		-	0.45
	Duty Point		Pl mention	
1.20.00	Stator winding			
	i) Connection		DELTA	
	ii) Type & nos. of terminals Brought out		6.00	
	iii) Resistance between terminals at 20°C		0.077	
	iv) Resistance per phase at 20°C		0.115	
	v) Inductance per phase		0.006	
	vi) Capacitance per phase		NA	
1.21.00.	Starting current as % of full load current			
	i) With IS tolerance	%	600	
	ii) Without IS tolerance	%	720	
1.22.00	Torque at full load	kgm	29.6	
1.23.00	Break away torque in % of full load torque	%	210	
1.24.0.	Pull up torque in % of full load torque	%	200	
1.25.00.	Pull out torque in % of full load torque	%	250	
1.26.00	Starting time in sec. Without mechanism coupled or Mechanism coupled through hydraulic coupling when it may be presumed that load is transferred to motor shaft only after attaining almost full speed.			
	i) with rated voltage	Sec.	2	
	ii) with 80% of rated voltage	Sec.	3	
	iii) with 110% of rated voltage	Sec.	2	
1.27.00	Starting time in sec. With mechanism coupled through Flexible coupling.			
	i) with rated voltage	Sec.	3	
	ii) with 80% of rated voltage	Sec.	5	
	iii) with 110% of rated voltage	Sec.	2	
1.28.00	Safe stall time (hot motor)			
	i) At rated voltage	Sec.	12	
	ii) At 80% of rated voltage	Sec.	19	
	iii) At 110% of rated voltage	Sec.	10	
1.29.00	Safe stall time (Cold motor)			
	i) At rated voltage	Sec.	27	
	ii) At 80% of rated voltage	Sec.	42	
	iii) At 110% of rated voltage	Sec.	22	
1.30.00	Limiting motor temperature to determine safe stall time	Deg. C	185	
1.31.00	Permissible maximum accelerating time (hot motor)			
	i) At rated voltage	Sec.	3	
	ii) At 80% of rated voltage	Sec.	5	
	iii) At 110% of rated voltage	Sec.	2	
1.32.00.	Permissible maximum accelerating time (cold motor)			
	i) At rated voltage	Sec.	4	
	ii) At 80% of rated voltage	Sec.	6	
	iii) At 110% of rated voltage	Sec.	3	
1.33.00	Insulation			
	i) Class of insulation		F	
	ii) Material & treatment of insulation		VPI	

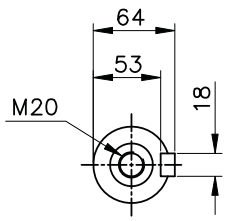
1.34.00	Whether insulation is suitable for 415 V, 6.6KV, ungrounded system		Suitable for 415V
1.35.00	Temperature rise under normal conditions over 50 deg C ambient temperature		
	i) By resistance method		70
	Degree centigrade over cooling water temp. for CACW motors.	Deg. C	NA
	Degree centigrade over cooling air temp. for CACA motor.	Deg. C	
	ii) By Thermometer method		NA
	Degree centigrade over cooling water temp. for CACW motor.	Deg. C	
	Degree centigrade over cooling air temp. for CACA motor.	Deg. C	
1.36.00	Method of starting		DOL
1.37.00.	Permissible starting duty cycles		2 HOT 3 COLD
1.38.00.	Stator thermal time constant		50/150
1.39.00	Maximum permissible voltage During high speed bus transfer & special design feature.		150%
1.40.00	Time required for voltage to decay down to when driving voltage is removed.		
	i) At 50% of rated voltage	Sec.	0.1
	ii) At 40% of rated voltage	Sec.	0.2
	iii) At 25% of rated voltage	Sec.	0.3
	iv) At 0% of rated voltage	Sec.	-
1.41.00	Method of cooling		TEFC
1.41.01	Details of water cooling system		NA
	i) No. of cooler		NA
	ii) Water requirement per cooler		NA
	iii) Losses removed by cooler		NA
	iv) Max. permissible temperature Of cooling water at inlet		NA
	v) Max. permissible temperature Of cooling water at outlet		NA
	vi) Maximum permissible pressure At water outlet		NA
	vii) Water pressure drop through the cooler		NA
	viii) Temp. of cold air coming Out & entering the machine For permissible cooling Water temperature of 310C		NA
	ix) Temp. rise of air passing through machine at full load.		NA
	x) Air pressure drop through The cooler		NA
	xi) Temp. rise of water through cooler		NA
	xii) Protection against leakage of water		NA
	xiii) Arrangement to ensure the water flow		NA
1.42.00	Bearings		
	i) Number		6313 C3/6312 C3 @DE/NDE
	ii) Type		DGBB
	iii) Lubrication system		PRELUBRICATED WITH EXTERNAL LUBRICATION SYSTEM
	iv) Quantity of lubrican reqd. For both the bearings.		-
	v) Life in hours at rated speed		40,000hrs
	vi) Recommended lubricant		GREESE
	vii) Bearing end play		1mm MAX
	viii) Inlet oil pressure		NA
	ix) Temp. rise of oil		NA
	x) Max. permissible temp. ofBearing		110 DEG C
	Xi) Max. permissible temp. of Oil		NA
	Xii) Permissible running time without forced oil at full load & full speed		NA
	xiii) Whether bearings are provided with 4 wire, platinum RTD having 100-ohm resistance at 0 Deg C for remote temp. indication.		NA
	xiv) Whether bearings are provided with local temperature indicator having two adjustable contacts rated for 2A at 240V AC or 0.2A at 220V DC.		NA
	xv) If forced lub oil system provided :		NA
	i) Qty of lubricant required for initial filling.		NA
	ii) Recommended period after which lubricant should be replaced		NA
	iii) Bearing cooling water requirement		NA
	iv) Max. permissible bearing cooling water inlet temp. (permissible)		NA
	v) Max. permissible bearing cooling water outlet temp.		NA
1.43.00.	Terminal designation correspond to direction of rotation (Facing driving end).		BIDIRECTIONAL MOTOR
1.44.00	Terminal boxes with accessories separate terminal boxes provided.		
	i) Main		1 NO
	ii) Space heaters		1 NO
	iii) Winding temp. detectors		NO
	iv) Bearing temp. detectors		NO
	v) Moisture detectors		NO
	vi) Neutral terminals		NO
1.45.00	Main terminal box details		
	i) Type & Nos.		IP:55 & 1Nos
	ii) Fault level permissible for 0.25 sec.	kA	50
	iii) Location		TOP
	iv) Cable gland size & no.		M50 X 1.5P, 2 NO
	v) Direction of cable entry.		FROM NDE
	vi) Gland plate material and thickness		CI/AL & 6 mm MINIMUM

1.46.00.	Space Heater		YES
	i) Number		1 NO
	ii) Location		LHS FROM NDE
	iii) Capacity of each		50 W
	iv) Total power requirement	kW	0.05
	v) Voltage.	V	240
	vi) Gland plate material and thickness		CI/AL & 6 mm MINIMUM
1.47.00.	Details of 4 wire platinum RTD having 100 ohm resistance at 0 Deg C for winding temp. detector.		NA
	i) Nos. provided		NA
	ii) Location		NA
1.48.00	Whether CTs for differential protection are provided		NA
	i) If Yes, no. of CTs supplied alongwith motors.C.T. details		NA
	a) C.T. ratio		NA
	b) Knee point voltage		NA
	ii) S.C. withstand capacity		NA
1.49.00	Type of mounting		B3
1.50.00	Shaft orientation		HORIZONTAL
1.51.00	Shaft extension		AS PER GAD MGAN225A0451
1.52.00	Grounding pads size nos. & location		2 X M8
1.53.00	Method of coupling to driven mechanism		
1.54.00	Motor GD2		1.68
1.55.00	Lifting device		EYE BOLT
1.56.00	Weight		
	i) Weight of stator (wound)	kg	220 APPROX
	ii) Weight of rotor (wound)	kg	148 APPROX
	iii) Weight of base plate	kg	NA
	iv) Weight of cooler	kg	NA
	v) Net weight of motor	kg	368 Approx. Kg
1.57.00	Shipping dimensions & weight		940x790x790 & 441 kg
1.58.00	Thermometer provided		NO
	i) In cold air path		NO
	ii) In hot air path		NO
	iii) For measurement of oil temp.		NO
1.59.00	Characteristic curves furnished		
	i) Speed vs. current at rated voltage (Yes / No)		Enclosed
	ii) Speed vs. torque at 110%, 100%, 90% and 80% of rated voltage (Yes / No)		Enclosed
	iii) Thermal withstand curve for hot & cold conditions. (Yes / No)		Enclosed
	iv) Efficiency vs. load (Yes / No)		Enclosed
	v) P.F. Vs. load (Yes / No)		Enclosed
	vi) Current vs. time (Yes / No)		Enclosed
	vii) Negative phase sequence curve (Yes / No)		Enclosed
1.60.00	Drawings furnished		
	i) General arrangement of motor (Yes / No)		YES
	ii) Main terminal box showing the method of terminating the incoming cables (Yes / No)		YES
	iii) Instruction manuals (Yes / No)		YES
	iv) Name Plate drawing (Yes/No)		NO
1.61.00	Rotor design as per specification		IS 648
1.62.00	Noise Level	dB	85 dB at 1 m
1.63.00	Vibration Pad (Yes / No)		NO
1.64.00	Drain Hole (two numbers with plug, one on either end of motor at bottom most point. (Yes / No)		NO
1.65.00	Painting shade		631 of IS-5
1.66.00	Earthing		
	i) Body (Number & Size)		2 X M8
	ii) Terminal Box (Number & Size)		1 X M8

DRG. REVIEW POINTS: – Standardisation | Gemometrical Reqmnts. | Surface Finish | Sectional Views/Arrows. | Material Grade | Process.Reqmnts. | Gauging Reqmnts. | Drg.No./Rev.No./Issue No. | Signature



Note: The motor are supplied with lubricated bearings and also have the provision for external greasing.



SHAFT END DETAILS

SPECIFICATION:-

RATING (KW/HP)	45/60
POLE	4
BEARING DE SIDE	6313 C3
BEARING NDE SIDE	6312 C3

MATERIAL OF CONSTRUCTION:-

FRAME	CAST IRON
FLANGE (DE)	CAST IRON
END COVER (NDE)	CAST IRON
T.BOX & COVER	CAST IRON
SHAFT	CARBON STEEL

REV. NO.	ECN DETAILS	DATE.	INTL.
3			
2			
1			

UNMENTIONED TOLERANCES ARE AS PER IS:2102-1/ ISO 2768-1									
	LINEAR DIMNS.	OVER & UPTO	0.5-3	3-6	6-30	30-120	120-400	400-1000	1000-2000
		TOLERANCE	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
	ANGULAR DIMNS.	PERMISSIBLE DEVIATIONS FOR LENGTHS OF THE SHORTER SIDE OF THE ANGLE.							
		OVER & UPTO	0-10	10-50	50-120	120-400	400.....		
		TOLERANCE	±1°	±0°30'	±0°20'	±0°10'	±0°5'		

TITLE *GENERAL ARRANGEMENT DRG.OF 225S/M FRAME FOOT MTG (B3) MOTOR (WITH AUX.T.BOX FOR SP.HTR. & CONDUIT ADAPTOR)*

Laxmi Hydraulics Pvt.Ltd. SOLAPUR
Website : www.lhp.co.in

UNLESS OTHERWISE SPECIFIED ALL DIMNS. ARE IN MM. | DO NOT SCALE THE DRAWING.

	NAME.	DATE.
DGN.		
DRN.	NVM	10.08.19
CHD.		10.08.19
APPD.		10.08.19

SCALE :--1:1
SHEET NO.:- 01 OF 02
DRG. NO. MGAN225A0451
ISSUE NO. 01 | REV.NO. 00

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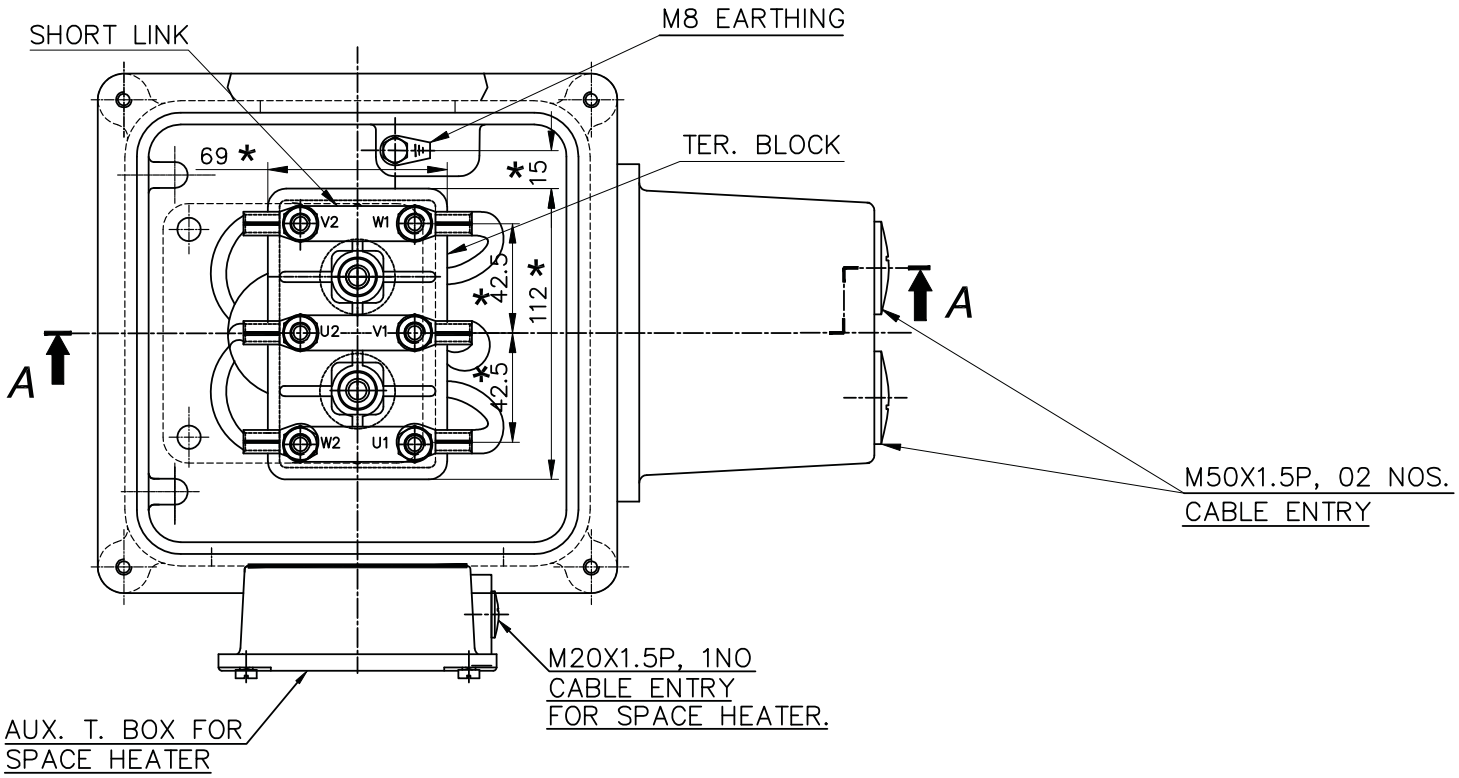
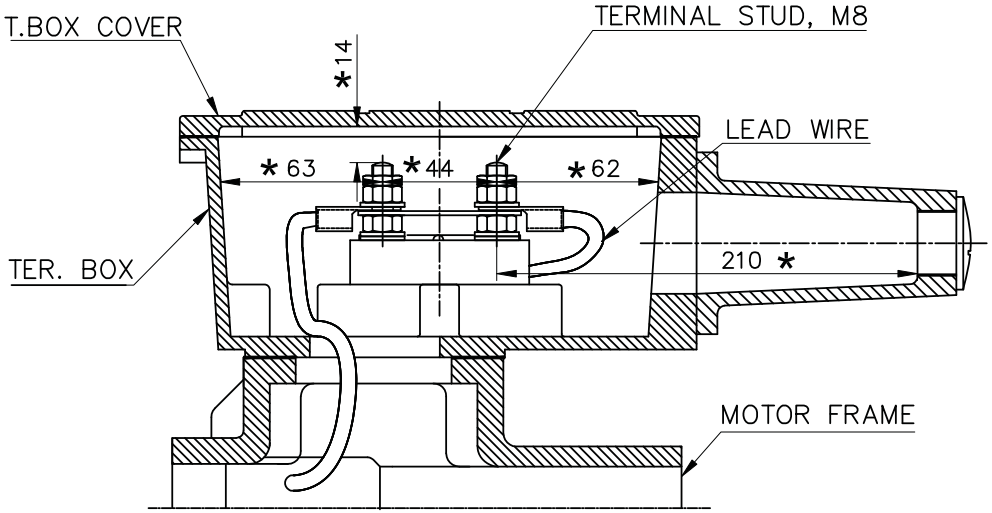


TOP VIEW SHOWING TERMINAL BOX WITHOUT COVER



SECTION A-A

*NOTE:- * MARKED DIM.S ARE APPROX.*

TITLE.		NAME.	DATE.
TER. BOX ARRANGEMENT DRG. FOR 225S/M FRAME FOOT MOUNTED (B3) MOTOR (WITH AUX.T.BOX FOR SP.HTR.& CONDUIT ADAPTOR)	DGN.		
	DRN.	NVM	10.08.19
	CHD.		10.08.19
	APPD.		10.08.19
UNLESS SPECIFIED ALL DIMENSIONS ARE IN MM.	SCALE :-1:1		
Laxmi Hydraulics Pvt.Ltd. SOLAPUR	DRG. NO. MGAN225A0451		
DO NOT SCALE THE DRAWING .	SHEET NO. 2/2	ISSUE NO. 01	REV.NO. 00

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APPROVED QUALITY PLAN AWU

CUSTOMER:- TSGENCO	QAP NO:-PE-V0-417-554-A002
CONTRACTOR:- BHARAT HEAVY ELECTRICALS LIMITED	Rev-01 Date:- 29.09.2021
PROJECT:- 5X800 MW TSGENCO YADADRI TPS	LOA No:-'P - 195/20, Dated : 14.12.2020
ITEM: AIR WASHER UNIT (AWU)& UNITARY AIR FILTRATION (UAF)	Inspection Cat-I
SYSTEM:-VENTILATION SYSTEM	

S.NO.	COMPONENT/ OPERATION	CHARACTERISTICS CHECKED	CATE-GORY	TYPE/METHOD OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENTS	ACCEPTANCE NORM	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N					M	C	N	
(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	D*	(10)			(11)
1.0	**RAW MATERIAL & BOUGHT OUT CONTROL**													
1.1	M.S sheets, Plates, Flats, Angles and Sections,Tank & Casing Material	Visual & Chemical, Mechanical Test	Major	Visual Measurement & Chemical test	One Sample / heat	One Sample / heat	Appr. drg./ Appr. Data sheet	Appr. drg./ Appr. Data sheet	Test certificate	√	P	V	V	Manufacturer's test certificates to be provided.
01 1.2	Pipes for header and spray set	Mechanical, Dimension	Major	TC Verification	100%	100%	IS:3589/1239	IS:3589/1239 Heavy Grade	Test Certificate	√	P	V	V	Pipe make, as per BHEL/ TSGENCO approved makes/Inspection 01
01 1.3	Air filter	Visual, dimension	Minor	TC Verification	100%	100%	Appd. Drg./ data sheet	Appd. Drg./ data sheet	Inspection Report	√	P	V	V	Inspection -As per Approved QAP
1.4	Mist Eliminators	Visual, dimension	Minor	TC Verification	100%	100%	Appd. Drg./ data sheet	Appd. Drg./ data sheet	Inspection Report	√	P	V	V	
1.5	Nozzle for Spray	Dimension, Visual & Material	Minor	Visual	100%	100%	AVPL Mfg's drawing	AVPL Mfg's drawing	Inspection Report	-	P	V	V	
	Valves,Strainer & Fittings													
2.0	**IN PROGRESS INSPECTION**													
2.1	Tank marking , cutting , forming, Casing & pipe fabrication,eliminator,Distribution Plate	Visual & measurement	Major	Visual	100%	10%	Approved drg	Approved drg	Internal inspection report	-	P	V	V	
2.2	Welding /Weldament check	DPT of weld	Major	NDT	20%	20%	ASTM E 165	No relevant indication	Inspection Report	√	P	V	V	
3.0	**IN ASSEMBLY INSPECTION**													
3.1	Overall dimension	Visual & measurement	Major	Measurement	One of each type	One of each type	Approved drg	Approved drg	Inspection report	√	P	W	W	
3.2	Assembly of tank ,internals & casing.	Visual, final dimension	Major	Visual & Measurement	100%	100%	Appd. Drawing	Appd. Drawing	Inspection Report	√	P	W	W	
4.0	**FINAL INSPECTION**													
01 4.1	Water fill test of Tank	Visual	Major	visual	100%	One of each type of Project Qty.	Appd. Drawing(Water fill for 30 minutes	No leakage	Inspection Report	√	P	W	W	Should be keep at sufficient Height to see the Leakage
4.2	Assembly	Visual & measurement	Major	Visual & measurement	One of each type	One of each type of Project Qty.	Appd. Drawing	No relevant indication	Inspection Report	√	P	W	W	1 No. AWU & 1 No. UAF of Project Qty. is to be assembled at shop & Inspected for visual & measurement
01 5	Painting	Visual,Surface Finish & DFT	Minor	Visual & Measurement	100%	100%	As per approved Painting document	Asper specs.	Inspection report	-	P	v	V	
01 6.0	QA documentation Review	Documet Review	Minor	Documet Review	100%	100%	Appd. Drawing		Inspection report	-	P	v	V	

LEGEND : * RECORDS IDENTIFIED WITH TICK ( ) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION M MANUFACTURER / SUB- SUPPLIER C: BHEL N: TSGENCO P PERFORM W : WITNESS AND V: VERIFICATION AS APPROPRIATE ,	BHEL	Customer

Note:-1) Instruments used for test shall have valid calibration certificate with tractability to national level.

2) Bought out items shall be from approved vendor by TSGENCO/TCE .

3) All inspection/verification/NDT reports along with material certificates shall be reviewed .

CE/TPC
CHIEF ENGINEER
nal Projects Construction
ENCO, Vidyut Soudha,

APPROVED QUALITY PLAN
CENTRIFUGAL FAN

MANUFCATURING QUALITY PLAN

CUSTOMER:- TSGENCO	QAP NO:-PE-V0-417-554-A004
CONTRACTOR- BHARAT HEAVY ELECTRICALS LIMITED	REV-01 Date :-28.09.2021
PROJ ECT:- 5X800 MW TSGENCO YADADRI TPS **Inspection Cat-1**	LOA No:-'P - 195/20, Dated : 14.12.2020
ITEM:-CENTRIFUGAL FANS	
SYSTEM:-FOR VENTILATION SYSTEM	

S.NO.	COMPONENT/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/METHOD OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENTS	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
										M	C	N	
(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)		(10)		(11)
1.0	**RAW MATERIAL**												
1.1	M.S sheets, Plates, Flats, Angles and Sections,Impeller	Visual & Chemical, Mechanical	Major	Visual, Mechanical test, Measurement and Chemical Test	1 No. Sample / heat	1 No. Sample / heat	Appr. drg./ Appr. Data sheet	Appr. drg./ Appr. Data sheet	Test certificate	P	V	V	Manufacturer's test certificates/Lab Test report to be provided.
1.2	Shaft (EN-8)	Visual, Chemical & Mechanical	Critical	- do -	1 No. Sample / heat	1 No. Sample / heat	- do -	- do -	- do -	P	V	V	
		Soundness	Critical	Ultrasonic Test (Shaft dia >=50mm)	100%	100%	ASTM A-388	Note-1	Test Report	P	V	V	
1.3	Bearing	Visual	Major	Check for make & no	100%	random	Fan Mfg. Drg.	Fan Mfg. Drg.	Arrival note	P	V	V	Make NTN/ SKF/ FAG
1.4	Pulleys	Visual & dimension	Major	Visual & Measurement	100%	random	Appr. drg./ Appr. Data sheet	Manufacturer catalogue / drg	Arrival note	P	V	V	Make-Fenner
1.5	V-Belt	Visual	Minor	Visual & check for make	100%	random	------do------	Dimension as per P.O.	Arrival note	P	V	V	Make-Fenner
2.0	**Inprogess Inspection**												
2.1	Casing & Impeller	Visual & measurement	Major	Visual	100%	random	Approved drg	Approved drg	Inspection report	P	V	V	
2.2	Shaft machining	Surface Defects Dimensions	Major	Visual, measurement	100%	random	Approved drg	Approved drg	Inspection report	P	V	V	
2.3	Impeller balancing (Dynamic)	Balancing level	Critical	Balancing	100%	100%	ISO 1940 - 2003 Gr. 6.3	ISO 1940 - 2003 Gr. 6.3	Balancing report	P	V	V	
2.4	Welding / Weldament Check	DPT of Weld	Major	NDT	20%	20%	ASTM 165	No relevant Indication	Inspection report	P	V	V	
3.0	**FINAL INSPECTION**												
3.1	Overall dimension	Visual & measurement	Major	Measurement	100%	One per size	Approved drg	Approved drg	Inspection report	P	W	W	
3.2	Final painting, Cleaning & Name	Visual & dimensional/DFT	Major	Visual	100%	-	Approved drg/ Min 50 micron DFT	Approved drg/ Min 50 micron DFT	Inspection report	P	-	V	Painting shall be done after Performance test
4.0	Final Acceptance												
4.1	Motors	-	-	-		-	-	-	-	-	V	V	Refer QAP of Motors
4.2	Run test of fan for 1 hours or till bearing temperature stabilizes With Shop Mootr	Visual & measurement	Critical	Measurement Fan Speed, vibration, bearing temp. rise, motor current & noise.	100%	One of each type of project Qty	IS-4894 & ISO 1940	Approved data sheet	Run test report	P	W	W	100% test is to be done by manufacturer and one of each type of project Qty by Customer.Noise , Vibration are for reference purpose only, actual valuas are to be shown at site.
4.3	Performance test of Fan with Shop Motor	Measurement,Static pressure,efficiency	Critical	Measurement a) Air Flow rate b) Bearing temp. rise c) Fan RPM d) Motor current e) Noise level f) Vibration g) Efficiency, Static head / total head, power consumption	One of each type and size of project Qty	One of each type and size of Project Qty	AMCA-210	Approved Drawing & Data Sheet/Noise Level-85 dbA/ Vibration as per ISO 1940/1	PT report	P	W	W	Tolerance if any shall be as per approved Drg./datasheet. Noise & vibration are for reference purpose only. Guaranteed values to be shown at site.
Note:-1	Acceptance Norm for UT, Back wall echo is set 100% of full screen height. In defect area, defect echo shall be less than 20% & BWE shall be above 80%.												

N.CUSTOMER/TSGENCO	P : PERFORMING
C.BHEL	W.Witness
M.AVPL/MANUFACTURER	V:Verification

Cutomer/Consultant

28/11/24

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APPROVED QUALITY PLAN PUMP

MANUFACTURER'S NAME AND ADDRESS	REFERENCE QUALITY PLAN					
FLOWMORE PUMPS	ITEM	HORIZONTAL CENTRIFUGAL PUMPS		SIGN OF MFGR.	PROJECT NAME : 5X800MW TSGENCO YADADRI TPS (UNIT 1 TO 5)	
FLOWMORE LIMITED UNIT-I 9TH MILESTONE G.T ROAD MOHAN NAGAR, SAHIBABAD, GHAZIABAD UNIT-II 28 A SITE –IV INDUSTRIAL AREA SAHIBABAD GHAZIABAD U.P	TYPE	END SUCTION, HORIZONTAL SPLIT CASE, SUMP & MULTISTAGE PUMP, FIRE FIGHTING PUMPS	RQP NO.	FL/HSC/01	CUSTOMER : TELANGANA STATE POWER GENERATION CORPN LTD. CONSULTANT : Tata Consulting Engineers Ltd.	
	DESIGN STANDARD	HIS /IS	REV NO.	02	RQP.NO: QP NO: 21024933/PS	REVIEWED BY / APPROVED BY
Inspection category as: Less than 75 KW -Cat-II, More than 75 kW -Cat-I (2)	POWER RATING (2)	FOR MISC PUMPS (HORIZONTAL) MOTOR RATING – 15KW – 280KW	DATE :	08/09/2021	PAGE NO. 1 of 4	

SN	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY M	AGENCY C	AGENCY N	REMARK
1	2	3	4	5	6		7	8	9		**10			11
RAW MATERIAL INSPECTION:														
1	CASING	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT		RELEVANT MATERIAL SPECS AS PER APPD. DRG./ DATA SHEETS		MTC	✓	P	V	V	NO REPAIR WELDING IS PERMITTED ON CI. AS CAST / PUNCHED HEAT NO SHALL BE PROVIDED FOR CORRELATION.
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST	1 SAMPLE / HEAT		RELEVANT MATERIAL SPECS AS PER APPD. DRG./ DATA SHEETS		MTC	✓	P	V	V	
		SURFACE EXAMINATION	MAJOR	VISUAL INSPECTION	100%		CASTING WILL BE FREE FROM CRACKS, SHRINKAGE, COLD SHUT, INJURIOUS POROSITY, SAND FUSION ETC.		IR		P	V	V	
2	IMPELLER	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1SAMPLE /HEAT		RELEVANT MATERIAL SPECS AS PER APPD. DRG./ DATA SHEETS		MTC	✓	P	V	V	
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST & HARDNESS	1SAMPLE/HEAT/ HT BATCH		RELEVANT MATERIAL SPECS AS PER APPD. DRG./ DATA SHEETS		MTC	✓	P	V	V	
		HEAT TREATMENT (AS APPLICABLE)	CRITICAL	REVIEW OF TIME TEMP CHART	100%		RELEVANT MATERIAL SPECS AS PER APPD. DRG./ DATA SHEETS		HT CHART	✓	P	V	V	
		SURFACE EXAMINATION	MAJOR	VISUAL INSPECTION	100%		CASTING WILL BE FREE FROM CRACKS, SHRINKAGE, COLD SHUT, INJURIOUS POROSITY, SAND FUSION ETC.		IR		P	V	V	
3 (2)	BARS (ROLLED / FORGED) FOR SHAFT, SHAFT SLEEVES, STUFFING BOX	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1SAMPLE /HEAT		RELEVANT MATERIAL SPECS AS PER APPD. DRG./ DATA SHEETS		MTC	✓	P	V	V	
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST	1SAMPLE /HEAT		RELEVANT MATERIAL SPECS AS PER APPD. DRG./ DATA SHEETS		MTC	✓	P	V	V	

(2)

LEGEND :
* **RECORDS** IDENTIFIED WITH TICK (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION
** **M** MANUFACTURER / SUB- SUPPLIER **C**: BHEL, **N**: TSGENCO **P** PERFORM **W** : WITNESS AND **V**: VERIFICATION AS APPROPRIATE ,**CHP**: CLIENT SHALL IDENTIFY IN COLUMN **'N'** AS **'W'** ,

NOTE#
Inspection engineer to check , approval date / revision documents at the time of inspection

FORMAT NO. – QS-01-QAI-P-10/F3 – R1	1/1	ENGG. DIV / QA&I

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MANUFACTURER'S NAME AND ADDRESS	REFERENCE QUALITY PLAN					
FLOWMORE LIMITED UNIT-I 9TH MILESTONE G.T ROAD MOHAN NAGAR, SAHIBABAD, GHAZIABAD UNIT-II 28 A SITE –IV INDUSTRIAL AREA SAHIBABAD GHAZIABAD U.P Inspection category as: Less than 75 KW -Cat-II, More than 75 KW -Cat-I	ITEM	HORIZONTAL CENTRIFUGAL PUMPS			SIGN OF MFGR.	PROJECT NAME : 5X800MW TSGENCO YADADRI TPS (UNIT 1 TO 5) CUSTOMER : TELANGANA STATE POWER GENERATION CORPN LTD. CONSULTANT : Tata Consulting Engineers Ltd.
	TYPE	END SUCTION, HORIZONTAL SPLIT CASE, SUMP & MULTISTAGE PUMP, FIRE FIGHTING PUMPS	RQP NO.	FL/HSC/01		
	DESIGN STANDARD	HIS /IS	REV NO.	02		RQP.NO: QP NO: 21024933/PS; REVIEWED BY; APPROVED BY
	POWER RATING	FOR MISC PUMPS (HORIZONTAL) MOTOR RATING – 15KW – 280KW	DATE :	08/09/2021		PAGE NO. 2 of 4

SN	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY M	AGENCY C	AGENCY N	REMARK
1	2	3	4	5	6		7	8	9		**10			11
	& COUPLING	SOUNDNESS	CRITICAL	ULTRASONIC TEST	100%		ASME Section-VIII-Division-1/Division-2 2015 ED,ASME SECTION-V-2015 ED		UT REPORT	✓	P	V	V	FOR BAR DIA. ≥ 40 MM ONLY. (EXCEPT IN THREADED PORTION, GROOVE, KEY WAY ON SHAFT).
4	WEARING RINGS	CHEMICAL PROPERTIES	MAJOR	CHEMICAL ANALYSIS,	1 SAMPLE / HEAT		RELEVANT MATERIAL SPECS AS PER APPD. DRG./ DATA SHEETS		MTC	✓	P	V	V	
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST & HARDNESS	1 SAMPLE / HEAT		RELEVANT MATERIAL SPECS AS PER APPD. DRG./ DATA SHEETS		MTR	✓	P	V	V	
	Mechanical Seal, Bearing, bought out items	MECHANICAL PROPERTIES	MAJOR	VISUAL	100 %		RELEVANT MATERIAL SPECS AS PER APPD. DRG./ DATA SHEETS		MTR / COC	✓	P	V	V	20%
IN PROCESS INSPECTION:														
5	CASING & WEAR RINGS	DIMENSIONAL	MAJOR	MEASURE	100%		MANUFACTURING DRAWING		IR	✓	P	V	V	
		HYDROSTATIC TEST OF CASING	CRITICAL	PRESSURE TEST	100%	20%	SEE NOTE-2	NO LEAKAGE	IR	✓	P	W	V	SEE NOTE-1
6	IMPELLER	DIMENSIONAL	MAJOR	MEASURE	100%		MANUFACTURING DRAWING		IR	✓	P	V	V	
		STATIC & DYNAMIC BALANCING	CRITICAL	MEASURE	100%	20%	ISO 1940, GR, 6.3		IR	✓	P	W	V	SEE NOTE-1
7	DPT OF MACHINED AREA OF CASINGS & IMPELLER	SOUNDNESS OF CASTINGS	MAJOR	NDT - DPT	100%		ASTM E165 / ASME sec VIII div 1 Appendix 8		DPT REPORT	✓	P	V	V	
8	SHAFT, SLEEVES & WEARING RING	DIMENSIONAL	MAJOR	VISUAL	100%		MANUFACTURING DRAWING		IR	✓	P	V	V	
		SOUNDNESS	CRITICAL	ULTRASONIC TEST	100%		ASME Section-VIII-Division-1/Division-2 2015 ED,ASME SECTION-V-2015 ED		UT REPORT	✓	P	W	V	FOR SHAFT DIA. ≥ 40 MM ONLY (EXCEPT IN THREADED PORTION, GROOVE, KEY WAY ON SHAFT). SEE NOTE-1

LEGEND :
* RECORDS IDENTIFIED WITH TICK (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION
** M MANUFACTURER / SUB- SUPPLIER C: BHEL, N: TSGENCO P PERFORM W : WITNESS AND V: VERIFICATION AS APPROPRIATE ,CHP: CLIENT SHALL IDENTIFY IN COLUMN 'N' AS 'W' ,

NOTE#
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RITESH KUMAR JAISWAL

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Thermal Projects Construction
TSGENCO Vidyut Soudha

REFERENCE QUALITY PLAN

MANUFACTURER'S NAME AND ADDRESS					
FLOWMORE PUMPS	ITEM	HORIZONTAL CENTRIFUGAL PUMPS		SIGN OF MFGR.	PROJECT NAME : 5X800MW TSGENCO YADADRI TPS (UNIT 1 TO 5)
FLOWMORE LIMITED UNIT-I 9TH MILESTONE G.T ROAD MOHAN NAGAR, SAHIBABAD, GHAZIABAD UNIT-II 28 A SITE –IV INDUSTRIAL AREA SAHIBABAD GHAZIABAD U.P	TYPE	END SUCTION, HORIZONTAL SPLIT CASE, SUMP & MULTISTAGE PUMP, FIRE FIGHTING PUMPS	RQP NO. FL/HSC/01		CUSTOMER : TELANGANA STATE POWER GENERATION CORPN LTD. **CONSULTANT : Tata Consulting Engineers Ltd.**
	DESIGN STANDARD	HIS /IS	REV NO. 02		RQP.NO: QP NO: 21024933/PS; REVIEWED BY; APPROVED BY
Inspection category as: Less than 75 KW -Cat-II, More than 75 kW -Cat-I	POWER RATING	FOR MISC PUMPS (HORIZONTAL) MOTOR RATING – 15KW – 280KW	DATE : 08/09/2021		PAGE NO. 3 of 4

SN	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D*	AGENCY M	AGENCY C	AGENCY N	REMARK
1	2	3	4	5	6		7	8	9	D*	**10			11
		DP TEST ON MACHINED AREA	MAJOR	DP TEST	100%		ASTM E165 / ASME sec VIII div 1 Appendix 8		DPT REPORT	✓	P	V	V	
FINAL INSPECTION :														
9	PUMP ASSEMBLY	DIMENSIONAL	MAJOR	MEASURE	100%	1 NO./ MODEL	APPROVED G.A DRAWING		IR	✓	P	V	V	
10	PERFORMANCE TEST WITH CONTRACT / LAB MOTOR	Q VS H Q VS P Q VS η	CRITICAL	MEASURE	100%	Refer Note 3 & 4	IS-5120 / IS 9137 / APPROVED DRAWING / DATA SHEET		IR	✓	P	W	W	REFER NOTE - 3
		NOISE LEVEL	MAJOR	MEASURE					IR	✓	P	W	W	REFER NOTE - 4
		VIBRATION	MAJOR	MEASURE					IR	✓	P	W	W	REFER NOTE - 4
		BEARING TEMP	MAJOR	MEASURE					IR	✓	P	W	W	
11	NPSHR TEST	NPSHR TEST	CRITICAL	MEASURE	100%	1 NO./ MODEL	IS-5120 / IS 9137 / APPROVED DRAWING / DATA SHEET		IR	✓	P	W	W	REFER NOTE - 6
12	PAINTING AND PACKING	TYPE OF PAINT, APPEARANCE, DFT	MAJOR	VISUAL & MEASURE	100%	100%	Painting shall be as per approved painting spec by TSGENCO		IR		P	V	V	
		CONFORMANCE TO PACKING SPECIFICATION	MAJOR	VISUAL	100%	100%	MANUFACTURE STANDARD PRACTICE		IR		P	V	V	
13	QA documentation review								IR		P	V	V	

NOTES:

1	For these checks, Witness (W) by BHEL and TSGENCO, shall be based on the following criteria; • For Pump, BHEL shall witness the checks & TSGENCO shall verify the Test Reports
2	Test pressure shall be 1.5 times the shut off pressure (considering the maximum suction pressure) or twice the duty point whichever is higher. Holding time will be 60 minutes.
3	For Performance Test of Pumps with LAB / JOB Motor, Witness (W) by BHEL and TSGENCO, shall be based on the following criteria; • For Pump Motor rating less than or equal to 75 KW, BHEL shall witness the checks ON 50 % of the Pumps & TSGENCO shall verify the Test Reports. • For Pump Motor rating more than 75 KW 100% pumps shall be witness by BHEL and 50% pumps will be witness by TSGENCO. • Report for the balance pump shall be submitted for review purpose.
4	Noise & Vibration level shall be recorded during shop test for reference purpose only. However values as per approved data sheet/ technical specification/ IS/ HIS to be guaranteed at site.

LEGEND :
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FORMAT NO. – QS-01-QAI-P-10/F3 – R1 | 1/1 | ENGG. DIV / QA&I

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MANUFACTURER'S NAME AND ADDRESS	REFERENCE QUALITY PLAN					
FLOWMORE PUMPS	ITEM	HORIZONTAL CENTRIFUGAL PUMPS			SIGN OF MFGR.	PROJECT NAME : 5X800MW TSGENCO YADADRI TPS (UNIT 1 TO 5)
FLOWMORE LIMITED UNIT-I 9TH MILESTONE G.T ROAD MOHAN NAGAR, SAHIBABAD, GHAZIABAD UNIT-II 28 A SITE –IV INDUSTRIAL AREA SAHIBABAD GHAZIABAD U.P	TYPE	END SUCTION, HORIZONTAL SPLIT CASE, SUMP & MULTISTAGE PUMP, FIRE FIGHTING PUMPS	RQP NO.	FL/HSC/01		CUSTOMER : TELANGANA STATE POWER GENERATION CORPN LTD. CONSULTANT : Tata Consulting Engineers Ltd.
	DESIGN STANDARD	HIS /IS	REV NO.	02		RQP.NO: QP NO: 21024933/PS; REVIEWED BY; APPROVED BY
Inspection category as: Less than 75 KW -Cat-II, More than 75 KW -Cat-I (2)	POWER RATING (2)	FOR MISC PUMPS (HORIZONTAL) MOTOR RATING – 15KW – 280KW	DATE :	08/09/2021		PAGE NO.: 4 of 4

SN	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARK
					M	C/N					M	C	N	
1	2	3	4	5	6		7	8	9	D*	**10			11
5					In case of abnormal noise, Pump shall be stripped and shall be re-offered for Performance Test after correction.									
6 (2)					• For Pump Motor rating less than or equal to 75 KW, both BHEL & TSGENCO shall review the Test Reports of the NPSH test witnessed by M/s FLOWMORE/ Third Party Agency, during Final inspection. • For Pump Motor rating more than 75 KW, both BHEL & TSGENCO shall witness NPSH test. However, in Case NPSH test has been carried out previously on the same Model as of the offered Pump, and was witnessed by TPIA / END CLINET, then retest of the NPSH Test is not required & BHEL & TSGENCO shall only review such NPSH Test Report, during final inspection.									
(2)					• Statutory requirements will be complied. • Instruments used for test shall have valid calibration certificate with tractability. • Bought out items shall be from approved vendor by TSGENCO/TCE for this project. • "W" at client column shall be considered as hold point • All inspection/verification/NDT reports along with material certificates shall be reviewed at the time of witness point									

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LEGEND :	NOTE#
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FORMAT NO. – QS-01-QAI-P-10/F3 – R1 / 1/1	ENGG. DIV / QA&I

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Reference Document

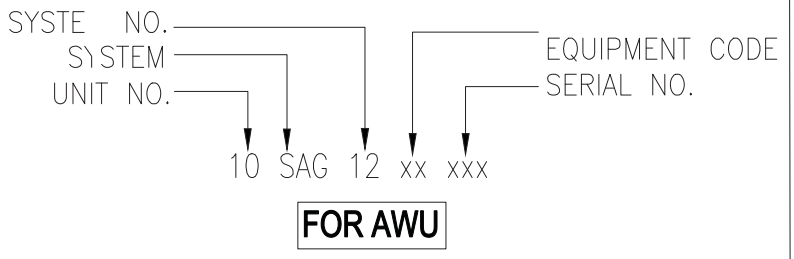
P & ID (PE-V0-417-554-A021)

IO LIST (PE-V0-417-554-A048)

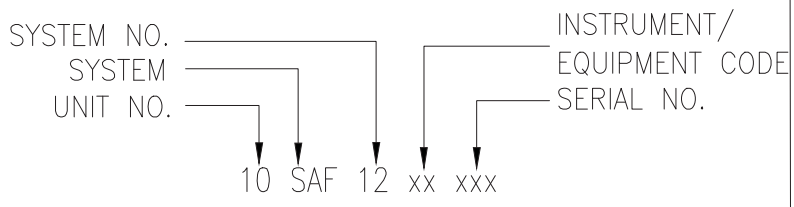
DRIVE LIST (PE-V0-417-554-A049)

NOTE:-Tagging Philosophy for other units

1. For KKS of unit 2 prefix 20 shall be used instead of 10.
2. For KKS of unit 3 prefix 30 shall be used instead of 10.
3. For KKS of unit 4 prefix 40 shall be used instead of 10.
4. For KKS of unit 5 prefix 50 shall be used instead of 10.



FOR AWU



FOR UAF

OPERATION & CONTROL PHILOSOPHY

1. **THE AIR WASHER & UAF SYSTEM CONSIST OF FOLLOWING AREAS.**

2. **A Row Side AWU- 10nos**-(All Working)
   - Centrifugal fan (10SAG12AN001,10SAG12AN002) -2nos in each, total -20nos (All Working)
   - Pump (10SAG12AP001, 10SAG12AP002)-2nos in each, total -20nos (1W+1S)
   - Fire Damper (10SAG12AA003) -34 appx.no (All Working)

3. **B-C Bay Side AWU-10nos**-(All Working)
   - Centrifugal fan (10SAG14AN001,10SAG14AN002) -2nos in each, total -20nos (All Working)
   - Pump (10SAG14SAP001, 10SAG14SAP002) -2nos in each, total -20nos (1W+1S)
   - Fire Damper (10SAG14AA003) -35 appx.no (All Working)

4. **UAF in ESP Building-5nos**-(All Working)
   - Centrifugal fan(10SAF12AN001) -1nos in each, total -5nos (All Working)
   - Pump (10SAF12AP001, 10SAF12AP001)-2nos in each, total -10nos (1W+1S)

2.1 DETAILS OF AIR WASHER & UAF SYSTEM

The above system will be operated & controlled by PLC either in sequence or in manual (with individual drive operation).

3.1. OPERATION & CONTROL OF VENTILATION SYSTEM

3.1.(A) Operation & Control of Ventilation System

- During sequential Operation, system will operate in sequence as per the preset program in PLC.
- During Manual operation each drive will operate manually through PLC system at drive level. PLC System shall consist of following Graphics pages in which P & I diagram are to be prepared with all necessary face plate, Display parameters & Alarm Configuration.
- Graphics for AWU Fan-1 to 20 System at 0.0 meters outside A Row
- Graphics for AWU Pump -1 to 20 System at 0.0 meters outside A Row
- Graphics for AWU Fan -1 to 20 System at roof of power house CCR area outside B-C Bay
- Graphics for AWU Pump -1 to 20 System at roof of power house CCR area outside B-C Bay
- Graphics for UAF Fan-1to5 System at roof of ESP control room
- Graphics for UAF Pump-1to10 System at roof of ESP control room
- In duty cycle sequence preset running time can be set in PLC and run time duration completed will be monitored in PLC until reset by Operator. When preset run time is completed then an alarm will be annunciated. Accordingly, operator will take decision for further selection.
- Similar to UAF system shall be for FGD area

3.2 THE DETAIL OPERATION OF AIR WASHER & UAF SYSTEM

3.2.1 MANUAL OPERATION THROUGH PLC

Step-1

The operator will open the respective graphics of the AWU/UAF system and system and select the working and standby of each drive.

Step-2

Operator will give the open command to each Motorized Fire Damper through the graphics/ face plate. The open command will be issued by PLC to MCC in which a relay will be energized which is turn supplies the required voltage to Fire Damper. On availability of power Fire Damper will be opened thus a feedback will be generated through limit switch which will be indicated in PLC through MCC. In the event of Fire a signal will be generated from Fire Alarm Panel which will be interfaced to PLC thus withdrawing the open command and the relay in MCC will be de-energized and power supply will be cut-off, being the spring return damper the damper will immediately will close giving the close feedback to PLC through MCC. Normally all Fire Dampers will be Open. Upon receipt of the command the PLC will check the following permissive/ protection (as explained above) to operate accordingly:-

Start Permissive:

- No fire signal(10SAG12SC201/202) from fire alarm panel.

Stop Protection:

- Fire signal from fire alarm panel.

STEP-3
(AWU Fan (10SAG12AN001/002) Operation (TYP.))

The **"Start"** command will be given from the PLC to AWU Fan & if following permissive are found ok then fan will be started.

Start Permissive

- AWU Fan is in Service/Maintenance mode. It should be in service mode for starting.
- Fire Dampers are opened.
- No Fire Signal.

Stop Protection:

- Close feedback from fire damper
- Fire signal from fire alarm panel.
- No run feedback received wthin10 sec of released of start command.
- Fan Outlet Pressure does not develop by pressure transmitter(10SAG12CP017/18)(Typ.) for 10SAG12AN001/002 (TYP.) by (40mmwc) within 60sec of start command.
- Plenum Pressure does not develop by pressure transmitter (10SAG12CP016/17) (Typ.) (2of2) (35mmwc) within 60sec of start command.

Alarm

- Plenum pressure low by pressure transmitter (1of2) after 60sec of start command.
- Plenum Pressure not develop (2of2) after 60sec of start command.
- Fan Outlet Pressure not develop.

ON, OFF & Trip indication of the AWU fan and Damper open indication will be available at PLC.

STEP-4
(AWU Pump (10SAG12AP001/002) Operation(TYP.))

After starting of AWU fan, Operator will give open command to Discharge valve(10SAG12AA101/102) for AWU Pump, valve will be operated based on following condition.

Start Permissive

- Respective AWU Pump should be in working mode.

Stop Protection

- Off feedback of respective AWU Pump.

After the opening of AWU Pump valve the operator will release the start command to AWU Pump. Upon receipt of the command the control system will check the following permissive/ protection and will operate accordingly.

Start Permissive

- Any AWU Fan is running.
- AWU Pump Outlet Valve is open
- AWU Pump is in working mode
- Humidity level (HS-10SAG12CU001/2)(typ)is ok (less than 55%)
- Tank water level(LT-10SAG12CL012/011) is ok greater than 300 mm (2of2).

Stop Protection

- AWU Pump Outlet Valve closed feedback
- AWU Tank water level becomes less than 300mm
- Off feedback of both AWU Fan
- No Run feedback within 10sec of reset start command
- Outlet Pressure Not Develop by pressure transmitter (10SAG12CP011/012)(TYP.) (2kg/cm2) within 60sec of start command.
- Header Pressure Not Develop by pressure transmitter(10SAG12CP014/013)()TYP. (2kg/cm2) within 60sec of start command.
- Humidity Level (HS-10SAG12CU001)is greater than 55% continuously for 180 sec.

Alarm

- Header pressure low by pressure transmitter (1of2) after 60sec of start command.
- Header Pressure not develop (2of2) after 60sec of start command.
- Outlet Pressure not develop.

ON, OFF & Trip indication of the pump will be available at PLC.

4.0 SEQUENCE OPERATION THROUGH PLC

The AWU Fan will be started first & then pump will be started provided that safety interlock of pump is ok as explained for Manual mode.

DETAILS OF SHUT DOWN SEQUENCE

4.1 MANUAL SHUT DOWN THROUGH PLC

STEP-1

- Give the Stop command to the AWU pump from PLC and pump will be stopped.

STEP-2

- Stop AWU Fan from PLC after stopping the Pump.

4.1.2 SEQUENCE SHUT DOWN THROUGH PLC

Respective AWU system will stop sequentially in steps as explained in case of manual mode operation.

