

# **2 X 660 MW - NTPC MOUDA STPP STAGE II .**


## **TECHNICAL SPECIFICATION FOR SELF CLEANING STRAINERS (SCS)**

**Specification No. : PE-TS- 387-165-N003 (REV. 0)**

**VOLUME -IIB**



**BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR  
PROJECT ENGINEERING MANAGEMENT  
PPEI BLDG., SEC-16A, PLOT NO. 25  
NOIDA – 201301 (UP)**

	<b>TITLE : TECHNICAL SPECIFICATION FOR SELF CLEANING STRAINERS (SCS)</b>  <b>PREAMBLE</b>	<b>SPEC. NO. PE-TS- 387-165-N003</b>	
		<b>VOLUME : II B</b>	
		<b>REV. NO. 0</b>	<b>DATE :04.02.2013</b>
		<b>SHEET 1</b>	<b>OF 2</b>

- 1.0 The tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.

**1.1 Volume -I CONDITIONS OF CONTRACT**

This consists of four parts as below :

- Volume - I A : This part contains instructions to bidders for making bids to BHEL.
- Volume - I B : This part contains general commercial conditions of the tender and include provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.
- Volume - I C : This part contains special conditions of contract.
- Volume - I D : This part contains commercial conditions for erection and commissioning site work, as applicable.

**1.2 Volume - II TECHNICAL SPECIFICATIONS**


Technical requirements are stipulated in Volume II which comprises of :

- Volume - II A : General Technical Conditions
- Volume - II B : Technical specification including drawings, if any

**1.2.1 Volume - II B :**

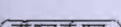
This volume is sub-divided into following sections:

- Section - A : This section outlines the scope of enquiry.
- Section - B : This section provides "Project Information"
- Section - C : This section indicates technical requirements specific to the contract, not covered in Section-D.
- Section - D : This section comprises of standard technical specifications of equipments complete with data sheet A, B & C.  
Data sheet-A specifies data and other requirements pertaining to the equipment.  
Data sheet - B specifies data to be filled by the bidder (Data Sheet B is contained in Volume - III)  
Data sheet - C indicates data documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).

	<b>TITLE : TECHNICAL SPECIFICATION FOR SELF CLEANING STRAINERS (SCS)</b>  <b>PREAMBLE</b>	<b>SPEC. NO. PE-TS- 387-165-N003</b>	
		<b>VOLUME : II B</b>	
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		<b>SHEET 2</b>	<b>OF 2</b>

**1.2.2 Volume - III TECHNICAL SCHEDULES**

- 1.0** This volume contains technical schedules and Data Sheets - B, which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per instructions given in Document No.PES-100-901 in Volume-III.
- 2.0** The requirements mentioned in Section C/Data Sheets-A of Section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section -D.

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		VOLUME : II B	
		SECTION : A	
		REV. NO. 0	DATE : 04.02.2013
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B	PROJECT INFORMATION
C	SPECIFIC REQUIREMENTS
C1	SPECIFIC TECHNICAL REQUIREMENTS FOR SELF CLEANING STRAINERS.
C2	SPECIFIC TECHNICAL REQUIREMENTS (ELECTRICAL)
C3	SPECIFIC TECHNICAL REQUIREMENTS (C&I)
D	STANDARD TECH. SPECIFICATIONS
D1	SELF CLEANING STRAINER <ul style="list-style-type: none"> <li>◆ STANDARD TECHNICAL SPEC.NO. PE-TS-999-165-N002</li> <li>◆ DATA SHEET-A</li> <li>◆ DATA SHEET-C</li> <li>◆ QUALITY PLAN</li> </ul>
D2	ELECTRICAL SYSTEMS
D3	CONTROL & INSTRUMENTATION SYSTEMS





**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-387-165-N003**

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**SECTION - A  
SCOPE OF ENQUIRY**



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

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**1.00.0 SCOPE**

This enquiry covers the design, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-contractors works properly packed for delivery of the items as follows:

**1.01.0 Self Cleaning Strainers :**

Self Cleaning Strainers (SCS) complete with all accessories as per the requirements specified in different sections of this specification **for :**

**• 2 X 660 MW - NTPC MOUDA STPP STAGE II .**

The bidder's scope also includes installation checks, commissioning, trial runs & PG Testing at site of SCS.

**1.01.1 The bids shall be evaluated as per NIT.**

Equipments shall be ordered separately for each project.

In the event of more than one order being placed on the same bidder, the drawings/ documents etc. shall be submitted separately for each project during detailed engg. stage for approval.

**2.00.00 GENERAL TECHNICAL INSTRUCTIONS:**

2.01.00 It is not the intent to specify herein all the details of design and manufacture. However the equipment shall conform in all respects to high standard of design, engineering and workmanship, and shall be capable of performing the required duties in a manner acceptable to Engineer/ Owner, who will interpret the meaning of drawing and specifications, and shall be entitled to reject any component or material, which in his judgement is not in full accordance herewith.

2.02.00 The omission of specific reference to any component/ accessory necessary for the proper performance of the equipments shall not relieve the bidder of the responsibility of providing such facilities to complete the supply of the equipments at quoted prices.

2.03.00 In case of any deviation from this Technical specification (Vol. IIB) and General Technical Conditions (Vol. IIC), the same shall be indicated in the schedule of deviations enclosed in Volume-III, Part-A. In the absence of duly filled schedules it will be assumed that the bid strictly conforms to the specification.

2.04.00 BHEL's/ Customer's representatives shall be given full access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.

2.05.00 The equipments covered under this specification shall not be despatched unless the same have been finally inspected, accepted and shipping release issued by BHEL/ Customer

2.06.00 Un-priced copy of price bid shall be furnished alongwith the technical bid.



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS- 387-165-N003**

**VOLUME : II B**

**SECTION : C**

**REV. NO. 0**

**DATE : 04.02.2013**

**SHEET**

**1**

**of**

**1**

## **SECTION - B**

### **PROJECT INFORMATION**




# **PROJECT SYNOPSIS**


**2X660MW NTPC, MOUDA STPP STAGE-II**

**MOUDA SUPER THERMAL POWER PROJECT  
STAGE-II (2X660 MW)  
STEAM TURBINE GENERATOR PACKAGE**

**TECHNICAL SPECIFICATION  
SECTION-VI  
PART - A**



CLAUSE NO.	PROJECT SYNOPSIS 		
1.00.00	<b>BACKGROUND</b>  Mouda STPP Stage-I comprising of two units of 500 MW each is presently under implementation. Now in view the huge power generation capacity requirement and future capacity addition plans, it is proposed to enhanced capacity of Mouda STPP. The present proposal is to install additional two units of 660 MW in Stage-II this making the ultimate capacity of the project to 2320 MW.		
1.01.00	<b>Location and Approach</b>  The plant site is located in Mouda Tehsil, district Nagpur of Maharashtra Stage, having latitude and longitude of 20° 10'50" N and 79° 23'52" E respectively. The site is bounded by villages Kumbhari on North, Lapka & Mouda on South, Koradi on East & Rahli on West and is at a distance of about 4 Kms. From Mouda town and approachable from NH-6. Nearest railway station is Chacker 8 Kms away from site on Nagpur – Kolkata Broad Gauge (BG) section of South Eastern Railway (main line).  Vicinity Plan is enclosed as <b>Exhibit-I</b> .  For further information apart from given in this sub-section and Bidders are also advised to visit the project site and collect data regarding local site conditions.  <b>Airport</b>  The nearest commercial airport is at Nagpur located at a distance of approximately 42 Kms form the project site.		
1.02.00	<b>Land</b>  For Stage-I of Mouda project, about 1580 acres of land required for the project is acquired/under acquisition.  About 125 acres of additional land for plant and 50 acres for Township required. The same has been identified contiguous to existing plant and township areas. The township is to be located in North West of the plant area and on Mouda – Ramtek road, 6 kms away from Mouda town. No major problem anticipated in acquisition as per site visit and discussions with State Govt. officials.  About 550 acres of land is required for ash disposal. Alternatives suggested by Mouda site visited on 09.07.09 and the land near Kirnapur & Kpra villages have been finalized. In principle land availability for Mouda Stage-II has been obtained from Office of the Collector, Nagpur vide letter ref. No. Desk-17/Resettlement/T-1/w.s. 323/09 dated 27.08.09.		
MOUDA SUPER THERMAL POWER PROJECT STAGE-II (2X660 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT SYNOPSIS  PAGE 1 OF 9


CLAUSE NO.	PROJECT SYNOPSIS			
1.03.00	<p><b>Water</b></p> <p>Make up water requirement for Stage-II of this project would be about <b>4800 m<sup>3</sup>/hr.</b> Water requirement for the project will be met from pondage created on river Wain Ganga/ Kanhan by construction of dam near Gosikhurd by Govt. of Maharashtra. Make-up water shall be drawn from above mentioned source and shall be pumped to the raw water reservoir located about 24 Kms from intake well.</p> <p>Maharashtra Government has approved the reservation of 100 MCM water including the evaporation losses for NTPC in Goshikhurd Project for the ultimate stage of the project (Stage-I 2x500 MW) + Stage-II (2x660 MW). Ministry of Industries, Energy and Labour Department, Government of Maharashtra vide letter dated 10.12.2002 has given in principle consent for making available the required water for the Mouda project.</p>			
1.04.00	<p><b>Railway Siding</b></p> <p>Employer intends to construct the railway siding to project site from the nearest existing railway line. However, the same may not be available to the bidder for his use to transport equipment and material.</p> <p>Bidder may visit the site and acquaint themselves with the facilities available.</p>			
1.05.00	<p><b>Metrological Data</b> Metrological Data from the nearest observatory is placed at <b>Annexure- 1.</b></p>			
1.06.00	<p><b>Plant Water Scheme</b></p> <p>The Plant water scheme is described below.</p>			
1.06.01	<p><b>Condenser Cooling (CW) Water System</b></p> <p>It is proposed to provide recirculating type CW system with induced draft type cooling towers. For the recirculating type CW system it is proposed to supply clarified water as make up. Raw water from the make-up water pump house shall be pumped to a Water Pretreatment Plant (PT - CW system). The treated clarified water shall be led to the cold water channel of CW system. CW system shall be operated at a C.O.C of about 4 . Chemical treatment programme (using acid dosing and scale cum corrosion inhibitors dosing) may be employed in addition to blow down of CW water to control the CW system chemistry in case CW system is required to be operated beyond 4COC. The expected circulating water analysis is given in this sub-section. CW blow down shall be drawn from the discharge of CW pumps and the same shall be led to a Service water Tank. For carrying circulating water from CW pump house to TG-area and from TG area to cooling tower, steel lined concrete encased duct would be provided. For interconnecting CW duct with</p>			
MOUDA SUPER THERMAL POWER PROJECT STAGE-II (2X660 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT SYNOPSIS	PAGE 2 OF 9









