

EFFLUENT TREATMENT PALNT

Cat IV

Shanix
23/6/10

Note ! Please ensure plug & socket electrical connection.

WARRANTY NO. **CST**
285
DATE **21/06/10**

Cat IV

1	10/6/2010	FOR APPROVAL	SKS	APU	AVS
0	9/10/2009	FOR INFORMATION	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By

PROJECT **PRAGATI-III COMBINED CYCLE POWER PROJECT
1500MW(NOMINAL).**

CUSTOMER:
 **PRAGATI POWER CORPORTION LIMITED (PPCL)**

CONSULTANT:
 **NTPC LIMITED, CONSUTANCY WING**

 **BHARAT HEAVY ELECTRICALS LTD**
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

 **THERMAX LIMITED**
PUNE

DATA SHEET FOR CONDUCTIVITY ANALYSER

THERMAX DOC.NO.:
WHJEB00011

BHEL DOC. NO. :
PE-VO-314-164-A 171

OC.NO. 630128
REV. NO : 01



PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL). (ETP PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-VO-314-164-A206
THERMAX DOC NO: WHJMD00002 REV NO.01
THERMAX OC NO: 630128

REPLIES TO THE DATA SHEET AS PER MAIL DATED ON 26.10.09 BY NTPC

CONDUCTIVITY ANALYSER

S.NO.	COMMENT	THERMAX REPLY	REMARKS
I	Please insure the Tag nos. as indicated in data sheet shall be same as that of P&ID	Noted & Confirmed	
II	Please insure all spares shall be as per specs	As per contract spares are not in Thermax scope.	
III	As per specs the range shall be 0.1 / cm to 0.15 / cm in 1.2 range.	We have selected conductivity range 0-1000 μ s/cm based on process requirement.	

INDEX FOR CONDUCTIVITY ANALYSER

SR NO.	TAG NO	SERVICE	RANGE μ S/Cm	OPERATING PARAMETERS		PLANT	REMARK
				TEMP	PRESSURE		
1	AE 803,AT 803	COMMON HEADER OF P-3150 A TO H	0-1000	AMB	8.2	ETP	REFER SHEET NO.3 FOR SENSOR & TRANSMITTER.

QTY :- 1 SET	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI	2	10/6/2010	SKS	APU	AVS
MAKE :-EMERSON		1	9/10/2009	SKS	APU	AVS
THERMAX LIMITED	O.C NO: 630128	0	7/10/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	Date	Prepd by	Chkd by	App by
Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	SH NO	
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJEB00011		ETP	2 OF 2	

Conductivity Analyser Specification Sheet

Sr	Identification	Specification
	General	
1	Make	EMERSON
	Transmitter	
2	Model Number	1181C-06-10-07-11
3	Type	Conductivity Transmitter
		2 wire with Local Indication
4	Conductivity Range	Refer Index sheet
5	Maximum Span Limit	5 to 2000 μ S/cm at 25 °C
6	Display	Digital display
7	Accuracy	$\pm$ 1 % Of Full Scale
8	Power Supply	24 VDC
9	Input	Single sensor input
10	Output	4-20 mA Analog DC
11	Temperature Compensation	Automatic
12	Range	5 to 85 °C
13	Element	10 K T.C.
14	Mounting Brackets	2" Pipe / Wall / Surface Mount
15	Electrical connections / Conduit Entry Size	1/2 " -14 NPT (F)X 2Nos.
	ELECTRODES	
16	Model Number	400-13-55
17	Type	Flow through
18	Cell Constant	1
19	Operating Temperature Range	0 to 105 °C
20	Operating Pressure Range	7.4 Psia to 250 Psig
21	Electrodes Material	Titanium
22	Electrodes Body Material	SS 316
23	O Rings	EPDM
24	Process Connection	3/4" MNPT
	Accessories	
25	Cable Between Sensors to Transmitter	10 Feet (3.1 m) Integral to sensor
26	Nameplate	SS 316
27	Flow Through Chamber Material	Low flow cell suitable for 12 MM OD tube connection (Suitable connector will be provided by THERMAX WWS)

	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI	2	10/6/2010	SKS	APU	AVS
		1	9/10/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630128	0	7/10/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	Date	Prepd by	Chkd by	App by
	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	SH NO	
	CONSULTANT:- NTPC - CONSULTANCY WING	WHJEB00011		ETP	2 OF 2	

Product Data Sheet

PDS 71-1181CT/rev.A

February 2000

Model 1181 C/T

Conductivity Two-Wire Transmitters

- FIELD MOUNTED TRANSMITTERS ideal for multiple loop installations.
- NEMA 4X WEATHERPROOF, CORROSION-RESISTANT, DUAL COMPARTMENT HOUSING provides maximum circuit protection for increased reliability in industrial environments.
- HAZARDOUS AREA INSTALLATION. Certified NEMA 7B explosion-proof and intrinsically safe when used with an approved sensor and safety barrier.
- COMMONALITY OF PARTS reduces inventory.
- SWITCH SELECTABLE RANGES further reduces inventory by permitting calibration of one model to virtually any Tag Number requiring the same measurement number.
- EXTERNAL ZERO AND SPAN, 20-turn potentiometers provide for fine calibration of the isolated 4-20 mA output signal.



FEATURES AND APPLICATIONS

The Rosemount Analytical two-wire transmitters, with the appropriate sensors, are designed to continuously measure the pH, ORP, conductivity, dissolved oxygen, or free residual chlorine in industrial processes. These field mounted transmitters are ideal for multiple loop applications where critical data processing and control are required.

The Model 1181 Transmitters include all the circuitry necessary for the measurement and transmission of an isolated 4-20 mA linear signal. Measurement range selection is made through internal range switches that are easily accessed by removing a housing cover. No further disassembly is required. A matrix is provided which conveniently indicates the proper switch position. Range selection can be made without the use of the instruction manual. Fine calibration of the 4-20 mA

signal is accomplished with the 20-turn external Zero and Span potentiometers.

The electronic printed circuits are protected from the environment by the NEMA 4X weatherproof, corrosion resistant enclosure. The printed circuit cards plug into a moisture barrier which is isolated from the field wiring and calibration terminals. Routine field calibration does not require exposing the electronics to harsh industrial environments. All PCBs are conformal coated for maximum protection. The PCBs are removed as a unit and may be individually replaced. The transmitter housing covers are sealed with large cross sectional O-rings and need not be replaced each time the cover is removed.

continued on page 2

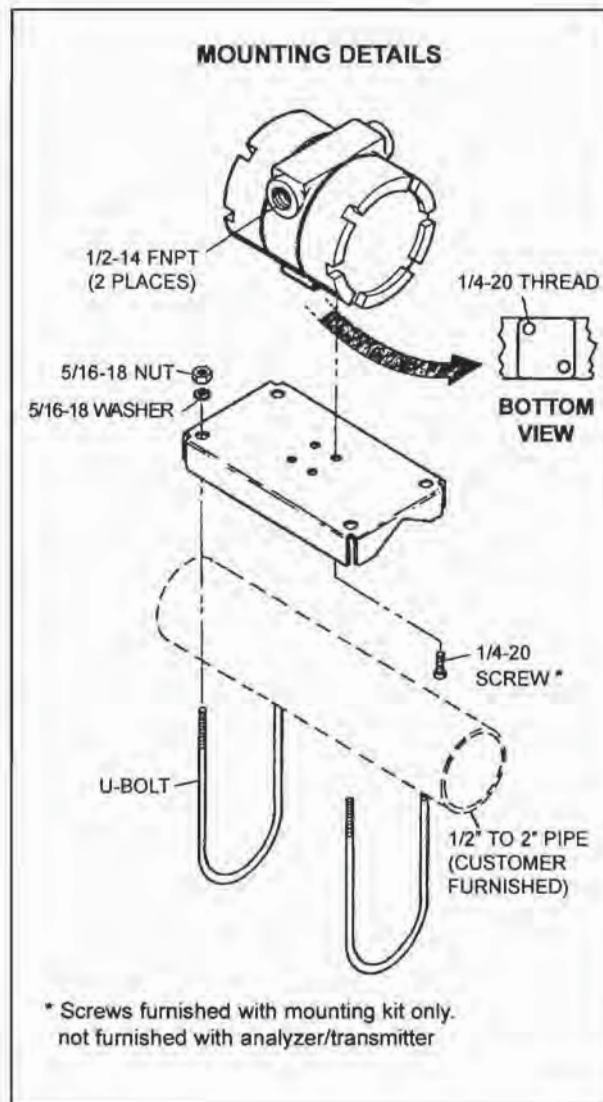
ROSEMOUNT®
Analytical


EMERSON
Process Management

The Model 1181 is available blind or with an analog or digital display. The digital display may be calibrated in engineering units and the analog display features multiple scales in engineering units.

The transmitters are certified explosion-proof, NEMA 7B, and intrinsically safe when installed with an approved barrier and sensor. Hazardous area certificates are provided by BASEEFA to CENELEC regulations, FM, CSA, SAA, SEV, and TUV. CSA has determined that the moisture barrier qualifies as Factory Sealed which means Explosion Proof Y fittings and sealing compound are not required for installation when this approval is selected.

Accessory items are available for the two-wire transmitters. The Model 515 isolated power supply provides power for up to 20 transmitters. Two transmitters may be wired directly to the power supply. For more than two transmitters, junction boxes are available, each accommodating wiring for a maximum of ten transmitters. Remote alarms are available with independently adjustable setpoints and hysteresis. Contacts of the Model 230A may be specified for high/low, high/high, or low/low operation. The impedance of the Model 230A alarm module is less than 100 ohms. For further information on the Models 515 and 230A, please refer to their respective product data sheet.



PHYSICAL SPECIFICATIONS – GENERAL

Enclosure: NEMA 4X, weatherproof and corrosion-resistant

NEMA 7B, explosion proof

Hazardous Area Classification:

Explosion Proof:

FM: Class I, Groups B, C, & D, Div. 1
Class II, Groups E, F, & G, Div. 1
Class III, Div. 1

CSA: Class I, Groups C & D, Div. 1
Class II, Groups E, F, & G, Div. 1
Class III, Factory Sealed, Div. 1
Class I, Groups A, B, C, & D, Div. 2
Enclosure: Type 4

Intrinsic Safety:

FM: Class I, II, & III, Div. 1
CSA: Class I, Groups A, B, C, & D, Encl 4, Class 1, Div. 1
Temperature Code T4
BASEEFA: EEx ia IIB T4, TAMB = 55°C

Display:

Blind: (Code 02)

Analog: plug in, 90 degree, 2.5 inch diameter

1181C: single scale, 0-100%

1181T: single scale, 0-100%

Digital: 3.5 digit, LCD, adjustable range in engineering units

Recommended Cable: Transmitter to Power Supply
Two Wire, 18 AWG, shielded, Belden 8760 or equal
(Rosemount Analytical P/N 9200001)

Weight/Shipping Weight:

1181C, T:

Blind: 1.8 kg/2.25 kg (4.0 lb/5.0 lb)

Analog/Digital: 2.48 kg/2.93 kg (5.5 lb/6.5 lb)

INSTRUMENT SPECIFICATIONS – GENERAL

Power Supply Requirements: (See Load/Supply Chart)

Lift Off Voltage: Blind & Analog: 10 VDC

Digital: 12.5 VDC

Maximum Operating Power: 40 milliwatts

Output: Blind & Analog: Isolated 4-20 mA into 700 ohms at 24 VDC

Digital: Isolated 4-20 mA into 575 ohms at 24 VDC

Input/Output Isolation: 600 Volts

Ambient Temperature: -25° to 70°C

Relative Humidity: 0-99%

Digital Display Accuracy: 0.1% reading ±1.0 count

Analog Display Accuracy: ±2.0%

External Zero: ±7.0% full scale (25% for 1181T)

External Span: ±7.0% full scale (50% for 1181T)

Shock: 10G maximum for 10 milliseconds

Vibration: 0.025 inches double amplitude 5 to 50 Hz for 2 hours

EMI/RFI:

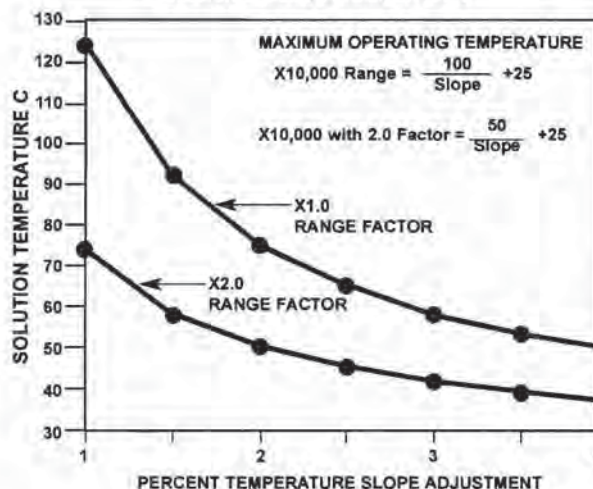
EN50081-1

EN50082-2



MAXIMUM OPERATING TEMPERATURE MODEL 1181C ONLY

For X10,000 Range Multiplier Only



Rosemount Analytical 3

The **Model 1181C** Transmitter measures conductivity over the range of 0-1.0 $\mu\text{S}/\text{cm}$ to 100,000 $\mu\text{S}/\text{cm}$ full scale. A unique feature of the Model 1181C is the 0-4% temperature slope adjustment which provides greater accuracy in chemical concentration control. The 0-4% temperature slope adjustment eliminates the need for special temperature compensation circuits required for the calibration to a specific acid, base, or salt over a specific operating temperature range.

INSTRUMENT SPECIFICATIONS @ 25°C

Measurement Range: 0-1.0 $\mu\text{S}/\text{cm}$ minimum*
100,000 $\mu\text{S}/\text{cm}$ maximum

Internal Range Select: Multipliers X100, X1000,
X10,000,
Range Factors X0.5, X1.0, X2.0

Accuracy: $\pm 1.0\%$ full scale
 $\pm 5.0\%$ full scale on X20K range

Stability: $\pm 1.0\%$ /month, non-cumulative

Repeatability: $\pm 0.5\%$ full scale

Temperature Coefficient: 0.1%/°C

Automatic Temperature Compensation: 5-85°C
50-150°C
100-200°C

Temperature Slope Adjust: 0-4%/°C

Maximum Operating Temperature of Sensor:

Slope	X10,000	X2.0 Factor
1.0%	125°C	75°C
2.0%	75°C	50°C
3.0%	58°C	42°C
4.0%	50°C	38°C

RECOMMENDED SENSORS:

Model 140 Conductivity

**Model 150 Insertion/Submersion
Conductivity**

Model 400 series Conductivity

* Not applicable for conductivity less than 10 $\mu\text{S}/\text{cm}$. See Models 3081C/81C, 1054BLC, or 1055C product data sheets for these applications.

MODEL 1181C

			CELL CONSTANT						
			0.01	0.1	0.2	0.5	1.0	2.0	5.0
RANGE FACTOR	X100	X0.5	C/F*	5	10	25	50	100	250
		X1.0	1.0	10	20	50	100	200	500
		X2.0	2.0	20	40	100	200	400	1,000
	X1,000	X0.5	5.0	50	100	250	500	1,000	2,500
		X1.0	10.0	100	200	500	1,000	2,500	5,000
		X2.0	20.0	200	400	1,000	2,000	4,000	10,000
	X10,000	X0.5	50	500	1,000	2,500	5,000	10,000	25,000
		X1.0	100	1,000	2,000	5,000	10,000	20,000	50,000
		X2.0	200	2,000	4,000	10,000	20,000	40,000	100,000
			FULL SCALE MICROSIEMENS/CM						

*C/F - Consult Factory

The **Model 1181T** Toroidal Transmitter measures conductivity over the range of 0-80 $\mu\text{S}/\text{cm}$ to 0-1000 mS/cm. The Model 1181T uses an inductive principal of measurement and employs the use of toroidal or electrodeless conductivity sensors. Toroidal conductivity sensors have no exposed electrodes to the measured solution, which practically eliminates routine sensor maintenance in applications where electrode fouling may occur. The Model 1181T also features the unique 0-4% temperature slope adjustment found on the Model 1181C Conductivity Transmitter.

INSTRUMENT SPECIFICATIONS @ 25°C

Measurement Range: 0-80 $\mu\text{S}/\text{cm}$ minimum
0-1000 mS/cm maximum

Internal Range Select: Multipliers X500, X1000,
X10,000
with jumper selectable span X1 & X10 and internal span adjust

Accuracy: $\pm 0.5\%$ full scale

Stability: $\pm 1\%$ per year

Repeatability: $\pm 0.1\%$ full scale

Temperature Coefficient: .05% of F.S./°C

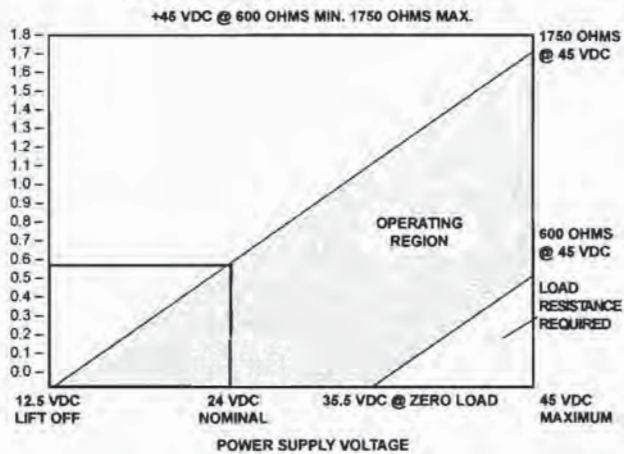
Temperature Slope Adjust: 0-4%/°C

Automatic Temperature Compensation: 0-200°C

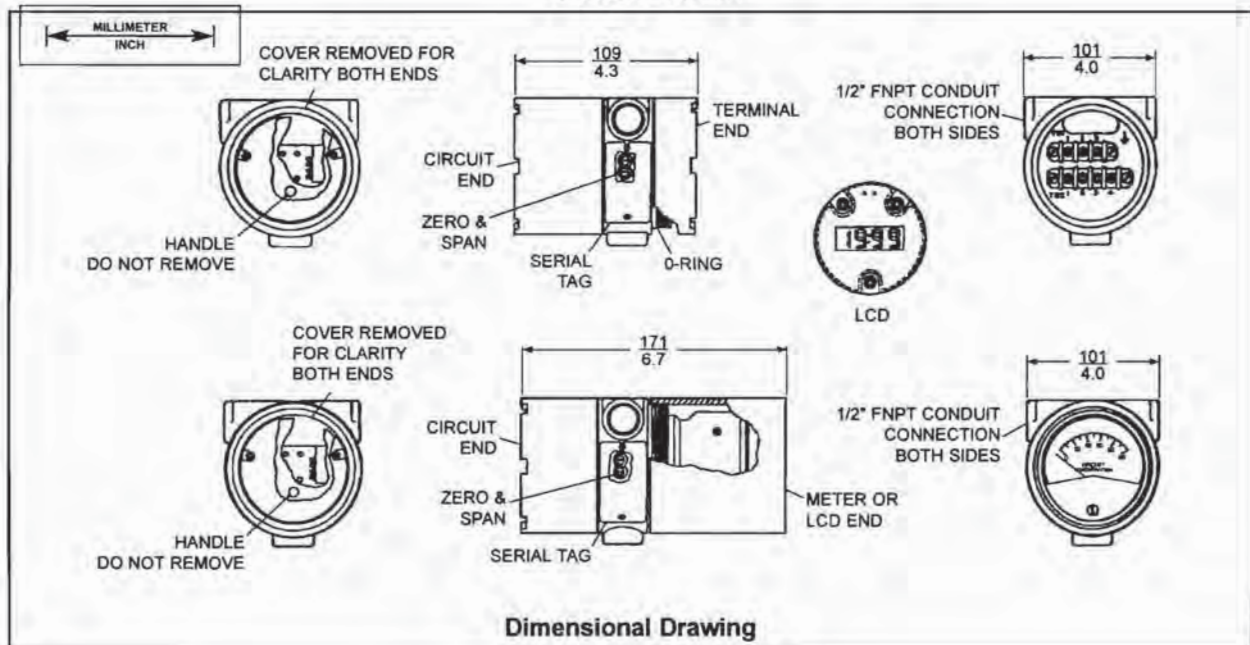
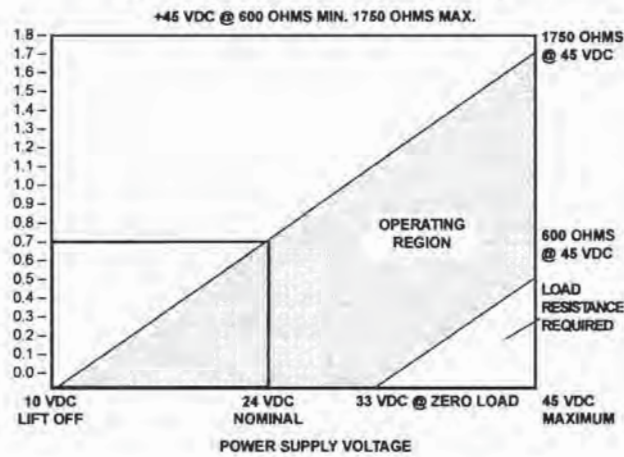
RECOMMENDED TOROIDAL SENSORS:

	FULL SCALE	
	Minimum	Maximum
Model 222	0-500 $\mu\text{S}/\text{cm}$	0-1000 mS/cm
Model 225	0-250 $\mu\text{S}/\text{cm}$	0-1000 mS/cm
Model 226	0-80 $\mu\text{S}/\text{cm}$	0-160 mS/cm
Model 228	0-250 $\mu\text{S}/\text{cm}$	0-1000 mS/cm

DIGITAL DISPLAY LOAD/POWER SUPPLY REQUIREMENTS



BLIND & ANALOG DISPLAY LOAD/POWER SUPPLY REQUIREMENTS



ORDERING INFORMATION

Model 1181 Two Wire Transmitter is housed in a NEMA 7B explosion-proof, 4X weatherproof, corrosion-resistant enclosure and includes all the circuitry necessary for measurement and transmission of an isolated 4-20 mA signal. The transmitter may be selected with or without an analog or digital display.

MODEL					
1181 TWO-WIRE TRANSMITTER					
Code	Input (Required selection)				
C	Contacting Conductivity				
T	Toroidal Conductivity				
Code	Display (Required selection)				
01	Analog display (For use with agency approval options 67 and 69)				
02	Blind, without indication				
03	Analog display (For use with agency approval option 73)				
06	Digital display (For use with agency approval options 67, 69, and 73)				
Code	Temperature Compensation (Required selection) For 1181C ONLY				
08	Automatic T.C. range, 50°C-150°C				
09	Automatic T.C. range, 100°C-200°C (Requires high temperature T.C. element in sensor)				
10	Automatic T.C. range, 5°C-85°C				
Code	Agency Approvals				
67	FM Explosion proof and Intrinsically Safe				
69	CSA Explosion proof and Intrinsically Safe				
73	CENELEC Intrinsically Safe/CE				
1181	C	01	08	67	EXAMPLE

Former Options

Code	Options (Order P/N's as separate line items)
07	ORDER AS P/N 2002577 2 in. pipe/wall mounting bracket
11	ORDER AS P/N 9240591 Stainless steel nameplate (specify marking)



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Emerson Process Management

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Product Data Sheet

PDS 71-400/rev.G

February 2006

Model 400 and 400VP Series

ENDURANCE® General Purpose Conductivity Sensors

- INITIAL CALIBRATION NOT REQUIRED.
Pre-determined cell constant ensures out-of-the box accuracy.
- VERSATILE MOUNTING CONFIGURATIONS:
screw-in, retractable, and flow-through.
- AVAILABLE WITH VARIOPOL (VP) quick disconnect fitting.

APPLICATIONS

The Model 400/400VP, 401, 402/402VP, and 404 sensors are intended for the determination of electrolytic conductivity in applications ranging from high purity water to cooling water. The sensors are ideal for use in clean, non-corrosive, samples having conductivity less than about 20,000 $\mu\text{S}/\text{cm}$. (The Model 401 sensor can be use in clean samples having conductivity as great as 200 mS/cm .) For dirty or corrosive samples or for samples having high conductivity, a toroidal sensor such as the Model 228 or 226 is recommended.

FEATURES

ENDURANCE sensors are contacting conductivity sensors. They are available in cell constants of 0.01, 0.1, 1.0, and 10/cm. The choice of cell constant depends on conductivity. High conductivity samples require larger cell constants.

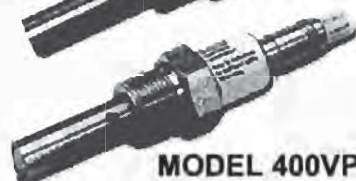
Sensors with 0.01, 0.1 and 1.0/cm cell constants have concentric titanium electrodes separated by a PEEK insulator. EPDM O-rings seal the internal parts of the sensor from the process liquid. A platinum RTD in the center electrode measures the solution temperature. Electrolytic conductivity is a strong function of temperature. The temperature measurement is used for correcting the conductivity readings to a reference temperature.

Sensors with 10/cm cell constants have graphite electrodes and an epoxy body. The RTD is enclosed in a titanium capsule protruding from the end of the sensor.

MODEL 400



MODEL 400VP



MODEL 401



MODEL 402



MODEL 402VP



MODEL 404



ROSEMOUNT®
Analytical


EMERSON
Process Management

Model 400 sensors are designed for direct screw-in insertion into process piping using a 3/4-inch MNPT fitting. The Model 400 sensor can also be used in side-stream samples. A 1-inch pipe tee with a 3/4-inch bushing is a suitable flow cell. A 3/4-inch pipe tee can be used with 0.1 and 1.0/cm cells. A transparent plastic flow cell is also available (PN 24091-02).

Model 401 sensors are intended for measuring clean, non-corrosive samples having conductivity between about 500 and 200,000 $\mu\text{S}/\text{cm}$. A 10/cm two-electrode sensor (Model 401-14) and a four-electrode sensor (Model 401-15) are available. The four-electrode sensor can be used only with four electrode Solu Comp conductivity analyzers. Solu Comp analyzers are obsolete.

Model 402 sensors are retractable; they can be removed from the process piping without shutting down and draining the line. Maximum retraction pressure is 64 psig (542 kPa abs). The sensor fits through a

1-1/4 inch full-port ball valve. Order the retraction assembly, which includes the ball valve, pipe nipple, packing adapter, and clamp to position the sensor, as an option.

Model 404 sensors combine the conductivity sensor with a flow cell. The design has a small holdup volume, so response to sudden changes in process conductivity and temperature are rapid. Model 404 sensors are available with a PVC or stainless steel body. The stainless steel version can be disassembled for cleaning. The PVC version cannot be taken apart.

Models 400 and 402 sensors are available with Variopol 6.0 quick disconnect watertight connectors. Wire the interconnecting cable to the analyzer and run the cable to the sensor. The sensor plugs into the cable receptacle. To replace the sensor, simply disconnect the Variopol fitting and plug in a new sensor. There is no need to rewire or rerun cable.

SPECIFICATIONS (Models 400 and 400VP)

Cell constants: 0.01, 0.1, and 1.0/cm

Wetted materials:

Electrodes: titanium
Body: 316 stainless steel
Insulator: PEEK
O-rings: EPDM

Process connection: 3/4 inch MNPT

Temperature: 32 – 221°F (0 – 105°C)

Temperature (option -60): 32 – 392°F (0 – 200°C)

Pressure: 250 psig (1825 kPa abs) maximum

Vacuum: 7.4 psia (51 kPa abs)

Cable length (Model 400 only): 10 ft (3.1 m) standard;
50 ft (15.2 m) optional

SPECIFICATIONS (Model 401)

Cell constants: 10/cm, 0.85/cm (four-electrode)

Wetted materials:

Electrodes: graphite
Connector: PVDF (Kynar®)
Insulator and body: epoxy
O-rings: EPDM
RTD capsule: titanium

Process connection (option -14): 3/4 inch MNPT

Process connection (option -15): 1 inch MNPT

Temperature: (32 – 212°F) (0 – 100°C).