4.2.2 THE DETAIL OPERATION OF UAF SYSTEM

Step-1

The operator will open the respective graphics of the UAF system and select the working and standby of each drive.

Step-2

Operator will give the open command to each Motorized Fire Damper through the graphics/ face plate. The open command will be issued by PLC to MCC in which a relay will be energized which is turn supplies the required voltage to Fire Damper. On availability of power Fire Damper will be opened thus a feedback will be generated through limit switch which will be indicated in PLC through MCC. In the event of Fire a signal will be generated from Fire Alarm Panel which will be interfaced to PLC thus withdrawing the open command and the relay in MCC will be de-energized and power supply will be cut-off, being the spring return damper the damper will immediately will close giving the close feedback to PLC through MCC. Normally all Fire Dampers will be Open. Upon receipt of the command the PLC will check the following permissive/ protection (as explained above) to operate accordingly:-

Start Permissive:

- No fire signal 10SAF12SC20 from fire alarm panel.

Stop Protection:

- Fire signal from fire alarm panel.

STEP-3
(UAF Fan (10SAF12AN001) Operation (TYP.))

The **"Start"** command will be given from the PLC to UAF Fan & if following permissive are found ok then fan will be started.

Start Permissive

- UAF Fan is in Service/Maintenance mode. It should be in service mode for starting.
- Fire damper are opened.
- No fire signal (10SAF12SC201).

  ON, OFF & Trip indication of the UAF fan and Damper open indication will be available at PLC.

Stop Protection:

- Close feedback from fire damper
- Fire signal from fire alarm panel.
- No run feedback received with in10 sec of released of start command.
- Fan Outlet pressure does not develop by pressure transmitter (10SAF12CP015 & 10SAF12CP016) (40mmwc) within 60sec of start command.

Alarm

- Fan Outlet pressure not develop

  ON, OFF & Trip indication of the UAF fan and Damper open indication will be available at PLC.

STEP-4
(UAF Pump (10SAF12AP001/002) Operation)(TYP.)

After starting of UAF fan Operator will give open command to Discharge valve(10SAF12AA101/102) for UAF Pump,
valve will be operate based on following condition:

Start Permissive

- Respective UAF Pump should be in working mode.

Stop Protection

- Off feedback of respective UAF Pump

After the opening of UAF Pump valve the operator will release the start command to UAF Pump. Upon receipt of the command the control system will check the following permissive/ protection and will operate accordingly.

Start Permissive

- UAF Fan is running.
- UAF Pump Outlet Valve is open.
- UAF Pump is in working mode.
- Humidity level (HS-10SAF12CU001/002)(TYP.)is ok (less than 55%)
- Tank water level(LT-10SAF12CL012/011)(TYP.) is ok greater than 300mm (2of2).

Stop Protection

- UAF Pump Outlet Valve closed feedback.
- UAF tank water level becomes less than 30mm.
- Off feedback of both UAF Fan.
- Outlet Pressure not develop by pressure transmitter ((2kg/cm2) within 60sec of start command.
- Header Pressure not develop by pressure transmitter (2kg/cm2) within 60sec of start command.
- Humidity level is greater than 55% continuously for 180sec.
- No Run feedback receipt within 10sec of reset start command.

Alarm

- Header Pressure low by pressure transmitter (1of2)(10SAF12CP011/012)(TYP). after 60sec of start command.
- Header Pressure not develop (2of2)(10SAF12CP014/013)(TYP).) after 60sec of start command.
- Outlet Pressure Not develop.

ON, OFF & Trip indication of the pump will be available at PLC.

4.3.3 SEQUENCE OPERATION THROUGH PLC

The UAF Fan will be started first & then pump will be started provided that safety interlock of pump is ok as explained for Manual mode.

5.0 DETAILS OF SHUT DOWN SEQUENCE

5.1 MANUAL SHUT DOWN THROUGH PLC

STEP-1

- Give the Stop command to the UAF pump from PLC and pump will be stopped.

STEP-2

- Stop UAF Fan from PLC after stopping the Pump.

5.1.1 SEQUENCE SHUT DOWN THROUGH PLC

Respective UAF system will stop sequentially in steps as explained in case of manual mode operation. Fire Dampers are opened. (It will always remain on until Fire signal available to PLC. In case of fire all fan & damper are closed.

Abbreviation

PLC – Programming Logic Control
UAF-Unitary air filtration
AWU-Air Washer Unit
CCR- Common Control Room
LT-Level Transmitter
HS-Humidity sensor

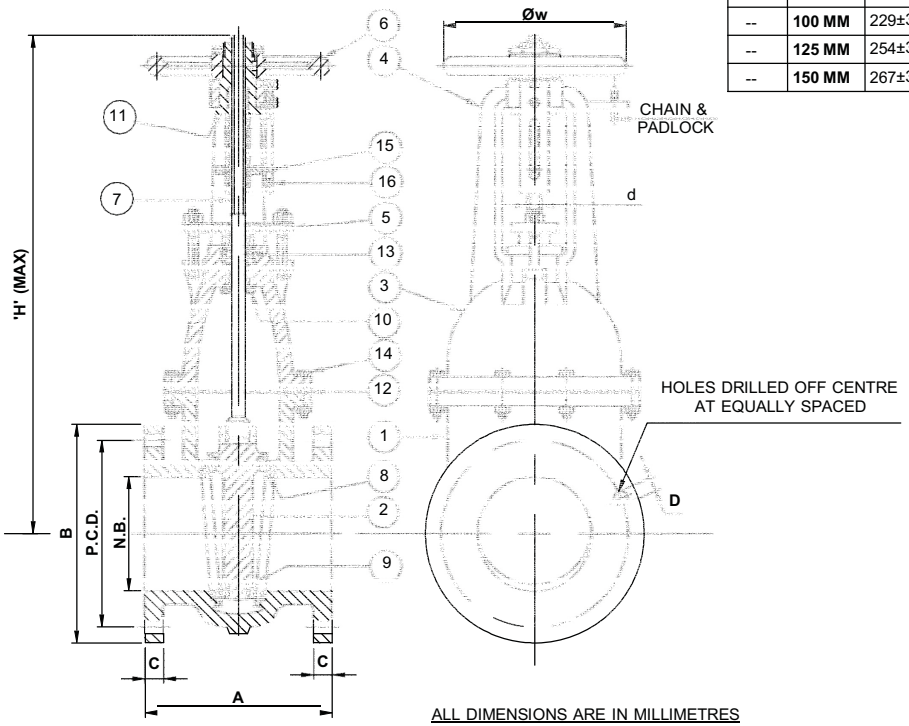
TECHNICAL DATA SHEET
CAST IRON GATE VALVE

1. Manufacturer	-	Bankim & Company.
2. Type of Valve.	-	C.I. Gate Valve, Outside Screwed, Non Rising Type Stem.
For Size	-	75 NB & Above
3. Construction Details :-		
a. Bonnet	-	Yoke Type, Bolted.
b. Spindle	-	Outside Screwed, Rising Type.
c. Wedge	-	Solid.
d. Seat	-	Renewable.
e. End Connection.	-	Flanged.
4. Materials of Construction :-		
a. Body, Bonnet, Wedge, Gland & Handwheel.	-	Cast Iron to IS-210, FG-260.
b. Spindle	-	S.S. to ASTM-A-276, TYPE-410.
c. Body Seat Ring	-	S.S. to ASTM-A-351, CF-8
d. Wedge Seat Ring	-	S.S. to ASTM-A-351, CF-8
e. Yoke Bush	-	Gun Metal to IS:318, LTB-2
f. Back Seat Bush	-	S.S. to ASTM-A-351, CF-8
g. Gasket	-	C.A.F. to IS:2712, Gr.C.
h. Gland Packing	-	Graphited Asbestos.
i. Bolts, Nuts & Studs.	-	Carbon Steel to IS:1367, Cl. 4.6/4.0
5. Flange to Flange distance.	-	As per ANSI B 16.10, Class-125
6. Flange dimension and drilling	-	As per ANSI-B-16.5, Class-150, Flat Face.
7. Design Code	-	As per IS 780-1984/IS 14846
8. Rating of Valve	-	PN-1.6
9. Hydrostatic Test Pressure :-		
a. Body	-	15 Kg/Cm^2
b. Seat & Back Seat	-	10 Kg/Cm^2

Note : 1)The Valves will be provided with Back Seat, Indicator & Locking Arrangement.
2) 250 NB Valves will be provided Back Seat, Indicator, Locking & Gear Arrangement.

3) Functional and dimensional testing and wear travel, seat contacts, smooth opening & closing shall be carried out on each valve.

QTY.	NOMINAL SIZE OF VALVE NB. (MIN)	FACE TO FACE A	FLANGE DIMENSIONS					HEIGHT. 'H' (MAX)		HYD.TEST PRESSURE kg / Cm 2		STEM DIA d ± 1	WALL THICKNESS		HAND WHEEL DIA w ± 5
			DIA B	THICK C	P.C.D.	NO. OF HOLES	HOLE DIA D	CLOSED	OPEN	BODY	BACK SEAT & SEAT		BODY ± 3	COVER ± 3	
--															
--	**80 MM**	203±3	190.5	19 $^{+3}_{-0}$	152.4	4	19	480	575	15	10	22	10	10	225
--	**100 MM**	229±3	229	23.8 $^{+3}_{-0}$	190.5	8	19	570	690	15	10	27	10.5	10.5	320
--	**125 MM**	254±3	254	23.8 $^{+3}_{-0}$	216	8	22.2	625	755	15	10	27	11.1	11.1	320
--	**150 MM**	267±3	279.5	25.4 $^{+3}_{-0}$	241.3	8	22.2	690	860	15	10	27	11.7	11.7	320



ALL DIMENSIONS ARE IN MILLIMETRES

16	INDICATOR SCALE	M.S (GALVANISED)	IS : 2062, GRADE - A.
15	INDICATOR RING	BRONZE	IS : 318, LTB -2
14	BOLTS & NUTS	CARBON STEEL	IS:1367, CLASS-4.6/4.0
13	GLAND PACKING	JUTE AND HEMP	IS:5414
12	GASKET	WIRE INSERTED RED RUBBER GASKET	
11	YOKE SLEEVE	BRONZE	IS : 318, LTB -2
10	BACK SEAT BUSH	STAINLESS STEEL	TYPE-410
9	WEDGE SEAT RING	STAINLESS STEEL	TYPE-410
8	BODY SEAT RING	STAINLESS STEEL	TYPE-410
7	STEM	STAINLESS STEEL	ASTM-A-276, TYPE-410
6	HAND WHEEL	CAST IRON	IS : 210, FG - 260
5	GLAND	CAST IRON	IS : 210, FG - 260
4	YOKE	CAST IRON	IS : 210, FG - 260
3	BONNET	CAST IRON	IS : 210, FG - 260
2	WEDGE	CAST IRON	IS : 210, FG - 260
1	BODY	CAST IRON	IS : 210, FG - 260
PART NO.	**DESCRIPTION**	**MATERIAL**	**SPECIFICATION**

NOTES

1. DESIGN AS PER : BS:5150
2. PRESSURE RATING : PN - 10
3. FACE TO FACE AS PER : AS PER ANSI-B-16.10, CLASS-150
4. FLANGE DIMENSIONS & DRILLING : AS PER ANSI- B- 16 . 5 , CLASS - 150 , FLAT FACE.
5. VALVE OPENING AND CLOSING DIRECTION SHALL BE IMPREGATED ON HANDWHEEL
6. VALVE FLOW DIRECTION SHALL BE IMPREGNATED O THE BODY.
7. OPEN AND CLOSE INDICATED SHALL BE PROVIDED ON THE VALVE
8. THE VALVES WILL BE PROVIDED WITH BACK SEAT, INDICATOR & LOCKING ARRANGMENT.
9. INSPECTION & TESTING - AS PER APPROVED Q.A.P.
10. PAINTING:
Primer Coat: Two (2) layers of Zinc phosphate Epoxy, total DFT: 75 Microns
Finish Coat: Two (2) Coats of Chlorinated Rubber Paint of 30-40 Microns each.
Shade - Sea Green, Shade no. 217 as per IS5

REV. NO.	DATE	NAME

REVISION TABLE

QTN NO.

DATE:

	NAME	DATE
DRAWN	B. DUTTA.	15.02.21
CHECKED	S. DAS.	15.02.21
APPROVED	P. DAS.	15.02.21

MANUFACTURER:-

JOB. NO.

SCALE - N. T. S.

CLIENT :- ADVANCE VENTILATION PVT. LTD.

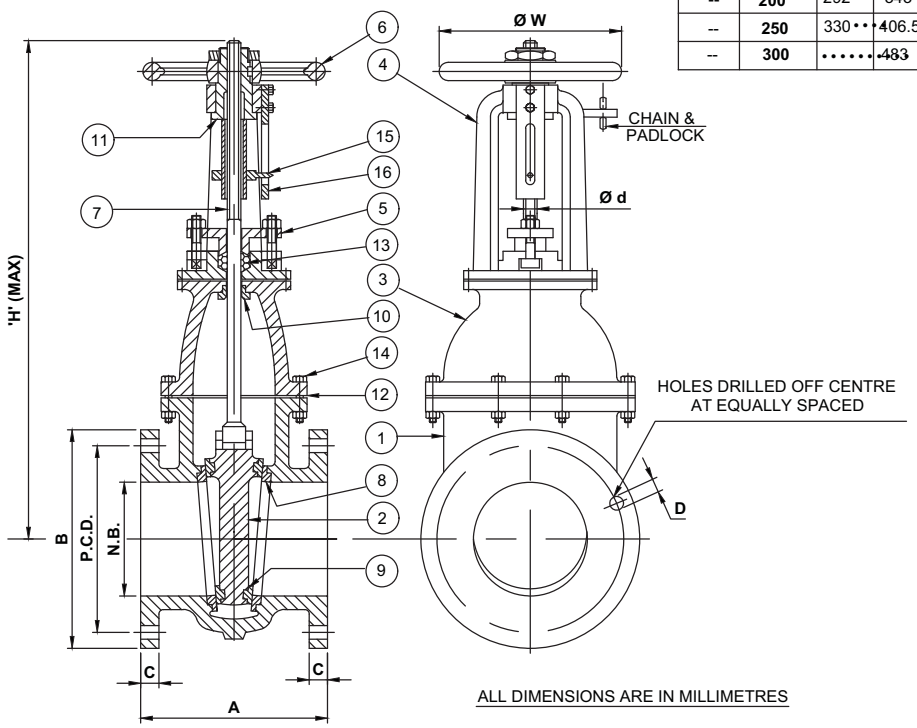
TITLE **"BANKIM" CAST IRON GATE VALVE OUTSIDE SCREWED NON RISING TYPE SPINDLE**

MANUFACTURER:-

BANKIM & COMPANY

DRG. NO. BM / AVPL / BHEL **REV. 01**

QTY.	NOMINAL SIZE OF VALVE NB (MIN)	FACE TO FACE A	FLANGE DIMENSIONS					HEIGHT. 'H' (MAX)		HYD.TEST PRESSURE kg / Cm^2		STEM DIA d (MIN)	WALL THICKNESS		HAND WHEEL DIA w
			DIA B	THICK C	P.C.D.	NO. OF HOLES	HOLE DIA D	CLOSED	OPEN	BODY	BACK SEAT & SEAT		BODY	COVER	
--	**200**	292	343	28.6^{+3}_{-0}	298.4	8	22.2	885	1100	15	10	32	12.8	12.8	360
--	**250**	330	406.5	30.2^{+3}_{-0}	362	12	25.4	1050	1315	15	10	36	14	14	400
--	**300**	483		31.8^{+3}_{-0}	431.8	12	25.4	1170	1490	15	10	36	15.2	15.2	400



PART NO.	DESCRIPTION	MATERIAL	SPECIFICATION
16	INDICATOR SCALE	M.S (GALVANISED)	IS : 2062, GRADE - A.
15	INDICATOR RING	BRONZE	IS : 318, LTB -2
14	BOLTS & NUTS	CARBON STEEL	IS:1367, CLASS-4.6/4.0
13	GLAND PACKING	JUTE AND HEMP	IS:5414
12	GASKET	WIRE INSERTED RED RUBBER GASKET	
11	YOKE SLEEVE	BRONZE	IS : 318, LTB -2
10	BACK SEAT BUSH	STAINLESS STEEL	TYPE-410
9	WEDGE SEAT RING	STAINLESS STEEL	TYPE-410
8	BODY SEAT RING	STAINLESS STEEL	TYPE-410
7	STEM	STAINLESS STEEL	ASTM-A-276, TYPE-410
6	HAND WHEEL	CAST IRON	IS : 210, FG - 260
5	GLAND	CAST IRON	IS : 210, FG - 260
4	YOKE	CAST IRON	IS : 210, FG - 260
3	BONNET	CAST IRON	IS : 210, FG - 260
2	WEDGE	CAST IRON	IS : 210, FG - 260
1	BODY	CAST IRON	IS : 210, FG - 260

NOTES

1. DESIGN AS PER : BS:5150
2. PRESSURE RATING : PN - 10
3. FACE TO FACE AS PER : AS PER ANSI-B-16.10, CLASS-150
4. FLANGE DIMENSIONS & DRILLING : AS PER ANSI- B- 16 . 5 , CLASS - 150 , FLAT FACE.
5. VALVE OPENING AND CLOSING DIRECTION SHALL BE IMPREGATED ON HANDWHEEL
6. VALVE FLOW DIRECTION SHALL BE IMPREGNATED O THE BODY.
7. OPEN AND CLOSE INDICATED SHALL BE PROVIDED ON THE VALVE
8. THE VALVES WILL BE PROVIDED WITH BACK SEAT, INDICATOR & LOCKING ARRANGMENT.
9. INSPECTION & TESTING - AS PER APPROVED Q.A.P.
10. PAINTING:
Primer Coat: Two (2) layers of Zinc phosphate Epoxy, total DFT: 75 Microns
Finish Coat: Two (2) Coats of Chlorinated Rubber Paint of 30-40 Microns each.
Shade - Sea Green, Shade no. 217 as per IS5

REV. NO.	DATE	NAME

REVISION TABLE

QTN NO.
DATE:

	NAME	DATE
DRAWN	B. DUTTA.	04.10.18.
CHECKED	S. DAS.	04.10.18.
APPROVED	P. DAS.	04.10.18.

MANUFACTURER:-
JOB. NO.

SCALE - N. T. S.

CLIENT :- ADVANCE VENTILATION PVT. LTD.

TITLE **"BANKIM" CAST IRON GATE VALVE OUTSIDE SCREWED NON RISING TYPE SPINDLE**

MANUFACTURER:-

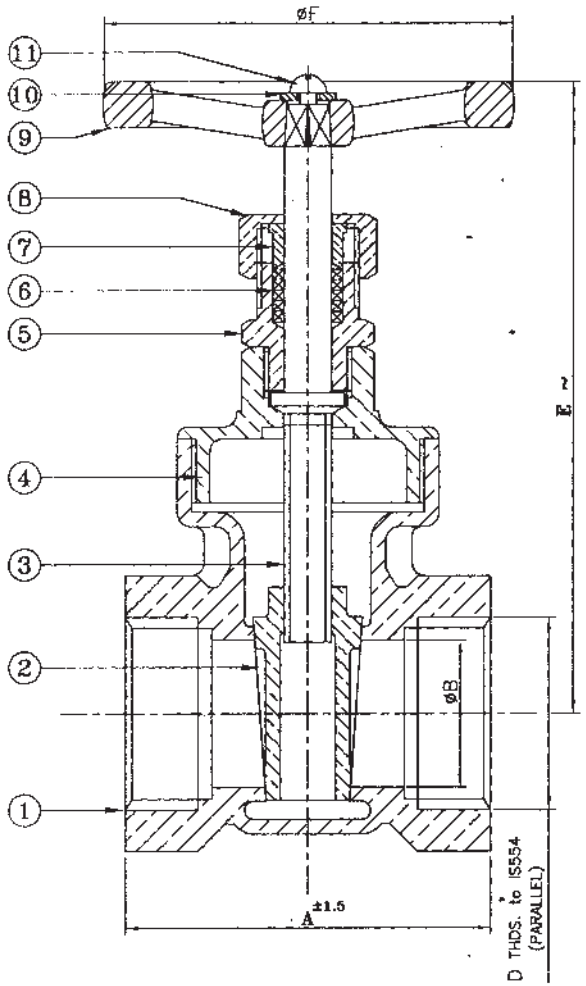
BANKIM & COMPANY

DRG. NO. BM / AVPL / NTPC / QTN / CISV-025 REV.01

TECHNICAL DATA SHEET FOR GUN METAL (GM)GATE VALVE			
Sr. No.	**Description**	**Material**	**Specification/ Standard**
1	Manufacturer	Leader Valves Ltd.	
2	Type	Screwed in Bonnet, Integral Seat, Non Rising stem.	
3	Size/Qty/Location/Tag No.	As per Approved P&ID	
4	Body	G.M	IS 318:81 Gr. LTB2
5	Wedge	G.M /Brass Rod	IS 318:81 Gr. LTB2/ IS 6912:05 Gr. FLB
6	Stem	High Tensil Brass	IS 6912:05 Gr. FHTB1
7	Bonnet	G.M /Brass Rod	IS 318:81 Gr. LTB2/ IS 6912:05 Gr. FLB
8	Stuffing Box	G.M /Brass Rod	IS 318:81 Gr. LTB2/ IS 6912:05 Gr. FLB
9	Packing	Hemp & Jute	
10	Gland	G.M /Brass Rod	IS 318:81 Gr. LTB2/ IS 6912:05 Gr. FLB
11	Gland Nut	G.M /Brass Rod	IS 318:81 Gr. LTB2/ IS 6912:05 Gr. FLB
12	Hand Wheel	C.I	IS 210 Gr. FG 220
13	Washer	Brass (15mm to 50 mm)	B.S 2874 CZ 122
14	Set Screw	Brass (15mm to 50 mm)	B.S 2874 CZ 122
15	Design Code	IS: 778	
16	Inspection & Testing	As per Approved QAP	
17	Pressure Rating	As per Approved PN 1.6	

1)

Functional and dimensional testing and wear travel, seat contacts, smooth opening & closing shall be carried out on each valve.



VALVE SIZE	DIMENSIONAL DATA				
	A	ØB	D	E~	ØF
15mm	60	15	½"	96	60
20mm	60	20	¾"	106	60
25mm	70	25	1"	118	70
32mm	80	32	1¼"	128	90
40mm	90	40	1½"	147	92
50mm	100	50	2"	164	103

STANDARD MATERIAL COMBINATION

P.NO.	Name of Parts	No.Off	Material	Specification/Standard
11	SET SCREW	1	M.S.	IS 2062:92
10	WASHER	1	M.S.	IS 2062:92
9	HAND WHEEL	1	C.I.	IS 210 Gr. FG200
8	GLAND NUT	1	G.M/ BRASS ROD	IS 318:81 Gr. LTB2/ IS 6912:05 Gr. FLB
7	GLAND	1	G.M/ BRASS ROD	IS 318:81 Gr. LTB2/ IS 6912:05 Gr. FLB
6	PACKING	–	HEMP & JUTE	
5	STUFFING BOX	1	G.M/ BRASS ROD	IS 318:81 Gr. LTB2/ IS 6912:05 Gr. FLB
4	BONNET	1	G.M/ BRASS ROD	IS 318:81 Gr. LTB2/ IS 6912:05 Gr. FLB
3	STEM	1	HIGH TENSILE BRASS	IS 6912:05 Gr. FLTB1
2	WEDGE	1	G.M/ BRASS ROD	IS 318:81 Gr. LTB2/ IS 6912:05 Gr. FLB
1	BODY	1	G.M	IS 318:81 Gr.LTB2

PART No.	REVISION MADE	REVISION No.	DATE	AUTHORISED SIGNATORY	REMARKS

LEADER VALVES LTD.

JALANDHAR–144004(INDIA)

All Dimensions in mm Unless otherwise specified

TITLE **COPPER ALLOY GATE VALVE.**

SCREWED IN BONNET, INTEGRAL SEAT,NON RISING STEM.
SCREWED FEMALE ENDS .

PRODUCT SPECIFICATION : IS 778–84 CLASS –1

SCALE

Test Pressure:–
BODY :– 1.5 MPa g (Hyd)
BACK SEAT & SEAT :– 1.0 MPa g (Hyd)
WORKING PRESSURE :– 1.0 Mpa UP TO 45°C
FLUID, WATER, TESTING STANDARD IS. 6157

DRN.	SUNIL	12.08.13
CHKD.	H.KUMAR	13.08.13
APPRD.		13.08.13

DRG.No.
941 SDJ–1300D/G

Issue Status 00

SHEET 1 OF 1

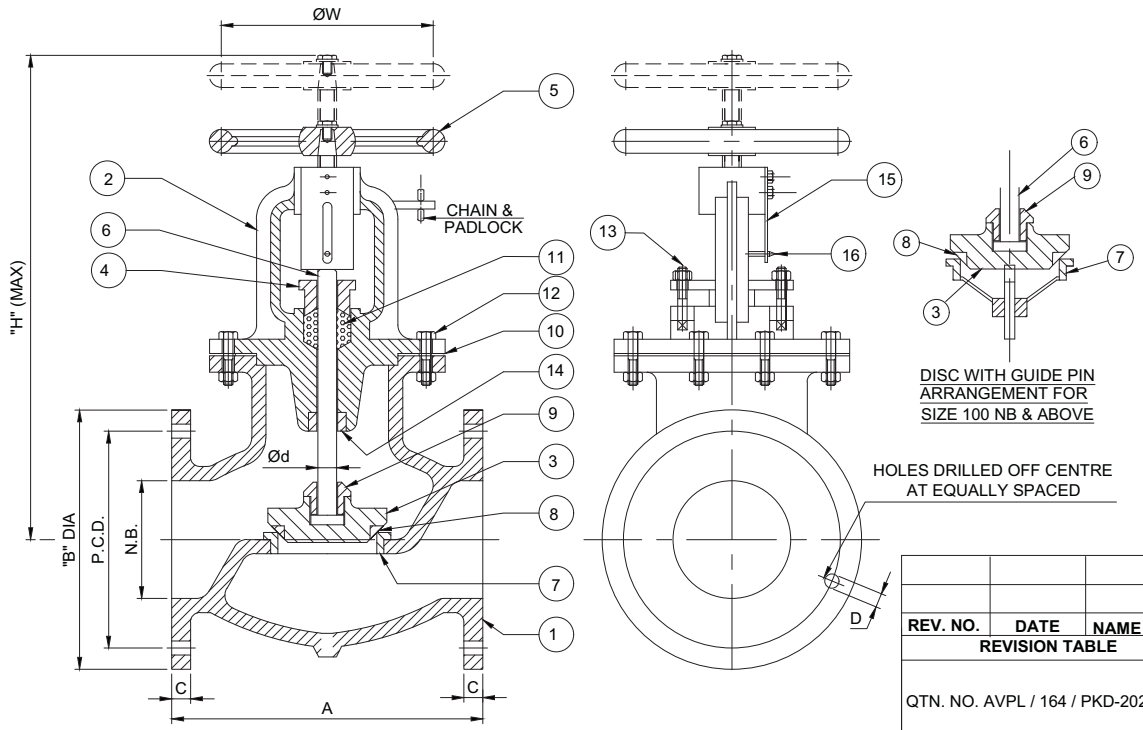
TECHNICAL DATA SHEET
CAST IRON GLOBE VALVE

1. Manufacturer	-	Bankim & Company.
2. Type of Valve.	-	C.I. Globe Valve, Outside Screwed, Rising Type Stem.
For Size	-	100 NB & Above.
3. Construction Details :-		
f. Bonnet	-	Yoke Type, Bolted.
g. Spindle	-	Outside Screwed, Rising Type.
h. Disc	-	Solid Renewable Loose Plug Type.
i. Seat	-	Renewable.
j. End Connection.	-	Flanged.
4. Materials of Construction :-		
j. Body, Bonnet, Disc, Gland & Handwheel.	-	Cast Iron to IS-210, FG-260.
k. Spindle	-	S.S. to ASTM-A-276, TYPE-410.
l. Body Seat Ring	-	S.S. to ASTM-A-351, CF-8
m. Disc Seat Ring	-	S.S. to ASTM-A-351, CF-8
n. Disc Nut	-	Gun Metal to IS:318, LTB-2
o. Back Seat Bush	-	S.S. to ASTM-A-351, CF-8
p. Gasket	-	C.A.F. to IS:2712, Gr.C.
q. Gland Packing	-	Graphited Asbestos.
r. Bolts, Nuts & Studs.	-	Carbon Steel to IS:1367, Cl. 4.6/4.0
5. Flange to Flange distance.	-	As per ANSI B 16.10, Class-125
6. Flange dimension and drilling	-	As per ANSI-B-16.5, Class-150, Flat Face.
7. Design Code	-	As per IS:9338
8. Rating of Valve	-	PN-1.6
9. Hydrostatic Test Pressure :-		
c. Body	-	15 Kg/Cm^2
d. Seat & Back Seat	-	10 Kg/Cm^2

Note : 1)The Valves will be provided with Back Seat, Indicator & Locking Arrangement.

2) Functional and dimensional testing and wear travel, seat contacts, smooth opening & closing shall be carried out on each valve.

	NOMINAL SIZE OF VALVE NB. (MIN)	FACE TO FACE A	FLANGE DIMENSIONS					HEIGHT. 'H' (MAX)		HYD.TEST PRESSURE kg / Cm 2		STEM DIA d ±1	HAND WHEEL DIA w ± 5
			DIA B	THICK C	P.C.D.	NO. OF HOLES	HOLE DIA D	CLOSED	OPEN	BODY	BACK SEAT & SEAT		
	100 MM	292±3	229	23.8^{+3}_{-0}	190.5	8	19	430	455	15	10	24	250
	200 MM	495±3	343	28.6^{+3}_{-0}	298.4	8	22.2	600	650	15	10	32	400



ALL DIMENSIONS ARE IN MILLIMETRES

PT. NO.	DESCRIPTION	MATERIAL	SPECN
16	INDICATOR PLATE	M.S. (GALVANISED)	IS : 2062 GR. A
15	INDICATOR RING	GUN METAL	IS : 318 ; LTB - 2
14	BACK SEAT BUSH	STAINLESS STEEL	ASTM-A-351, CF- 8
13	GLAND STUS & NUTS	CARBON STEEL	IS:1367, CL-4.6/4.0
12	BONNET BOLTS & NUTS	CARBON STEEL	IS:1367, CL-4.6/4.0
11	GLAND PACKING	JUTE & HEMP	IS: 5414
10	GASKET	C A F	IS : 2712, GR.'C'
9	DISK NUT	GUN METAL	IS : 318 ; LTB - 2
8	DISK FACING RING	STAINLESS STEEL	ASTM-A-351, CF- 8
7	BODY SEAT RING	STAINLESS STEEL	ASTM-A-351, CF- 8
6	STEM	STAINLESS STEEL	ASTM-A-276, TYPE-410
5	HAND WHEEL	CAST IRON	IS : 210 ; FG - 260
4	GLAND	CAST IRON	IS : 210 ; FG - 260
3	DISC	CAST IRON	IS : 210 ; FG - 260
2	BONNET	CAST IRON	IS : 210 ; FG - 260
1	BODY	CAST IRON	IS : 210 ; FG - 260

REV. NO.	DATE	NAME

REVISION TABLE

QTN. NO. AVPL / 164 / PKD-2021

DATE : 02.03.21.

CLIENT : ADVANCE VENTILATION PVT. LTD.

NOTES

1. MANUFACTURING STANDARD : AS PER IS: 9338
2. PRESSURE RATING : PN-1.0
3. FACE TO FACE AS PER : ANSI B 16.10, CLASS - 125
4. FLANGE DIMENSIONS & DRILLING : ANSI-B-16.5, CLASS-150, FLAT FACE.
5. THE VALVES WILL BE PROVIDED WITH BACK SEAT, INDICATOR & LOCKING ARRANGEMENT.

	NAME	DATE
DRAWN	B. DUTTA.	02.08.19.
CHECKED	S. DAS.	02.08.19.
APPROVED	P. DAS.	02.08.19.

MANUFACTURER:-

JOB.NO.

SCALE - N. T. S.

TITLE **"BANKIM" CAST IRON GLOBE VALVE. OUTSIDE SCREWED RISING SPINDLE.**

MANUFACTURER:-

BANKIM & COMPANY

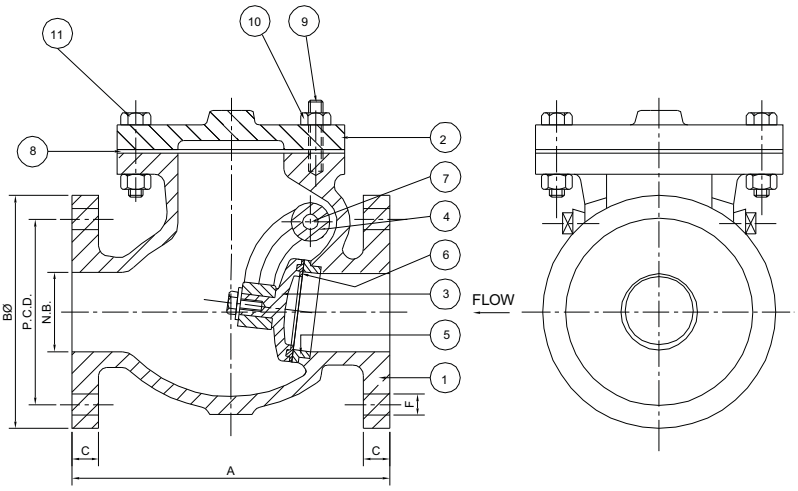
DRG. NO. BM / AVPL / QTN / CIGV-034 REV. 01

TECHNICAL DATA SHEET
CAST IRON CHECK VALVE

1.	Manufacturer	-	Bankim & Company.
2.	Type of Valve.	-	C.I. Check Valve, Swing Type.
	For Size	-	100 NB & Above.
3.	Construction Details :-		
	a) Cover	-	Bolted.
	b) Flap	-	Swing Type.
	c) Seat	-	Renewable.
	d) End Connection.	-	Flanged.
4.	Materials of Construction :-		
	a) Body, Cover, Flap & Hinge Bracket	-	Cast Iron to IS:210, FG-260.
	b) Body & Flap Seat Ring.	-	S.S. to ASTM-A-351, CF-8
	c) Hinge Pin	-	S.S. to ASTM-A-276, TYPE-410.
	d) Bolts, Nuts & Studs.	-	Carbon Steel to IS:1367, Cl. 4.6/4.0
	e) Gasket	-	C.A.F. to IS:2712, Gr.C.
5.	Flange to Flange distance.	-	As per ANSI B 16.10, Class-125
6.	Flange dimension and drilling	-	As per ANSI-B-16.5, Class-150, Flat Face.
7.	Design Code	-	IS-5312
8.	Rating of Valve	-	PN-1.6
9.	Hydrostatic Test Pressure :-		
	a) Body	-	15 Kg/Cm^2
	b) Seat	-	10 Kg/Cm^2

1) **Functional and dimensional testing and wear travel, seat contacts, smooth opening & closing shall be carried out on each valve.**

QTY.	NOMINAL SIZE OF VALVE (NB)	FACE TO FACE 'A'	FLANGE DIMENSIONS					HYD. TEST PRESSURE Kg / Cm^2		HINGE PIN DIA.
			DIA 'B'	THK. 'C'	P.C.D.	NO. OF HOLES	HOLE DIA. 'F'	BODY	SEAT	
14	100	292 ±3	229	23.8^{+3}_{0}	190.5	8	19	15	10	12
40	200	495 ±3	343	28.6^{+3}_{0}	298.4	8	22.2	15	10	20



SL. NO.	DESCRIPTION	MATERIAL	SPECIFICATION
11	BOLTS	CARBON STEEL	IS:1367, CL- 4.6/4.0
10	NUTS	CARBON STEEL	IS:1367, CL- 4.6/4.0
9	STUDS	CARBON STEEL	IS:1367, CL- 4.6/4.0
8	GASKET	C.A.F.	IS: 2712 GR. C
7	HINGE PIN	STAINLESS STEEL	ASTM-A-276, TYPE-410
6	FLAP SEAT RING	STAINLESS STEEL	ASTM-A-351, CF-8
5	BODY SEAT RING	STAINLESS STEEL	ASTM-A-351, CF-8
4	HINGE BRACKET	CAST IRON	IS: 210 , FG - 260
3	FLAP	CAST IRON	IS: 210 , FG - 260
2	COVER	CAST IRON	IS: 210 , FG - 260
1	BODY	CAST IRON	IS: 210 , FG - 260

ALL DIMENSIONS ARE IN MM.

NOTES

1. MANUFACTURING STANDARD : AS PER IS: 5312
2. PRESSURE RATING : PN-1.0
3. FACE TO FACE AS PER : ANSI B 16.10, CLASS-125
4. FLANGE DIMENSIONS & DRILLING : ANSI-B-16.5, CLASS-150, FLAT FACE.

REV. NO.	DATE	NAME

REVISION TABLE

QTN. NO. AVPL / 164 / PKD-2021

DATE : 02.03.21.

	NAME	DATE
DRAWN	P. DAS	04.03.21.
CHECKED	S. DAS	04.03.21.
APPROVED	P. K. DAS.	04.03.21.

MANUFACTURER:-

JOB.NO.

SCALE - N. T. S.

CLIENT : ADVANCE VENTILATION PVT. LTD.

TITLE

"BANKIM" CAST IRON NON RETURN VALVE

SWING TYPE

MANUFACTURER:-

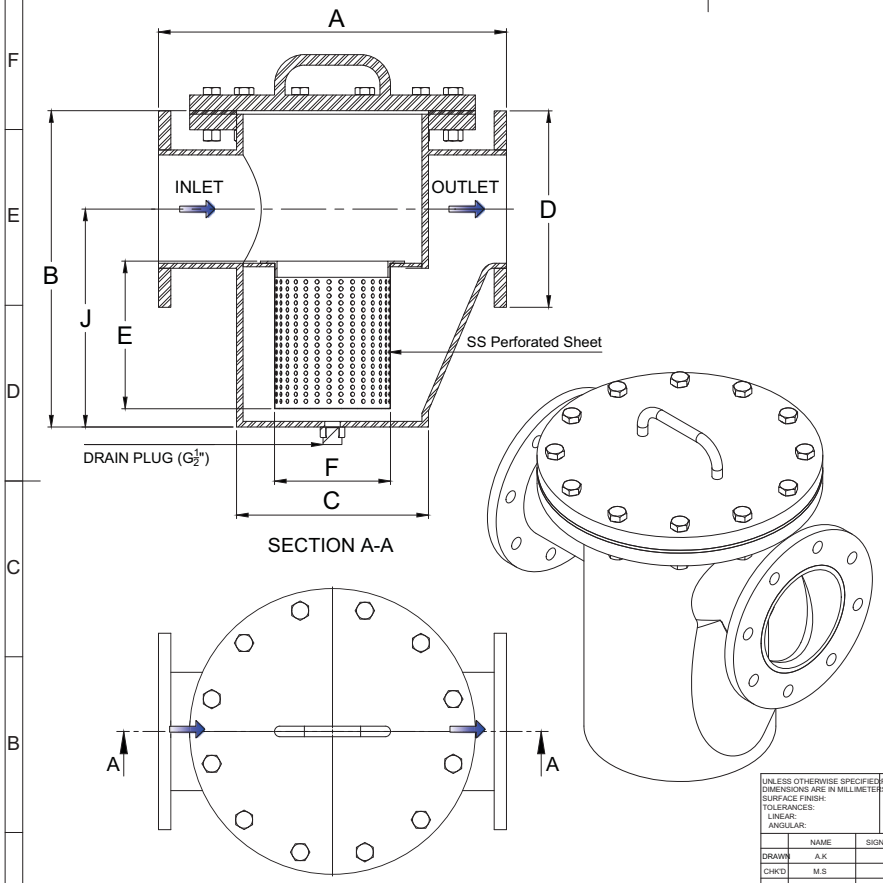
BANKIM & COMPANY

DRG. NO. BM / AVPL / QTN / CIRV / 035 **REV. 01**

POT STRAINER DATA SHEET

M.S 'Pot' with SS basket for water line.

Sr.no.	***Parts***	***Details***
1	Body	MS Pipe Class 'C' as per IS 1239 / 3589.
2	Flanges	BS 10 Table E
3	Basket	Removable basket of SS 304 Sheet, 24 gauge with 3mm perforation with 40% Open area, duly copper riveted. Supported with brass / SS ring.
4	Nut , Bolts & Drain Plug	M.S as per A4 - 70
5	Gasket	High pressure Rubber Sheet, 3mm thickness.
6	Pressure Rating	Hydraulic Test Pressure is 16kg/cm2 (PN 10).
7	Magnet	Permanent Magnet is provided near drain plug to attract suspended iron particles.
8	Paint	Enamel Paint Shade DG.
9	Make	D.S ENG



DIMENSION							
Size	A	B	ØC	ØD	E	F	J
Ø50	265	255	114	152	110	75	180
Ø65	315	305	140	165	130	85	225
Ø80	380	330	168	184	130	85	235
Ø100	450	380	218	215	180	125	270
Ø125	450	425	218	254	200	145	285
Ø150	520	450	274	279	210	165	310
Ø200	630	570	325	336	255	215	385
Ø250	650	625	355	406	265	255	420
Ø300	720	730	405	457	290	305	500
Ø350	1000	890	450	520	410	355	725

Test Pressure		
SHELL	BY WATER	232 PSI
		16 kg/cm²

Feature :-	
1	Face to Face Dimension :- ASME B16.10
2	End Flange Dimension :- BS10 TABLE-E
3	Design : ASME B16.34 / MS
4	Test EN 12266-1 / BS6755 Part-1

MATERIAL LIST

S.NO.	PART NAME	MATERIAL
1	MS Pot Body	MS Pipe IS 1239 / 3589
2	Basket (Filter Screen)	SS-304 Perforated Filter Screen Of 3 mm Perforation X 24c.Thickness
3	Gasket for Body	Black rubber gasket (PTFE)
4	Strainer Bonnet	MS Plate IS 2062
5	Drain Plug	A4-70
6	Hex Bolt / Hex Nut	A4-70
7	Magnet	Magnet is provided with drain plug

All dimension are shown in mm.

* All dimension are subject to change without further notification

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH:
TOLERANCES:
LINEAR:
ANGULAR:

DEBURR AND BREAK SHARP EDGES

DO NOT SCALE DRAWING | REVISION 00

TITLE: M.S POT STRAINER (SERIES CONNECTION)

	NAME	SIGNATURE	DATE
DRAWN	A.K		10/9/2019
CHK'D	M.S		10/9/2019
APPV'D	M.S		10/9/2019
MFG	D.S		10/9/2019
Q.A			

MATERIAL:

D.S ENGINEERING & MECHANICAL WORKS

DWG NO. DS/MS-POT / 03

A3

MOTORZIED BUTTERFLY VALVES

ACVATIX™

Butterfly valves PN 16 VKF42..

- **Nodular cast iron valve body**
- **DN 50...600**
- **k_{vs} 70...37,000 m^3/h**
- **For fitting with PN 16 counter-flanges to ISO 7005**
- **Tight-closing in accordance with ISO 5208, leakage rate A**
- **No maintenance required**
- **Can be equipped with SQL321B.., SQL361B.., SQL351B.. electromotoric actuators, or GEB..1E, GBB..1E,GIB..1E damper actuator**

Use

This device is used as motorized or shut-off valves in heating, ventilation and air conditioning systems applications.

- In open and closed circuits
- For 2-position (SPDT) or 3-position controls
- For DC 0…10 V control signals (by SQL361B.. actuator) and 4..20mA control signals (by SQL351B.. actuator)
- For chiller and cooling tower sequencing circuits
- To open or close the flow to a heat exchanger or to complete plant sections

Type summary

Product No.	Stock Number	DN	k_{vs} [m^3/h]	Top Flange EN ISO 5211	Flow velocity of medium [1] Water [m/s]
VKF42.50	S55237-V100	50	70	F07	4.5
VKF42.65	S55237-V101	65	155		
VKF42.80	S55237-V102	80	250		
VKF42.100	S55237-V103	100	510		
VKF42.125	S55237-V104	125	820		
VKF42.150	S55237-V105	150	1350		
VKF42.200	S55237-V106	200	3100		
VKF42.250	S55237-V107	250	4550	F10	
VKF42.300	S55237-V108	300	7500		
VKF42.350	S55237-V109	350	10250	F12	
VKF42.400	S55237-V110	400	14100		
VKF42.450	S55237-V111	450	18500	F14	
VKF42.500	S55237-V112	500	24000		
VKF42.600	S55237-V113	600	37000	F16	

[1] Recommended maximum velocity of flow and the butterfly valve fully open

k_{vs} Nominal flow rate of cold water (5…30 °C) through the fully open butterfly valve by a differential pressure of 100 kPa (1 bar)

Ordering

Butterfly valve, actuator must be ordered separately.
When ordering, please specify the quantity, product name and product number.

Example

Product No.	Stock No.	Product Name	Quantity
VKF42.50	S55237-V100	Butterfly valve	1

Delivery

Butterfly valve and actuator are packed separately.

Rev. No.

Please see chapter “Rev. No” on page 8.

Equipment combinations

	Electromotoric Actuators						
	SQL321B25 SQL361B25 SQL351B25	SQL321B50 SQL361B50 SQL351B50	SQL321B150 SQL361B150 SQL351B150	SQL321B270 SQL361B270 SQL351B270	SQL321B570 SQL361B570 SQL351B570	SQL321B1400 SQL361B1400 SQL351B1400	SQL321B2650 SQL361B2650 SQL351B2650
Butterfly Valve	Δp_s [kPa]						
VKF42.50	700						
VKF42.65	700						
VKF42.80	700						
VKF42.100		700					
VKF42.125		700					
VKF42.150		700					
VKF42.200			700				
VKF42.250				700			
VKF42.300				700			
VKF42.350					700		
VKF42.400					700		
VKF42.450						700	
VKF42.500						700	
VKF42.600							700

Δp_s Maximum permissible differential pressure at which the motorized butterfly valve will close securely against the pressure (close off pressure).

Product No.	Mounting kit	Actuators			
		GEB..1E	GBB...1E [1)]	GIB..1E	2*GIB...1E
		Δp_s [kPa]			
VKF42.50	ASK77.9	700			
VKF42.65		700			
VKF42.80		700			
VKF42.80	ASK77.10		700		
VKF42.100				700	
VKF42.125	ASK77.11				700
VKF42.150					700

[1)] GBB.. phase out at end of Y2020.

Δp_s Maximum permissible differential pressure at which the motorized butterfly valve will close securely against the pressure (close off pressure).

Actuator overview

Product No.	Operating Voltage	Positioning Signal	Position Feedback Signal	Positioning Time for 90° at 50 Hz [s]	Nominal Torque [Nm]	Flange Connection EN ISO 5211	Datasheet
SQL321B25	AC 220 V 1 phase	2-position (SPDT)	-	11	25	F07	N4520
SQL361B25		DC 0…10 V	DC 0…10 V	11	25	F07	
SQL351B25		4..20mA	4..20mA	11	25	F07	
SQL321B50		2-position (SPDT)	-	19	50	F07	
SQL361B50		DC 0…10 V	DC 0…10 V	19	50	F07	
SQL351B50		4..20mA	4..20mA	19	50	F07	
SQL321B150		2-position (SPDT)	-	39	150	F07	
SQL361B150		DC 0…10 V	DC 0…10 V	39	150	F07	
SQL351B150		4..20mA	4..20mA	39	150	F07	
SQL321B270		2-position (SPDT)	-	39	270	F10	
SQL361B270		DC 0…10 V	DC 0…10 V	39	270	F10	
SQL351B270		4..20mA	4..20mA	39	270	F10	
SQL321B570		2-position (SPDT)	-	47	570	F12 / F10	
SQL361B570		DC 0…10 V	DC 0…10 V	47	570	F12 / F10	
SQL351B570		4..20mA	4..20mA	47	570	F12 / F10	
SQL321B1400		2-position (SPDT)	-	76	1400	F14	
SQL361B1400		DC 0…10 V	DC 0…10 V	76	1400	F14	
SQL351B1400		4..20mA	4..20mA	76	1400	F14	
SQL321B2650		2-position (SPDT)	-	105	2650	F16	
SQL361B2650		DC 0…10 V	DC 0…10 V	105	2650	F16	
SQL351B2650		4..20mA	4..20mA	105	2650	F16	

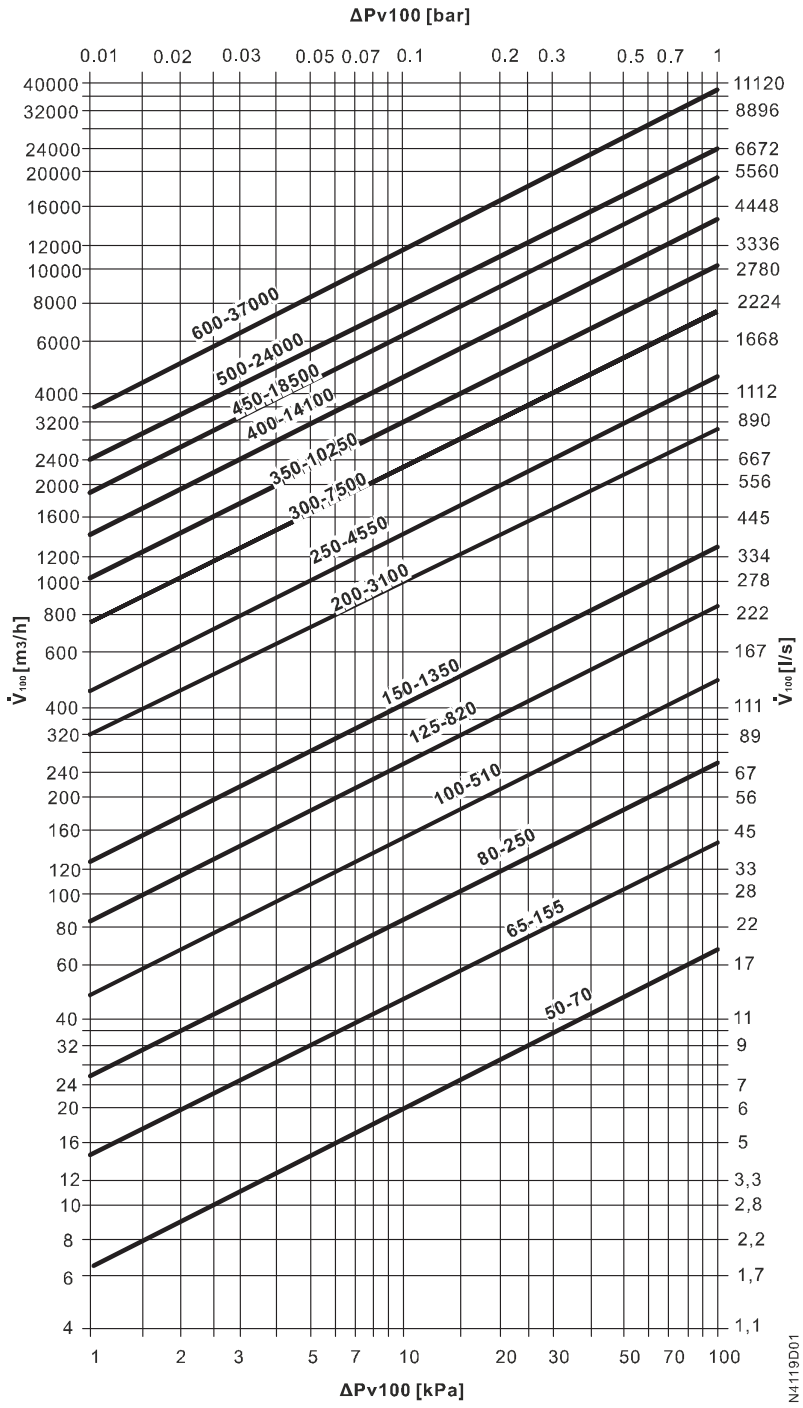
Type		Operating voltage	Positioning signal	Positioning time	Torque	Connecting cable	Data sheet
GEB341.1E	**GEB346.1E**	AC 100..240 V	2-position	150 s	20 Nm	0.9 m	A6V11449860
GEB141.1E	**GEB146.1E**	AC/DC 24 V	3-position				
GEB161.1E	**GEB166.1E**		DC 0/2…10V				
GBB331.1E	**GBB336.1E**	AC 230 V	3-position	150 s	25 Nm	0.9 m	N4626
GBB131.1E	**GBB136.1E**	AC 24 V					
GBB161.1E	**GBB166.1E**		DC 0…10 V				
GIB331.1E	**GIB336.1E**	AC 230 V	3-position	150 s	35 Nm	0.9 m	N4626
GIB131.1E	**GIB136.1E**	AC 24 V					
GIB161.1E	**GIB166.1E**		DC 0…10 V				

Mechanical design

Ring format, nodular cast iron valve body with EPDM seat and multiple shaft bushing.
The seat is also used to seal the flange. There is thus no contact between the medium and the valve body.
The valve has a swing-through disc (angle of rotation 360°). The position of the valve disc is indicated by a notch on the front of the shaft.