CLAUSE NO.	PROJECT SYNOPSIS			
	COOLING WATER ANALYSIS			
	Sl. No.	Constituent	as	mg per litre
	1.	Calcium	CaCO <sub>3</sub>	407
	2.	Magnesium	CaCO <sub>3</sub>	250
	3.	Sodium & Potassium	CaCO <sub>3</sub>	175
	4.	Cations	CaCO <sub>3</sub>	832
	5.	Bicarbonates	CaCO <sub>3</sub>	516
	6.	Chloride	CaCO <sub>3</sub>	162
	7.	Sulphate	CaCO <sub>3</sub>	154
	8.	Anions	CaCO <sub>3</sub>	832
	9.	Silica	SiO <sub>2</sub>	50
	10.	Iron	Fe	<0.8
	11.	pH Value	-	8.4
	12.	TSS	mg/l	<25
	<p><b>Note :</b> The C.W system is expected to operate at about 3.0 Cycles of Concentration.</p>			
MOUDA SUPER THERMAL POWER PROJECT STAGE-II (2X660 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A		PROJECT SYNOPSIS  PAGE 5 OF 9

CLAUSE NO.	PROJECT SYNOPSIS		<div>एनटीपीसी NTPC</div>																		
	<div>ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER</div> <table><thead><tr><th>Sl.No.</th><th>Characteristics</th><th>Value</th></tr></thead><tbody><tr><td>1.</td><td>Silica (Max.)</td><td>0.02 ppm as Sio2</td></tr><tr><td>2.</td><td>Iron as Fe</td><td>Nil</td></tr><tr><td>3.</td><td>Total hardness</td><td>Nil</td></tr><tr><td>4.</td><td>pH value</td><td>6.8 to 7.2</td></tr><tr><td>5.</td><td>Conductivity</td><td>Not more than 0.1 µs/cm excluding the effects of free CO<sub>2</sub></td></tr></tbody></table> <div>NOTE: FOR PASSIVATED DM WATER pH IS 8.5 -9.5</div>			Sl.No.	Characteristics	Value	1.	Silica (Max.)	0.02 ppm as Sio2	2.	Iron as Fe	Nil	3.	Total hardness	Nil	4.	pH value	6.8 to 7.2	5.	Conductivity	Not more than 0.1 µs/cm excluding the effects of free CO <sub>2</sub>
Sl.No.	Characteristics	Value																			
1.	Silica (Max.)	0.02 ppm as Sio2																			
2.	Iron as Fe	Nil																			
3.	Total hardness	Nil																			
4.	pH value	6.8 to 7.2																			
5.	Conductivity	Not more than 0.1 µs/cm excluding the effects of free CO <sub>2</sub>																			
MOUDA SUPER THERMAL POWER PROJECT STAGE-II (2X660 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT SYNOPSIS  PAGE 6 OF 9																		



CLAUSE NO.	<div data-bbox="722 244 999 280" data-label="Section-Header">PROJECT SYNOPSIS</div> <div data-bbox="1289 232 1433 300" data-label="Image"> </div> <div data-bbox="1246 320 1426 353" data-label="Text">Exhibit No. 1</div>		
MOUDA SUPER THERMAL POWER PROJECT STAGE-II (2X660 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI PART-A	PROJECT SYNOPSIS	PAGE 7 OF 9



CLAUSE NO.

PROJECT SYNOPSIS



Annexure-I

प्रलयायवी सारणी CLIMATOLOGICAL TABLE														
STATION : Nagpur(Sonagaon)														
उचाई : 310 मी (1017 फीट)														
रेखांक : 21°00' N देशांक : 79°03' E														
समुद्र सतह से उचाई : 310 METRES														
आर्द्रता : 1930 से 1980 तक के दिनों पर अवलोकन														
BASED ON OBSERVATIONS FROM 1931 TO 1980														
वायु तापमान														
मास	जन	फरवरी	मार्च	अप्रैल	मई	जून	जुलै	अगस्त	सितम्बर	अक्टूबर	नवम्बर	दिसम्बर	जन	फरवरी
सर्वोच्च तापमान	38.0	35.0	32.0	28.0	24.0	21.0	19.0	18.0	19.0	21.0	24.0	28.0	32.0	35.0
दैनिक औसत तापमान	28.0	26.0	24.0	21.0	18.0	16.0	15.0	16.0	18.0	21.0	24.0	28.0	32.0	35.0
निम्नतम तापमान	16.0	14.0	12.0	9.0	7.0	5.0	4.0	5.0	7.0	10.0	13.0	16.0	20.0	24.0
वायु तापमान	21.0	19.0	17.0	14.0	11.0	9.0	8.0	9.0	11.0	14.0	17.0	21.0	25.0	29.0
वायु आर्द्रता														
सर्वोच्च आर्द्रता	85	80	75	65	55	45	40	45	55	65	75	80	85	85
दैनिक औसत आर्द्रता	65	60	55	45	35	25	20	25	35	45	55	60	65	65
निम्नतम आर्द्रता	45	40	35	25	15	10	10	15	25	35	45	50	55	55
वायु आर्द्रता	55	50	45	35	25	15	10	15	25	35	45	50	55	55
वर्षा														
सर्वोच्च वर्षा	10.0	12.0	15.0	20.0	25.0	30.0	35.0	30.0	25.0	20.0	15.0	10.0	8.0	5.0
दैनिक औसत वर्षा	5.0	6.0	7.0	8.0	9.0	10.0	11.0	10.0	9.0	8.0	7.0	6.0	5.0	4.0
निम्नतम वर्षा	2.0	3.0	4.0	5.0	6.0	7.0	8.0	7.0	6.0	5.0	4.0	3.0	2.0	1.0
वर्षा	7.0	8.0	9.0	10.0	11.0	12.0	13.0	12.0	11.0	10.0	9.0	8.0	7.0	6.0
हवा का दबाव														
सर्वोच्च दबाव	1015	1013	1011	1009	1007	1005	1003	1001	1000	1001	1003	1005	1007	1009
दैनिक औसत दबाव	1010	1008	1006	1004	1002	1000	998	997	998	1000	1002	1004	1006	1008
निम्नतम दबाव	1005	1003	1001	999	997	995	993	991	990	991	993	995	997	1000
हवा का दबाव	1008	1006	1004	1002	1000	998	996	995	996	998	1000	1002	1004	1006
हवा की गति														
सर्वोच्च गति	15	12	10	8	6	5	4	5	6	8	10	12	15	15
दैनिक औसत गति	10	8	7	6	5	4	3	4	5	6	7	8	10	10
निम्नतम गति	5	4	3	2	1	1	1	1	1	1	1	1	2	3
हवा की गति	8	6	5	4	3	2	1	2	3	4	5	6	8	8
हवा की दिशा														
सर्वोच्च दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
दैनिक औसत दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
निम्नतम दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की तापमान														
सर्वोच्च तापमान	35	32	28	24	20	16	12	10	12	15	18	22	26	30
दैनिक औसत तापमान	25	22	18	14	10	8	7	8	10	12	15	18	22	26
निम्नतम तापमान	15	12	8	4	0	-2	-3	-2	0	2	5	8	12	16
हवा की तापमान	18	15	12	8	4	0	-1	0	1	2	4	7	10	14
हवा की आर्द्रता														
सर्वोच्च आर्द्रता	80	75	65	55	45	35	30	35	45	55	65	75	80	80
दैनिक औसत आर्द्रता	60	55	45	35	25	15	10	15	25	35	45	55	60	60
निम्नतम आर्द्रता	40	35	25	15	10	5	5	10	15	25	35	40	45	45
हवा की आर्द्रता	50	45	35	25	15	10	5	10	15	25	35	40	45	45
हवा की गति														
सर्वोच्च गति	10	8	6	4	3	2	1	2	3	4	5	6	8	10
दैनिक औसत गति	6	5	4	3	2	1	1	1	1	1	1	1	2	3
निम्नतम गति	3	2	1	1	1	1	1	1	1	1	1	1	1	1
हवा की गति	4	3	2	1	1	1	1	1	1	1	1	1	1	1
हवा की दिशा														
सर्वोच्च दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
दैनिक औसत दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
निम्नतम दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की तापमान														
सर्वोच्च तापमान	30	28	24	20	16	12	8	6	8	10	12	16	20	24
दैनिक औसत तापमान	20	18	14	10	8	6	5	6	8	10	12	16	20	24
निम्नतम तापमान	10	8	4	0	-2	-3	-4	-3	-1	1	3	6	10	14
हवा की तापमान	12	10	8	4	0	-1	-2	-1	0	1	2	4	8	12
हवा की आर्द्रता														
सर्वोच्च आर्द्रता	75	70	60	50	40	30	25	30	40	50	60	70	75	75
दैनिक औसत आर्द्रता	55	50	40	30	20	10	5	10	20	30	40	50	55	55
निम्नतम आर्द्रता	35	30	20	10	5	0	0	5	10	20	30	35	40	40
हवा की आर्द्रता	45	40	30	20	10	5	0	5	10	20	30	35	40	40
हवा की गति														
सर्वोच्च गति	6	4	3	2	1	1	1	1	1	1	1	1	2	3
दैनिक औसत गति	4	3	2	1	1	1	1	1	1	1	1	1	1	1
निम्नतम गति	1	1	1	1	1	1	1	1	1	1	1	1	1	1
हवा की गति	2	1	1	1	1	1	1	1	1	1	1	1	1	1
हवा की दिशा														
सर्वोच्च दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
दैनिक औसत दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
निम्नतम दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की तापमान														
सर्वोच्च तापमान	25	22	18	14	10	8	4	2	4	6	8	12	16	20
दैनिक औसत तापमान	15	12	8	4	0	-2	-3	-2	0	2	4	8	12	16
निम्नतम तापमान	5	2	-2	-6	-10	-12	-13	-12	-10	-8	-6	-4	-2	0
हवा की तापमान	8	6	4	0	-4	-8	-10	-9	-7	-5	-3	-1	1	5
हवा की आर्द्रता														
सर्वोच्च आर्द्रता	65	60	50	40	30	20	15	20	30	40	50	60	65	65
दैनिक औसत आर्द्रता	45	40	30	20	10	5	0	10	20	30	40	50	55	55
निम्नतम आर्द्रता	25	20	10	5	0	0	0	5	10	20	30	35	40	40
हवा की आर्द्रता	35	30	20	10	5	0	0	5	10	20	30	35	40	40
हवा की गति														
सर्वोच्च गति	6	4	3	2	1	1	1	1	1	1	1	1	2	3
दैनिक औसत गति	4	3	2	1	1	1	1	1	1	1	1	1	1	1
निम्नतम गति	1	1	1	1	1	1	1	1	1	1	1	1	1	1
हवा की गति	2	1	1	1	1	1	1	1	1	1	1	1	1	1
हवा की दिशा														
सर्वोच्च दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
दैनिक औसत दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
निम्नतम दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की तापमान														
सर्वोच्च तापमान	20	18	14	10	8	4	0	-2	0	2	4	8	12	16
दैनिक औसत तापमान	10	8	4	0	-2	-4	-5	-4	-2	0	2	6	10	14
निम्नतम तापमान	0	-2	-6	-10	-12	-14	-15	-14	-12	-10	-8	-6	-4	-2
हवा की तापमान	4	2	-2	-6	-8	-10	-11	-10	-8	-6	-4	-2	0	4
हवा की आर्द्रता														
सर्वोच्च आर्द्रता	55	50	40	30	20	10	5	10	20	30	40	50	55	55
दैनिक औसत आर्द्रता	35	30	20	10	5	0	0	5	10	20	30	40	45	45
निम्नतम आर्द्रता	15	10	5	0	0	0	0	5	10	20	30	35	40	40
हवा की आर्द्रता	25	20	10	5	0	0	0	5	10	20	30	35	40	40
हवा की गति														
सर्वोच्च गति	6	4	3	2	1	1	1	1	1	1	1	1	2	3
दैनिक औसत गति	4	3	2	1	1	1	1	1	1	1	1	1	1	1
निम्नतम गति	1	1	1	1	1	1	1	1	1	1	1	1	1	1
हवा की गति	2	1	1	1	1	1	1	1	1	1	1	1	1	1
हवा की दिशा														
सर्वोच्च दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
दैनिक औसत दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
निम्नतम दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की तापमान														
सर्वोच्च तापमान	25	22	18	14	10	8	4	2	4	6	8	12	16	20
दैनिक औसत तापमान	15	12	8	4	0	-2	-3	-2	0	2	4	8	12	16
निम्नतम तापमान	5	2	-2	-6	-10	-12	-13	-12	-10	-8	-6	-4	-2	0
हवा की तापमान	8	6	4	0	-4	-8	-10	-9	-7	-5	-3	-1	1	5
हवा की आर्द्रता														
सर्वोच्च आर्द्रता	65	60	50	40	30	20	15	20	30	40	50	60	65	65
दैनिक औसत आर्द्रता	45	40	30	20	10	5	0	10	20	30	40	50	55	55
निम्नतम आर्द्रता	25	20	10	5	0	0	0	5	10	20	30	35	40	40
हवा की आर्द्रता	35	30	20	10	5	0	0	5	10	20	30	35	40	40
हवा की गति														
सर्वोच्च गति	6	4	3	2	1	1	1	1	1	1	1	1	2	3
दैनिक औसत गति	4	3	2	1	1	1	1	1	1	1	1	1	1	1
निम्नतम गति	1	1	1	1	1	1	1	1	1	1	1	1	1	1
हवा की गति	2	1	1	1	1	1	1	1	1	1	1	1	1	1
हवा की दिशा														
सर्वोच्च दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
दैनिक औसत दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
निम्नतम दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की दिशा	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW
हवा की तापमान														
सर्वोच्च तापमान	20	18	14	10	8	4	0	-2	0	2	4	8	12	16
दैनिक औसत तापमान	10	8	4	0	-2	-4	-5	-4	-2	0	2	6	10	14
निम्नतम तापमान	0	-2	-6	-10	-1									