Pressure: 200 psig (1481 kPa abs) maximum

Cable length: 10 ft (3.1 m) standard; 50 ft (15.2 m) optional

SPECIFICATIONS (Models 402 and 402VP)

Cell constants: 0.01, 0.1, 1.0, and 10/cm

Wetted materials (0.01, 0.1, and 1.0/cm cells):

Electrodes: titanium
Sensor tube: 316 stainless steel
Insulator: PEEK
O-rings: EPDM
Washer: Neoprene

Wetted materials (10/cm cell):

Electrodes: graphite embedded in epoxy body
Sensor tube: 316 stainless steel
Insulator: Epoxy
O-rings: EPDM
Washer: Neoprene
RTD capsule: titanium

Process connection: sensor is inserted through
1-1/4 inch NPT full port ball valve

Temperature: 32 – 212°F (0 – 100°C)

Pressure: 200 psig (1481 kPa abs) maximum

Retraction pressure: 64 psig (542 kPa abs) maximum

Cable length (Model 402 only): 10 ft (3.1 m).
For longer cable length, choose option -60 (integral junction box) and order interconnecting cable separately.

¹Kynar is a registered trademark of Elf Atochem North America, Inc.

SPECIFICATIONS (Model 404)

Cell constants: 0.01 and 0.1/cm

Wetted materials (option -16):

Electrodes: titanium
Insulator: PEEK
O-rings: EPDM
Body: PVC
Fittings: polyethylene

Wetted materials (option -17):

Electrodes: titanium
Insulator: PEEK
O-rings: EPDM
Body: 303 stainless steel
Fittings: 316 stainless steel

Process connection (option -16): 3/8 inch barbed tubing connector

Process connection (option -17): compression fitting for 3/8 inch OD tubing. Fittings can be removed to leave 1/4-inch FNPT ports.

Temperature (option -16): 32 – 140°F (0 – 60°C).

Temperature (option -17): 32 – 212°F (0 – 100°C).

Pressure (option -16): 100 psig (791 kPa abs) at 77°F (25°C); 20 psig (239 kPa abs) at 140°F (60°C)

Pressure (option -17): 100 psig (791 kPa abs) maximum

Cable length: 10 ft (3.1 m) standard; 50 ft (15.2 m) optional

SPECIFICATIONS (Flow cell for Model 400/400VP, PN 24091-02)

Wetted Materials:

Body: polycarbonate
Fittings: 316 stainless steel
O-ring: silicone

Process connection: compression fitting for 1/4 inch OD tubing

Temperature: 122°F (50°C) maximum

Pressure: 65 psig (549 kPa abs) maximum

SPECIFICATIONS (Retraction assembly for Model 402/402VP, PN 23765-00/01)

Wetted Materials:

Ball valve: 316 stainless steel with Teflon® seals and seat steel
Nipple: 316 stainless steel
Packing rings: graphite
Packing bushing 303 stainless steel
Retraction body: 316 stainless steel

Process connection: ball valve 1-1/4 inch FNPT; nipple 1-1/4 inch MNPT

Temperature: 32 – 212°F (0 – 100°C).

Pressure: 200 psig (1481 kPa abs) maximum

Retraction pressure: 64 psig (542 kPa abs) maximum

Teflon is a registered trademark of E.I. duPont de Nemours and Co.

SENSOR AND INSTRUMENT SELECTION GUIDELINES

Instrument	Recommended for range for cell constant (μS/cm)		
	0.01/cm	0.1/cm	1.0/cm
1055	0-50	0.1-2500	10-8000
54eC	0-50	0.1-2000	10-12,000
5081-C	0-50	0.1-500	10-20,000
Xmt-C	0-50	0.1-500	10-20,000

WEIGHTS AND SHIPPING WEIGHTS

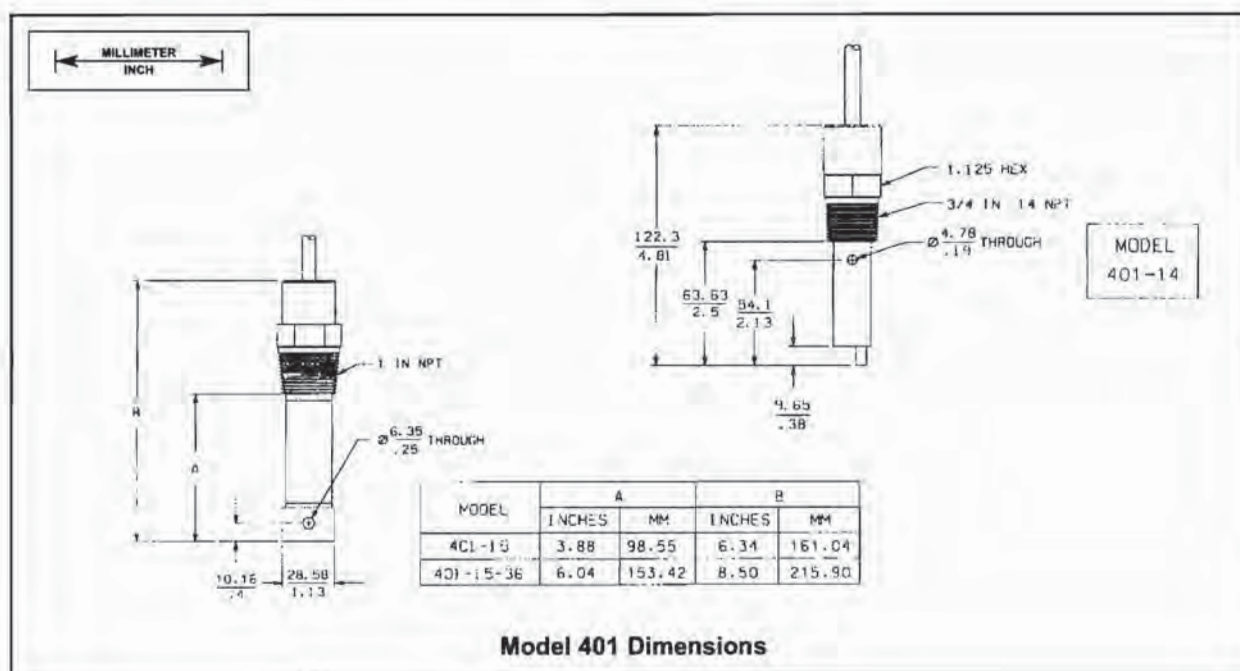
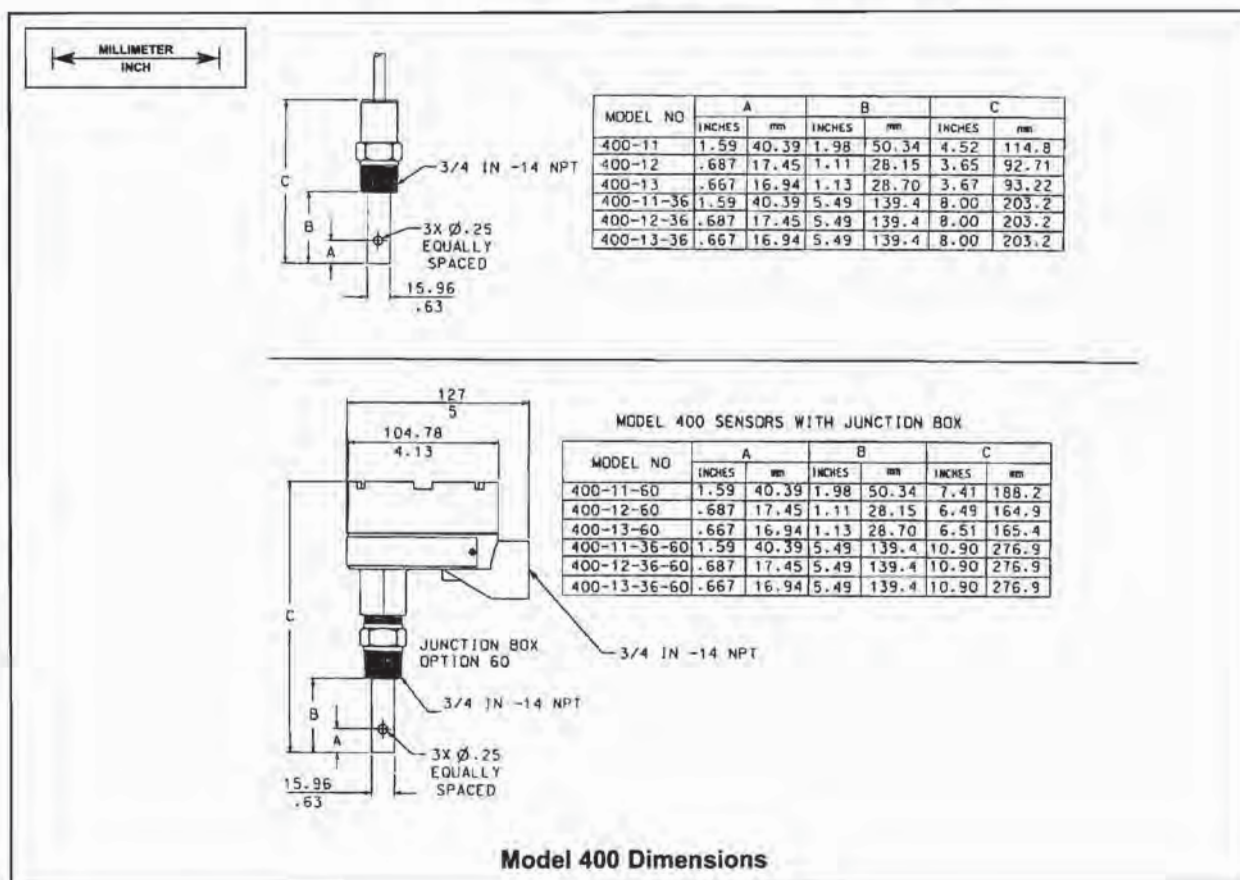
MODEL	WITH 10 ft. (3.1 m) CABLE		WITH 50 ft. CABLE		WITH JUNCTION BOX	
	Weight	Shipping Weight	Weight	Shipping Weight	Weight	Shipping Weight
400	1 lb (0.5 kg)	2 lb (1.0 kg)	4 lb (2.0 kg)	5 lb (2.5 kg)	3 lb (1.5 kg)	4 lb (2.0 kg)
401-14	1 lb (0.5 kg)	2 lb (1.0 kg)	—	—	—	—
401-15	1 lb (0.5 kg)	2 lb (1.0 kg)	4 lb (2.0 kg)	5 lb (2.5 kg)	—	—
402	3 lb (1.5 kg)	4 lb (2.0 kg)	—	—	4 lb (2.0 kg)	5 lb (2.5 kg)
404-16	2 lb (1.0 kg)	3 lb (1.5 kg)	4 lb (2.0 kg)	5 lb (2.5 kg)	—	—
404-17	4 lb (2.0 kg)	5 lb (2.5 kg)	6 lb (3.0 kg)	7 lb (3.5 kg)	—	—

MODEL	Weight	Shipping Weight
400VP	1 lb (0.5 kg)	2 lb (1.0 kg)
402VP	3 lb (1.5 kg)	4 lb (2.0 kg)

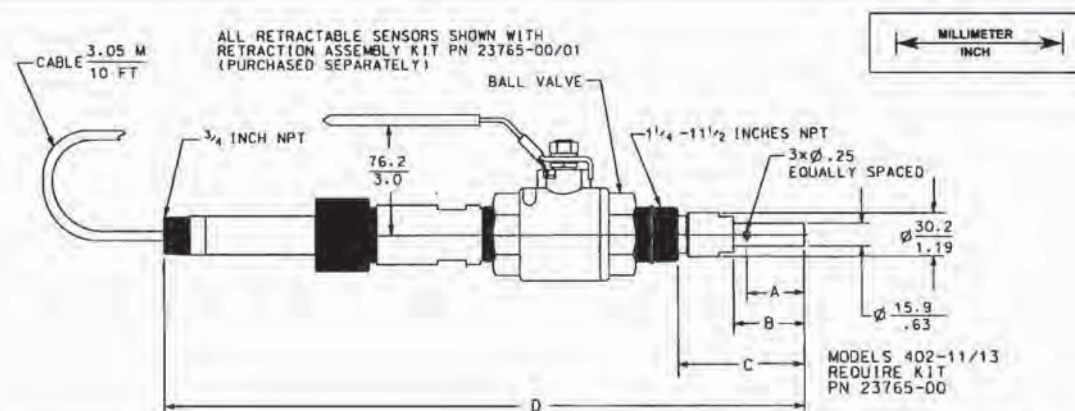
*Interconnecting cable weighs 0.6 lb/10 ft (1.0 kg/10 m).
For shipping weight add 1 lb (0.5 kg)*

Rosemount Analytical 3

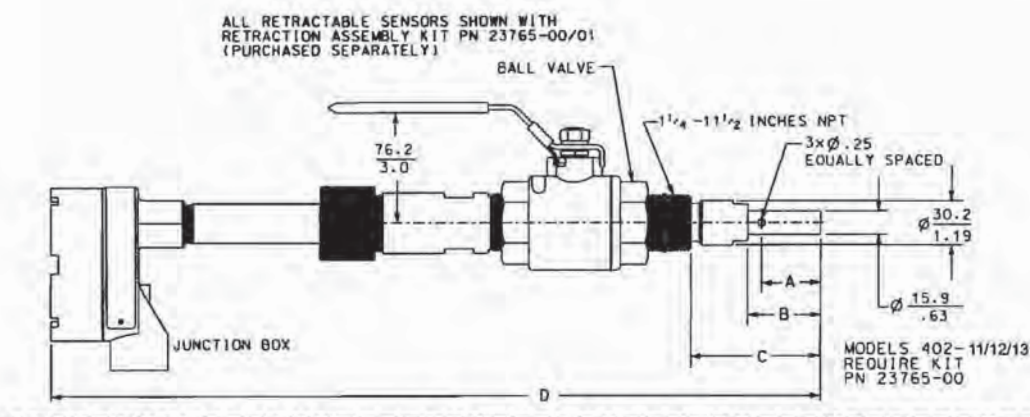
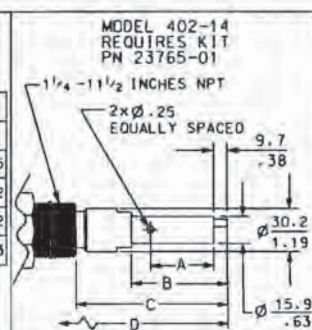
ENDURANCE SENSOR DIMENSIONS



ENDURANCE SENSOR DIMENSIONS



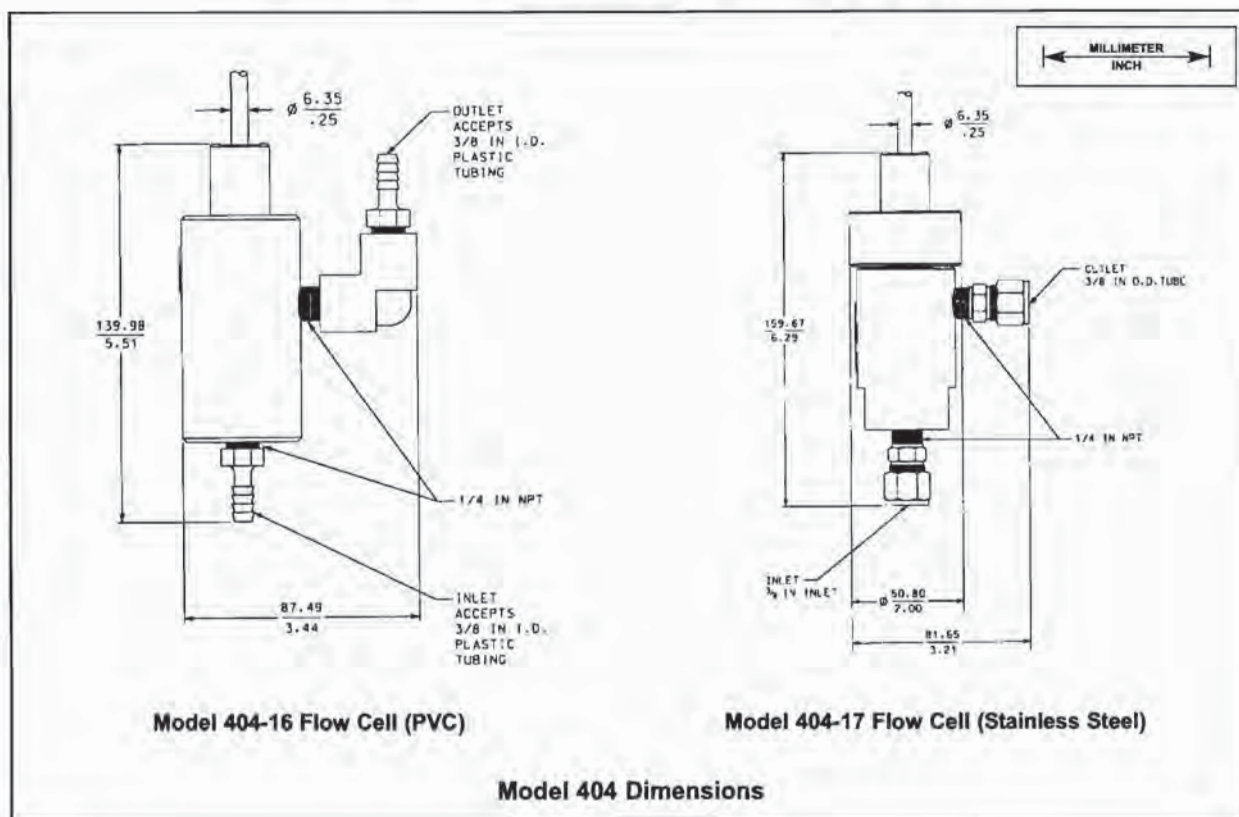
MODEL	RETRACTION ASSY KIT	A		B		C (MIN - MAX)		D	
		INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
402-11	23765-00	1.59	40.4	1.98	50.3	3.21-5.34	82-136	18.13	460.5
402-12	23765-00	.687	17.4	1.11	28.2	2.34-4.47	59-114	17.33	440.2
402-13	23765-00	.667	16.9	1.13	28.7	2.36-4.49	60-114	17.33	440.2
402-14	23765-01	2.13	54.1	2.66	67.6	3.89-4.91	99-125	18.83	478.3



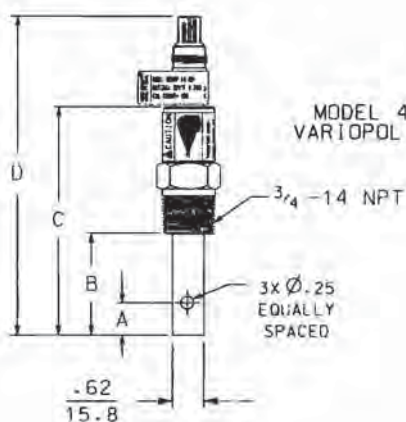
MODEL	RETRACTION ASSY KIT	A		B		C (MIN - MAX)		D	
		INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
402-11	23765-00	1.59	40.4	1.98	50.3	3.21-5.34	82-136	21.1	537
402-12	23765-00	.687	17.4	1.11	28.2	2.34-4.47	59-114	20.3	515
402-13	23765-00	.667	16.9	1.13	28.7	2.36-4.49	60-114	20.3	515
402-14	23765-01	2.13	54.1	2.66	67.6	3.89-4.91	99-125	22.1	554

Model 402 Dimensions Shown with Options -31, -32, and -60

ENDURANCE SENSOR DIMENSIONS

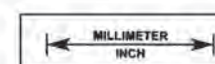
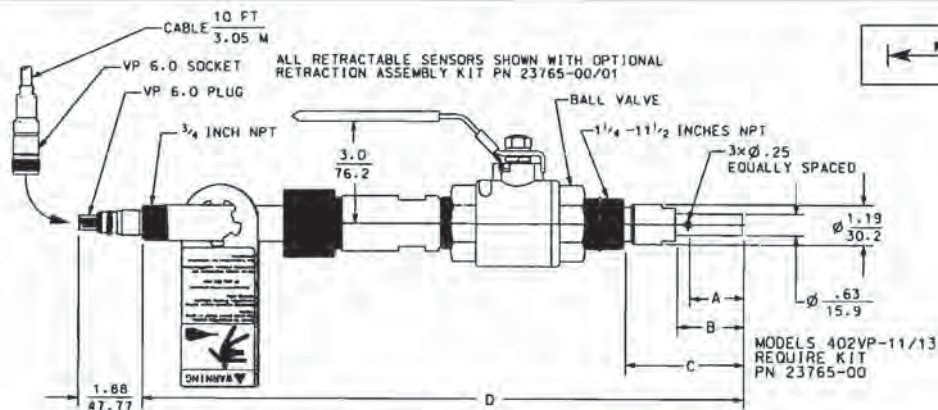


ENDURANCE SENSOR DIMENSIONS

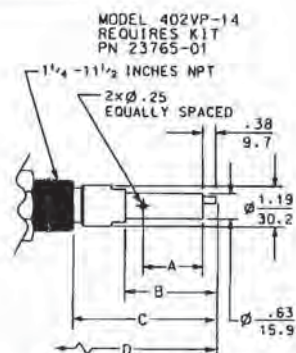


MODEL NO	TABLE							
	A		B		C		D	
	INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
400VP-11 (-53/-54/-55/-56)	1.59	40.4	1.98	50.3	4.43	112.5	6.30	160.0
400VP-12 (-53/-54/-55/-56)	0.67	17.0	1.10	27.9	3.47	90.4	5.43	137.9
400VP-13 (-53/-54/-55/-56)	0.67	17.0	1.10	27.9	3.58	90.9	5.45	138.4
400VP-11 (-53/-54/-55/-56)-36	1.59	40.4	5.48	139.2	7.91	200.9	9.78	248.4
400VP-12 (-53/-54/-55/-56)-36	0.67	17.0	5.48	139.2	7.91	200.9	9.78	248.4
400VP-13 (-53/-54/-55/-56)-36	0.67	17.0	5.48	139.2	7.91	200.9	9.78	248.4

Model 400VP Dimensions

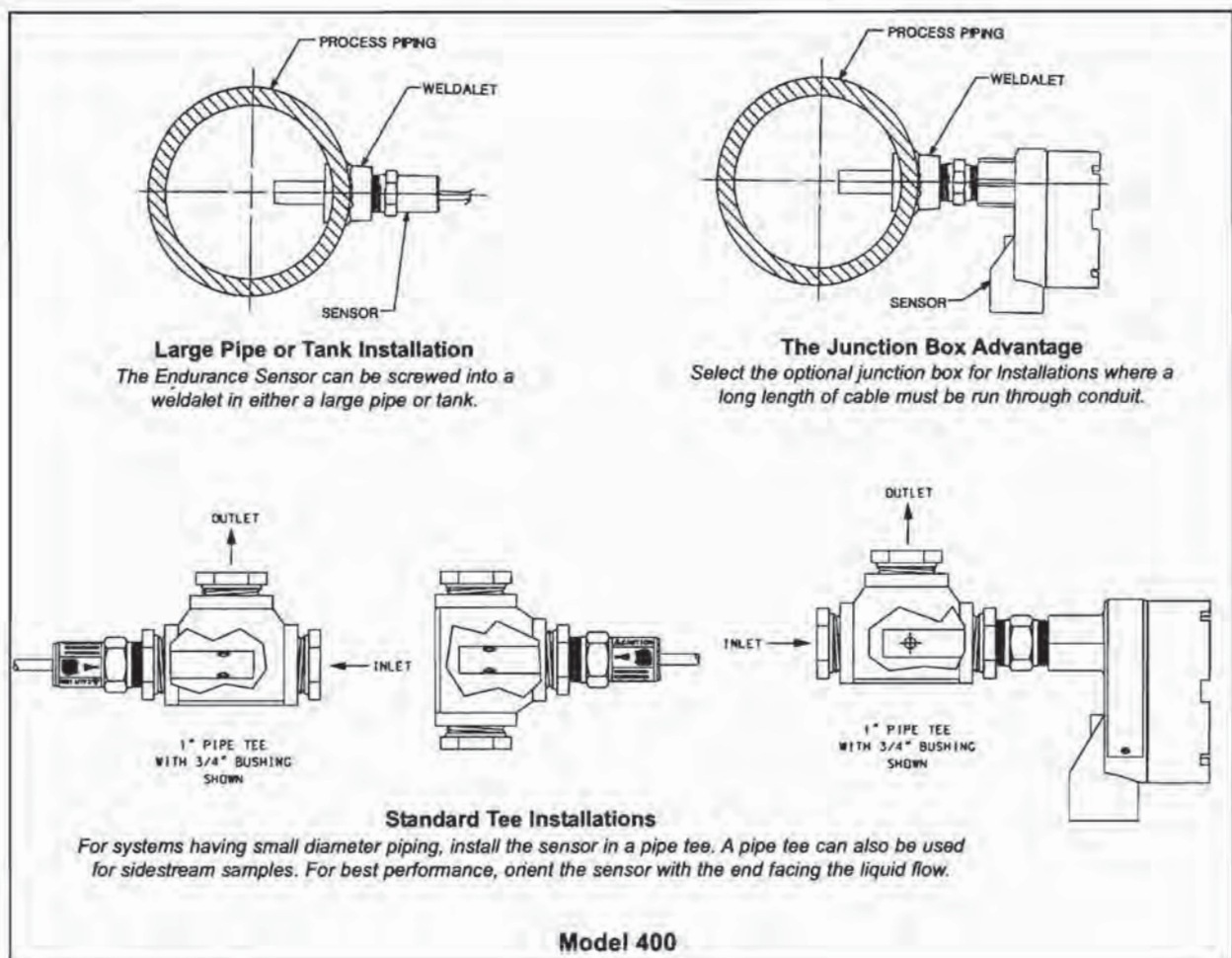
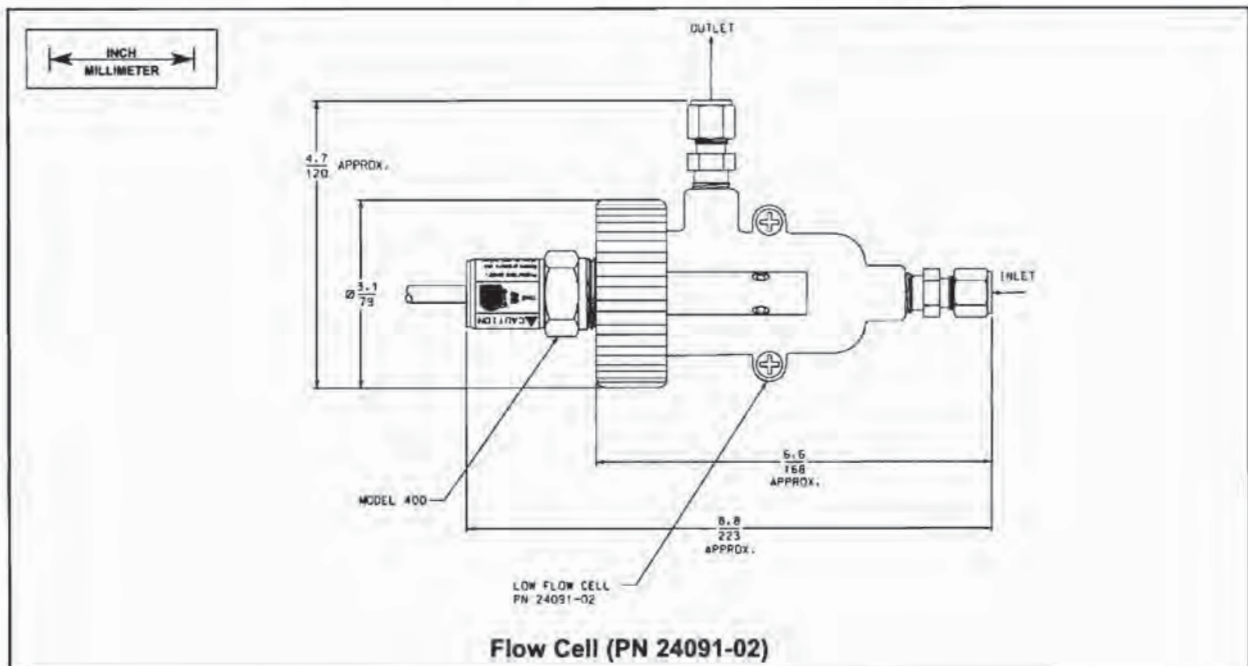