Sizing

Flow diagram



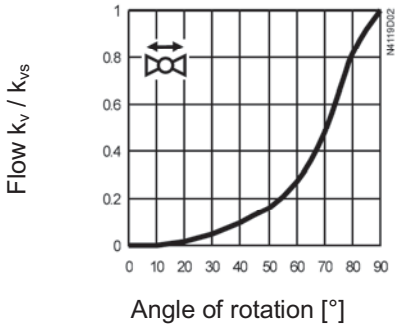
Δp_{v100} = Differential pressure across the fully open butterfly valve by a volume flow $\dot{V}_{100}$

$\dot{V}_{100}$ = Volume flow through the fully open butterfly valve

100 kPa = 1 bar ≈ 10 mWC

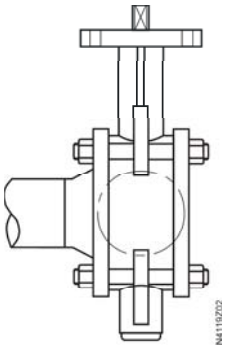
1 m^3/h = 0.278 l/s water at 20 °C

Flow characteristic



Engineering notes

Single flange mounting is possible: 700 kPa



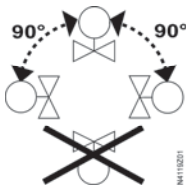
The VKF42.. butterfly valves can accommodate flow in either direction.

Warning ⚠ **To avoid pressure shocks on the butterfly valve, the VKF42.. must be driven to its fully open position either manually or via control signal Y14 prior to activating the pump(s).**

Mounting notes

The mounting instruction 74 319 0808 0 (M4119) is enclosed in the product packaging.
DN 50…500 butterfly valves can be mounted in PN 10, PN 16, ANSI150, JIS10K applications.
DN 600 butterfly valve can be mounted in PN 16 applications only!
Do not use additional flange sealing.

Orientation



Upright to horizontal

Maintenance notes

The VKF42.. butterfly valves require no maintenance.

Caution ⚠

Before performing any service works on the valve, actuator or mounting kit:

- Switch off the pump and power supply
- Close the main shut-off valves in the pipe work
- Release pressure in the pipes and allow them to cool down completely

If necessary, disconnect electrical connections from terminals.

The valve must be commissioned only with the actuator correctly assembled.

Disposal

The valve is considered an electronics device for disposal in terms of European Directive 2012/19/EU and may not be disposed of as domestic garbage.

- Disassemble the valve into individual parts prior to disposing of it and sort the individual parts by the various types of materials.
- Comply with all local and currently applicable laws and regulations.

Warranty

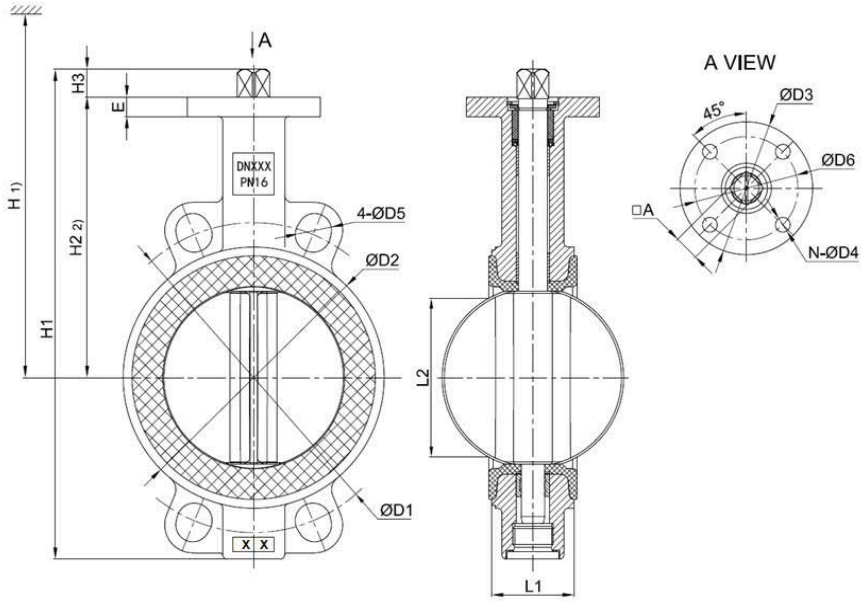
The technical data given for these applications is valid only in conjunction with the Siemens actuators as detailed under "Equipment combinations", page 2.
All terms of the warranty will be invalidated by the use of actuators from other manufacturers.

Technical data

Operating data	PN class	PN10 and PN16 to ISO 7005 ANSI150 to ASME B16.5 JIS10K to JIS B2220
	Permissible operating pressure	1600 kPa (16 bar)
	Flow characteristic	according to the diagram on page 5
	Leakage rate	A to ISO 5208 (tight-closing)
	Permissible medium	Chilled water, low temperature hot water, cooling water, brine, demineralized water (softened), water with anti-freeze Recommendation: Water treatment to VDI 2035
	Medium temperature	-10…80 °C
	Flange connection for pipes [1)]	PN10 and PN16 to ISO 7005 ANSI150 to ASME B16.5 JIS10K to JIS B2220
	Face to face dimension	DIN EN 558, series 20
	Top flange (flange for actuator)	EN ISO 5211
	Angle of rotation	90°
Standards	Environmental compatibility	ISO 14001 (Environment) ISO 9001 (Quality) Directive 2002/95/EC (RoHS)
Materials	Body DN 50…600	Nodular cast iron EN-GJS-450-10 (QT450-10)
	Shaft	Stainless steel 1.4021 (2Cr13)
	Valve disc	Nodular cast iron EN-GJS-450-10 (QT450-10), Nylon coating
	Seat	EPDM
Dimensions		Refer to page 7 “Dimensions”
Weight		Refer to page 7 “Dimensions”

[1)] VKF42.., DN 600 is only suited for PN 16

Dimensions (mm)



Product No.	DN	L1	L2	H[1)]	H1	H2[2)]	H3	ØD3	E	PN 16			EN ISO 5211	n-ØD4	ØD6	A	Weight
										D1	D2	ØD5				□	kg
VKF42.50	50	43	29	607	229	143	14	90	9	125	93	19	F07	4-10	70	11	2.72
VKF42.65	65	46	46	620	248	156	14	90	9	145	108	19					3.44
VKF42.80	80	46	66	626	271	162	14	90	9	160	124	19					4.03
VKF42.100	100	52	93	641	299	177	14	90	11	180	152	19					5.2
VKF42.125	125	56	104	654	332	190	19	90	13	210	177	19				17	7.24
VKF42.150	150	56	148	669	362	205	19	90	13	240	210	23					9
VKF42.200	200	60	196	700	426	236	22	125	15	295	265	23					14.1
VKF42.250	250	68	244	803	498	267	24	125	17	355	313	28	F10	4-12	102	22	21.14
VKF42.300	300	78	295	844	575	308	24	125	17	410	371	28	F10	4-12	102	22	31.8
VKF42.350	350	78	328	904	669	368	29	150	20	470	434	28	F12	4-14	125	27	50
VKF42.400	400	102	380	936	778	400	29	150	21	525	480	31	F12	4-14	125	27	71.4
VKF42.450	450	114	430	1163	846	422	45	175	22	585	536	31	F14	4-18	140	36	90
VKF42.500	500	127	478	1221	934	480	45	175	24	650	590	34	F14	4-18	140	36	114
VKF42.600	600	154	576	1303	1086	562	50	210	28	770	693	37	F16	4-22	165	46	189

L1	Corresponds to overall length according to EN 558, series 20	
H[1)]	Overall height of valve and actuator	
	=	Valve installation height (H2) from middle of pipe
	+	Installation height of actuator
		- SQL321B25 = 195 mm (DN50…100)
		- SQL3..1B50, SQL3..1B150 = 264 mm (DN50…200)
		- SQL3..1B270, SQL3..1B570 = 336 mm (DN250…350)
		- SQL3..1B1400, SQL3..1B2650 = 541 mm (DN400…600)
	+	Minimum clearance (⩾200 mm) from ceiling or wall for mounting, connection, operation, service etc.
H2[2)]	Dimension for actuator connection from centre of pipe	

Revision numbers

Product No.	Valid from Rev. No.	Product No.	Valid from Rev. No.	Product No.	Valid from Rev. No.
VKF42.50	..C	VKF42.150	..C	VKF42.400	..C
VKF42.65	..C	VKF42.200	..C	VKF42.450	..C
VKF42.80	..C	VKF42.250	..C	VKF42.500	..C
VKF42.100	..C	VKF42.300	..C	VKF42.600	..C
VKF42.125	..C	VKF42.350	..C		

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Tel. +41 58 724 2424
www.siemens.com/buildingtechnologies

LEVEL TRANSMITTER

Item: Smart Line Level (DP Type) Transmitter			
Engineering Units : Flow : Liquid - M3 / Hr, Steam Kg / Hr, Pressure : Kg / cm2 , Temperatue : Deg C, Level : mmWC			SHEET 08 OF 9
Model	**Decodification**	**Description**	
General	Make	Honeywell	
	Function	Transmission & Indication	
	Model No.	**YSTD820-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000; Y : Epoxy Polyester Poweder Coated Hybrid Paint + 5Pin Plug & Socket connector**	
	Qty	As per attached BOM	
	Tag No.	As per attached BOM	
	Calibration Range	As per attached BOM	
	Sensor	Piezoresistive	
	Supply Voltage	10.8 to 42.4 V DC	
	Load Resistance	600 ohms @24V DC	
	Communication	Hart Protocol	
	Display	2 Lines 16 Characters (4.13H x 1.83W mm)	
	Reference Accuracy	0.0375% of Span	
	Turndown Ratio	400:1	
	Stability	0.010% of URL per year for 15 Years	
	MAWP	310 Bar	
	Maximum Allowed Working Temperature	125 Deg.C (for Temp Higher than 125 Deg C, a suitable length of impulse line to be used, considering 100 Deg.C temperature drop for every One meter length of impulse pipe)	
	Protection Class	IP 67	
	Area Classification	Hazardous Area	
	Connection Location	Side/Side	
STD820	Instrument Range	Min Span 0 to 2.5 mbar to Max Span 0 to 1000 mbar	
E	Process Wetted Heads & Diaphragm Materials	Process Head Material : 316 Stainless steel & Diaphragm Material : 316L Stainless Steel	
1	Fill Fluid	Silicone Oil 200	
A	Process Connection	1/4" NPT (F)	
C	Bolt/Nut Materials	Carbon Steel	
4	Vent/Drain Type/Location	Head Type : Dual Ended, Vent Type : Standard Vent, Location : End & Vent material : Matches Head Material[1]	
A	Gasket Materials	Teflon or PTFE (Glass Filled)	
S	Static Pressure	Standard Static Pressure	
1	Head/Connect Orientation	Standard, High Side Left, Low Side Right[2] / Std Head Orientation	
C	Approvals	ATEX Explosion proof, Intrinsically Safe & Non-incendive	
A	Electronic Housing Material, Connection Type & Lightning Protection	Material : Y : Epoxy Polyester Powder Coated Hybrid Paint, Connection : 1/2" NPT & Lightning Protection : None	
H	Output/Protocol	Anlogue Output : 4-20mA dc, Digital Protocol : Hart Protocol	
C	Customer Interface Selections	Indicator : Basic, Ext Zero, Span & Config Buttons : Yes, Languages : English	
1	Application Software	Standard Diagnostics	
1	Output Limit, Failsafe & Write Protect Settings	Write Protect : Disabled, Fail Mode : High> 21.0 mAdc, High & Low Output Limits[3] : Honeywell Std (3.8-20.8 mAdc)	
C	General Configuration	Custom Configuration (Unit Data Required from customer)	
B	Accuracy & Calibration	Accuracy : Standard, Calibrated Range : Custom (Unit Data Required), Calibration Qty : Single Calibration	
1	Mounting Bracket	Bracket Type : Angle Bracket, Material : Carbon Steel	
1	Customer Tag	One Wired Stainless Steel Tag (Up to 4 lines 26 Char/line)	
A0	Plugs & Adapters	No Conduit Plugs or Adapters Required	
F1	Certifications	Calibration Test Report & Certificate of Conformance (F3399)	
0000	Manufacturing Specials	Factory Identification	
P&S	Accessories	5Pin Plug & Socket connector	

SmartLine

Honeywell

Technical Information

STD800 SmartLine Differential Pressure
Specification 34-ST-03-82, Jan 2021

Introduction

Part of the SmartLine® family of products, the STD800 is a high performance differential pressure transmitter featuring piezoresistive sensor technology. By combining differential pressure sensing with on chip static pressure and temperature compensation the STD800 offers high accuracy and stability over a wide range of application pressures and temperatures. The SmartLine family is also fully tested and compliant with Experion® PKS providing the highest level of compatibility assurance and integration capabilities. SmartLine easily meets the most demanding application needs for pressure measurement applications.

Best in Class Features:

- Accuracies up to 0.035% of span standard & 0.025% of span optional
- Stability up to 0.01% of URL per year for 15 years
- Automatic static pressure & temperature compensation
- Rangeability up to 400:1
- Response times as fast as 90ms
- Multiple local display capabilities
- External zero, span, & configuration capability
- Polarity insensitive electrical connections
- Comprehensive on-board diagnostic capabilities
- Integral Dual Seal design for highest safety based on ANSI/NFPA 70-202 and ANSI/ISA 12.27.0
- World class overpressure protection
- Full compliance to SIL 2/3 requirements.
- Modular design characteristics
- Available with additional 15-year warranty
- Plugged Impulse Line Detection Option
- Dual/Triple Calibration Option (HART & Fieldbus only)

Figure 1 – STD800 Differential Pressure Transmitters feature field-proven piezoresistive sensor technology

Communications/Output Options:

- 4-20mA dc
- Honeywell Digitally Enhanced (DE)
- HART ® (version 7.0)
- FOUNDATION™ Fieldbus

All transmitters are available with the above listed communications protocols.

Span & Range Limits:

Model	URL "H_2O (mbar)	LRL "H_2O (mbar)	Min Span "H_2O (mbar)
STD810	10 (25)	-10 (-25)	0.1 (0.25)
STD820	400 (1000)	-400 (-1000)	1.0 (2.5)
Model	**psi (bar)**	**psi (bar)**	**psi (bar)**
STD830	100 (7.0)	-100 (-7.0)	1 (0.07)
STD870	3000 (210)	-100 (-7.0)	30 (2.1)

Description

The SmartLine family of gauge pressure, differential pressure, and absolute pressure transmitters is designed around a high performance piezo-resistive sensor. This one sensor integrates multiple sensors linking process pressure measurement with on-board static pressure (DP Models) and temperature compensation measurements resulting in the best total performance available. This level of performance allows the ST 800 to replace virtually any competitive transmitter available today.

Unique Indication/Display Options

The ST 800 modular design accommodates a basic alphanumeric LCD display or a unique advanced graphics LCD display with many unparalleled features.

Basic Alphanumeric LCD Display Features

- Modular (may be added or removed in the field)
- 0, 90,180, & 270 degree position adjustments
- Configurable (HART only) and standard (Pa, KPa, MPa, KGcm2, Torr, ATM, inH2O, mH2O, bar, mbar, inH2O, inHG, FTH2O, mmH2O, mm HG, & psi) measurement units
- 2 Lines 16 Characters (4.13H x 1.83W mm)
- Square root output indication (√)

Advanced Graphics LCD Display Features

- Modular (may be added or removed in the field)
- 0, 90, 180, & 270 degree position adjustments
- Standard and custom measurement units available.
- Up to eight display screens with 3 formats are possible
- (Large PV with Bar Graph or PV with Trend Graph)
- Configurable screen rotation timing (1 to 30 sec)
- Display Square Root capabilities may be set separately from the 4-20mA dc output signal
- Unique “Health Watch” indication provides instant visibility of diagnostics
- Multiple language capability. (EN, DE, FR, IT, ES, RU, TR, CN & JP)

Diagnostics

SmartLine transmitters all offer digitally accessible diagnostics which aid in providing advanced warning of possible failure events minimizing unplanned shutdowns, providing **lower overall operational costs**

Configuration Tools

Integral Three Button Configuration Option

Suitable for all electrical and environmental requirements, SmartLine offer the ability to configure the transmitter and display via three externally accessible buttons when either display option is selected. Zero/span capabilities are also optionally available via these buttons with or without selection of a display option.

Hand Held Configuration

SmartLine transmitters feature two-way communication and configuration capability between the operator and the transmitter. All Honeywell transmitters are designed and tested for compliance with the offered communication protocols and are designed to operate with any Standards compliant handheld configuration device.

Personal Computer Configuration

Honeywell’s SCT 3000 Configuration Toolkit provides an easy way to configure Digitally Enhanced (DE) instruments using a personal computer as the configuration interface. Field Device Manager (FDM) Software and FDM Express are also available for managing HART & Fieldbus device configurations.

System Integration

- SmartLine communications protocols all meet the most current published standards for HART/DE/Fieldbus.
- Integration with Honeywell’s Experion PKS offers the following unique advantages.
  - Transmitter messaging
  - Maintenance mode indication
  - Tamper reporting
  - FDM Plant Area Views with Health summaries
  - All ST 800 units are Experion tested to provide the highest level of compatibility assurance

Modular Design

To help contain maintenance & inventory costs, all ST 800 transmitters are modular in design supporting the user's ability to replace meter bodies, add indicators or change electronic modules without affecting overall performance or approval body certifications. Each meter body is uniquely characterized to provide in-tolerance performance over a wide range of application variations in temperature and pressure and due to the Honeywell advanced interface, electronic modules may be swapped with any electronics module without losing in-tolerance performance characteristics.

Modular Features:

- Meter body replacement
- Exchange/replace electronics/comms modules*
- Add or remove integral indicators*
- Add or remove lightning protection (terminal connection)*

* Field replaceable in all electrical environments (including IS) except flameproof without violating agency approvals.

With no performance effects, Honeywell's unique modularity results in ***lower inventory needs and lower overall operating costs.***

Plugged Impulse Line Detection:

STD800 models are offered with a PILD option which provides indication of a plugged impulse line or process connection. When used in conjunction with a basic or advanced display, a non-critical diagnostic indication appears on the integral display. For units without an integral display, an indication can be seen via the host or hand held device when HART Protocol is utilized.

Dual/Triple Calibration:

STD800 models are optionally offered with multiple calibrations. In lieu of a standard factory calibration, units can be supplied with 1, 2, or 3 customer specified calibrations. These calibrations are stored in the meter body and provide users with factory calibrated performance at up to three different calibrated ranges. This increases application flexibility without requiring any costly recalibration or additional inventory.

Performance Specifications

Reference Accuracy (conformance to +/-3 Sigma)

Table 1

Model	URL	LRL	Min Span	Maximum Turndown Ratio	Stability (% URL/ Yr for 15 years)	Reference Accuracy[1,2] (% Span) Std/Opt
STD810	10 in H_2O (25mbar)	-10 in H_2O (-25mbar)	0.1 in H_2O (0.25mbar)	100:1	0.015	0.035
STD820	400 in H_2O (1000mbar)	-400 in H_2O (-1000mbar)	1 in H_2O (2.5mbar)	400:1	0.010	0.0375 / 0.025
STD830	100 psi (7.0 bar)	-100 psi (-7.0 bar)	1 psi (0.07 bar)	100:1	0.020	0.0375 / 0.0325
STD870	3000 psi (210 bar)	-100 psi (-7.0 bar)	30 psi (2.1 bar)	100:1	0.010	0.0375 / 0.0350

Zero and span may be set anywhere within the listed (URL/LRL) range limits

Accuracy at Specified Span, Temperature and Static Pressure Effects: (conformance to +/-3)

Table 2

			Accuracy[1,2] (% of Span)				Combined Zero & Span temperature Effect (% Span / 28°C (50 °F))		Combined Zero & Span Static Line Pressure Effect[4] (% Span/1000psi)[3]	
	Model	URL	Reference Turndown	A	B	C (see URL units)	D	E	F	G
Standard Accuracy	STD810	10 in H_2O (25mbar)	10:1	0.010	0.025	1 (2.5)	0.070	0.040	0.050	0.075
	STD820	400 in H_2O (1000mbar)	16:1	0.005	0.0325	25 (62.5)	0.025	0.007	0.080	0.007
	STD830	100 psi (7.0 bar)	6.7:1	0.005	0.0325	15 (1.05)	0.025	0.010	0.075	0.075
	STD870	3000 psi (210 bar)	15:1	0.005	0.0325	200 (14)	0.025	0.006	0.075	0.075
High Accuracy Option	STD820	400 in H_2O (1000mbar)	16:1	0.005	0.020	25 (62.5)	0.025	0.0107	0.080	0.007
	STD830	100 psi (7 bar)	6.7:1	0.005	0.0275	15 (1.05)	0.025	0.010	0.075	0.075
	STD870	3000 psi (210 bar)	15:1	0.005	0.030	200 (14)	0.025	0.006	0.075	0.075
			Turn Down Effect				Temp Effect		Static Effect	
			$\pm[A+B]$ if $Span \geq C$ $\pm\left[A+B\left(\frac{C}{Span}\right)\right]$ if $Span < C$				$\pm[D+E\left(\frac{URL}{Span}\right)]$		$\pm[F+G\left(\frac{URL}{Span}\right)]$	

Total Performance = +/- $\sqrt{(\text{Accuracy})^2 + (\text{Temp Effect})^2 + (\text{Static Line Pressure Effect})^2}$

Total Performance Examples: (standard accuracy 5:1 Turndown, up to 50 ºF shift & up to 1000 psi Static Pressure[3])

Model	Total Performance	Model	Total Performance
STD810 @ 2"H_2O	0.505% of span	**STD830 @ 20 psi**	0.140% of span
STD820 @ 80" H_2O	0.135% of span	**STD870 @ 600 psi**	0.131% of span

Typical Calibration Frequency: Calibration verification is recommended every four (4) years

Notes:

1. Terminal based Accuracy – Incudes combined effects of linearity, hysteresis and repeatability. Analog output adds 0.005% of span
2. For zero based spans and reference conditions of 25 °C (77 °F). 0 psig static pressure. 10 to55% RH, and 316 Stainless Steel barrier diaphragm.
3. STD810 includes only zero shift with static pressure. Results ar % of span/25 psig.

Operating Conditions – All Models

Parameter	Reference Condition		Rated Condition		Operative Limits		Transportation and Storage	
	°C	°F	°C	°F	°C	°F	°C	°F
Ambient Temperature[1] STD800	25±1	77±2	-40 to 85	-40 to 185	-40 to 85	-40 to 185	-55 to 120	-67 to 248
Meter Body Temperature[2] STD810, 820, 830, 870	25±1	77±2	-40 to 110[1]	-40 to 230[1]	-40 to 125	-40 to 257	-55 to 120	-67 to 248
Humidity %RH	10 to 55		0 to 100		0 to 100		0 to 100	
Vac. Region – Min. Pressure All Models Except STD810 **mmHg absolute** **inH_2O absolute**	Atmospheric Atmospheric		25 13		2 (short term)[3] 1 (short term)[3]			
Supply Voltage **Load Resistance**	10.8 to 42.4 Vdc at terminals (IS versions limited to 30 Vdc) 0 to 1,440 ohms (as shown in Figure 2)							
Maximum Allowable Working Pressure (MAWP)[4,5] (ST 800 products are rated to Maximum Allowable Working Pressure. MAWP depends on Approval Agency and transmitter materials of construction.)	**Standard:** STD810 = 50 psi (3.45 bar) STD820, STD830 and STD870 = 4,500 psi (310 bar) **Optional:** STD820, STD830, STD870 = 6,000 psi (420 bar) Static Pressure Limit = Maximum Allowable Working Pressure (MAWP) = Overpressure Limit for ST 800 Differential Pressure Transmitters							

[1] LCD Display operating temperature -20°C to +70°C . Storage temperature -30°C to 80°C.

[2] Silicone 704 minimum temperature rating is 0ºC (32ºF). CTFE minimum temperature rating is -30°C (-22°F). NEOBEE M-20 minimum temperature rating is -15ºC (5ºF). NEOBEE® is a registered trademark of Stepan Company.

[3] Short term equals 2 hours at 70°C (158°F).

[4] MAWP applies for temperatures -40 to 125°C. Static Pressure Limit is de-rated to 3,000 psi for -26°C to -40°C. for all models except STD810. Use of graphite. o-rings de-rates transmitter to 3,625 psi. Use of 1/2:" process adaptors with graphite o-rings de-rates transmitter to 3,000 psi.

[5] Consult factory for MAWP of ST 800 transmitters with CRN approval.

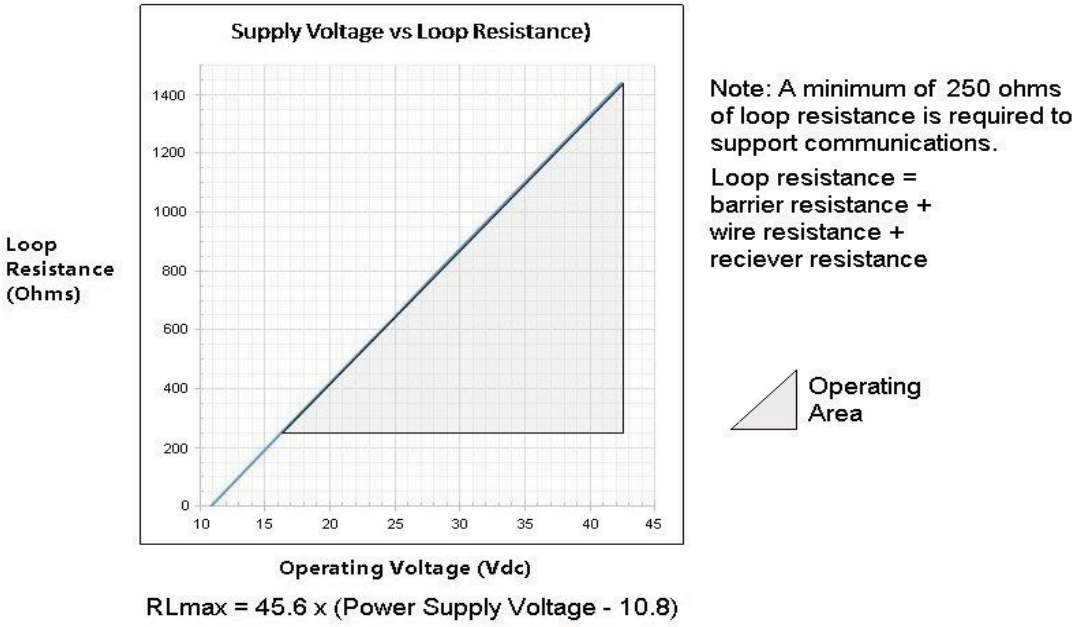

Figure 2 - Supply voltage and loop resistance chart & calculations

Performance Under Rated Conditions – All Models

Parameter	Description
Analog Output **Digital Communications**:	Two-wire, 4 to 20 mA (HART & DE Transmitters only) Honeywell DE, HART 7 protocol or FOUNDATION Fieldbus ITK 6.0.1 compliant All transmitters, irrespective of protocol have polarity insensitive connection.
HART & DE Output Failure Modes (NAMUR for DE Units requires selecting display and configuration buttons or factory configuration)	**Compliance**: **Honeywell Standard:** **NAMUR NE 43** **Normal Limits:** 3.8 – 20.8 mA 3.8 – 20.5 mA **Failure Mode:** ≤ 3.6 mA and ≥ 21.0 mA ≤ 3.6 mA and ≥ 21.0 mA
Supply Voltage Effect	0.005% span per volt.
Transmitter Turn on Time (includes power up & test algorithms)	HART or DE: 2.5 sec. Foundation Fieldbus: Host dependant
Response Time (delay + time constant)	**DE/HART Analog Output** 90mS **FOUNDATION Fieldbus** 150mS (Host Dependant)
Damping Time Constant	**HART:** Adjustable from 0 to 32 seconds in 0.1 increments. **Default:** 0.50 seconds **DE:** Discrete values 0, .16, .32, .48, 1, 2, 4, 8, 16, 32 seconds. **Default:** 0.48 seconds
Vibration Effect **ST 820, ST 830, ST 870**	Less than +/- 0.1% of URL w/o damping Per IEC60770-1 field or pipeline, high vibration level (10-2000Hz: 0.21 displacement/3g max acceleration)
Electromagnetic Compatibility	IEC 61326-3-1
Lightning Protection Option	**Leakage Current:** 10uA max @ 42.4VDC 93C **Impulse rating:** 8/20uS 5000A (>10 strikes) 10000A (1 strike min.) 10/1000uS 200A (> 300 strikes)

Materials Specifications (see model selection guide for availability/restrictions with various models)

Parameter	Description
Barrier Diaphragms Material	316L SS, Hastelloy® C-276[2], Monel® 400 [3], Tantalum, Gold-plated 316L SS, Gold-plated Hastelloy® C-276, Gold-plated Monel® 400
Process Head Material	316 SS[4], Carbon Steel (Zinc-plated) [5] 316 SS[4], Carbon Steel (Zinc-plated) [5], Hastelloy C-276[6], Monel 400 [7]
Vent/Drain Valves & Plugs [1]	316 SS[4], Hastelloy C-276[2], Monel 400 [7]
Head Gaskets	Glass-filled PTFE standard. Viton® and graphite are optional.
Meter Body Bolting	Carbon Steel (Zinc plated) standard. Options include 316 SS, NACE A286 SS bolts, Monel K500, Super Duplex and B7M.
Optional Adapter Flange and Bolts	Adapter Flange materials include 316 SS, Hastelloy C-276 and Monel 400. Bolt material for flanges is dependent on process head bolts material chosen. Standard adaptor seal material is glass-filled PTFE. Viton and graphite are optional.
Mounting Bracket	Carbon Steel (Zinc-plated) or 304 Stainless Steel or 316 Stainless Steel
Fill Fluid	Silicone Oil 200, Silicone Oil 704, Inert Fluorinated Oil CTFE and NEOBEE® M-20 (Note that STD810 is only available with Silicone Oil 200 and NEOBEE® M-20)
Electronic Housing	Pure Polyester Powder Coated Low Copper (<0.4%)-Aluminum. Meets NEMA 4X, IP66, & P67. All stainless steel housing is optional.
Mounting	Can be mounted in virtually any position using the standard mounting bracket. Bracket is designed to mount on 2-inch (50 mm) vertical or horizontal pipe. See Figure 3.
Process Connections	1/4- NPT or 1/2- NPT with adapter (meets DIN requirements)
Wiring	Accepts up to 16 AWG (1.5 mm diameter).
Dimensions	See Figure 4.
Net Weight	8.3 pounds (3.8 Kg) with Aluminum Housing

[1] Vent/Drains are sealed with Teflon®

[2] Hastelloy C-276 or UNS N10276

[3] Monel 400 or UNS N04400

[4] Supplied as 316 SS or as Grade CF8M, the casting equivalent of 316 SS.

[5] Carbon Steel heads are zinc-plated and not recommended for water service due to hydrogen migration. For that service, use 316 stainless steel wetted Process Heads.

[6] Hastelloy C-276 or UNS N10276. Supplied as indicated or as Grade CW12MW, the casting equivalent of Hastelloy C-276

[7] Monel 400 or UNS N04400. Supplied as indicated or as Grade M30C, the casting equivalent of Monel 400

Communications Protocols & Diagnostics

HART Protocol

Version:

HART 7

Power Supply

Voltage: 10.8 to 42.4Vdc at terminals

Load: Maximum 1440 ohms See figure 2

Minimum Load: 0 ohms. (For handheld communications a minimum load of 250 ohms is required)

Foundation Fieldbus (FF)

Power Supply Requirements

Voltage: 9.0 to 32.0Vdc at terminals

Steady State Current: 17.6mAdc

Software Download Current: 27.4mAdc

Available Function Blocks

Block Type	Qty	Execution Time
Resource	1	n/a
Transducer	1	n/a
Diagnostic	1	n/a
Analog Input	1*	30 ms
PID w/Autotune	1	45 ms
Integrator	1	30 ms
Signal Char (SC)	1	30 ms
LCD Display	1	n/a
Flow Block	1	30 ms
Input Selector	1	30 ms
Arithmetic	1	30 ms

* AI block may have two (2) additional instantiations.

All available function blocks adhere to FOUNDATION Fieldbus standards. PID blocks support ideal & robust PID algorithms with full implementation of Auto-tuning.

Link Active Scheduler

Transmitters can perform as a backup Link Active Scheduler and take over when the host is disconnected. Acting as a LAS, the device ensures scheduled data transfers typically used for the regular, cyclic transfer of control loop data between devices on the Fieldbus.

Number of Devices/Segment

Entity IS model: 6 devices/segment

Schedule Entries

18 maximum schedule entries

Number of VCR's: 24 max

Compliance Testing: Tested according to ITK 6.0.1

Software Download

Utilizes Class-3 of the Common Software Download procedure as per FF-883 which allows the field devices of any manufacturer to receive software upgrades from any host.

Honeywell Digitally Enhanced (DE)

DE is a Honeywell proprietary protocol which provides digital communications between Honeywell DE enabled field devices and Hosts.

Power Supply

Voltage: 10.8 to 42.4Vdc at terminals

Load: Maximum 1440 ohms See figure 2

Standard Diagnostics

ST 800 top level diagnostics are reported as either critical or non-critical and readable via the DD/DTM tools or integral display as shown below.

Critical Diagnostics		
HART DD/DTM tools	**Advanced Display**	**Basic Display**
Electronic Module DAC Failure	Electronics Module fault	Electronics Module fault
Meter Body NVM Corrupt	Meterbody fault	Meterbody fault
Config Data Corrupt	Electronics Module fault	Electronics Module fault
Electronic Module Diag Failure	Electronics Module fault	Electronics Module fault
Meter Body Critical Failure	Meterbody fault	Meterbody fault
Sensor Comm Timeout	Meterbody Comm fault	Meterbody Comm fault

Non-Critical Diagnostics		
HART DD/DTM tools	**Advanced Display**	**Basic Display**
Display Failure	n/a	n/a
Electronic Module Comm Failure	n/a	n/a
Meter Body Excess Correct	Zero Correct (OK or EXCESSIVE) Span Correct (OK or EXCESSIVE)	n/a
Sensor Over Temperature	Meterbody Temp (OK, OVER TEMP)	n/a
Fixed Current Mode	Analog Out mode (Fixed or Normal)	n/a
PV Out of Range	Primary PV (OK or OVERLOAD)	n/a
No Factory Calibration	Factory Cal (OK, NO FACTORY CAL)	n/a
No DAC Compensation	DAC Temp Comp (OK, NO COMPENSATION)	n/a
LRV Set Error – Zero Config Button	n/a	n/a
URV Set Error – Span Config Button	n/a	n/a
AO Out of Range	n/a	n/a
Loop Current Noise	n/a	n/a
Meter Body Unreliable Comm	Meterbody Comm (OK, SUSPECT)	n/a
Tamper Alarm	n/a	n/a
No DAC Calibration	n/a	n/a
Sensor Supply Voltage Low	Supply Voltage (OK, LOW, or HIGH)	n/a

Refer to ST 800 diagnostics tech note for additional level diagnostics.

Other Certification Options

Materials

- NACE MRO175, MRO103, ISO15156

Hazardous Areal Certifications:

MSG CODE	AGENCY	TYPE OF PROTECTION	COMM. OPTION	ELECTRICAL PARAMETERS	AMBIENT TEMP (Ta)
A	FM Approvals™ USA	**Explosionproof:** Class I, Division 1, Groups A, B, C, D; Dust Ignition Proof: Class II, III, Division 1, Groups E, F, G; T6..T5 Class I, Zone 0/1, AEx db IIC T6..T5 Ga/Gb Class II, Zone 21, AEx tb IIIC T95° Db	All	Note 1	T5: -50 ºC to 85ºC T6: -50 ºC to 65ºC
		Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G: T4 Class I, Zone 0, AEx ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2a	-50 ºC to 70ºC
			Foundation Fieldbus	Note 2b	-50 ºC to 70ºC
		Nonincendive: Class I, Division 2, Groups A, B, C, D locations, T4 Class I, Zone 2, AEx nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50 ºC to 85ºC
		Enclosure: Type 4X/ IP66/ IP67	All	All	-
		STANDARDS: FM Class 3600:2011; FM Class 3610: 2010; FM Class 3611: 2004; FM Class 3615: 2006; FM Class 3616: 2011; FM Class 3810: 2005; ANSI/ISA 60079-0: 2013; ANSI/UL 60079-1: 2015; ANSI/UL 60079-11: 2014; ANSI/ISA 60079-15: 2012; ANSI/UL 60079-26: 2017; ANSI/UL 60079-31: 2015; ANSI/NEMA 250: 2003; ANSI/ IEC 60529: 2004			
B	Canadian Standards Association (CSA) USA and Canada	**Explosion Proof:** Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1, T6..T5 Class I Zone 1 AEx db IIC T6..T5 Ga/Gb Ex db IIC T6..T5 Ga/Gb Zone 22 AEx tb IIIC T95° Db Ex tb IIIC T95° Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1, T4 Class I Zone 0, AEx ia IIC T4 Ga Class I Zone 2, AEx ic IIC T4 Gc Ex ia IIC T4 Ga Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Nonincendive: Class I, Division 2, Groups A, B, C, D; Class II, Division 2, Groups F, G; Class III, Division 2, T4 Class I Zone 2 AEx nA IIC T4 Gc Ex nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C to 85°C
		Enclosure: Type 4X/ IP66/ IP67	All	All	-

MSG CODE	AGENCY	TYPE OF PROTECTION	COMM. OPTION	ELECTRICAL PARAMETERS	AMBIENT TEMP (Ta)
		STANDARDS: CSA C22.2 No. 0-10; CSA C22.2 No. 94-M91; CSA C22.2 No. 25-1966; CSA C22.2 No. 30-M1986; CSA C22.2 No. 142-M1987; CSA C22.2 No. 157-92; CSA C22.2 No. 213-M1987; CSA-C22.2 No. 60529:05; CSA-C22.2 No. 60079-0:11; CSA-C22.2 No. 60079-1:11; CSA-C22.2 No. 60079-11:11; CSA-C22.2 No. 60079-15:12; CSA-C22.2 No. 60079-31:12; ISA 12.12.01-2010; ISA 60079-0: 2009; ISA 60079-11: 2011; ISA 60079-15: 2009; ISA 60079-26: 2008; ISA-60079-27:2007 (12.02.04)-2006 (R2011); UL 913 Ed. 6; UL 916:1998; ANSI/ISA-12.27.01-2011			
C	**ATEX**	**Flameproof: SIRA 12ATEX2233X** II 1/2 G Ex db IIC T6..T5 Ga/Gb II 2 D Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: SIRA 12ATEX2233X II 1 G Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) II 1 G Ex ia IIC T4 Ga	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: SIRA 12ATEX4234X II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: SIRA 12ATEX4234X II 3 G Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) II 3 G Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
		STANDARDS: EN 60079-0: 2012/A11: 2013; EN 60079-1: 2014; EN 60079-7: 2015; EN 60079-11: 2012; EN 60079-26: 2015; EN 60079-31: 2009			
D	**IECEx World**	**Flameproof: IECEx SIR 12.0100X** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: IECEx SIR 12.0100X Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: IECEx SIR 12.0100X Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: IECEx SIR 12.0100X Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
		STANDARDS: IEC 60079-0: 2011; IEC 60079-1: 2014; IEC 60079-7: 2017; IEC 60079-11: 2011; IEC 60079-26: 2014; IEC 60079-31: 2013			

E	**SAEx South Africa**	**Flameproof :** Ex d IIC T6…T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC Ga T4 FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
F	**INMETRO Brazil**	**Flameproof:** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2a	-50°C TO 70°C
			Foundation Fieldbus	Note 2b	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	-
G	**NEPSI CHINA**	**Flameproof:** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T 95°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	-

H	**KOSHA Korea**	**Flameproof :** Ex d IIC T4, T5, T6 Ex tD A21 IP66/IP67 T95°C…T120 °C	All	Note 1	T4: -50°C TO 85°C T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4	4-20 mA / DE/ HART	Note 2	Ta= -50 ºC to 70ºC
			Foundation Fieldbus	Note 2	Ta= -50 ºC to 70ºC
		Enclosure: IP66/ IP67	All	All	-
I	**EAC Russia, Belarus and Kazakhstan**	**Flameproof:** Ga/Gb Ex d IIC T6..T5 Ex tb IIIC Db T 85°C	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ga Ex ia IIC T4 X FISCO Field Device (Only for FF Option) Ga Ex ia IIC T4 X	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Non Sparking: 2 Ex nA IIC T4 Gc X	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ga Ex ic IIC T4 X FISCO Field Device (Only for FF Option) 2 Ex ic IIC T4 Gc X	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	
J	**CCoE INDIA**	**Flameproof:** Ex d IIC T6..T5 Ga/Gb	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Non Sparking Ex nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
K	**UATR UKRAINE**	**Flameproof:** II 1/2 G Ex db IIC T6..T5 Ga/Gb II 2 D Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: II 1 G Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) II 1 G Ex ia IIC T4 Ga	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Enclosure: IP66/ IP67	All	All	-

Notes:

1. Operating Parameters:

   Voltage= 11 to 42 V DC Current= 4-20 mA Normal

   = 10 to 30 V (FF) = 30 mA (FF)

2. Intrinsically Safe Entity Parameters

a. Analog/ DE/ HART Entity Values:

Vmax= Ui = 30V Imax= Ii= 105mA Ci = 4.2nF Li =984 uH Pi =0.9W

Transmitter with Terminal Block Revision E or Later

Vmax= Ui = 30V Imax= Ii= 225mA Ci = 4.2nF Li = 0 Pi =0.9W

Note : Transmitter with Terminal Block Revision E or later

The revision is on the label that is on the module. There will be two lines of text on the label:

- First is the Module Part #: 50049839-001 or 50049839-002
- Second line has the supplier information, along with the REVISION:

XXXXXXX-EXXXX, THE "X" is production related, THE POSITION of the "E" IS THE REVISION.

b. Foundation Fieldbus- Entity Values

Vmax= Ui = 30V Imax= Ii= 180mA Ci = 0nF Li = 984 uH Pi =1W

Transmitter with Terminal Block Revision F or Later)

Vmax= Ui = 30V Imax= Ii= 225mA Ci =0nF Li = 0 Pi =1 W

FISCO Field Device

Vmax= Ui = 17.5V Imax= Ii= 380 mA Ci = 0nF Li = 0 Pi =5.32 W

Note : Transmitter with Terminal Block Revision F or later

The revision is on the label that is on the module. There will be two lines of text on the label:

- First is the Module Part #: 50049839-003 or 50049839-004
- Second line has the supplier information, along with the REVISION:

XXXXXXX-EXXXX, THE "X" is production related, THE POSITION of the "E" IS THE REVISION.

Approval Certifications:

<table>
<tr><td rowspan="5">Marine Certificates</td><td>This certificate defines the certifications covered for the ST 800 Pressure Transmitter family of products, including the SMV 800 Smart Multivariable Transmitter. It represents the compilation of the five certificates Honeywell currently has covering the certification of these products into marine applications.
For ST 800 Smart Pressure Transmitter and SMV800 Smart Multivarible Transmitter</td></tr>
<tr><td>American Bureau of Shipping (ABS) - 2009 Steel Vessel Rules 1-1-4/3.7, 4-6-2/5.15, 4-8-3/13 & 13.5, 4-8-4/27.5.1, 4-9-7/13. Certificate number: 04-HS417416-PDA</td></tr>
<tr><td>Bureau Veritas (BV) - Product Code: 389:1H. Certificate number: 12660/B0 BV</td></tr>
<tr><td>Det Norske Veritas (DNV) - Location Classes: Temperature D, Humidity B, Vibration A, EMC B, Enclosure C. For salt spray exposure; enclosure of 316 SST or 2-part epoxy protection with 316 SST bolts to be applied. Certificate number: A-11476</td></tr>
<tr><td>Korean Register of Shipping (KR) - Certificate number: LOX17743-AE001</td></tr>
<tr><td>Lloyd's Register (LR) - Certificate number: 02/60001(E1) & (E2)</td></tr>
<tr><td>SIL 2/3 Certification</td><td>IEC 61508 SIL 2 for non-redundant use and SIL 3 for redundant use according to EXIDA and TÜV Nord Sys Tec GmbH & Co. KG under the following standards: IEC61508-1: 2010; IEC 61508-2: 2010; IEC61508-3: 2010.</td></tr>
<tr><td>MEASUREMENT INTRUMENTS DIRECTIVE (MID) 2004/ 22/ EC</td><td>Certificate Issued by NMI Certin B.V.
Mechanical Class: M3 Electromagnetic Environment: E3
Ambient Temperature Range: -25 ºC to + 55 ºC
<table>
<tr><th>Unit</th><th>Custom Calibration</th></tr>
<tr><td>STD820</td><td>0 to 1000 mBar</td></tr>
<tr><td>STD830</td><td>0 to 7 Bar</td></tr>
<tr><td>STA84L</td><td>0 to 35 Bar A</td></tr>
<tr><td>STG84L</td><td>0 to 35 Bar</td></tr>
<tr><td>STD870</td><td>0 to 100 Bar</td></tr>
<tr><td>STA87L</td><td>0 to 100 Bar A</td></tr>
<tr><td>STG87L</td><td>0 to 100 Bar</td></tr>
</table></td></tr>
</table>

Mounting & Dimensional Drawings

Mounting Configurations

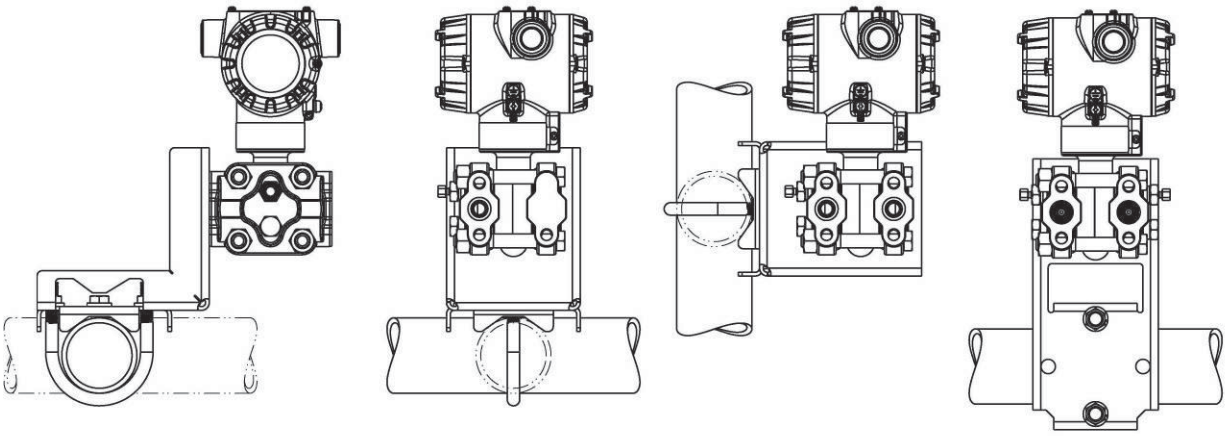

Figure 3 – Typical mounting configurations for STD810, STD820, STD830 and STD870 for reference

Reference Dimensions: millimeters / inches

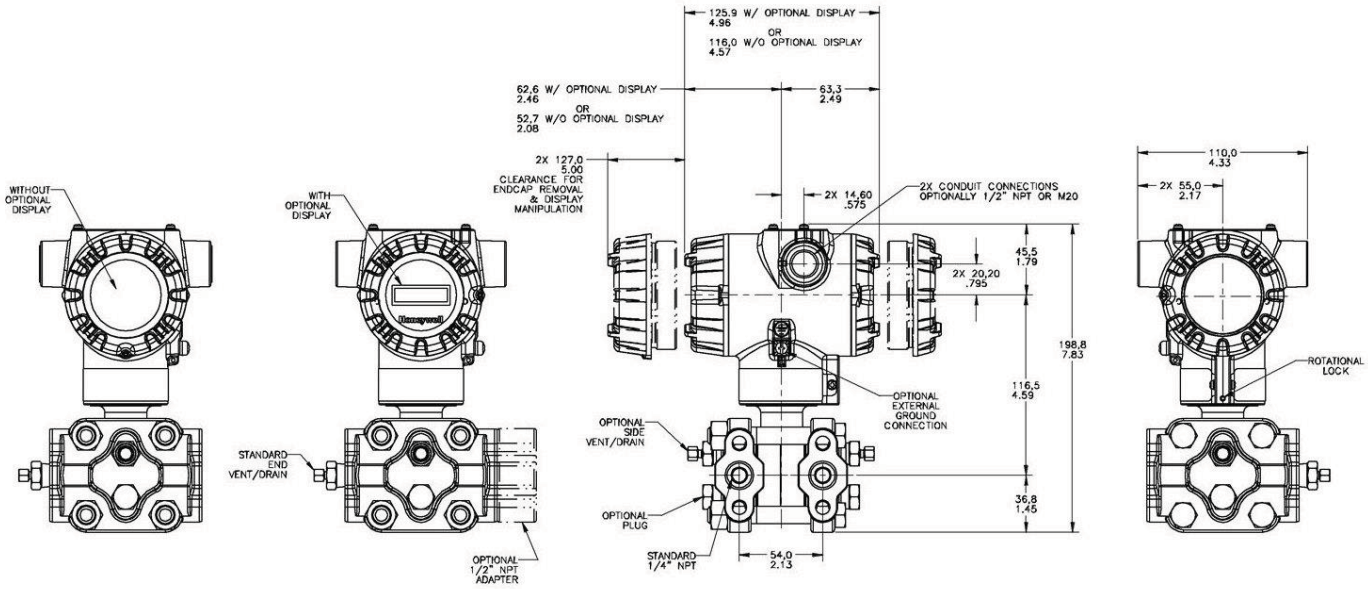

Figure 4 – Typical mounting dimensions of STD810, STD820, STD830 & STD870 for reference

Model Selection Guide

Model Selection Guides are subject to change and are inserted into the specifications as guidance only.