**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-387-165-N001**

**VOLUME : II B**

**SECTION : C**

**REV. NO. 0**

**DATE : 04.02.2013**

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## **SECTION – C**

### **SPECIFIC REQUIREMENTS**

**SECTION C1 : SELF CLEANING STRAINERS**

**SECTION C2 : ELECTRICAL SYSTEMS**

**SECTION C3 : C&I SYSTEMS**



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS- 387-165-N001**

**VOLUME : IIB**

**SECTION : C**

**REV. NO. 0**

**DATE : 04.02.2013**

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**SECTION C1  
SELF CLEANING STRAINERS  
(MECHANICAL DETAILS)**





**TITLE : TECHNICAL SPECIFICATION  
FOR**

**SELF CLEANING STRAINERS (SCS).**

**SPEC. NO: PE-TS-387-165-N003**

**VOLUME : II B**

**SECTION: C1**

**REV. NO. 0**

**DATE : 12.02.2013**

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## 1.0 GENERAL

The Self Cleaning Strainers (SCS) complete with all accessories shall conform to the standard technical specifications (Section-D) and Data Sheet-A enclosed herewith. In addition the requirements of this section C shall also be complied with. However, wherever the details given in Section-D and Data Sheet-A are different, the requirements of Data Sheet-A shall prevail. Similarly in the event of contradictions between Section-C & Section-D/ Data Sheet-A, Section-C shall prevail.

Section C consists of 3 parts viz. Sec. C1, C2 and C3 for Mechanical, Electrical and C&I respectively, the requirements of all 3 sections shall be complied with.

## 2.0 DESCRIPTION OF EQUIPMENTS :

### 2.1 Self Cleaning Strainers (SCS) :

Self Cleaning Strainers per unit where specified shall be installed on the discharge side of ACW pumps. The water through the self cleaning strainers outlet shall be supplied to the Secondary side of Plate Heat Exchangers. The water analysis is indicated in project information in section B.


## 3.0 SCOPE OF SUPPLY UNDER THE SPECIFICATION IN THE BIDDER'S SCOPE FOR SELF CLEANING STRAINERS.

3.1 The scope of supply for Self Cleaning Strainers covered under this specification is as under.

The size, MOC's and other particulars of the equipments for following projects are detailed in Data Sheet A annexed with Section – D of the specification.

SL.NO.	PROJECT	SELF CLEANING STRAINERS
1.	2X660 MW – NTPC MOUDA STPP STAGE-II	2 SETS PER UNIT VIZ. TOTAL 4 SETS FOR 2 UNIT.



16		<b>TITLE : TECHNICAL SPECIFICATION FOR SELF CLEANING STRAINERS (SCS).</b>	<b>SPEC. NO: PE-TS-387-165-N003</b>	
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### 3.2 SCOPE OF SUPPLY OF SCS INCLUDED IN THE BIDDER'S SCOPE :

The Qty of SCS covered under the specification shall be as per Data Sheet A of respective projects.

Each self cleaning strainer shall be complete with following accessories and auxiliaries.

- a) Flushing pump with drive Motor (if required) - 1 No.
- b) Debris disposal pipework ( 40 Mtr. ) with suitable bends (5 nos.), flanges, counterflanges, fittings and other interconnecting pipe, various valves in the debris disposal pipework shall be in the scope of the bidder.
- c) Filter body/ housing Vent and Drain connections along with their isolating valves.
- d) SCS shall be supplied along with flanges as well as the Counter flanges, complete with bolts, nuts and gaskets.
- e) Differential pressure measuring system for SCS. DP measuring system shall comprise of 2 Nos. DPT + 1 No. DPG for SCS and shall be with *Remote seal* arrangement . Stubs for DPT and DPG shall be independent.
- f) Supporting arrangement complete with foundation plates, anchor bolts, nuts, sleeves, inserts, all installation materials, fixing bolts, clamps and other accessories etc for complete equipment supplied under this package.
- g) Set of commissioning spares, on "As required basis".
- h) The Electrical & C&I items/ accessories as specified in succeeding clause / respective sections herein.
- i) Scope of Starter Panel (Switch Gear Panel) shall be as follows:  
  
2 Sets of SCS shall have one Common Starter Panel (Switch Gear Panel) for DCS based control system.  
  
Switch Gear Panel should have suitable arrangement like Bus Coupler for providing redundancy to incoming supply feeder (1 Working + 1 Standby feeder).
- j) Power and Control cables between Starter Panel and various drives in bidder's scope of supply for specified projects.
- k) Control cables between field instruments and junction box / control panel for all projects.


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- l) Set of mandatory spares as indicated in Data Sheet A.
- m) All the field instruments stipulated in this specification shall be in Bidder's scope.
- n) Finish paints for touch up painting of equipment after erection at site, in sealed containers.
- o) Set of special tools and tackles if required for maintenance and erection of the equipment supplied.
- p) Various drawings, data test reports/ certificates instruction manuals for erection operation and maintenance etc. as specified in Data Sheet-C. and cables schedule indicating BOQ for power & control cables.
- q) Local Control Panels & Instruments: Scope and Type as specified in C&I section wherever required.

Any item not specified but required to make SCS a complete package shall also be in bidders scope.

**4.0 SCOPE OF SERVICES INCLUDED IN THE BIDDER'S SCOPE :**

The bidder's scope also includes following services at site, for scope under this specification for SCS for respective projects


- a) Installation checks (Erection in BHEL's scope).
- b) Commissioning of equipment.
- c) Trial run for requisite period
- d) Performance Testing

The trial run of equipment shall be generally conducted immediately after commissioning while PG testing shall be conducted at a later date. These activities for different units shall be timed separately.

The no. of visits may be suitably assessed by bidders as per their experience with site stay periods on as required basis.

In the event of order no. of visits as follows shall be made as a minimum with charges included in the bidder's base price itself.



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- **For drawings/documents approval**

In the event of order all drawings / documents in soft as well as hard copy shall be submitted within 2 weeks of LOI for approval.

Further on receipt of Customer comments, if required bidder's engineer shall visit BHEL/ Customer alongwith soft copy to resolve all issues and incorporate comments in the soft copy for across the table finalisation and Category-I approval.

- **Site Visits :**

- No. of site visits for combined activities of erection checks and commissioning for SCS as applicable shall be one per unit - for both sets of equipments of one unit. Time duration for erection and commissioning shall be "on as required basis" with equipments run for trial operation thereafter for requisite period to demonstrate satisfactory operation.

However the no. of visits may be suitably assessed by bidders as per their experience with site stay periods on as required basis.

- Bidder shall demonstrate guarantees including pressure drops at site during subsequent visit for SCS of each unit.
- For trouble shooting on "as required basis".

## 5.0 EXCLUSIONS :

The following are excluded from the bidder's scope .


- Civil foundation works required for installation
- Erection of Equipment at site.


## 6.0 DESIGN CONSTRUCTION :

In addition to the requirements of Section-D the following shall also be complied with for packages/ projects under scope of this specification:

- The materials of construction specified in Data Sheet-A are minimum requirements and materials of construction for other components not specified shall be similarly selected by the bidder for the intended duty which shall be subject to purchaser's approval during detailed engineering in the event of order.