MODEL	RETRACTION ASSY KIT	A		B		C (MIN - MAX)		D	
		INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
402-11	23765-00	1.59	40.4	1.98	50.3	3.21-5.34	82-136	18.13	460.5
402-12	23765-00	.687	17.4	1.11	28.2	2.34-4.47	59-114	17.33	440.2
402-13	23765-00	.667	16.9	1.13	28.7	2.36-4.49	60-114	17.33	440.2
402-14	23765-01	2.13	54.1	2.66	67.6	3.89-4.91	99-125	18.83	478.3

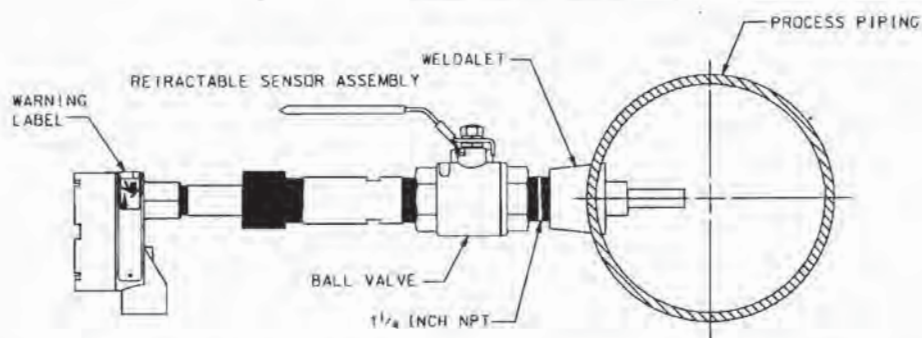


Model 402VP Dimensions

ENDURANCE INSTALLATION DETAILS

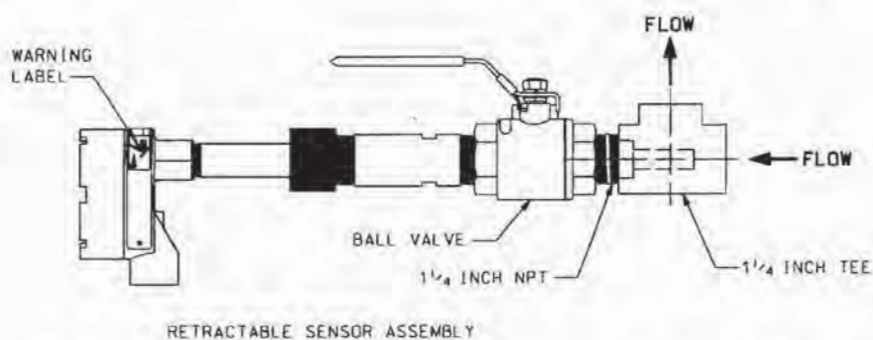


ENDURANCE INSTALLATION DETAILS



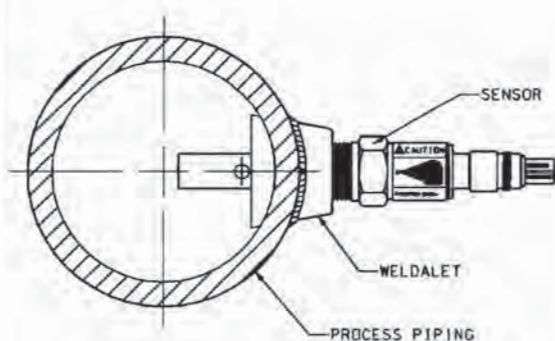
Model 402 Retractable Sensor Installed In a Large Pipe or Tank

The Endurance Retractable Sensor can be attached through a weldolet in either a large pipe or tank.



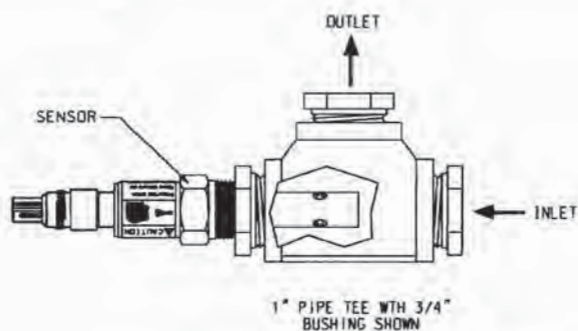
Model 402 Retractable Sensor Installed In a Standard Tee

For best performance, orient the sensor with the end facing the liquid flow.



Large Pipe or Tank Installation

The Endurance Sensor can be screwed into a weldolet in either a large pipe or tank.

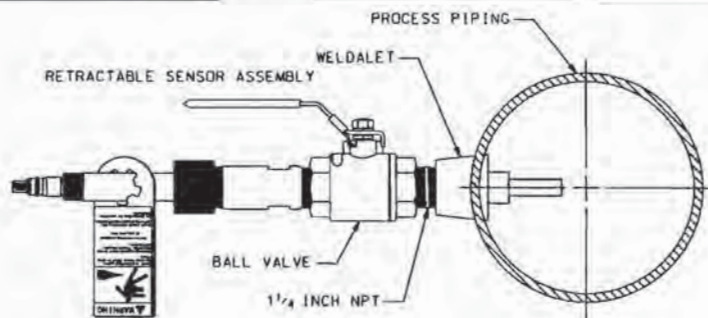


Standard Tee Installations

For systems having small diameter piping, install the sensor in a pipe tee. A pipe tee can also be used for sidestream samples. For best performance, orient the sensor with the end facing the liquid flow.

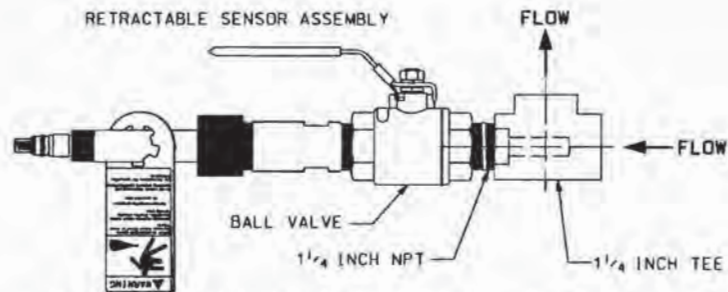
Model 400VP

ENDURANCE INSTALLATION DETAILS



Model 402VP Retractable Sensor Installed in a Large Pipe or Tank

The ENDURANCE Retractable Sensor can be attached through a weldolet in either a large pipe or tank.



Model 402VP Retractable Sensor Installed in a Standard Tee

For best performance, orient the sensor with the end facing the liquid flow.

Model 402VP

ORDERING INFORMATION

Model 400 Screw-in conductivity sensor with integral cable is intended for the determination of electrolytic conductivity in clean water applications where the sensor can be directly screwed into the process piping or used in a pipe tee or flow cell in a sidestream.

MODEL 400 SCREW-IN CONDUCTIVITY SENSOR	
CODE	Cell Constant (required selection)
11	0.01/cm
12	0.1/cm
13	1.0/cm
CODE Temperature Measurement	
—	Pt 1000 for 1054BLC, 1054BR, 1054BDC, 1055, 54C, 54eC, 3081C, 4081C, 5081-C, and Xmt-C
54	Pt 100 for 1054C, 1054AC, 1054BC, 2081C, and 2054C
55	10K ohm TC for 1181C-08 or -10
56	100K ohm TC for 1181C-09
CODE	Additional Options (optional selection)
36	Extended insertion length (5.5 in from bottom of threads to tip of sensor)
50	Extended cable length, 50 ft (15.2 m)
60	Integral junction box (required for high temperature applications) (See NOTE.)
400	11 36 EXAMPLE

NOTE: Interconnecting cable between the junction box and analyzer must be purchased as a separate item. See **ACCESSORIES**.

ORDERING INFORMATION

Model 400VP Screw-in conductivity sensor with Variopol connector is intended for the determination of electrolytic conductivity in clean water applications where the sensor can be directly screwed into the process piping or used in a pipe tee or flow cell in a sidestream.

Interconnecting cable must be ordered separately. See **ACCESSORIES**.

MODEL 400VP SCREW-IN CONDUCTIVITY SENSOR	
CODE	Cell Constant (required selection)
11	0.01/cm
12	0.1/cm
13	1.0/cm
CODE	Temperature Measurement
—	Pt 1000 for 1054BLC, 1054BR, 1054BDC, 1055, 54C, 54eC, 3081C, 4081C, 5081-C, and Xmt-C
54	Pt 100 for 1054C, 1054AC, 1054BC, 2081C, and 2054C
55	10K ohm TC for 1181C-08 or -10
56	100K ohm TC for 1181C-09
CODE	Additional Options (optional selection)
36	Extended insertion length (6 in from inside face of flange to end of sensor, option -11 only)
400VP	11 EXAMPLE

Cat IV

EFFLUENT TREATMENT PLANT

TRANS NO. **CBI-185**

DATE **22/12/2010**

- ☐ I. APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION
- ☐ II. APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION SUBJECT TO INCORPORATION OF COMMENTS/ MODIFICATIONS AS NOTED/RESUBMIT REVISED DRAWING/DRAWINGS
- ☐ III. NOT APPROVED/RESUBMIT REVISED DRAWING/DRAWINGS AFTER INCORPORATION OF COMMENTS/ MODIFICATIONS AS NOTED.
- ☒ IV. FOR INFORMATION AND RECORDS.
- ☐ V. REVISE AND RESUBMIT FOR INFO & REC.

BHARAT HEAVY ELECTRICALS LTD.
PROJECT ENGINEERING MANAGEMENT
(MECHANICAL AUXILIARY)

This approval shall be incorporated as laid down in the contract and it shall not release the contractor from his contractual obligations.

APPROVAL	DATE	APPROVED BY
CAT I = Approved		
CAT II = Approved With Comments as Noted		
CAT III = Not Approved		
CAT IV = Not Approved Drawing		
BHEL - PERMANENT		APPROVED BY
NAME AKS		
SIGNATURE	DATE 19/03/10	

I. APPROVAL CONVEYED HEREIN NEITHER RELIEVES THE CONTRACTOR OF HIS CONTRACTUAL OBLIGATION AND RESPONSIBILITIES FOR CORRECTING DEFECTS OR OMISSIONS MATERIAL OF CONSTRUCTION DESIGN DETAILS AS PER HIS INTENDED PARTICULARS AND CONFORMITY OF THE SUPPLIES WITH THE SPECIFICATIONS APPROVED SCHEDULES AND STATUTORY LAWS AND REGULATIONS UNDER THE CONTRACT.

I	22/12/2009	REVISED AS PER NTPC COMMENTS	SKS	APU	AVS
0	17/11/2009	ISSUED FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By

PRAGATI-III COMBINED CYCLE POWER PROJECT
1500MW(NOMINAL).

CUSTOMER:



PRAGATI POWER CORPORATION LIMITED (PPCL)

CONSULTANT:



NTPC LIMITED, CONSULTANCY WING



BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA



THERMAX LIMITED
PUNE

DATA SHEET FOR ORIFICE PLATES.

THERMAX DOC.NO.: WHJBB00010	BHEL DOC. NO. : PE-VO-314-164-A172	OC.NO. 630128 REV. NO : 01
--------------------------------	---------------------------------------	-------------------------------



PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL). (ETP PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-VO-314-164-A172
THERMAX OC NO: 630128

REPLIES TO THE COMMENT ON DATA SHEET

ORIFICE PLATE DOC NO. WHJBB00010

S.NO.	COMMENT	THERMAX REPLY	REMARKS
I	3 Pairs of tapping is required as per specs clause no.11.01.00 sec VI part ch I4 pg19 / 21	Noted & confirmed.	
II	Please indicate root valve size & material type	Root valve: ½" NPT (F) SS 316 ball valve is provided.	
II	Please submit the flow VS DP curve	Noted & same is submitted in revised data sheet.	

ORIFICE PLATES (F/E)									
GENERAL	1	TAG NO		FE-507					
	2	SUPPLY		ORIFICE PLATE					
	3	MAKE TO		BS-1042 (LATEST REV.) / ISO-5167					
	4	PLATE MATERIAL		SS 316					
	5	TAP		FLANGED TAPPING					
	7	TAP SIZE		1/2: NPT (F)					
	8	LOCATION		COMMON OUTLET HEADER OF P-3150 A to H					
	9	LINE SIZE AND MATERIAL		500 CS					
	OPERATING CONDITIONS	10	FLUID		EFFLUENT				
11		MAX. FLOW M ³ /HR		380					
12		NOR. FLOW M ³ /HR		350					
13		METER MAX M ³ /HR		400					
14		PRESS OPERATING KG/CM ²		8.2					
15		TEMP OPERATING DEG. CEN		AMB					
16		S.G. AT 15 DEG CEN		1					
17		PROCESS MAX. PRESS. KG/CM ²		10					
18		PROCESS PIPE MATERIAL		CS					
PLATE DETAILS	19	TYPE		CONCENTRIC.					
	20	ORIFICE BORE		198.86					
	21	PIPE OD mm &	ID mm	508 / 492					
	22	FLANGE SIZE AND RATING		ANSI B 16.5, 150#					
	23	INDICATOR TYPE		DIFFERENTIAL PRESSURE TYPE.					
	24	DIFF RANGE mm of WC		1750					
	25	VENT HOLE		YES.					
	26	PLATE THICKNESS		6.35 mm.					
	27	QUANTITY		1					
NOTES :- (1) D. P. RANGE SHALL BE SELECTED SUCH THAT d/D (BETA RATIO) SHALL BE IN BETWEEN 0.4 TO 0.7. (2) TAG NO., PIPE ID / OD, ORIFICE BORE, D. P. RANGE, FLOW RANGE, MATERIAL OF CONSTRUCTION, SERVICES ARE TO BE ENGRAVED ON THE UPSTREAM SIDE OF INTEGRAL BAR HANDLE FOR ALL ORIFICE PLATES. (3) COMPLETE ASSEMBLY i.e. ORIFICE PLATE WITH ANSI 300# WELD NECK FLANGES DULY TAPPED WILL BE IN THE SUPPLY OF INSTRUMENT VENDOR. (4) NO.OF TAP HOLES - 3									
QTY :- 1 NO		PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI			3	22/12/2009	SKS	APU	AVS
MAKE :-MICROPRECISION					2	16/12/2009	SKS	APU	AVS
					1	17/11/2009	SKS	APU	AVS
THERMAX LIMITED		O.C NO: 630128			0	7/10/2009	SKS	APU	AVS
Water & Waste Solutions		OWNER: PRAGATI POWER CORPORATION LTD.,DELHI			Rev	Date	Prepd by	Chkd by	App by
Sai Chambers, Wakadewadi		CLIENT : BHARAT HEAVY ELECTRICALS LTD			Specification No		Plant	SH NO	
Pune 411 003 (INDIA)		CONSULTANT:- NTPC - CONSULTANCY WING			WHJB00010		ETP	2 OF 2	

MICRO PRECISION PRODUCTS PVT. LTD. Faridabad.

Bore Calculation as per ISO - 5167

CUSTOMER M/S THERMAX LIMITED
PROJECT/CONSULTANT PRAGATI - III CCPP 1500MW (NOMINAL)

P.O./Enq.No. E-MAIL ENQUIRY DT 07.10.2009
TAG/ITEM No. FE-507
MICRO Job No./ Quote No. Q90813

Service EFFLUENT
Flow Element and Type O.PLATE, CONC.SQ.ED
Material of Flow Element SS316
Material of Pipe CARBON STEEL
Material of Flange A105
Pipe Size OD (mm) / ID (mm) 508.00 / 492.00

Type of Tapping FLANGE TAPS
No. of Tapping 3 PAIRS
Maximum Flow m3/Hr(Q) 380.00000000
Normal Flow m3/Hr(Qn) 350.00000000
METER MAX (Design Flow) m3/Hr(Qm) 400.00000000

Temperature Operating Celsius (t) 20.00000000
Upstream Pressure (Operating Condition)... Kg/cm2 (P)abs 9.23320000

Density (Operating Condition) Kg/m3 ROH (p)t 1000.00000000
Viscosity (Operating Condition) (poise) Mu(u) 0.01000000

Diff Pressure at METER MAX mm of WC (hm) 1750.00000000
Diff Pressure at Normal Flow (hn) 1339.84375000

I.D. of Pipe at 20 deg. C mm (D) 492.00000000
Coeff. of Expan.-Flow Element mm/mm-C (a)pe 0.00001730
Coeff. of Expan.-Pipe mm/mm-C (a)p 0.00001200
Correction Factor For Pipe I.D. at t deg C (Fp) 1.00000000
Temp. Corr. Factor For Orifice Plate (Fop) 1.00000000

Reynold Number RD(n) 251498.7271084E
Therefore Approx. Beta = d/D (Approx. Beta)(B) 0.40490236

Discharge Coefficient (C) 0.60129356

Beta Updated (Bi) 0.40447827

d(corrected) at 20 deg C dc=d/Fop mm (dc) 199.00330984

Vent Hole Diameter mm (G) 7.14000000

Vent Hole Location mm (D-G)/2 242.43000000

d (After Vent Hole Correction) mm (dv) 198.86241381

Pressure Loss at (METER MAX) mm WC (w) 1432.63760431

Pressure Loss at (NORMAL FLOW) mm WC(w1) 1096.86316581

Pressure Loss at (MAXIMUM FLOW) mm WC(w2) 1292.95543791

DATE 08/10/09

Revision no: B, DT 21.12.2009; PIPE ID REVISED. TYPE & NO. OF TAPPINGS
Reference no. Q90813-D/FE-507

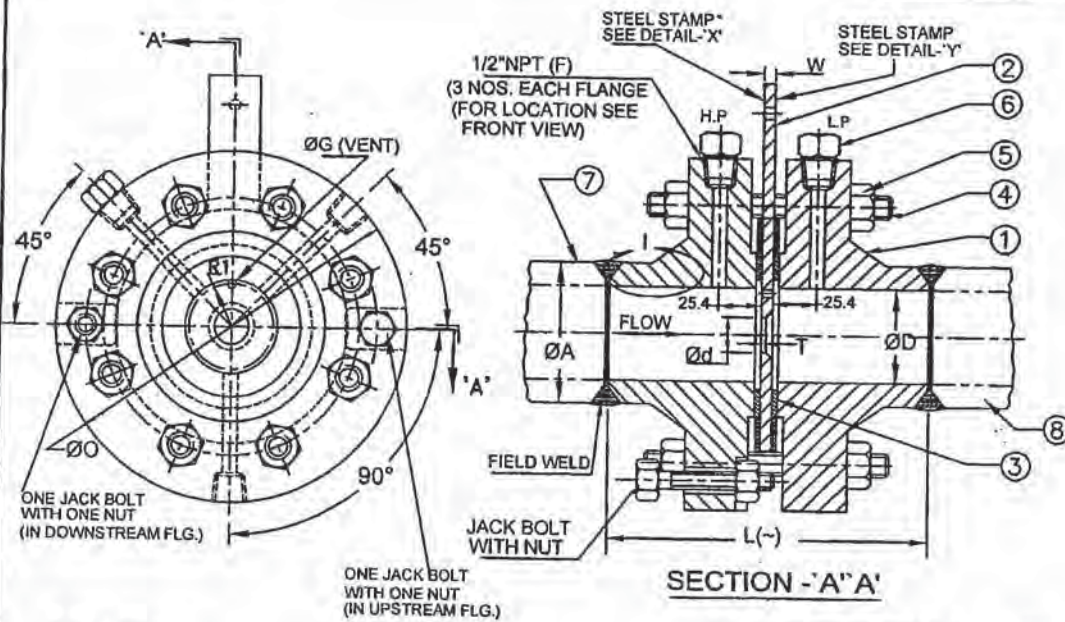
CROSS CHECK OF RESULTS USING CALCULATED VALUES BUT UNITS AS UNDER: -

$Q_v = 3.14/4 * C * E * (d_i * d_i) * \sqrt{2 * \Delta(P) * (p) t}$ where (p)t in kg/m3
 Q_v in m3/sec : $\Delta(P)$ in Pa : $d_i = (d/1000)$ in meters : $E = 1/\sqrt{1 - (Bi^4)}$
 Q_v (m3/sec) = 0.11101010 Q_m (m3/Hr) = 399.63636394

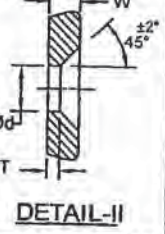
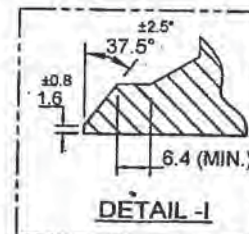
Calculation done by : SSV/SK

Calculation checked by : J

F/DSG/01 REV.00 dt. 01/12/2009

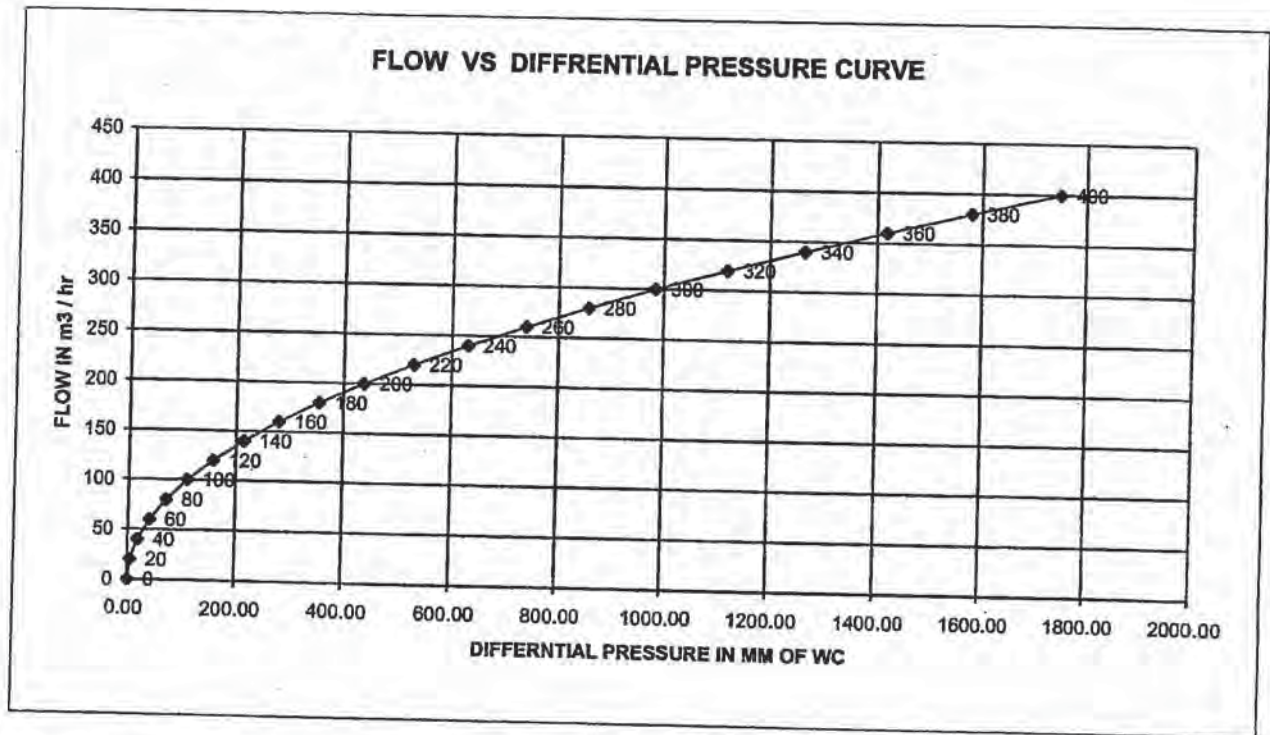
**NOTES:-**

- ONE PAIR OF PRESSURE TAPPING WILL BE PROVIDED WITH 1/2\"NPT (M) PLUG AND OTHER ONE PAIRS WITH PLASTIC CAPS.
- 1 NO. JACK BOLT WITH NUT WILL BE PROVIDED IN EACH FLANGE AND BOTH LOCKED DIAMETRICALLY OPPOSITE.



4	FE-511	50 mm	CLASS-300 ASME-B 16.36	1	31.40	51.30	60.3	165.1	184	3.18	0.79	2.38 (VENT)	24.46
3	FE-507	500 mm	CLASS-300 ASME-B 16.36	1	198.86	492.0	508.0	774.7	339.0	6.35	6.35	7.14 (VENT)	242.43
2	FE-501B	800 mm	CLASS-300 ASME-B 16.47, SERIES B	1	560.07	796.80	812.8	1054.1	352	6.35	6.35	12.7 (VENT)	392.05
1	FE-501A	800 mm	CLASS-300 ASME-B 16.47, SERIES B	1	560.07	796.80	812.8	1054.1	352	6.35	6.35	12.7 (VENT)	392.05
S.NO.	TAG NO.	SIZE (NPS)	RATING (ANSI)	QTY. (SET)	Ød	ØD	ØA	ØO	L(≈)	W	T	ØG	R1

8	DOWN STREAM PIPE	1	NOT IN OUR SCOPE		
7	UP STREAM PIPE	1	NOT IN OUR SCOPE		
6	PLUG (1/2" NPT (F))	2	C.S		
5	NUT	TO SUIT NO. OF HOLES	A194 GR.2H		
4	STUD		A193 GR.B7		
3	GASKET (4.5 mm THK.)	2	SS 304 SPIRAL WOUND+ GRAPHITE FILLER		ASME-B 16.20
2	ORIFICE PLATE (CONC. SQ. EDGE)	1	SS-304		
1	FLANGE (WNRF-FACE FINISH-125~250 AARH)	2	A105		
PART NO.	DESCRIPTION	QTY. PER ASSY.	SPECIFICATION	STOCK SIZE	REF. DRG. NO./STD.
			MATERIAL		
		PROJECT 1500 MW PRAGQTTI- III CCP PROJECT BAWANA		GEN. TOL. EXCEPT AS NOTED	
		CUSTOMER M/S. THERMAX LIMITED		ALL DIMENSIONS ARE IN MM EXCEPT AS NOTED	
		ENQ. NO. E MAIL ENQUIRY DT. 07.10.08.2009		APPROVED	S.L.S.
		JOB NO.		CHECKED	S.PAL
		TITLE		DRAWN	A.SINGH
		ORIFICE FLANGE ASSY.		DESIGNED	
		(MODEL NO. MOFA10)			NAME SIG. DATE
DATE	NO.	DESCRIPTION	DRAWING NO.		
REVISION			MOFA10/4619		
SCALE	N.T.S.	MICRO PRECISION PRODUCTS PVT. LTD.		SHEET 1 OF 1	
		3, LINK ROAD, SECTOR-28, FARIDABAD		REV. 0	



1 CUSTOMER	:	M/S THERMAX LIMITED
2 P.O. NO.	:	E-MAIL ENQUIRY DT 07.10.2009
3 PROJECT	:	PRAGATI - III CCPP 1500 MW (NOMINAL)
4 JOB NO.	:	-
5 TAG NO.	:	FE-507
6 SERVICE	:	EFFLUENT

7 O. PLATE I.D. 198.86 mm

8 FLOW EQUATION WITH CONSTANT DENSITY OF 1000.00 KG/M3

$W = K \times \text{SQRT}(DP)$ WHERE DP IS IN MM OF WC & FLOW IN M3/HR

$= 9.561829 \times \text{SQRT}(DP)$

9 FLOW EQUATION WITH CHANGE IN DENSITY

$W = K \times \text{SQRT}(DP) \times \text{SQRT}(ROH)$ WHERE ROH IS IN KG/M3

$= 0.302372 \times \text{SQRT}(DP) \times \text{SQRT}(ROH)$



NTPC Limited
(A Govt. of India Enterprise)
CONSULTANCY WING

TRANS NO. **241-105**
DATE **18/11/09**
(Signature)
(Date)

☐ APPROVED/RELEASED FOR CONSTRUCTION
☐ APPROVED/RELEASED FOR FLOAT BOARD CONSTRUCTION
AS NOTED/REMARKS
☐ NOT APPROVED/REJECTED FOR CONSTRUCTION
AFTER INCORPORATION OF COMMENTS/AMENDMENTS
AS NOTED
☐ FOR INFORMATION AND RECORDS
☐ FOR REVISION AND RESUBMIT FOR FINAL REC.