Model STD800
Differential Pressure Transmitter

Model Selection Guide:
34-ST-16-82 Issue 25

Instructions: Make selections from all Tables Key through XIII using column below the proper arrow. Asterisk indicates availability. Letter (a) refer to restrictions highlighted in the restrictions table. Tables delimited with dashes.

Key	I	II	III	IV	V	VI	VII	VIII (Optional)	IX
STD ___	- _____	- _	- _	- ___	- ___	- _	- ____	- __,__,__	- 0000

KEY NUMBER	URL	LRL	Max Span	Min Span	Units
Measurement Range	10 (25.0)	-10 (-25.0)	10 (25)	0.1 (0.25)	" H_2O (mbar)
	400/(1000)	-400/(-1000)	400/(1000)	1.0 (2.5)	" H_2O (mbar)
	100 (7.0)	-100 (-7.0)	100 (7.0)	1 (0.07)	psi (bar)
	3000 (210)	-100 (-7.0)	3000 (210)	30 (2.1)	psi (bar)

Selection	Availability			
STD810	↓			
STD820		↓		
STD830			↓	
STD870				↓

TABLE I	METER BODY SELECTIONS								
a. Process Wetted Heads & Diaphragm Materials	Process Head Material	Diaphragm Material							
	Plated Carbon Steel	316L Stainless Steel	A_____	*	*	*	*		
		Hastelloy® C-276	B_____		*	*	*		
		Monel® 400	C_____		*	*	*		
		Tantalum	D_____		a	a	a		
		Gold Plated Stainless Steel	1_____	*	*	*	*		
		Gold Plated Hastelloy C-276	2_____		*	*	*		
		Gold Plated Monel 400	3_____		*	*	*		
	316 Stainless Steel	316L Stainless Steel	E_____	*	*	*	*		
		Hastelloy C-276	F_____		*	*	*		
		Monel 400	G_____		*	*	*		
		Tantalum	H_____		a	a	a		
		Gold Plated Stainless Steel	4_____	*	*	*	*		
		Gold Plated Hastelloy C-276	5_____		*	*	*		
		Gold Plated Monel 400	6_____		*	*	*		
	Hastelloy C-276	Hastelloy C-276	J_____		*	*	*		
		Tantalum	K_____		a	a	a		
		Gold Plated Hastelloy C-276	7_____		*	*	*		
	Monel 400	Monel 400	L_____		a	a	a		
		Gold Plated Monel 400	8_____		a	a	a		
b. Fill Fluid	Silicone Oil 200		_1____	*	*	*	*		
	Fluorinated Oil CTFE		_2____		*	*	*		
	Silicone Oil 704		_3____		*	*	*		
	NEOBEE® M-20		_4____	*	*	*	*		
c. Process Connection	None	None (1/4" NPTF female thread Std)	___A___	*	*	*	*		
	1/2" NPT female	Materials to Match Head & Head Bolt Materials Selections [1]	___H___	*	*	*	*		
d. Bolt/Nut Materials	Carbon Steel		___C___	*	*	*	*		
	316 SS		___S___	*	*	*	*		
	Grade 660 (NACE A286) with NACE 304 SS Nuts		___N___	*	*	*	*		
	Grade 660 (NACE A286) Bolts & Nuts		___K___	p	p	p	p	p	
	Monel K500		___M___	p	p	p	p	p	
	Super Duplex		___D___	p	p	p	p	p	
	B7M		___B___	*	*	*	*		
e. Vent/Drain Type/Location	Head Type	Vent Type	Location	Vent Material					
	Single Ended	None	None	None	____1__	*	*	*	*
	Single Ended	Standard Vent	Side	Matches Head Material [1]	____2__	*	*	*	*
	Single Ended	Center Vent	Side	Stainless Steel Only	____3__	t	t	t	t
	Dual Ended	Standard Vent	End	Matches Head Material [1]	____4__	*	*	*	*
	Dual Ended	Center Vent	End	Stainless Steel Only	____5__	t	t	t	t
	Dual Ended	Std Vent/Plug	Side/End	Matches Head Material [1]	____6__	*	*	*	*
f. Gasket Material	Teflon® or PTFE (Glass Filled)				_____A_	*	*	*	*
	Viton® or Fluorocarbon Elastomer				_____B_	*	*	*	*
	Graphite				_____C_	*	*	*	*
g. Static Pressure	Standard Static Pressure - 4500 psig (310 bar) except STD810: 50 psi (3.5 bar)				______S	*	*	*	*
	High Pressure 6000 psi (415 bar)				______H		k	k	k

[1] Except Carbon Steel Heads shall use 316SS Vent/Drain, Plugs & Adapters when required

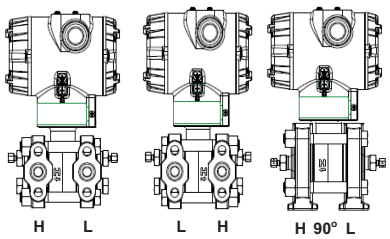

TABLE II	Meter Body & Connection Orientation		STD870	STD830	STD820	STD810
Head/Connect Orientation	Standard	High Side Left, Low Side Right[2] / Std Head Orientation	1	*	*	*	*
	Reversed	Low Side Left, High Side Right[2] / Std Head Orientation	2	*	*	*	*
	90/Standard	High Side Left, Low Side Right[2] / 90[0] Head Rotation	3	h	h	h	h

TABLE III	Agency Approvals (see data sheet for Approval Code Details)					
Approvals	No Approvals Required	0	*	*	*	*
	FM Explosion proof, Intrinsically Safe, Non-incendive, & Dustproof	A	*	*	*	*
	CSA Explosion proof, Intrinsically Safe, Non-incendive, & Dustproof	B	*	*	*	*
	ATEX Explosion proof, Intrinsically Safe & Non-incendive	C	*	*	*	*
	IECEx Explosion proof, Intrinsically Safe & Non-incendive	D	*	*	*	*
	SAEx Explosion proof, Intrinsically Safe & Non-incendive	E	*	*	*	*
	INMETRO Explosion proof, Intrinsically Safe & Non-incendive	F	*	*	*	*
	NEPSI Explosion proof, Intrinsically Safe & Non-incendive	G	*	*	*	*
	KOSHA Explosion proof, Intrinsically Safe & Non-incendive	H	*	*	*	*
	EAC Customs Union(Russia,Belarus,Kazakhstan)Ex Approval, Flame proof, Intrinsically Safe	I	*	*	*	*
	CCoE Explosion proof, Intrinsically Safe & Non-incendive	J	*	*	*	*
	UATR Flameproof, Intrinsically Safe & Dustproof	K	*	*	*	*

TABLE IV	TRANSMITTER ELECTRONICS SELECTIONS							
a. Electronic Housing Material & Connection Type	Material	Connection	Lightning Protection					
	Polyester Powder Coated Aluminum	1/2 NPT	None	A_ _	*	*	*	*
	Polyester Powder Coated Aluminum	M20	None	B_ _	*	*	*	*
	Polyester Powder Coated Aluminum	1/2 NPT	Yes	C_ _	*	*	*	*
	Polyester Powder Coated Aluminum	M20	Yes	D_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	1/2 NPT	None	E_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	M20	None	F_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	1/2 NPT	Yes	G_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	M20	Yes	H_ _	*	*	*	*
b. Output/ Protocol	Analog Output	Digital Protocol						
	4-20mA dc	HART Protocol		_H_	*	*	*	*
	4-20mA dc	DE Protocol		_D_	u	u	u	u
	none	Foundation Fieldbus		_F_	*	*	*	*
c. Customer Interface Selections	Indicator	Ext Zero, Span & Config Buttons	Languages					
	None	None	None	_ _0	*	*	*	*
	None	Yes (Zero/Span Only)	None	_ _A	f	f	f	f
	Basic	None	English	_ _B	*	*	*	*
	Basic	Yes	English	_ _C	*	*	*	*
	Advanced	None	EN, GE, FR, IT, SP, RU, TU	_ _D	*	*	*	*
	Advanced	Yes	EN, GR, FR, IT,SP, RU, TU	_ _E	*	*	*	*
	Advanced	None	EN, CH, JP	_ _H	*	*	*	*
	Advanced	Yes	EN, CH, JP	_ _J	*	*	*	*

TABLE V	CONFIGURATION SELECTIONS							
a. Application Software	Diagnostics							
	Standard Diagnostics			1_ _	*	*	*	*
	Advanced Diagnostics (Above with Plugged Impulse Detection PILD)			2_ _	*	*	*	*
b. Output Limit, Failsafe & Write Protect Settings	Write Protect	Fail Mode	High & Low Output Limits[3]					
	Disabled	High> 21.0mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_1_	f	f	f	f
	Disabled	Low< 3.6mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_2_	f	f	f	f
	Enabled	High> 21.0mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_3_	f	f	f	f
	Enabled	Low< 3.6mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_4_	f	f	f	f
	Enabled	N/A	N/A Fieldbus or Profibus	_5_	g	g	g	g
	Disabled	N/A	N/A Fieldbus or Profibus	_6_	g	g	g	g
c. General Configuration	Factory Standard			_ _S	*	*	*	*
	Custom Configuration (Unit Data Required from customer)			_ _C	*	*	*	*

[2] Left side/Right side as viewed from the customer connection perspective

[3] NAMUR Output Limits 3.8 - 20.5mAdc can be configured by the customer or select custom configuration Table Vc

TABLE VI	CALIBRATION & ACCURACY SELECTIONS				STD870	STD830	STD820	STD810
	Accuracy	Calibrated Range	Calibration Qty					
a. Accuracy and Calibration	Standard	Factory Std	Single Calibration	A	*	*	*	*
	Standard	Custom (Unit Data Required)	Single Calibration	B	*	*	*	*
	Standard	Custom (Unit Data Required)	Dual Calibration	C	*	*	*	*
	Standard	Custom (Unit Data Required)	Triple Calibration	D	*	*	*	*
	High Accuracy	Factory Std	Single Calibration	E		s	s	s
	High Accuracy	Custom (Unit Data Required)	Single Calibration	F		s	s	s
	High Accuracy	Custom (Unit Data Required)	Dual Calibration	G		s	s	s
	High Accuracy	Custom (Unit Data Required)	Triple Calibration	H		s	s	s

TABLE VII	ACCESSORY SELECTIONS						
	Bracket Type	Material					
a. Mounting Bracket	None	None	0 _ _ _	*	*	*	*
	Angle Bracket	Carbon Steel	1 _ _ _	*	*	*	*
	Angle Bracket	304 SS	2 _ _ _	*	*	*	*
	Angle Bracket	316 SS	3 _ _ _	*	*	*	*
	Marine Approved Bracket	Carbon Steel	8 _ _ _	*	*	*	*
	Marine Approved Bracket	304 SS	4 _ _ _	*	*	*	*
	Flat Bracket	Carbon Steel	5 _ _ _	*	*	*	*
	Flat Bracket	304 SS	6 _ _ _	*	*	*	*
	Flat Bracket	316 SS	7 _ _ _	*	*	*	*
b. Customer Tag	Customer Tag Type						
	No customer tag		_ 0 _ _	*	*	*	*
	One Wired Stainless Steel Tag (Up to 4 lines 26 char/line)		_ 1 _ _	*	*	*	*
	Two Wired Stainless Steel Tag (Up to 4 lines 26 char/line)		_ 2 _ _	*	*	*	*
c. Unassembled Conduit Plugs & Adapters	Unassembled Conduit Plugs & Adapters						
	No Conduit Plugs or Adapters Required		_ _ A0	*	*	*	*
	1/2 NPT Male to 3/4 NPT Female 316 SS Certified Conduit Adapter		_ _ A2	n	n	n	n
	1/2 NPT 316 SS Certified Conduit Plug		_ _ A6	n	n	n	n
	M20 316 SS Certified Conduit Plug		_ _ A7	m	m	m	m
	Minifast® 4 pin (1/2 NPT) (not suitable for X-Proof applications)		_ _ A8	n	n	n	n
	Minifast® 4 pin (M20) (not suitable for X-Proof applications)		_ _ A9	m	m	m	m

TABLE VIII	OTHER Certifications & Options: (String in sequence comma delimited (XX, XX, XX,....)						
Certifications & Warranty	None - No additional options		00	*	*	*	*	
	Low Temperature Rating (-50 deg C min. ambient operative temperature limit)		LT	w	w	w		
	NACE MR0175; MR0103; ISO15156 (FC33338) Process wetted parts only		FG	*	*	*	*	b
	NACE MR0175; MR0103; ISO15156 (FC33339) Process wetted and non-wetted parts		F7	c	c	c	c	
	Marine (DNV, ABS, BV, KR, LR)		MT	d	d	d	d	
	EN10204 Type 3.1 Material Traceability (FC33341)		FX	*	*	*	*	
	Certificate of Conformance (F3391)		F3	*	*	*	*	b
	Calibration Test Report & Certificate of Conformance (F3399)		F1	*	*	*	*	
	Certificate of Origin (F0195)		F5	*	*	*	*	
	FMEDA (SIL 2/3) Certification (FC33337)		FE	j	j	j	j	
	Over-Pressure Leak Test Certificate (1.5X MAWP) (F3392)		TP	*	*	*	*	
	Cert Clean for O_2 or CL_2 service per ASTM G93		OX	e	e	e	e	
	PMI Certification[1]		PM	*	*	*	*	
	Extended Warranty Additional 1 year		01	*	*	*	*	b
	Extended Warranty Additional 2 years		02	*	*	*	*	
	Extended Warranty Additional 3 years		03	*	*	*	*	
	Extended Warranty Additional 4 years		04	*	*	*	*	
	Extended Warranty Additional 15 years		15	*	*	*	*	

TABLE IX	Manufacturing Specials					
Factory	Factory Identification		0000	*	*	*	*

MODEL RESTRICTIONS

Restriction Letter	Available Only with		Not Available with	
	Table	Selection(s)	Table	Selection(s)
a			VIII	F7, FG
k			Ia	J,K,7,L,8 _ _ _ _ _ _
			Ic	_ _ H _ _ _ _ _
			Id	_ _ _ B,D,M,N,S _ _ _
			Ie	_ _ _ _ 1, 2, 3, 5, 6 _ _
			III	B- No CRN number available
			If	_ _ _ _ _ C _
c	1d	_ _ _ N,K,D,B _ _ _	Ia	D,H,K,L,8 _ _ _ _ _ _
d	IV a	C, D, G, H _ _	VIIa	1,2,3,5,6,7 _ _ _
e	Ib	_ 2 _ _ _ _ _		
f			IVb	_ F _
g			IVb	_ H, D _
h			Ie	_ _ _ _ 4, 5, 6 _ _
			VIIa	1,2,3,4,5,6,7,8 _ _ _
j	IVb	_ H _	Vb	_ 1,2,6 _
m	IV a	B, D, F, H _ _		
n	IV a	A, C, E, G _ _		
p			III	B- No CRN number available
t			Ia	J, K, 7, L, 8
s	Ia	A,E _ _ _ _ _ _		
u			Va	2 _ _
			VIa	C,D,G,H
v	IV a	C, D, G, H _ _	IVb	_D,F_
w	Ib	_1 _ _ _ _ _	VIII	FE
b	Select only one option from this group			

[1]The PM option is available on all Smartline Pressure Transmitter process wetted parts such as process heads, flanges, bushings and vent plugs except plated carbon steel process heads and flanges. PM option information is also available on diaphragms except Gold plated and STG and STA in-line construction pressure transmitters.

FIELD INSTALLABLE REPLACEMENT PARTS

Description	Kit Number
Integrally Mounted Basic Indicator Kit (Compatible with all Electronic Modules)	50049911-501
Integrally Mounted Advanced Indicator Kit (compatible with all Electronic Modules)	50049846-501
Terminal Strip w/o Lightening Protection for HART or DE Modules	50075472-531
Terminal Strip w/Lightning Protection Kit for HART or DE Modules	50075472-532
Terminal Strip w/o Lightening Protection FFB/*Profibus* Module	50075472-533
Terminal Strip w/Lightning Protection Kit for FFB/*Profibus* Module	50075472-534
HART Electronics Module	50049849-501
HART Electronics Module w/connection for external configuration buttons	50049849-502
DE Electronics Module	50049849-503
DE Electronics Module w/connection for external configuration buttons	50049849-504
FFB Electronics Module Kit	50049849-507
FFB Electronics Module w/connection for external configuration buttons	50049849-508

PRODUCT MANUALS

Description	Part Number
ST 800 Smart Transmitter User Manual - English	34-ST-25-35
ST 800 Smart Transmitter HART/DE Communications Manual - English	34-ST-25-38
ST 800 Smart Transmitter Safety Manual - English	34-ST-25-37
ST 800 Smart Transmitter Foundation Fieldbus Manual - English	34-ST-25-39
ST 800 Smart Transmitter Function Block Manual - English	34-ST-25-42

All product documentation is available at www.honeywellprocess.com.

Sales and Service

For application assistance, current specifications, ordering, pricing, and name of the nearest Authorized Distributor, contact one of the offices below.

ASIA PACIFIC

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FAX: +(61) 7-3840 6481
Toll Free 1300-36-39-36
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Web
Knowledge Base search
engine http://bit.ly/2N5VIdi

AMERICAS

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(Sales) 1-800-343-0228

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FP-Sales-Apps@Honeywell.com
or
(TAC)
hfs-tac-support@honeywell.com

Web
Knowledge Base search
engine http://bit.ly/2N5VIdi

Specifications are subject to change without notice.

For more information
To learn more about SmartLine Pressure Transmitters, visit www.honeywellprocess.com
Or contact your Honeywell Account Manager

Process Solutions
Honeywell
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Houston, TX 77042

Honeywell Control Systems Ltd
Honeywell House, Skimped Hill Lane
Bracknell, England, RG12 1EB

Shanghai City Centre, 100 Jungi Road
Shanghai, China 20061

www.honeywellprocess.com

34-ST-03-82
Jan 2021

DIFFERENTIAL PRESSURE TRANSMITTER

Item: Smart Line Differential Pressure Transmitter		
Engineering Units : Flow : Liquid - M3 / Hr, Steam Kg / Hr, Pressure : Kg / cm2 , Temperatue : Deg C, Level : mmWC		SHEET 01 OF 9

Model	Decodification	Description
General	Make	Honeywell
	Function	Transmission & Indication
	Model No.	**STD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1-0000**
	Qty	As per attached BOM
	Tag No.	As per attached BOM
	Calibration Range	As per attached BOM
	Sensor	Piezoresistive
	Supply Voltage	10.8 to 42.4 V DC
	Load Resistance	600 ohms @24V DC
	Communication	Hart Protocol
	Display	2 Lines 16 Characters (4.13H x 1.83W mm)
	Reference Accuracy	0.035% of Span
	Turndown Ratio	100:1
	Stability	0.015% of URL per year for 15 Years
	MAWP	3.45 Bar
	Maximum Allowed Working Temperature	125 Deg.C (for Temp Higher than 125 Deg C, a suitable length of impulse line to be used, considering 100 Deg.C temperature drop for every One meter length of impulse pipe)
	Protection Class	IP 67
	Area Classification	Hazardous Area
	Connection Location	Side/Side
STD810	Instrument Range	Min Span 0 to 0.25 mbar to Max Span 0 to 25 mbar
E	Process Wetted Heads & Diaphragm Materials	Process Head Material : 316 Stainless steel & Diaphragm Material : 316L Stainless Steel
1	Fill Fluid	Silicone Oil 200
A	Process Connection	1/4" NPT (F)
C	Bolt/Nut Materials	Carbon Steel
4	Vent/Drain Type/Location	Head Type : Dual Ended, Vent Type : Standard Vent, Location : End & Vent material : Matches Head Material[1]
A	Gasket Materials	Teflon or PTFE (Glass Filled)
S	Static Pressure	Standard Static Pressure
1	Head/Connect Orientation	Standard, High Side Left, Low Side Right[2] / Std Head Orientation
C	Approvals	ATEX Explosion proof, Intrinsically Safe & Non-incendive
A	Electronic Housing Material, Connection Type & Lightning Protection	Material : Polyester Powder Coated Aluminum, Connection : 1/2" NPT & Lightning Protection : None
H	Output/Protocol	Anlogue Output : 4-20mA dc, Digital Protocol : Hart Protocol
C	Customer Interface Selections	Indicator : Basic, Ext Zero, Span & Config Buttons : Yes, Languages : English
1	Application Software	Standard Diagnostics
1	Output Limit, Failsafe & Write Protect Settings	Write Protect : Disabled, Fail Mode : High> 21.0 mAdc, High & Low Output Limits[3] : Honeywell Std (3.8-20.8 mAdc)
C	General Configuration	Custom Configuration (Unit Data Required from customer)
B	Accuracy & Calibration	Accuracy : Standard, Calibrated Range : Custom (Unit Data Required), Calibration Qty : Single Calibration
1	Mounting Bracket	Bracket Type : Angle Bracket, Material : Carbon Steel
1	Customer Tag	One Wired Stainless Steel Tag (Up to 4 lines 26 Char/line)
A0	Plugs & Adapters	No Conduit Plugs or Adapters Required
F1	Certifications	Calibration Test Report & Certificate of Conformance (F3399)
0000	Manufacturing Specials	Factory Identification

SmartLine

Honeywell

Technical Information

STD800 SmartLine Differential Pressure
Specification 34-ST-03-82, Jan 2021

Introduction

Part of the SmartLine® family of products, the STD800 is a high performance differential pressure transmitter featuring piezoresistive sensor technology. By combining differential pressure sensing with on chip static pressure and temperature compensation the STD800 offers high accuracy and stability over a wide range of application pressures and temperatures. The SmartLine family is also fully tested and compliant with Experion® PKS providing the highest level of compatibility assurance and integration capabilities. SmartLine easily meets the most demanding application needs for pressure measurement applications.

Best in Class Features:

- Accuracies up to 0.035% of span standard & 0.025% of span optional
- Stability up to 0.01% of URL per year for 15 years
- Automatic static pressure & temperature compensation
- Rangeability up to 400:1
- Response times as fast as 90ms
- Multiple local display capabilities
- External zero, span, & configuration capability
- Polarity insensitive electrical connections
- Comprehensive on-board diagnostic capabilities
- Integral Dual Seal design for highest safety based on ANSI/NFPA 70-202 and ANSI/ISA 12.27.0
- World class overpressure protection
- Full compliance to SIL 2/3 requirements.
- Modular design characteristics
- Available with additional 15-year warranty
- Plugged Impulse Line Detection Option
- Dual/Triple Calibration Option (HART & Fieldbus only)

Figure 1 – STD800 Differential Pressure Transmitters feature field-proven piezoresistive sensor technology

Communications/Output Options:

- 4-20mA dc
- Honeywell Digitally Enhanced (DE)
- HART ® (version 7.0)
- FOUNDATION™ Fieldbus

All transmitters are available with the above listed communications protocols.

Span & Range Limits:

Model	URL "H_2O (mbar)	LRL "H_2O (mbar)	Min Span "H_2O (mbar)
STD810	10 (25)	-10 (-25)	0.1 (0.25)
STD820	400 (1000)	-400 (-1000)	1.0 (2.5)
Model	**psi (bar)**	**psi (bar)**	**psi (bar)**
STD830	100 (7.0)	-100 (-7.0)	1 (0.07)
STD870	3000 (210)	-100 (-7.0)	30 (2.1)

Description

The SmartLine family of gauge pressure, differential pressure, and absolute pressure transmitters is designed around a high performance piezo-resistive sensor. This one sensor integrates multiple sensors linking process pressure measurement with on-board static pressure (DP Models) and temperature compensation measurements resulting in the best total performance available. This level of performance allows the ST 800 to replace virtually any competitive transmitter available today.

Unique Indication/Display Options

The ST 800 modular design accommodates a basic alphanumeric LCD display or a unique advanced graphics LCD display with many unparalleled features.

Basic Alphanumeric LCD Display Features

- Modular (may be added or removed in the field)
- 0, 90,180, & 270 degree position adjustments
- Configurable (HART only) and standard (Pa, KPa, MPa, KGcm2, Torr, ATM, inH2O, mH2O, bar, mbar, inH2O, inHG, FTH2O, mmH2O, mm HG, & psi) measurement units
- 2 Lines 16 Characters (4.13H x 1.83W mm)
- Square root output indication (√)

Advanced Graphics LCD Display Features

- Modular (may be added or removed in the field)
- 0, 90, 180, & 270 degree position adjustments
- Standard and custom measurement units available.
- Up to eight display screens with 3 formats are possible
- (Large PV with Bar Graph or PV with Trend Graph)
- Configurable screen rotation timing (1 to 30 sec)
- Display Square Root capabilities may be set separately from the 4-20mA dc output signal
- Unique “Health Watch” indication provides instant visibility of diagnostics
- Multiple language capability. (EN, DE, FR, IT, ES, RU, TR, CN & JP)

Diagnostics

SmartLine transmitters all offer digitally accessible diagnostics which aid in providing advanced warning of possible failure events minimizing unplanned shutdowns, providing **lower overall operational costs**

Configuration Tools

Integral Three Button Configuration Option

Suitable for all electrical and environmental requirements, SmartLine offer the ability to configure the transmitter and display via three externally accessible buttons when either display option is selected. Zero/span capabilities are also optionally available via these buttons with or without selection of a display option.

Hand Held Configuration

SmartLine transmitters feature two-way communication and configuration capability between the operator and the transmitter. All Honeywell transmitters are designed and tested for compliance with the offered communication protocols and are designed to operate with any Standards compliant handheld configuration device.

Personal Computer Configuration

Honeywell’s SCT 3000 Configuration Toolkit provides an easy way to configure Digitally Enhanced (DE) instruments using a personal computer as the configuration interface. Field Device Manager (FDM) Software and FDM Express are also available for managing HART & Fieldbus device configurations.

System Integration

- SmartLine communications protocols all meet the most current published standards for HART/DE/Fieldbus.
- Integration with Honeywell’s Experion PKS offers the following unique advantages.
  - Transmitter messaging
  - Maintenance mode indication
  - Tamper reporting
  - FDM Plant Area Views with Health summaries
  - All ST 800 units are Experion tested to provide the highest level of compatibility assurance

Modular Design

To help contain maintenance & inventory costs, all ST 800 transmitters are modular in design supporting the user's ability to replace meter bodies, add indicators or change electronic modules without affecting overall performance or approval body certifications. Each meter body is uniquely characterized to provide in-tolerance performance over a wide range of application variations in temperature and pressure and due to the Honeywell advanced interface, electronic modules may be swapped with any electronics module without losing in-tolerance performance characteristics.

Modular Features:

- Meter body replacement
- Exchange/replace electronics/comms modules*
- Add or remove integral indicators*
- Add or remove lightning protection (terminal connection)*

* Field replaceable in all electrical environments (including IS) except flameproof without violating agency approvals.

With no performance effects, Honeywell's unique modularity results in ***lower inventory needs and lower overall operating costs.***

Plugged Impulse Line Detection:

STD800 models are offered with a PILD option which provides indication of a plugged impulse line or process connection. When used in conjunction with a basic or advanced display, a non-critical diagnostic indication appears on the integral display. For units without an integral display, an indication can be seen via the host or hand held device when HART Protocol is utilized.

Dual/Triple Calibration:

STD800 models are optionally offered with multiple calibrations. In lieu of a standard factory calibration, units can be supplied with 1, 2, or 3 customer specified calibrations. These calibrations are stored in the meter body and provide users with factory calibrated performance at up to three different calibrated ranges. This increases application flexibility without requiring any costly recalibration or additional inventory.

Performance Specifications

Reference Accuracy (conformance to +/-3 Sigma)

Table 1

Model	URL	LRL	Min Span	Maximum Turndown Ratio	Stability (% URL/ Yr for 15 years)	Reference Accuracy[1,2] (% Span) Std/Opt
STD810	10 in H_2O (25mbar)	-10 in H_2O (-25mbar)	0.1 in H_2O (0.25mbar)	100:1	0.015	0.035
STD820	400 in H_2O (1000mbar)	-400 in H_2O (-1000mbar)	1 in H_2O (2.5mbar)	400:1	0.010	0.0375 / 0.025
STD830	100 psi (7.0 bar)	-100 psi (-7.0 bar)	1 psi (0.07 bar)	100:1	0.020	0.0375 / 0.0325
STD870	3000 psi (210 bar)	-100 psi (-7.0 bar)	30 psi (2.1 bar)	100:1	0.010	0.0375 / 0.0350

Zero and span may be set anywhere within the listed (URL/LRL) range limits

Accuracy at Specified Span, Temperature and Static Pressure Effects: (conformance to +/-3)

Table 2

			Accuracy[1,2] (% of Span)				Combined Zero & Span temperature Effect (% Span / 28°C (50 °F))		Combined Zero & Span Static Line Pressure Effect[4] (% Span/1000psi)[3]	
	Model	URL	Reference Turndown	A	B	C (see URL units)	D	E	F	G
Standard Accuracy	STD810	10 in H_2O (25mbar)	10:1	0.010	0.025	1 (2.5)	0.070	0.040	0.050	0.075
	STD820	400 in H_2O (1000mbar)	16:1	0.005	0.0325	25 (62.5)	0.025	0.007	0.080	0.007
	STD830	100 psi (7.0 bar)	6.7:1	0.005	0.0325	15 (1.05)	0.025	0.010	0.075	0.075
	STD870	3000 psi (210 bar)	15:1	0.005	0.0325	200 (14)	0.025	0.006	0.075	0.075
High Accuracy Option	STD820	400 in H_2O (1000mbar)	16:1	0.005	0.020	25 (62.5)	0.025	0.0107	0.080	0.007
	STD830	100 psi (7 bar)	6.7:1	0.005	0.0275	15 (1.05)	0.025	0.010	0.075	0.075
	STD870	3000 psi (210 bar)	15:1	0.005	0.030	200 (14)	0.025	0.006	0.075	0.075
			Turn Down Effect				Temp Effect		Static Effect	
			$\pm[A+B]$ if $Span \geq C$ $\pm\left[A+B\left(\frac{C}{Span}\right)\right]$ if $Span < C$				$\pm[D+E\left(\frac{URL}{Span}\right)]$		$\pm[F+G\left(\frac{URL}{Span}\right)]$	

Total Performance = +/- $\sqrt{(\text{Accuracy})^2 + (\text{Temp Effect})^2 + (\text{Static Line Pressure Effect})^2}$

Total Performance Examples: (standard accuracy 5:1 Turndown, up to 50 ºF shift & up to 1000 psi Static Pressure[3])

Model	Total Performance	Model	Total Performance
STD810 @ 2"H_2O	0.505% of span	**STD830 @ 20 psi**	0.140% of span
STD820 @ 80" H_2O	0.135% of span	**STD870 @ 600 psi**	0.131% of span

Typical Calibration Frequency: Calibration verification is recommended every four (4) years

Notes:

1. Terminal based Accuracy – Incudes combined effects of linearity, hysteresis and repeatability. Analog output adds 0.005% of span
2. For zero based spans and reference conditions of 25 °C (77 °F). 0 psig static pressure. 10 to55% RH, and 316 Stainless Steel barrier diaphragm.
3. STD810 includes only zero shift with static pressure. Results ar % of span/25 psig.

Operating Conditions – All Models

Parameter	Reference Condition		Rated Condition		Operative Limits		Transportation and Storage	
	°C	°F	°C	°F	°C	°F	°C	°F
Ambient Temperature[1] STD800	25±1	77±2	-40 to 85	-40 to 185	-40 to 85	-40 to 185	-55 to 120	-67 to 248
Meter Body Temperature[2] STD810, 820, 830, 870	25±1	77±2	-40 to 110[1]	-40 to 230[1]	-40 to 125	-40 to 257	-55 to 120	-67 to 248
Humidity %RH	10 to 55		0 to 100		0 to 100		0 to 100	
Vac. Region – Min. Pressure All Models Except STD810 **mmHg absolute** **inH_2O absolute**	Atmospheric Atmospheric		25 13		2 (short term)[3] 1 (short term)[3]			
Supply Voltage **Load Resistance**	10.8 to 42.4 Vdc at terminals (IS versions limited to 30 Vdc) 0 to 1,440 ohms (as shown in Figure 2)							
Maximum Allowable Working Pressure (MAWP)[4,5] (ST 800 products are rated to Maximum Allowable Working Pressure. MAWP depends on Approval Agency and transmitter materials of construction.)	**Standard:** STD810 = 50 psi (3.45 bar) STD820, STD830 and STD870 = 4,500 psi (310 bar) **Optional:** STD820, STD830, STD870 = 6,000 psi (420 bar) Static Pressure Limit = Maximum Allowable Working Pressure (MAWP) = Overpressure Limit for ST 800 Differential Pressure Transmitters							

[1] LCD Display operating temperature -20°C to +70°C . Storage temperature -30°C to 80°C.

[2] Silicone 704 minimum temperature rating is 0ºC (32ºF). CTFE minimum temperature rating is -30°C (-22°F). NEOBEE M-20 minimum temperature rating is -15ºC (5ºF). NEOBEE® is a registered trademark of Stepan Company.

[3] Short term equals 2 hours at 70°C (158°F).

[4] MAWP applies for temperatures -40 to 125°C. Static Pressure Limit is de-rated to 3,000 psi for -26°C to -40°C. for all models except STD810. Use of graphite. o-rings de-rates transmitter to 3,625 psi. Use of 1/2:" process adaptors with graphite o-rings de-rates transmitter to 3,000 psi.

[5] Consult factory for MAWP of ST 800 transmitters with CRN approval.

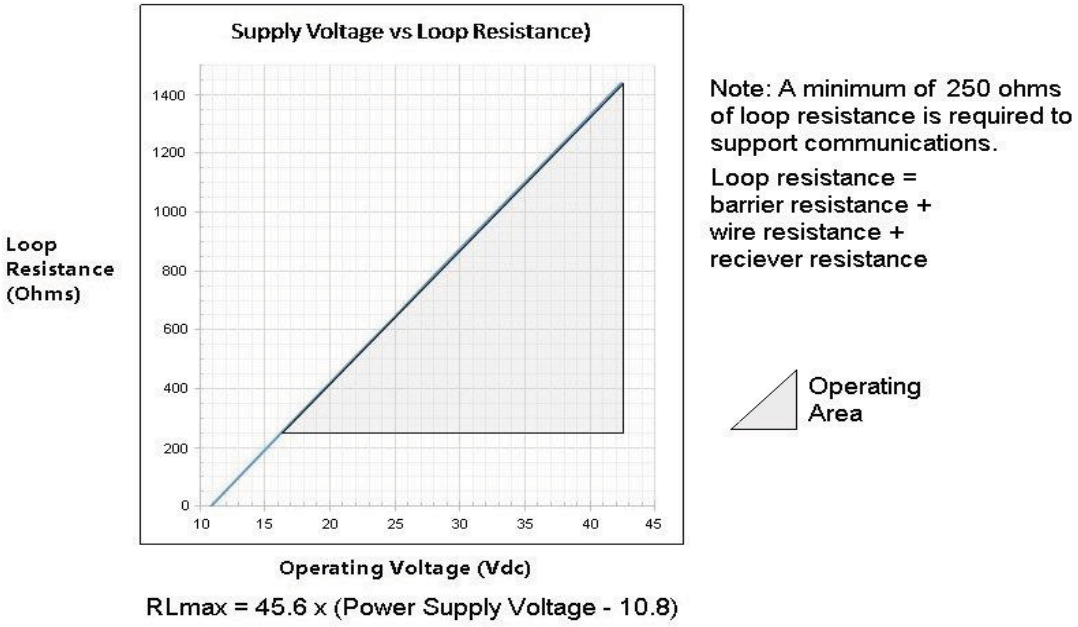

Figure 2 - Supply voltage and loop resistance chart & calculations

Performance Under Rated Conditions – All Models

Parameter	Description
Analog Output **Digital Communications**:	Two-wire, 4 to 20 mA (HART & DE Transmitters only) Honeywell DE, HART 7 protocol or FOUNDATION Fieldbus ITK 6.0.1 compliant All transmitters, irrespective of protocol have polarity insensitive connection.
HART & DE Output Failure Modes (NAMUR for DE Units requires selecting display and configuration buttons or factory configuration)	**Compliance**: **Honeywell Standard:** **NAMUR NE 43** **Normal Limits:** 3.8 – 20.8 mA 3.8 – 20.5 mA **Failure Mode:** ≤ 3.6 mA and ≥ 21.0 mA ≤ 3.6 mA and ≥ 21.0 mA
Supply Voltage Effect	0.005% span per volt.
Transmitter Turn on Time (includes power up & test algorithms)	HART or DE: 2.5 sec. Foundation Fieldbus: Host dependant
Response Time (delay + time constant)	**DE/HART Analog Output** 90mS **FOUNDATION Fieldbus** 150mS (Host Dependant)
Damping Time Constant	**HART:** Adjustable from 0 to 32 seconds in 0.1 increments. **Default:** 0.50 seconds **DE:** Discrete values 0, .16, .32, .48, 1, 2, 4, 8, 16, 32 seconds. **Default:** 0.48 seconds
Vibration Effect **ST 820, ST 830, ST 870**	Less than +/- 0.1% of URL w/o damping Per IEC60770-1 field or pipeline, high vibration level (10-2000Hz: 0.21 displacement/3g max acceleration)
Electromagnetic Compatibility	IEC 61326-3-1
Lightning Protection Option	**Leakage Current:** 10uA max @ 42.4VDC 93C **Impulse rating:** 8/20uS 5000A (>10 strikes) 10000A (1 strike min.) 10/1000uS 200A (> 300 strikes)

Materials Specifications (see model selection guide for availability/restrictions with various models)

Parameter	Description
Barrier Diaphragms Material	316L SS, Hastelloy® C-276[2], Monel® 400 [3], Tantalum, Gold-plated 316L SS, Gold-plated Hastelloy® C-276, Gold-plated Monel® 400
Process Head Material	316 SS[4], Carbon Steel (Zinc-plated) [5] 316 SS[4], Carbon Steel (Zinc-plated) [5], Hastelloy C-276[6], Monel 400 [7]
Vent/Drain Valves & Plugs [1]	316 SS[4], Hastelloy C-276[2], Monel 400 [7]
Head Gaskets	Glass-filled PTFE standard. Viton® and graphite are optional.
Meter Body Bolting	Carbon Steel (Zinc plated) standard. Options include 316 SS, NACE A286 SS bolts, Monel K500, Super Duplex and B7M.
Optional Adapter Flange and Bolts	Adapter Flange materials include 316 SS, Hastelloy C-276 and Monel 400. Bolt material for flanges is dependent on process head bolts material chosen. Standard adaptor seal material is glass-filled PTFE. Viton and graphite are optional.
Mounting Bracket	Carbon Steel (Zinc-plated) or 304 Stainless Steel or 316 Stainless Steel
Fill Fluid	Silicone Oil 200, Silicone Oil 704, Inert Fluorinated Oil CTFE and NEOBEE® M-20 (Note that STD810 is only available with Silicone Oil 200 and NEOBEE® M-20)
Electronic Housing	Pure Polyester Powder Coated Low Copper (<0.4%)-Aluminum. Meets NEMA 4X, IP66, & P67. All stainless steel housing is optional.
Mounting	Can be mounted in virtually any position using the standard mounting bracket. Bracket is designed to mount on 2-inch (50 mm) vertical or horizontal pipe. See Figure 3.
Process Connections	1/4- NPT or 1/2- NPT with adapter (meets DIN requirements)
Wiring	Accepts up to 16 AWG (1.5 mm diameter).
Dimensions	See Figure 4.
Net Weight	8.3 pounds (3.8 Kg) with Aluminum Housing

[1] Vent/Drains are sealed with Teflon®

[2] Hastelloy C-276 or UNS N10276

[3] Monel 400 or UNS N04400

[4] Supplied as 316 SS or as Grade CF8M, the casting equivalent of 316 SS.

[5] Carbon Steel heads are zinc-plated and not recommended for water service due to hydrogen migration. For that service, use 316 stainless steel wetted Process Heads.

[6] Hastelloy C-276 or UNS N10276. Supplied as indicated or as Grade CW12MW, the casting equivalent of Hastelloy C-276

[7] Monel 400 or UNS N04400. Supplied as indicated or as Grade M30C, the casting equivalent of Monel 400

Communications Protocols & Diagnostics

HART Protocol

Version:

HART 7

Power Supply

Voltage: 10.8 to 42.4Vdc at terminals

Load: Maximum 1440 ohms See figure 2

Minimum Load: 0 ohms. (For handheld communications a minimum load of 250 ohms is required)

Foundation Fieldbus (FF)

Power Supply Requirements

Voltage: 9.0 to 32.0Vdc at terminals

Steady State Current: 17.6mAdc

Software Download Current: 27.4mAdc

Available Function Blocks

Block Type	Qty	Execution Time
Resource	1	n/a
Transducer	1	n/a
Diagnostic	1	n/a
Analog Input	1*	30 ms
PID w/Autotune	1	45 ms
Integrator	1	30 ms
Signal Char (SC)	1	30 ms
LCD Display	1	n/a
Flow Block	1	30 ms
Input Selector	1	30 ms
Arithmetic	1	30 ms

* AI block may have two (2) additional instantiations.

All available function blocks adhere to FOUNDATION Fieldbus standards. PID blocks support ideal & robust PID algorithms with full implementation of Auto-tuning.

Link Active Scheduler

Transmitters can perform as a backup Link Active Scheduler and take over when the host is disconnected. Acting as a LAS, the device ensures scheduled data transfers typically used for the regular, cyclic transfer of control loop data between devices on the Fieldbus.

Number of Devices/Segment

Entity IS model: 6 devices/segment

Schedule Entries

18 maximum schedule entries

Number of VCR's: 24 max

Compliance Testing: Tested according to ITK 6.0.1

Software Download

Utilizes Class-3 of the Common Software Download procedure as per FF-883 which allows the field devices of any manufacturer to receive software upgrades from any host.

Honeywell Digitally Enhanced (DE)

DE is a Honeywell proprietary protocol which provides digital communications between Honeywell DE enabled field devices and Hosts.

Power Supply

Voltage: 10.8 to 42.4Vdc at terminals

Load: Maximum 1440 ohms See figure 2

Standard Diagnostics

ST 800 top level diagnostics are reported as either critical or non-critical and readable via the DD/DTM tools or integral display as shown below.

Critical Diagnostics		
HART DD/DTM tools	**Advanced Display**	**Basic Display**
Electronic Module DAC Failure	Electronics Module fault	Electronics Module fault
Meter Body NVM Corrupt	Meterbody fault	Meterbody fault
Config Data Corrupt	Electronics Module fault	Electronics Module fault
Electronic Module Diag Failure	Electronics Module fault	Electronics Module fault
Meter Body Critical Failure	Meterbody fault	Meterbody fault
Sensor Comm Timeout	Meterbody Comm fault	Meterbody Comm fault

Non-Critical Diagnostics		
HART DD/DTM tools	**Advanced Display**	**Basic Display**
Display Failure	n/a	n/a
Electronic Module Comm Failure	n/a	n/a
Meter Body Excess Correct	Zero Correct (OK or EXCESSIVE) Span Correct (OK or EXCESSIVE)	n/a
Sensor Over Temperature	Meterbody Temp (OK, OVER TEMP)	n/a
Fixed Current Mode	Analog Out mode (Fixed or Normal)	n/a
PV Out of Range	Primary PV (OK or OVERLOAD)	n/a
No Factory Calibration	Factory Cal (OK, NO FACTORY CAL)	n/a
No DAC Compensation	DAC Temp Comp (OK, NO COMPENSATION)	n/a
LRV Set Error – Zero Config Button	n/a	n/a
URV Set Error – Span Config Button	n/a	n/a
AO Out of Range	n/a	n/a
Loop Current Noise	n/a	n/a
Meter Body Unreliable Comm	Meterbody Comm (OK, SUSPECT)	n/a
Tamper Alarm	n/a	n/a
No DAC Calibration	n/a	n/a
Sensor Supply Voltage Low	Supply Voltage (OK, LOW, or HIGH)	n/a

Refer to ST 800 diagnostics tech note for additional level diagnostics.

Other Certification Options

Materials

- NACE MRO175, MRO103, ISO15156

Hazardous Areal Certifications:

MSG CODE	AGENCY	TYPE OF PROTECTION	COMM. OPTION	ELECTRICAL PARAMETERS	AMBIENT TEMP (Ta)
A	FM Approvals™ USA	**Explosionproof:** Class I, Division 1, Groups A, B, C, D; Dust Ignition Proof: Class II, III, Division 1, Groups E, F, G; T6..T5 Class I, Zone 0/1, AEx db IIC T6..T5 Ga/Gb Class II, Zone 21, AEx tb IIIC T95° Db	All	Note 1	T5: -50 ºC to 85ºC T6: -50 ºC to 65ºC
		Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G: T4 Class I, Zone 0, AEx ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2a	-50 ºC to 70ºC
			Foundation Fieldbus	Note 2b	-50 ºC to 70ºC
		Nonincendive: Class I, Division 2, Groups A, B, C, D locations, T4 Class I, Zone 2, AEx nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50 ºC to 85ºC
		Enclosure: Type 4X/ IP66/ IP67	All	All	-
		STANDARDS: FM Class 3600:2011; FM Class 3610: 2010; FM Class 3611: 2004; FM Class 3615: 2006; FM Class 3616: 2011; FM Class 3810: 2005; ANSI/ISA 60079-0: 2013; ANSI/UL 60079-1: 2015; ANSI/UL 60079-11: 2014; ANSI/ISA 60079-15: 2012; ANSI/UL 60079-26: 2017; ANSI/UL 60079-31: 2015; ANSI/NEMA 250: 2003; ANSI/ IEC 60529: 2004			
B	Canadian Standards Association (CSA) USA and Canada	**Explosion Proof:** Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1, T6..T5 Class I Zone 1 AEx db IIC T6..T5 Ga/Gb Ex db IIC T6..T5 Ga/Gb Zone 22 AEx tb IIIC T95° Db Ex tb IIIC T95° Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1, T4 Class I Zone 0, AEx ia IIC T4 Ga Class I Zone 2, AEx ic IIC T4 Gc Ex ia IIC T4 Ga Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Nonincendive: Class I, Division 2, Groups A, B, C, D; Class II, Division 2, Groups F, G; Class III, Division 2, T4 Class I Zone 2 AEx nA IIC T4 Gc Ex nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C to 85°C
		Enclosure: Type 4X/ IP66/ IP67	All	All	-

MSG CODE	AGENCY	TYPE OF PROTECTION	COMM. OPTION	ELECTRICAL PARAMETERS	AMBIENT TEMP (Ta)
		STANDARDS: CSA C22.2 No. 0-10; CSA C22.2 No. 94-M91; CSA C22.2 No. 25-1966; CSA C22.2 No. 30-M1986; CSA C22.2 No. 142-M1987; CSA C22.2 No. 157-92; CSA C22.2 No. 213-M1987; CSA-C22.2 No. 60529:05; CSA-C22.2 No. 60079-0:11; CSA-C22.2 No. 60079-1:11; CSA-C22.2 No. 60079-11:11; CSA-C22.2 No. 60079-15:12; CSA-C22.2 No. 60079-31:12; ISA 12.12.01-2010; ISA 60079-0: 2009; ISA 60079-11: 2011; ISA 60079-15: 2009; ISA 60079-26: 2008; ISA-60079-27:2007 (12.02.04)-2006 (R2011); UL 913 Ed. 6; UL 916:1998; ANSI/ISA-12.27.01-2011			
C	**ATEX**	**Flameproof: SIRA 12ATEX2233X** II 1/2 G Ex db IIC T6..T5 Ga/Gb II 2 D Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: SIRA 12ATEX2233X II 1 G Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) II 1 G Ex ia IIC T4 Ga	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: SIRA 12ATEX4234X II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: SIRA 12ATEX4234X II 3 G Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) II 3 G Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
		STANDARDS: EN 60079-0: 2012/A11: 2013; EN 60079-1: 2014; EN 60079-7: 2015; EN 60079-11: 2012; EN 60079-26: 2015; EN 60079-31: 2009			
D	**IECEx World**	**Flameproof: IECEx SIR 12.0100X** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: IECEx SIR 12.0100X Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: IECEx SIR 12.0100X Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: IECEx SIR 12.0100X Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
		STANDARDS: IEC 60079-0: 2011; IEC 60079-1: 2014; IEC 60079-7: 2017; IEC 60079-11: 2011; IEC 60079-26: 2014; IEC 60079-31: 2013			

E	**SAEx South Africa**	**Flameproof :** Ex d IIC T6…T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC Ga T4 FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
F	**INMETRO Brazil**	**Flameproof:** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2a	-50°C TO 70°C
			Foundation Fieldbus	Note 2b	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	-
G	**NEPSI CHINA**	**Flameproof:** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T 95°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	-

H	**KOSHA Korea**	**Flameproof :** Ex d IIC T4, T5, T6 Ex tD A21 IP66/IP67 T95°C…T120 °C	All	Note 1	T4: -50°C TO 85°C T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4	4-20 mA / DE/ HART	Note 2	Ta= -50 ºC to 70ºC
			Foundation Fieldbus	Note 2	Ta= -50 ºC to 70ºC
		Enclosure: IP66/ IP67	All	All	-
I	**EAC Russia, Belarus and Kazakhstan**	**Flameproof:** Ga/Gb Ex d IIC T6..T5 Ex tb IIIC Db T 85°C	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ga Ex ia IIC T4 X FISCO Field Device (Only for FF Option) Ga Ex ia IIC T4 X	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Non Sparking: 2 Ex nA IIC T4 Gc X	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ga Ex ic IIC T4 X FISCO Field Device (Only for FF Option) 2 Ex ic IIC T4 Gc X	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	
J	**CCoE INDIA**	**Flameproof:** Ex d IIC T6..T5 Ga/Gb	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Non Sparking Ex nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
K	**UATR UKRAINE**	**Flameproof:** II 1/2 G Ex db IIC T6..T5 Ga/Gb II 2 D Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: II 1 G Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) II 1 G Ex ia IIC T4 Ga	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Enclosure: IP66/ IP67	All	All	-

Notes:

1. Operating Parameters:

   Voltage= 11 to 42 V DC Current= 4-20 mA Normal

   = 10 to 30 V (FF) = 30 mA (FF)

2. Intrinsically Safe Entity Parameters

a. Analog/ DE/ HART Entity Values:

Vmax= Ui = 30V Imax= Ii= 105mA Ci = 4.2nF Li =984 uH Pi =0.9W

Transmitter with Terminal Block Revision E or Later

Vmax= Ui = 30V Imax= Ii= 225mA Ci = 4.2nF Li = 0 Pi =0.9W

Note : Transmitter with Terminal Block Revision E or later

The revision is on the label that is on the module. There will be two lines of text on the label:

- First is the Module Part #: 50049839-001 or 50049839-002
- Second line has the supplier information, along with the REVISION:

XXXXXXX-EXXXX, THE "X" is production related, THE POSITION of the "E" IS THE REVISION.

b. Foundation Fieldbus- Entity Values

Vmax= Ui = 30V Imax= Ii= 180mA Ci = 0nF Li = 984 uH Pi =1W

Transmitter with Terminal Block Revision F or Later)

Vmax= Ui = 30V Imax= Ii= 225mA Ci =0nF Li = 0 Pi =1 W

FISCO Field Device

Vmax= Ui = 17.5V Imax= Ii= 380 mA Ci = 0nF Li = 0 Pi =5.32 W

Note : Transmitter with Terminal Block Revision F or later

The revision is on the label that is on the module. There will be two lines of text on the label:

- First is the Module Part #: 50049839-003 or 50049839-004
- Second line has the supplier information, along with the REVISION:

XXXXXXX-EXXXX, THE "X" is production related, THE POSITION of the "E" IS THE REVISION.