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	<p>6.2 Housing/ body of SCS Filter shall be designed and manufactured as per the applicable codes for pressure vessels and to take care of force and moments as enclosed in the specification. However in no case thickness of housing/ body shall be less than the thickness as specified in "Pipe size Table" enclosed in Data Sheet-A of SCS.</p> <p>6.3 Adequate provision for future installation of Cathodic Protection for SCS (Sacrificial type shall be in Purchaser Scope) shall be kept by the bidder in the equipment.</p> <p>6.4 Velocity in the pipe work shall be less than 1.5 m/ sec for pump suction and less than 2.2 m/ sec. in other pipe work. All valves upto 150 NB shall be ball valves. For higher sizes, gate/ globe/ B.F. valves shall be provided. All instrument valves shall be needle valves.</p> <p><b>7.0 Self Cleaning Strainers :</b></p> <p>7.1.1 Performance Guarantee Parameters shall be as under :</p> <ul style="list-style-type: none"> <li>• Pressure drop in Self Cleaning Strainers in clean condition viz. after backwashing.</li> </ul> <p>7.1.2 Bidder to note that bids shall be evaluated on account of pressure drop across Self Cleaning Strainers (in clean condition) &amp; liquidated damages on account of not meeting the same shall be in accordance with following :</p> <p><b>A) Bid Evaluation Criteria and Liquidated Damages:</b></p> <p>The bids received shall be evaluated for Pressure drop across Self Cleaning strainers :</p> <ul style="list-style-type: none"> <li>• The permissible limit of pressure drop across self cleaning strainers in clean condition shall be 0.6 MWC.</li> <li>• If the pressure drops quoted are higher than above limit, the bids shall be technically loaded @ Rate as mentioned in Data Sheet-A for respective projects per <b>0.4 MWC</b> pressure drop (viz. per unit).</li> <li>• However no advantage shall be given for pressure drops quoted less than above permissible limit.</li> <li>• The maximum acceptable limit for pressure drop across self cleaning strainer (with technical loadings) shall be 1.0 MWC. The bids will be technically rejected for pressure drops quoted higher than above maximum limit.</li> <li>• The guaranteed pressure drops shall be demonstrated at site by vendors and if found higher shall be subject to LD @ twice the bid evaluation factor as above.</li> </ul>	

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**8.0 SPARES :**

**8.1 Recommended Spares :**  
The supply of spare parts as necessary recommended by the manufacture for three (3) years of reliable operation and maintenance of SCS of respective projects shall be supplied. List of such spares along with the unit price shall not be included in base price but indicated separately in the schedule of prices for recommended spares enclosed in Vol. -III.

**8.2 Mandatory Spares**  
Mandatory Spares shall be as per Data Sheet-A or annexure enclosed with data sheet of the respective packages applicable for specific projects, prices for same shall be included by bidder in the equipment base price itself.

**9.0 Quality Plan**  
Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ Customer approval and customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. Charges for 3<sup>rd</sup> party inspection (TUV/ equivalent) for imported components wherever required shall be included by bidder in the base price itself. Witness for all the test identified under agency "C" & "N" in Quality plan shall be by third party.

If BHEL or BHEL customer decides to witness the tests along with third party, the cost of travel of BHEL or BHEL customer shall be borne by BHEL or BHEL customer themselves.

**10.0 DELIVERY & DRAWINGS/ DOCUMENTS DISTRIBUTION SCHEDULE :**


a. Delivery of Equipment for each project shall be as per NIT.

b. The drawings to be submitted by bidder in event of award of contract for SCS for each project shall be as follows:

- Technical Data Sheets, P&ID, Installation Plan , for ,SCS .
- GA drawings, C & I Document( Part-I & II) of SCS as applicable.
- Quality Plan.
- O & M Manual.

c. Drawings submission schedule shall be as per NIT/as advised by Project Group.



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**11.0** The makes of various bought out items shall be subjected to purchaser's approval in the event of order.

**12.0** It is mandatory for the bidders to submit along with the bid the deviations if any whether major or minor in the schedule of deviations only. ***In the absence of deviations listed in the schedule of deviations the offer shall be deemed to be in full conformity with the specification "non-withstanding" any thing else stated elsewhere in bidder's offer, data sheets etc. The implied/ indirect deviations in data sheets etc. Shall not be binding on the purchaser.***

**13.0** The following documents shall be furnished by the bidder with his offer :

- Compliance certificate duly signed and stamped (Enclosed at Schedules).
- Guarantee schedule duly signed and stamped (Enclosed at Schedules).
- GA drawings of following with empty/ filled-ups.
  - GA of SCS (As applicable).
  - Debris Flushing pumps (if applicable)
  - Other equipments considered necessary for Layout/ Civil.
- Electrical Load Data (Enclosed at Vol. III of Specification)
- Schedule of Deviation (Enclosed at Schedules).

The bidder to note that load requirement furnished and finalised during tender stage shall only be provided by BHEL and any changes or additional requirement of Electrical load by bidder during contract stage shall be provided by BHEL with cost repercussions to the bidder.

**NOTE:** Apart from above, no other drawing/ document/ data sheet etc. shall be submitted along with the offer. If any drawing/ document etc. is submitted with the offer, same shall be considered as for 'Reference' purpose only and shall not be reviewed/ commented upon and any deviation, exclusion to scope, etc. taken in documents but not highlighted in the deviation schedule shall not be taken cognizance of.





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**ANNEXURE-I**

**SELF CLEANING STRAINERS**

SL.NO.	Projects	Size (NB)	Length of SCS (Including Counter Flange)	Scope of Counter Flange	Scope of nuts and bolts.
1.	2X660 MW – NTPC, MOUDA STPP STAGE-II	700 NB	2200 mm	In Bidder's Scope	In Bidder's Scope



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**SECTION C2**  
**SELF CLEANING STRAINERS**  
**ELECTRICAL DETAILS**



TITLE

## LV MOTORS

### DATA SHEET-A

2x660 MW MOUDA STPP

SPECIFICATION NO.

VOLUME II B

SECTION D

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- 1.0 Design ambient temperature : 50 °C
- 2.0 Maximum acceptable kW rating of LV motor: Below 200KW
- 3.0 Installation (Indoors/ Outdoors) : As required
- 4.0 Details of supply system
  - a) Rated voltage (with variation) : 415V  $\pm$  10%
  - b) Rated frequency (with variation) : 50 Hz +3 to -5%
  - c) Combined voltage & freq. variation : 10% (sum of absolute values)
  - d) System fault level at rated voltage : 45 kA RMS for 1 sec
  - e) Short time rating for terminal boxes
    - o 110 kW and above (Breaker : 45 KA for 0.20 sec. controlled)
    - o Below 110 kW (Contactor : 45 KA protected by fuse controlled)
  - f) LV System grounding : Solidly
- 5.0 Class of insulation : Class 'F', with temp rise limited to class B.
- 6.0 Minimum voltage for starting : 85% of rated voltage  
(As percentage of rated voltage)
- 7.0 Power cables data : Shall be given during Detailedengg
- 8.0 Earth Conductor Size & Material : Shall be given during Detailedengg
- 9.0 Space heater supply : 240 V, 1 $\phi$  , 50 Hz
- 10.0 Rating up to which Single phase motor : Acceptable below 0.20 kW
- 11.0 The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following  
(Without any further tolerance) : As per clause no. 7.16 of technical spec sec-VI part-B (page 5 of 8)
- 12.0 Additional tests : As per QP
- 12.1 Flame-proof motor
  - a) Enclosure suitable (As per IS:2148) : As per requirement
  - b) Classification of Hazardous area : As per requirement  
(As per IS: 5572 part-I)
- 12.0 Makes : As per customer approved vendors



## ANNEXURE – I TO SECTION – C : STANDARD ELECTRICAL SCOPE BETWEEN BHEL/NTPC AND VENDOR

## PACKAGE : SCS

## PROJECT : 2X660 MW MOUDA STPP, STAGE- II.

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL/NTPC	BHEL/NTPC	1. 415 V AC/240 V AC supply shall be provided by BHEL/NTPC based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract including power supply equipment (battery charger etc) required for the PLC/control panel (as applicable) for the system supplied by vendor. 2. Interposing relays (RE 302 of Jyoti make or equivalent), if required for PLC and microprocessor based systems, shall be provided by BHEL/NTPC in MCCs. Requirement of these relays shall be furnished by vendor during detailed engineering stage.
2	Local Push Button Station (for motors)	Vendor	Vendor	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL/NTPC's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	BHEL/NTPC Vendor BHEL /NTPC	BHEL/NTPC BHEL/NTPC BHEL/NTPC	1. Sizes and quantity of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL/NTPC). Finalisation of cable sizes shall be done by BHEL/NTPC. Vendor shall provide lugs & glands accordingly. 2. Laying of cables by BHEL/NTPC. 3. Termination at BHEL/NTPC equipment terminals by BHEL/NTPC. 4. Termination at Vendor equipment terminals by Vendor.
4	Any special type of cable like compensating, co-axial, prefab, MICC, fibre optical etc.	Vendor	Vendor	
5	Cable trays, accessories & cable trays supporting system	BHEL/NTPC	BHEL/NTPC	
6	Cable glands and lugs for equipments supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power cables 3. Solder less crimping type heavy duty copper lugs for control cables.
7	Conduit and conduit accessories for cabling between equipments supplied by vendor	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537. Makes of conduits shall be subject to

## ANNEXURE – I TO SECTION – C : STANDARD ELECTRICAL SCOPE BETWEEN BHEL/NTPC AND VENDOR

## PACKAGE : SCS

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
8	Lighting	BHEL/NTPC	BHEL/NTPC	customer/ BHEL/NTPC approval at contract stage.
9	Equipment grounding & lightning protection	BHEL/NTPC	BHEL/NTPC	
10	Below grade grounding	BHEL/NTPC	BHEL/NTPC	
11	LT Motors with base plate and foundation hardware	Vendor	Vendor	Makes shall be subject to customer/ BHEL/NTPC approval at contract stage.
12	Mandatory spares	Vendor	-	Vendor to quote as per specification.
13	Recommended O & M spares, E & C spares, erection & maintenance tools & tackle.	Vendor	-	As per specification
14	Any other equipment/material/service required for completeness of system but not specified above (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	
15	a) Input cable schedules (C & I) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for C & I systems for vendor supplied equipment shall be furnished during detail engineering by vendor in soft copies in the BHEL/NTPC cable schedule format.
16	Equipment layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipments requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Electrical equipment layout drawing shall be to BHEL/NTPC approval.
17	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

## NOTES:

1. Make of all electrical equipments/items supplied shall be reputed make & shall be subject to approval of BHEL/NTPC/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/NTPC/customer after award of contract without any commercial implication.
3. For skid mounted system, 2 nos. (1W+1S) supply of 415 V, 3 phase AC shall be provided by BHEL/NTPC. Complete electrical distribution for the skid including changeover between feeder/starters/LCP/inter-locks/protection devices / any other supply etc. shall be in bidder's scope.





**ELECTRICAL EQUIPMENT SPECIFICATION  
FOR SCS**

**(ELECTRICAL PORTION)**

SPECIFICATION NO.  
PE-TS-

VOLUME NO. : **II-B**

SECTION : **C**

REV NO. : **00** DATE : **9.1.12**

SHEET : **1** OF **1**

**1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER :**

- a) Services and equipment as per "Electrical Scope between BHEL and Vendor".
- b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The same shall be provided by the bidder without any extra charge.
- c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
- d) Erection and Commissioning spares.
- e) Erection & Maintenance tools & tackles.
- f) Electrical load requirement for SCS.
- g) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- h) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer /BHEL approval without any commercial and delivery implications to BHEL
- i) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.