I APPROVE/CONFIRMED HEREIN NEITHER RELIEVES THE CONTRACTOR OF HIS
CONTRACTUAL OBLIGATION AND RESPONSIBILITIES FOR CORRECTNESS OF
DESIGN, MATERIALS AND CONSTRUCTION DESIGN DETAILS, ASSEMBLY,
INSTALLATION, PERFORMANCE AND CONFORMITY OF THE SUPPLIES TO THE
APPROVED SCHEMES AND STATUTORY LAWS. NOR
THE CONTRACTOR'S OBLIGATION UNDER THE CONTRACT.

Pl. ensure that the top cover is sealed properly
approved PSD and Pl. send one copy of
approved PSD to us.

Rev. No	Date	Description	Prepared By	Reviewed By	Released By
0	5/11/2009	FOR APPROVAL	SKS	APU	AVS

PROJECT	PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).
CUSTOMER:	 PRAGATI POWER CORPORATION LIMITED (PPCL)
CONSULTANT:	 NTPC LIMITED, CONSULTANCY WING
	 BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA
	 THERMAX LIMITED PUNE

DATA SHEET FOR FLOAT & BOARD TYPE LEVEL INDICATOR.

THERMAX DOC.NO.: WHJCB0008	BHEL DOC. NO. : PE-VO-314-164-A212	OC.NO. 630128 REV. NO : 00
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FLOAT & BOARD TYPE LEVEL INDICATOR							
GENERAL INFORMATION							
FLOAT	SS-316						
FLOAT DIAMETER	150 MM UP TO 0.4 M/200 MM 4.0 M						
GUIDE WIRE	SS-316						
TENSION ASSEMBLY	Cd PLATED STEEL						
ANCHOR	SS 316						
FLOAT CABLE	SS-316						
BOARD	AL EPOXY PAINTED						
MARKINGS	SCALE & NUMERICALS IN BLACK COLOUR (LC=50mm)						
CONNECTING ASSEMBLY	RED COLOUR						
INDICATOR/ POINTER	G.I CLASS 'B'						
INSTRUMENT CONNECTION	AL (EPOXY PAINTED)						
	40NB ANSI B 16.5, 150 # FF						
TAG NO	LOCATION	OPERATING CONDITIONS				TANK HEIGHT	TYPE OF TANK
		PRESSURE	TEMP	FLUID	SG.GRAVITY		
LIB - 621 A	LIME DOSING TANK-T3140 A	ATM	AMB	WATER	0.998	1900	RCC
LIB - 621 B	LIME DOSING TANK-T3140 B	ATM	AMB	WATER	0.998	1900	RCC
LIB - 623 A	LIME DOSING TANK-T3180 A	ATM	AMB	LIME	0.998	1400	RCC
LIB - 623 B	LIME DOSING TANK-T3180 B	ATM	AMB	LIME	0.998	1400	RCC
LIB - 626	OVERHEAD WATER STORAGE TANK-T-3110	ATM	AMB	WATER	1	1400	RCC
LIB - 627	THICKENER OVERFLOW COLLECTION SUMP-T-3190	ATM	AMB	WATER	1	2600	RCC
LIB - 629 A	CMB-I-T-3020	ATM	AMB	WATER	1	4900	RCC
LIB - 629 B	CMB-II-T-3020	ATM	AMB	WATER	1	4900	RCC

TAG NO.	MAKE	MODEL NO
LIB - 621 A	LEVCON	ML-196-1900
LIB - 621 B		ML-196-1900
LIB - 623 A		ML-196-1400
LIB - 623 B		ML-196-1400
LIB - 626		ML-196-1400
LIB - 627		ML-196-2500
LIB - 629 A		ML-196-4900
LIB - 629 B		ML-196-4900

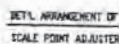
NOTE: GUIDE / MEASURING NOZZLE ARRANGEMENT ALONG WITH COUNTER FLANGES SHALL BE SUPPLIED BY VENDOR.

QTY : 06 NOS	PROJECT PRAGATI-II COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT SAKINAKADEM					
MAKE :LEVCON		1	5/1/2008	SKS	APU	AYS
THERMAX LIMITED	O.C NO: 630128	0	30/10/2008	SKS	APU	AYS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD, DELHI	Rev	Date	Prepd by	Ckd by	App by
Sd Chambers, Wakademiid	CLIENT : BHARAT HEAVY ELECTRICALS LTD		Specification No	Plant		SH NO
Phone 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING		WUCR0008	ETP		3 OF 2

MLI Series Float & Board Type Mechanical Level Indicator is used for local liquid level indicator of non-pressurised tanks.



- Simple in Construction.
- Top Mounting Type.
- Chances of failure practically zero as complete operation is mechanical.
- Bright visual indication on flat board scale fitted directly on side of the tank.
- Steel Ball bearing in pulley housing to ensure easier movement of float.
- Anchor Bar with Guide Wire Ropes and Tension Adjusters (to keep guide wire rope taut) prevent lateral movement of float due to turbulence.
- Brass Pull Chain (for range above 2.25 m).
- In case of large ranges (6M & Above), half size scale is provided for more convenient Visibility & to reduce Cost. The pointer is fitted on a floating pulley and pointer movement is half of float movement.



Applications :

Local Indication of Level in non-pressurised tanks containing water, oil etc.

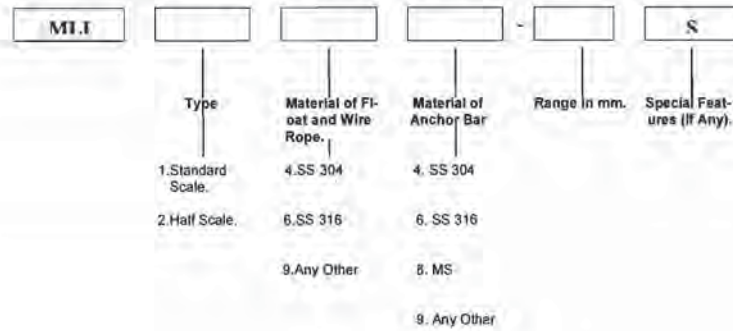
Principle of Operation :

A float moves up and down with rise and fall of liquid level in the tank. Correspondingly the pointer mechanism, with counter balance weight attached to the float wire rope (passing through a pair of pulleys) moves down and up against the Scale (with Scale Channel Block mounted vertically at side of tank). The reading against the pointer on the scale gives direct indication of liquid level.

Specifications :

Materials of Construction		
Float	:	SS 304/ SS 316.
Wire Rope	:	SS 316.
Pulley Housing	:	Aluminium.
Pulley & Pulley Shafts	:	SS 304
Flanges, Channel Blocks, Tension Adjusters, Counter Balance Weights.	:	MS.
Scale & Pointer	:	Aluminium.
Flanges	:	Mild Steel flanges normally confirm to 1"ANSI # 150 RF(plate type).
Type of Scale	:	Standard Full scale type upto 6 M. Half scale above 6 M..
Channel Blocks	:	150 MM wide up to range of 4 M & 250 mm wide above 4 M (with correspondingly thicker and bigger Lines & Letters).
No.of Channel Blocks	:	Supplied in 2 M sections for bolting up at site.
Channel Block Mounting	:	Plate welded at bottom with grouting arrangement. Series of 14 mm dia holes at 300 mm intervals at the back for suitable supporting brackets.
Range & Float Sizes	:	Upto 0-4 M : 150 mm dia round. Upto 4-6 M : 200 mm dia round. Above 6 M : 300 mm dia round.
Accuracy	:	± 15 mm up to range of 6 M. ± 20 mm for range above 6 M.
Painting	:	Pointer – Red, Scale – Black on white background, Channel Block and other MS Parts – Epilux 4 Zinc Rich Primer followed by Epilux – 4 Enamel Finish Paint.

MODEL NUMBER OF MECHANICAL LEVEL INDICATOR



Since improvements are made form from time to time , the specifications are liable to change without notice.

Head Office Address : "RajKamal" Bldg, 6th Floor, 13, Camac Street, Kolkata – 700017, Tel : (033)2283-2764/66,(033)2280-7180 Fax : (033)2283-2719/2280-9645.E-mail : levconh@vsnl.net, levconw@vsnl.net.

Mumbai Branch Address : 301, Protprima Chambers, 1 Suren Road,Andheri East, Mumbai-400093, Tel : (022)2683-2127/ 2683-3015, Fax : (022)2683-3015

LI/MLI/01 (Dt. 17.06.2003).

EFFLUENT TREATMENT PLANT		 एन टी सी NTPC NTPC Limited (A Govt. of India Enterprise) CONSULTANCY WING			
TRANS NO. <u>241-105</u> DATE <u>18/11/09</u> (SIGNATURE) <u>[Signature]</u> (DATE) _____		☐ I. APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION ☐ II. APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION SUBJECT TO INCORPORATION OF "GIVEN" MODIFICATIONS ☐ III. NOT APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION AFTER INCORPORATION OF "GIVEN" MODIFICATIONS AS NOTED ☒ IV. FOR INFORMATION AND RECORDS ☐ V. REVISE AND RESUBMIT FOR INF & REC.			
I. APPROVAL GRANTED HEREIN NEITHER RELIEVES THE CONTRACTOR OF HIS CONTRACTUAL OBLIGATION AND RESPONSIBILITIES FOR CORRECTNESS OF DIMENSIONS, MATERIAL OF CONSTRUCTION, DESIGN DETAILS, ASSEMBLY, PERFORMANCE PARTICULARS AND CONFORMITY OF THE SUPPLIES WITH THE SPECIFICATIONS, APPROVED SCHEMES AND STATUTORY LAWS, NOR DOES IT TRANSFER THE PURCHASER'S RIGHT UNDER THE CONTRACT. II. APPROVAL GRANTED HEREIN DOES NOT IMPLY THAT THE CONTRACTOR'S OBLIGATION TO COMPLY WITH THE SPECIFICATIONS IS PERMITTED WITHOUT THE PURCHASER'S APPROVAL.					
0	5/11/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By
PROJECT		PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).			
CUSTOMER:		 PRAGATI POWER CORPORATION LIMITED (PPCL)			
CONSULTANT:		 NTPC LIMITED, CONSULTANCY WING			
		 BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			
		 THERMAX LIMITED PUNE			
DATA SHEET FOR REFLEX TYPE LEVEL GAUGE					
THERMAX DOC. NO.:		BHEL DOC. NO.:		OC. NO. 630128	
WHJCA00018		PE-VO-314-164-A246		REV. NO : 00	

LEVEL GAUGES (REFLEX TYPE)							
SURFACE CONDENS.	1	TAG NO.	LG 620 A/B	LG 622 A/B	LG 624 A/B	LG 625 A/B/C/D	
	2	LOCATION	T - 3150 A/B	T - 3130 A/B	T - 3160 A/B	T - 3170 A/B	
	3	TANK HEIGHT IN MM	1400	1900	1400	2000	
	4	TYPE OF TANK	RCC	RCC	RCC	RCC	
	5	UPPER LIQUID	PE	ALUM	HCL	DWPE	
	6	PRESS OPERAT. 1 MAX Kg/Sq.cm	ATM				
	7	TEMP OPERAT. 1 MAX DEG CEN	AMB				
	8	SP.GRAVITY	1	1.1293	1.104	1	
GAUGE DETAILS	9	TYPE	---REFLEX---				
	10	NO. OF SECTIONS	3	4	3	3	
	11	CENTER-CENTER DISTANCE IN MM	1000	1300	1000	900	
	12	CONN. SIZE	--- 25 NB FLANGED ---				
	13	FLANGE STANDARD	AS PER ANSI-B-16.5-150# FF				
	14	CONN. LOCATION	REAR X REAR				
	15	SCALE	AL SCALE (C-10 MM)				
	16	GLASS MATL	TOUGHENED BORO SILICATE				
	17	GLASS DIMENSION	34mm wide x 17mm thick				
	18	SPINDLE	SS - 316	SS - 316	PP	SS - 316	
	19	GLASS COVERS	SS - 316	SS - 316	PVC	SS - 316	
GAUGE COCK	20	SEAT & TRIP	SS - 316	SS - 316	PP	SS - 316	
	21	BODY MATERIAL	SS 316	SS 316	PP	SS 316	
	22	VESSEL CONNECTION	FLANGED SS 316		FLANGED PP	FLANGED SS 316	
	23	BALL CHECK : GLASS	YES	YES	YES	YES	
	24	PACKING	PTFE				
	25	MINIMUM RATING Kg/Sq.cm	2	2	2	2	
	26	DRAIN VALVE	1/2" NPT Ball Valve in SS 316	1/2" NPT Ball Valve in SS 316	1/2" BSP Ball Valve in PP	1/2" NPT Ball Valve in SS 316	
	27	VENT VALVE	1/2" NPT with Plug in SS 316	1/2" NPT with Plug in SS 316	1/2" BSP with Plug in PP	1/2" NPT with Plug in SS 316	
	28	QUANTITY	2	2	2	4	
	29	MODEL NO.	RS 446-1116	RS 446-1116	RS 19-1119	RS 446-1116	
30	MAKE	LEVCON					
NOTE : SS TAG PLATE SHALL BE SUPPLIED ALONG WITH GAUGES							
QTY : 10		PROJECT: PRAGATI - III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI					
MAKE: LEVCON				1	5/11/2009		
THERMAX LIMITED		O.C NO: 630128		0	29/10/2009	SXS	
Water & Waste Solutions		OWNER: PRAGATI POWER CORPORATION LTD, DELHI		Rev	DATE	PREPD. BY	
Sai Chambers, Wakadewadi		CLIENT : BHARAT HEAVY ELECTRICALS LTD		Specification No		PLANT	
Pune 411 003 (INDIA)		CONSULTANT:- NTPC - CONSULTANCY WING		WH/CA00018		ETP	
						SH NO	
						2 OF 2	
						APU	
						App by	



Levcon INSTRUMENTS PRIVATE LIMITED

Reflex Level Gauge

RS Series Reflex Level Gauges are very robust and reliable and are used for local indication of clear and non-viscous liquids in vessels under temperature and pressure conditions like Steam Boilers, Condensers, Accumulators and Other Pressure Vessels.



Features :

- Suitable for side mounting on Tank/ Pressure Vessel.
- Large Chamber type in case of boiling/ evaporating liquids.
- Covers with top & bottom strengthening ribs as standard, 3 Piece Type for high pressure applications.
- Die forged parts in case of CS/ SS 304/ SS 316 leading to robust construction.
- Carbon Steel Parts are normally phosphated and subsequently High Temperature painted to ensure long life.
- Additional Gauge section (optional) at side to achieve uninterrupted visibility.
- High Quality gaskets for Sealing & Cushioning.
- Spring Cones for bolts in case of high pressure applications.
- Offset type Valves (with Safety Ball sealing arrangements) at top, bottom or sides. Other types on request.
- Bolted Bonnet or Screwed Bonnet type having Handwheel Operated Valves.
- Rotatable Gauge Body in case of Top & Bottom Connections having union nut & nipple type couplings.
- IBR/ Lloyds Certification (if required).
- Where high temperature is involved, the Glass Cover bolts should be re-tightened (at specified Torque, using Torque Wrench) at site after High Temperature is attained.

Applications :

Direct level indication of clear non-viscous liquids in any Process Industry (including Boilers) involving non-corrosive or corrosive liquids.

Principle of Operation:

With the rise or fall of liquid level in the vessel, liquid level moves up or down inside the Gauge Body. Clear indication of liquid level can be obtained from the front due to double reflection at glass serration.

Specifications :

Materials of Construction : Carbon Steel, Stainless Steel, PVC, Polypropylene, Rubber/ FEP Lined or ECTFE/ FEP Coated for Corrosive Applications.

Glass	Moulded borosilicate (extra hard) Reflex glasses conforming to BS 3463 : 1975 or Equivalent Standard.
Gaskets for Glass	Sealing Side : SLS150B – Grafoil with SS Sheet insert. Cushion Side : SIL4430 – Glass Fibre with Nitrile Rubber Binder. N.B : Other Gaskets : CAF, Teflon, Neoprene also available.
Bolts, Studs & Nuts	High Tensile steel (A193B7, A1942H or Equivalent). Other types on request.
Process Connections	Flanged, SW, BW or Screwed (Through Standard or Spherical Unions).
Pressure Rating	Upto 80 kg/cm ² (or above).
Temperature Rating	400°C max. for Non-Steam / Non-Corrosive Applications (243°C max. for steam and corrosive applications).
Optional Items	Aluminium / Stainless Steel engraved Scale, External or Internal Steam Heating Jackets, Antifrost Blocks (in case of sub-zero applications) etc.

MODEL NUMBER OF REFLEX LEVEL GAUGES

RS	Type	Design of Gauge Body.	Pressure Class	Gauge Body Material	Types of Valves & Combinations.	Top Valve Design	Bottom Valve Design	Material of Valves etc.	Special Features
	RS-Reflex Standard.	4.40/45 mm. wide.	1.Nominal Pressure.	4.SS 304	1.Offset type at Top & Bottom.	0.Without Valves.		4.SS 304	Spherical Union Heating Jackets, Antifrost block, End Tube Type Connections, Chain Operated Valves etc.
		5.90/100 mm wide.	4.10/15 Kg/Cm ²	6.SS 316	2.Offset type at Top Side & Bottom Side.	1.Globe Type Hand-wheel operated.	2.Do (High Pr.)	6.SS 316	
		6.120/130 mm wide.	5.20/30 Kg/Cm ²	8.Carbon Steel.	4.Straight type at Top & Bottom.	3.Globe type Push Button Operated.		8.Carbon Steel.	
		7.150/160 mm wide.	6.50/65 Kg/Cm ²	9.Others including PVC/ PP.	5.Straight type at Top & Bottom Side.	4.Globe type Wt. Lever Operated.		9.Others including PVC/ PP.	
		8.Large Chamber.	7.80/110 Kg/Cm ²		6.Straight type at Top Side & Bottom Side.				
		9.Large Chamber (Lined/Coated)	8.High Pr. Type		7.Straight type at Top Side & Bottom Side.				
					8.Expansion Loop at Top Side only.				
					9.Expansion Loops at Top & Bottom.				

All combinations are not possible. Please refer to the Manufacturers for concurrence. Special Materials under designated category will be differentiated by 'S'. For instance, In case SS 316L construction, number ' 5 ' will be used with 'S' at end.

Pressure Class 4, 5, 6 and 7 are basically 150/ 300/ 600/ 900 ANSI Classes & hence max.pressures may be higher than the figures indicated.

Since improvements are made from time to time, the specifications are liable to change without notice.

Head Office Address: "RajKamal" Bldg. 6th Floor, 13, Camac Street, Kolkata – 700017, Tel : 033)2283-2766/3022-5767/3022-9368 Fax : (033)2283-2719/2280-9645. E-mail : info@levcongroup.com, levconh@vsnl.net, levcon@ricmail.com.

Mumbai Branch Address : 301, Protprima Chambers, 1 Suren Road, Andheri East, Mumbai-400093, Tel : (022)2683-2127/ 2683-3015, Fax : (022)2683-3015. E-mail : levconm@airtelmail.in

LI/TR/01R (Dt. 25.05.2009).

NTPC

(A Govt of India Enterprise)
CONSISTENT TO

EFFLUENT TREATMENT PLANT

CBI-185

22/2/2010

Cat-IV

Cat-IV

DATE

DIV. REVISION

BHARAT HEAVY ELECTRICALS LTD.
PROJECT ENGINEERING MANAGEMENT
(MECHANICAL AUXILIARY)

his approval is given as laid down in the contract and I do not release the contractor from his contractual obligations.

APPROVAL: ☒ AWARDED = **I**

AT I = Approved
AT II = Approved With Comments as Noted
AT III = Not Approved
AT IV = Rejected Drawing

BHEL - PENDING APPROVED BY

NAME: **AKS**

SIGNATURE: **AKS**

DATE: **13/03/10**

I, ALTHOUGH CONVINCED THERE IN NEITHER RECEIVED THE CONTRACTUAL DELIVERABLES FOR RESPONSIBILITIES FOR CHECKING DIMENSIONS, MATERIALS, CONSTRUCTION DESIGN DETAILS AS PERFORMANCE PARTICULARS, QUALITY OF THE SUPPLIES WITH THE SPECIFICATIONS, APPROVED AS IT LIMIT THE PURCHASERS TO MAKE IN APPROVED DRAWING OR INCURANCE IN WORKING

1	2/2/2010	FOR APPROVAL	SKS	APU	AVS
0	22/12/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By

PROJECT PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).

CUSTOMER:

PRAGATI POWER CORPORATION LIMITED (PPCL)

CONSULTANT:

NTPC LIMITED, CONSUTANCY WING


BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA


THERMAX LIMITED
PUNE

DATA SHEET FOR CAPACITANCE TYPE LEVEL SWITCH

THERMAX DOC.NO.:
WHJCD00025

BHEL DOC. NO.:
PE-VO-314-164-A213

OC.NO. 630128
REV. NO : 01



PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL). (ETP PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-VO-314-164-A213
THERMAX OC NO: 630128

CAPACITANCE TYPE LEVEL SWITCH DOC NO. WHJCD00025

S.NO.	PARAMETER	COMPLIANCE REPORT	REMARKS
I	Power Supply	We have revised power supply from 230 V AC to 24 V DC	
II	BHEL to confirm vendor is in approved vendor list	Noted & confirmed	

INDEX FOR CAPACITANCE TYPE LEVEL SWITCH																																																
SR NO.	TAG NO	LOCATION	FLUID	TANK HEIGHT mm	ACTIVE PROBE LENGTH mm	REMARK																																										
1	LSH-720 A	HRSG AREA-1 & 2 ES-1	EFFLUENT	2950	2050	FOR SPECIFICATION REFER SHEET NO.04																																										
2	LSL-720 B	HRSG AREA-1 & 2 ES-1	EFFLUENT	2950	2850	FOR SPECIFICATION REFER SHEET NO.04																																										
3	LSH-721 A	HRSG AREA-3 & 4 ES-2	EFFLUENT	2950	2050	FOR SPECIFICATION REFER SHEET NO.04																																										
4	LSL-721 B	HRSG AREA-1 & 2 ES-2	EFFLUENT	2950	2850	FOR SPECIFICATION REFER SHEET NO.04																																										
5	LSH-722 A	STG AREA-1,GTG AREA-1 & 2 ES-4	EFFLUENT	2950	2050	FOR SPECIFICATION REFER SHEET NO.04																																										
6	LSL-722 B	STG AREA-1,GTG AREA-1 & 2 ES-4	EFFLUENT	2950	2850	FOR SPECIFICATION REFER SHEET NO.04																																										
7	LSH-723 A	GTG AREA-3,4,STG AREA -2 ES-5	EFFLUENT	3450	2550	FOR SPECIFICATION REFER SHEET NO.04																																										
8	LSL-723 B	GTG AREA-3,4,STG AREA -2 ES-5	EFFLUENT	3450	3350	FOR SPECIFICATION REFER SHEET NO.04																																										
9	LSH-724 A	GTG WASH WATER WASG ES-6	EFFLUENT	2950	2050	FOR SPECIFICATION REFER SHEET NO.04																																										
10	LSL-724 B	GTG WASH WATER WASG ES-6	EFFLUENT	2950	2850	FOR SPECIFICATION REFER SHEET NO.04																																										
11	LSH-725 A	STG MAINTANCE BAY ES-7	EFFLUENT	2950	2050	FOR SPECIFICATION REFER SHEET NO.04																																										
12	LSL-725 B	STG MAINTANCE BAY ES-7	EFFLUENT	2950	2850	FOR SPECIFICATION REFER SHEET NO.04																																										
13	LSH-726 A	GTG WATER WASTE-3 & 4. ES 8	EFFLUENT	2950	2050	FOR SPECIFICATION REFER SHEET NO.04																																										
14	LSL-726 B	GTG WATER WASTE-3 & 4. ES 8	EFFLUENT	2950	2850	FOR SPECIFICATION REFER SHEET NO.04																																										
15	LSH-727 A	T-3010	WASTE WATER	3200	1700	FOR SPECIFICATION REFER SHEET NO.04																																										
16	LSL-727 B	T-3010	WASTE WATER	3200	3100	FOR SPECIFICATION REFER SHEET NO.04																																										
17	LSH-728 A	T-3010	WASTE WATER	3200	1700	FOR SPECIFICATION REFER SHEET NO.04																																										
18	LSL-728 B	T-3010	WASTE WATER	3200	3100	FOR SPECIFICATION REFER SHEET NO.04																																										
19	LSH-729 A	SSF BACKWASH SUMP	BACKWASH	3200	1700	FOR SPECIFICATION REFER SHEET NO.04																																										
20	LSL-729 B	SSF BACKWASH SUMP	BACKWASH	3200	3100	FOR SPECIFICATION REFER SHEET NO.04																																										
21	LSH-730 A	T-3030	WATER	2450	650	FOR SPECIFICATION REFER SHEET NO.04																																										
22	LSL-730 B	T-3003	WATER	2450	2250	FOR SPECIFICATION REFER SHEET NO.04																																										
23	LSH-732 A	HRSG-1,ES-14	EFFLUENT	2950	1550	FOR SPECIFICATION REFER SHEET NO.04																																										
24	LSL-732 B	HRSG-1,ES-14	EFFLUENT	2950	2850	FOR SPECIFICATION REFER SHEET NO.04																																										
25	LSH-733 A	HRSG-2,ES-15	EFFLUENT	2950	1550	FOR SPECIFICATION REFER SHEET NO.04																																										
26	LSL-733 B	HRSG-2,ES-15	EFFLUENT	2950	2850	FOR SPECIFICATION REFER SHEET NO.04																																										
27	LSH-734 A	HRSG-3,ES-16	EFFLUENT	2950	1550	FOR SPECIFICATION REFER SHEET NO.04																																										
28	LSL-734 B	HRSG-3,ES-16	EFFLUENT	2950	2850	FOR SPECIFICATION REFER SHEET NO.04																																										
29	LSH-735 A	HRSG-4,ES-17	EFFLUENT	2950	1550	FOR SPECIFICATION REFER SHEET NO.04																																										
30	LSL-735 B	HRSG-4,ES-17	EFFLUENT	2950	2850	FOR SPECIFICATION REFER SHEET NO.04																																										
64 <table> <tr> <td>QTY :- NOS.</td><td>PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI</td><td>2</td><td>2/2/2010</td><td>SKS</td><td>APU</td><td>AVS</td></tr> <tr> <td>MAKE :- NIVO CONTROL</td><td></td><td>1</td><td>22/12/2009</td><td>SKS</td><td>APU</td><td>AVS</td></tr> <tr> <td>THERMAX LIMITED</td><td>O.C NO: 630128</td><td>0</td><td>6/10/2009</td><td>SKS</td><td>APU</td><td>AVS</td></tr> <tr> <td>Water & Waste Solutions</td><td>OWNER: PRAGATI POWER CORPORATION LTD.,DELHI</td><td>Rev</td><td>DATE</td><td>PREPD. BY</td><td>CHKD. BY</td><td>App by</td></tr> <tr> <td>Sai Chambers, Wakadewadi</td><td>CLIENT : BHARAT HEAVY ELECTRICALS LTD</td><td colspan="2">Specification No</td><td>PLANT</td><td colspan="2">SH NO</td></tr> <tr> <td>Pune 411 003 (INDIA)</td><td>CONSULTANT:- NTPC - CONSULTANCY WING</td><td colspan="2">WHJEG00001</td><td>ETP</td><td colspan="2">2 OF 4</td></tr> </table>							QTY :- NOS.	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI	2	2/2/2010	SKS	APU	AVS	MAKE :- NIVO CONTROL		1	22/12/2009	SKS	APU	AVS	THERMAX LIMITED	O.C NO: 630128	0	6/10/2009	SKS	APU	AVS	Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	DATE	PREPD. BY	CHKD. BY	App by	Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		PLANT	SH NO		Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJEG00001		ETP	2 OF 4	
QTY :- NOS.	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI	2	2/2/2010	SKS	APU	AVS																																										
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Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		PLANT	SH NO																																											
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJEG00001		ETP	2 OF 4																																											