Approval Certifications:

<table>
<tr><td rowspan="5">Marine Certificates</td><td>This certificate defines the certifications covered for the ST 800 Pressure Transmitter family of products, including the SMV 800 Smart Multivariable Transmitter. It represents the compilation of the five certificates Honeywell currently has covering the certification of these products into marine applications.
For ST 800 Smart Pressure Transmitter and SMV800 Smart Multivarible Transmitter</td></tr>
<tr><td>American Bureau of Shipping (ABS) - 2009 Steel Vessel Rules 1-1-4/3.7, 4-6-2/5.15, 4-8-3/13 & 13.5, 4-8-4/27.5.1, 4-9-7/13. Certificate number: 04-HS417416-PDA</td></tr>
<tr><td>Bureau Veritas (BV) - Product Code: 389:1H. Certificate number: 12660/B0 BV</td></tr>
<tr><td>Det Norske Veritas (DNV) - Location Classes: Temperature D, Humidity B, Vibration A, EMC B, Enclosure C. For salt spray exposure; enclosure of 316 SST or 2-part epoxy protection with 316 SST bolts to be applied. Certificate number: A-11476</td></tr>
<tr><td>Korean Register of Shipping (KR) - Certificate number: LOX17743-AE001</td></tr>
<tr><td>Lloyd's Register (LR) - Certificate number: 02/60001(E1) & (E2)</td></tr>
<tr><td>SIL 2/3 Certification</td><td>IEC 61508 SIL 2 for non-redundant use and SIL 3 for redundant use according to EXIDA and TÜV Nord Sys Tec GmbH & Co. KG under the following standards: IEC61508-1: 2010; IEC 61508-2: 2010; IEC61508-3: 2010.</td></tr>
<tr><td>MEASUREMENT INTRUMENTS DIRECTIVE (MID) 2004/ 22/ EC</td><td>Certificate Issued by NMI Certin B.V.
Mechanical Class: M3 Electromagnetic Environment: E3
Ambient Temperature Range: -25 ºC to + 55 ºC
<table>
<tr><th>Unit</th><th>Custom Calibration</th></tr>
<tr><td>STD820</td><td>0 to 1000 mBar</td></tr>
<tr><td>STD830</td><td>0 to 7 Bar</td></tr>
<tr><td>STA84L</td><td>0 to 35 Bar A</td></tr>
<tr><td>STG84L</td><td>0 to 35 Bar</td></tr>
<tr><td>STD870</td><td>0 to 100 Bar</td></tr>
<tr><td>STA87L</td><td>0 to 100 Bar A</td></tr>
<tr><td>STG87L</td><td>0 to 100 Bar</td></tr>
</table></td></tr>
</table>

Mounting & Dimensional Drawings

Mounting Configurations

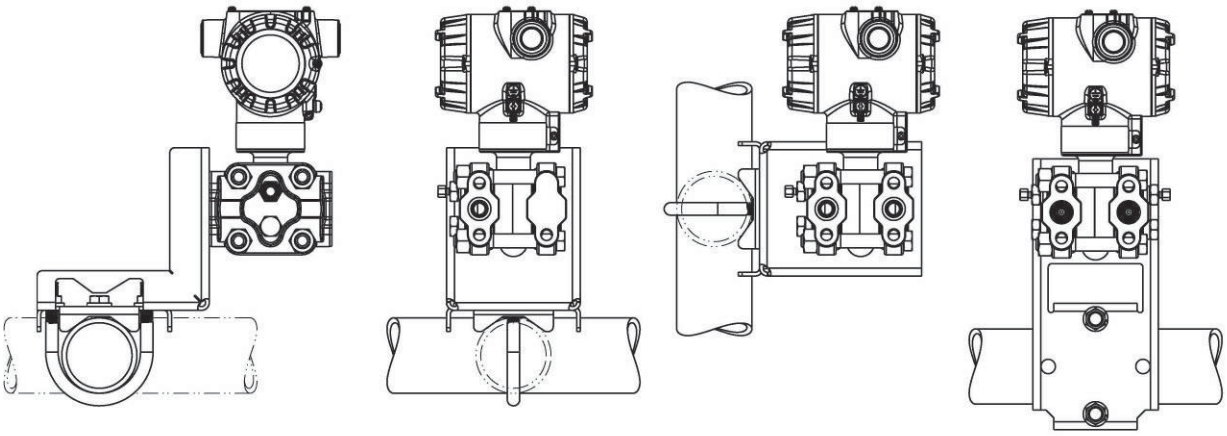

Figure 3 – Typical mounting configurations for STD810, STD820, STD830 and STD870 for reference

Reference Dimensions: millimeters / inches

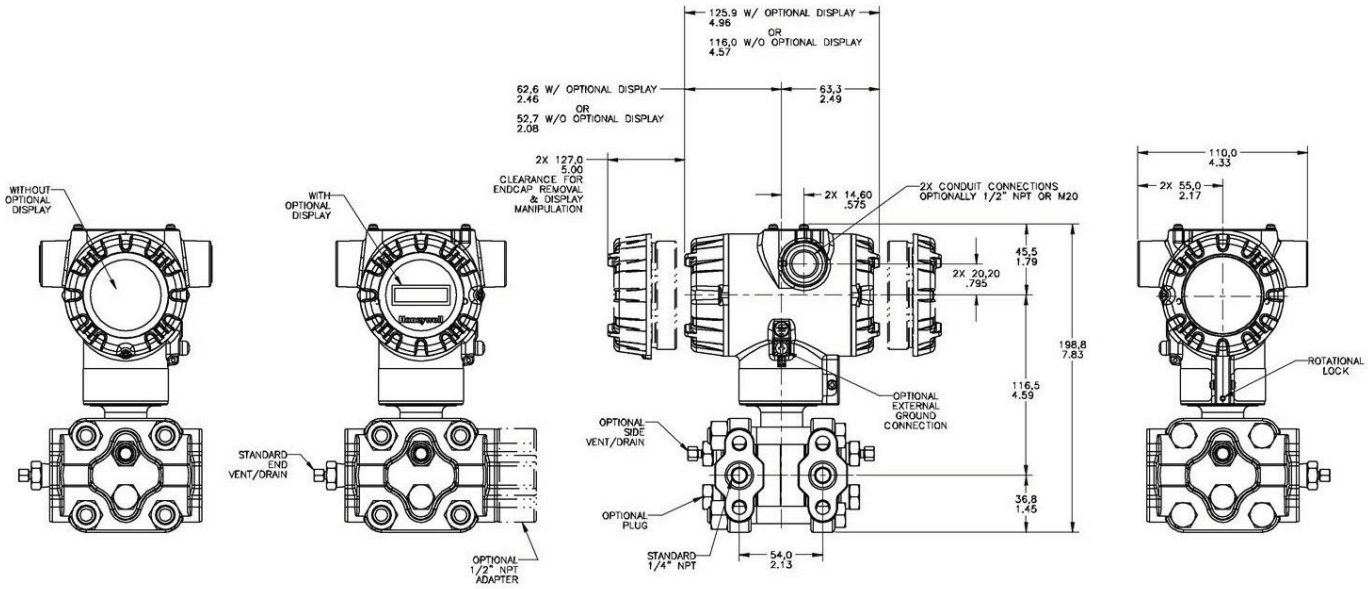

Figure 4 – Typical mounting dimensions of STD810, STD820, STD830 & STD870 for reference

Model Selection Guide

Model Selection Guides are subject to change and are inserted into the specifications as guidance only.

Model STD800
Differential Pressure Transmitter

Model Selection Guide:
34-ST-16-82 Issue 25

Instructions: Make selections from all Tables Key through XIII using column below the proper arrow. Asterisk indicates availability. Letter (a) refer to restrictions highlighted in the restrictions table. Tables delimited with dashes.

Key	I	II	III	IV	V	VI	VII	VIII (Optional)	IX
STD ___	- _____	- _	- _	- ___	- ___	- _	- ____	- __,__,__	- 0000

KEY NUMBER	URL	LRL	Max Span	Min Span	Units
Measurement Range	10 (25.0)	-10 (-25.0)	10 (25)	0.1 (0.25)	" H_2O (mbar)
	400/(1000)	-400/(-1000)	400/(1000)	1.0 (2.5)	" H_2O (mbar)
	100 (7.0)	-100 (-7.0)	100 (7.0)	1 (0.07)	psi (bar)
	3000 (210)	-100 (-7.0)	3000 (210)	30 (2.1)	psi (bar)

Selection	Availability			
STD810	↓			
STD820		↓		
STD830			↓	
STD870				↓

TABLE I	METER BODY SELECTIONS								
a. Process Wetted Heads & Diaphragm Materials	Process Head Material	Diaphragm Material							
	Plated Carbon Steel	316L Stainless Steel	A_____	*	*	*	*		
		Hastelloy® C-276	B_____		*	*	*		
		Monel® 400	C_____		*	*	*		
		Tantalum	D_____		a	a	a		
		Gold Plated Stainless Steel	1_____	*	*	*	*		
		Gold Plated Hastelloy C-276	2_____		*	*	*		
		Gold Plated Monel 400	3_____		*	*	*		
	316 Stainless Steel	316L Stainless Steel	E_____	*	*	*	*		
		Hastelloy C-276	F_____		*	*	*		
		Monel 400	G_____		*	*	*		
		Tantalum	H_____		a	a	a		
		Gold Plated Stainless Steel	4_____	*	*	*	*		
		Gold Plated Hastelloy C-276	5_____		*	*	*		
		Gold Plated Monel 400	6_____		*	*	*		
	Hastelloy C-276	Hastelloy C-276	J_____		*	*	*		
		Tantalum	K_____		a	a	a		
		Gold Plated Hastelloy C-276	7_____		*	*	*		
	Monel 400	Monel 400	L_____		a	a	a		
		Gold Plated Monel 400	8_____		a	a	a		
b. Fill Fluid	Silicone Oil 200		_1____	*	*	*	*		
	Fluorinated Oil CTFE		_2____		*	*	*		
	Silicone Oil 704		_3____		*	*	*		
	NEOBEE® M-20		_4____	*	*	*	*		
c. Process Connection	None	None (1/4" NPTF female thread Std)	___A___	*	*	*	*		
	1/2" NPT female	Materials to Match Head & Head Bolt Materials Selections [1]	___H___	*	*	*	*		
d. Bolt/Nut Materials	Carbon Steel		___C___	*	*	*	*		
	316 SS		___S___	*	*	*	*		
	Grade 660 (NACE A286) with NACE 304 SS Nuts		___N___	*	*	*	*		
	Grade 660 (NACE A286) Bolts & Nuts		___K___	p	p	p	p	p	
	Monel K500		___M___	p	p	p	p	p	
	Super Duplex		___D___	p	p	p	p	p	
	B7M		___B___	*	*	*	*		
e. Vent/Drain Type/Location	Head Type	Vent Type	Location	Vent Material					
	Single Ended	None	None	None	____1__	*	*	*	*
	Single Ended	Standard Vent	Side	Matches Head Material [1]	____2__	*	*	*	*
	Single Ended	Center Vent	Side	Stainless Steel Only	____3__	t	t	t	t
	Dual Ended	Standard Vent	End	Matches Head Material [1]	____4__	*	*	*	*
	Dual Ended	Center Vent	End	Stainless Steel Only	____5__	t	t	t	t
	Dual Ended	Std Vent/Plug	Side/End	Matches Head Material [1]	____6__	*	*	*	*
f. Gasket Material	Teflon® or PTFE (Glass Filled)				_____A_	*	*	*	*
	Viton® or Fluorocarbon Elastomer				_____B_	*	*	*	*
	Graphite				_____C_	*	*	*	*
g. Static Pressure	Standard Static Pressure - 4500 psig (310 bar) except STD810: 50 psi (3.5 bar)				______S	*	*	*	*
	High Pressure 6000 psi (415 bar)				______H		k	k	k

[1] Except Carbon Steel Heads shall use 316SS Vent/Drain, Plugs & Adapters when required

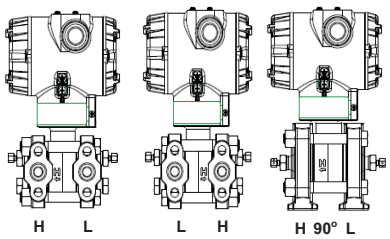

TABLE II	Meter Body & Connection Orientation		STD870	STD830	STD820	STD810
Head/Connect Orientation	Standard	High Side Left, Low Side Right[2] / Std Head Orientation	1	*	*	*	*
	Reversed	Low Side Left, High Side Right[2] / Std Head Orientation	2	*	*	*	*
	90/Standard	High Side Left, Low Side Right[2] / 90[0] Head Rotation	3	h	h	h	h

TABLE III	Agency Approvals (see data sheet for Approval Code Details)					
Approvals	No Approvals Required	0	*	*	*	*
	FM Explosion proof, Intrinsically Safe, Non-incendive, & Dustproof	A	*	*	*	*
	CSA Explosion proof, Intrinsically Safe, Non-incendive, & Dustproof	B	*	*	*	*
	ATEX Explosion proof, Intrinsically Safe & Non-incendive	C	*	*	*	*
	IECEx Explosion proof, Intrinsically Safe & Non-incendive	D	*	*	*	*
	SAEx Explosion proof, Intrinsically Safe & Non-incendive	E	*	*	*	*
	INMETRO Explosion proof, Intrinsically Safe & Non-incendive	F	*	*	*	*
	NEPSI Explosion proof, Intrinsically Safe & Non-incendive	G	*	*	*	*
	KOSHA Explosion proof, Intrinsically Safe & Non-incendive	H	*	*	*	*
	EAC Customs Union(Russia,Belarus,Kazakhstan)Ex Approval, Flame proof, Intrinsically Safe	I	*	*	*	*
	CCoE Explosion proof, Intrinsically Safe & Non-incendive	J	*	*	*	*
	UATR Flameproof, Intrinsically Safe & Dustproof	K	*	*	*	*

TABLE IV	TRANSMITTER ELECTRONICS SELECTIONS							
a. Electronic Housing Material & Connection Type	Material	Connection	Lightning Protection					
	Polyester Powder Coated Aluminum	1/2 NPT	None	A_ _	*	*	*	*
	Polyester Powder Coated Aluminum	M20	None	B_ _	*	*	*	*
	Polyester Powder Coated Aluminum	1/2 NPT	Yes	C_ _	*	*	*	*
	Polyester Powder Coated Aluminum	M20	Yes	D_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	1/2 NPT	None	E_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	M20	None	F_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	1/2 NPT	Yes	G_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	M20	Yes	H_ _	*	*	*	*
b. Output/ Protocol	Analog Output	Digital Protocol						
	4-20mA dc	HART Protocol		_H_	*	*	*	*
	4-20mA dc	DE Protocol		_D_	u	u	u	u
	none	Foundation Fieldbus		_F_	*	*	*	*
c. Customer Interface Selections	Indicator	Ext Zero, Span & Config Buttons	Languages					
	None	None	None	_ _0	*	*	*	*
	None	Yes (Zero/Span Only)	None	_ _A	f	f	f	f
	Basic	None	English	_ _B	*	*	*	*
	Basic	Yes	English	_ _C	*	*	*	*
	Advanced	None	EN, GE, FR, IT, SP, RU, TU	_ _D	*	*	*	*
	Advanced	Yes	EN, GR, FR, IT,SP, RU, TU	_ _E	*	*	*	*
	Advanced	None	EN, CH, JP	_ _H	*	*	*	*
	Advanced	Yes	EN, CH, JP	_ _J	*	*	*	*

TABLE V	CONFIGURATION SELECTIONS							
a. Application Software	Diagnostics							
	Standard Diagnostics			1_ _	*	*	*	*
	Advanced Diagnostics (Above with Plugged Impulse Detection PILD)			2_ _	*	*	*	*
b. Output Limit, Failsafe & Write Protect Settings	Write Protect	Fail Mode	High & Low Output Limits[3]					
	Disabled	High> 21.0mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_1_	f	f	f	f
	Disabled	Low< 3.6mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_2_	f	f	f	f
	Enabled	High> 21.0mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_3_	f	f	f	f
	Enabled	Low< 3.6mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_4_	f	f	f	f
	Enabled	N/A	N/A Fieldbus or Profibus	_5_	g	g	g	g
	Disabled	N/A	N/A Fieldbus or Profibus	_6_	g	g	g	g
c. General Configuration	Factory Standard			_ _S	*	*	*	*
	Custom Configuration (Unit Data Required from customer)			_ _C	*	*	*	*

[2] Left side/Right side as viewed from the customer connection perspective

[3] NAMUR Output Limits 3.8 - 20.5mAdc can be configured by the customer or select custom configuration Table Vc

TABLE VI	CALIBRATION & ACCURACY SELECTIONS				STD870	STD830	STD820	STD810
	Accuracy	Calibrated Range	Calibration Qty					
a. Accuracy and Calibration	Standard	Factory Std	Single Calibration	A	*	*	*	*
	Standard	Custom (Unit Data Required)	Single Calibration	B	*	*	*	*
	Standard	Custom (Unit Data Required)	Dual Calibration	C	*	*	*	*
	Standard	Custom (Unit Data Required)	Triple Calibration	D	*	*	*	*
	High Accuracy	Factory Std	Single Calibration	E		s	s	s
	High Accuracy	Custom (Unit Data Required)	Single Calibration	F		s	s	s
	High Accuracy	Custom (Unit Data Required)	Dual Calibration	G		s	s	s
	High Accuracy	Custom (Unit Data Required)	Triple Calibration	H		s	s	s

TABLE VII	ACCESSORY SELECTIONS						
	Bracket Type	Material					
a. Mounting Bracket	None	None	0 _ _ _	*	*	*	*
	Angle Bracket	Carbon Steel	1 _ _ _	*	*	*	*
	Angle Bracket	304 SS	2 _ _ _	*	*	*	*
	Angle Bracket	316 SS	3 _ _ _	*	*	*	*
	Marine Approved Bracket	Carbon Steel	8 _ _ _	*	*	*	*
	Marine Approved Bracket	304 SS	4 _ _ _	*	*	*	*
	Flat Bracket	Carbon Steel	5 _ _ _	*	*	*	*
	Flat Bracket	304 SS	6 _ _ _	*	*	*	*
	Flat Bracket	316 SS	7 _ _ _	*	*	*	*
b. Customer Tag	Customer Tag Type						
	No customer tag		_ 0 _ _	*	*	*	*
	One Wired Stainless Steel Tag (Up to 4 lines 26 char/line)		_ 1 _ _	*	*	*	*
	Two Wired Stainless Steel Tag (Up to 4 lines 26 char/line)		_ 2 _ _	*	*	*	*
c. Unassembled Conduit Plugs & Adapters	Unassembled Conduit Plugs & Adapters						
	No Conduit Plugs or Adapters Required		_ _ A0	*	*	*	*
	1/2 NPT Male to 3/4 NPT Female 316 SS Certified Conduit Adapter		_ _ A2	n	n	n	n
	1/2 NPT 316 SS Certified Conduit Plug		_ _ A6	n	n	n	n
	M20 316 SS Certified Conduit Plug		_ _ A7	m	m	m	m
	Minifast® 4 pin (1/2 NPT) (not suitable for X-Proof applications)		_ _ A8	n	n	n	n
	Minifast® 4 pin (M20) (not suitable for X-Proof applications)		_ _ A9	m	m	m	m

TABLE VIII	OTHER Certifications & Options: (String in sequence comma delimited (XX, XX, XX,....)						
Certifications & Warranty	None - No additional options		00	*	*	*	*	
	Low Temperature Rating (-50 deg C min. ambient operative temperature limit)		LT	w	w	w		
	NACE MR0175; MR0103; ISO15156 (FC33338) Process wetted parts only		FG	*	*	*	*	b
	NACE MR0175; MR0103; ISO15156 (FC33339) Process wetted and non-wetted parts		F7	c	c	c	c	
	Marine (DNV, ABS, BV, KR, LR)		MT	d	d	d	d	
	EN10204 Type 3.1 Material Traceability (FC33341)		FX	*	*	*	*	
	Certificate of Conformance (F3391)		F3	*	*	*	*	b
	Calibration Test Report & Certificate of Conformance (F3399)		F1	*	*	*	*	
	Certificate of Origin (F0195)		F5	*	*	*	*	
	FMEDA (SIL 2/3) Certification (FC33337)		FE	j	j	j	j	
	Over-Pressure Leak Test Certificate (1.5X MAWP) (F3392)		TP	*	*	*	*	
	Cert Clean for O_2 or CL_2 service per ASTM G93		OX	e	e	e	e	
	PMI Certification[1]		PM	*	*	*	*	
	Extended Warranty Additional 1 year		01	*	*	*	*	b
	Extended Warranty Additional 2 years		02	*	*	*	*	
	Extended Warranty Additional 3 years		03	*	*	*	*	
	Extended Warranty Additional 4 years		04	*	*	*	*	
	Extended Warranty Additional 15 years		15	*	*	*	*	

TABLE IX	Manufacturing Specials					
Factory	Factory Identification		0000	*	*	*	*

MODEL RESTRICTIONS

Restriction Letter	Available Only with		Not Available with	
	Table	Selection(s)	Table	Selection(s)
a			VIII	F7, FG
k			Ia	J,K,7,L,8 _ _ _ _ _ _
			Ic	_ _ H _ _ _ _ _
			Id	_ _ _ B,D,M,N,S _ _ _
			Ie	_ _ _ _ 1, 2, 3, 5, 6 _ _
			III	B- No CRN number available
			If	_ _ _ _ _ C _
c	1d	_ _ _ N,K,D,B _ _ _	Ia	D,H,K,L,8 _ _ _ _ _ _
d	IV a	C, D, G, H _ _	VIIa	1,2,3,5,6,7 _ _ _
e	Ib	_ 2 _ _ _ _ _		
f			IVb	_ F _
g			IVb	_ H, D _
h			Ie	_ _ _ _ 4, 5, 6 _ _
			VIIa	1,2,3,4,5,6,7,8 _ _ _
j	IVb	_ H _	Vb	_ 1,2,6 _
m	IV a	B, D, F, H _ _		
n	IV a	A, C, E, G _ _		
p			III	B- No CRN number available
t			Ia	J, K, 7, L, 8
s	Ia	A,E _ _ _ _ _ _		
u			Va	2 _ _
			VIa	C,D,G,H
v	IV a	C, D, G, H _ _	IVb	_D,F_
w	Ib	_1 _ _ _ _ _	VIII	FE
b	Select only one option from this group			

[1]The PM option is available on all Smartline Pressure Transmitter process wetted parts such as process heads, flanges, bushings and vent plugs except plated carbon steel process heads and flanges. PM option information is also available on diaphragms except Gold plated and STG and STA in-line construction pressure transmitters.

FIELD INSTALLABLE REPLACEMENT PARTS

Description	Kit Number
Integrally Mounted Basic Indicator Kit (Compatible with all Electronic Modules)	50049911-501
Integrally Mounted Advanced Indicator Kit (compatible with all Electronic Modules)	50049846-501
Terminal Strip w/o Lightening Protection for HART or DE Modules	50075472-531
Terminal Strip w/Lightning Protection Kit for HART or DE Modules	50075472-532
Terminal Strip w/o Lightening Protection FFB/*Profibus* Module	50075472-533
Terminal Strip w/Lightning Protection Kit for FFB/*Profibus* Module	50075472-534
HART Electronics Module	50049849-501
HART Electronics Module w/connection for external configuration buttons	50049849-502
DE Electronics Module	50049849-503
DE Electronics Module w/connection for external configuration buttons	50049849-504
FFB Electronics Module Kit	50049849-507
FFB Electronics Module w/connection for external configuration buttons	50049849-508

PRODUCT MANUALS

Description	Part Number
ST 800 Smart Transmitter User Manual - English	34-ST-25-35
ST 800 Smart Transmitter HART/DE Communications Manual - English	34-ST-25-38
ST 800 Smart Transmitter Safety Manual - English	34-ST-25-37
ST 800 Smart Transmitter Foundation Fieldbus Manual - English	34-ST-25-39
ST 800 Smart Transmitter Function Block Manual - English	34-ST-25-42

All product documentation is available at www.honeywellprocess.com.

Sales and Service

For application assistance, current specifications, ordering, pricing, and name of the nearest Authorized Distributor, contact one of the offices below.

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engine http://bit.ly/2N5VIdi

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Web
Knowledge Base search
engine http://bit.ly/2N5VIdi

Specifications are subject to change without notice.

For more information
To learn more about SmartLine Pressure Transmitters, visit www.honeywellprocess.com
Or contact your Honeywell Account Manager

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34-ST-03-82
Jan 2021

PRESSURE TRANSMITTER

Item: Smart Line Pressure Transmitter			
Engineering Units : Flow : Liquid - M3 / Hr, Steam Kg / Hr, Pressure : Kg / cm2 , Temperatue : Deg C, Level : mmWC			SHEET 05 OF 9
Model	**Decodification**	**Description**	
General	Make	Honeywell	
	Function	Transmission & Indication	
	Model No.	**YSTG74L-E1G000-1-C-AHD-11C-B-51A0-F1(PT)-0000; Y : Epoxy Polyester Poweder Coated Hybrid Paint + 5Pin Plug & Socket connector**	
	Qty	As per attached BOM	
	Tag No.	As per attached BOM	
	Calibration Range	As per attached BOM	
	Sensor	Piezoresistive	
	Supply Voltage	10.8 to 42.4 V DC	
	Load Resistance	600 ohms @24V DC	
	Communication	Hart Protocol	
	Display	2 Lines 6 digits PV (9.95H x 4.20W mm) 8 Characters	
	Reference Accuracy	0.055% of Span	
	Turndown Ratio	100:1	
	Stability	0.015% of URL per year for 10 Years	
	MAWP	35 Bar	
	Maximum Allowed Working Temperature	125 Deg.C (for Temp Higher than 125 Deg C, a suitable length of impulse line to be used, considering 100 Deg.C temperature drop for every One meter length of impulse pipe)	
	Protection Class	IP 67	
	Area Classification	Hazardous Area	
	Connection Location	Bottom	
STG74L	Instrument Range	Min Span 0 to 0.35 bar to Max Span 0 to 35 bar	
E	Process Wetted Heads & Diaphragm Materials	Process Head Material : 316 Stainless steel & Diaphragm Material : 316L SS	
1	Fill Fluid	Silicone Oil 200	
G	Process Connection	1/2" NPT (F)	
0	Bolt/Nut Materials	None	
0	Vent/Drain Type/Location	None	
0	Gasket Materials	None	
1	Head/Connect Orientation	Standard, High Side Left, Low Side Right[2] / Std Head Orientation	
C	Approvals	ATEX Explosion proof, Intrinsically Safe & Non-incendive	
A	Electronic Housing Material, Connection Type & Lightning Protection	Material : Y : Epoxy Polyester Powder Coated Hybrid Paint, Connection : 1/2" NPT & Lightning Protection : None	
H	Output/Protocol	Anlogue Output : 4-20mA dc, Digital Protocol : Hart Protocol	
D	Customer Interface Selections	Indicator : Standard(w/Internal Zero,Span & Config Buttons), Ext Zero, Span & Config Buttons :None, Languages : English	
1	Application Software	Standard Diagnostics	
1	Output Limit, Failsafe & Write Protect Settings	Write Protect : Disabled, Fail Mode : High> 21.0 mAdc, High & Low Output Limits[3] : Honeywell Std (3.8-20.8 mAdc)	
C	General Configuration	Custom Configuration (Unit Data Required from customer)	
B	Accuracy & Calibration	Accuracy : Standard, Calibrated Range : Custom (Unit Data Required), Calibration Qty : Single Calibration	
5	Mounting Bracket	Bracket Type : Flat Bracket, Material : Carbon Steel	
1	Customer Tag	One Wired Stainless Steel Tag (Up to 4 lines 26 Char/line)	
A0	Plugs & Adapters	No Conduit Plugs or Adapters Required	
F1	Certifications	Calibration Test Report & Certificate of Conformance	
0000	Manufacturing Specials	Factory Identification	
P&S	Accessories	5Pin Plug & Socket connector	

SmartLine

Honeywell

Technical Information

STG700 SmartLine Gauge Pressure Specification 34-ST-03-102, Jan 2021

Introduction

Part of the SmartLine® family of products, the STG700 and STG70L are suitable for monitoring, control and data acquisition featuring piezoresistive sensor technology combining pressure sensing with on chip temperature compensation capabilities providing high accuracy, stability and performance over a wide range of application pressures and temperatures. The SmartLine family is also fully tested and compliant with Experion® PKS providing the highest level of compatibility assurance and integration capabilities. SmartLine easily meets the most demanding application needs for pressure measurement applications.

Best in Class Features:

- Accuracies up to 0.055% of span standard & 0.04% of span optional
- Stability up to 0.02% of URL per year for 10 years
- Automatic temperature compensation
- Rangeability up to 100:1
- Response times as fast as 100ms
- Alphanumeric display capabilities
- External zero, span, & configuration capability
- Polarity insensitive electrical connections
- Comprehensive on-board diagnostic capabilities
- Integral Dual Seal design for safety based on ANSI/NFPA 70-202 and ANSI/ISA 12.27.0
- Full compliance to SIL 2/3 requirements as a standard.
- Modular design characteristics
- Available additional with 4-year warranty

Span & Range Limits:

Model	URL psi (bar)	LRL psi (bar)	Min Span
STG730/STG73L	50 (3.5)	-14.7 (-1.0)	0.5 (0.035)
STG740/STG74L	500 (35)	-14.7 (-1.0)	5 (.35)
STG770/STG77L	3000 (210)	-14.7 (-1.0)	30 (2.1)
STG78L	6000 (420)	-14.7 (-1.0)	60 (4.2)
STG79L	10000	-14.7 (-1.0)	100 (6.9)

Figure 1 – STG700 Gauge Pressure Transmitters feature field-proven piezoresistive sensor technology

Communications/Output Options:

- Honeywell Digitally Enhanced (DE)
- HART ® (version 7.0)
- FOUNDATION™ Fieldbus

All transmitters are available with the above listed communications protocols.

Description

The SmartLine family pressure transmitters are designed around a high performance piezo-resistive sensor. This one sensor actually integrates multiple sensors linking process pressure measurement with on-board static pressure (DP Models) and temperature compensation measurements. This level of performance allows the ST 700 to replace most competitive transmitters available today.

Indication/Display Option

The ST 700 modular design accommodates a basic alphanumeric LCD display.

Basic Alphanumeric LCD Display Features

- Modular (may be added or removed in the field)
- 0, 90,180, & 270 degree position adjustments
- Configurable (HART only) and standard (Pa, KPa, MPa, KGcm2, Torr, ATM, inH_2O, mH_2O, bar, mbar, inH_2O, inHG, FTH_2O, mmH_2O, mm HG, & psi) measurement units
- 2 Lines 16 Characters (4.13H x 1.83W mm)
- Square root output indication (√)

Simple LCD Display Features

- Modular (may be added or removed in the field)
- Supports HART protocol variant
- 0, 90,180, & 270 degree position adjustments
- Configurable (HART only) and standard (Pa, KPa, MPa, KGcm2, Torr, ATM, inH_2O, mH_2O, bar, mbar, inH_2O, inHG, FTH_2O, mmH_2O, mm HG, & psi) measurement units.
- Supports Flow engineering units
- 2 Lines 6 digits PV (9.95H x 4.20W mm) 8 Characters
- Square root output indication (√) and Write protect Indication
- Built in Basic Device Configuration through Internal Buttons – Range/Engineering Unit/Loop Test /Loop Calibration/Zero /Span Setting

Diagnostics

SmartLine transmitters all offer digitally accessible diagnostics which aid in providing advanced warning of possible failure events minimizing unplanned shutdowns, providing **lower overall operational costs**

System Integration

- SmartLine communications protocols all meet the most current published standards for HART/DE/Fieldbus.
- Integration with Honeywell's Experion PKS offers the following unique advantages.
- Tamper reporting
- FDM Plant Area Views with Health summaries
- All ST 700 units are Experion tested to provide the highest level of compatibility assurance

Configuration Tools

External Three Button Configuration Option

Suitable for all electrical and environmental requirements, SmartLine offers the ability to configure the transmitter and display via three externally accessible buttons when a display option is selected. Zero/span capabilities are also optionally available via these buttons with or without selection of the display option.

Internal Two Button Configuration Option

The Simple display has two buttons that can be used for Basic configuration such as re ranging, PV Engineering unit setting, Zero/Span settings and Loop testing and calibration functions.

Hand Held Configuration

SmartLine transmitters feature two-way communication and configuration capability between the operator and the transmitter. All Honeywell transmitters are designed and tested for compliance with the offered communication protocols and are designed to operate with any Standards compliant handheld configuration device.

Personal Computer Configuration

Honeywell's SCT 3000 Configuration Toolkit provides an easy way to configure Digitally Enhanced (DE) instruments using a personal computer as the configuration interface. Field Device Manager (FDM) Software and FDM Express are also available for managing HART & Fieldbus device configurations.

Modular Design

To help contain maintenance & inventory costs, all ST 700 transmitters are modular in design supporting the user's ability to replace meter bodies, add indicators or change electronic modules without affecting overall performance or approval body certifications. Each meter body is uniquely characterized to provide in-tolerance performance over a wide range of application variations in temperature and pressure and due to the Honeywell advanced interface, electronic modules may be swapped with any electronics module without losing in-tolerance performance characteristics.

Modular Features

- Meter body replacement
- Exchange/replace electronics/comms modules*
- Add or remove integral indicator*
- Add or remove lightning protection (terminal connection)*

* Field replaceable in all electrical environments (including IS) except flameproof without violating agency approvals.

With no performance effects, Honeywell's unique modularity results in ***lower inventory needs and lower overall operating costs.***

Performance Specifications

Reference Accuracy: (conformance to +/-3 Sigma)

Table 1

	Model	URL	LRL	Min Span	Maximum Turndown Ratio	Stability (% URL/Year for 10 years)	Reference Accuracy[1,2] (% Span) Standard/ option
Standard Accuracy	STG730	50 psi (3.5 bar)	-14.7 psi (-1.0 bar)	0.5 psi (.035 bar)	100:1	0.02	0.055 / 0.040
	STG73L	50 psi (3.5 bar)	-14.7 psi (-1.0 bar)	0.5 psi (.035 bar)			
	STG740	500 psi (35 bar)	-14.7 psi (-1.0 bar)	5 psi (.35 bar)			
	STG74L	500 psi (35 bar)	-14.7 psi (-1.0 bar)	5 psi (.35 bar)		0.015	
	STG770	3000 psi (210 bar)	-14.7 psi (-1.0 bar)	30 psi (2.1 bar)		0.02	
	STG77L	3000 psi (210 bar)	-14.7 psi (-1.0 bar)	30 psi (2.1 bar)			
	STG78L	6000 psi (420 bar)	-14.7 psi (-1.0 bar)	60 psi (4.2 bar)			
	STG79L	10000 psi (690 bar)	-14.7 psi (-1.0 bar)	100 (6.9 bar)			

Zero and span may be set anywhere within the listed (URL/LRL) range limits

Accuracy, Span and Temperature Effect: (Conformance to +/-3 Sigma)

Table 2

			Accuracy[1,2] (% of Span)				Combined Zero & Span temperature Effect (% Span / 28°C (50°F))	
	Model	URL	Reference Turndown	A	B	C (see URL units)	D	E
Standard Accuracy	STG730	50 psi (3.5 bar)	25:1	0.005	0.050	2 (0.14)	0.060	0.005
	STG73L	50 psi (3.5 bar)	12.5:1			4 (60.28)	0.050	0.010
	STG740	500 psi (35 bar)	35:1			14.5 (1.0)		0.007
	STG74L	500 psi (35 bar)	35:1			14.5 (1.0)		0.010
	STG770	3000 psi (210 bar)	10:1			300 (21)		0.010
	STG77L	3000 psi (210 bar)	8.5:1			350 (24.7)		0.015
	STG78L	6000 psi (420 bar)	12:1			500 (35)		0.050
	STG79L	10000 psi (690 bar)	10:1	0.025	0.040	1000 (69)	0.150	0.100
High Accuracy Option	STG730	50 psi (3.5 bar)	25:1	0.005	0.035	2 (0.14)	0.060	0.005
	STG73L	50 psi (3.5 bar)	12.5:1			4 (60.28)		0.010
	STG740	500 psi (35 bar)	35:1			14.5 (1.0)	0.050	0.007
	STG74L	500 psi (35 bar)	35:1			14.5 (1.0)		0.010
	STG770	3000 psi (210 bar)	10:1			300 (21)		0.010
	STG77L	3000 psi (210 bar)	8.5:1			350 (24.7)		0.015
	STG78L	6000 psi (420 bar)	12:1			500 (35)		0.050
			Turn Down Effect				Temp Effect	
			$\pm[A+B]$ if $Span \geq C$ $\pm\left[A+B\left(\frac{C}{Span}\right)\right]$ if $Span < C$				$\pm[D+E\left(\frac{URL}{Span}\right)]$	

Total Performance (% of Span):

Total Performance Calculation: $= +/- \sqrt{(\text{Accuracy})^2 + (\text{Temperature Effect})^2}$

Total Performance Examples (for comparison): standard accuracy 5:1 Turndown, +/-50 ºF (28ºC) shift

STG730 @ 100 psi: 0.101% of span
STG740 @ 100 psi: 0.101% of span
STG770 @ 600 psi: 0.074% of span
STG78L @ 1200 psi: 0.305% of span
STG73L @ 100 psi: 0.123% of span
STG74L @ 100 psi: 0.114% of span
STG77L @ 600 psi: 0.137% of span
STG79L @ 2000 psi: 0.653% of span

Typical Calibration Frequency:

Calibration verification is recommended every two (2) years

Notes:

1. Terminal Based Accuracy - Includes combined effects of linearity, hysteresis, and repeatability. Analog output adds 0 .005% of span.
2. For zero based spans and reference conditions of: 25 ºC (77oF) for LRV > = 0 psia, 10 to 55% RH, and 316 Stainless Steel barrier diaphragm.

Operating Conditions – All Models

Parameter	Reference Condition		Rated Condition		Operative Limits		Transportation and Storage	
	ºC	ºF	ºC	ºF	ºC	ºF	ºC	ºF
Ambient Temperature[1]	25 1	77 2	-40 to 85	-40 to 185	-40 to 85	-40 to 185	-55 to 120	-67 to 248
Meter Body Temperature[2]	25 1	77 2	-40 to 110	-40 to 230	-40 to 125	-40 to 257	-55 to 120	-67 to 248
Humidity %RH	10 to 55		0 to 100		0 to 100		0 to 100	
Vac. Region – Min. Pressure mmHg absolute inH_2O absolute	Atmospheric Atmospheric		25 13		2 (short term) [3] 1 (short term) [3]			
Supply Voltage Load Resistance	10.8 to 42.4 Vdc at terminals 0 to 1,440 ohms (as shown in Figure 2)							
Maximum Allowable Working Pressure (MAWP)[4, 5] (ST700 products are rated to Maximum Allowable Working Pressure. MAWP depends on Approval Agency and transmitter materials of construction.)	ST 730 50 psi (3.5 bar) ST 740 500 psi (35 bar) ST 770 3000 psi (210 bar)				ST 73L 50 psi (3.5 bar) ST 74L 500 psi (35 bar) ST 77L 3000 psi (210 bar) ST 78L 6000 psi (420 bar) ST 7 L 10000 psi (6 0 bar)			

[1] LCD Display operating temperature -20°C to +70°C Storage temperature -30°C to 80°C.

[2] Silicone 704 minimum temperature rating is 0ºC (32ºF). CTFE minimum temperature rating is -30°C (-22°F). NEOBEE® M-20 minimum temperature rating is -15ºC (5ºF). NEOBEE® is a registered trademark of Stepan Company.

[3] Short term equals 2 hours at 70°C (158°F).

[4] Units can withstand overpressure of 1.5 x MAWP without damage.

[5] Consult the factory for MAWP of ST 700 transmitters with CRN approval.

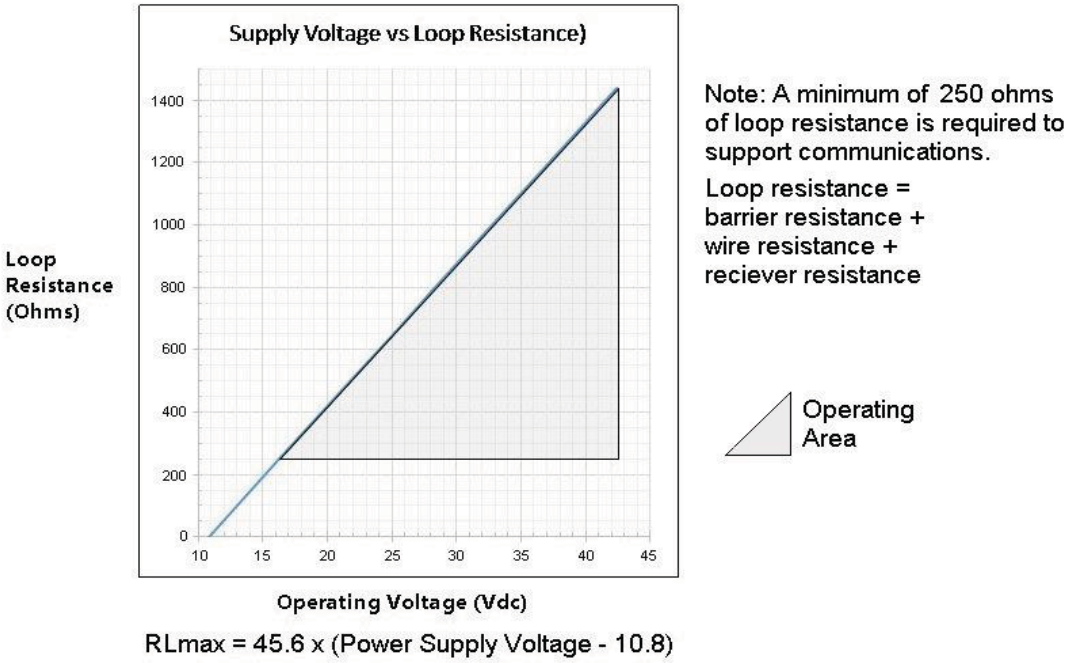

Figure 2 - Supply voltage and loop resistance chart & calculations

Performance Under Rated Conditions – All Models

Parameter	Description
Analog Output Digital Communications:	Two-wire, 4 to 20 mA (HART & DE Transmitters only) Honeywell DE, HART 7 protocol or FOUNDATION Fieldbus ITK 6.0.1 compliant All transmitters, irrespective of protocol have polarity insensitive connection.
HART & DE Output Failure Modes (NAMUR for DE Units requires selecting display and configuration buttons or factory configuration)	**Compliance**: **Honeywell Standard:** **NAMUR NE 43** **Normal Limits:** 3.8 – 20.8 mA 3.8 – 20.5 mA **Failure Mode:** ≤ 3.6 mA and ≥ 21.0 mA ≤ 3.6 mA and ≥ 21.0 mA
Supply Voltage Effect	0.005% span per volt.
Transmitter Turn on Time (includes power up & test algorithms)	HART or DE: 2.5 sec Foundation Fieldbus: Host dependant
Response Time (delay + time constant)	**DE/HART Protocol** 100ms; **FOUNDATION Fieldbus** 150ms (Host Dependant)
Damping Time Constant	**HART:** Adjustable from 0 to 32 seconds in 0.1 increments. **Default Value:** 0.5 seconds **DE:** Discrete values 0, 0.16, 0.32, 0.48, 1, 2, 4, 8, 16, 32 seconds. **Default Value:** 0.48 seconds
Vibration Effect:	Less than +/- 0.1% of URL w/o damping Per IEC60770-1 field or pipeline, high vibration level (10-2000Hz: 0.21 displacement/3g max acceleration)
Electromagnetic Compatibility	IEC 61326-3-1
Lightning Protection Option	**Leakage Current:** 10uA max @ 42.4VDC 93C **Impulse rating:** 8/20uS 5000A (>10 strikes) 10000A (1 strike min.) 10/1000uS 200A (> 300 strikes)

Materials Specifications (see model selection guide for availability/restrictions with various models)

Parameter	Description
Barrier Diaphragms Material	**STG700**: 316L SS, Hastelloy® C-276[2], Monel® 400 [3], Tantalum **STG70L**: 316L SS, Hastelloy C-276
Process Head Material	**STG700**: Carbon Steel (Zinc Plated)[5], 316 SS[4], Hastelloy® C-276[6], Monel® 400 [7] **STG70L:** 316L SS, Hastelloy® C-276[6]
Vent/Drain Valves & Plugs [1]	**STG700:**316 SS[4], Hastelloy C-276[2], Monel 400 [7] **STG70L:** N/A
Head Gaskets	**STG700:** Glass-filled PTFE standard. Viton® and graphite are optional. **STG70L:** N/A
Meter Body Bolting	**STG700:** Carbon Steel (Zinc plated) standard. Options include 316 SS, NACE A286 SS bolts and nuts or NACE A286 SS bolts and 304 SS nuts **STG70L:** N/A
Mounting Bracket	Carbon Steel (Zinc-plated) or 304 Stainless Steel or 316 Stainless Steel. See Figure 3 and Figure 5
Fill Fluid	Silicone, CTFE, NEOBEE M-20, Silicone 704.
Electronic Housing	Pure Polyester Powder Coated Low Copper (<0.4%)-Aluminum. Meets NEMA 4X, IP66, IP67 and NEMA 7 (explosion proof). All stainless steel housing is optional.
Process Connections	**STG700:** ½ -inch NPT(female), DIN 19213 (standard) **STG70L:** ½ -inch NPT(female), ½ -inch NPT male, 9/16 Aminco, DIN19213 (except STG79L), G½ -B Male Thread
Wiring	Accepts up to 16 AWG (1.5 mm diameter).
Dimensions	See Figure 4 and Figure 6
Net Weight	**STG700:** 8.3 pounds (3.8 Kg). **STG70L:** 3.6 pounds (1.6 Kg) with Aluminum Housing

[1] Vent/Drains are sealed with Teflon®

[2] Hastelloy® C-276 or UNS N10276

[3] Monel® 400 or UNS N04400

[4] Supplied as 316 SS or as Grade CF8M, the casting equivalent of 316 SS.

[5] Carbon Steel heads are zinc-plated and not recommended for water service due to hydrogen migration. For that service, use 316 stainless steel wetted Process Heads.

[6] Hastelloy® C-276 or UNS N10276. Supplied as indicated or as Grade CW12MW, the casting equivalent of Hastelloy® C-276

[7] Monel® 400 or UNS N04400. Supplied as indicated or as Grade M30C, the casting equivalent of Monel® 400

Communications Protocols & Diagnostics

HART Protocol

Version:

HART 7

Power Supply

Voltage: 10.8 to 42.4Vdc at terminals

Load: Maximum 1440 ohms See figure 2

Minimum Load: 0 ohms. (For handheld communications a minimum load of 250 ohms is required)

Foundation Fieldbus (FF)

Power Supply Requirements

Voltage: 9.0 to 32.0Vdc at terminals

Steady State Current: 17.6mAdc

Software Download Current: 27.4mAdc

Available Function Blocks

Block Type	Qty	Execution Time
Resource	1	n/a
Transducer	1	n/a
Diagnostic	1	n/a
Analog Input	1*	30 ms
PID w/Autotune	1	45 ms
Integrator	1	30 ms
Signal Char (SC)	1	30 ms
LCD Display	1	n/a
Flow Block	1	30 ms
Input Selector	1	30 ms
Arithmetic	1	30 ms

* AI block may have two (2) additional instantiations.

All available function blocks adhere to FOUNDATION Fieldbus standards. PID blocks support ideal & robust PID algorithms with full implementation of Auto-tuning.

Link Active Scheduler

Transmitters can perform as a backup Link Active Scheduler and take over when the host is disconnected. Acting as a LAS, the device ensures scheduled data transfers typically used for the regular, cyclic transfer of control loop data between devices on the Fieldbus.

Number of Devices/Segment

Entity IS model: 6 devices/segment

Schedule Entries

18 maximum schedule entries

Number of VCR's: 24 max

Compliance Testing: Tested according to ITK 6.0.1

Software Download

Utilizes Class-3 of the Common Software Download procedure as per FF-883 which allows the field devices of any manufacturer to receive software upgrades from any host.

Honeywell Digitally Enhanced (DE)

DE is a Honeywell proprietary protocol which provides digital communications between Honeywell DE enabled field devices and Hosts.