**2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:**

Refer "Electrical Scope between BHEL and Vendor".

**3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID**

- 3.1** Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/quality assurance requirements stipulated. In line with this two signed and stamped copies of the following shall be furnished by the bidder as technical offer:

- a) A copy of this sheet "Electrical equipment Specification for "SCS" and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
- b) List of Erection and Commissioning spares.
- c) List of Erection & Maintenance tools & tackles.
- d) Electrical load requirement

- 3.2** No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

**4.0 List of enclosures :**

- a) Specification AC/DC Motors
- b) Data sheet of AC/DC Motors.
- c) Quality Plan.
- d) Load data format.



## **SUB-SECTION-III:E1**

### **MOTORS**

MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) /  
NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) /  
RAGHUNATHPUR TPP PHASE-II (2 x660MW)  
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION  
SECTION-VI  
BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2

CLAUSE NO.	TECHNICAL REQUIREMENTS		<div>एनटीपीसी NTPC</div>	
	MOTORS			
1.00.00	GENERAL REQUIREMENTS			
1.01.00	For the purpose of design of equipment/systems, an ambient temperature of 50 deg. centigrade and relative humidity of 95 %(at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.			
1.02.00	All equipments shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.			
1.03.00	Contractor shall provide fully compatible electrical system, equipments, accessories and services.			
1.04.00	All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.			
1.05.00	The auxiliary AC voltage supply arrangement shall have and 415V systems. It shall be designed to limit voltage variations as given below under worst operating condition :			
	(a)	11kV, 3.3 kV	+/- 6%	
	(b)	415/240V	+/- 10%	
1.06.00	The voltage level for motors shall be as follows:-			
	a)	Upto 0.2KW	: 240V, Single Phase AC/ 415V Three phase AC	
	b)	Above 0.2KW and upto 200KW	: 415V, Three Phase AC	
	c)	Above 200KW and upto 1500 KW	: 3.3 kV, Three Phase AC	
	d)	Above 1500 KW	: 11 kV, Three Phase AC	
1.07.00	Fault level shall be limited to 40kA RMS for 1 second for 11kV, 3.3 kV system and 45 kA RMS 1 second for 415V system. 415V system shall be solidly grounded and 220 VDC system shall be isolated type.			
1.08.00	Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor motors.			
1.09.00	The responsibility of coordination with electrical agencies and obtaining all necessary clearances shall be of the contractor.			
1.10.00	Degree of Protection			
	Degree of protection for various enclosures as per IS: 4691, IEC60034-05 shall be as follows:-			
	i)	Indoor motors	-	IP 54
	ii)	Outdoor motors	-	IP 55
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2		PART-B SUB SECTION-III: E1 (MOTORS) PAGE 1 OF 8




CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC
	iii) CW motors (in case of Screen protected Drip proof) - IP 23 iv) Cable box - indoor area - IP 54 v) Cable box - outdoor area - IP 55	
2.00.00	<b>CODES AND STANDARDS</b> 1) Three phase induction motors : IS:325, IEC:60034 2) Single phase AC motors : IS:996, IEC:60034 3) Crane duty motors : IS:3177, IEC:60034 4) DC motors/generators : IS:4722 5) Energy Efficient motors : IS 12615	
3.00.00	<b>TYPE</b>	
3.01.00	<b>AC Motors:</b> (a) Squirrel cage induction motor suitable for direct-on-line starting. (b) Continuous duty LT motors upto 160 KW Output rating (at 50 deg.C ambient temperature) ,shall be Energy Efficient motors ,Efficiency class-Eff1, conforming to IS 12615. (c) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.	
3.02.00	DC Motors Shunt wound.	
4.00.00	<b>RATING</b> (a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor. (b) Whenever the basis for motor ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.	
5.00.00	<b>TEMPERATURE RISE</b> <b>Air cooled motors</b> 70 deg. C by resistance method for both thermal class 130(B)& 155(F) insulation. <b>Water cooled</b> 80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.	
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE		<b>TECHNICAL SPECIFICATION</b> SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2 <b>PART-B</b> SUB SECTION-III: E1 (MOTORS) PAGE 2 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>	
	41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class Y wet wound Boiler circulation pump motor.		
6.00.00	OPERATIONAL REQUIREMENTS		
6.01.00	Starting Time		
6.01.01	For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.		
6.01.02	For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.		
6.01.03	For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.		
6.01.04	Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.		
6.02.00	Torque Requirements		
6.02.01	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.		
6.02.02	Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.		
6.03.00	Starting voltage requirement		
	(a) 85% upto 1500KW		
	(d) 80% from 1501 KW to 4000KW		
	(e) 75% > 4000KW		
7.00.00	DESIGN AND CONSTRUCTIONAL FEATURES		
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors, space heater terminals inside the main terminal box may be acceptable.		
7.02.00	All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). CW motors can be screen protected drip proof (SPDP) type. Motors located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below		
	(a) Fuel oil area : Group - IIB		
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2	PART-B SUB SECTION-III: E1 (MOTORS)
			PAGE 3 OF 8




CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
7.03.00	<p>Winding and Insulation</p> <p>(a) Type : Non-hygroscopic, oil resistant, flame resistant</p> <p>(b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature</p> <p>(c) 11kV, 3.3 kV AC motors : Thermal Class 155(F) insulation with winding temperature rise limited to thermal class 130(B). The winding insulation process shall be total Vacuum Pressure Impregnated i.e. resin pour method. The lightning impulse &amp; interturn insulation surge withstand level shall be as per IEC-60034 Part-15.</p> <p>(d) 415V AC &amp; 220V DC motors : Thermal Class 130(B) or better</p>			
7.04.00	Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.			
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.			
7.06.00	Noise level for all the motors shall be limited to 85dB (A). Bearing housing vibration shall be limited within the limits prescribed in IEC 60034-14/IS:12075 . Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.			
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and duplex platinum resistance type temperature detectors preferably 2 numbers.			
7.08.00	Motor body shall have two earthing points on opposite sides.			
7.09.00	HT motors can be offered with either elastimould termination or dust tight phase separated double walled (metallic as well as insulated barrier) cable terminal boxes. In case elastimould terminations are offered, then protective cover and trifurcating sleeves shall also be provided. In case cable terminal box is offered, then Employer shall provide termination kit. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel for three core cables) or 4 mm (non magnetic material for single core cables) shall be provided in case of cable terminal boxes.			
7.10.00	The spacing between gland plate & centre of terminal stud shall be as per Table-I.			
7.11.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.			
7.12.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV / 415V systems without any injurious effect on its life.			
7.13.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2	PART-B SUB SECTION-III: E1 (MOTORS)	PAGE 4 OF 8



CLAUSE NO.	TECHNICAL REQUIREMENTS			
7.14.00	11kV and 3.3 kV motors Cable Terminal Box shall be suitable for fault level of 750MVA for 0.12 sec and 250 MVA for 0.12 sec respectively.Elastimould termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.			
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box, cable glands & lugs suitable for the same.			
7.16.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance).			
	(a) Upto 110KW:	11.0		
	(b) Above 110KW & upto 1500KW:	10.0		
	(c) Above 1500KW & upto 4000KW:	9.0		
	(d) Above 4000KW:	6 to 6.5		
8.00.00	TYPE TEST			
8.01.00	HT MOTORS			
8.01.01	The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.			
8.01.02	The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.			
8.01.03	In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the Employer for waiver of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The Employer reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.			
8.01.04	Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2		PART-B SUB SECTION-III: E1 (MOTORS)
PAGE 5 OF 8				




CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
8.01.05	<p><b>LIST OF TESTS TO BE CONDUCTED</b></p> <p>The following type tests shall be conducted on each type and rating of HT motor</p> <ul style="list-style-type: none"> <li>(a) No load saturation and loss curves upto approximately 115% of rated voltage</li> <li>(b) Measurement of noise at no load.</li> <li>(c) Momentary overload test (subject to test bed constraint).</li> <li>(d) Full load test (subject to test bed constraint).</li> <li>(e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.</li> <li>(f) Lightning Impulse withstand test on the sample coil shall be as per clause 5.1.3.2, IEC-60034, Part-15.</li> <li>(g) Surge withstand voltage test on interturn insulation as per IEC 60034-15</li> </ul>			
8.01.06	<p><b>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</b></p> <p>The following type test reports shall be submitted for each type and rating of HT motor</p> <ul style="list-style-type: none"> <li>(a) Degree of protection test for the enclosure followed by IR, HV and no load run test.</li> <li>(b) Fault level withstand test for each type of cable terminal box of HT motors.</li> </ul>			
8.02.00	<b>LT Motors</b>			
8.02.01	<p>LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Employer's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.</p>			
8.02.02	<p>However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.</p>			
8.02.03	<p><b>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</b></p> <p>The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only</p>			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE		<b>TECHNICAL SPECIFICATION SECTION-VI</b> BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2	<b>PART-B SUB SECTION-III: E1 (MOTORS)</b>	<b>PAGE 6 OF 8</b>

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	<ol style="list-style-type: none"> <li>1. Measurement of resistance of windings of stator and wound rotor.</li> <li>2. No load test at rated voltage to determine input current power and speed</li> <li>3. Open circuit voltage ratio of wound rotor motors ( in case of Slip ring motors)</li> <li>4. Locked rotor readings of voltage, current and power input at a suitable reduced voltage.</li> <li>5. Full load test to determine efficiency power factor and slip .</li> <li>6. Temperature rise test .</li> <li>7. Momentary overload test .</li> <li>8. Insulation resistance test .</li> <li>9. High voltage test .</li> <li>10. Test for vibration severity of motor.</li> <li>11. Test for noise levels of motor .</li> <li>12. Test for degree of protection and</li> <li>13. Overspeed test.</li> </ol>			
8.03.00	All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.			
8.04.00	The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2	PART-B SUB SECTION-III: E1 (MOTORS)	PAGE 7 OF 8	