INDEX FOR CAPACITANCE TYPE LEVEL SWITCH																																											
SR NO.	TAG NO	LOCATION	FLUID	TANK HEIGHT mm	ACTIVE PROBE LENGTH mm	REMARK																																					
31	LSH-739 A	T-3180 A	LIME	1400	700	FOR SPECIFICATION REFER SHEET NO.04																																					
32	LSL-739 B	T-3180 A	LIME	1400	1200	FOR SPECIFICATION REFER SHEET NO.04																																					
33	LSH-739 C	T-3180 B	LIME	1400	700	FOR SPECIFICATION REFER SHEET NO.04																																					
34	LSL-739 D	T-3180 B	LIME	1400	1200	FOR SPECIFICATION REFER SHEET NO.04																																					
35	LSH-741 A	TREATED WATER SUMP-ES-13	TREATED WATER	2900	500	FOR SPECIFICATION REFER SHEET NO.04																																					
36	LSL-741 A	TREATED WATER SUMP SUMP-ES-13	TREATED WATER	2900	2700	FOR SPECIFICATION REFER SHEET NO.04																																					
37	LSH-742 A	SLUDGE COLLECTION SUMP-ES-9	SLUDGE	3400	700	FOR SPECIFICATION REFER SHEET NO.04																																					
38	LSL-742 A	SLUDGE COLLECTION SUMP-ES-9	SLUDGE	3400	3200	FOR SPECIFICATION REFER SHEET NO.04																																					
39	LSH-743 A	CLARIFIER SLUDGE SUMP-ES-10	SLUDGE	3900	2600	FOR SPECIFICATION REFER SHEET NO.04																																					
40	LSL-743 B	CLARIFIER SLUDGE SUMP-ES-10	SLUDGE	3900	3700	FOR SPECIFICATION REFER SHEET NO.04																																					
41	LSH-737 A	T-3140 A	LIME	1700	500	FOR SPECIFICATION REFER SHEET NO.04																																					
42	LSL-737 B	T-3140 A	LIME	1700	1500	FOR SPECIFICATION REFER SHEET NO.04																																					
43	LSH-737 C	T-3140 B	LIME	1700	500	FOR SPECIFICATION REFER SHEET NO.04																																					
44	LSL-737 D	T-3140 B	LIME	1700	1500	FOR SPECIFICATION REFER SHEET NO.04																																					
45	LSH-744 A	T-3020 CENTRAL MONTERING BASIN COMP I	WATER	1500	700	FOR SPECIFICATION REFER SHEET NO.04																																					
46	LSL-744 B		WATER	1500	1300	FOR SPECIFICATION REFER SHEET NO.04																																					
47	LSLL-744 C		WATER	1500	700	FOR SPECIFICATION REFER SHEET NO.04																																					
48	LSHH-744 D		WATER	1500	1300	FOR SPECIFICATION REFER SHEET NO.04																																					
49	LSH-744 E	T-3020 CENTRAL MONTERING BASIN COMP II	WATER	1500	700	FOR SPECIFICATION REFER SHEET NO.04																																					
50	LSL-744 F		WATER	1500	1300	FOR SPECIFICATION REFER SHEET NO.04																																					
51	LSLL-744 G		WATER	1500	700	FOR SPECIFICATION REFER SHEET NO.04																																					
52	LSHH-744 H		WATER	1500	1300	FOR SPECIFICATION REFER SHEET NO.04																																					
53	LSH-746 A	THICKEND SLUDGE SUMP-ES-12	SLUDGE	3900	2900	FOR SPECIFICATION REFER SHEET NO.04																																					
54	LSL-746 B	THICKEND SLUDGE SUMP-ES-12	SLUDGE	3900	3700	FOR SPECIFICATION REFER SHEET NO.04																																					
55	LSH-747 A	CWT TREATMENT N-PIT ES-11	EFFLUENT	2600	1500	FOR SPECIFICATION REFER SHEET NO.04																																					
56	LSL-747 B	CWT TREATMENT N-PIT ES-11	EFFLUENT	2600	2400	FOR SPECIFICATION REFER SHEET NO.04																																					
57	LSH-749 A	T-3100	WATER	2600	500	FOR SPECIFICATION REFER SHEET NO.04																																					
58	LSL-749 B	T-3100	WATER	2600	2400	FOR SPECIFICATION REFER SHEET NO.04																																					
59	LSH-750 A	T-3190	DARIN SUMP-I	1000	300	FOR SPECIFICATION REFER SHEET NO.04																																					
60	LSL-750 B	T-3190	DARIN SUMP-I	1000	800	FOR SPECIFICATION REFER SHEET NO.04																																					
61	LSH-751 A	T-3200	DARIN SUMP-II	1000	300	FOR SPECIFICATION REFER SHEET NO.04																																					
62	LSL-751 B	T-3200	DRAIN SUMP-II	1000	800	FOR SPECIFICATION REFER SHEET NO.04																																					
63	LSH-748 A	T-3110	WATER	1550	650	FOR SPECIFICATION REFER SHEET NO.04																																					
64	LSL-748 B	T-3110	WATER	1550	1350	FOR SPECIFICATION REFER SHEET NO.04																																					
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QTY :- 5000	PROJECT: PRAGATI-III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI	2	2/2/2010	SKS	APU	AVS																																					
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LEVEL SWITCH (CAPACITANCE TYPE)

TYPE

1.PROBE

1.1 MOUNTING

1.2 MOC

2.PRE AMPLIFIER

2.1 PROTECTION CLASS

2.2 AMBIENT TEMP

3. CONTROL UNIT

3.1 MOUNTING

3.2 PROTECTION

3.3 POWER SUPPLY

3.4 SWITCH / CONTACT TYPE

3.5 CONTACT RATING

3.6 RESPONSE TIME

3.7 CABLE ENTRY

SET POINTS

TYPE OF TANK

CAPACITANCE TYPE

FLANGED TO 4 " ANSI 150 # FF

WIRE ROPE IN SS316 WITH FEP INSULATION

SOLID STATE ELECTRONIC MODULE TO BE MOUNTED ON

PROBE HEAD

IP -65

0 Deg.C. to 80 Deg.C. (AUTOMATIC TEMP.COMPENSATED.).

WALL MOUNTING - REMOTE

IP-65,WEATHERPROOF

24 VDC

2 SPDT SNAP ACTION DRY CONTACT
PER SET POINT

5 AMP AT 240 V AC RESISTIVE LOAD

LESS THAN 0.3 Sec

3/4" ET (F) X 3 NOS

ONE

RCC

NOTE: 1.SS TAG PLATE SHALL BE SUPPLIED ALONG WITH SWITCHES.
2.FOR TANK HEIGHT& ACTIVE ROPE LENGTH REFER INDEX SHEET

MAKE	MODEL NO.
NIVO CONTROL	ALC 541F

	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI	2	2/2/2010	SKS	APU	AVS
		1	22/12/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630128	0	6/10/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	DATE	PREPD. BY	CHKD. BY	App by
	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		PLANT	SH NO	
	CONSULTANT:- NTPC - CONSULTANCY WING	WHJEG00001		ETP	4 OF 4	

Capacitance Level Controller



NIVOLARM ALC 511/512/521/541



Applications:

Fine, Coarse or Bulk Solids. Conductive or Non-Conductive, Corrosive or Non-Corrosive Liquids. Slurries & Sticky Material

HIGH DURABILITY AND SYSTEM RELIABILITY

No Moving Parts, Interference Free Signal from Sensor

CALIBRATION FROM REMOTE LOCATION

Controller can be mounted far away from Sensor

IGNORES BUILD UP

Uses Ground / Energized Shield Probe

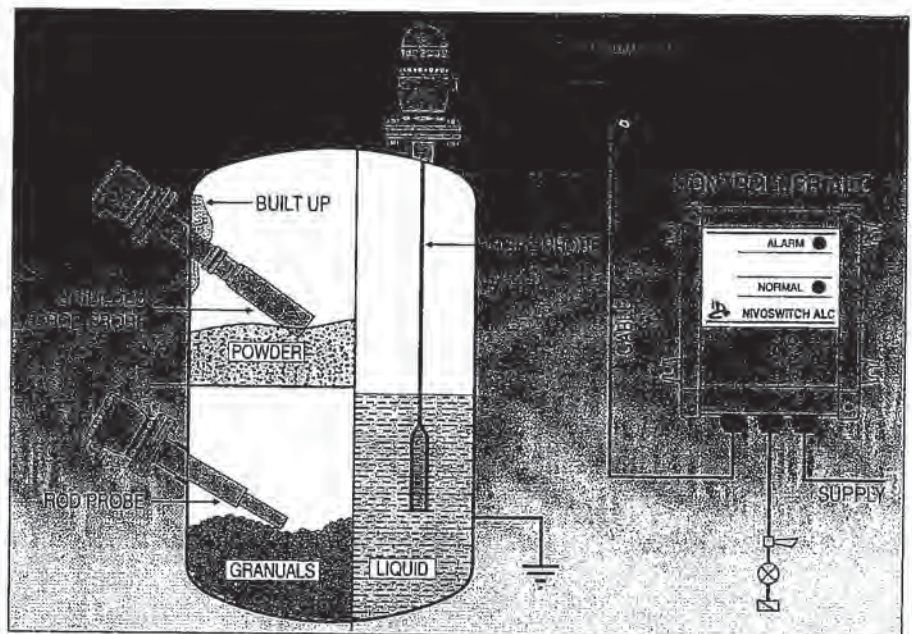
LOW INSTALLATION COST

Uses ordinary Multi-Core Cable

ALC an economical solution to level detection. Its sensor electronic gives DC Signal (Interference Free) which can be transmitted over long distances using ordinary unscreened multi-core cable.

Types of probes using different material of constructions are available to use in wide range of applications such as:

Acids	Hydrocarbons
Alkalies	Detergents
Coal	Plastics
Fly Ash	Cement
Sugar	Clinkers
Mineral Ores	



Change in Level causes change in Capacitance due to different Dielectric Constant of Fill Material. This causes change of admittance in the Measuring Circuit leading a change in RF Current which is detected by the Instrument.

Different models and their output:

- ALC 511 Single Set Point with Time Delay.
- ALC 512 Adjustable Switching Differential for Pump Control.
- ALC 521 Two Independent Set Points using two Sensors.
- ALC 541 Single Set Point with functional alarm and 7 segments display.
- ALC 541(F) Specially Designed for Fly Ash level detection with Fault Indication. Duly tested for Electromagnetic Interferences and Fast Electrical Transients.

Optional:

- Sheet Steel (Panel Mounting) Housing
- For use in Hazardous Applications ALC is available in intrinsic safe and ex-proof versions.

Dimension & Weight:

Model	Dimension	Weight
ALC 511/512/521/541	198(L)×170(W)×67(H)mm	Approximately 2kg

For detailed specifications please refer data sheet.

A complete measuring system consists of:

Probe Fully or partly insulated rod (with or without active shielding) or rope type.

Sensor Preamplifier mounted in probe head or separately (high temp. application) Generates signal and converts detected change in Signal to DC Signal.

Controller Electronic PCB in Cast Aluminium weather proof IP 65 Housing. Supplies Power to the Sensor. It also Receives DC Signal from Sensor and gives relay output.

Sensor is to be connected to controller using cable (Customer's Scope)



Marketed and Supported by

Toshbro Limited

15 Mahal Industrial Estate, Mahakali Caves Road, MIDC, Andheri (East), Mumbai-400 093
Phones: (22) 8373111, 8371695. Fax: (22) 836 4828, e-mail: toshbro@bom2.vsnl.net.in

Manufactured by

Nivo Controls Private Limited

104-115, Electronic Complex,
Indore 452 010. INDIA

Phones: 0731 553248/49, 558357

Fax: 0731 550075

e-mail: nivoin@bom4.vsnl.net.in

Branches	Phone	Fax	Branches	Phone	Fax	Branches	Phone	Fax
Ahmedabad	079-6578145	6577941	Delhi	011-5752464	5766222	Nagpur	0712-533859	224362
Ajmer	0145-420506	420505	Goa	0832-42692	224904	Pune	0212-310905	317606
Bangalore	080-3496143	3396143	Hyderabad	040-294906	291589	Vadodara	0265-422768	428057
Calcutta	033-2454687	2457508	Indore	0731-510120	550075			
Chennai	044-8276338	8276338	Lucknow	0522-282825	281277			

96/MKT/56/V2

CIRCULATING WATER TREATMENT PLANT

(A Govt. of India Enterprise)
CONSULTANCY WING

Signature
19/12/10

(SIGNATURE)

(DATE)

- ☐ I. APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION
- ☐ II. APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION SUBJECT TO INCORPORATION OF COMMENTS/MODIFICATIONS AS NOTED RESUBMIT REVISED DRAWING/DOCUMENT
- ☐ III. NOT APPROVED RESUBMIT REVISED DRAWING/DOCUMENT AFTER INCORPORATION OF COMMENT/MODIFICATION AS NOTED.
- ☒ IV. FOR INFORMATION AND RECORDS.
- ☐ IV. REVISE AND RESUBMIT, FOR INF. & REC.

APPROVAL CONVEYED HERE IN NEITHER RELIVES THE CONTRACTOR OF HIS ACTUAL OBLIGATION AND RESPONSIBILITIES FOR CORRECTNESS OF DESIGN, MATERIAL OF CONSTRUCTION, DESIGN DETAILS ASSEMBLY, PERFORMANCE PARTICULARS AND CONFORMITY OF THE SUPPLIES WITH SPECIFICATIONS, APPROVED SCHEMES AND STATUTORY LAWS. APPROVAL DOES NOT LIMIT THE PURCHASERS RIGHT UNDER THE CONTRACT. APPROVAL OF APPROVED DRAWING/DOCUMENTS IS PERMITTED WITHOUT FURTHER APPROVAL.

1	22/12/2009	REVISED AS PER NTPC COMMENTS	SKS	APU	AVS
0	25/11/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By
PROJECT		PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).			
CUSTOMER:		PRAGATI POWER CORPORTION LIMITED (PPCL)			
CONSULTANT:		NTPC LIMITED, CONSUTANCY WING			
		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			
		THERMAX LIMITED PUNE			

DATA SHEET FOR SIDE MOUNTED MAGNETIC FLOAT TYPE LEVEL SWITCH

THERMAX DOC.NO.: WHJCD00023	BHEL DOC. NO. PE-V0-314-156	BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGINEERING MANAGEMENT NOIDA OC NO. 630128 REV. NO: 00 01
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APPROVAL

CAT I = APPROVED

CAT II = APPROVED WITH COMMENTS AS NOTED

CAT III = NOT APPROVED

CAT IV = NOT APPROVED

BHEL - PE-156-156

NAME A.K.S.

SIGNATURE

DATE 13/12/10



PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL). (CWT PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-V0-314-156-A304 A
THERMAX OC NO: 630128

REPLIES TO THE COMMENT ON DATA SHEET

SIDE MOUNTED MAGNETIC FLOAT TYPE LEVEL SWITCH NO. WHJCD00023

S.NO.	COMMENT	THERMAX REPLY	REMARKS
I	SWITCH MICRO SWITCH WITH 2 SPDT SNAP ACTION DRY CONTACT	NOTED & CONFIRMED, DATA SHEET IS REVISED ACCORDINGLY	
II	ELECTRICAL CONNECTION SHALL BE PLUG IN SOCKET.	NOTED & CONFIRMED, DATA SHEET IS REVISED ACCORDINGLY	
III	CONTACT RATING 60 V DC, 6 VA	NOTED & CONFIRMED, DATA SHEET IS REVISED ACCORDINGLY	

LEVEL SWITCH (SIDE MOUNTED MAGNETIC FLOAT TYPE)					
TYPE	SIDE MOUNTED FLOAT OPERATED				
DIMENSIONS	MANUFACTURER'S STANDARD				
SWITCH	MICRO SWITCH WITH 2SPDT SNAP ACTION DRY CONTACT				
CONTACT RATING	6 V DC 6 VA				
ELECTRICAL CONNECTION	PLUG IN SOCKET				
ENCLOSURE	ALUMINIUM WEATHERPROOF-IP-65				
DIFFERENTIAL	12 ±2 mm (FIXED)				
ACCURACY	± 2 mm				
REPEATABILITY	± 1.5 mm				
MATERIAL OF FLOAT	SS316				
FLANGE MOC	SS316				
CONNECTION LOCATION	SIDE & SIDE				
LEVEL SWITCH FLANGE DETAILS	65 NB, ANSI B 16.5 150 # FF				

TAG NO	OPERATING CONDITIONS			FLUID	LOCATION
	NORMAL PRESSURE KG/CM2	TEMP ° C	SP GRAVITY		
LSL-703 A	ATM	AMB	1	SCALE INHIBITOR	T - 2020 A
LSLL-703 B	ATM	AMB	1	SCALE INHIBITOR	T - 2020 A
LSL-704 A	ATM	AMB	1	SCALE INHIBITOR	T -2020 B
LSLL-704 B	ATM	AMB	1	SCALE INHIBITOR	T - 2020 B
LSL-705 A	ATM	AMB	1	BIOCIDE	T - 2030 A
LSLL-705 B	ATM	AMB	1	BIOCIDE	T - 2030 A
LSL-706 A	ATM	AMB	1	BIOCIDE	T - 2030 B
LSLL-706 B	ATM	AMB	1	BIOCIDE	T - 2030 B
LSH - 707 A	ATM	AMB	1.0317	H2SO4	T - 2040 A
LSL - 707 B	ATM	AMB	1.0317	H2SO4	T - 2040 A
LSLL - 707 C	ATM	AMB	1.0317	H2SO4	T - 2040 A
LSH - 708 A	ATM	AMB	1.0317	H2SO4	T - 2040 B
LSL - 708 B	ATM	AMB	1.0317	H2SO4	T - 2040 B
LSLL - 708 C	ATM	AMB	1.0317	H2SO4	T - 2040 B
LSH - 709 A	ATM	AMB	1.0317	H2SO4	T - 2040 C
LSL - 709 B	ATM	AMB	1.0317	H2SO4	T - 2040 C
LSLL - 709 C	ATM	AMB	1.0317	H2SO4	T - 2040 C



MAKE	MODEL NO.
SBEM	137EA 2 7 T SA 2 S000-

QTY :- 17 NOS	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT	2	22/12/2009	SKS	APU	AVS
MAKE :-SBEM	1500 MW (NOMINAL) AT BAWANA,DELHI	1	25/11/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sal Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630128	0	20/8/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	Date	Prepd by	Chkd by	App by
	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant		SH NO
	CONSULTANT:- NTPC - CONSULTANCY WING	WH/CD00023		CLO2 & CW		2 OF 3

LEVEL SWITCH (SIDE MOUNTED MAGNETIC FLOAT TYPE)

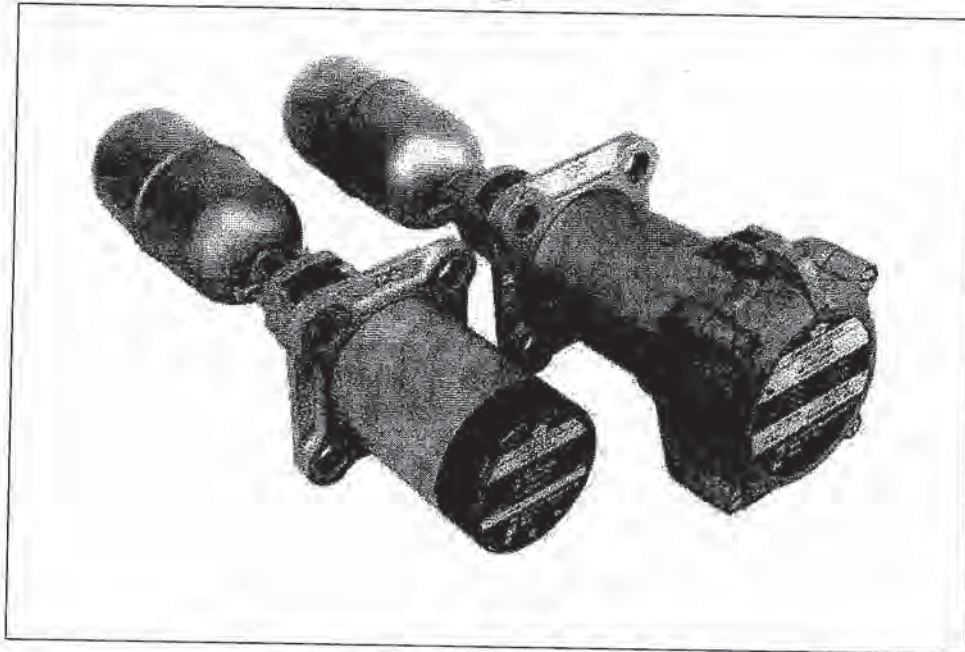
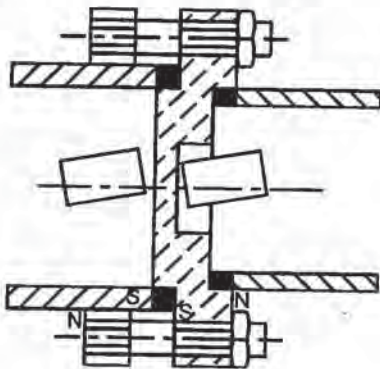
TYPE	SIDE MOUNTED FLOAT OPERATED
DIMENSIONS	MANUFACTURER'S STANDARD
SWITCH	MICRO SWITCH WITH 2SPDT SNAP ACTION DRY CONTACT
CONTACT RATING	6 V DC, 6 VA
ELECTRICAL CONNECTION	PLUG IN SOCKET
ENCLOSURE	ALUMINIUM WEATHERPROOF-IP-65
DIFFERENTIAL	25 ±2 mm
ACCURACY	± 2 mm
REPEATABILITY	± 1.5 mm
MATERIAL OF FLOAT	PP
FLANGE MOC	PP
CONNECTION LOCATION	SIDE & SIDE
LEVEL SWITCH FLANGE DETAILS	65 NB, ANSI B 16.5 150 # FF

TAG NO	OPERATING CONDITIONS			FLUID	LOCATION
	NORMAL PRESSURE KG/CM2	TEMP ° C	SP GRAVITY		
LSL - 701 A	ATM	AMB	1	CORROSION INHIBITOR	T - 2010 A
LSLL-701 B	ATM	AMB	1	CORROSION INHIBITOR	T - 2010 A
LSL - 702 A	ATM	AMB	1	CORROSION INHIBITOR	T - 2010 B
LSLL - 702 B	ATM	AMB	1	CORROSION INHIBITOR	T - 2010 B

(Signature)

MAKE	MODEL NO.
SBEM	137CEA 27 T P A 2 P--

QTY :- 04 NOS	PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT	2	22/12/2009	SKS	APU	AVS
MAKE :- SBEM	1500 MW (NOMINAL) AT BAWANA, DELHI	1	25/11/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630128	0	20/8/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	SH NO	
	CONSULTANT:- NTPC - CONSULTANCY WING	WHJCD00023		CWT	3 OF 3	

**OPERATING PRINCIPLE:**

The float movement of the level switch is transmitted through a solid non magnetic wall by the repulsion of like magnetic poles. This ensures that the float magnet imparts a snap action to the electric or pneumatic switch elements. 'S.B.E.M.' level switches are absolutely leak proof & not subject to material fatigue due to gland less design.

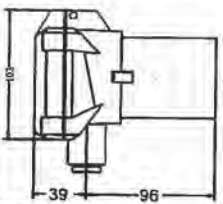
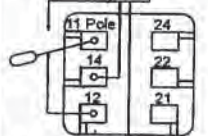
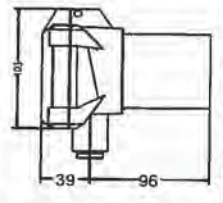
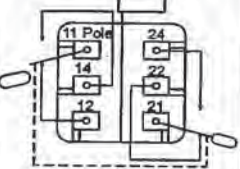
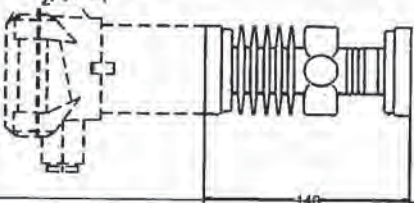
FEATURES:

- ☐ Modular construction:
 1. Switch module.
 2. Flange module.
 3. Float module.This means it gives flexibility with unlimited switch combinations to suit individual needs.
- ☐ Available in Electric On/Off and pneumatic proportions.
- ☐ Electric Switch available in Flameproof version also.
- ☐ Available with fixed or adjustable differential.
- ☐ High temperature version available.
- ☐ All wetted parts in stainless steel.
- ☐ Different types of Float Chambers available. For details refer LF-137.08/04.