Power Supply

Voltage: 10.8 to 42.4Vdc at terminals

Load: Maximum 1440 ohms See figure 2

Standard Diagnostics

ST 700 top level diagnostics are reported as either critical or non-critical and readable via the DD/DTM tools or integral display as shown

Critical Diagnostics

HART DD/DTM Tools	Basic Display	Simple Display
Electronic Module DAC Failure	Electronics module fault	Fault Comm El
Meter Body NVM Corrupt	Meter Body fault	Fault Mtrbody
Config. Data Corrupt	Electronics module fault	Fault Comm El
Electronic Module Diag Failure	Electronics module fault	Fault Comm El
Meter Body Critical Failure	Meter Body fault	Fault Mtrbody
Sensor Comms Timeout	Meter Body Comm fault	Fault Mbd Com

Non-Critical Diagnostics

HART DD/DTM Tools
Display Failure
Electronic Module Comm Failure
Meter Body Excess Correct
Sensor Over Temperature
Fixed Current Mode
PV Out of Range
No Factory Calibration
No DAC Compensation
LRV Set Error – Zero Config. Button
URV Set Error – Zero Config. Button
AO Out of Range
Loop Current Noise
Meter Body Unreliable Comm
Tamper Alarm,
No DAC Calibration
Sensor Supply Voltage Low

Hazardous Areal Certifications:

MSG CODE	AGENCY	TYPE OF PROTECTION	COMM. OPTION	ELECTRICAL PARAMETERS	AMBIENT TEMP (Ta)
A	FM Approvals™ USA	**Explosionproof:** Class I, Division 1, Groups A, B, C, D; Dust Ignition Proof: Class II, III, Division 1, Groups E, F, G; T6..T5 Class l, Zone 0/1, AEx db IIC T6..T5 Ga/Gb Class ll, Zone 21, AEx tb IIIC T95° Db	All	Note 1	T5: -50 ºC to 85ºC T6: -50 ºC to 65ºC
		Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G: T4 Class l, Zone 0, AEx ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2a	-50 ºC to 70ºC
			Foundation Fieldbus	Note 2b	-50 ºC to 70ºC
		Nonincendive: Class I, Division 2, Groups A, B, C, D locations, T4 Class l, Zone 2, AEx nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50 ºC to 85ºC
		Enclosure: Type 4X/ IP66/ IP67	All	All	-
		STANDARDS: FM Class 3600:2011; FM Class 3610: 2010; FM Class 3611: 2004; FM Class 3615: 2006; FM Class 3616: 2011; FM Class 3810: 2005; ANSI/ISA 60079-0: 2013; ANSI/UL 60079-1: 2015; ANSI/UL 60079-11: 2014; ANSI/ISA 60079-15: 2012; ANSI/UL 60079-26: 2017; ANSI/UL 60079-31: 2015; ANSI/NEMA 250: 2003; ANSI/ IEC 60529: 2004			
B	Canadian Standards Association (CSA) USA and Canada	**Explosion Proof:** Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1, T6..T5 Class I Zone 1 AEx db IIC T6..T5 Ga/Gb Ex db IIC T6..T5 Ga/Gb Zone 22 AEx tb IIIC T95° Db Ex tb IIIC T95° Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1, T4 Class I Zone 0, AEx ia IIC T4 Ga Class I Zone 2, AEx ic IIC T4 Gc Ex ia IIC T4 Ga Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Nonincendive: Class I, Division 2, Groups A, B, C, D; Class II, Division 2, Groups F, G; Class III, Division 2, T4 Class I Zone 2 AEx nA IIC T4 Gc Ex nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C to 85°C
		Enclosure: Type 4X/ IP66/ IP67	All	All	-

MSG CODE	AGENCY	TYPE OF PROTECTION	COMM. OPTION	ELECTRICAL PARAMETERS	AMBIENT TEMP (Ta)
		STANDARDS: CSA C22.2 No. 0-10; CSA C22.2 No. 94-M91; CSA C22.2 No. 25-1966; CSA C22.2 No. 30-M1986; CSA C22.2 No. 142-M1987; CSA C22.2 No. 157-92; CSA C22.2 No. 213-M1987; CSA-C22.2 No. 60529:05; CSA-C22.2 No. 60079-0:11; CSA-C22.2 No. 60079-1:11; CSA-C22.2 No. 60079-11:11; CSA-C22.2 No. 60079-15:12; CSA-C22.2 No. 60079-31:12; ISA 12.12.01-2010; ISA 60079-0: 2009; ISA 60079-11: 2011; ISA 60079-15: 2009; ISA 60079-26: 2008; ISA-60079-27:2007 (12.02.04)-2006 (R2011); UL 913 Ed. 6; UL 916:1998; ANSI/ISA-12.27.01-2011			
C	**ATEX**	**Flameproof: SIRA 12ATEX2233X** II 1/2 G Ex db IIC T6..T5 Ga/Gb II 2 D Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: SIRA 12ATEX2233X II 1 G Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) II 1 G Ex ia IIC T4 Ga	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: SIRA 12ATEX4234X II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: SIRA 12ATEX4234X II 3 G Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) II 3 G Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
		STANDARDS: EN 60079-0: 2012/A11: 2013; EN 60079-1: 2014; EN 60079-7: 2015; EN 60079-11: 2012; EN 60079-26: 2015; EN 60079-31: 2009			
D	**IECEx World**	**Flameproof: IECEx SIR 12.0100X** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: IECEx SIR 12.0100X Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: IECEx SIR 12.0100X Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: IECEx SIR 12.0100X Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
		STANDARDS: IEC 60079-0: 2011; IEC 60079-1: 2014; IEC 60079-7: 2017; IEC 60079-11: 2011; IEC 60079-26: 2014; IEC 60079-31: 2013			

E	**SAEx South Africa**	**Flameproof :** Ex d IIC T6…T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC Ga T4 FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
F	**INMETRO Brazil**	**Flameproof:** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga	4-20 mA / DE/ HART	Note 2a	-50°C TO 70°C
		FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	Foundation Fieldbus	Note 2b	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	-
G	**NEPSI CHINA**	**Flameproof:** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T 95°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	-

H	**KOSHA Korea**	**Flameproof :** Ex d IIC T4, T5, T6 Ex tD A21 IP66/IP67 T95°C…T120 °C	All	Note 1	T4: -50°C TO 85°C T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4	4-20 mA / DE/ HART	Note 2	Ta= -50 ºC to 70ºC
			Foundation Fieldbus	Note 2	Ta= -50 ºC to 70ºC
		Enclosure: IP66/ IP67	All	All	-
I	**EAC Russia, Belarus and Kazakhstan**	**Flameproof:** Ga/Gb Ex d IIC T6..T5 Ex tb IIIC Db T 85°C	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ga Ex ia IIC T4 X FISCO Field Device (Only for FF Option) Ga Ex ia IIC T4 X	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Non Sparking: 2 Ex nA IIC T4 Gc X	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ga Ex ic IIC T4 X FISCO Field Device (Only for FF Option) 2 Ex ic IIC T4 Gc X	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	
J	**CCoE INDIA**	**Flameproof:** Ex d IIC T6..T5 Ga/Gb	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Non Sparking Ex nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
K	**UATR UKRAINE**	**Flameproof:** II 1/2 G Ex db IIC T6..T5 Ga/Gb II 2 D Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: II 1 G Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) II 1 G Ex ia IIC T4 Ga	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Enclosure: IP66/ IP67	All	All	-

Notes:

1. Operating Parameters:

   Voltage= 11 to 42 V DC Current= 4-20 mA Normal
   = 10 to 30 V (FF) = 30 mA (FF)

2. Intrinsically Safe Entity Parameters

   a. Analog/ DE/ HART Entity Values:

   Vmax= Ui = 30V Imax= Ii= 105mA Ci = 4.2nF Li =984 uH Pi =0.9W

   Transmitter with Terminal Block Revision E or Later

   Vmax= Ui = 30V Imax= Ii= 225mA Ci = 4.2nF Li = 0 Pi =0.9W

   Note : Transmitter with Terminal Block Revision E or later

   The revision is on the label that is on the module. There will be two lines of text on the label:

   - First is the Module Part #: 50049839-001 or 50049839-002
   - Second line has the supplier information, along with the REVISION:

   XXXXXXX-EXXXX, THE "X" is production related, THE POSITION of the "E" IS THE REVISION.

   b. Foundation Fieldbus- Entity Values

   Vmax= Ui = 30V Imax= Ii= 180mA Ci = 0nF Li = 984 uH Pi =1W

   Transmitter with Terminal Block Revision F or Later

   Vmax= Ui = 30V Imax= Ii= 225mA Ci =0nF Li = 0 Pi =1 W

   FISCO Field Device

   Vmax= Ui = 17.5V Imax= Ii= 380 mA Ci = 0nF Li = 0 Pi =5.32 W

   Note : Transmitter with Terminal Block Revision F or later

   The revision is on the label that is on the module. There will be two lines of text on the label:

   - First is the Module Part #: 50049839-003 or 50049839-004
   - Second line has the supplier information, along with the REVISION:

   XXXXXXX-EXXXX, THE "X" is production related, THE POSITION of the "E" IS THE REVISION.

Approval Certifications:

Marine Certificates	This certificate defines the certifications covered for the ST 800 Pressure Transmitter family of products, including the SMV 800 Smart Multivariable Transmitter. It represents the compilation of the five certificates Honeywell currently has covering the certification of these products into marine applications. For SmartLine Pressure Transmitter and SMV800 Smart Multivarible Transmitter
	American Bureau of Shipping (ABS) - 2009 Steel Vessel Rules 1-1-4/3.7, 4-6-2/5.15, 4-8-3/13 & 13.5, 4-8-4/27.5.1, 4-9-7/13. Certificate number: 04-HS417416-PDA
	Bureau Veritas (BV) - Product Code: 389:1H. Certificate number: 12660/B0 BV
	Det Norske Veritas (DNV) - Location Classes: Temperature D, Humidity B, Vibration A, EMC B, Enclosure C. For salt spray exposure; enclosure of 316 SST or 2-part epoxy protection with 316 SST bolts to be applied. Certificate number: A-11476
	Korean Register of Shipping (KR) - Certificate number: LOX17743-AE001
	Lloyd's Register (LR) - Certificate number: 02/60001(E1) & (E2)
SIL 2/3 Certification	IEC 61508 SIL 2 for non-redundant use and SIL 3 for redundant use according to EXIDA and TÜV Nord Sys Tec GmbH & Co. KG under the following standards: IEC61508-1: 2010; IEC 61508-2: 2010; IEC61508-3: 2010.

Other Certification Options

Materials

- NACE MRO175, MRO103, ISO15156

Mounting & Dimensional Drawings)

Reference Dimensions: $\frac{\text{millimeters}}{\text{inches}}$

Mounting Configurations: (Dual head design)

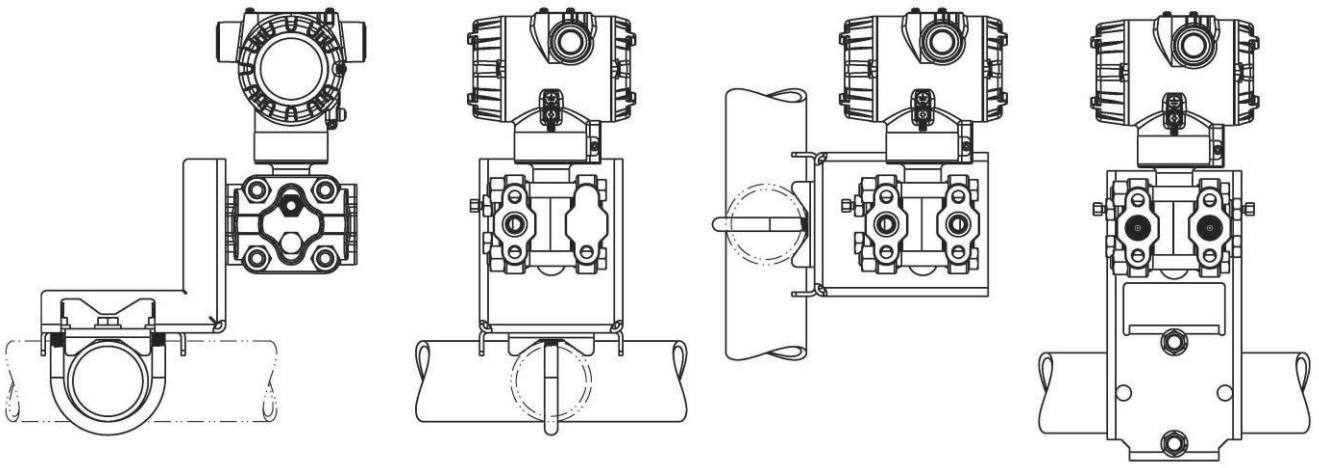

Figure 3 – Mounting options: (Dual head design)

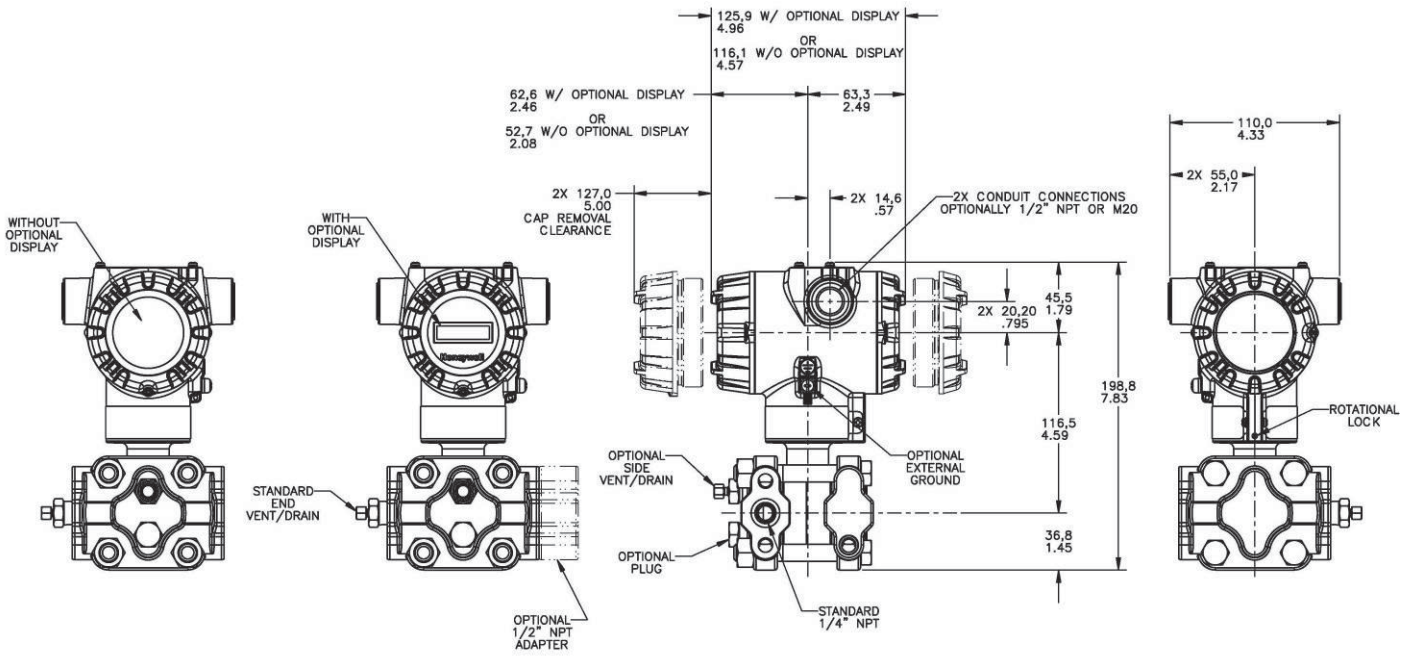

Figure 4 – Typical dimensions of STG740 & STG770 for reference

Reference Dimensions: millimeters / inches

Mounting Configurations (Inline Designs)

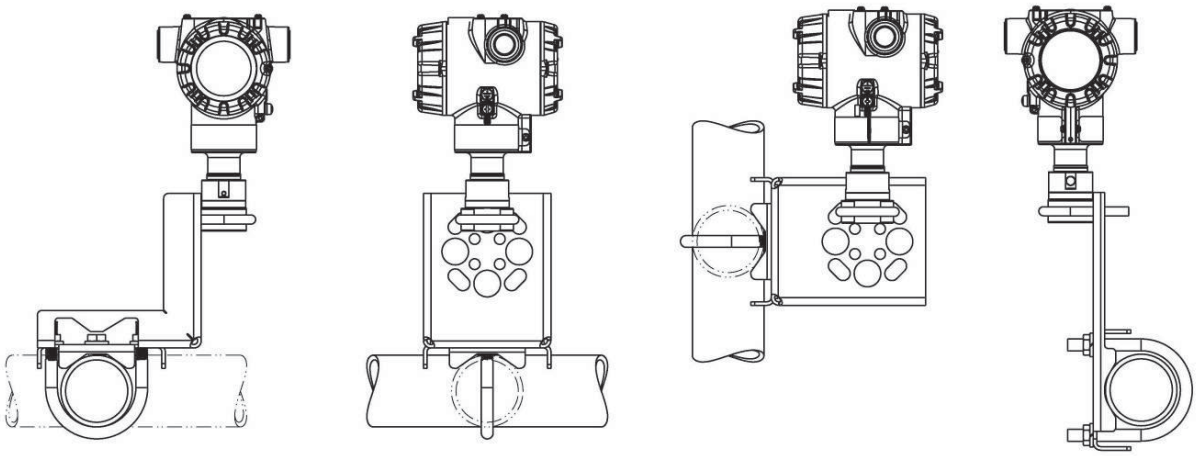

Figure 5 – Mounting Options (Inline Design)

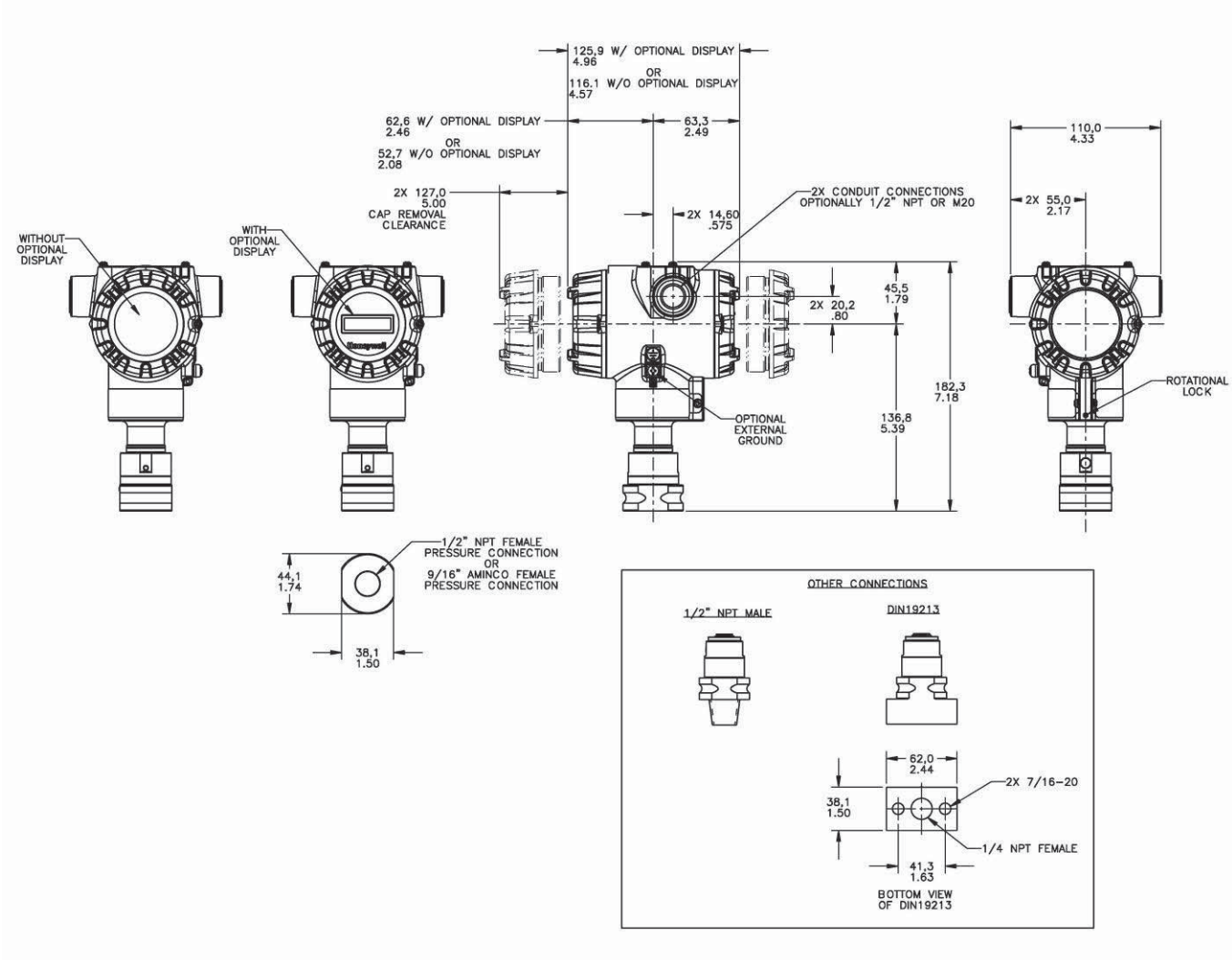

Figure 6 – Typical dimensions of STG74L, STG77L, STG78L, & STG79L for reference

Model Selection Guides are subject to change and are inserted into the specifications as guidance only.
Prior to specifying or ordering a model check for the latest revision Model Selection Guides which are published at:
www.honeywellprocess.com/en-US/pages/default.aspx

Model Selection Guide

Model STG700
Gauge Pressure Transmitters

Model Selection Guide
34-ST-16-102 Issue 24

Instructions: Make selections from all Tables using column below the proper arrow. Asterisk indicates availability. Letter (a) refers to restrictions highlighted in the restrictions table. Tables delimited with dashes.

Key	I	II	III	IV	V	VI	VII	VIII	IX
STG ___	- _____	- _	- _	- ___	- ___	- _	- ____	- __-__-__	- 0000

KEY NUMBER	URL/Max Span	LRL	Min Span	Units
Gauge Dual Head	50 (3.5)	-14.7 (-1.0)	0.5 (.035)	psi (bar)
	500 (35)	-14.7 (-1.0)	5 (.35)	psi (bar)
	3000 (210)	-14.7 (-1.0)	30 (2.1)	psi (bar)
Gauge In-Line	50 (3.5)	-14.7 (-1.0)	0.5 (.035)	psi (bar)
	500 (35)	-14.7 (-1.0)	5 (.35)	psi (bar)
	3000 (210)	-14.7 (-1.0)	30(2.1)	psi (bar)
	6000 (420)	-14.7 (-1.0)	60 (4.2)	psi (bar)
	10000 (690)	-14.7 (-1.0)	100 (6.9)	psi (bar)

Selection	Availability				
STG730	↓				
STG740	↓				
STG770		↓			
STG73L			↓		
STG74L			↓		
STG77L				↓	
STG78L				↓	
STG79L					↓

TABLE I	METER BODY SELECTIONS				
a. Process Head & Diaphragm Materials	Process Head/Reference Head Material[1b]	Barrier Diaphragm Material			
	Plated Carbon Steel / Plated Carbon Steel	316L SS	A_____	*	*
		Hastelloy® C - 276	B_____	*	*
		Monel 400®	C_____	*	*
		Tantalum	D_____	a	a
	316 Stainless Steel / 316 Stainless Steel	316L SS	E_____	*	*
		Hastelloy C - 276	F_____	*	*
		Monel 400	G_____	*	*
		Tantalum	H_____	a	a
	Hastelloy C - 276 / 316 Stainless Steel	Hastelloy C - 276	J_____	*	*
		Tantalum	K_____	a	a
	Monel 400 / 316 Stainless Steel	Monel 400	L_____	a	a
b. Fill Fluid	Silicone Oil 200		_1____	*	*
	Fluorinated Oil CTFE		_2____	*	*
	Silicone Oil 704		_3____	*	*
	NEOBEE® M-20		_4____	*	*
c. Process Connection	Size/Type	Material			
	9/16" Aminco	Same as Process Head	__A___		
	1/2" NPT (female)	Same as Process Head [1a]	__G___	*	*
	1/2" NPT (male)	Same as Process Head	__H___		
	DIN 19213 (1/4" female NPT)	Same as Process Head	__D___	*	*
	G 1/2 B Threaded Fitting	Same as Process Head	__B___		
	M20 (male)	Same as Process Head	__N___		
d. Bolt/Nuts Materials	None		___0__		
	Carbon Steel		___C__	*	*
	316 SS		___S__	*	*
	Grade 660 (NACE A286) with NACE 304 SS Nuts		___N__	*	*
	Grade 660 (NACE A286) Bolts & Nuts		___K__	p	p
	Monel K500		___M__	p	p
	Super Duplex		___D__	p	p
	B7M		___B__	*	*
e. Vent/Drain Type/Location	Head Type	Vent Type	Location	Vent Material	
	None	None	None	None	____0_					
	Single Ended	None	None	None	____1_	*	*			
	Single Ended	Standard Vent	Side	Matches Head Material[1]	____2_	*	*			
	Single Ended	Center Vent	Side	Stainless Steel Only	____3_	t	t			
	Dual Ended	Standard Vent	End	Matches Head Material[1]	____4_	*	*			
	Dual Ended	Center Vent	End	Stainless Steel only	____5_	t	t			
	Dual Ended	Std Vent/Plug	Side/End	Matches Head Material[1]	____6_	*	*			
f. Gasket Materials	None				_____0					
	Teflon® or PTFE (Glass Filled)				_____A	*	*			
	Viton®				_____B	*	*			
	Graphite				_____C	*	*			

[1] Except Carbon Steel Heads shall use 316SS Vent/Drain & Plugs and or 1/2" adapters

[1a] STG730,740,770 supplied via 1/2" flange adapter same material as process head except carbon steel shall use 316 SS

[1b] Reference head available with Dual Head Gage models only. In-Line Gage models are supplied with Process Head only.

STG79L
STG77L, STG78L
STG73L, STG74L
STG770
STG730, STG740

TABLE II	Meter Body & Connection Orientation						
Head/Connect Orientation	Standard	High Side Left, Low Side Right[2] / Std Head Orientation	1	*	*	*	*	*
	Reversed	Low Side Left, High Side Right[2] / Std Head Orientation	2	*	*			
	90/Standard	High Side Left, Low Side Right[2] / 90[0] Head Rotation	3	h	h			

TABLE III	AGENCY APPROVALS						
Approvals	No Approvals Required	0	*	*	*	*	*
	<FM> Explosion proof, Intrinsically Safe, Non-incendive, & Dustproof	A	*	*	*	*	*
	CSA Explosion proof, Intrinsically Safe, Non-incendive, & Dustproof	B	*	*	*	*	p
	ATEX Explosion proof, Intrinsically Safe & Non-incendive	C	*	*	*	*	*
	IECEx Explosion proof, Intrinsically Safe & Non-incendive	D	*	*	*	*	*
	SAEx Explosion proof, Intrinsically Safe & Non-incendive	E	*	*	*	*	*
	INMETRO Explosion proof, Intrinsically Safe & Non-incendive	F	*	*	*	*	*
	NEPSI Explosion proof, Intrinsically Safe & Non-incendive	G	*	*	*	*	*
	KOSHA Explosion proof, Intrinsically Safe & Non-incendive	H	*	*	*	*	*
	EAC Customs Union (Russia,Belarus,Kazakhstan)Ex Approval Flame proof, Intrinsically Safe	I	*	*	*	*	*
	ATEX/IECEx Explosion proof, Intrinsically Safe & Non-incendive	1	*	*	*	*	*
	CCoE Explosion proof, Intrinsically Safe & Non-incendive	J	*	*	*	*	*
	UATR Flameproof, Intrinsically Safe & Dustproof	K	*	*	*	*	*

TABLE IV	TRANSMITTER ELECTRONICS SELECTIONS						
a. Electronic Housing Material & Connection Type	Material	Connection	Lightning Protection				
	Polyester Powder Coated Aluminum	1/2 NPT	None	A _ _	*	*	*	*	*
	Polyester Powder Coated Aluminum	M20	None	B _ _	*	*	*	*	*
	Polyester Powder Coated Aluminum	1/2 NPT	Yes	C _ _	*	*	*	*	*
	Polyester Powder Coated Aluminum	M20	Yes	D _ _	*	*	*	*	*
	316 Stainless Steel (Grade CF8M)	1/2 NPT	None	E _ _	*	*	*	*	*
	316 Stainless Steel (Grade CF8M)	M20	None	F _ _	*	*	*	*	*
	316 Stainless Steel (Grade CF8M)	1/2 NPT	Yes	G _ _	*	*	*	*	*
	316 Stainless Steel (Grade CF8M)	M20	Yes	H _ _	*	*	*	*	*
b. Output/ Protocol	Analog Output	Digital Protocol						
	4-20mA dc	HART Protocol		_ H _	*	*	*	*	*
	4-20mA dc	DE Protocol		_ D _	*	*	*	*	*
	none	Foundation Fieldbus		_ F _	*	*	*	*	*
c. Customer Interface Selections	Indicator	Ext Zero, Span & Config Buttons	Languages						
	None	None	None	_ _ 0	*	*	*	*	*
	None	Yes (Zero/Span Only)	None	_ _ A	f	f	f	f	f
	Basic	None	EN	_ _ B	*	*	*	*	*
	Basic	Yes	EN	_ _ C	*	*	*	*	*
	Standard (w/internal Zero, Span & Conf Buttons)	None	English	_ _ D	u	u	u	u	u

TABLE V	CONFIGURATION SELECTIONS						
a. Application Software	Diagnostics						
	Standard Diagnostics			1 _ _	*	*	*	*	*
b. Output Limit, Failsafe & Write Protect Settings	Write Protect	Fail Mode	High & Low Output Limits[3]						
	Disabled	High> 21.0mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_ 1 _	f	f	f	f	f
	Disabled	Low< 3.6mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_ 2 _	f	f	f	f	f
	Enabled	High> 21.0mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_ 3 _	f	f	f	f	f
	Enabled	Low< 3.6mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_ 4 _	f	f	f	f	f
	Enabled	N/A	N/A Fieldbus	_ 5 _	g	g	g	g	g
	Disabled	N/A	N/A Fieldbus	_ 6 _	g	g	g	g	g
c. General Configuration	General Configuration						
	Factory Standard			_ _ S	*	*	*	*	*
	Custom Configuration (Unit Data Required from customer)			_ _ C	*	*	*	*	*

[2] Left side/Right side as viewed from the customer connection perspective

[3] NAMUR Output Limits are configurable by customer

TABLE VI	CALIBRATION & ACCURACY SELECTIONS			STG79L	STG77L, STG78L	STG73L, STG74L	STG770	STG730, STG740
	Accuracy	Calibrated Range	Calibration Qty					
a. Accuracy and Calibration	Standard	Factory Standard	Single Calibration	A	*	*	*	*	*
	Standard	Custom (Unit Data Required)	Single Calibration	B	*	*	*	*	*
	High Accuracy	Factory Standard	Single Calibration	E	s	s	s	s	s
	High Accuracy	Custom (Unit Data Required)	Single Calibration	F	s	s	s	s	s

TABLE VII	ACCESSORY SELECTIONS							
	Bracket Type	Material						
a. Mounting Bracket	None	None	0 _ _ _	*	*	*	*	*
	Angle Bracket	Carbon Steel	1 _ _ _	*	*	*	*	*
	Angle Bracket	304 SS	2 _ _ _	*	*	*	*	*
	Angle Bracket	316 SS	3 _ _ _	*	*	*	*	*
	Marine Approved Bracket	Carbon Steel	8 _ _ _	*	*			
	Marine Approved Bracket (In-Line)	Carbon Steel	9 _ _ _			*	*	*
	Marine Approved Bracket	304 SS	4 _ _ _	*	*			
	Marine Approved Bracket (In-Line)	304 SS	A _ _ _			*	*	*
	Flat Bracket	Carbon Steel	5 _ _ _	*	*	*	*	*
	Flat Bracket	304 SS	6 _ _ _	*	*	*	*	*
	Flat Bracket	316 SS	7 _ _ _	*	*	*	*	*
b. Customer Tag	Customer Tag Type							
	No customer tag		_ 0 _ _	*	*	*	*	*
	One Wired Stainless Steel Tag (Up to 4 lines 26 char/line)		_ 1 _ _	*	*	*	*	*
	Two Wired Stainless Steel Tag (Up to 4 lines 26 char/line)		_ 2 _ _	*	*	*	*	*
c. Unassembled Conduit Plugs & Adapters	Unassembled Conduit Plugs & Adapters							
	No Conduit Plugs or Adapters Required		_ _ A0	*	*	*	*	*
	1/2 NPT Male to 3/4 NPT Female 316 SS Certified Conduit Adapter		_ _ A2	n	n	n	n	n
	1/2 NPT 316 SS Certified Conduit Plug		_ _ A6	n	n	n	n	n
	M20 316 SS Certified Conduit Plug		_ _ A7	m	m	m	m	m
	Minifast® 4 pin (1/2 NPT) (not suitable for X-Proof applications)		_ _ A8	n	n	n	n	n
	Minifast® 4 pin (M20) (not suitable for X-Proof applications)		_ _ A9	m	m	m	m	m

TABLE VIII	OTHER Certifications & Options: (String in sequence comma delimited (XX, XX, XX,....)							
Certifications & Warranty	No additional options	00	*	*	*	*	*	
	NACE MR0175; MR0103; ISO15156 (FC33338) Process wetted parts only	FG	*	*	*	*	*	b
	NACE MR0175; MR0103; ISO15156 (FC33339) Process wetted and non-wetted parts	F7	c	c	c	c	c	b
	Marine (DNV, ABS, BV, KR, LR)	MT	d	d	d	d	d	
	EN10204 Type 3.1 Material Traceability (FC33341)	FX	*	*	*	*	*	
	Certificate of Conformance (F3391)	F3	*	*	*	*	*	b
	Calibration Test Report & Certificate of Conformance (F3399)	F1	*	*	*	*	*	b
	Certificate of Origin (F0195)	F5	*	*	*	*	*	
	FMEDA (SIL 2/3) Certification (FC33337)	FE	j	j	j	j	j	
	Over-Pressure Leak Test Certificate (1.5X MAWP) (F3392)	TP	*	*	*	*	*	
	Cert Clean for O_2 or CL_2 service per ASTM G93	OX	e	e	e	e	e	
	PMI Certification[1]	PM	*	*	*	*	*	
	Extended Warranty Additional 1 year	01	*	*	*	*	*	b
	Extended Warranty Additional 2 years	02	*	*	*	*	*	b
	Extended Warranty Additional 3 years	03	*	*	*	*	*	b
	Extended Warranty Additional 4 years	04	*	*	*	*	*	b

TABLE IX	Manufacturing Specials						
Factory	Factory Identification	0 0 0 0	*	*	*	*	*

RESTRICTIONS

Restriction Letter	Available Only with		Not Available with	
	Table	Selection(s)	Table	Selection(s)
a			VIII	FG, F7
c	Id	_ _ _ 0,N,K,D,B _ _ _	I a	D,H,K,L _ _ _ _ _
d	IV a	C,D,G,H _ _	VIIa	1,2,3,5,6,7 _ _ _
e	Ib	_ 2 _ _ _ _		
f			IV b	_ F_
g			IVb	_ H,D _
h			Ie	_ _ _ _ 4, 5, 6 _ _
			VIIa	1,2,3,4,5,6,7,8 _ _ _
j	IV b	_ H _	Vb	_ 1,2,6_
m	IV a	B,D,F,H _ _		
n	IV a	A,C,E,G _ _		
p			III	B- No CRN number available
s	I a	A, E _ _ _ _ _		
t			Ia	J, K, L _ _ _ _ _
u	IVb	_ H_		
b	Select Only one option from this group			

[1]The PM option is available on all Smartline Pressure Transmitter process wetted parts such as process heads, flanges, bushings and vent plugs except plated carbon steel process heads and flanges. PM option information is also available on diaphragms except STG and STA in-line construction pressure transmitters.

FIELD INSTALLABLE ACCESSORY KITS

Description	Kit Number
Integrally Mounted Basic Indicator Kit (Compatible with all Electronic Modules)	50049911-501
Terminal Strip w/Lightning Protection Kit for HART or DE Modules	50075472-532
Terminal Strip w/Lightning Protection Kit for FFB Module	50075472-534
Terminal Strip w/o Lightning Protection for HART or DE Modules	50075472-531
Terminal Strip w/o Lightening Protection FFB-Module	50075472-533
HART Electronics Module	50049849-501
HART Electronics Module w/connection for external configuration buttons	50049849-502
DE Electronics Module	50049849-503
DE Electronics Module w/connection for external configuration buttons	50049849-504
FFB Electronics Module Kit	50049849-509
FFB Electronics Module w/connection for external configuration buttons	50049849-510
Standard Display Module	50126003-501

PRODUCT MANUALS

Description	Part Number
ST 700 Smart Transmitter User Manual - English	34-ST-25-44
ST 700 Smart Transmitter HART/DE Communications Manual - English	34-ST-25-47
sT 700 Smart Transmitter Safety Manual - English	34-ST-25-37
ST700 Smart Transmitter Foundation Fieldbus Manual - English	34-ST-25-48
ST 700 Smart Transmitter Function Block Manual - English	34-ST-25-49

All product documentation is available at www.honeywellprocess.com.

Sales and Service

For application assistance, current specifications, ordering, pricing, and name of the nearest Authorized Distributor, contact one of the offices below.

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engine http://bit.ly/2N5VIdi

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Knowledge Base search
engine http://bit.ly/2N5VIdi

Specifications are subject to change without notice.

For more information
To learn more about SmartLine Pressure Transmitters visit www.honeywellprocess.com
Or contact your Honeywell Account Manager

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Houston, TX 77042

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Honeywell House, Skimped Hill Lane
Bracknell, England, RG12 1EB

Shanghai City Centre, 100 Jungi Road
Shanghai, China 20061

www.honeywellprocess.com

34-ST-03-102
Jan 2021

HVAC	PT	20SAF12CP016	Pressure Transmitter(DP Type)	PT-2 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
HVAC	PT	30SAF12CP015	Pressure Transmitter(DP Type)	PT-1 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
HVAC	PT	30SAF12CP016	Pressure Transmitter(DP Type)	PT-2 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
HVAC	PT	40SAF12CP015	Pressure Transmitter(DP Type)	PT-1 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
HVAC	PT	40SAF12CP016	Pressure Transmitter(DP Type)	PT-2 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
HVAC	PT	50SAF12CP015	Pressure Transmitter(DP Type)	PT-1 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021
HVAC	PT	50SAF12CP016	Pressure Transmitter(DP Type)	PT-2 AT UAF Fan Outlet Of UAF	NA	ESP Building	Honeywell	0-1000mmwc	0-150mmwc	65mmwc	YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000	PE-V0-417-554-A021

Item: Smart Line DP TYPE Pressure Transmitter		
Engineering Units : Flow : Liquid - M3 / Hr, Steam Kg / Hr, Pressure : Kg / cm2 , Temperatue : Deg C, Level : mmWC		SHEET 06 OF 9

Model	Decodification	Description
General	Make	Honeywell
	Function	Transmission & Indication
	Model No.	**YSTD810-E1AC4AS-1-C-AHC-11C-B-11A0-F1(PT)-0000 ; Y : Epoxy Polyester Powder Coated Hybrid Paint + 5Pin Plug & Socket connector**
	Qty	As per attached BOM
	Tag No.	As per attached BOM
	Calibration Range	As per attached BOM
	Sensor	Piezoresistive
	Supply Voltage	10.8 to 42.4 V DC
	Load Resistance	600 ohms @24V DC
	Communication	Hart Protocol
	Display	2 Lines 16 Characters (4.13H x 1.83W mm)
	Reference Accuracy	0.035% of Span
	Turndown Ratio	100:1
	Stability	0.015% of URL per year for 15 Years
	MAWP	3.45 Bar
	Maximum Allowed Working Temperature	125 Deg.C (for Temp Higher than 125 Deg C, a suitable length of impulse line to be used, considering 100 Deg.C temperature drop for every One meter length of impulse pipe)
	Protection Class	IP 67
	Area Classification	Hazardous Area
	Connection Location	Side/Side
STD810	Instrument Range	Min Span 0 to 0.25 mbar to Max Span 0 to 25 mbar
E	Process Wetted Heads & Diaphragm Materials	Process Head Material : 316 Stainless steel & Diaphragm Material : 316L Stainless Steel
1	Fill Fluid	Silicone Oil 200
A	Process Connection	1/4" NPT (F)
C	Bolt/Nut Materials	Carbon Steel
4	Vent/Drain Type/Location	Head Type : Dual Ended, Vent Type : Standard Vent, Location : End & Vent material : Matches Head Material[1]
A	Gasket Materials	Teflon or PTFE (Glass Filled)
S	Static Pressure	Standard Static Pressure
1	Head/Connect Orientation	Standard, High Side Left, Low Side Right[2] / Std Head Orientation
C	Approvals	ATEX Explosion proof, Intrinsically Safe & Non-incendive
A	Electronic Housing Material, Connection Type & Lightning Protection	Material : Y : Epoxy Polyester Powder Coated Hybrid Paint, Connection : 1/2" NPT & Lightning Protection : None
H	Output/Protocol	Anlogue Output : 4-20mA dc, Digital Protocol : Hart Protocol
C	Customer Interface Selections	Indicator : Basic, Ext Zero, Span & Config Buttons : Yes, Languages : English
1	Application Software	Standard Diagnostics
1	Output Limit, Failsafe & Write Protect Settings	Write Protect : Disabled, Fail Mode : High> 21.0 mAdc, High & Low Output Limits[3] : Honeywell Std (3.8-20.8 mAdc)
C	General Configuration	Custom Configuration (Unit Data Required from customer)
B	Accuracy & Calibration	Accuracy : Standard, Calibrated Range : Custom (Unit Data Required), Calibration Qty : Single Calibration
1	Mounting Bracket	Bracket Type : Angle Bracket, Material : Carbon Steel
1	Customer Tag	One Wired Stainless Steel Tag (Up to 4 lines 26 Char/line)
A0	Plugs & Adapters	No Conduit Plugs or Adapters Required
F1	Certifications	Calibration Test Report & Certificate of Conformance (F3399)
0000	Manufacturing Specials	Factory Identification
P&S	Accessories	5Pin Plug & Socket connector

SmartLine

Honeywell

Technical Information

STD800 SmartLine Differential Pressure
Specification 34-ST-03-82, Jan 2021

Introduction

Part of the SmartLine® family of products, the STD800 is a high performance differential pressure transmitter featuring piezoresistive sensor technology. By combining differential pressure sensing with on chip static pressure and temperature compensation the STD800 offers high accuracy and stability over a wide range of application pressures and temperatures. The SmartLine family is also fully tested and compliant with Experion® PKS providing the highest level of compatibility assurance and integration capabilities. SmartLine easily meets the most demanding application needs for pressure measurement applications.

Best in Class Features:

- Accuracies up to 0.035% of span standard & 0.025% of span optional
- Stability up to 0.01% of URL per year for 15 years
- Automatic static pressure & temperature compensation
- Rangeability up to 400:1
- Response times as fast as 90ms
- Multiple local display capabilities
- External zero, span, & configuration capability
- Polarity insensitive electrical connections
- Comprehensive on-board diagnostic capabilities
- Integral Dual Seal design for highest safety based on ANSI/NFPA 70-202 and ANSI/ISA 12.27.0
- World class overpressure protection
- Full compliance to SIL 2/3 requirements.
- Modular design characteristics
- Available with additional 15-year warranty
- Plugged Impulse Line Detection Option
- Dual/Triple Calibration Option (HART & Fieldbus only)

Figure 1 – STD800 Differential Pressure Transmitters feature field-proven piezoresistive sensor technology

Communications/Output Options:

- 4-20mA dc
- Honeywell Digitally Enhanced (DE)
- HART ® (version 7.0)
- FOUNDATION™ Fieldbus

All transmitters are available with the above listed communications protocols.

Span & Range Limits:

Model	URL "H_2O (mbar)	LRL "H_2O (mbar)	Min Span "H_2O (mbar)
STD810	10 (25)	-10 (-25)	0.1 (0.25)
STD820	400 (1000)	-400 (-1000)	1.0 (2.5)
Model	**psi (bar)**	**psi (bar)**	**psi (bar)**
STD830	100 (7.0)	-100 (-7.0)	1 (0.07)
STD870	3000 (210)	-100 (-7.0)	30 (2.1)

Description

The SmartLine family of gauge pressure, differential pressure, and absolute pressure transmitters is designed around a high performance piezo-resistive sensor. This one sensor integrates multiple sensors linking process pressure measurement with on-board static pressure (DP Models) and temperature compensation measurements resulting in the best total performance available. This level of performance allows the ST 800 to replace virtually any competitive transmitter available today.

Unique Indication/Display Options

The ST 800 modular design accommodates a basic alphanumeric LCD display or a unique advanced graphics LCD display with many unparalleled features.

Basic Alphanumeric LCD Display Features

- Modular (may be added or removed in the field)
- 0, 90,180, & 270 degree position adjustments
- Configurable (HART only) and standard (Pa, KPa, MPa, KGcm2, Torr, ATM, inH2O, mH2O, bar, mbar, inH2O, inHG, FTH2O, mmH2O, mm HG, & psi) measurement units
- 2 Lines 16 Characters (4.13H x 1.83W mm)
- Square root output indication (√)

Advanced Graphics LCD Display Features

- Modular (may be added or removed in the field)
- 0, 90, 180, & 270 degree position adjustments
- Standard and custom measurement units available.
- Up to eight display screens with 3 formats are possible
- (Large PV with Bar Graph or PV with Trend Graph)
- Configurable screen rotation timing (1 to 30 sec)
- Display Square Root capabilities may be set separately from the 4-20mA dc output signal
- Unique “Health Watch” indication provides instant visibility of diagnostics
- Multiple language capability. (EN, DE, FR, IT, ES, RU, TR, CN & JP)

Diagnostics

SmartLine transmitters all offer digitally accessible diagnostics which aid in providing advanced warning of possible failure events minimizing unplanned shutdowns, providing **lower overall operational costs**

Configuration Tools

Integral Three Button Configuration Option

Suitable for all electrical and environmental requirements, SmartLine offer the ability to configure the transmitter and display via three externally accessible buttons when either display option is selected. Zero/span capabilities are also optionally available via these buttons with or without selection of a display option.

Hand Held Configuration

SmartLine transmitters feature two-way communication and configuration capability between the operator and the transmitter. All Honeywell transmitters are designed and tested for compliance with the offered communication protocols and are designed to operate with any Standards compliant handheld configuration device.

Personal Computer Configuration

Honeywell’s SCT 3000 Configuration Toolkit provides an easy way to configure Digitally Enhanced (DE) instruments using a personal computer as the configuration interface. Field Device Manager (FDM) Software and FDM Express are also available for managing HART & Fieldbus device configurations.

System Integration

- SmartLine communications protocols all meet the most current published standards for HART/DE/Fieldbus.
- Integration with Honeywell’s Experion PKS offers the following unique advantages.
  - Transmitter messaging
  - Maintenance mode indication
  - Tamper reporting
  - FDM Plant Area Views with Health summaries
  - All ST 800 units are Experion tested to provide the highest level of compatibility assurance

Modular Design

To help contain maintenance & inventory costs, all ST 800 transmitters are modular in design supporting the user's ability to replace meter bodies, add indicators or change electronic modules without affecting overall performance or approval body certifications. Each meter body is uniquely characterized to provide in-tolerance performance over a wide range of application variations in temperature and pressure and due to the Honeywell advanced interface, electronic modules may be swapped with any electronics module without losing in-tolerance performance characteristics.

Modular Features:

- Meter body replacement
- Exchange/replace electronics/comms modules*
- Add or remove integral indicators*
- Add or remove lightning protection (terminal connection)*

* Field replaceable in all electrical environments (including IS) except flameproof without violating agency approvals.

With no performance effects, Honeywell's unique modularity results in ***lower inventory needs and lower overall operating costs.***

Plugged Impulse Line Detection:

STD800 models are offered with a PILD option which provides indication of a plugged impulse line or process connection. When used in conjunction with a basic or advanced display, a non-critical diagnostic indication appears on the integral display. For units without an integral display, an indication can be seen via the host or hand held device when HART Protocol is utilized.

Dual/Triple Calibration:

STD800 models are optionally offered with multiple calibrations. In lieu of a standard factory calibration, units can be supplied with 1, 2, or 3 customer specified calibrations. These calibrations are stored in the meter body and provide users with factory calibrated performance at up to three different calibrated ranges. This increases application flexibility without requiring any costly recalibration or additional inventory.

Performance Specifications

Reference Accuracy (conformance to +/-3 Sigma)

Table 1

Model	URL	LRL	Min Span	Maximum Turndown Ratio	Stability (% URL/ Yr for 15 years)	Reference Accuracy[1,2] (% Span) Std/Opt
STD810	10 in H_2O (25mbar)	-10 in H_2O (-25mbar)	0.1 in H_2O (0.25mbar)	100:1	0.015	0.035
STD820	400 in H_2O (1000mbar)	-400 in H_2O (-1000mbar)	1 in H_2O (2.5mbar)	400:1	0.010	0.0375 / 0.025
STD830	100 psi (7.0 bar)	-100 psi (-7.0 bar)	1 psi (0.07 bar)	100:1	0.020	0.0375 / 0.0325
STD870	3000 psi (210 bar)	-100 psi (-7.0 bar)	30 psi (2.1 bar)	100:1	0.010	0.0375 / 0.0350

Zero and span may be set anywhere within the listed (URL/LRL) range limits

Accuracy at Specified Span, Temperature and Static Pressure Effects: (conformance to +/-3)

Table 2

			Accuracy[1,2] (% of Span)				Combined Zero & Span temperature Effect (% Span / 28°C (50 °F))		Combined Zero & Span Static Line Pressure Effect[4] (% Span/1000psi)[3]	
	Model	URL	Reference Turndown	A	B	C (see URL units)	D	E	F	G
Standard Accuracy	STD810	10 in H_2O (25mbar)	10:1	0.010	0.025	1 (2.5)	0.070	0.040	0.050	0.075
	STD820	400 in H_2O (1000mbar)	16:1	0.005	0.0325	25 (62.5)	0.025	0.007	0.080	0.007
	STD830	100 psi (7.0 bar)	6.7:1	0.005	0.0325	15 (1.05)	0.025	0.010	0.075	0.075
	STD870	3000 psi (210 bar)	15:1	0.005	0.0325	200 (14)	0.025	0.006	0.075	0.075
High Accuracy Option	STD820	400 in H_2O (1000mbar)	16:1	0.005	0.020	25 (62.5)	0.025	0.0107	0.080	0.007
	STD830	100 psi (7 bar)	6.7:1	0.005	0.0275	15 (1.05)	0.025	0.010	0.075	0.075
	STD870	3000 psi (210 bar)	15:1	0.005	0.030	200 (14)	0.025	0.006	0.075	0.075
			Turn Down Effect				Temp Effect		Static Effect	
			$\pm[A+B]$ if $Span \geq C$ $\pm\left[A+B\left(\frac{C}{Span}\right)\right]$ if $Span < C$				$\pm[D+E\left(\frac{URL}{Span}\right)]$		$\pm[F+G\left(\frac{URL}{Span}\right)]$	

Total Performance = +/- $\sqrt{(\text{Accuracy})^2 + (\text{Temp Effect})^2 + (\text{Static Line Pressure Effect})^2}$

Total Performance Examples: (standard accuracy 5:1 Turndown, up to 50 ºF shift & up to 1000 psi Static Pressure[3])

Model	Total Performance	Model	Total Performance
STD810 @ 2"H_2O	0.505% of span	**STD830 @ 20 psi**	0.140% of span
STD820 @ 80" H_2O	0.135% of span	**STD870 @ 600 psi**	0.131% of span

Typical Calibration Frequency: Calibration verification is recommended every four (4) years

Notes:

1. Terminal based Accuracy – Incudes combined effects of linearity, hysteresis and repeatability. Analog output adds 0.005% of span
2. For zero based spans and reference conditions of 25 °C (77 °F). 0 psig static pressure. 10 to55% RH, and 316 Stainless Steel barrier diaphragm.
3. STD810 includes only zero shift with static pressure. Results ar % of span/25 psig.

Operating Conditions – All Models

Parameter	Reference Condition		Rated Condition		Operative Limits		Transportation and Storage	
	°C	°F	°C	°F	°C	°F	°C	°F
Ambient Temperature[1] STD800	25±1	77±2	-40 to 85	-40 to 185	-40 to 85	-40 to 185	-55 to 120	-67 to 248
Meter Body Temperature[2] STD810, 820, 830, 870	25±1	77±2	-40 to 110[1]	-40 to 230[1]	-40 to 125	-40 to 257	-55 to 120	-67 to 248
Humidity %RH	10 to 55		0 to 100		0 to 100		0 to 100	
Vac. Region – Min. Pressure All Models Except STD810 **mmHg absolute** **inH_2O absolute**	Atmospheric Atmospheric		25 13		2 (short term)[3] 1 (short term)[3]			
Supply Voltage **Load Resistance**	10.8 to 42.4 Vdc at terminals (IS versions limited to 30 Vdc) 0 to 1,440 ohms (as shown in Figure 2)							
Maximum Allowable Working Pressure (MAWP)[4,5] (ST 800 products are rated to Maximum Allowable Working Pressure. MAWP depends on Approval Agency and transmitter materials of construction.)	**Standard:** STD810 = 50 psi (3.45 bar) STD820, STD830 and STD870 = 4,500 psi (310 bar) **Optional:** STD820, STD830, STD870 = 6,000 psi (420 bar) Static Pressure Limit = Maximum Allowable Working Pressure (MAWP) = Overpressure Limit for ST 800 Differential Pressure Transmitters							

[1] LCD Display operating temperature -20°C to +70°C . Storage temperature -30°C to 80°C.