CLAUSE NO.	<div> <div>एनटीपीसी</div> <div>NTPC</div> </div> <b>TECHNICAL REQUIREMENTS</b>																												
	<p style="text-align: center;"><b>TABLE - I</b></p> <p style="text-align: center;"><b>DIMENSIONS OF TERMINAL BOXES</b></p> <p><b>FOR LV MOTORS:</b></p> <table> <tr> <th>Motor MCR in KW</th><th>Minimum distance between centre of stud and gland plate in mm</th></tr> <tr> <td>UP to 3 KW</td><td>As per manufacturer's practice.</td></tr> <tr> <td>Above 3 KW - upto 7 KW</td><td>85</td></tr> <tr> <td>Above 7 KW - upto 13 KW</td><td>115</td></tr> <tr> <td>Above 13 KW - upto 24 KW</td><td>167</td></tr> <tr> <td>Above 24 KW - upto 37 KW</td><td>196</td></tr> <tr> <td>Above 37 KW - upto 55 KW</td><td>249</td></tr> <tr> <td>Above 55 KW - upto 90 KW</td><td>277</td></tr> <tr> <td>Above 90 KW - upto 125 KW</td><td>331</td></tr> <tr> <td>Above 125 KW-upto 200 KW</td><td>203</td></tr> </table> <p><b>FOR HT MOTORS:</b></p> <p>The distance between gland plate and the terminal studs shall not be less than 500 mm.</p> <p><b>PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:</b></p> <p>NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:</p> <table> <tr> <th>Motor MCR in KW</th><th>Clearance</th></tr> <tr> <td>UP to 110 KW</td><td>10mm</td></tr> <tr> <td>Above 110 KW and upto 150 KW</td><td>12.5mm</td></tr> <tr> <td>Above 150 KW</td><td>19mm</td></tr> </table>	Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm	UP to 3 KW	As per manufacturer's practice.	Above 3 KW - upto 7 KW	85	Above 7 KW - upto 13 KW	115	Above 13 KW - upto 24 KW	167	Above 24 KW - upto 37 KW	196	Above 37 KW - upto 55 KW	249	Above 55 KW - upto 90 KW	277	Above 90 KW - upto 125 KW	331	Above 125 KW-upto 200 KW	203	Motor MCR in KW	Clearance	UP to 110 KW	10mm	Above 110 KW and upto 150 KW	12.5mm	Above 150 KW	19mm
Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm																												
UP to 3 KW	As per manufacturer's practice.																												
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Above 55 KW - upto 90 KW	277																												
Above 90 KW - upto 125 KW	331																												
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UP to 110 KW	10mm																												
Above 110 KW and upto 150 KW	12.5mm																												
Above 150 KW	19mm																												
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE	<div> <div>TECHNICAL SPECIFICATION</div> <div>SECTION-VI</div> <div>BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2</div> </div> <div> <div>PART-B</div> <div>SUB SECTION-III: E1 (MOTORS)</div> </div> <div>PAGE 8 OF 8</div>																												

FOR 2X660MW NTPC MOUDA STPP STAGE-II

CLAUSE NO.		QUALITY ASSURANCE										
INDUCTION MOTOR & SYNCHRONOUS MACHINE												
TESTS/CHECKS  TEMS/COMPONENTS		Visual	Dimensional	Make/Type/Rating/TC/General Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment		
Plates for stator frame, end shield, spider etc.		Y	Y	Y	Y						Y	
Shaft		Y	Y	Y	Y	Y	Y				Y	
Magnetic Material		Y	Y	Y	Y	Y		Y				
Rotor Copper/Aluminium		Y	Y	Y	Y		Y	Y			Y	
Stator copper		Y	Y	Y	Y			Y			Y	
SC Ring		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Insulating Material		Y		Y	Y			Y				
Tubes for Cooler		Y	Y	Y	Y	Y					Y	
Sleeve Bearing		Y	Y	Y	Y	Y					Y	
Stator/Rotor, Exciter Coils		Y	Y	Y				Y	Y			
Castings, stator frame, terminal box and bearing housing etc.		Y	Y	Y	Y	Y			Y			
Fabrication & machining of stator, rotor, terminal box		Y	Y			Y					Y	
Wound stator		Y	Y					Y	Y			
Wound Exciter		Y	Y					Y	Y			
Rotor complete		Y	Y					Y				
Exciter, Stator, Rotor, Terminal Box assembly		Y	Y					Y				
Accessories, RTD, BTD,CT, Brushes, Diodes, Space heater, antifriction bearing, cable glands, lugs, gaskets etc.		Y	Y	Y								
Motor ( IS 325 / 4722/ 9283)		Y	Y	Y								



FOR 2X660MW NTPC MOUDA STPP STAGE-II

CLAUSE NO.	QUALITY ASSURANCE						<div>एन टी पी सी</div> <div>NTPC</div>			
INDUCTION MOTOR & SYNCHRONOUS MACHINE										
TESTS/CHECKS  ITEMS/COMPONENTS		Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	All routine & acceptance tests as per IS-325/IS-4722 /IS- 9283/IS 2148/IEC 60079-I	Vibration	Over speed	Tan delta, shaft voltage & polarization index test
Plates for stator frame, end shield, spider etc.										
Shaft										
Magnetic Material		Y		Y						
Rotor Copper/Aluminium										
Stator copper				Y						
SC Ring										
Insulating Material				Y						
Tubes for Cooler			Y							
Sleeve Bearing			Y							
Stator/Rotor, Exciter Coils										
Castings, stator frame, terminal box and bearing housing etc.										
Fabrication & machining of stator, rotor, terminal box										
Wound stator										
Wound Exciter										
Rotor complete					Y	Y				
Exciter, Stator, Rotor, Terminal Box assembly										
Accessories, RTD, BTD,CT, Brushes, Diodes, Space heater, antifriction bearing, cable glands, lugs, gaskets etc.										
Motor ( IS 325 / 4722 / 9283/2148/IEC 60079-I)							Y	Y	Y	Y1
<div>Note : 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices &amp; Procedure followed along with relevant supporting documents during QP finalisation. However, No QP for LT motor upto 50KW.</div> <div>2. Makes of all major bought out items will be subject to NTPC approval.</div> <div>Y1 = for HT Motor / Machines only.</div>										
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE				TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2			PART-B SUB-SECTION-VII:QE1 MOTOR		PAGE 2 OF 2	



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS- 387-165-N001**

**VOLUME : IIB**

**SECTION : C**

**REV. NO. 0**

**DATE : 04.02.2013**

**SHEET 1 of 1**

**SECTION C3  
SELF CLEANING STRAINERS  
C&I DETAILS**



**SPECIFIC C&I TECHNICAL REQUIREMENT FOR SCS**

<b>Sl.No.</b>		<b>2X660MW MOUDA</b>
1.00	<b>SYSTEM</b>	<b>SCS</b>
2.00	<b>COMMON / PER UNIT</b>	<b>PER UNIT</b>
3.00	<b>CONTROL SYSTEM</b>	<b>DCS (TG C&amp;I)</b>
3.10	<b>PROCESSOR CONFIGURATION FOR PLC SYSTEM</b>	NA
4.00	<b>LOCATION OF CONTROL SYSTEM</b>	CCR
4.10	<b>CONTROL SYSTEM SCOPE (BIDDER/ BHEL/ CUSTOMER)</b>	BHEL
5.00	<b>HARDWIRED INTERFACE WITH DCS (Y/N)</b>	NA
5.10	<b>PURPOSE OF HARDWIRED INTERFACE WITH DCS</b>	
5.11	<b>a) COMMAND FROM DCS (Y/N)</b>	NA
5.12	<b>b) STATUS FEEDBACK TO DCS (Y/N)</b>	NA
5.13	<b>c) GROUP FAULT ALARM TO DCS (Y/N)</b>	NA
6.00	<b>SOFTLINK TO DCS (Y/N)</b>	NA
6.10	<b>PURPOSE OF SOFTLINK TO DCS</b>	
6.11	<b>a) COMMAND INTERFACE WITH DCS (Y/N)</b>	NA
6.12	<b>b) STATUS MONITORING IN DCS (Y/N)</b>	NA
7.00	<b>PROTECTION CLASS FOR PLC / RIO PANEL</b>	NA
8.00	<b>CONTROL FROM PB's ON LCP/OWS ON LCP</b>	NA
9.00	<b>ANNUNCIATION ON LCP (Y/N) – IF Y, MIN NO. OF HARDWIRED ALARMS / INDICATIONS</b>	NA
9.10	<b>MIMIC ON LCP (Y/N)</b>	NA
10.00	<b>CONTROL FROM DCS IN CCR (Y/N)</b>	Y
11.00	<b>TYPE OF SOFTLINK (TP/OFC)</b>	NA
11.10	<b>COMMUNICATION CABLE SCOPE (BIDDER/ PEM/ EDN/ CUSTOMER)</b>	NA
11.20	<b>REDUNDANT CABLE (Y/N)</b>	NA
11.30	<b>PROTOCOL</b>	NA
12.00	<b>RIO / RPU (Y/N)</b>	NA
13.00	<b>## NO. OF OWS / LAPTOP</b>	NA
13.10	<b>SIZE OF OWS/ CRT OR LCD</b>	NA
14.00	<b>NO. OF PRINTER</b>	NA
14.10	<b>PRINTER SIZE AND TYPE</b>	NA
15.00	<b>\$\$ POWER SUPPLY AVAILABLE FOR BALL MONITOR (24V DC / 110 V AC UPS / 230 V AC UPS)</b>	24V DC
15.10	<b>&amp;&amp; POWER SUPPLY AVAILABLE FOR PLC PANEL (3PHASE, 415 V AC/ 1PHASE, 110 V UPS/ 1PHASE, 230 V UPS)</b>	NA
15.20	<b>REDUNDANT FEEDERS (R) / NON-REDUNDANT (NR) FEEDERS FOR POWER SUPPLY</b>	NA
15.30	<b>UPS BATTERY CONFIGURATION (1X100% / 2X100%)</b>	NA
15.40	<b>BATTERY TYPE (LEAD ACID/ Ni-Cd)</b>	NA

15.50	BATTERY BACK-UP TIME (in minutes)	NA
16.00	ACTUATOR WITH INTEGRAL STARTER (Y/N)	Y
17.00	PG/ DPG/ PS/ DPS/ PT/ DPT per Balls Collecting Strainer	DPT = 2 nos. DPG = 1 no.
19.00	REMARKS	
20.00	PROJECT SPECIFIC INFO	

**NOTES:**

1. \$\$ THIS IS APPLICABLE FOR DCS CONTROLLED SYSTEMS ONLY.
2. IN CASE OF DCS CONTROLLED SYSTEMS, BIDDER TO TERMINATE ALL INSTRUMENTATION AND CONTROL ELEMENTS IN JUNCTION BOXES FOR FURTHER CABLING TO DCS BY BHEL/CUSTOMER. BIDDER TO PROVIDE INPUT/OUTPUT LIST, DRIVES LIST, JUNCTION BOX SCHEDULE AND TERMINATION DETAILS, RECOMMENDED CONTROL LOGICS / WRITE-UP ETC. DURING DETAILED ENGINEERING
3. FOR THE PROJECTS IN WHICH CONTROL ARE ENVISAGED WITH DCS CONTROL SYSTEM FOR SCS- 2 SETS OF SCS SHALL HAVE ONE COMMON STARTER PANEL (SWITCH GEAR PANEL).
4. INSTRUMENT RACK AND JUNCTION BOXES SHALL BE IN BIDDER'S SCOPE OF SUPPLY.
5. BIDDER TO FURNISH ELECTRICAL LOAD DATA DURING DETAILED ENGINEERING.
6. ALARM FACIA SHALL BE UNDER BIDDER'S SCOPE. NO. OF FACIA SHALL BE DECIDED DURING DETAILED ENGINEERING.