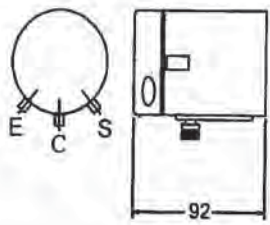
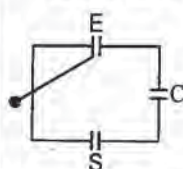
SWITCH MODULES

Type selection depending on application :

- ☐ Output required : electric or pneumatic
- ☐ Required action / function : Alarm annunciator, Motor starter or Pneumatic Proportional valves
- ☐ Type of enclosure to meet environmental conditions
- ☐ Flame Proof or Weather Proof: IP 65 / IP 67
- ☐ Max. operating temperature inside vessel / tank for high temperature stand off

Type Code	Output		Terminal Configuration.	Enclosure Material of Construction	Degree of Protection	Max. Ambient temp.	Max. Operating temp.
EA	Electric ON/OFF.		C/O contact position with 1 microswitch 	Die cast Aluminium	IP 65	0° C to 70°C	0° C to 180°C
EY	Electric On/Off Flameproof		C/O contact position with 2 microswitches 	Die cast Aluminium grade LM 6	IP 65	0° C to 70°C	0° C to 180°C
H	High Temp Stand-off with Electric ON/OFF.			For high temp. stand off sleeve-Cast Aluminium	IP 65	0° C to 70°C	-20°C to 300°C

- ☐ Operating pressure : 30 Kg/cm² (wet side)
- ☐ Contact rating : 5 Amps 230 VAC Resistive, (standard)
- ☐ Special execution on request: 1) IP 67 2) Operating temperature up to 300° C 3) Contact rating 10A@ 230VAC 4) Silicon bellows

Type Code	Output		Input/Output Diagram and Pressure Ratings	Enclosure Material Of Construction	Max Ambient Temp	Max Operating Temp
PNP	Pneumatic Proportional		E - Exhaust Port S - Input Port 1.4 Kg/cm ² air pressure C - Controlled output port 0.2 to 1.0 Kg/cm ² 	Aluminium	0-70°C	0-300°C

Supply connections : Std. 1/8" NPT (female), Optional 1/4" NPT (male/female), 1/4" BSP (male/female) with adaptors.
Instrument quality air supply is essential for PNP switch modules.
For more details on PNP switch controller refer LF-137-0808

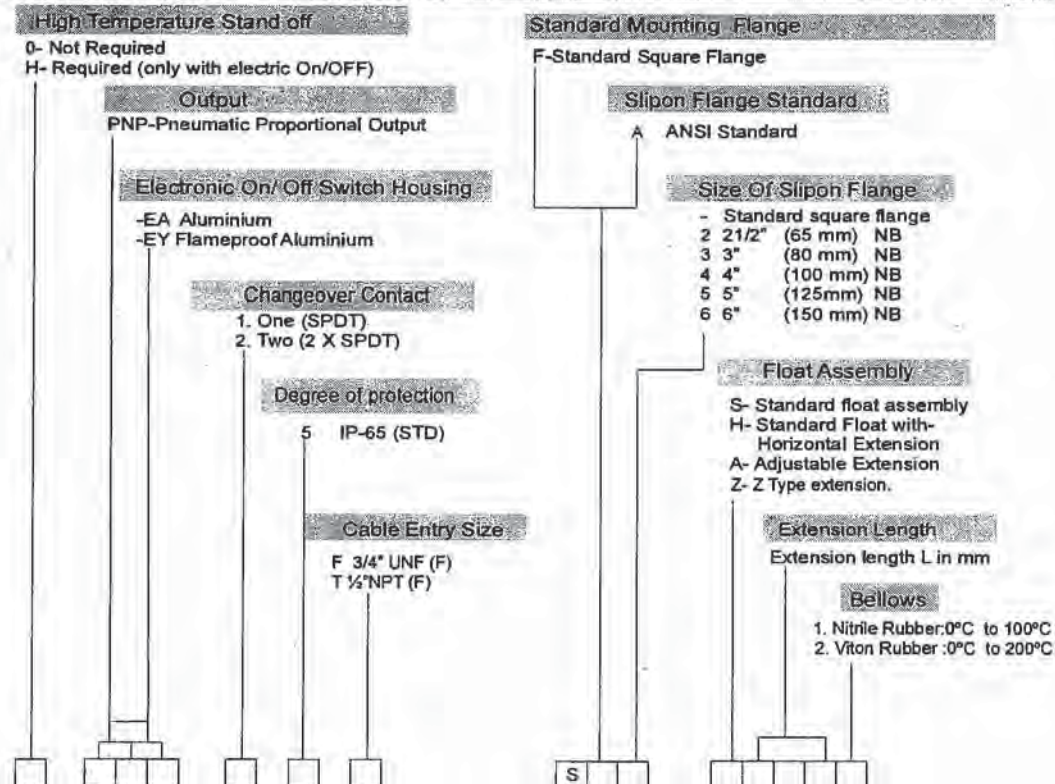
FLANGE MODULES:

Type selection depending on :

- ☐ Standard mounting flange
☐ Flange / nozzle mounting to ANSI.

Tank Code	Type		Material Of Construction	Mounting Details
SF	Standard mounting square flange		Stainless steel casting AISI 316	Direct mounting tank opening Min. $\varnothing$ 66 mounting holes to suit - M 12/1/2" BSW
SA	Slip on flange to suit side and top		a - sealing flange (fabricated) AISI 316 b - slip on flange, carbon steel passivated sealing flange.	Slip on flange nozzle mounting range 2 1/2" NB to 6" for ANSI, NB L max. 2 1/2", 3" 70 4", 5" 80 6" 90

ORDERING CODE:



ORDERING EXAMPLES MODULE CODES

1. Model Code: **H-EA25FSA4S300-**

Float switch with Electric ON/OFF, enclosure of aluminium with high temperature standoff having IP 65 degree of protection with 2 changeover contacts & 3/4" UNF Cable entry. Standard Square Flange, with a Standard Float Assembly & Extension Length L= 300mm.

2. Model Code: **-EA26TSA1Z2001**

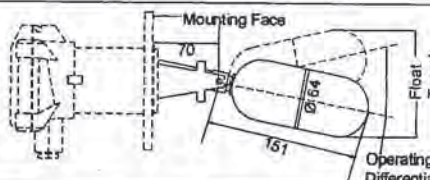
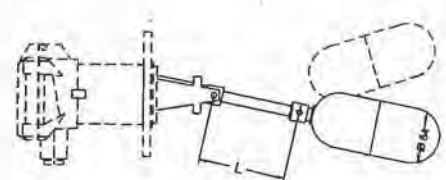
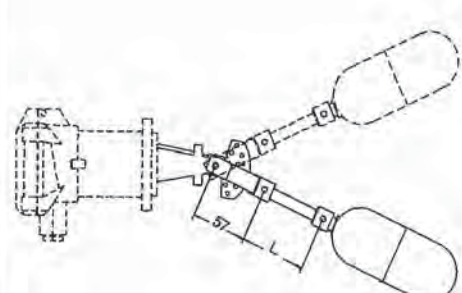
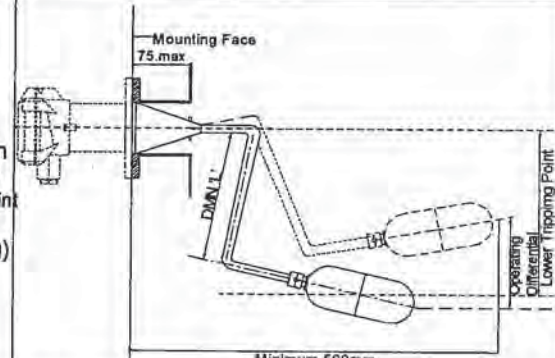
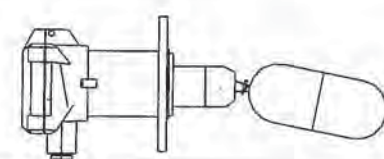
Float switch with Electric ON/OFF, aluminium housing with IP 65 degree of protection with 2 changeover contacts & 1/2" NPT Cable entry. 6" ANSI slip on flange, with a Z-type Float Assembly & extension length=200mm with nitrile rubber bellows.

3. For PNP Model Code please refer LF-137-0808

FLOAT MODULES:

Type selection depending on :

- ☐ Mounting position
- ☐ Level differential required
- ☐ Output of switch module

Type Code	Type		Switch Orientation	Float Travel in mm	Operating Differential												
					Liquid Density (Min) - 0.7 Kg/dm3												
					Operating differential values are referred to Liquid Density=1												
S	Standard Float Assembly		Horizontal	117 total	With On/Off Switch module 12mm total												
H	Horizontal		Horizontal	600 max	247 max. With L=990mm (0.25 X L approx)												
				Variable with extension Length L = 990mm max.													
				For 'H' total length with extension - L+221mm (from mounting face)													
A	Adjustable Differential extension		Horizontal with On/Off switch modules only	Adjustable 160-790 (approx.)	Adjustable 35-555 (approx.)												
				Std. Extension Lengths													
				<table><thead><tr><th>Code</th><th>Length</th></tr></thead><tbody><tr><td>-000</td><td>Without extension</td></tr><tr><td>-080</td><td>80mm</td></tr><tr><td>-180</td><td>180mm</td></tr><tr><td>-280</td><td>280mm</td></tr></tbody></table> For 'A' total length with extension - L+278mm (from mounting face)		Code	Length	-000	Without extension	-080	80mm	-180	180mm	-280	280mm		
Code	Length																
-000	Without extension																
-080	80mm																
-180	180mm																
-280	280mm																
Z	Z type extension (to lower tripping point below mounting)		Horizontal	O.D Operating differential +/- 10 Extension Length LTP Lower Trip Point +/- 25mm <table><thead><tr><th>L</th><th colspan="2">LTP @ SG = 1.0 - O.D</th></tr></thead><tbody><tr><td>100</td><td>116</td><td>41</td></tr><tr><td>200</td><td>216</td><td>45</td></tr><tr><td>300</td><td>316</td><td>49</td></tr></tbody></table>		L	LTP @ SG = 1.0 - O.D		100	116	41	200	216	45	300	316	49
L	LTP @ SG = 1.0 - O.D																
100	116	41															
200	216	45															
300	316	49															
S	Standard with Bellows		Horizontal	For Float Travel & Operating Differential Refer Application Note													

Material Of Construction for Wetside Components: AISI 316 Stainless Steel

[illegible]

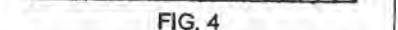


CONTROL PUMPS OR VALVES





EXTERNALLY MOUNTED





[illegible]

FIG. 6

1) Sketch giving details of installation

2) Application details

Fluid

Oper:

Operating temp. °C

Minimum density K_0

Switch mounti

Electric/Pneum

Contact rating 5 A/10A, 1 C/o / 3

High temp. stand off. Yes/No.

Standard sql

Nozzle size 2 1/2" NB to 6" NB

Std./Hori. extn/Ver.extn

Extension length horizontal

Lessons (optional)
Counterforce strategy

Elect. chamber type

Float chamber mate

Counter flange stand

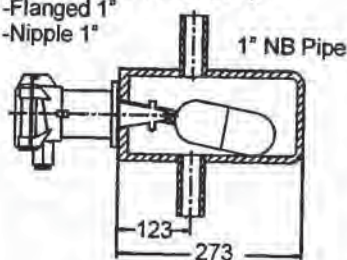
Material of counter flange CS/SS3

Float chamber mate

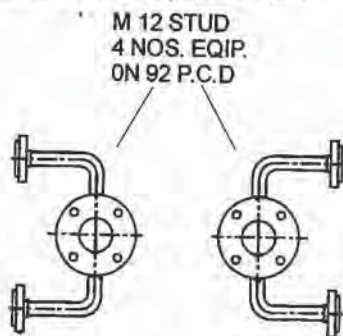
FLOAT CHAMBERS (FOR EXTERNAL MOUNTING)

FOR DETAILS REFER LF-137-0804

Ends of pipe available
bare weldable (as shown)
- Flanged 1"
- Nipple 1"

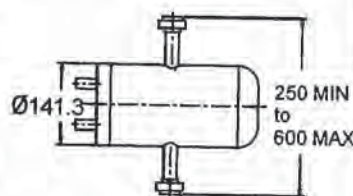


Type A

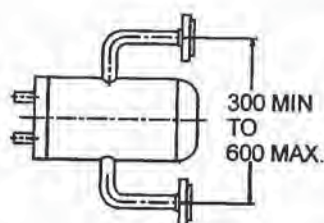


Type B

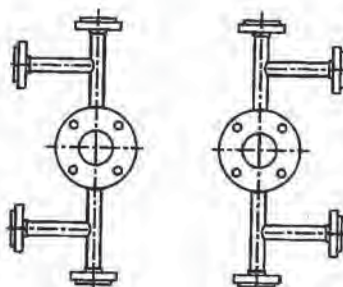
Type C



Type D

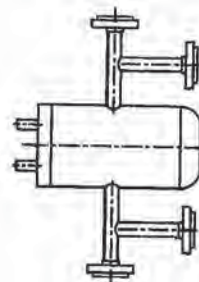


Type E



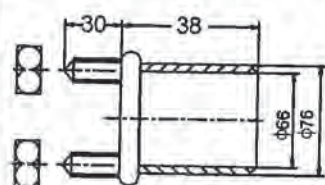
Type F
(LH Connection)

Type G
(RH Connection)

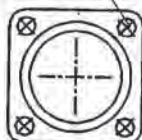


Type H

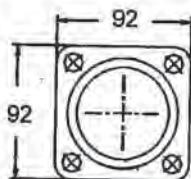
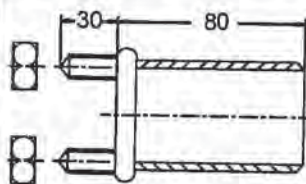
MOUNTING ACCESSORIES



M 12, 4 Nos.,
ON 92 P.C.D.



- A. Counter flange extended - (weldable)
Matl. : AISI - 316/CS painted
Construction : fabricated.
-To facilitate welding of counter flange on tank,
provide $\varnothing 77$ hole on the tank.



- B. Counter flange extended - (weldable)
Matl. : AISI - 316/CS painted
Construction : fabricated.
To facilitate welding of counter flange on thick coated
tank, provide $\varnothing 77$ hole on the tank.

*** Continuous developments may necessitate changes without notice.

LF-137-0807 R07 06/09

SBEM

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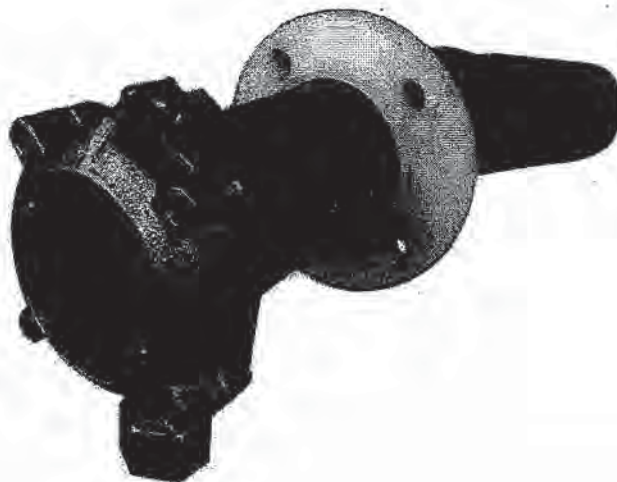
pune@sbem.co.in

SBEM

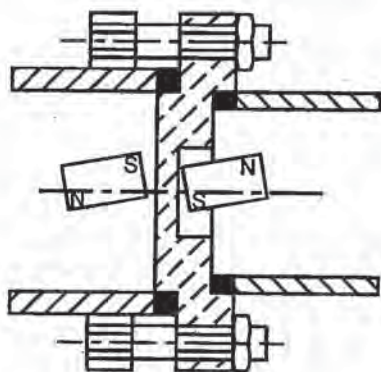
Level Measurement & Control Solutions

MAGNETIC FLOAT SWITCH, SERIES 137-C

FOR CORROSIVE APPLICATIONS



For corrosive applications SBEM offers a special construction in side mounted float switches in which wetted parts are in Polypropylene and switch enclosure is in aluminium. The basic principle of operation remains the same as in our standard magnetic float switch of series 137.



The movement of the float is transmitted through a solid Non magnetic wall by repulsion of like magnetic poles. This ensures that the float magnet imparts a snap action to the microswitch (es). Standard round flange or sealing /slip on type mounting having gland less construction Isolates the switch from the product completely. The Sturdy design, the double snap effect as result of the magnets used and the snap action of the microswitch (es) guarantee a virtually unlimited life time.

SPECIFICATIONS

Working Pressure	: Atmospheric (liquid column height above float 8 meter maximum for liquid density 1.2 kg/dm ³)
Operating temperature	: 0 to 60 °C
Ambient temperature	: 0 to 60 °C
Density of liquid	: 0.7 to 1.2 kg/dm ³
Weight (without flange)	: 2.0 kg (Approx.)
Operating differential	: 12 ± 2 mm (fixed)
Repeatability	: ± 2 mm
Switch enclosure	: Aluminium alloy
Ingress protection	: IP-65 as per IS:13947 (Part I) -1993
Switch element	: Microswitch, SPDT, Silver Plated contacts
Switch rating	: 5 A @ 230 VAC (Resistive)
Flange material	: Polypropylene
Flange type	: ANSI 150# or standard round flange.
Wetside material	: Polypropylene

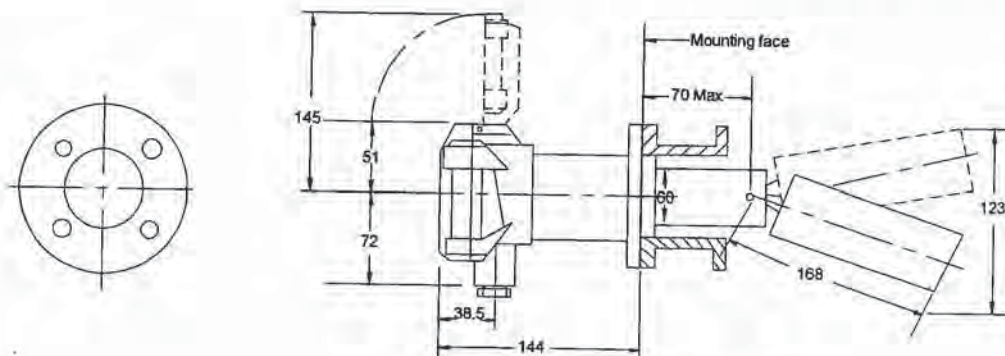
ORDERING CODE FOR POLYPROPYLENE SWITCH

SWITCH					FLANGE		FLOAT						
1	3	7	-	C	E	A		5	P				
ELECTRIC ON-OFF					FLANGE MATERIAL					P - POLYPROPYLENE			
MATERIAL OF CONSTRUCTION					FLANGE SIZE					2 - 65 NB (2 1/2")			
ALUMINIUM - A					R - STD (ROUND FLANGE)								
CHANGE OVER CONTACTS					FLANGE STANDARD					A - ANSI			
ONE MICROSWITCH - 1					R - STD (ROUND FLANGE)								
TWO MICROSWITCHES - 2					MATERIAL OF CONSTRUCTION					P - POLYPROPYLENE			
DEGREE OF PROTECTION													
IP-65 - 5													
CABLE ENTRY SIZE													
3/4" UNF/ET - F													
1/2"NPT - T													

NOTE:

1. ALL FLANGES ARE INTEGRAL, NO SLIP ON FLANGE NECESSARY.
2. STANDARD ROUND FLANGE TO BE SELECTED WHEN CHAMBERS MODEL 137-CH, LF-137-0804-R04 IS REQUIRED.

MECHANICAL DIMENSIONS



NOTE:

1. STANDARD FLANGE IS INTEGRAL ONLY (DIMENSIONS FOR STD. FLANGE, OD117, THICKNES 13 WITH 4 HOLES OF DIA 14 ON 92 PCD.)
2. DIMENSION OF ANSI FLANGE, NO. OF HOLES, HOLES SIZES & PCD AS PER ANSI 160#, 2 1/2" NB.

*** Continuous developments may necessitate changes without notice.

LF-137-0801 R07 06/2009

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SEWAGE TRETMENT PLANT

0	30/10/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By
PROJECT		PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).			
CUSTOMER: 		PRAGATI POWER CORPORTION LIMITED (PPCL)			
CONSULTANT: 		NTPC LIMITED, CONSUTANCY WING			
		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			
		THERMAX LIMITED PUNE			
DATA SHEET FOR PH ANALYSER					
THERMAX DOC.NO.: WHJEB00022		BHEL DOC. NO. : BHEL DOC. NO. :PE-V0-314-673-A139			OC.NO. 630128 REV. NO : 00

INDEX FOR PH ANALYSER							
SR NO.	TAG NO	LOCATION	RANGE pH	OPERATING PARAMETERS		REMARK	
				TEMP	PRESSURE KG/CM2		
1	AE - 811	DISCHARGE OF TREATED SEWAGE PUMP P-4070 A/B	0-14	AMB	1.5	FOR SENSOR SPECIFICATION REFER SHEET NO.03	
2	AT - 811	DISCHARGE OF TREATED SEWAGE PUMP P-4070 A/B	0-14	AMB	1.5	FOR TRANSMITTER SPECIFICATION REFER SHEET NO.04	
QTY :- 1 SET		PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI					
MAKE :- AS PER APPROVED VENDOR LIST							
THERMAX LIMITED		O.C NO: 630128	0	30/10/2009	SKS	APU	AVS
Water & Waste Solutions		OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	DATE	PREPD. BY	CHKD. BY	App by
Sai Chambers, Wakadewadi		CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		PLANT	SH NO	
Pune 411 003 (INDIA)		CONSULTANT:- NTPC - CONSULTANCY WING	WHJEB00022		STP	Page 137 of 283 2 OF 4	

PH SENSOR SPECIFICATION SHEET							
Sr	Identification	Specification					
	General						
1	Make	EMERSON					
	Transmitter						
2	Model Number	399-01					
3	Analyzer Compatibility	1181PH					
4	Type	Flow Through PH Sensor					
5	PH Range	Refer Sheet no.1					
6	Process Temperature	65°C @ 100Psi					
7	Maximum Process Pressure	100 psig @ 65°C					
8	Sample Flow Rate	60 to 180 ml/min					
9	Process Connections	1 in. MNPT					
10	Reference Electrode	Double junction KCl gel Filled, Ceramic Junction					
11	Sensor Cable	10 ft cable with integral preamp					
12	Sensor Body	Tefzel					
13	Sample IN / OUT Connections	1/4" NPT (F)					
14	Cell Holder	POLYCARBONATE FLOW THROUGH CHAMBER					
		PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI					
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)		O.C NO: 630128	0	30/10/2009	SKS	APU	AVS
		OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	DATE	PREPD. BY	CHKD. BY	App by
		CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		PLANT	SH NO	
		CONSULTANT:- NTPC - CONSULTANCY WING	WHJEB00022		STP	Page 138 of 283 3 of 4	

PH TRANSMITTER SPECIFICATION SHEET							
Sr	Identification	Specification					
	General						
1	Make	EMERSON					
		Transmitter					
2	Model Number	1181 PH-06-07-11					
3	Type	2 wire with Local Indication					
4	PH Range	Refer Sheet no.1					
5	Maximum Span Limit	0 to 14 PH					
6	Internal Range Select	Any 2 to 14 PH span in one PH steps					
7	Accuracy	± 0.1 % Of Full Scale or ± 0.05 pH or better					
8	Stability	± 0.1 % / month					
9	Repeatability	± 0.05 % of span or better					
10	Power Supply	24 VDC					
11	Display	Digital Type					
12	Input	Single sensor input					
13	Output	4-20 mA Analog DC Isolated					
14	Temperature Compensation	Automatic					
	Range	5 to 85 °C for 399 & 4 to 71 °C for 320HP					
	Temperature Coefficient	± 0.0028 PH/°C Full Scale					
15	Mounting Brackets	2" Pipe / Wall / Surface Mount					
16	Enclosure / Housing	NEMA 4X Whether-Proof.					
17	Electrical connections / Conduit Entry Size	1/2 "-14 NPT (F)X 2Nos.					
	Accessories						
18	Nameplate	SS 316					
		PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI					
THERMAX LIMITED		O.C NO: 630128	0	30/10/2009	SKS	APU	AVS
Water & Waste Solutions		OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	DATE	PREPD. BY	CHKD. BY	App by
Sai Chambers, Wakadewadi		CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		PLANT	SH NO	
Pune 411 003 (INDIA)		CONSULTANT:- NTPC - CONSULTANCY WING	WHJEB00022		STP	Page 139 of 283	

pH/ORP Sensors

- NEW OPTIONS to meet a variety of application requirements, including:

- * Low ionic strength water
- * Processes with hydrofluoric acid, high pH, and reference poisoning elements

- QUICK CABLE-TO-SENSOR RELEASE, provided by the water-tight VP multiple-pin connector, eliminates cable twisting.
- EXTENDED SENSOR LIFE provided by double or triple junction reference cell in process solutions containing poisoning ions.
- OPTIMUM VERSITILITY FOR VARIOUS MOUNTING OPTIONS provided by one-piece construction with process threads in two places.
- MAXIMUM CHEMICAL RESISTANCE provided by rugged tefzel¹ body, completely sealed to eliminate sensor leakage.
- ENHANCED PERFORMANCE AND INCREASED LIFE with minimized glass cracking provided by field-proven AccuGLASS^{TM2} pH glass formulations.



MODEL 399

Insertion/Submersion
Sensor with integral cable



MODEL 399VP

Insertion/Submersion Sensor
with new VP connector
(uses mating VP cable)

¹ Tefzel and Viton are registered trademarks of E.I. du Pont de Nemours and Co.

² AccuGLASS is trademark of Rosemount Analytical.

FEATURES AND APPLICATIONS

The reference junction aids in the sensor's resistance to poisoning ions and helps prolong sensor life. Models 399 and 399VP are provided with a double junction reference, which protects the reference element from poisoning ions — such as ammonia, chlorine, cyanides, and sulfides — in the process. When large amounts of poisoning agents are present, an optional triple junction may be ordered to help prolong the sensor life. Both models, in either the double or triple reference configuration, are made with an outer ceramic junction constructed in an annular design around the pH/ORP-sensitive membrane.

The AccuGLASS pH glass formulations exceed industry standards. The AccuGlass pH glass is a result of many years of glass research resulting in a formulation which has been found to increase the life of the sensor. Unlike other

pH glasses presently on the market, this glass resists cracking especially at higher temperatures and reduces sodium ion error commonly found in high pH applications. Overall, the AccuGlass formulation enhances the sensor performance to measure pH more accurately and have a longer sensor life than ever before.

A choice of pH glass electrodes is available to best meet various application needs. Four types are available: hemi bulb, flat bulb, HF resistant, and Hi pH glass. The AccuGLASS hemi bulb is the standard glass offered on both models and can be used for most applications. The hemi bulb is also found on the HF resistant and Hi pH glass options. The AccuGLASS flat glass option can be used in abrasive or coating applications that etch or build up on glass, respectively.

Continued on following page...

FEATURES AND APPLICATIONS (cont.)

NEW - Model 399VP is offered with a watertight sensor-to-cable connector which eliminates re-wiring and cable twisting when replacing sensors. The Variopool VP multiple pin connector is an integral part of each sensor model and uses a mating VP cable; see page 7 for example. Once the cable is installed and wired to the analyzer, sensors are easily replaced without replacing the cable and without rewiring the analyzer. Also the cable can be disconnected from the sensor before removal from the process which eliminates cable twisting.

Models 399 and 399VP are housed in a molded Tefzel body with Viton o-rings, making each sensor virtually indestructible and chemically resistant. Complete encapsulation eliminates leakage or high humidity problems traditionally found in other pH/ORP designs. The simplified construction, designed with user convenience in mind does not require electrolyte (KCl) replenishment or any high maintenance troubleshooting procedures.

A preamplifier converts the high impedance pH signal into a stable, noise-free signal and must be used with all pH sensors. The Model 399 offers the choice of an integral sensor preamplifier. Both Models can use a remote preamplifier, integral to the analyzer/transmitter or in a remote junction box. All preamplifiers have a transmission capability of up to three miles. The Rosemount Analytical preamplifier method has become the industry standard for pH/ORP measurement reliability.

Installation is easily achieved through the wide variety of mounting configurations. Both Models feature 1 inch (MNPT) front and rear facing connections for insertion, submersion, or flow-through pH and ORP applications.

New options are available for special application needs, including high purity/low conductivity water, heavy reference poisoning, and continuous high or low temperature processes. Consult the factory or your local sales representative for more details on these new options.

Both models are combination sensors (pH, reference, and temperature within sensor body) and measure pH or ORP (Oxidation/Reduction Potential) of aqueous solutions in pipelines, open tanks, or ponds. Models 399 and 399VP are suitable for virtually all applications and are compatible with Rosemount Analytical and other manufacturers' instruments.