[2] Silicone 704 minimum temperature rating is 0ºC (32ºF). CTFE minimum temperature rating is -30°C (-22°F). NEOBEE M-20 minimum temperature rating is -15ºC (5ºF). NEOBEE® is a registered trademark of Stepan Company.

[3] Short term equals 2 hours at 70°C (158°F).

[4] MAWP applies for temperatures -40 to 125°C. Static Pressure Limit is de-rated to 3,000 psi for -26°C to -40°C. for all models except STD810. Use of graphite. o-rings de-rates transmitter to 3,625 psi. Use of 1/2:" process adaptors with graphite o-rings de-rates transmitter to 3,000 psi.

[5] Consult factory for MAWP of ST 800 transmitters with CRN approval.

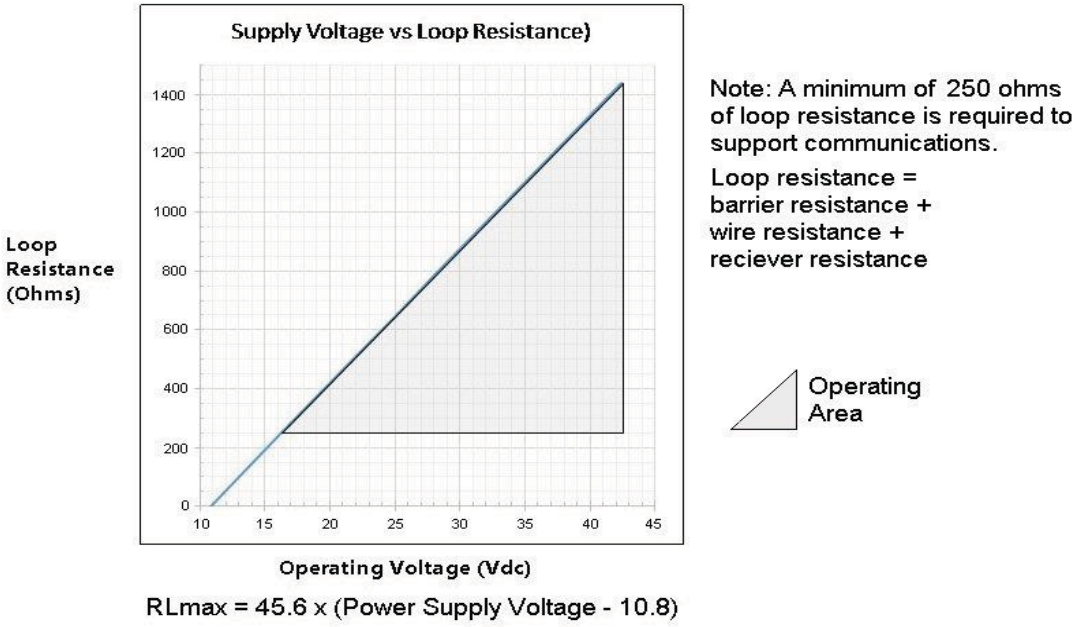

Figure 2 - Supply voltage and loop resistance chart & calculations

Performance Under Rated Conditions – All Models

Parameter	Description
Analog Output **Digital Communications**:	Two-wire, 4 to 20 mA (HART & DE Transmitters only) Honeywell DE, HART 7 protocol or FOUNDATION Fieldbus ITK 6.0.1 compliant All transmitters, irrespective of protocol have polarity insensitive connection.
HART & DE Output Failure Modes (NAMUR for DE Units requires selecting display and configuration buttons or factory configuration)	**Compliance**: **Honeywell Standard:** **NAMUR NE 43** **Normal Limits:** 3.8 – 20.8 mA 3.8 – 20.5 mA **Failure Mode:** ≤ 3.6 mA and ≥ 21.0 mA ≤ 3.6 mA and ≥ 21.0 mA
Supply Voltage Effect	0.005% span per volt.
Transmitter Turn on Time (includes power up & test algorithms)	HART or DE: 2.5 sec. Foundation Fieldbus: Host dependant
Response Time (delay + time constant)	**DE/HART Analog Output** 90mS **FOUNDATION Fieldbus** 150mS (Host Dependant)
Damping Time Constant	**HART:** Adjustable from 0 to 32 seconds in 0.1 increments. **Default:** 0.50 seconds **DE:** Discrete values 0, .16, .32, .48, 1, 2, 4, 8, 16, 32 seconds. **Default:** 0.48 seconds
Vibration Effect **ST 820, ST 830, ST 870**	Less than +/- 0.1% of URL w/o damping Per IEC60770-1 field or pipeline, high vibration level (10-2000Hz: 0.21 displacement/3g max acceleration)
Electromagnetic Compatibility	IEC 61326-3-1
Lightning Protection Option	**Leakage Current:** 10uA max @ 42.4VDC 93C **Impulse rating:** 8/20uS 5000A (>10 strikes) 10000A (1 strike min.) 10/1000uS 200A (> 300 strikes)

Materials Specifications (see model selection guide for availability/restrictions with various models)

Parameter	Description
Barrier Diaphragms Material	316L SS, Hastelloy® C-276[2], Monel® 400 [3], Tantalum, Gold-plated 316L SS, Gold-plated Hastelloy® C-276, Gold-plated Monel® 400
Process Head Material	316 SS[4], Carbon Steel (Zinc-plated) [5] 316 SS[4], Carbon Steel (Zinc-plated) [5], Hastelloy C-276[6], Monel 400 [7]
Vent/Drain Valves & Plugs [1]	316 SS[4], Hastelloy C-276[2], Monel 400 [7]
Head Gaskets	Glass-filled PTFE standard. Viton® and graphite are optional.
Meter Body Bolting	Carbon Steel (Zinc plated) standard. Options include 316 SS, NACE A286 SS bolts, Monel K500, Super Duplex and B7M.
Optional Adapter Flange and Bolts	Adapter Flange materials include 316 SS, Hastelloy C-276 and Monel 400. Bolt material for flanges is dependent on process head bolts material chosen. Standard adaptor seal material is glass-filled PTFE. Viton and graphite are optional.
Mounting Bracket	Carbon Steel (Zinc-plated) or 304 Stainless Steel or 316 Stainless Steel
Fill Fluid	Silicone Oil 200, Silicone Oil 704, Inert Fluorinated Oil CTFE and NEOBEE® M-20 (Note that STD810 is only available with Silicone Oil 200 and NEOBEE® M-20)
Electronic Housing	Pure Polyester Powder Coated Low Copper (<0.4%)-Aluminum. Meets NEMA 4X, IP66, & P67. All stainless steel housing is optional.
Mounting	Can be mounted in virtually any position using the standard mounting bracket. Bracket is designed to mount on 2-inch (50 mm) vertical or horizontal pipe. See Figure 3.
Process Connections	1/4- NPT or 1/2- NPT with adapter (meets DIN requirements)
Wiring	Accepts up to 16 AWG (1.5 mm diameter).
Dimensions	See Figure 4.
Net Weight	8.3 pounds (3.8 Kg) with Aluminum Housing

[1] Vent/Drains are sealed with Teflon®

[2] Hastelloy C-276 or UNS N10276

[3] Monel 400 or UNS N04400

[4] Supplied as 316 SS or as Grade CF8M, the casting equivalent of 316 SS.

[5] Carbon Steel heads are zinc-plated and not recommended for water service due to hydrogen migration. For that service, use 316 stainless steel wetted Process Heads.

[6] Hastelloy C-276 or UNS N10276. Supplied as indicated or as Grade CW12MW, the casting equivalent of Hastelloy C-276

[7] Monel 400 or UNS N04400. Supplied as indicated or as Grade M30C, the casting equivalent of Monel 400

Communications Protocols & Diagnostics

HART Protocol

Version:

HART 7

Power Supply

Voltage: 10.8 to 42.4Vdc at terminals

Load: Maximum 1440 ohms See figure 2

Minimum Load: 0 ohms. (For handheld communications a minimum load of 250 ohms is required)

Foundation Fieldbus (FF)

Power Supply Requirements

Voltage: 9.0 to 32.0Vdc at terminals

Steady State Current: 17.6mAdc

Software Download Current: 27.4mAdc

Available Function Blocks

Block Type	Qty	Execution Time
Resource	1	n/a
Transducer	1	n/a
Diagnostic	1	n/a
Analog Input	1*	30 ms
PID w/Autotune	1	45 ms
Integrator	1	30 ms
Signal Char (SC)	1	30 ms
LCD Display	1	n/a
Flow Block	1	30 ms
Input Selector	1	30 ms
Arithmetic	1	30 ms

* AI block may have two (2) additional instantiations.

All available function blocks adhere to FOUNDATION Fieldbus standards. PID blocks support ideal & robust PID algorithms with full implementation of Auto-tuning.

Link Active Scheduler

Transmitters can perform as a backup Link Active Scheduler and take over when the host is disconnected. Acting as a LAS, the device ensures scheduled data transfers typically used for the regular, cyclic transfer of control loop data between devices on the Fieldbus.

Number of Devices/Segment

Entity IS model: 6 devices/segment

Schedule Entries

18 maximum schedule entries

Number of VCR's: 24 max

Compliance Testing: Tested according to ITK 6.0.1

Software Download

Utilizes Class-3 of the Common Software Download procedure as per FF-883 which allows the field devices of any manufacturer to receive software upgrades from any host.

Honeywell Digitally Enhanced (DE)

DE is a Honeywell proprietary protocol which provides digital communications between Honeywell DE enabled field devices and Hosts.

Power Supply

Voltage: 10.8 to 42.4Vdc at terminals

Load: Maximum 1440 ohms See figure 2

Standard Diagnostics

ST 800 top level diagnostics are reported as either critical or non-critical and readable via the DD/DTM tools or integral display as shown below.

Critical Diagnostics		
HART DD/DTM tools	**Advanced Display**	**Basic Display**
Electronic Module DAC Failure	Electronics Module fault	Electronics Module fault
Meter Body NVM Corrupt	Meterbody fault	Meterbody fault
Config Data Corrupt	Electronics Module fault	Electronics Module fault
Electronic Module Diag Failure	Electronics Module fault	Electronics Module fault
Meter Body Critical Failure	Meterbody fault	Meterbody fault
Sensor Comm Timeout	Meterbody Comm fault	Meterbody Comm fault

Non-Critical Diagnostics		
HART DD/DTM tools	**Advanced Display**	**Basic Display**
Display Failure	n/a	n/a
Electronic Module Comm Failure	n/a	n/a
Meter Body Excess Correct	Zero Correct (OK or EXCESSIVE) Span Correct (OK or EXCESSIVE)	n/a
Sensor Over Temperature	Meterbody Temp (OK, OVER TEMP)	n/a
Fixed Current Mode	Analog Out mode (Fixed or Normal)	n/a
PV Out of Range	Primary PV (OK or OVERLOAD)	n/a
No Factory Calibration	Factory Cal (OK, NO FACTORY CAL)	n/a
No DAC Compensation	DAC Temp Comp (OK, NO COMPENSATION)	n/a
LRV Set Error – Zero Config Button	n/a	n/a
URV Set Error – Span Config Button	n/a	n/a
AO Out of Range	n/a	n/a
Loop Current Noise	n/a	n/a
Meter Body Unreliable Comm	Meterbody Comm (OK, SUSPECT)	n/a
Tamper Alarm	n/a	n/a
No DAC Calibration	n/a	n/a
Sensor Supply Voltage Low	Supply Voltage (OK, LOW, or HIGH)	n/a

Refer to ST 800 diagnostics tech note for additional level diagnostics.

Other Certification Options

Materials

- NACE MRO175, MRO103, ISO15156

Hazardous Areal Certifications:

MSG CODE	AGENCY	TYPE OF PROTECTION	COMM. OPTION	ELECTRICAL PARAMETERS	AMBIENT TEMP (Ta)
A	FM Approvals™ USA	**Explosionproof:** Class I, Division 1, Groups A, B, C, D; Dust Ignition Proof: Class II, III, Division 1, Groups E, F, G; T6..T5 Class I, Zone 0/1, AEx db IIC T6..T5 Ga/Gb Class II, Zone 21, AEx tb IIIC T95° Db	All	Note 1	T5: -50 ºC to 85ºC T6: -50 ºC to 65ºC
		Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G: T4 Class I, Zone 0, AEx ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2a	-50 ºC to 70ºC
			Foundation Fieldbus	Note 2b	-50 ºC to 70ºC
		Nonincendive: Class I, Division 2, Groups A, B, C, D locations, T4 Class I, Zone 2, AEx nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50 ºC to 85ºC
		Enclosure: Type 4X/ IP66/ IP67	All	All	-
		STANDARDS: FM Class 3600:2011; FM Class 3610: 2010; FM Class 3611: 2004; FM Class 3615: 2006; FM Class 3616: 2011; FM Class 3810: 2005; ANSI/ISA 60079-0: 2013; ANSI/UL 60079-1: 2015; ANSI/UL 60079-11: 2014; ANSI/ISA 60079-15: 2012; ANSI/UL 60079-26: 2017; ANSI/UL 60079-31: 2015; ANSI/NEMA 250: 2003; ANSI/ IEC 60529: 2004			
B	Canadian Standards Association (CSA) USA and Canada	**Explosion Proof:** Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1, T6..T5 Class I Zone 1 AEx db IIC T6..T5 Ga/Gb Ex db IIC T6..T5 Ga/Gb Zone 22 AEx tb IIIC T95° Db Ex tb IIIC T95° Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1, T4 Class I Zone 0, AEx ia IIC T4 Ga Class I Zone 2, AEx ic IIC T4 Gc Ex ia IIC T4 Ga Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Nonincendive: Class I, Division 2, Groups A, B, C, D; Class II, Division 2, Groups F, G; Class III, Division 2, T4 Class I Zone 2 AEx nA IIC T4 Gc Ex nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C to 85°C
		Enclosure: Type 4X/ IP66/ IP67	All	All	-

MSG CODE	AGENCY	TYPE OF PROTECTION	COMM. OPTION	ELECTRICAL PARAMETERS	AMBIENT TEMP (Ta)
		STANDARDS: CSA C22.2 No. 0-10; CSA C22.2 No. 94-M91; CSA C22.2 No. 25-1966; CSA C22.2 No. 30-M1986; CSA C22.2 No. 142-M1987; CSA C22.2 No. 157-92; CSA C22.2 No. 213-M1987; CSA-C22.2 No. 60529:05; CSA-C22.2 No. 60079-0:11; CSA-C22.2 No. 60079-1:11; CSA-C22.2 No. 60079-11:11; CSA-C22.2 No. 60079-15:12; CSA-C22.2 No. 60079-31:12; ISA 12.12.01-2010; ISA 60079-0: 2009; ISA 60079-11: 2011; ISA 60079-15: 2009; ISA 60079-26: 2008; ISA-60079-27:2007 (12.02.04)-2006 (R2011); UL 913 Ed. 6; UL 916:1998; ANSI/ISA-12.27.01-2011			
C	**ATEX**	**Flameproof: SIRA 12ATEX2233X** II 1/2 G Ex db IIC T6..T5 Ga/Gb II 2 D Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: SIRA 12ATEX2233X II 1 G Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) II 1 G Ex ia IIC T4 Ga	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: SIRA 12ATEX4234X II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: SIRA 12ATEX4234X II 3 G Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) II 3 G Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
		STANDARDS: EN 60079-0: 2012/A11: 2013; EN 60079-1: 2014; EN 60079-7: 2015; EN 60079-11: 2012; EN 60079-26: 2015; EN 60079-31: 2009			
D	**IECEx World**	**Flameproof: IECEx SIR 12.0100X** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: IECEx SIR 12.0100X Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: IECEx SIR 12.0100X Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: IECEx SIR 12.0100X Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
		STANDARDS: IEC 60079-0: 2011; IEC 60079-1: 2014; IEC 60079-7: 2017; IEC 60079-11: 2011; IEC 60079-26: 2014; IEC 60079-31: 2013			

E	**SAEx South Africa**	**Flameproof :** Ex d IIC T6…T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC Ga T4 FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
F	**INMETRO Brazil**	**Flameproof:** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2a	-50°C TO 70°C
			Foundation Fieldbus	Note 2b	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	-
G	**NEPSI CHINA**	**Flameproof:** Ex db IIC T6..T5 Ga/Gb Ex tb IIIC T 95°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Increase Safety: II 3 G Ex ec IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ex ic IIC T4 Gc FISCO Field Device (Only for FF Option) Ex ic IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	-

H	**KOSHA Korea**	**Flameproof :** Ex d IIC T4, T5, T6 Ex tD A21 IP66/IP67 T95°C…T120 °C	All	Note 1	T4: -50°C TO 85°C T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4	4-20 mA / DE/ HART	Note 2	Ta= -50 ºC to 70ºC
			Foundation Fieldbus	Note 2	Ta= -50 ºC to 70ºC
		Enclosure: IP66/ IP67	All	All	-
I	**EAC Russia, Belarus and Kazakhstan**	**Flameproof:** Ga/Gb Ex d IIC T6..T5 Ex tb IIIC Db T 85°C	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ga Ex ia IIC T4 X FISCO Field Device (Only for FF Option) Ga Ex ia IIC T4 X	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Zone 2, Non Sparking: 2 Ex nA IIC T4 Gc X	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Zone 2, Intrinsically Safe: Ga Ex ic IIC T4 X FISCO Field Device (Only for FF Option) 2 Ex ic IIC T4 Gc X	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 2	-50°C TO 85°C
		Enclosure : IP 66/67	All	All	
J	**CCoE INDIA**	**Flameproof:** Ex d IIC T6..T5 Ga/Gb	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) Ex ia IIC T4 Ga; Ex ic IIC T4 Gc	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Non Sparking Ex nA IIC T4 Gc	4-20 mA / DE/ HART/ Foundation Fieldbus	Note 1	-50°C TO 85°C
		Enclosure: IP66/ IP67	All	All	-
K	**UATR UKRAINE**	**Flameproof:** II 1/2 G Ex db IIC T6..T5 Ga/Gb II 2 D Ex tb IIIC T95°C…T120°C Db	All	Note 1	T5: -50°C TO 85°C T6: -50°C TO 65°C
		Intrinsically Safe: II 1 G Ex ia IIC T4 Ga FISCO Field Device (Only for FF Option) II 1 G Ex ia IIC T4 Ga	4-20 mA / DE/ HART	Note 2	-50°C TO 70°C
			Foundation Fieldbus	Note 2	-50°C TO 70°C
		Enclosure: IP66/ IP67	All	All	-

Notes:

1. Operating Parameters:

   Voltage= 11 to 42 V DC Current= 4-20 mA Normal

   = 10 to 30 V (FF) = 30 mA (FF)

2. Intrinsically Safe Entity Parameters

a. Analog/ DE/ HART Entity Values:

Vmax= Ui = 30V Imax= Ii= 105mA Ci = 4.2nF Li =984 uH Pi =0.9W

Transmitter with Terminal Block Revision E or Later

Vmax= Ui = 30V Imax= Ii= 225mA Ci = 4.2nF Li = 0 Pi =0.9W

Note : Transmitter with Terminal Block Revision E or later

The revision is on the label that is on the module. There will be two lines of text on the label:

- First is the Module Part #: 50049839-001 or 50049839-002
- Second line has the supplier information, along with the REVISION:

XXXXXXX-EXXXX, THE "X" is production related, THE POSITION of the "E" IS THE REVISION.

b. Foundation Fieldbus- Entity Values

Vmax= Ui = 30V Imax= Ii= 180mA Ci = 0nF Li = 984 uH Pi =1W

Transmitter with Terminal Block Revision F or Later)

Vmax= Ui = 30V Imax= Ii= 225mA Ci =0nF Li = 0 Pi =1 W

FISCO Field Device

Vmax= Ui = 17.5V Imax= Ii= 380 mA Ci = 0nF Li = 0 Pi =5.32 W

Note : Transmitter with Terminal Block Revision F or later

The revision is on the label that is on the module. There will be two lines of text on the label:

- First is the Module Part #: 50049839-003 or 50049839-004
- Second line has the supplier information, along with the REVISION:

XXXXXXX-EXXXX, THE "X" is production related, THE POSITION of the "E" IS THE REVISION.

Approval Certifications:

<table>
<tr><td rowspan="5">Marine Certificates</td><td>This certificate defines the certifications covered for the ST 800 Pressure Transmitter family of products, including the SMV 800 Smart Multivariable Transmitter. It represents the compilation of the five certificates Honeywell currently has covering the certification of these products into marine applications.
For ST 800 Smart Pressure Transmitter and SMV800 Smart Multivarible Transmitter</td></tr>
<tr><td>American Bureau of Shipping (ABS) - 2009 Steel Vessel Rules 1-1-4/3.7, 4-6-2/5.15, 4-8-3/13 & 13.5, 4-8-4/27.5.1, 4-9-7/13. Certificate number: 04-HS417416-PDA</td></tr>
<tr><td>Bureau Veritas (BV) - Product Code: 389:1H. Certificate number: 12660/B0 BV</td></tr>
<tr><td>Det Norske Veritas (DNV) - Location Classes: Temperature D, Humidity B, Vibration A, EMC B, Enclosure C. For salt spray exposure; enclosure of 316 SST or 2-part epoxy protection with 316 SST bolts to be applied. Certificate number: A-11476</td></tr>
<tr><td>Korean Register of Shipping (KR) - Certificate number: LOX17743-AE001</td></tr>
<tr><td>Lloyd's Register (LR) - Certificate number: 02/60001(E1) & (E2)</td></tr>
<tr><td>SIL 2/3 Certification</td><td>IEC 61508 SIL 2 for non-redundant use and SIL 3 for redundant use according to EXIDA and TÜV Nord Sys Tec GmbH & Co. KG under the following standards: IEC61508-1: 2010; IEC 61508-2: 2010; IEC61508-3: 2010.</td></tr>
<tr><td>MEASUREMENT INTRUMENTS DIRECTIVE (MID) 2004/ 22/ EC</td><td>Certificate Issued by NMI Certin B.V.
Mechanical Class: M3 Electromagnetic Environment: E3
Ambient Temperature Range: -25 ºC to + 55 ºC
<table>
<tr><th>Unit</th><th>Custom Calibration</th></tr>
<tr><td>STD820</td><td>0 to 1000 mBar</td></tr>
<tr><td>STD830</td><td>0 to 7 Bar</td></tr>
<tr><td>STA84L</td><td>0 to 35 Bar A</td></tr>
<tr><td>STG84L</td><td>0 to 35 Bar</td></tr>
<tr><td>STD870</td><td>0 to 100 Bar</td></tr>
<tr><td>STA87L</td><td>0 to 100 Bar A</td></tr>
<tr><td>STG87L</td><td>0 to 100 Bar</td></tr>
</table></td></tr>
</table>

Mounting & Dimensional Drawings

Mounting Configurations

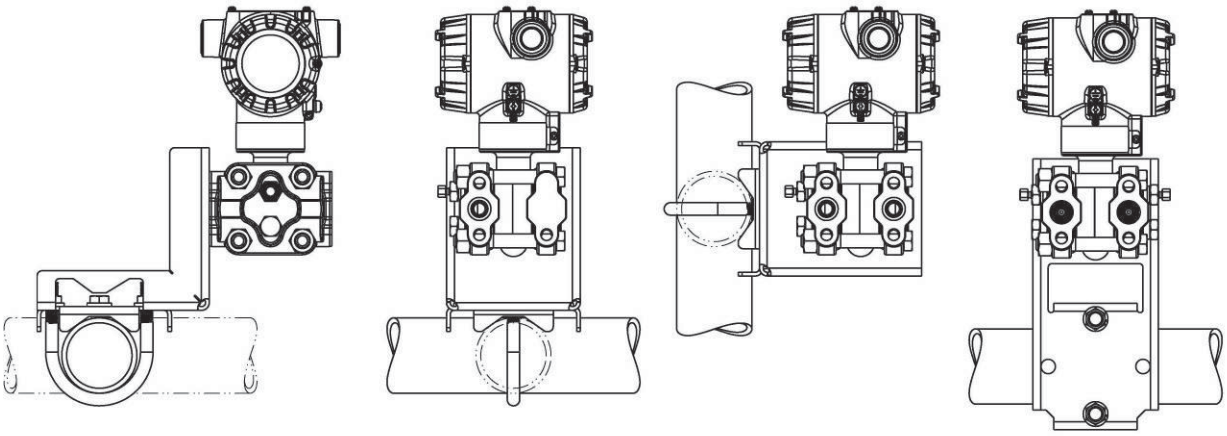

Figure 3 – Typical mounting configurations for STD810, STD820, STD830 and STD870 for reference

Reference Dimensions: millimeters / inches

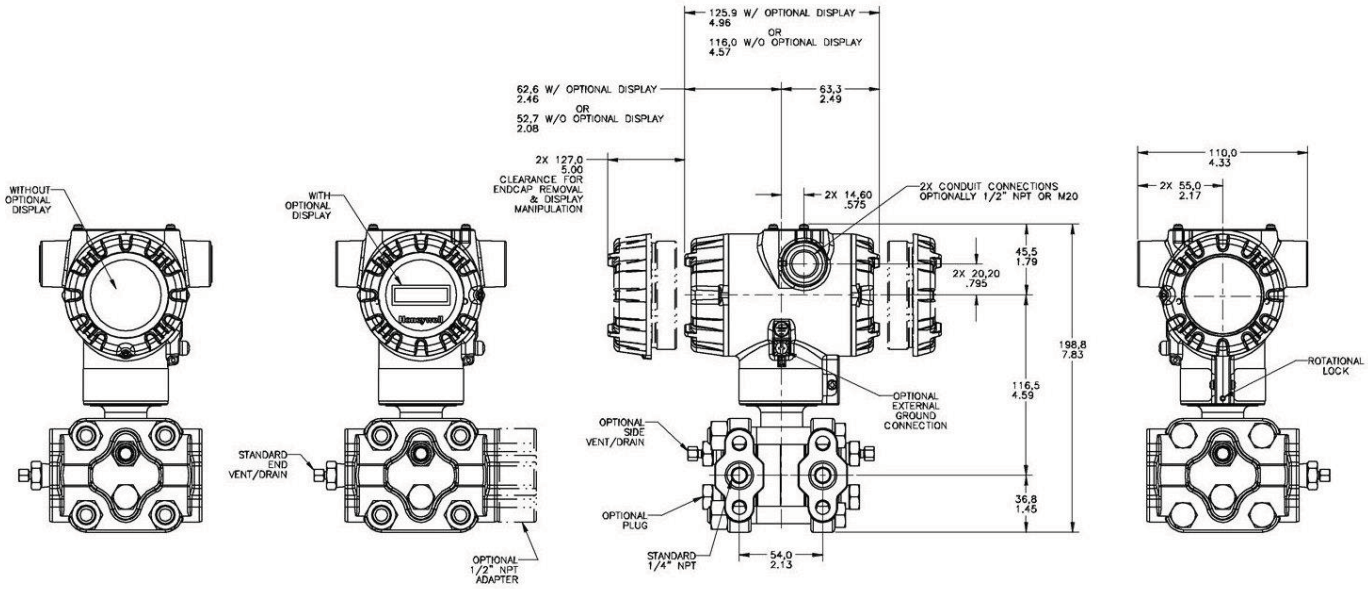

Figure 4 – Typical mounting dimensions of STD810, STD820, STD830 & STD870 for reference

Model Selection Guide

Model Selection Guides are subject to change and are inserted into the specifications as guidance only.

Model STD800
Differential Pressure Transmitter

Model Selection Guide:
34-ST-16-82 Issue 25

Instructions: Make selections from all Tables Key through XIII using column below the proper arrow. Asterisk indicates availability. Letter (a) refer to restrictions highlighted in the restrictions table. Tables delimited with dashes.

Key	I	II	III	IV	V	VI	VII	VIII (Optional)	IX
STD ___	- _____	- _	- _	- ___	- ___	- _	- ____	- __,__,__	- 0000

KEY NUMBER	URL	LRL	Max Span	Min Span	Units
Measurement Range	10 (25.0)	-10 (-25.0)	10 (25)	0.1 (0.25)	" H_2O (mbar)
	400/(1000)	-400/(-1000)	400/(1000)	1.0 (2.5)	" H_2O (mbar)
	100 (7.0)	-100 (-7.0)	100 (7.0)	1 (0.07)	psi (bar)
	3000 (210)	-100 (-7.0)	3000 (210)	30 (2.1)	psi (bar)

Selection	Availability			
STD810	↓			
STD820		↓		
STD830			↓	
STD870				↓

TABLE I	METER BODY SELECTIONS								
a. Process Wetted Heads & Diaphragm Materials	Process Head Material	Diaphragm Material							
	Plated Carbon Steel	316L Stainless Steel	A_____	*	*	*	*		
		Hastelloy® C-276	B_____		*	*	*		
		Monel® 400	C_____		*	*	*		
		Tantalum	D_____		a	a	a		
		Gold Plated Stainless Steel	1_____	*	*	*	*		
		Gold Plated Hastelloy C-276	2_____		*	*	*		
		Gold Plated Monel 400	3_____		*	*	*		
	316 Stainless Steel	316L Stainless Steel	E_____	*	*	*	*		
		Hastelloy C-276	F_____		*	*	*		
		Monel 400	G_____		*	*	*		
		Tantalum	H_____		a	a	a		
		Gold Plated Stainless Steel	4_____	*	*	*	*		
		Gold Plated Hastelloy C-276	5_____		*	*	*		
		Gold Plated Monel 400	6_____		*	*	*		
	Hastelloy C-276	Hastelloy C-276	J_____		*	*	*		
		Tantalum	K_____		a	a	a		
		Gold Plated Hastelloy C-276	7_____		*	*	*		
	Monel 400	Monel 400	L_____		a	a	a		
		Gold Plated Monel 400	8_____		a	a	a		
b. Fill Fluid	Silicone Oil 200		_1____	*	*	*	*		
	Fluorinated Oil CTFE		_2____		*	*	*		
	Silicone Oil 704		_3____		*	*	*		
	NEOBEE® M-20		_4____	*	*	*	*		
c. Process Connection	None	None (1/4" NPTF female thread Std)	___A___	*	*	*	*		
	1/2" NPT female	Materials to Match Head & Head Bolt Materials Selections [1]	___H___	*	*	*	*		
d. Bolt/Nut Materials	Carbon Steel		___C___	*	*	*	*		
	316 SS		___S___	*	*	*	*		
	Grade 660 (NACE A286) with NACE 304 SS Nuts		___N___	*	*	*	*		
	Grade 660 (NACE A286) Bolts & Nuts		___K___	p	p	p	p	p	
	Monel K500		___M___	p	p	p	p	p	
	Super Duplex		___D___	p	p	p	p	p	
	B7M		___B___	*	*	*	*		
e. Vent/Drain Type/Location	Head Type	Vent Type	Location	Vent Material					
	Single Ended	None	None	None	____1__	*	*	*	*
	Single Ended	Standard Vent	Side	Matches Head Material [1]	____2__	*	*	*	*
	Single Ended	Center Vent	Side	Stainless Steel Only	____3__	t	t	t	t
	Dual Ended	Standard Vent	End	Matches Head Material [1]	____4__	*	*	*	*
	Dual Ended	Center Vent	End	Stainless Steel Only	____5__	t	t	t	t
	Dual Ended	Std Vent/Plug	Side/End	Matches Head Material [1]	____6__	*	*	*	*
f. Gasket Material	Teflon® or PTFE (Glass Filled)				_____A_	*	*	*	*
	Viton® or Fluorocarbon Elastomer				_____B_	*	*	*	*
	Graphite				_____C_	*	*	*	*
g. Static Pressure	Standard Static Pressure - 4500 psig (310 bar) except STD810: 50 psi (3.5 bar)				______S	*	*	*	*
	High Pressure 6000 psi (415 bar)				______H		k	k	k

[1] Except Carbon Steel Heads shall use 316SS Vent/Drain, Plugs & Adapters when required

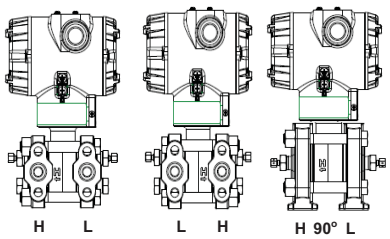

TABLE II	Meter Body & Connection Orientation		STD870	STD830	STD820	STD810
Head/Connect Orientation	Standard	High Side Left, Low Side Right[2] / Std Head Orientation	1	*	*	*	*
	Reversed	Low Side Left, High Side Right[2] / Std Head Orientation	2	*	*	*	*
	90/Standard	High Side Left, Low Side Right[2] / 90[0] Head Rotation	3	h	h	h	h

TABLE III	Agency Approvals (see data sheet for Approval Code Details)					
Approvals	No Approvals Required	0	*	*	*	*
	FM Explosion proof, Intrinsically Safe, Non-incendive, & Dustproof	A	*	*	*	*
	CSA Explosion proof, Intrinsically Safe, Non-incendive, & Dustproof	B	*	*	*	*
	ATEX Explosion proof, Intrinsically Safe & Non-incendive	C	*	*	*	*
	IECEx Explosion proof, Intrinsically Safe & Non-incendive	D	*	*	*	*
	SAEx Explosion proof, Intrinsically Safe & Non-incendive	E	*	*	*	*
	INMETRO Explosion proof, Intrinsically Safe & Non-incendive	F	*	*	*	*
	NEPSI Explosion proof, Intrinsically Safe & Non-incendive	G	*	*	*	*
	KOSHA Explosion proof, Intrinsically Safe & Non-incendive	H	*	*	*	*
	EAC Customs Union(Russia,Belarus,Kazakhstan)Ex Approval, Flame proof, Intrinsically Safe	I	*	*	*	*
	CCoE Explosion proof, Intrinsically Safe & Non-incendive	J	*	*	*	*
	UATR Flameproof, Intrinsically Safe & Dustproof	K	*	*	*	*

TABLE IV	TRANSMITTER ELECTRONICS SELECTIONS							
a. Electronic Housing Material & Connection Type	Material	Connection	Lightning Protection					
	Polyester Powder Coated Aluminum	1/2 NPT	None	A_ _	*	*	*	*
	Polyester Powder Coated Aluminum	M20	None	B_ _	*	*	*	*
	Polyester Powder Coated Aluminum	1/2 NPT	Yes	C_ _	*	*	*	*
	Polyester Powder Coated Aluminum	M20	Yes	D_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	1/2 NPT	None	E_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	M20	None	F_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	1/2 NPT	Yes	G_ _	*	*	*	*
	316 Stainless Steel (Grade CF8M)	M20	Yes	H_ _	*	*	*	*
b. Output/ Protocol	Analog Output	Digital Protocol						
	4-20mA dc	HART Protocol		_H_	*	*	*	*
	4-20mA dc	DE Protocol		_D_	u	u	u	u
	none	Foundation Fieldbus		_F_	*	*	*	*
c. Customer Interface Selections	Indicator	Ext Zero, Span & Config Buttons	Languages					
	None	None	None	_ _0	*	*	*	*
	None	Yes (Zero/Span Only)	None	_ _A	f	f	f	f
	Basic	None	English	_ _B	*	*	*	*
	Basic	Yes	English	_ _C	*	*	*	*
	Advanced	None	EN, GE, FR, IT, SP, RU, TU	_ _D	*	*	*	*
	Advanced	Yes	EN, GR, FR, IT,SP, RU, TU	_ _E	*	*	*	*
	Advanced	None	EN, CH, JP	_ _H	*	*	*	*
	Advanced	Yes	EN, CH, JP	_ _J	*	*	*	*

TABLE V	CONFIGURATION SELECTIONS							
a. Application Software	Diagnostics							
	Standard Diagnostics			1_ _	*	*	*	*
	Advanced Diagnostics (Above with Plugged Impulse Detection PILD)			2_ _	*	*	*	*
b. Output Limit, Failsafe & Write Protect Settings	Write Protect	Fail Mode	High & Low Output Limits[3]					
	Disabled	High> 21.0mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_1_	f	f	f	f
	Disabled	Low< 3.6mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_2_	f	f	f	f
	Enabled	High> 21.0mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_3_	f	f	f	f
	Enabled	Low< 3.6mAdc	Honeywell Std (3.8 - 20.8 mAdc)	_4_	f	f	f	f
	Enabled	N/A	N/A Fieldbus or Profibus	_5_	g	g	g	g
	Disabled	N/A	N/A Fieldbus or Profibus	_6_	g	g	g	g
c. General Configuration	Factory Standard			_ _S	*	*	*	*
	Custom Configuration (Unit Data Required from customer)			_ _C	*	*	*	*

[2] Left side/Right side as viewed from the customer connection perspective

[3] NAMUR Output Limits 3.8 - 20.5mAdc can be configured by the customer or select custom configuration Table Vc

TABLE VI	CALIBRATION & ACCURACY SELECTIONS				STD870	STD830	STD820	STD810
	Accuracy	Calibrated Range	Calibration Qty					
a. Accuracy and Calibration	Standard	Factory Std	Single Calibration	A	*	*	*	*
	Standard	Custom (Unit Data Required)	Single Calibration	B	*	*	*	*
	Standard	Custom (Unit Data Required)	Dual Calibration	C	*	*	*	*
	Standard	Custom (Unit Data Required)	Triple Calibration	D	*	*	*	*
	High Accuracy	Factory Std	Single Calibration	E		s	s	s
	High Accuracy	Custom (Unit Data Required)	Single Calibration	F		s	s	s
	High Accuracy	Custom (Unit Data Required)	Dual Calibration	G		s	s	s
	High Accuracy	Custom (Unit Data Required)	Triple Calibration	H		s	s	s

TABLE VII	ACCESSORY SELECTIONS						
	Bracket Type	Material					
a. Mounting Bracket	None	None	0 _ _ _	*	*	*	*
	Angle Bracket	Carbon Steel	1 _ _ _	*	*	*	*
	Angle Bracket	304 SS	2 _ _ _	*	*	*	*
	Angle Bracket	316 SS	3 _ _ _	*	*	*	*
	Marine Approved Bracket	Carbon Steel	8 _ _ _	*	*	*	*
	Marine Approved Bracket	304 SS	4 _ _ _	*	*	*	*
	Flat Bracket	Carbon Steel	5 _ _ _	*	*	*	*
	Flat Bracket	304 SS	6 _ _ _	*	*	*	*
	Flat Bracket	316 SS	7 _ _ _	*	*	*	*
b. Customer Tag	Customer Tag Type						
	No customer tag		_ 0 _ _	*	*	*	*
	One Wired Stainless Steel Tag (Up to 4 lines 26 char/line)		_ 1 _ _	*	*	*	*
	Two Wired Stainless Steel Tag (Up to 4 lines 26 char/line)		_ 2 _ _	*	*	*	*
c. Unassembled Conduit Plugs & Adapters	Unassembled Conduit Plugs & Adapters						
	No Conduit Plugs or Adapters Required		_ _ A0	*	*	*	*
	1/2 NPT Male to 3/4 NPT Female 316 SS Certified Conduit Adapter		_ _ A2	n	n	n	n
	1/2 NPT 316 SS Certified Conduit Plug		_ _ A6	n	n	n	n
	M20 316 SS Certified Conduit Plug		_ _ A7	m	m	m	m
	Minifast® 4 pin (1/2 NPT) (not suitable for X-Proof applications)		_ _ A8	n	n	n	n
	Minifast® 4 pin (M20) (not suitable for X-Proof applications)		_ _ A9	m	m	m	m

TABLE VIII	OTHER Certifications & Options: (String in sequence comma delimited (XX, XX, XX,....)						
Certifications & Warranty	None - No additional options		00	*	*	*	*	
	Low Temperature Rating (-50 deg C min. ambient operative temperature limit)		LT	w	w	w		
	NACE MR0175; MR0103; ISO15156 (FC33338) Process wetted parts only		FG	*	*	*	*	b
	NACE MR0175; MR0103; ISO15156 (FC33339) Process wetted and non-wetted parts		F7	c	c	c	c	
	Marine (DNV, ABS, BV, KR, LR)		MT	d	d	d	d	
	EN10204 Type 3.1 Material Traceability (FC33341)		FX	*	*	*	*	
	Certificate of Conformance (F3391)		F3	*	*	*	*	b
	Calibration Test Report & Certificate of Conformance (F3399)		F1	*	*	*	*	
	Certificate of Origin (F0195)		F5	*	*	*	*	
	FMEDA (SIL 2/3) Certification (FC33337)		FE	j	j	j	j	
	Over-Pressure Leak Test Certificate (1.5X MAWP) (F3392)		TP	*	*	*	*	
	Cert Clean for O_2 or CL_2 service per ASTM G93		OX	e	e	e	e	
	PMI Certification[1]		PM	*	*	*	*	
	Extended Warranty Additional 1 year		01	*	*	*	*	b
	Extended Warranty Additional 2 years		02	*	*	*	*	
	Extended Warranty Additional 3 years		03	*	*	*	*	
	Extended Warranty Additional 4 years		04	*	*	*	*	
	Extended Warranty Additional 15 years		15	*	*	*	*	

TABLE IX	Manufacturing Specials					
Factory	Factory Identification		0000	*	*	*	*

MODEL RESTRICTIONS

Restriction Letter	Available Only with		Not Available with	
	Table	Selection(s)	Table	Selection(s)
a			VIII	F7, FG
k			Ia	J,K,7,L,8 _ _ _ _ _ _
			Ic	_ _ H _ _ _ _ _
			Id	_ _ _ B,D,M,N,S _ _ _
			Ie	_ _ _ _ 1, 2, 3, 5, 6 _ _
			III	B- No CRN number available
			If	_ _ _ _ _ C _
c	1d	_ _ _ N,K,D,B _ _ _	Ia	D,H,K,L,8 _ _ _ _ _ _
d	IV a	C, D, G, H _ _	VIIa	1,2,3,5,6,7 _ _ _
e	Ib	_ 2 _ _ _ _ _		
f			IVb	_ F _
g			IVb	_ H, D _
h			Ie	_ _ _ _ 4, 5, 6 _ _
			VIIa	1,2,3,4,5,6,7,8 _ _ _
j	IVb	_ H _	Vb	_ 1,2,6 _
m	IV a	B, D, F, H _ _		
n	IV a	A, C, E, G _ _		
p			III	B- No CRN number available
t			Ia	J, K, 7, L, 8
s	Ia	A,E _ _ _ _ _ _		
u			Va	2 _ _
			VIa	C,D,G,H
v	IV a	C, D, G, H _ _	IVb	_D,F_
w	Ib	_1 _ _ _ _ _	VIII	FE
b	Select only one option from this group			

[1]The PM option is available on all Smartline Pressure Transmitter process wetted parts such as process heads, flanges, bushings and vent plugs except plated carbon steel process heads and flanges. PM option information is also available on diaphragms except Gold plated and STG and STA in-line construction pressure transmitters.

FIELD INSTALLABLE REPLACEMENT PARTS

Description	Kit Number
Integrally Mounted Basic Indicator Kit (Compatible with all Electronic Modules)	50049911-501
Integrally Mounted Advanced Indicator Kit (compatible with all Electronic Modules)	50049846-501
Terminal Strip w/o Lightening Protection for HART or DE Modules	50075472-531
Terminal Strip w/Lightning Protection Kit for HART or DE Modules	50075472-532
Terminal Strip w/o Lightening Protection FFB/*Profibus* Module	50075472-533
Terminal Strip w/Lightning Protection Kit for FFB/*Profibus* Module	50075472-534
HART Electronics Module	50049849-501
HART Electronics Module w/connection for external configuration buttons	50049849-502
DE Electronics Module	50049849-503
DE Electronics Module w/connection for external configuration buttons	50049849-504
FFB Electronics Module Kit	50049849-507
FFB Electronics Module w/connection for external configuration buttons	50049849-508

PRODUCT MANUALS

Description	Part Number
ST 800 Smart Transmitter User Manual - English	34-ST-25-35
ST 800 Smart Transmitter HART/DE Communications Manual - English	34-ST-25-38
ST 800 Smart Transmitter Safety Manual - English	34-ST-25-37
ST 800 Smart Transmitter Foundation Fieldbus Manual - English	34-ST-25-39
ST 800 Smart Transmitter Function Block Manual - English	34-ST-25-42

All product documentation is available at www.honeywellprocess.com.

Sales and Service

For application assistance, current specifications, ordering, pricing, and name of the nearest Authorized Distributor, contact one of the offices below.

ASIA PACIFIC

Honeywell Process Solutions,
Phone: + 800 12026455 or
+44 (0) 1202645583
(TAC) hfs-tac-support@honeywell.com

Australia
Honeywell Limited
Phone: +(61) 7-3846 1255
FAX: +(61) 7-3840 6481
Toll Free 1300-36-39-36
Toll Free Fax:
1300-36-04-70

China – PRC - Shanghai
Honeywell China Inc.
Phone: (86-21) 5257-4568
Fax: (86-21) 6237-2826

Singapore
Honeywell Pte Ltd.
Phone: +(65) 6580 3278
Fax: +(65) 6445-3033

South Korea
Honeywell Korea Co Ltd
Phone: +(822) 799 6114
Fax: +(822) 792 9015

EMEA

Honeywell Process Solutions,
Phone: + 800 12026455 or
+44 (0) 1202645583

Email: (Sales)
FP-Sales-Apps@Honeywell.com
or
(TAC)
hfs-tac-support@honeywell.com

Web
Knowledge Base search
engine http://bit.ly/2N5VIdi

AMERICAS

Honeywell Process Solutions,
Phone: (TAC) (800) 423-9883
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(Sales) 1-800-343-0228

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Web
Knowledge Base search
engine http://bit.ly/2N5VIdi

Specifications are subject to change without notice.

For more information
To learn more about SmartLine Pressure Transmitters, visit www.honeywellprocess.com
Or contact your Honeywell Account Manager

Process Solutions
Honeywell
1250 W Sam Houston Pkwy S
Houston, TX 77042

Honeywell Control Systems Ltd
Honeywell House, Skimped Hill Lane
Bracknell, England, RG12 1EB

Shanghai City Centre, 100 Jungi Road
Shanghai, China 20061

www.honeywellprocess.com

34-ST-03-82
Jan 2021

PRESSURE GAUGE

TECHNICAL DATA SHEET FOR PRESSURE GAUGE

Sr.	ITEM	DESCRIPTION
1	Manufacturer	Gauge Bourdon India Pvt. Ltd., Panvel
2	Type	Bourdon sensing Pressure Gauge
3	Model No.	BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-6)-KSC-L
4	Quantity	2 No.s
5	Dial Size	150 mm, Aluminium,white background with black marking
6	Location	Discharge & suction of UAF Pump
7	Case & Bezel	SS 304, Bayonet type Bezel, weatherproof to IP-68 as per IEC:60529
8	Windows	Shatterproof Glass
9	Bourdon	SS 316 Seamless
10	Socket	SS 316
11	Movement	SS 304
12	Range	1.5- 3 kg/cm² (Operating pressure Range) & 0- 6 kg/cm²(Instrument pressure Range)
13	Scale	Linear
14	Connection	1/2 " NPT (M)
15	Accuracy	±1% F.S.D
16	Over Range	130% F.S.D
17	Zero Reset	Provided (Micrometer Pointer)
18	Blow out Disc	Provided (Neoprene) on top of case
19	Tag Plate	SS Tag Plate provided

Bourdon Sensing Pressure Gauges

MODEL : BSPG (Dry Case)
LFBSPG (Liquid Filled Case)

Features

- Compliance to latest EN-837 standard
- Range : (-)1 to 1600 kg/cm²
- Bourdon in SS316 Ti as standard providing better mechanical properties guaranteeing repeatability and accuracy
- Accuracy ±1% FSD (Standard), ± 0.5% FSD on request
- Unit of measurement - kg/cm², bar, psi, kPa, MPa

- Pressure Gauges intended for Process Industries such as Chemicals, Petro-chemicals, Energy or Gas industry, Food processing, Nuclear etc.
- These pressure gauges have been designed to satisfy requirements to operate in aggressive environment.

Specifications

Ref. Standard	EN-837
Dial	100 mm / 150 mm in Aluminium, white background, black markings
Case	SS304 / SS316 with bayonet bezel Phenol with screwed bezel
Protection	IP-68 (IS:13947 part I / IEC:60529)
Window	Safety glass (Shatter proof / Toughened glass)
Bourdon	SS316, SS316 Ti, SS316L, Monel
Socket	22mm Square in SS316, SS316 Ti, SS316L, Monel
Movement	SS304, SS316
Range	As per EN 837 (refer table) minimum span 0.6 kg/cm2, maximum 1600 kg/cm2
Connection	1/2" NPT (M) as standard* (other optional)
Accuracy	±1% FSD (0.5% on request)
Over range	As per EN 837
Zero adjustment	Micrometer Pointer
Blow out disc	Provided (on top)
Temperature suitability	Ambient (-)20°C to 60°C, Media 200°C
Temperature Effect	Within ±0.4% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
Optional	IBR certification Maxima pointer NACE compliance External Knob for zero setting Built in Snubber Built in Gauge Saver Liquid filled Case (SS case only) Vacuum Protection CE Atex

* For ranges above 1000 bar, connection shall be 1/2"BSP(M) with Bottom Entry only

Ranges

Gauge	bar, kg/cm2	Least count
Vacuum	(-)1 to 0	0.02
	-760 to 0mmHg	20
Compound	(-)1 to 0.6	0.05
	(-)1 to 1.5	0.05
	(-)1 to 3	0.10
	(-) 1 to 5	0.10
	(-)1 to 9	0.20
	(-)1 to 15	0.50
	(-)1 to 24	0.50
	(-)1 to 39	1.0
Pressure	0 to 0.6	0.01
Gauge	0 to 1	0.02
('C' shaped	0 to 1.6	0.05
Bourdon)	0 to 2.5	0.05
	0 to 4	0.10
	0 to 6	0.10
	0 to 10	0.20
	0 to 16	0.50
	0 to 25	0.50
	0 to 40	1.0
	0 to 60	1.0
Pressure	0 to 100	2.0
Gauge	0 to 160	5.0
Coil type	0 to 250	5.0
Bourdon	0 to 400	10.0
	0 to 600	10.0
	0 to 800	20.0
	0 to 1000	20.0
	0 to 1600	50.0

For range other than above please contact our design dept.