**LEGEND:**

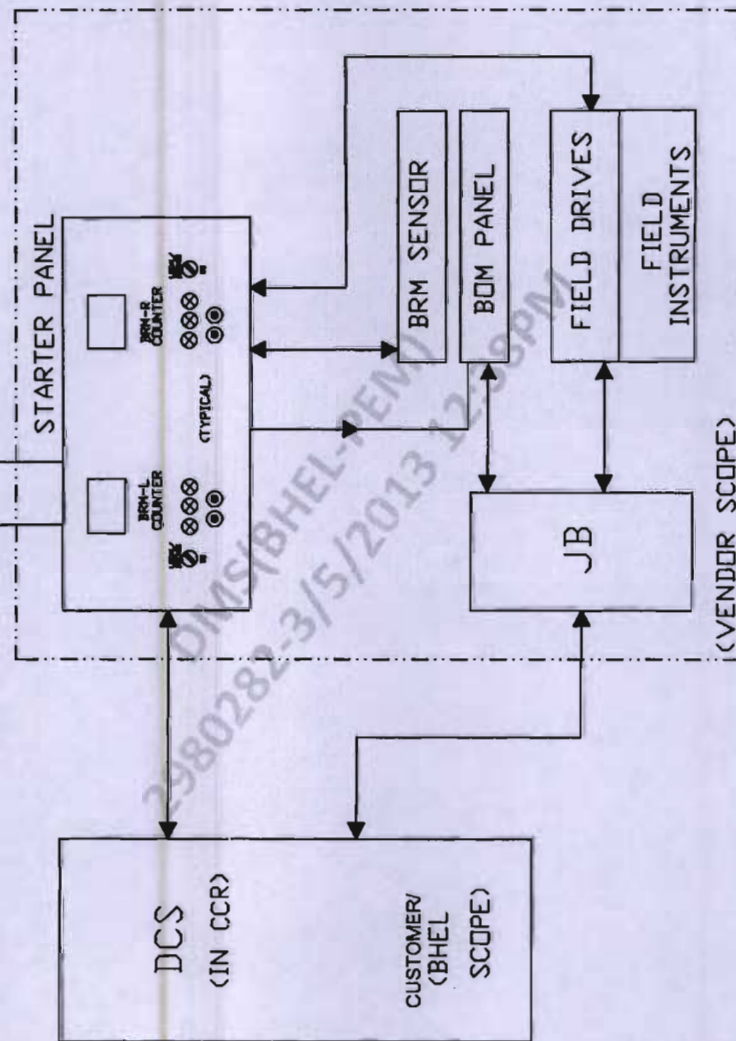
DCS- DISTRIBUTED CONTROL SYSTEM  
 PLC- PROGRAMMABLE LOGIC CONTROLLER  
 RPU - REMOTE PROCESSING UNIT



# STANDARD BLOCK DIAGRAM FOR SCS PACKAGE WITH DCS CONTROL

415V AC, 3P, 4WIRE  
REDUNDANT FEEDER (BY CUSTOMER/BHEL)

CONFIGURATION A:  
WITH STARTER PANEL IN VENDOR SCOPE



PE-DG-999-145-1274A(a)



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS- 387-165-N001**

**VOLUME : IIB**

**SECTION : D**

**REV. NO. 0**

**DATE : 04.02.2013**

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## **SECTION – D**

### **STANDARD TECHNICAL SPECIFICATION**

**SECTION D1 : SELF CLEANING STRAINERS**

**SECTION D2 : ELECTRICAL SYSTEMS**

**SECTION D3 : C&I SYSTEM**





**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS- 387-165-N001**

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**SECTION : D**


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## **SECTION D1**

### **STANDARD TECHNICAL SPECIFICATION FOR SELF CLEANING STRAINERS**

	TITLE :	SPEC. NO. PE-TS- 999-165-N002
बी एस ई सी	STANDARD TECHNICAL SPECIFICATION	VOLUME : II B
	SELF - CLEANING FILTERS	SECTION : D
		REV. NO. 0      DATE : 02.12.2009
		SHEET 1 OF 10

1.00.00      **GENERAL**

This specification covers the Design, Performance and Operational Requirements, Constructional Features, Manufacture, Assembly. Inspection and Testing at the Manufacturer's and/or his Sub-contractor's works and Painting for delivery of Self-cleaning filter (Backwash Type) complete with all accessories as specified hereinafter.

2.00.00      **CODES AND STANDARDS**

2.01.00      The design, materials manufacture, inspection and testing of the self-cleaning filter complete with all accessories, shall comply with the requirements of the latest revisions of the following appropriate codes and standards :

2.01.01      IS / BS / DIN / US Standards regarding pressure vessels, pipes, flanges and others as necessary.

2.01.02      IS / BS / DIN / ASTM Standards for materials specification and testing procedures.

2.01.03      IS / BS / DIN / AWWA Standards for valves and their testing.

2.02.00      In case of any conflict between the above codes / standards and this specification, the later shall prevail and in case of any further conflict in the matter, the interpretation of the specification by the Engineer shall be final and binding.

3.00.00      **DESIGN AND CONSTRUCTION**

3.01.00      **General Requirements**

3.01.01      Unless otherwise necessary manufacturer's standard and proven models of the self cleaning filter shall be supplied.

3.01.02      The self-cleaning filter shall be capable of safe, proper and continuous operation. Vibration, noise, mechanical stresses shall be kept within allowable limits specified by relevant codes / standards, In design due attention shall be given to ease of maintenance, repair and cleaning.

3.01.03      Suitable corrosion allowance shall be provided wherever necessary.


3.01.04      Unless otherwise specified in Data Sheet-A, the inlet and outlets of the filter shall be co-axial without any off set between the centre lines of inlet and outlet pipes.


3.02.00      **Performance Requirements**

The self-cleaning filter with all accessories shall be designed and guaranteed to meet the following requirements :-


3.02.01      The self - cleaning filter shall perform satisfactorily under the flow and pressure conditions specified in Data Sheet -A and shall be capable of housing the various forms of debris / sludge i.e., suspended particles / matter, mussels, grass, leaves,



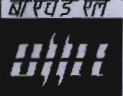
	<b>TITLE :</b>	<b>SPEC. NO.</b> <b>PE-TS- 999-165-N002</b>
	<b>STANDARD TECHNICAL SPECIFICATION</b>	<b>VOLUME : II B</b>
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		<b>SHEET 2 OF 10</b>
	wood pieces etc. The performance of the filter shall be continuous with minimum number of flushing / backwashing operations.	
3.02.02	The self-cleaning filter shall be designed such that the pressure drop across the filter (i.e., between inlet and outlet connections) under clean conditions and partially (50%) choked conditions shall not be more than those specified in Data Sheet -A.	
3.02.03	Unless otherwise specified in Data Sheet -A, debris discharge / wash water flow rate during flushing/back washing operation shall be limited to 10% of the total flow rate and flushing / backwashing operation shall be completed within a period of maximum three (3) minutes. The pressure drop across the debris filter during flushing/backwashing operation shall not be more than the pressure drop under partially (50%) choked condition.	
3.02.04	The coarse particles and floating matter accumulating at the filter section/screen are flushed out of the system by the debris flushing / backwash unit such that the pressure drop across the filter after flushing / backwashing, shall not be more than the pressure drop under clean conditions.	
3.03.00	<b><u>Operational Requirement</u></b>	
	The self-cleaning filter and other accessories shall be designed for the following flushing/backwashing operation modes :	
3.03.01	Complete automatic flushing/backwashing operation effected by the following :- <ul style="list-style-type: none"> <li>♦ differential pressure measuring system at a pre-determined differential pressure across the filter</li> <li>♦ adjustable timer (0-24 hours)</li> <li>♦ push button (for manual initiation of sequential flushing / backwashing)</li> </ul>	
3.03.02	Manual operation in the event of failure of control system.	
3.04.00	<b><u>Filter Housing / Body</u></b>	
3.04.01	The self-cleaning filter housing/body shall be designed and manufactured as per the applicable codes for pressure vessels. However in no case thickness of housing/ body shall not be less than connecting pipe thickness as specified in Data Sheet-A. It shall house the filter section / screen assembly and shall have flanged inlet, outlet, flushing / debris discharge openings and pressure measuring tappings etc.	
3.04.02	In design of filter housing / body due attention shall be given for easy removal and replacement of filter section / screen assembly.	
3.04.03	The filter shall be provided with inspection hole with bolted cover.	

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		SHEET 3 OF 10
3.04.04	The filter body / housing shall be provided with vent and drain connections with isolating valves. It shall be possible to drain unfiltered and filtered water.	
3.04.05	If specified in Data Sheet-A, filter body/housing shall be epoxy painted.	
3.05.00	<b><u>Filter Section / Screen assembly.</u></b>	
3.05.01	The filter section/screen shall be designed for the maximum differential pressure across the filter and shall be securely positioned by a supporting cage and shall be securely mounted in the housing or body.	
3.05.02	The perforation/mesh size of the filter section shall not be more than that specified in Data Sheet-A.	
3.05.03	The arrangement of the filter section shall be such that there shall be no forced accumulation of debris.	
3.06.00	<b><u>Differential Pressure Measuring System</u></b>	
3.06.01	The self-cleaning filter shall be provided with a measuring system for differential pressure across the filter section/screen, to check debris accumulation and to initiate flushing / backwashing operation. This shall consist of a separate differential pressure transmitter for normal automatic flushing operation and separate DP Switch as a backup in the event of DPT failure, a differential pressure gauge for manual observation with adequate no. of tappings with isolating valves and equalizing valves.	
3.06.02	The contacts for differential pressure transmitter, differential pressure switch and for differential pressure gauge shall be independent so that in the event of failure of one, the other is available.	
3.06.03	The differential pressure measuring system shall also be equipped with built in flushing arrangement consisting of flushing pump, valves and associated piping, to prevent blockage of the system with any debris. Unless otherwise specified in Section C, water required for flushing the differential pressure measuring system shall be taken from downstream side of the strainer/ screen.	
3.07.00	<b><u>Flushing / Backwash Unit :</u></b>	
3.07.01	The self-cleaning filter shall be provided with suitable flushing/backwash unit (to be installed at ground floor) and debris discharge/backwash outlet valve with associated actuator to flush out the accumulated debris / sludge.	
3.07.02	The flushing pump shall be provided with mechanical seals to the extent possible. If gland packing is provided it should be of good quality to prevent leakage of water from pump glands.	
3.07.3	The flushing backwash unit shall be either fixed type with actuator operated	