PHYSICAL SPECIFICATIONS

Materials of Construction: Tefzel, glass, ceramic, & Viton

Process Connections: 1 in. MNPT, 2 places

Integral Cable:

Model 399: 5 conductor, 10 or 32 ft cable undressed (integral preamp), 10 ft coax cable (remote preamp) 4 conductor, 20 or 100 ft cable undressed (for Solu Comp)

Model 399VP: None; must use mating VP cable

Measured Range: pH: ACCUGLASS 0-14
ORP: -1500 to +1500 mV

Maximum Pressure:

790 kPa [abs] (100 psig) at 65°C (see Graph 1 below)

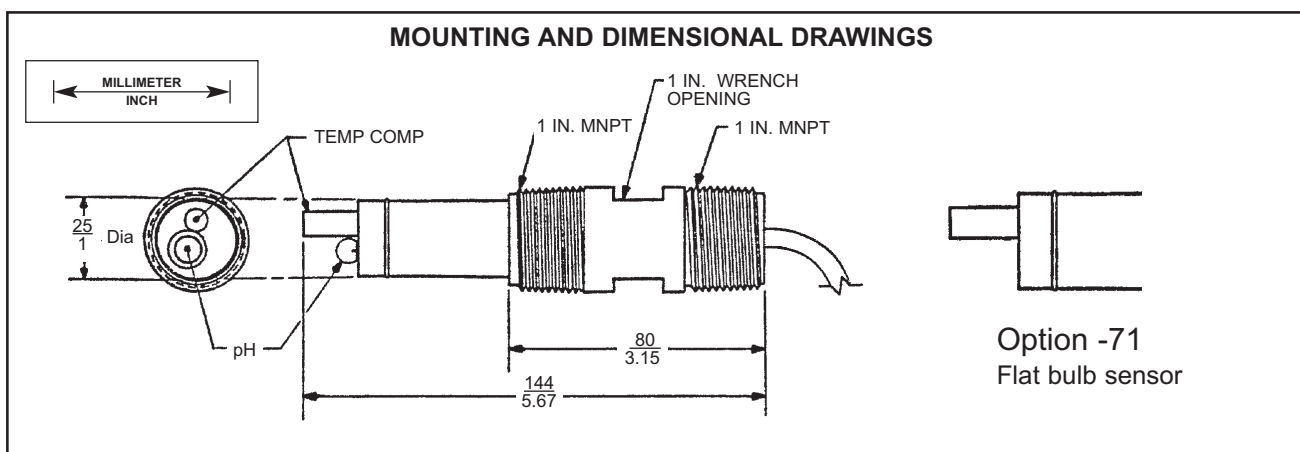
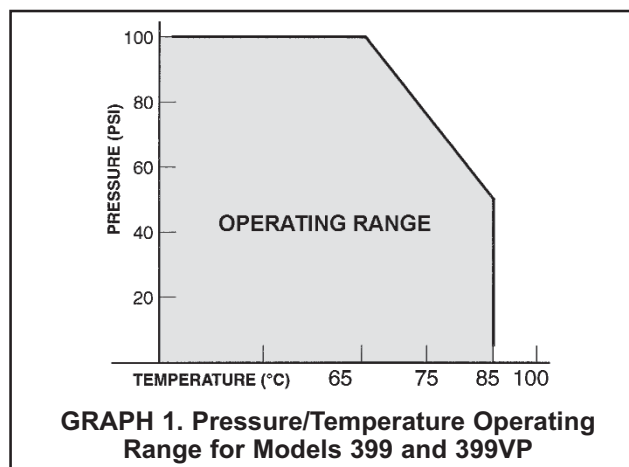
Weight/Shipping Weight: 0.45 kg/0.9 kg (1 lb/2 lb)

Temperature Compensation: Automatic 0° to 85°C (32° to 185°F), Temperature compensation is not required for 399 ORP when used with Models 1060, 1023 or 1181 ORP

Percent Linearity Over pH Range:

	GPLR Hemi Bulb	Flat Bulb
1-2 pH	94%	93%
2-12 pH	99%	98%
12-13 pH	97%	95%

- High pH glass provides greater accuracy over 12.5 pH
- HF glass provides improved resistance to hydrofluoric acid up to 300 ppm



ORDERING INFORMATION

The **Model 399 pH/ORP Sensor** is available with custom glass electrodes housed in a molded Tefzel body with 1 in. MNPT threads suitable for insertion, submersion or flow through installation. The sensor includes a general purpose hemi bulb pH electrode (flat bulb optional) or a platinum ORP electrode and a double junction gel filled reference electrode. The Model 399 pH is available with an optional integral hermetically sealed preamplifier. The Model 399 ORP is only available with an integral preamplifier. Automatic temperature compensation is standard with the Model 399 pH, but is not required on the Model 399 ORP (except when used with the Model 1054A ORP Microprocessor Analyzer). Variable cable lengths are available for both the 399 pH and 399 ORP.



The Model 399 insertion/submersion sensor with integral cable is offered with or without a built-in preamplifier.

MODEL 399 pH SENSOR	
Code	399 pH (GPLR hemi bulb) Preamplifier/Cable (Required Selection)
01	10 ft cable with integral preamp for Models 1181pH and 1050
05	32 ft cable with integral preamp for Models 1181pH and 1050
03	10 ft cable with integral preamp for Model 1003
06	32 ft cable with integral preamp for Model 1003
07	10 ft cable with integral preamp for Model 1054A/B and 2081 pH
08	32 ft cable with integral preamp for Model 1054A/B and 2081 pH
02	10 ft coax cable for remote preamp, 3K ohm TC (Models 1181, 1050, and 1003)
04	10 ft cable for remote preamp, Pt100 TC (Solu Cube)
09	10 ft coax cable for remote preamp, Pt100 TC (Model 1054A/B)
12	20 ft cable for Model SCL-P (Formerly pH201)
13	100 ft cable for Model SCL-P (Formerly pH201-Z100)
09-62	10 ft coax cable for remote preamp, Pt100 RTD (Models 54e, 1055, 81, 2081, 3081, 4081, 5081, and Xmt)
10	10 ft cable with integral preamp for Models 54e, 81, 1055, 3081, 4081, 5081, and Xmt
14	32 ft cable with integral preamp for Models 54e, 81, 1055, 3081, 4081, 5081, and Xmt
Code	Specialized Glass Types (optional - choose one)
73	High pH (improved accuracy above 12.5 pH))
15	HF Resistant (up to 300 ppm)
71	GPLR Flat bulb (for abrasives)
Code	Specialized Reference Fills - valid only with standard hemi glass (optional - choose one)
301	Low ionic strength water, greater than 5 μ S/cm
302	Triple reference for improved resistance to poisoning ions (sulfide & heavy metals)
303	Low temperature storage (below freezing)
399	14 73 EXAMPLE

MODEL 399 ORP SENSOR	
Code	399 ORP Preamplifier/Cable (Required Selection)
30	32 ft cable with integral preamp for Models 1181OR and 1060
31	32 ft cable with integral preamp for Model 1023
32	32 ft cable with integral preamp for Model 1054A/B ORP
33	20 ft cable for for remote preamp for Models SCL-Q, 54e, 81, 1055, 3081, 4081, 5081, and Xmt
34	32 ft cable with integral preamp for Models 54e, 81, 1055, 3081, 4081, 5081, and Xmt
399	32 EXAMPLE

Two-Wire Transmitters

- **TWO-WIRE FIELD MOUNTED TRANSMITTERS.** Ideal for multiple loop installations where central data processing and control are required. Field mounting near the sensor for ease in routine calibration.
- **NEMA 4X WEATHERPROOF, CORROSION-RESISTANT, DUAL COMPARTMENT HOUSING.** Provides maximum circuit protection for increased reliability in industrial environments.
- **HAZARDOUS AREA INSTALLATION.** Certified NEMA 7B explosion-proof and intrinsically safe when used with an approved sensor and safety barrier.
- **COMMONALITY OF PARTS.** Reduces inventory required to support different field measurements.
- **EXTERNAL ZERO AND SPAN, 20-turn potentiometers** provide for fine calibration of the isolated 4-20 mA output signal.



FEATURES AND APPLICATIONS

The Rosemount Analytical Two-Wire field mounted transmitters, with the appropriate sensors, are designed to continuously measure the pH, ORP, Conductivity, Dissolved Oxygen, or Free Residual Chlorine in industrial processes.

The Model 1181 Transmitters include all the circuitry necessary for the measurement and transmission of an isolated 4-20 mA linear signal. Measurement range selection is made through internal range switches that are easily accessed by removing a housing cover. No further disassembly is required. A matrix is provided which conveniently indicates the proper switch position. Range selection can be made without the use of the instruction manual. Fine calibration of the 4-20 mA signal is accomplished with the 20-turn external Zero and Span potentiometers.

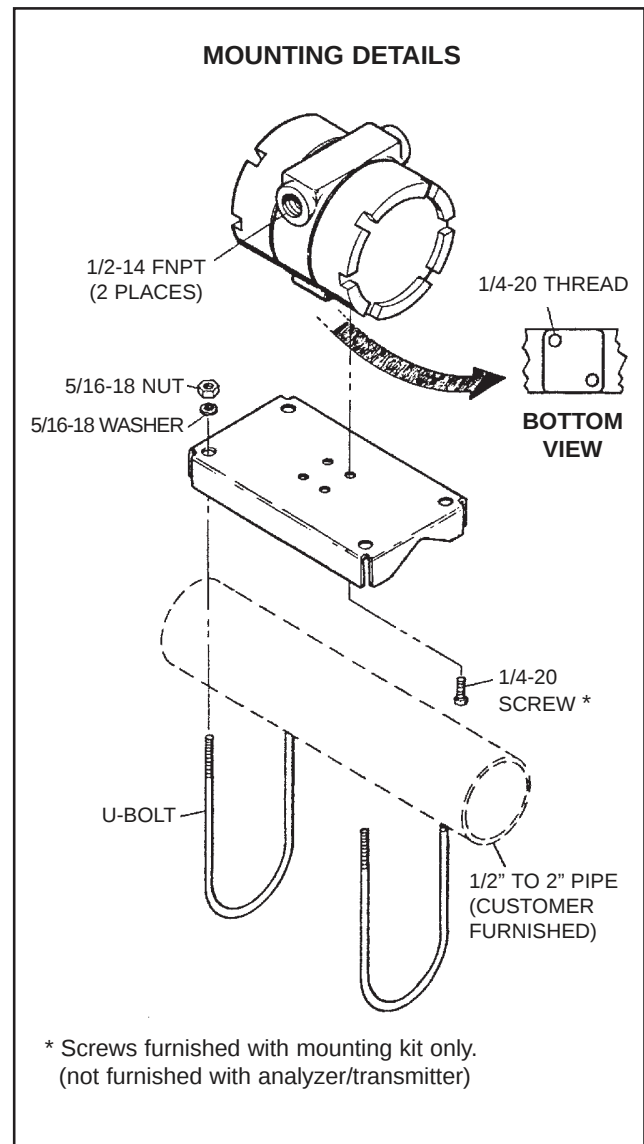
The electronic printed circuits are protected from the environment by the NEMA 4X weatherproof, corrosion resistant enclosure. The printed circuit cards plug into a moisture barrier which is isolated from the field wiring and calibration terminals. Routine field calibration does not require exposing the electronics to harsh industrial environments. All PCBs are conformal coated for maximum protection. The PCBs are removed as a unit and may be individually replaced. The transmitter housing covers are sealed with large cross sectional O-rings and need not be replaced each time the cover is removed.

The Model 1181 is available with or without an analog or digital display. The digital display may be calibrated in engineering units and the analog display features multiple scales in engineering units.

The transmitters are certified explosion-proof, NEMA 7B, and intrinsically safe when installed with an approved barrier and sensor. Hazardous area certificates are provided by BASEEFA to CENELEC regulations, FM, CSA, SAA, SEV, and TUV. CSA has determined that the moisture barrier qualifies as Factory Sealed which means Explosion Proof Y fittings and sealing compound are not required for installation when this approval is selected.

Accessory items are available for the two-wire transmitters. The Model 515 Isolated Power Supply provides power for up to 20 transmitters. Two transmitters may be wired directly to the power supply. For more than two transmitters, junction boxes are available, each accommodating wiring for a maximum of ten transmitters. Remote alarms are available with independently adjustable set points and hysteresis.

Contacts of the Model 230A may be specified for high/low, high/high, or low/low operation. The impedance of the Model 230A Alarm Module is less than 100 ohms. For further information on the Models 515 and 230A, please refer to their respective product data sheet.



PHYSICAL SPECIFICATIONS – GENERAL

Enclosure: NEMA 4X, weatherproof and corrosion-resistant
NEMA 7B, explosion proof

Hazardous Area Classification:

Explosion Proof:

FM: Class I, Groups B, C, & D, Div. 1
Class II, Groups E, F, & G, Div. 1
Class III
CSA: Class I, Groups C & D
Class II, Groups E, F, & G
Class III, Encl 4
Class I, Groups A, B, C, & D, Div. 2
Encl 4, Factory Sealed

Intrinsic Safety:

FM: Class I, II, & III, Div. 1
CSA: Class I, Groups A, B, C, & D, Encl 4
Temperature Code T4
CENELEC: Ex ia IIB T4 (Tamb = 55°C)

Display:

Analog: plug in, 90 degree, 2.5 inch diameter
1181pH: dual scale, 0-100% & 0-14pH
1181ORP: dual scale, 0 center, ±1.0 & 0-100%
Digital: 3.5 digit, LCD, adjustable range in engineering units

Recommended Cable: Transmitter to Power Supply
Two Wire, 18 AWG, shielded, Belden 8760 or equal
(Rosemount Analytical PN 9200001)

Weight/Shipping Weight:

Blind: 1.44 kg/1.89 kg (3.18 lb/4.18 lb)
Analog/Digital: 2.15 kg/2.6 kg (4.74 lb/5.75 lb)

PERFORMANCE SPECIFICATIONS – GENERAL

Power Supply Requirements: (See Load/Supply Chart)

Lift Off Voltage: Blind & Analog: 10 VDC
Digital: 12.5 VDC

Maximum Operating Power: 40 milliwatts

Output: Blind & Analog: Isolated 4-20 mA into 700 ohms at 24 VDC
Digital: Isolated 4-20 mA into 575 ohms at 24 VDC

Input/Output Isolation: 600 Volts

Ambient Temperature: -30° to 55°C (-22° to 131°F)

Ambient Humidity: 0-99% RH

Digital Display Accuracy: 0.1% reading ±1.0 count

Analog Display Accuracy: ±2.0%

External Zero: ±7.5% full scale

External Span: ±7.5% full scale

Shock: 10G maximum for 10 milliseconds

Vibration: 0.025 inches double amplitude 5 to 50 Hz
for 2 hours

EMI/RFI:

EN50081-1

EN50082-2



The **Model 1181pH** Transmitter measures over the full range of 0-14 pH. The 4-20 mA isolated output may be field calibrated to represent any 2 to 14 pH span. Two digital displays are offered with the 1181pH. The Code 04 LCD display receives its input from the pH preamplifier. The advantage of the Code 04 display is that it will continue to display the measured pH regardless of the calibrated output. The Code 06 LCD display and the analog display receive their input from the 4-20 mA loop current and will display pH to the calibrated output only.

The **1181pH** Transmitter is available with an integral preamp. The Code 43 integral preamp is for use with sensors having a Pt 100 temperature compensator and the Code 44 internal preamp is for use with the Rosemount Analytical standard 3K temperature compensator. An integral preamp is not compatible with the Code 04 LCD display and Code 02 Blind. These options require a Tall Housing Cover (PN 3002468). The maximum recommended distance between the sensor and integral preamp is 15 ft (4.5 meters).

PERFORMANCE SPECIFICATIONS @ 25°C

(Electronics only)

Measurement Range: 0-14 pH

Internal Range Select: Any 2 to 14 pH span in one-pH steps

Accuracy: $\pm 0.1\%$ full scale

Stability: $\pm 0.1\%$ /month

Repeatability: ± 0.1 pH

Temperature Coefficient: ± 0.0028 pH/°C full scale

Automatic Temperature Compensation: 0° to 100°C (32° to 212°F)

RECOMMENDED SENSORS:

Model 300 Retractable pH Sensor

Model 320B Flow Through pH Sensor

Model 320HP High Purity pH Sensor

Model 328A Steam Sterilizable pH Sensor

Model 381 Insertion/Submersion/Flow-Through pH Sensor

Model 385 Retractable pH Sensor

Model 389 Disposable pH Sensor

Model 396 TUpH Disposable Sensor

Model 399 Disposable pH Sensor

The **Model 1181ORP** Transmitter measures over the range of ± 1200 mV. The 4-20 mA isolated output may be calibrated to represent any 200 to 2400 mV range.

PERFORMANCE SPECIFICATIONS @ 25°C

Measurement Ranges: Span: 200 mV to 2400 mV in 200 mV steps

Zero: 0 to ± 2400 mV in 200 mV steps

Accuracy: $\pm 0.1\%$ full scale

$\pm 0.2.0$ mV full scale

Stability: $\pm 0.1\%$ full scale/month

± 2.0 mV/month, non-cumulative

Repeatability: $\pm 0.1\%$ full scale

± 2.0 mV/month

Temperature Coefficient: ± 200 ppm/°C full scale

± 0.4 mV/°C full scale

Automatic Temperature Compensations: N/A

RECOMMENDED SENSORS:

Model 300 Retractable ORP Sensor

Model 330B Flow Through ORP Sensor

Model 381 Insertion/Submersion/Flow-Through ORP Sensor

Model 385 Retractable ORP Sensor

Model 389 Disposable pH Sensor

Model 399 Disposable ORP Sensor

ORDERING INFORMATION

Model 1181pH/ORP Two Wire Transmitter: Housed in a NEMA 7B explosion-proof, NEMA 4X weatherproof, corrosion-resistant enclosure and includes all the circuitry necessary for measurement and transmission of an isolated 4-20 mA signal. The transmitter may be selected with local analog or digital display or as a blind unit.

MODEL 1181 TWO-WIRE TRANSMITTER				
Code	Input (Required Selection)			
pH	pH measurement in an aqueous solution			
ORP	Oxidation Reduction Potential			
Code	Display (Required Selection)			
01	FM & CSA approved, analog indication, dual linear scale (0-14pH & 0-100%) (1.0 to 0 to 1.0mV & 0-100%)			
02	Blind, no indication (pH only)			
03	FM, CSA, CENELEC approved, analog indication (0-14pH & 0-100%) (1.0 to 0 to 1.0 mV and 0-100%)			
06	FM, CSA, CENELEC approved, digital indication, factory calibrated to 0-100% but field selectable to any range			
Code	Agency Approvals			
67	FM approved, Intrinsically Safe when used with approved sensor and safety barrier			
69	CSA approved, Intrinsically Safe when used with approved sensor and safety barrier			
73	CENELEC approved, Intrinsically Safe (not available with Code -01) Safety barrier required			
1181	pH	01	67	EXAMPLE

Former Options

Code	Options (Order PN'S as separate line items)
07	ORDER AS PN 2002577 2 in. pipe/wall mounting bracket (1lb/.5kg)
11	ORDER AS PN 9240591 Stainless steel nameplate (specify marking)
43	ORDER AS PN 22743-01 Integral Preamp compatible with Pt 100 Shipped loose. (With code -02 add PN 3002468)
44	ORDER AS PN 22744-01 Integral preamp, STD. Shipped loose. (With code 02 add PN 3002468)



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the right answers,
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Emerson Process Management

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Irvine, CA 92606 USA
Tel: (949) 757-8500
Fax: (949) 474-7250

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EFFLUENT TREATMENT PLANT

Cat - IV

Submittal
1073/w

DATE 8/3/10

APPROVED BY
AFTER INCORPORAT.
AS NOTED
FOR INFORMATION
REVISE AND RES

Cat - IV

1	20/2/2010	REVISED AS PER NTPC COMMENT	SKS	APU	AVS
0	17/12/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By

PROJECT PRAGATI-III COMBINED CYCLE POWER PROJECT
1500MW(NOMINAL).

CUSTOMER:
 PRAGATI POWER CORPORTION LIMITED (PPCL)

CONSULTANT:
 NTPC LIMITED, CONSUTANCY WING

 BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

 THERMAX LIMITED
PUNE

DATA SHEET FOR PRESSURE GAUGES

THERMAX DOC.NO.: WHJAA00068	BHEL DOC. NO. : PE-VO-314-164-A210	OC.NO. 630128 REV. NO : 01
--------------------------------	---------------------------------------	-------------------------------



PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL). (ETP PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-VO-314-164-A210
THERMAX OC NO: 630128

PRESSURE GAUGE DOC NO. WHJAA00068

S.NO.	PARAMETER	CLARIFICATION	REMARKS
I	Mention pressure gauges manufacturers name & same is in approved vendor list.	Noted & data sheet is revised accordingly & GLUCK is approved vendor by NTPC	

PRESSURE GAUGES (CHEMICAL SEAL TYPE)								
SPECIFICATION FOR PRESSURE GAUGE								
1. TYPE	Direct	10. BEZEL RING	SCREWED					
2. MOUNTING	Local	11. SOCKET MATERIAL	SS - 316					
3. DIAL SIZE	150MM	12. MOVEMENT	SS - 304					
4. DIAL COLOUR	White with black inscription	13. RUPTURE DISC	Yes					
5. CASE MAT & ENCLOSURE CLASS	DI-Cast AL Weatherproof & dust proof as per NEMA - 4	14. OVERRANGE PROTECTION	130 % of FSD					
6. PRESS. ELEMENT	Bourdon	15. ACCESSORIES	A) Snubber 1/2" NPT(M) X 1/2" NPT(F)-SS-316 B)GLYCERINE FILLED CASING					
7. ELEMENT MAT.	SS316	16. GLASS	SHATTER PROOF TYPE					
8. ACCURACY	± 1% of FSD	17. Max. working temp	50 Deg. Celcius.					
9. ZERO ADJUST.	Micrometer Pointer with Epoxy coated Screw adj.							
SPECIFICATION FOR CHEMICAL SEAL								
1.TOP CHAMBER	CARBON STEEL	4. PACKING MATERIAL- FIBRE ASBESTOS ACID PROOF						
2.BOTTOM CHAMBER	CS + PTFE	5. DIAPHRAGM-SS316+PTFE						
3.TRANSMITTING FLUID	SILICON OIL	6. PROCESS CONNECTION- 1/2 NPT (M)						
TAG NO	RANGE Kg/cm2	OPER. PRESS. Kg/cm2	OPER. TEMP. DEG. C.	MEDIUM	LOCATION	MODEL NO	MAKE	ACCESSORIES
PG-134 A	0-1.6	1	AMB	WASTE WATER	DISCHARGE OF P-3040 A	CS-S-TH + 8 A-BD	GLUCK	A
PG-134 B	0-1.6	1	AMB	WASTE WATER	DISCHARGE OF P-3040 B	CS-S-TH + 8 A-BD		A
PG-134 C	0-1.6	1	AMB	WASTE WATER	DISCHARGE OF P-3040 C	CS-S-TH + 8 A-BD		A
PG-137 A	0-6	3	AMB	ALUM	DISCHARGE OF P-3260 A	CS-S-TH + 8 A-BD		A
PG-137 B	0-6	3	AMB	ALUM	DISCHARGE OF P-3260 B	CS-S-TH + 8 A-BD		A
PG-140 A	0-10	5	AMB	WATER	DISCHARGE OF P-3240 A	CS-S-TH + 8 A-BD		A
PG-140 B	0-10	5	AMB	WATER	DISCHARGE OF P-3240 B	CS-S-TH + 8 A-BD		A
PG-145 A	0-4	2.5	AMB	TREATED WATER	DISCHARGE OF P-3120 A	CS-S-TH + 8 A-BD		A
PG-145 B	0-4	2.5	AMB	TREATED WATER	DISCHARGE OF P-3120 B	CS-S-TH + 8 A-BD		A
PG-145 C	0-4	2.5	AMB	TREATED WATER	DISCHARGE OF P-3120 C	CS-S-TH + 8 A-BD		A
PG-148 A	0-1	0.5	AMB	TREATED EFFLUENT	SUCTION OF P-3150 A	CS-S-TH + 8 A-BD		A
PG-148 B	0-1	0.5	AMB	TREATED EFFLUENT	SUCTION OF P-3150 B	CS-S-TH + 8 A-BD		A
PG-148 C	0-1	0.5	AMB	TREATED EFFLUENT	SUCTION OF P-3150 C	CS-S-TH + 8 A-BD		A
PG-148 D	0-1	0.5	AMB	TREATED EFFLUENT	SUCTION OF P-3150 D	CS-S-TH + 8 A-BD		A
PG-148 E	0-1	0.5	AMB	TREATED EFFLUENT	SUCTION OF P-3150 E	CS-S-TH + 8 A-BD		A
PG-148 F	0-1	0.5	AMB	TREATED EFFLUENT	SUCTION OF P-3150 F	CS-S-TH + 8 A-BD		A
PG-148 G	0-1	0.5	AMB	TREATED EFFLUENT	SUCTION OF P-3150 G	CS-S-TH + 8 A-BD		A
PG-148 H	0-1	0.5	AMB	TREATED EFFLUENT	SUCTION OF P-3150 H	CS-S-TH + 8 A-BD		A
PG-149 A	0-16	8.2	AMB	TREATED EFFLUENT	DISCHARGE OF P-3150 A	CS-S-TH + 8 A-BD		A
PG-149 B	0-16	8.2	AMB	TREATED EFFLUENT	DISCHARGE OF P-3150 B	CS-S-TH + 8 A-BD		A
PG-149 C	0-16	8.2	AMB	TREATED EFFLUENT	DISCHARGE OF P-3150 C	CS-S-TH + 8 A-BD		A
PG-149 D	0-16	8.2	AMB	TREATED EFFLUENT	DISCHARGE OF P-3150 D	CS-S-TH + 8 A-BD		A
PG-149 E	0-16	8.2	AMB	TREATED EFFLUENT	DISCHARGE OF P-3150 E	CS-S-TH + 8 A-BD		A
PG-149 F	0-16	8.2	AMB	TREATED EFFLUENT	DISCHARGE OF P-3150 F	CS-S-TH + 8 A-BD		A
PG-149 G	0-16	8.2	AMB	TREATED EFFLUENT	DISCHARGE OF P-3150 G	CS-S-TH + 8 A-BD		A
PG-149 H	0-16	8.2	AMB	TREATED EFFLUENT	DISCHARGE OF P-3150 H	CS-S-TH + 8 A-BD		A
NOTES : 1. THE TAG PLATE SHOULD BE IN ENGRAVED PHENOLIC LAMINATED TO BE MARKED ON DIAL. 2. 3-WAY GAUGE COCK & SNUBBER SHALL BE SEPARATELY SUPPLIED BY THERMAX								
QTY : 26 NOS.	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI			2	20/2/2010	SKS	APU	AVS
MAKE : GLUCK				1	17/12/2009	SKS	APU	AVS
THERMAX LIMITED	O.C NO: 630128			0	30/08/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI			Rev	Date	Prepd by	Chkd by	App by
Sal Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD			Specification No		Plant	SHMO	
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING			WHJAA00058		ETP	2 OF 8	

PRESSURE GAUGES (CHEMICAL SEAL TYPE)

SPECIFICATION FOR PRESSURE GAUGE

1. TYPE	Direct	10. BEZEL RING	SCREWED
2. MOUNTING	Local	11. SOCKET MATERIAL	SS - 316
3. DIAL SIZE	150MM	12. MOVEMENT	SS - 304
4. DIAL COLOUR	White with black inscription	13. RUPTURE DISC	Yes
5. CASE MAT & ENCLOSURE CLASS	DI-Cast AL Weatherproof & dust proof as per NEMA - 4	14. OVERRANGE PROTECTION	130 % of FSD
6. PRESS. ELEMENT	Bourdon	15. ACCESSORIES	A) Snubber 1/2" NPT(M) X 1/2" NPT(F)-SS-316 B) GLYCERINE FILLED CASING
7. ELEMENT MAT.	SS316	16. GLASS	SHATTER PROOF TYPE.
8. ACCURACY	± 1% of FSD	17. Max. working temp	50 Deg. Celcius.
9. ZERO ADJUST.	Micrometer Pointer with Epoxy coated Screw adj.		