The parameters mentioned here are the standard specifications/ values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing, Diaphragm Seal etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France

Ordering Information

MODEL

BASIC MODEL CODE

BSPG	Dry Case
LFBSPG	Liquid Filled Case

MOUNTING

V	Bottom Entry, Local Mounting
S	Bottom Entry, Surface Mounting
Y	Bottom Entry, 2" Pipe Mounting
C	Back Entry, Local Mounting
P	Back Entry, Flush Panel Mounting

DIAL SIZE

100 - 100 mm **150** - 150 mm

CASE

S4S	SS 304
S6S	SS 316
PHN	Phenolic

BOURDON

S6S	SS 316
S6L	SS 316L
S6T	SS 316Ti
MN4	Monel

SOCKET

S6S	SS 316
S6L	SS 316L
S6T	SS 316Ti
MN4	Monel

MOVEMENT

S4S	SS 304
S6S	SS 316

CONNECTION

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	**06**	NPS	**NS**	Male	**M**
		3/8"	**10**	NPT	**NT**	Female	**F**
		1/2"	**15**	BSP	**BP**		
		3/4"	**20**	BSPT	**BT**		
		1"	**25**	JIS-PF	**PF**		
		M20	**M20**	JIS-PT	**PT**		
				Gas	**GS**		
				R	**RR**		
				Rp	**RP**		
				Pitch 1.5	**C**		

e.g. For 1/2"NPT(M), Code: **T15NTM**
For M20x1.5 (F), Code: **TM20CF**

OPTION

A05	Accuracy ±0.5%FSD
ATX	Atex
BGS	Built In Gauge Saver
BOB	Blow out disc at back
BSN	Built In Snubber
CLB	Colour Band
CEM	CE marking
DC2	Silicone Oil Filled Case
DUS	Dual Scale
EXZ	External Knob for Zero Adjustment
FLG	Flanged Process Conn
GLY	Glycerine filled Case
IBR	IBR
MXP	Maxima pointer with Acrylic Window
NAC	NACE
OXY	O2 Cleaning
OR5	150% FSD Over range
PHD	Phenolic / Plastic Dial
S4D	SS DIAL (SS304)
S6D	SS DIAL (SS316)
VCP	Vacuum Protection
L	Nil
CSU	Chemical Seal
ACC	Accessory
XXX	Other

UNIT

KSC	kg/cm2(g)
BAR	bar(g)
PSI	psi(g)
KPA	kPa(g)
MPA	MPa(g)
MBR	mbar(g)
MMW	mm WC(g)
CMW	cm WC(g)
MWC	m WC(g)
INW	inch WC(g)
MMH	mm Hg(g)
CMH	cm Hg(g)
INH	inch Hg(g)
XXX	Other (Please specify)

RANGE

Please select from Table

FLG - FLANGE

Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	**F**	1/2"	**15**	150	**A**	RF	**RF**
		3/4"	**20**	300	**B**	FF	**FF**
		1"	**25**	600	**C**	RTJ	**RJ**
		1-1/2"	**40**	900	**D**	LT	**LT**
		2"	**50**	1500	**E**	LG	**LG**
		3"	**80**	2500	**F**		

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

Sample Model Code: BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-10)-BAR-BOB

TEMPERATURE GAUGE

TECHNICAL DATA SHEET FOR TEMPRATURE GAUGE		
S.no	**Description**	**Technical Specification**
1	Item	BIMETALLIC DIAL THERMOMETERS
2	Model	BDT-V-15-S4S-C10-150-S6S-15NTM- 0~80-DGC-TW(TWBT-01-S6S-30-20-11-T15NTF-T20NTM-150-50-4-0)
3	Manufacture	Gauges Bourdon (I) Pvt. Ltd.
4	Quantity	As per P&ID
5	Range	0 to 80 Degree
6	Dial Size	150mm
7	Accuracy	± 1% of FSD
8	Over Range Protection	130% of FSD
9	Bulb, Stem & Connection size	AISI 316 SS
10	Stem dia	10 mm
11	Enclosure	SS304 with bayonet type bezel ring, Weatherproof to IP68 as per IEC: 60529
12	Mounting	Bottom entry, local mounting
13	Standard Fitment	Zero adjustable pointer.
14	Connection Size	½" NPT (M)
15	Accessories	Thermowell Type: Bar Stock Material: SS 316 Process connection: ¾" NPT (M) Gauge connection: ½" NPT (F) Immersion length : As per Line Size. I D : 11 mm O.D: 20 mm

Bimetal Dial Thermometer

The Bimetal thermometer employs a bimetal strip in the form of helix (it works on the principle of thermal expansion - two metals having different coefficient of expansions are joined to form a bimetal. The resultant expansion of bimetal is proportional to temperature). Bimetal dial thermometers are simple in construction, yet rugged. They are used for measurement of temperature in most of the industrial applications. They are offered in the range of (-) 50°C to 600°C. With rigid stem having bottom or back entry. It can also be offered in every angle rotatable construction.

Features

- Rugged construction
- Bottom/Back entry, every angle construction
- Fast response
- Protection class IP-67
- Accuracy ± 1% FSD
- High repeatability, low hysteresis
- Hermetically sealed case

Specifications

Ref. Standard	ASME B 40.200, EN 13190
Dial	100 mm or 150 mm in aluminium white background, black markings
Case	SS304 with bayonet bezel / SS316 optional
Protection	Weatherproof to IP - 67 (IS/IEC : 60947 / IEC : 60529)
Window	Shatterproof glass
Pointer	Aluminium, black, micrometer adjustable
Stem	SS304 or SS316 in 6 mm, 8 mm, 10 mm, 12 mm dia and length from 100 mm to 1000 mm as standard
Connection	½" NPT (M) as standard in SS304 or SS316 adjustable three piece compression fitting
Range	(-) 50°C to 600°C with a minimum span of 60°C
Accuracy	± 1% FSD
Over range	125% FSD (upto max temp range of 500°C)
Reset	Micrometer Pointer (standard) External (optional)
Optional	1) Silicon Oil Filled Case (Suitable upto 339°C Max) 2) Contacts: Single SPST, normally open to close on rise / fall in temperature (specify action required) adjustable over the entire range, rating 30 VA @ 230 V AC (100 mm dial, back entry only)
Note	1) For minimum insertion length essential for proper sensing, contact our design department. 2) Three point calibration certificate accompanies each thermometer.

Under Technical Collaboration with M/s. Gauges Bourdon, U.K.

Ordering Information

MODEL : BDT

MOUNTING
V Bottom Entry, Local Mounting
C Back Entry, Local Mounting
E Every Angle, Local Mounting

DIAL
10 - 100 mm 15 - 150 mm

CASE
S4 SS304
S6 SS316

STEM-OD
A 6 mm C 10 mm
B 8 mm D 12 mm

STEM LENGTH
Specify in mm

STEM MATERIAL
S4 - SS304 S6 - SS316

CONNECTION

SIZE	TYPE	MALE / FEMALE	METRIC THREADS
6 1/4"	NT NPT	M Male	18 M - M 18 x 1.5
10 3/8"	BP BSP	F Female	20 M - M 20 x 1.5
15 1/2"	BT BSPT		24 M - M 24 x 1.5
20 3/4"	PF PF		X X - Any other
25 1"	GS Gas		
	NS NPS		

OPTION
A Thermowell
C Colour Band
D Dual Scale
E 1 SPST Electrical contact
S Silicon Oil Filled Case *

UNIT
C Deg C F Deg F

RANGE **

(-) 50 to (+) 30	0 to 200
(-) 30 to (+) 50	0 to 250
(-) 20 to (+) 60	0 to 300
0 to 60	0 to 350
0 to 80	0 to 400
0 to 100	0 to 500
0 to 120	0 to 600
0 to 160	

* Silicon Oil Filled Case shall be suitable up to maximum temperature of 339°C only.

** Ranges mentioned are in °C. Equivalent unit in °F can be provided on request.

FLOW METER

TECHNICAL DATASHEET OF FLOWMETER (ROTAMETER)		
S.NO	**DESCRIPTION**	**MATERIAL**
1	MAKE	INSTRUMENTATION ENGINEERS PVT. LTD.
2	IE BYPASS TYPE	Glass TUBE ROTAMETER
3	CONNECTION	1/2 : BSP(F)
4	INLET / OUTLET	REAR / REAR
5	FLOAT / TUBE	316SS / BOROSILICATE
6	FLOW RANGE / INSCRIPTION	90-600/M3/HR (CHILLED WATER)
7	END FITTING	316SS / BOROSILICATE
8	OPER. PRESS	35MWC
9	OPER. TEMP	12 DEG. C
10	SPECIFIC GRAVITY	1
11	ACCURACY	+/- 2 % OF FSD
12	WEATHER PROOF PROTECTION	IP-65
13	LINE SIZE	200MM
14	ACCESSORIES	AS REQUIRED
15	Quantity	1+1=2(inc mandatory spares)

FLOMETERS
The Measure of Excellence....

DESIGN SPECIFICATIONS

IE Glass Tube Variable Area Flow Meters

DESCRIPTION

IE Glass Tube Variable Area Flow Meters are intended for general in line and bypass metering applications where operating conditions are within the limitations of glass metering tubes. A wide range of capacities and options is available. These packed gland meters are constructed to withstand the stresses and vibrations inherent in industrial piping installations.

DESIGN FEATURES

- Dowel pin, side plate construction
- Detachable flow scales
- Precision bore ribbed borosilicate glass metering tubes
- Externally adjustable packing glands
- Connections can be rotated 360^{O} at 90^{O} intervals
- Laminated safety glass shielding
- 10 to 1 rangeability
- Scale length of 127 mm, 150 mm and 250 mm
- Standard floats are interchangeable in tubes of given flow meter size
- Wide choice of float types and capacity ranges

SPECIFICATIONS

WARNING: Do not operate this instrument in excess of the specifications listed below. Failure to heed warning may result in serious personal injury or damage to equipment.

Glass metering tubes are designed for operation up to the maximum operating pressures and temperatures as specified herein. Due to the inherent brittle characteristics of glass and conditions beyond our control, breakage could result below specified operating conditions. Possible glass tube breakage represents a potential hazard to operating personnel; therefore, operator protection should be supplied where operating pressures may exceed 50 psig. A customer supplied safety shield constructed of 1/2- inch acrylic plastic may be used or the glass tube meter may be replaced with an all-metal meter.

Capacities

150 mm scale (Table 4)
250 mm scale (Table 5)
250 mm scale, low-pressure drop floats (Table 6)
127 mm scale (Table 7)
127 mm scale, extension models (Table 8)

It is important to note that other capacity ranges are obtainable. Specific information on special ranges and capacities can be obtained from IE.

Performance

Industrial Accuracy: ±2% of full scale from 100% to 10% of scale reading.
Calibrated Accuracy: ±1% of full scale from 100% to 10% of scale reading.
Repeatability: 0.5% of full scale

Ratings

WARNING: Do not exceed the maximum pressures and temperatures given below. Exceeding these ratings could result in tube breakage and serious personal injury.

Table 1 - Pressure Ratings

Meter Size	Max. Operating Pressure (Kg/cm2g)
2	35.1
6	31.6
7	24.6
8	21.0
9	12.3
10	7.0
12	5
13	5

NOTES:

1. Maximum operating temperature rating is 121^{o}C for gas service and 93^{o}C for liquid service.
2. Pressure ratings are based on static pressure applicable at 121^{o}C
3. Fluid temperatures below 0^{o}C will cause frosting of the glass metering tube.
4. For safety reasons, glass tubes cannot be supplied for caustic services.

Instrumentation Engineers Pvt. Ltd.
Plots 1,2,3 Phase III, IDA Jeedimetla, Hyderabad 500 055
Tel: (40) 2309 5147 Fax: (40) 2309 6401
E-mail: sales@ieflowmeters.com

July 2008

Table 2 - Connections

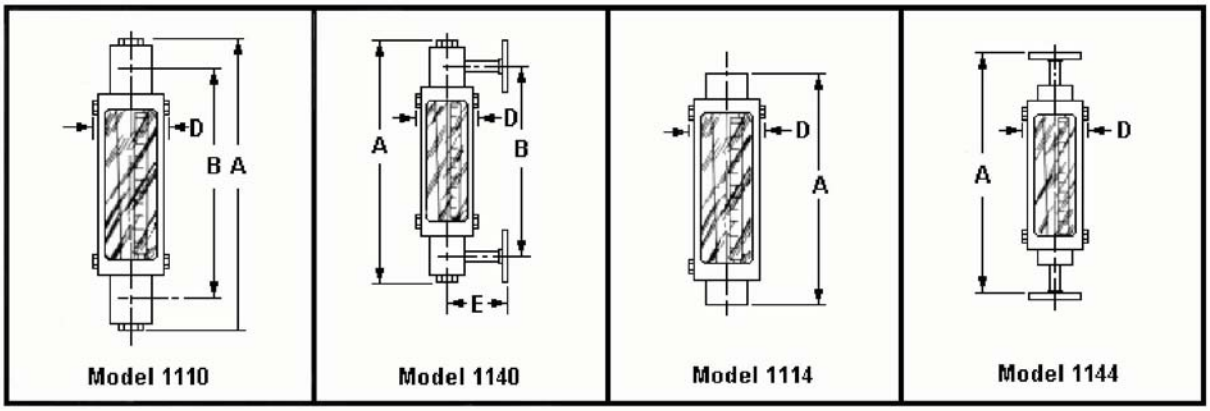
Meter Size	Model 1110 In & Out Horizontal (Screwed)	Model 1114 In & Out Vertical (Screwed)	Model 1140 In & Out Horizontal (Flanged)	Model 1144 In & Out Vertical (Flanged)
2 - 6	1/4”	1/4”	1/2”	1/2”
7 - 8	1/2”	1/2”	1/2”	1/2”
9	3/4”	3/4”	3/4”	3/4”
10	1”	1”	1”	1”
12	1-1/2”	1-1/2”	1-1/2”	1-1/2”
13	1-1/2”	2”	1-1/2”	2”

Pressure Drop
See Capacity Tables

Scales
Nominal lengths: 127mm, 150mm and 250 mm
Type: Standard: Detachable aluminium plate; Optional: Detachable 316 stainless steel plate
Graduations: Choice of direct reading, arbitrary millimetre or 0-100 linear with calibration curves or percentage of maximum flow with factor tag.

Materials of Construction
METERING TUBES
Borosilicate glass
FLOATS
Sizes 2-6: (Spherical) Tungsten Carbide, Glass or 316 Stainless Steel; Sizes 8-13: Standard: 316 Stainless Steel; Optional: Aluminium, Teflon or Hastelloy C
END FITTINGS
Steel, 316 stainless steel, hastelloy C, brass
PACKINGS
Standard: Neoprene; Optional: Viton, Teflon
O-RINGS
Standard: Neoprene; Optional: Viton, Teflon
SIDE PLATES
Standard: Steel; Optional: 316 Stainless Steel
GLAND RINGS
Standard: Steel; Optional: 316 Stainless Steel
WINDOW BEZELS
Standard: Aluminium; Optional: Stainless Steel
GLAND FOLLOWERS
Standard: Steel; Optional: 316 Stainless Steel
FASTNERS
304 Stainless Steel
SIDE PLATE GASKETS
Asbestos
COATINGS (Optional)
Epoxy painting of external surfaces of end fittings, gland rings, gland followers and both surfaces of side plates. (Window frames, bolts and dowel pins not coated.)

Figure 1 – Dimensions in mm (for Certified Prints write to Factory)



Meter Size	Model 1110 & 1140						Model 1114		Model 1144		All Meters
	Nominal Scale Length						Nominal Scale Length		Nominal Scale Length		
	127 MM			250 MM			127 MM	250 MM	127 MM	250 MM	
	A	B	E	A	B	E	A	A	A	A	D
2-6*	257.2	218.3	88.9	-	-	-	244.5	-	377.8	-	61.9
7&8	390.5	292.1	88.9	517.5	419.1	88.9	304.8	431.8	454	581	82.6
9	431.8	317.5	101.6	558.8	444.5	101.6	311.2	438.2	450.9	577.9	95.3
10	454	317.5	101.6	581	444.5	101.6	311.2	438.2	444.5	571.5	112.7
12	511.2	393.7	127	638.2	520.7	127	403.2	530.2	542.9	669.9	112.7
13	539.8	393.7	127	666.8	520.7	127	384.2	511.2	523.9	650.9	123.8

*Available in 150 MM scale length only and dimensions are identical to 127 MM meters.

Table 4 – Capacities (150mm Tubes)

Meter Size	Tube Number	Float Number	Maximum Flow Rates					
			Water		Air	H_2	He	
			CCM	ΔP (iwc)	SLPM			ΔP (iwc)
2	R-2-15-AAA	G2	0.54	0.1	0.049	0.102	0.0444	0.18
		S2	2.49	0.58	0.146	0.322	0.144	0.67
		C2	4.9	1.16	0.245	0.594	0.268	1.24
	R-2-15-AA	G2	1.11	0.1	0.096	0.209	0.0916	0.18
		S2	4.93	0.58	0.265	0.631	0.293	0.67
		C2	9.33	1.16	0.43	1.12	0.533	1.24
	R-2-15-D	G2	5.75	0.1	0.37	1.03	0.491	0.18
		S2	20.6	0.58	0.82	2.52	1.39	0.67
		C2	33.2	1.16	1.22	3.88	2.28	1.24
	R-2-15-A	G2	18.3	0.1	0.95	2.63	1.54	0.18
		S2	52.1	0.58	1.9	5.57	3.42	0.67
		C2	81.8	1.16	2.8	8.2	5.16	1.24
	R-2-15-B	G2	52.8	0.1	2.35	8.01	5.02	0.18
		S2	133	0.58	4.6	15.9	10.3	0.67
		C2	199	1.16	6.6	22.9	14.9	1.24
	R-2-15-C	G2	84.6	0.1	3.8	12.9	8	0.18
		S2	218	0.58	7.6	26.1	16.7	0.67
		C2	326	1.16	10.4	37.6	24.4	1.24
6	R-6-15-A	G6	200	0.2	8.6	29.9	19.2	0.36
		S6	493	1.17	16.4	58.9	38.3	1.34
		C6	726	2.32	23	83.3	55.2	2.49
	R-6-15-B	G6	573	0.2	23.5	85.9	55.3	0.36
		S6	1350	1.17	43	160	109	1.34
		C6	1950	2.32	60	222	152	2.49

Table 6 – Capacities (250mm Tubes Low Pressure Drop)

Meter Size	Tube Number	Float Number	Float Material	Maximum Flow Rates		
				Air SLPM	H2O LPM	ΔP (iwc)
7	R-7M-25-1	SPOOL	Aluminum	11.3	0.36	0.59
			316 SS	19.5	0.63	1.61
8	R-8M-25-2	8-RV-2	Aluminum	25.1	0.81	0.8
			316 SS	44.6	1.44	1.61
	R-8M-25-4		Aluminum	34.1	1.10	1.05
			316 SS	62.2	2.00	1.49
9	R-9M-25-1	SPOOL	Aluminum	103.9	3.35	0.93
			316 SS	161.3	5.20	2.41
	R-9M-25-3		Aluminum	128.7	4.15	1
			316 SS	195.4	6.29	2.81
10	R-10M-25-1	10-RV-15	Aluminum	163.3	5.26	0.8
			316 SS	254.8	8.21	1.61
	R-10M-25-3		Aluminum	221.8	7.14	1.13
			316 SS	340.8	10.98	1.89
12	R-12M-25-4	12-RV-65	Aluminum	340.6	10.97	1.21
			316 SS	599.1	19.30	2.17
	R-12M-25-5		Aluminum	617.4	19.89	1.29
			316 SS	1087.7	35.03	2.57
13	R-13M-25-1	13-RV-168	Aluminum	700	22.55	1.81
			316 SS	1310.3	42.20	3.72
	R-13M-25-3		Aluminum	1077	34.69	2.21
			316 SS	2091.1	67.35	4.9

Table 5 Capacities (250mm Tubes)

Meter Size	Tube Number	Float Number	Maximum Flow Rates					Meter Size	Tube Number	Float Number	Maximum Flow Rates				
			Water			Air					Water			Air	
			LPM	ΔP (iwc)	VIS LIMIT	SLPM	ΔP (iwc)				LPM	ΔP (iwc)	VIS LIMIT	SLPM	ΔP (iwc)
6	R-6M-25-1A	G6	0.28	0.2	1	12.3	0.36	10	R-10M-25-1	10-RV-64	17.18	8	14	511.18	9
		S6	0.68	1.17	1	22.8	1.34			10-RV-138*	24.3	17	22	753.31	19
7	R-7M-25-1	G7	0.58	-	1	24	-			10-RS-64	21.35	15	3.7	662.78	17
		S7	1.48	-	1	50	-			10-RS-138*	30.36	21	5	942.47	23
8	R-8M-25-2	8-RV-3	2.08	2	2	62.87	3			10-LJ-238*	56.43	52	1	1752.15	59
		8-RV-8	2.95	5	3.3	91.19	6		R-10M-25-3	10-RV-64	23.77	11	15	729.52	13
		8-RV-14	3.94	8	4.6	121.21	9			10-RV-138*	33.46	23	23	1022.35	26
		8-RV-31*	5.68	17	6	173.32	19			10-RS-64	29.67	15	3.7	910.49	17
		8-RS-8	3.79	6	1.7	117.51	7			10-RS-138*	41.37	29	5.5	1284.44	33
		8-RS-14	5	11	1.8	155.19	12			10-LJ-238*	87.43	98	1	2714.6	112
		8-RS-31*	7.15	22	2.6	219.76	25	12	R-12M-25-4	12-RV-221	35.31	8	28	1070.78	9
		8-LJ-48*	11.39	45	1	353.72	51			12-RV-343*	44.32	12	35	1334.44	14
	R-8M-25-4	8-RV-3	2.95	4	2	89.77	4			12-RS-221	47.16	9	4	1434.41	10
		8-RV-8	4.13	7	3.7	126.02	8			12-RS-343*	58.4	13	4.3	1777.08	15
		8-RV-14	5.49	12	5.4	166.52	14			12-LJ-740*	113.55	31	1	3491.86	36
		8-RV-31*	7.8	23	7	235.62	28		R-12M-25-5	12-RV-221	65.14	10	29	2022.44	11
		8-RS-8	5.3	10	1.8	164.52	11			12-RV-343*	79.3	15	36	2448.26	17
		8-RS-14	6.93	17	1.9	214.1	19			12-RS-221	84.78	12	4.2	2601.19	14
		8-RS-31*	9.8	33	3.1	301.89	37			12-RS-343*	101.82	18	4.5	3161.16	20
		8-LJ-48*	18.47	93	1	573.47	106			12-LJ-740*	255.83	65	1	7944.05	75
9	R-9M-25-1	9-RV-33	7.19	5	10	223.28	6	13	R-13M-25-1	13-RV-510	75.47	12	40	2309.5	14
		9-RV-87*	11.66	12	15	355.7	14			13-RV-760*	90.05	18	50	2718.72	20
		9-RS-33	9.54	7	2.4	296.23	8			13-RS-510	101.78	15	7.3	3067.06	17
		9-RS-87*	15.29	14	3.4	476.91	16			13-RS-760*	120.55	21	9	3709.92	24
		9-LJ-160*	26.04	31	1	808.5	35			13-LJ-1394	206.66	46	1	-	-
	R-9M-25-3	9-RV-33	9.58	6	11	295.94	7		R-13M-25-3	13-RV-510	120.29	17	42	3707.09	19
		9-RV-87*	14.84	14	17	460.2	16			13-RV-760*	142.32	24	52	4395.27	27
		9-RS-33	12.26	7	2.4	380.9	8			13-RS-510	153.29	23	6.6	4759.23	26
		9-RS-87*	19.38	17	3.5	600.38	20			13-RS-760*	187.55	32	9.3	5822.89	36
		9-LJ-160*	36.53	43	1	1134.02	49			13-LJ-1394	373.2	92	1	-	-

* - These floats are not recommended for gas service unless operating pressure (downstream) exceeds 30 psig
All gas flows are at 14.7 psia and 70°F

Table 7 - Capacities (127mm Tubes)

Meter Size	Tube Number	Float Number	Maximum Flow Rate				
			Water			Air	
			LPM	DP IWC	VIS. LIMIT	SLPM	DP IWC
8	R-8M-127-1	8-RV-3	1.9	2	2	58.1	2
		8-RV-8	2.8	3	3.3	85.2	4
		8-RV-14	3.6	6	4.6	111.9	6
		8-RV-31*	5.2	11	6	158.6	13
		8-RS-8	3.5	4	1.7	108	4
		8-RS-14	4.6	6	1.8	142.5	7
		8-RS-31*	6.4	13	2.6	197.7	15
		8-LJ-48*	9.8	22	1	304.2	25
	R-8M-127-4	8-RV-3	2.7	2	2	83.3	2
		8-RV-8	3.9	4	3.7	118.7	5
		8-RV-14	5.1	7	5.4	154.6	8
		8-RV-31*	7	14	7	213.3	15
		8-RS-8	4.9	5	1.8	152.7	6
		8-RS-14	6.4	8	1.9	197.7	10
		8-RS-31*	8.7	16	3.1	267.6	18
		8-LJ-48*	16.7	35	1	512.6	40
9	R-9M-127-1	9-RV-33	6.4	4.6	10	198.2	6
		9-RV-87*	10	11.5	15	310	13
		9-RS-33	8.3	5.3	2.3	256.3	6
		9-RS-87*	13.1	13	3.4	406	15
		9-LJ-160*	22.4	26.6	1	694	31
10	R-10M-127-1	10-RV-64	16.2	7	14	502	8
		10-RV-138*	22.5	14	22	697	16
		10-RS-64	20.4	8.4	3	634	10
		10-RS-138*	28.1	16.2	5	870	19
		10-LJ-238*	51.7	36	1	1604	41
	R-10M-127-3	10-RV-64	22.8	9.2	15	689	11
		10-RV-138*	30.3	17.2	23	941	20
		10-RS-64	28.6	11.4	3.7	872.3	13
		10-RS-138*	37.6	21	5.5	1179	24
		10-LJ-238*	85.1	61	1	2640	70
12	R-12M-127-1	12-RV-221	32.6	8	28	997.7	9
		12-RV-343*	40.7	12	35.5	1233.3	14
		12-RS-221	43.5	8	4	1333.9	10
		12-RS-343*	52.9	13	4.3	1605.7	15
		12-LJ-740*	92	28	1	2826.3	32
	R-12M-127-3	12-RV-221	62.9	10	29	1915.9	11
		12-RV-343*	74.5	14	36	2274.1	17
		12-RS-221	82.6	12	4.2	2540.3	13
		12-RS-343*	93.6	16	4.5	2883	19
		12-LJ-740*	272.5	57	1	-	-
13	R-13M-127-1	13-RV-510	73	12	40	2216	14
		13-RV-760*	86.7	17	50	2628.1	20
		13-RS-510	99.4	14	7.3	2982.1	16
		13-RS-760*	118.5	20	9	3571.2	23
		13-LJ-1394*	179.6	38	1	-	-
	R-13M-127-3	13-RV-510	115.1	16	42	3540	18
		13-RV-760*	132.1	22	52	4083.7	25
		13-RS-510	156.3	20	7.6	4853	23
		13-RS-760*	176	27	9.3	5464	31
		13-LJ-1394*	355	70	1	-	-

Table 8 - Capacities (127mm Tubes extension floats)

Meter Size	Tube Number	Float Number	Maximum Flow Rates				
			Water			Air	
			LPM	DP IWC	VIS. LIMIT	SLPM	DP IWC
8	R-8M-127-1	8-EV-30	5.7	11	8.5	176.3	12.6
		8-ES-30	7.6	13	1.4	235	14.5
		8-EV-135*	12.1	46.7	13.8	376	52.5
		8-ES-135*	15.1	52.9	2	470.1	64.9
	R-8M-127-4	8-EV-30	8.7	14	11.4	270.3	14.5
		8-ES-30	10.6	16	1.7	329	17.5
		8-EV-135*	18.9	63.4	17.8	587.6	68
		8-ES-135*	21.6	66.4	2.5	669.8	75.2
9	R-9M-127-1	9-EV-60	10.6	8.1	12.8	329	9.5
		9-ES-60	14.4	9.1	2	446.6	10.6
		9-EV-190*	17	25	16.8	528.8	26.4
		9-ES-190*	22.7	27.3	2.5	705.1	32.7
10	R-10M-127-1	10-EV-100	22.7	10.2	19.5	705.1	12
		10-ES-100	28.4	12.4	2.8	881.4	14.3
		10-EV-270*	34.1	25.5	24.5	1057.6	30.7
		10-ES-270*	49.2	31.1	3.8	1527.7	34.7
	R-10M-127-3	10-EV-100	30.3	13.2	23	940.1	15.3
		10-ES-100	39.7	16.1	3.4	1233.9	17.3
		10-EV-270*	51.1	31.9	30	1586.5	35.7
		10-ES-270*	68.1	38.2	4.4	2115.3	37.7
12	R-12M-127-1	12-EV-285	41.6	9.9	27	1292.7	11.6
		12-ES-285	53	10.6	3.9	1645.2	12.6
		12-EV-453*	56.8	15	32	1762.7	18.3
		12-ES-453*	75.7	17.3	4.7	2350.3	19.3
	R-12M-127-3	12-EV-285	83.3	11.9	39	2585.3	14.2
		12-ES-285	106	17	44	3290.4	22.6
		12-EV-453*	113.6	13.9	5.8	3525.5	16.2
		12-ES-453*	143.8	19	6.6	4465.6	24.6
13	R-13M-127-1	13-EV-505	132.5	15.9	50	4113	17.9
		13-ES-505	170.3	19.9	7.2	5288.2	22.9
		13-EV-865*	174.1	23.1	59	5405.7	28.7
		13-ES-865*	227.1	30.7	8.5	7050.9	33.7

* - These floats are not recommended for gas service unless operating pressure (downstream) exceeds 30 psig
All gas flows are at 14.7 psia and 70°F

Capacities (Float Size 2) PF Floats

Maximum Flow Rates						
Meter Size	Tube Number	Float Number	Water		Air	
			CCM	ΔP (IWC)	SLPM	ΔP (IWC)
2	R-2-15-AAA	PF1	3.74	0.58	0.21	0.67
		PF2	4.98		0.29	
	R-2-15-AA	PF1	7.4		0.39	
		PF2	9.86		0.53	
	R-2-15-A	PF1	78.5		2.85	
		PF2	104.2		3.8	
	R-2-15-B	PF1	199.5		6.9	
		PF2	266		9.2	
	R-2-15-C	PF1	327		11.4	
		PF2	436		15.2	

* All air flows are at 14.7 psia and 70°F

TEMPERATURE CUM RELATIVE HUMIDITY SENSOR

Sr. No	Area	Abbr.	KKS Code No.	Instrument_Type	Service	Line size (mm)	Location	Manufacturer /Vendor Name	Instrument Range	PROCESS RANGE	SET POINT/CALIBRATION	Model Number	REF_P&ID_NO
12	HVAC	HS	10SAG12CU001	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	0.6	QFM2171	PE-V0-417-554-A021
13	HVAC	HS	10SAG12CU002	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	0.6	QFM2171	PE-V0-417-554-A021
14	HVAC	HS	10SAG12CU003	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	0.6	QFM2171	PE-V0-417-554-A021
15	HVAC	HS	10SAG12CU004	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	0.6	QFM2171	PE-V0-417-554-A021
3	HVAC	HS	30SAG12CU001	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	30SAG12CU002	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	HS	30SAG12CU003	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
6	HVAC	HS	30SAG12CU004	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
3	HVAC	HS	50SAG12CU001	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	50SAG12CU002	Humidity Sensor	HS AT LV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
5	HVAC	HS	50SAG12CU003	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
6	HVAC	HS	50SAG12CU004	Humidity Sensor	HS AT MV Switchgear Room For AWU-1	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
3	HVAC	HS	50SAG14CU001	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	50SAG14CU002	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
3	HVAC	HS	10SAG14CU001	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	10SAG14CU002	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
3	HVAC	HS	30SAG14CU001	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	30SAG14CU002	Humidity Sensor	HS AT Auxilary Boiler MCC For AWU-3	NA	MPH Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
3	HVAC	HS	10SAF12CU001	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	10SAF12CU002	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
3	HVAC	HS	20SAF12CU001	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	20SAF12CU002	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
3	HVAC	HS	30SAF12CU001	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	30SAF12CU002	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
3	HVAC	HS	20SAF12CU001	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	20SAF12CU002	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
3	HVAC	HS	20SAF12CU001	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021
4	HVAC	HS	20SAF12CU002	Humidity Sensor	HS AT UAF Fan Outlet Of UAF	NA	ESP Building	SIEMENS	0 - 100 %	0 - 100 %	60%	QFM2171	PE-V0-417-554-A021

TECHNICAL DATASHEET OF TEMPERATURE CUM RH SENSOR		
S.no	**Description**	**Technical specifications**
1	Manufacturer	SIEMENS
2	Model No.	QFM2171
3	Quantity	1 No.s
4	Instrument Range	TEMPERATURE 0 - 50 DEGREE C , RH - 0 - 100%
5	Purpose of Measurement	TEMPERATURE + RH
6	Range	TEMPERATURE 0 - 50 DEGREE C , RH - 0 - 100%
7	Accuracy	(+/-)0.2°C) & (+/-) 3% for RH.(30% to 70%)
8	Process connection	NA
9	Repeatability	(+/-) 0.8K & (+/-) 5%
10	Maximum Process value	28 Degree C & 55% RH
11	Design Process value	27 Degree C (Normal) & 45% RH (Min)
12	Cable gland type	Double compression Brass
13	Cable Entry Type & Size	3C X 1.5 sqmm
14	Sensor	NTC-10K (inbuilt)
15	Sensor material	semiconducting material (metal oxides)
16	Housing Material	Fibre glass reinforced Polycarbonate
17	Mounting Type	DUCT Mounted / Wall Mounted
18	Signal type	4 - 20 mA
19	Ambient Temperature	(-)30 to +85 degree Centigrade
20	INPUT POWER	24VDC (from microcontroller)
21	Mandatory Spares	2 Nos. of Temperature cum RH sensor

Symaro™

Duct sensors

QFM21...

for relative humidity and temperature

- **Operating voltage AC 24 V / DC 13.5...35 V**
- **Signal output DC 0...10 V / 4…20 mA for relative humidity**
- **Signal output DC 0...10 V / 4…20 mA / T1 / LG-Ni 1000 for temperature**
- **Measuring accuracy ±3 % r. h. within the comfort range**
- **Range of use –15…+60 °C / 0…95 % r. h. (non-condensing)**

Use

The QFM21… duct sensors are for use in air ducts of ventilation and air conditioning plant for acquiring:

- The relative humidity and
- The temperature.

The sensors are used as:

- Control sensors in the supply or extract air
- Reference sensors, e.g. for shifting the dew point
- Limit sensors, e.g. in connection with steam humidifiers
- Limit sensors, e.g. for measured value indication or for connection to a building automation and control system
- Sensors for enthalpy and absolute humidity, together with SEZ220 (see Data Sheet N5146)

Type summary

Type reference	*Temperature measuring range*	*Temperature signal output*	*Humidity measuring range*	*Humidity signal output*	*Operating voltage*
QFM2100	None	None	0...100 %	active, DC 0...10 V	AC 24 V or DC 13.5…35 V
QFM2101	None	None	0...100 %	active, 4…20 mA	DC 13.5…35 V
QFM2120	−35...+50 °C	passive, LG-Ni 1000	0...100 %	active, DC 0...10 V	AC 24 V or DC 13.5…35 V
QFM2140	−35...+50 °C	passive, T1 (PTC)	0...100 %	active, DC 0...10 V	AC 24 V or DC 13.5…35 V
QFM2160	0...50 °C / −35...+35 °C or −40...+70 °C	active, DC 0...10 V	0...100 %	active, DC 0...10 V	AC 24 V or DC 13.5…35 V
QFM2171	0...50 °C / −35...+35 °C or −40...+70 °C	active, 4…20 mA	0...100 %	active, 4…20 mA	DC 13.5…35 V

Ordering and delivery

When ordering, please give name and type reference, e.g.:
Duct sensor **QFM2120**
The sensor is supplied with mounting flange and cable entry gland M16.

Equipment combinations

All systems and devices capable of acquiring and handling the sensor's DC 0...10 V, 4...20 mA, LG-Ni 1000 or T1 output signal.
When using the sensors for minimum or maximum selection, for averageing, or to calculate enthalpy, enthalpy difference, absolute humidity, and dewpoint, we recommend to use the SEZ220 signal converter (see Data Sheet N5146).

Function

Relative humidity

The sensor acquires the relative humidity in the air duct via its capacitive humidity sensing element whose electrical capacitance changes as a function of the relative humidity.
The electronic measuring circuit converts the sensor's signal to a continuous DC 0...10 V or 4…20 mA signal, which corresponds to 0...100 % r. h.

Temperature

The sensor acquires the temperature in the air duct via its sensing element whose electrical resistance changes as a function of the temperature.
Depending on the type of sensor this change in resistance is converted either to an active DC 0…10 V or 4…20 mA output signal corresponding to a temperature range of 0… 50 °C, –35…+35 °C, or –40...+70 °C. The measuring range can be selected. The temperature is provided as a simulated passive LG-Ni 1000- or T1-output signal (≙ –35…50 °C) as an alternative to the active output signal.

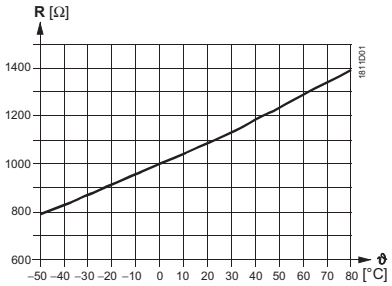
Simulated passive output signal

The measuring current of systems / devices for acquiring the electrical resistance of the passive sensor differs greatly and impacts self-heating of the temperature sensing element at the end of the measuring tip. To compensate the impact, the passive output signal is simulated with an electronic circuit.

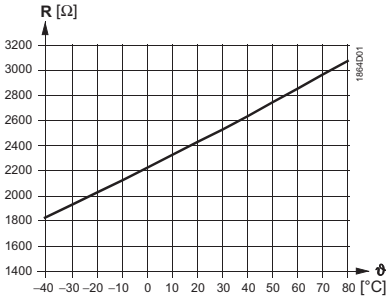
Sensing elements, simulated

Characteristic:

LG-Ni 1000



T1 (PTC)

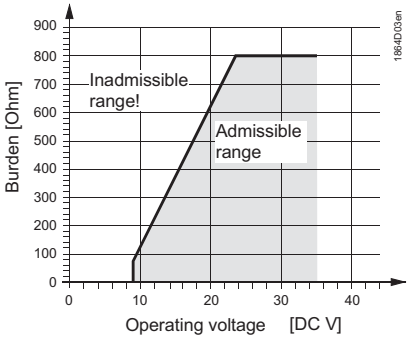


Legend

R	Resistance value in Ohm
ϑ	Temperature in degrees Celsius

Burden diagram

Output signal, terminal I1 / I2

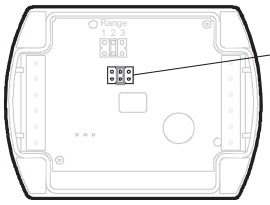


Mechanical design

The duct sensor consists of a housing, a printed circuit board, connection terminals, a mounting flange and an immersion rod having a measuring tip.
The 2-sectional housing comprises a base and a removable cover (snap-on design).
The measuring circuit and the setting element are located on the printed circuit board inside the cover, the connection terminals on the base.
The sensing elements are located at the end of the measuring tip and protected by a filter cap.
Cable entry is made via the screwed cable gland M16 supplied with the sensor.
Immersion rod and housing are made of plastic and are rigidly connected.

The sensor is fitted with the mounting flange supplied with the sensor. The flange is to be placed over the immersion rod and then secured in accordance with the required immersion length.

Setting element



Measuring range 1|2|3


	Test function active				
	U1	U2	BS-MS	I1	I2
	10 V	5 V	⏏ 20 °C	20 mA	12 mA
	5 V	10 V	⏏ 75 °C	12 mA	20 mA
	0 V	5 V	⏏ 20 °C	4 mA	12 mA
	5 V	0 V	⏏ –35 °C	12 mA	4 mA

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The setting element is located inside the cover. It comprises 6 pins and a jumper. It is used to select the required measuring range and to activate the test function.

The different jumper settings have the following meaning:

- *For the passive temperature measuring range:*
  Jumper in the middle position (R2) = –35...+50 °C (factory setting)
- *For the active temperature measuring range:*
  Jumper in the left position (R1) = –35...+35 °C,
  Jumper in the middle position (R2) = 0...50 °C (factory setting)
  Jumper in the right position (R3) = –40...+70 °C
- *For activating the test function:*
  Jumper in the horizontal position: The values according to the table "Test function active" will be made available at the signal output.

Malfunction

- Should the temperature sensor become faulty a voltage of 0 V (4 mA) will be applied at signal output U2 (I2) or signal output BS-MS becomes high impedance (>1 MΩ) after 60 seconds, and the humidity signal at signal output U1 (I1) will reach 10 V (20 mA).
- Should the humidity sensor become faulty a voltage of 10 V (20 mA) will be applied at signal output U1 (I1) after 60 seconds, and the temperature signal will remain active.

Accessories

Name	*Type reference*
Filter cap (for replacement)	**AQF3101**

Engineering notes

A transformer for safety extra low-voltage (SELV) with separate windings for 100 % duty is required to power the sensor. When sizing and protecting the transformer, local safety regulations must be complied with.
When sizing the transformer, the power consumption of the duct sensor must be taken into consideration.
For correct wiring, refer to the Data Sheets of the devices with which the sensor is used.
The permissible cable lengths must be considered.

Cable routing and cable selection

It must be considered for routing of cables that the longer the cables run side by side and the smaller the distance between them, the greater electrical interference. Shielded cables must be used in environments with EMC problems.
Twisted pair cables are required for the secondary supply lines and the signal lines.

Note to **QFM2171**

Terminals G1(+) and I1(–) of the humidity output must always be connected to power, even if only terminals G2(+) and I2(–) of the temperature output are used!

Mounting notes

Location	Mount the sensor in the center of the duct wall. If used together with steam humidifiers, the minimum distance after the humidifier must be 3 m to max 10 m. Fit the sensor in the extract air duct if the application involves dew point shifting. Fit only the flange to the duct wall. The sensor is then inserted through the flange and engaged.
Caution!	• To ensure degree of protection IP 54, fit the sensor with the cable entry pointing downward. • The sensing elements inside the measuring tip are sensitive to impact. Avoid any impact on mounting.
Mounting instructions	The mounting instructions are printed on the inside of the package of the device.

Commissioning notes

Check wiring before switching on power. The temperature measuring range must be selected on the sensor, if required.
Wiring and the output signals can be checked by making use of the test function (refer to "Mechanical design").

We recommend not to use voltmeters or ohmmeters directly at the sensing element. In the case of the simulated passive output signals, measurements with commercially available meters cannot be made (measuring current too small).

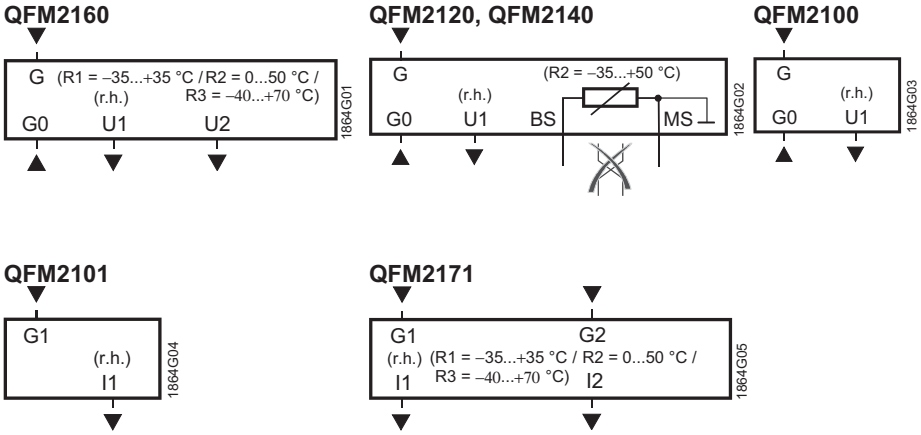
Technical data

Power supply	Operating voltage	AC 24 V ±20 % or DC 13.5...35 V
	Frequency	50/60 Hz at AC 24 V
	Power consumption	≤1 VA
Cable lengths for measuring signal	Perm. cable lengths	See data sheet of the device handling the signal
Functional data of humidity sensor	Range of use	0…95 % r. h. (non-condensing)
	Measuring range	0…100 % r. h.
	Measuring accuracy at 23 °C and AC/DC 24 V in 0...95 % r. h. 30...70 % r. h.	 ±5 % r. h. ±3 %, r. h. typically
	Temperature dependency	≤0.1 % r. h./°C
	Time constant at 0...50 °C and 10...80 % r.h.	< 20 s
	Perm. air velocity	20 m/s
	Output signal, linear (terminal U1)	DC 0...10 V ≙ 0...100 % r. h., max. ±1 mA
	Output signal, linear (terminal I1) Burden	4…20 mA ≙ 0...100 % r. h. See "Function"
Functional data of temperature sensor with QFM2160, QFM2171	Measuring range	0...50 °C (R2 = factory setting), −35...+35 °C (R1) or −40…+70 °C (R3)
	Sensing element	NTC 10 kΩ
	Measuring accuracy at AC/DC 24 V in 15...35 °C −35...+50 °C	 ±0.8 K ±1 K
	Time constant	< 3.5 min. in with 2 m/s moved air
	Output signal, linear (terminal U2)	DC 0...10 V ≙ 0...50 °C /−35...+35 °C /−40...+70 °C max. ±1 mA

	Output signal, linear (terminal I2)	4…20 mA ≙ 0...50 °C /−35...+35 °C /−40...+70 °C
	Burden	See "Function"
Functional data of temperature sensor with QFM2120, QFM2140	Measuring range	−35...+50 °C
	Sensing element simulated, corresponding to	
	QFM2120	LG-Ni 1000
	QFM2140	T1 (PTC)
	Measuring accuracy at AC/DC 24 V in the range of	
	15...35 °C	±0.8 K
	−35...+50 °C	±1 K
	Time constant	< 3.5 min. in with 2 m/s moved air
	Perm. measuring current with	
	QFM2120	1.18…4.21 mA
	QFM2140	0.53…1.89 mA
Protective data	Degree of protection of housing	IP 54 as per IEC 60 529 in built-in state
	Safety class	III as per EN 60 730
Electrical connections	Connection terminals for	1×2.5 mm^2 or 2×1.5 mm^2
	Cable entry gland (enclosed)	M 16 x 1.5
Environmental conditions	Operation	IEC 60721-3-3
	Climatic conditions	Class 3K5
	Temperature (housing with electronics)	−15...+60 °C
	Humidity	0...95 % r. h. (non-condensing)
	Mechanical conditions	Class 3M2
	Transport	IEC 60721-3-2
	Climatic conditions	Class 2K3
	Temperature	−25...+70 °C
	Humidity	<95 % r. h.
	Mechanical conditions	Class 2M2
Materials and colors	Base	Polycarbonate, RAL 7001 (silver-grey)
	Cover	Polycarbonate, RAL 7035 (light-grey)
	Immersion rod	Polycarbonate, RAL 7001 (silver-grey)
	Filter cap	Polycarbonate, RAL 7001 (silver-grey)
	Mounting flange	PA66 – GF35 (black)
	Cable entry gland	PA, RAL 7035 (light-grey)
	Sensor (complete assembly)	Silicone-free
	Packaging	Corrugated cardboard
Standards and directives	Product standard: Automatic electrical controls for household and similar use	EN 60 730-1
	Electromagnetic compatibility	
	Immunity	EN 61 000-6-1
	Emissions	EN 61 000-6-3
	CE conformity to	EMC directive 2004/108/EC
	C-tick conformity (EMC) to	EN 61 000-6-3
	UL conformity [1]	UL 873
Environmental compatibility	Environmental product declaration CE1E1864en provides information on environmentally compatible product design and assessment (RoHS compliance, composition of substances, packaging, environmental benefit, disposal).	ISO 14001 (environment) ISO 9001 (quality) SN 36350 (environmental comp. products) RL 2002/95/EC (RoHS)
Weight	Incl. packaging	
	QFM21…	Approx. 0.18 kg

1) Does not apply to the **QFM2160** duct sensor!

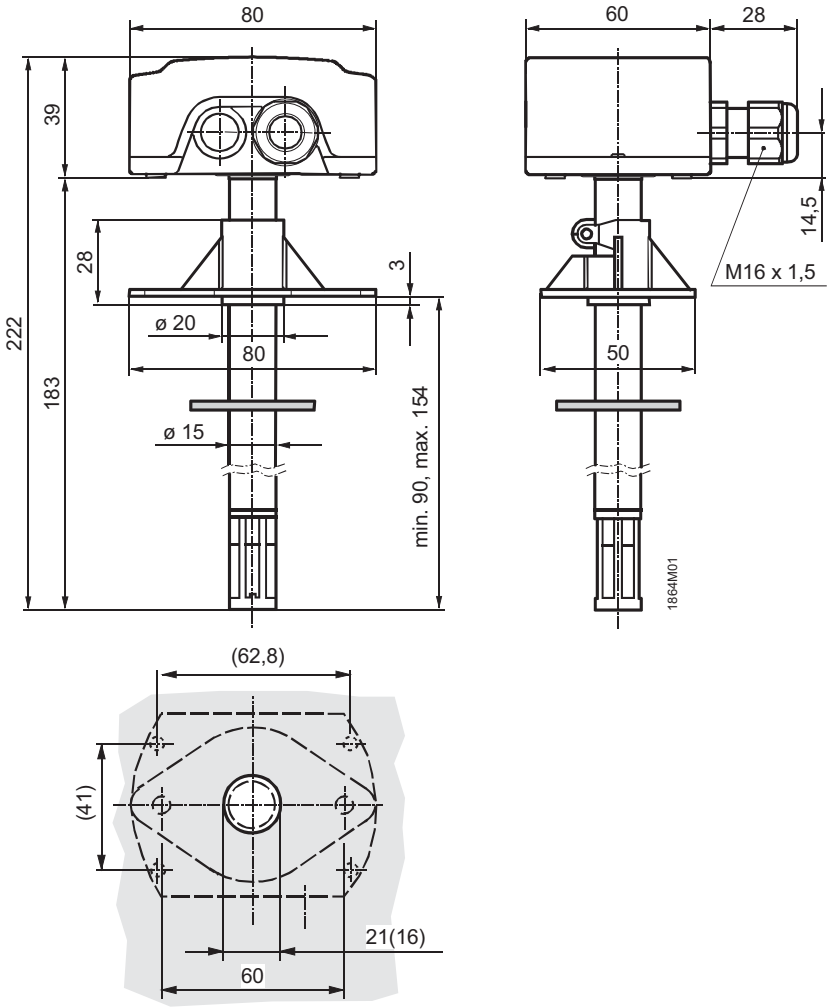
Connection terminals



G, G0	Operating voltage AC 24 V (SELV) or DC 13.5...35 V
G1, G2	Operating voltage DC 13.5...35 V
U1	Signal output DC 0...10 V for 0...100 % r. h.
U2	Signal output DC 0...10 V for temperature range 0...50 °C (R2 = factory setting), –35...+35 °C (R1) or –40...+70 °C (R3)
I1	Signal output 4…20 mA for 0...100 % r. h.
I2	Signal output 4…20 mA for temperature range 0...50 °C (R2 = factory setting), –35...+35 °C (R1) or –40...+70 °C (R3)
BS, MS	Signal output LG-Ni 1000- or T1 for temperature range –35...+50 °C (passive, simulated); wires must not be interchanged

*Note on connection terminals of the **QFM2171**:*
Terminals G1(+) and I1(–) for the humidity output must always be connected to power, even if only the temperature output G2(+) and I2(–) is used!

Dimensions



Drilling plan with (without) mounting flange

Dimensions in mm