SPECIFICATION FOR CHEMICAL SEAL

1. TOP CHAMBER	CARBON STEEL	4. PACKING MATERIAL- FIBRE ASBESTOS ACID PROOF
2. BOTTOM CHAMBER	CS + PTFE	5. DIAPHRAGM-SS316+PTFE
3. TRANSMITTING FLUID	SILICON OIL	6. PROCESS CONNECTION- 1/2 NPT (M)

TAG NO	RANGE Kg/cm2	OPER. PRESS. Kg/cm2	OPER. TEMP. DEG. C.	MEDIUM	LOCATION	MODEL NO	MAKE	ACCESSORIES
PG-155 A	0-10	5.4	AMB	WATER	DISCHARGE OF P-3310 A	CS-S-TH + 8 A -BD	GLUCK	A
PG-155 B	0-10	5.4	AMB	WATER	DISCHARGE OF P-3310 B	CS-S-TH + 8 A -BD		A
PG-156 A	0-6	2.9	AMB	WATER	DISCHARGE OF P-3320 A	CS-S-TH + 8 A -BD		A
PG-156 B	0-6	2.9	AMB	WATER	DISCHARGE OF P-3320 B	CS-S-TH + 8 A -BD		A

- NOTES :**
1. THE TAG PLATE SHOULD BE IN ENGRAVED PHENOLIC LAMINATED TO BE MARKED ON DIAL.
 2. 3- WAY GAUGE COCK & SNUBBER SHALL BE SEPARATELY SUPPLIED BY THERMAX

QTY :- 04 NOS	PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI	2	20/2/2010	SKS	APU	AVS
MAKE :- GLUCK		1	17/12/2009	SKS	APU	AVS
THERMAX LIMITED	O.C NO: 630128	0	30/08/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	SH NO	
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJAA00068		ETP	Page 151 of 283 3 OF 6	

PRESSURE GAUGES (CHEMICAL SEAL TYPE)										
SPECIFICATION FOR PRESSURE GAUGE										
1. TYPE	Direct	10. BEZEL RING	SCREWED							
2. MOUNTING	Local	11. SOCKET MATERIAL	SS - 316							
3. DIAL SIZE	150MM	12. MOVEMENT	SS - 304							
4. DIAL COLOUR	White with black inscription	13. RUPTURE DISC	Yes							
5. CASE MAT & ENCLOSURE CLASS	DI-Cast AL Weatherproof & dust proof as per NEMA - 4	14. OVERRANGE PROTECTION	130 % of FSD							
6. PRESS. ELEMENT	Bourdon	15. ACCESSORIES	A) Snubber 1/2" NPT(M) X 1/2" NPT(F) SS-316 B) GLYCERINE FILLED CASING							
7. ELEMENT MAT.	SS316	16. GLASS	SHATTER PROOF TYPE							
8. ACCURACY	± 1% of FSD	17. Max. working temp	50 Deg. Celsius							
9. ZERO ADJUST.	Micrometer Pointer with Epoxy coated Screw adj.									
SPECIFICATION FOR CHEMICAL SEAL										
1. TOP CHAMBER	CARBON STEEL	4. PACKING MATERIAL- FIBRE ASBESTOS	ACID PROOF							
2. BOTTOM CHAMBER	CS + PTFE	5. DIAPHRAGM-SS316+PTFE								
3. TRANSMITTING FLUID	SILICON OIL	6. PROCESS CONNECTION- 25 NB	ANSI B 16.5, 150 # FF							
TAG NO	RANGE Kg/cm ²	OPER. PRESS. Kg/cm ²	OPER. TEMP. DEG. C.	MEDIUM	LOCATION	MODEL NO	MAKE	ACCESSORIES		
PG - 120 A	0-6	3	AMB	EFFLUENT	DISCHARGE OF P-3010 A	CS-S-RF + 8 AG-BD	GLUCK	B		
PG - 120 B	0-6	3	AMB	EFFLUENT	DISCHARGE OF P-3010 B	CS-S-RF + 8 AG-BD		B		
PG - 121 A	0-6	2.9	AMB	EFFLUENT	DISCHARGE OF P-3020 A	CS-S-RF + 8 AG-BD		B		
PG - 121 B	0-6	2.9	AMB	EFFLUENT	DISCHARGE OF P-3020 B	CS-S-RF + 8 AG-BD		B		
PG - 122 A	0-10	7	AMB	EFFLUENT	DISCHARGE OF P-3050 A	CS-S-RF + 8 AG-BD		B		
PG - 122 B	0-10	7	AMB	EFFLUENT	DISCHARGE OF P-3050 B	CS-S-RF + 8 AG-BD		B		
PG - 123 A	0-4	2.2	AMB	EFFLUENT	DISCHARGE OF P-3060 A	CS-S-RF + 8 AG-BD		B		
PG - 123 B	0-4	2.2	AMB	EFFLUENT	DISCHARGE OF P-3060 B	CS-S-RF + 8 AG-BD		B		
PG - 124 A	0-10	6.2	AMB	EFFLUENT	DISCHARGE OF P-3070 A	CS-S-RF + 8 AG-BD		B		
PG - 124 B	0-10	6.2	AMB	EFFLUENT	DISCHARGE OF P-3070 B	CS-S-RF + 8 AG-BD		B		
PG - 125 A	0-6	3.6	AMB	EFFLUENT	DISCHARGE OF P-3080 A	CS-S-RF + 8 AG-BD		B		
PG - 125 B	0-6	3.6	AMB	EFFLUENT	DISCHARGE OF P-3080 B	CS-S-RF + 8 AG-BD		B		
PG - 126 A	0-16	7.6	AMB	EFFLUENT	DISCHARGE OF P-3090 A	CS-S-RF + 8 AG-BD		B		
PG - 126 B	0-16	7.6	AMB	EFFLUENT	DISCHARGE OF P-3090 B	CS-S-RF + 8 AG-BD		B		
PG - 127 A	0-10	6.5	AMB	SUMP	DISCHARGE OF P-3030 A	CS-S-RF + 8 AG-BD		B		
PG - 127 B	0-10	6.5	AMB	SUMP	DISCHARGE OF P-3030 B	CS-S-RF + 8 AG-BD		B		
PG - 128 A	0-4	1.8	AMB	SUMP	DISCHARGE OF P-3100 A	CS-S-RF + 8 AG-BD		B		
PG - 128 B	0-4	1.8	AMB	SUMP	DISCHARGE OF P-3100 B	CS-S-RF + 8 AG-BD		B		
PG - 130 A	0-6	3.7	AMB	EFFLUENT	DISCHARGE OF P-3200 A	CS-S-RF + 8 AG-BD		B		
PG - 130 B	0-6	3.7	AMB	EFFLUENT	DISCHARGE OF P-3200 B	CS-S-RF + 8 AG-BD		B		
PG-131 A	0-6	3.4	AMB	EFFLUENT	DISCHARGE OF P-3210 A	CS-S-RF + 8 AG-BD		B		
PG-131 B	0-6	3.4	AMB	EFFLUENT	DISCHARGE OF P-3210 B	CS-S-RF + 8 AG-BD		B		
PG-135 A	0-6	3	AMB	PE	DISCHARGE OF P-3280 A	CS-S-RF + 8 AG-BD		B		
PG-135 B	0-6	3	AMB	PE	DISCHARGE OF P-3280 B	CS-S-RF + 8 AG-BD		B		
PG-150 A	0-6	3	AMB	DWPE	DISCHARGE OF P-3180 A	CS-S-RF + 8 AG-BD		B		
PG-150 B	0-6	3	AMB	DWPE	DISCHARGE OF P-3180 B	CS-S-RF + 8 AG-BD		B		
PG-150 C	0-6	3	AMB	DWPE	DISCHARGE OF P-3180 C	CS-S-RF + 8 AG-BD		B		
NOTES : 1. THE TAG PLATE SHOULD BE IN ENGRAVED PHENOLIC LAMINATED TO BE MARKED ON DIAL.										
QTY :- 27 NOS	PROJECT: PRAGATI - III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI	2	20/2/2010	SKS	APU	AVS				
MAKE :- GLUCK		1	17/12/2009	SKS	APU	AVS				
THERMAX LIMITED	O.C NO: 630128	0	30/09/2009	SKS	APU	AVS				
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by				
Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	SH NO					
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJAA00068		ETP	4 OF 6					

PRESSURE GAUGES (CHEMICAL SEAL TYPE)

SPECIFICATION FOR PRESSURE GAUGE

1. TYPE	Direct	10. BEZEL RING	SCREWED
2. MOUNTING	Local	11. SOCKET MATERIAL	SS - 316
3. DIAL SIZE	150MM	12. MOVEMENT	SS - 304
4. DIAL COLOUR	White with black inscription	13. RUPTURE DISC	Yes
5. CASE MAT & ENCLOSURE CLASS	DI-Cast AL Weatherproof & dust proof as per NEMA - 4	14. OVERRANGE PROTECTION	130 % of FSD
6. PRESS. ELEMENT	Bourdon	15. ACCESSORIES	A) Snubber 1/2" NPT(M) X 1/2" NPT(F)-SS-316 B) GLYCERINE FILLED CASING
7. ELEMENT MAT.	SS316	16. GLASS	SHATTER PROOF TYPE.
8. ACCURACY	± 1% of FSD	17. Max. working temp	50 Deg. Celcius.
9. ZERO ADJUST.	Micrometer Pointer with Epoxy coated Screw adj.		

SPECIFICATION FOR CHEMICAL SEAL

1. TOP CHAMBER	CARBON STEEL	4. PACKING MATERIAL- FIBRE ASBESTOS ACID PROOF
2. BOTTOM CHAMBER	CS + PTFE	5. DIAPHRAGM-SS316+PTFE
TRANSMITTING FLUID	SILICON OIL	6. PROCESS CONNECTION- 25 NB ANSI B 16.5, 150 # FF

TAG NO	RANGE Kg/cm2	OPER. PRESS. Kg/cm2	OPER. TEMP. DEG. C.	MEDIUM	LOCATION	MODEL NO	MAKE	ACCESSORIES
PG - 132 A	0-4	2.3	AMB	EFFLUENT	DISCHARGE OF P-3220 A	CS-S-RF + 8 AG -BD	GLUCK	B
PG - 132 B	0-4	2.3	AMB	EFFLUENT	DISCHARGE OF P-3220 B	CS-S-RF + 8 AG -BD		B
PG - 133 A	0-4	2.6	AMB	EFFLUENT	DISCHARGE OF P-3230 A	CS-S-RF + 8 AG -BD		B
PG - 133 B	0-4	2.6	AMB	EFFLUENT	DISCHARGE OF P-3230 B	CS-S-RF + 8 AG -BD		B
PG-136 A	0-4	2	AMB	LIME	DISCHARGE OF P-3270 A	CS-S-RF + 8 AG -BD		B
PG-136 B	0-4	2	AMB	LIME	DISCHARGE OF P-3270 B	CS-S-RF + 8 AG -BD		B
PG-138 A	0-4	2	AMB	LIME	DISCHARGE OF P-3300 A	CS-S-RF + 8 AG -BD		B
PG-138 B	0-4	2	AMB	LIME	DISCHARGE OF P-3300 B	CS-S-RF + 8 AG -BD		B
PG-139 A	0-6	3	AMB	ACID	DISCHARGE OF P-3290 A	CS-S-RF + 8 AG -BD		B
PG-139 B	0-6	3	AMB	ACID	DISCHARGE OF P-3290 B	CS-S-RF + 8 AG -BD		B
PG-143 A	0-1.6	1	AMB	SLUDGE	DISCHARGE OF P-3130 A	CS-S-RF + 8 AG -BD		B
PG-143 B	0-1.6	1	AMB	SLUDGE	DISCHARGE OF P-3130 B	CS-S-RF + 8 AG -BD		B
PG-145 A	0-2.5	1.8	AMB	SLUDGE	DISCHARGE OF P-3160 A	CS-S-RF + 8 AG -BD		B
PG-145 B	0-2.5	1.8	AMB	SLUDGE	DISCHARGE OF P-3160 B	CS-S-RF + 8 AG -BD		B
PG-145 C	0-4	1.8	AMB	SLUDGE	DISCHARGE OF P-3160 C	CS-S-RF + 8 AG -BD		B
PG-151 A	0-6	2.98	AMB	THICKENED SLUDGE	DISCHARGE OF P-3170 A	CS-S-RF + 8 AG -BD		B
PG-151 B	0-6	2.98	AMB	THICKENED SLUDGE	DISCHARGE OF P-3170 B	CS-S-RF + 8 AG -BD		B
PG-151 C	0-6	2.98	AMB	THICKENED SLUDGE	DISCHARGE OF P-3170 C	CS-S-RF + 8 AG -BD		B
PG-153 A	0-16	8.8	AMB	EFFLUENT	DISCHARGE OF P-3140 A	CS-S-RF + 8 AG -BD		B
PG-153 B	0-16	8.8	AMB	EFFLUENT	DISCHARGE OF P-3140 B	CS-S-RF + 8 AG -BD		B
PG-154 A	0-2.5	1.2	AMB	THICKNER OVERFLOW	DISCHARGE OF P-3190 A	CS-S-RF + 8 AG -BD		B
PG-154 B	0-2.5	1.2	AMB	THICKNER OVERFLOW	DISCHARGE OF P-3190 B	CS-S-RF + 8 AG -BD		B

NOTES : 1. THE TAG PLATE SHOULD BE IN ENGRAVED PHENOLIC LAMINATED TO BE MARKED ON DIAL.

QTY :- 22 NOS	PROJECT: PRAGATI - III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI	2	20/2/2010	SKS	APU	AVS
MAKE :- GLUCK		1	17/12/2009	SKS	APU	AVS
THERMAX LIMITED	O.C NO: 630128	0	30/08/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	Page 153 of 283	
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJAA00068		ETP	5 OF 6	

PRESSURE GAUGES (DIRECT BOURDON TYPE)

GENERAL INFORMATION

1. TYPE	Direct	10. BEZEL RING	SCREWED
2. MOUNTING	Local	11. SOCKET MATERIAL	SS-316
3. DIAL SIZE	150MM	12. CONNECTION	1/2" NPT (M) Bottom
4. DIAL COLOUR	White with black inscription	13. MOVEMENT	SS - 304
5. CASE MAT & ENCLOSURE CLASS	DI-Cast AL Weatherproof & dust proof as per NEMA - 4	14. RUPTURE DISC	Yes
6. PRESS. ELEMENT	Bourdon	15. OVERRANGE PROTECTION	130 % of FSD
7. ELEMENT MAT.	SS316	16. ACCESSORIES	A) Snubber 1/2" NPT(M) X1/2" NPT(F) - SS-316 B) GLYCERINE FILLED CASING
8. ACCURACY	± 1% of FSD	17. GLASS	Shatter Proof Type
9. ZERO ADJUST.	Micrometer Pointer with Epoxy coated Screw adj.	18. MAX. WORKING TEMP	80 Deg. Celcius.

TAG NO	RANGE Kg/cm2	OPER. PRESS. Kg/cm2	OPER. TEMP. DEG. C.	MEDIUM	LOCATION	MODEL NO	MAKE	ACCESSORIES
PG-142 A	0-1	0.35	AMB	AIR	DISCHARGE OF AB-3010 A	8A-BD	GLUCK	A
PG-142 B	0-1	0.35	AMB	AIR	DISCHARGE OF AB-3010 B	8A-BD		A
PG-144 A	0-1	0.25	AMB	AIR	DISCHARGE OF AB-3020 A	8A-BD		A
PG-144 B	0-1	0.25	AMB	AIR	DISCHARGE OF AB-3020 B	8A-BD		A
PG-147 A	0-1	0.54	AMB	AIR	DISCHARGE OF AB-3040 A	8A-BD		A
PG-147 B	0-1	0.54	AMB	AIR	DISCHARGE OF AB-3040 B	8A-BD		A
PG-152 A	0-1	0.25	AMB	AIR	DISCHARGE OF AB-3030 A	8A-BD		A
PG-152 B	0-1	0.25	AMB	AIR	DISCHARGE OF AB-3030 B	8A-BD		A

NOTES :
1. THE TAG PLATE SHOULD BE IN ENGRAVED PHENOLIC LAMINATED TO BE MARKED ON DIAL.
2. 3-WAY GAUGE COCK & SNUBBER SHALL BE SEPARATELY SUPPLIED BY THERMAX

QTY :- 08 NOS	PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI	2	20/2/2010	SKS	APU	AVS
MAKE :- GLUCK		1	17/12/2009	SKS	APU	AVS
THERMAX LIMITED	O.C NO. 630128	0	30/08/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
Sal Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	SH NO	
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJAA00068		ETP	Page 154 of 283 5 OF 8	



Gluck (India) Mfg. Co.

Pressure Gauge Selection

General Information

When selecting a pressure gauge, it is important to consider following factors to insure safety, accuracy and utility.

- **Gauge Measuring Principles**

Bourdon tube pressure gauges

Most standard dial type pressure gauges use a 'C' shaped or helically wound elastic measuring element known as Bourdon Tube. Bourdon tubes are generally made of a copper alloy or stainless steel alloy which are soldered or welded to the socket; the free end being firmly closed with an adjusting nut. A change in pressure causes the measuring element in to deflection. This deflection of the free end of the bourdon tube is proportional to the applied pressure and is transmitted to a rotary geared movement. This movement carries the pointer and indicates the pressure on a dial with ~270° scale graduation. Bourdon tube gauges are used for the measurement of high pressure up to 1000 bar and vacuum to -1 bar of gases, steam and fluids except for those having a high viscosity, or which are liable to crystallize. Accuracy is between $\pm 0.1\%$ and $\pm 2.5\%$ of full scale deflection.

Diaphragm pressure gauges

A thin, concentrically corrugated diaphragm is clamped between two flanges. The diaphragm will be loaded with the process pressure on one side and elastically deflects from its normal position. This travel is proportional to the applied pressure and is transmitted to a rotary movement by a push/pull rod. This movement carries the pointer and indicates the pressure on a dial with ~270° scale graduation. Diaphragm pressure gauges are used for the measurement of pressure from as low as 100 MMWC up to 25 Bar and vacuum to -1 bar of gases, steam and fluids. Accuracy is $\pm 1.6\%$ of full scale deflection. The diaphragm is made of copper alloy or stainless steel alloy and can be protected against aggressive medium using foils made of Tantalum, Hastalloy-C, and PTFE etc. The connecting part can be protected using suitable material i.e. stainless steel alloy, PP, PVC, PTFE, PVDF etc. Diaphragm pressure gauges with open measuring flange are perfectly suited for high viscous, crystallizing and solid matter containing medium. Diaphragm pressure gauges can be easily supplied with overload safety. (For details see General Information – Diaphragm Pressure Gauges)

Capsule pressure gauges

The capsule consist of two thin, concentrically corrugated diaphragm welded or soldered together. Pressure changes in capsule causes and elastic deformation on both the sides of the measuring element. The motion of the measuring element is proportional to the measured pressure. It is transmitted to the pointer by a movement and indicated on a dial with ~270° scale graduation. Capsule pressure gauges are used for measurement of low positive or negative values up to 600 mbar. Accuracy is between $\pm 1.6\%$ and $\pm 2.5\%$ of full scale deflection.

Bourdon tube pressure gauges with chemical seals

The bourdon tube gauge is screwed in to the seal. The seal consist of a defined cavity which will be closed with a thin, elastic diaphragm i.e. membrane. The volume between this diaphragm and the bourdon tube will be filled with a transmission fluid after total evacuation. When the process fluid exerts a pressure, the elastic diaphragm transmits it through the transmission fluid to bourdon tube pressure gauge. The bourdon tube transfers the measured pressure by a movement on a dial with ~270° scale graduation. Due to the transmission fluid filling, the connection between the seal and the gauge must remain closed. The seals can be made in various forms and types depending on criticality of end applications. Gauges with seals can be used for the measurement of pressure up to 1000 bar and vacuum to -1 bar. Accuracy is between $\pm 0.55\%$ to $\pm 1.6\%$ of full scale deflection. A gauge with connecting flange is suited for high viscous, crystallizing, corrosive and solid matter containing medium. Flat seals can be used for clearance-volume free pressure measurement. Connecting parts of the seals can be made of resistant material against aggressive medium. For particular application a flexible capillary tube is installed between chemical seal unit and bourdon tube pressure gauge i.e. Remote reading/mounting. The most current version is a diaphragm seal mounted to a bourdon tube pressure gauge; therefore we use this version as an example to describe construction and function. Otherwise this seal can be connected to pressure transmitter, switch or transducer. (For details see General Information – Chemical Seals)

- **Gauge Types**

**General Purpose Gauges**

These gauges often referred to as commercial or equipment gauge. Though general purpose gauges may have to be ruggedly constructed, the service conditions are not expected to be severe. Designed for low cost without refinements, they are frequently referred to as "throw away" gauges since it is not economical to attempt repairs on this type of gauges. Most general purpose gauges have a black ABS or painted steel case with brass internal parts and connection.

Industrial Gauges

These gauges are having heavy duty construction designs and typically used in more demanding applications. These gauges usually have a greater accuracy requirement than general purpose gauges. The industrial stainless steel type gauges are built for extended life and designed for harsh corrosive environments.

Process Gauges

Process gauges combine the heavy duty operating and construction requirement of industrial gauges with more exacting accuracy and service life which is demand of many process applications. Process gauges are designed for the chemical, petroleum and other process industries. The cases are made of corrosion resistant material like Stainless steel 304 or Aluminium or thermoplastics and if process requires, can offer a solid front / blow out back safety case design.

Precision & Test Gauges

Dial type test gauges are cost effective, extremely sensitive and highly accurate. These gauges are excellent for instrument shops, gauges manufacture, repair and calibration shops, testing laboratories and other application demanding precision and consistent results. Test gauges feature adjustable knife-edge pointer and mirror bands on the dial to assure precise readings.

Low Pressure Gauges

Low pressure gauges utilize a capsule & diaphragm sensing element design and accurately measure pressure between 100 up to 6000 MMWC. Typical measuring units are inches of water, mm of water, oz/sq. inch, mm of mercury, inch of mercury etc.

Specialty Pressure Gauges

Special gauges designed for specific applications

- *Gauge Size*

The gauge size is typically referring to the nominal diameter of the dial (ANSI) or case (DIN) for bourdon or capsule or diaphragm pressure gauges. The dial is the viewing area of the gauge that shows the pressure scale and needle pointer. Gauges are available in a wide range of sizes from 1-1/2" up to 10". Dial size is determined in two ways. First, a requirement for higher accuracy dictates that a larger dial size be available for display of small and readable pressure scale increments. Second, by a requirement that the pressure gauge user/operator be able to read the scale from a distance that physical circumstances may dictate.

- *Gauge Mounting and Connection*

Pressure gauges should have rigid mounting to protect it from mechanical vibration of the equipments or system lines and should be mounted in upright position. Equipment structure and system design presents a need for variable mounting requirements and case styles. Considering these parameters following mountings and process connections are available for most gauges type.



Gluck (India) Mfg. Co.

Pressure Gauge Selection

General Information

Entry & Mounting Styles (Our type abbreviation used in Model Nos.)

- Bottom Entry Direct Mounting (BD)
- Bottom Entry Surface Mounting (BS)
- Center Back Entry Direct Mounting (CBD)
- Center Back Entry Panel Mounting (CBP)
- Center Back Entry Bracket Mounting (CBB)
- Side Back Entry Direct Mounting (SBD)
- Side Back Entry Panel Mounting (SBP)
- Side Back Entry Bracket Mounting (SBB)

Process Connection

- 1/8", 1/4", 3/8", 1/2" NPT (M) or BSP (M) (For detail availability refer catalogue)
- For diaphragm and chemical seal gauges flanged process connection are available refer catalogue.
- Other specific process connections can be provided as per requirement.

- *Gauge Pressure Range*

A gauge range of twice the normal working pressure is generally selected. The maximum operating pressure in all cases should be limited to 75% of the gauge range. Where alternating pressure and pulsation are encountered, working pressure should be limited to 2/3 of the gauge range. Overlooking these criteria may result in to over pressure failure or loss of gauge accuracy.

- *Pressure fluid composition*

Copper alloy i.e. Brass or stainless steel is the standard wetted parts (material in contact with the pressure media) available on most pressure gauges. Since the sensing element of a pressure gauge be exposed directly to the measured medium, consider the characteristics of this media i.e. corrosiveness, Temperature, viscosity (May be varying with temperature), solid content, crystallizing nature etc. Ignoring this may result in to loss of accuracy, failure of elastic sensing element, explosion and can be further worst. For pressure fluids that will not solidify under normal/operating conditions or leave deposits a standard bourdon tube gauge may be acceptable. Otherwise, a diaphragm gauge or chemical seal attached to bourdon gauge should be used. For wetted parts selection refer chemical compatibility table or contact factory.

- *Gauge case/Housing*

Stainless steel, black ABS, painted steel, brass, aluminium, thermoplastic is standard case material. Select a material suitable to your application referring product catalogue and possible combination of case material for it. Stainless steel, ABS and aluminium cases are recommended for our door service. General purpose or most standard gauges have a dry case (No liquid fill), while industrial and process gauges have a liquid fill option available.

- *Gauge Front ring/Bezel and Window*

The front ring/bezel can be made of acrylic, stainless steel, brass, steel, aluminium or thermoplastic. The viewing window is held in place by the front ring/bezel. Some rings are permanent crimp design, while others can be removed providing access to dial/pointer for recalibration or repair. Window materials are typically clear acrylic, polycarbonate, plain glass or safety glass.



Gluck (India) Mfg. Co.

Pressure Gauge Selection

General Information

• Gauge Dial/Pointer

The pressure scale is printed on the face of dial. The pointer typically moves clockwise to measure pressure and counter clockwise to measure vacuum. Some gauges offer adjustable pointer or mechanism for recalibration. Test gauges offer a mirrored band on the dial and a knife-edge pointer, making it easy to take very accurate readings.

• Gauge Accuracy

Gauges are available with the following accuracy as per ASME B40.1, EN-837-1, IS-3624 and BS-1780. Initial system engineered design requirements will dictate the required pressure gauge accuracy. System should be designed with cost and safety in mind. Generally, gauges with better accuracy are larger and more expensive.

Accuracy Grades as per ASME B40.100 1998			
Accuracy Grade	Permissible Error ($\pm$ Percent of Span)		
	Lower $\frac{1}{4}$	Middle $\frac{1}{2}$	Upper $\frac{1}{4}$
4A*	0.1	0.1	0.1
3A	0.25	0.25	0.25
2A	0.5	0.5	0.5
1A	1.0	1.0	1.0
A	2.0	1.0	2.0
B	3.0	2.0	3.0
C	4.0	3.0	4.0
D	5.0	5.0	5.0
* Grade 4A gauges must remain within specified tolerance before and after lightly tapped.			

Accuracy Classes as per EN-837-1:1996	
Accuracy Class	Permissible Error ($\pm$ Percent of Span)
0,1	0.1
0,25	0.25
0,6	0.6
1	1.0
1,6	1.6
2,5	2.5
4	4
For gauges with pointer stop, the accuracy class will cover 10% to 100% of the range. For gauges with free zero, the accuracy class will cover 0% to 100% of the range and zero shall be used as an accuracy check point.	

Accuracy Class as per BS-1780:Part 2: 1971			
Accuracy Class	Permissible Error ($\pm$ Percent of Span)		
	Below 10%	10 to 90%	Above 90%
Test Gauge	0.25	0.25	0.25
Class 1	1-1/2	1	1-1/2
Class 2	3	3	3

Accuracy Class as per IS-3624 1987			
Accuracy Class	Permissible Error ($\pm$ Percent of Span)		
	Below 10%	10 to 90%	Above 90%
Test Gauge	0.25	0.25	0.25
Class 1A	1	1/2	1
Class 1B	1-1/2	1	1-1/2
Class II	3	3	3

• Liquid Filled Option

Liquid filled gauges help absorb vibration and pressure spikes/surges, increasing the service life of the gauge. The dampening action of the liquid reduces pointer flutter and lubricates the internal parts, dramatically reducing wear in the movement. Glycerine is the standard fill fluid and provides the best performance in most applications; Silicone has a low viscosity and works well when extreme temperature fluctuation or icing is expected. The fill liquid must be compatible with the gauge application.

Further, when gauges are filled with the glycerine for low temperatures a glycerine – water mixture in following ratios is used:

Up to 0° C	90 % Glycerine and 10 % water
Up to -20° C	80 % Glycerine and 20 % water
Up to -40° C	65 % Glycerine and 35 % water

When a glycerine-water mixture is used at ambient temperatures, the dampening effect is reduced with increased water ratio.