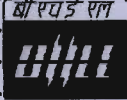


	<b>TITLE :</b>	<b>SPEC. NO.</b> <b>PE-TS- 999-165-N002</b>
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	<p>flushing valves or electric motor driven (through reduction gear) backwash rotor. In case of backwash rotor, it shall be fitted with removable shoes for smooth and close running contact with the filter section/screen and to prevent the unfiltered water from bypassing to waste.</p>	
3.07.04	If any water is to be injected for backwashing the filter section/screen, water shall be taken from down-stream side of the filter section/ screen with necessary pump, valves and piping for water injection supplied by the bidder.	
3.07.05	View glass to be provided in debris outlet pipe to monitor the flushing of debris.	
3.08.00	<b><u>Valves</u></b>	
	The flushing valves (if any,) the debris discharge/backwash outlet valve, isolation, vent and drain valves shall conform to appropriate codes / standards. The debris discharge/backwash outlet valve shall be larger than the debris discharge/back wash outlet pipe.	
3.09.00	<b><u>Instrumentation and Control System</u></b>	
3.09.01	Complete instrumentation and control system for automatic flushing / backwashing operation, protection, interlocking, indication/annunciation of high differential pressure and other malfunctions etc. shall be provided. This shall consist of adequate operational hardware, local control panel and interconnecting control and power cabling between the control panel and the self-cleaning filter and its associated electrical devices.	
3.09.02	The control panel shall house all necessary instruments, indicating/ annunciation lamps, alarms, differential pressure indicator, timer, function selector switches, relays, protection and interlocking systems, start/stop push buttons, counter to register number of flushing operations etc., and shall be complete with internal wiring. In addition to the above, the control panel shall meet the requirements of the enclosed specification.	
3.09.03	All instrumentation shall be of reputed make and shall meet the requirement of the enclosed specification.	
3.10.00	<b><u>Other Accessories.</u></b>	
3.10.01	Counter flanges, flat faced slip on type, complete with gaskets, bolts and nuts etc., shall be supplied for the filter inlet, outlet connections and all other terminal points. Fabrication, dimensions and drilling of the flanges shall conform to the codes/standards specified in Data Sheet-A.	
3.10.02	Self-cleaning filter shall be provided with suitable lifting arrangement for handling during erection and maintenance.	
3.10.03	Necessary supporting arrangement (wherever applicable) complete with foundation plates, bolts, nuts etc., shall be provided.	



	<b>TITLE :</b>	<b>SPEC. NO.</b> <b>PE-TS- 999-165-N002</b>
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<b>3.11.00</b>	<b><u>Material of Construction</u></b>	
	Material of self-cleaning filter and other accessories shall be corrosion resistant and consistent with the fluid handled. However material specification for various components shall be equal or superior to those specified in Data Sheet-A.	
<b>4.00.00</b>	<b><u>PAINTING</u></b>	
<b>4.01.00</b>	The surface preparation of the filter housing / body and other parts shall be done as per the standard mentioned in Data Sheet-A and shall include the following :	
	a) Removal of oil, grease, dirt and swarf etc.	
	b) Removal of rust and scale etc.	
	c) Sand blasting/shot blasting.	
<b>4.02.00</b>	All internal surfaces of the filter which are subject to immersion or water spray and which are not made of stainless steel or other corrosion resistant materials after surface preparation, shall be coated with adequate coats (minimum 200 to 250 microns thick) of epoxy paint of approved make and quality over a coat of zinc chromite primer, unless otherwise specified in Data sheet-A.	
<b>4.03.00</b>	The external surfaces of the filter and other accessories after surface preparation, shall be coated with adequate coats (minimum 175 to 200 microns thick) of synthetic enamel paint of approved make and quality over two coats of red oxide primer, unless otherwise specified in Data Sheet-A.	
<b>5.00.00</b>	<b><u>SHOP INSPECTION AND TESTS</u></b>	
<b>5.01.00</b>	<b><u>General :</u></b>	
<b>5.01.01</b>	Manufacturer shall conduct all tests and stage inspections as per the approved quality plan to ensure that the self-cleaning filter and other accessories shall conform to the requirements of this specification and of the applicable codes/standards.	
<b>5.01.02</b>	All materials used for manufacture/fabrication of the filter shall be of tested quality. Relevant test certificates for chemical analysis, mechanical tests and heat treatment shall be made available before the final shop inspection. In case the relevant test certificates are not available, the manufacturer shall arrange to carry out the necessary tests as per approved quality plan and applicable codes at his cost, for which samples shall be identified by BHEL's representative.	
<b>5.01.03</b>	All shop tests shall be conducted in the presence of BHEL's representative and test certificates / reports for the same shall be furnished to BHEL for approval.	
<b>5.01.04</b>	Qualification of welding procedures and welders shall be as per ASME B&PV	



	<b>TITLE :</b>	<b>SPEC. NO.</b> <b>PE-TS- 999-165-N002</b>
	<b>STANDARD TECHNICAL SPECIFICATION</b>	<b>VOLUME : II B</b>
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5.02.00	Code, Section-IX / applicable codes. <b><u>Filter Housing / Body</u></b>	
5.02.01	Chemical analysis, mechanical tests shall be carried out on housing/body material.	
5.02.02	All butt welded joints shall be subjected to radiographic / ultrasonic testing as per applicable codes. However all welded joints shall be subjected to 100% magnetic particle / penetrant testing to ensure freedom from defects.	
5.03.00	<b><u>Rubber Lining (as applicable)</u></b>	
	Rubber lining shall be subjected to surface crack test, 100% spark and hardness tests and shall be checked for layer thickness, defects etc.	
5.04.00	<b><u>Filter Section/Screen assembly</u></b>	
	Supporting cage and filter section/screen materials shall be tested for chemical properties. Checks shall be carried out for perforation/mesh size, defects etc.	
5.05.00	<b><u>Flushing / Backwash Unit</u></b>	
5.05.01	Material of various components of the flushing/Backwash Unit shall be tested for chemical and mechanical properties.	
5.05.02	Hollow shaft of backwash rotor shall be ultrasonically tested as per ASTM-A 388 for internal flaws. Penetrant test shall be carried out for surface flaws.	
5.06.00	<b><u>Valves</u></b>	
	Inspection and testing of valves including leakage test shall be carried out as per the requirements of the applicable standards. Correlating test certificates for materials of the valve components shall be furnished.	
5.07.00	<b><u>Flanges</u></b>	
5.07.01	In case of fabricated flanges, all the welds shall be subjected to 100% radiography as per ASME B&PV code, section VIII, Division-1.	
5.07.02	In case of forged flanges, ultrasonic testing shall be carried out as per ASTM-E 388.	
5.07.03	If the thickness of the plate used for flanged is 40mm or more the same shall be checked ultrasonically as per ASTM-A 435 to demonstrate the absence of lamination and lack of fusion etc.	
5.07.04	Chemical and mechanical test certificates shall furnish for flange materials.	
5.07.05	Flanges shall be checked for edge preparation, fit up and satisfactory working with	

TITLE :		SPEC. NO. PE-TS- 999-165-N002	
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matching parts.

5.08.00 All materials for various nozzles, seals, pipes, gaskets, nuts bolts etc., shall be of tested quality and correlating test certificates for chemical and mechanical properties shall be furnished.

5.09.00 **Dimensional Checks**

Dimensional checks of various components of the filter shall be carried out as per the drawings approved by BHEL.

5.10.00 **Hydrostatic Test**

Hydrostatic test shall be conducted on the filter housing/body at a pressure of 2 times the design pressure. The duration of the test shall be minimum 30 minutes.

5.11.00 **Leakage Test**

Leakage test shall be conducted at the design pressure to demonstrate that the filter assembly is leak tight and no water seepage shall take place at various nozzle and valve connections.

5.12.00 **Functional Tests**

The self-cleaning filter assembly complete with valves, actuators and other accessories shall be subjected to functional tests and the following shall be checked :-

5.12.01 Smooth and free operation of all movable parts.

5.12.02 Interlocks and sequential operation.

5.12.03 Satisfactory operation of actuator torque switches, limit switches etc.

6.00.00 **TESTING AT SITE**

After completion of installation at site, the self cleaning filter with complete accessories, will be tested to check that the filter performance meets the requirements of its specification, Rectification of all defects shall have to be done by the supplier at no extra cost to the Owner / Purchaser. However the Owner / Purchaser reserves the right to reject the equipment / parts not meeting the requirement if the deficiency still persists.

7.00.00 **PERFORMANCE GUARANTEE**

7.00.00 **PERFORMANCE GUARANTEE & Bid evaluation criteria**

The Self cleaning strainer shall be guaranteed to meet the performance requirements specified in Section-D , Data Sheet A and Guarantee schedule and also for trouble free operation after commissioning. Schedule of performance guarantees (enclosed in



	TITLE :	SPEC. NO. PE-TS- 999-165-N002
8/14/5 PM	STANDARD TECHNICAL SPECIFICATION	VOLUME : II B
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		SHEET 8 OF 10

Volume III) duly filled and signed shall be furnished with the bid.

The Performance guarantees of equipments shall stand valid till the satisfactory completion of performance testing & its acceptance by BHEL/ Customer. If the guarantee period specified in the Commercial Specification is higher, same shall prevail.

- 7.01.00 Performance Guarantee Parameters shall be as under :
- Pressure drop in Self cleaning strainer in clean condition viz. after backwashing.

- 7.02.01 Bidder to note that bids shall be evaluated on account of pressure drop across Self cleaning strainer (in clean condition) & liquidated damages on account of not meeting the same shall be in accordance with following :

**A) Bid Evaluation Criteria and Liquidated Damages:**

The bids received shall be evaluated for Pressure drop across Self cleaning strainer:

- The permissible limit of pressure drop across Self cleaning strainer in clean condition shall be 0.6 MWC.
- If the pressure drops quoted are higher than above limit, the bids shall be technically loaded @ Rate as mentioned in Data Sheet-A for respective projects per 1 MWC pressure drop (viz. per unit).
- However no advantage shall be given for pressure drops quoted less than above permissible limit.
- The maximum acceptable limit for pressure drop across self cleaning strainer ( with technical loadings) shall be 1.0 MWC

The bids will be technically rejected for pressure drops quoted higher than above maximum limit.

- The guaranteed pressure drops shall be demonstrated at site by vendors and if found higher shall be subject to LD @ twice the bid evaluation factor as above.

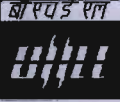
**8.00.00 QUALITY ASSURANCE & QUALITY PLAN**

- 8.01.00 The self - cleaning filter and other accessories to be supplied shall have assured quality and workmanship.

- 8.02.00 Typical quality plans (Q.P. No. PEM-MSE-SQP-07) are enclosed herewith this specification for bidder's guidance. The bidder shall comply with these minimum requirements and shall furnishing own quality plan based on materials and components of the filter being offered.

**9.00.00 NAME PLATE AND TAG NUMBERS**

- 9.01.00 The filter shall be provided with a permanently attached brass or stainless steel plate indicating the following details:-

	<b>TITLE :</b>	<b>SPEC. NO.</b> <b>PE-TS- 999-165-N002</b>
	<b>STANDARD TECHNICAL SPECIFICATION</b>	<b>VOLUME : II B</b>
	<b>SELF - CLEANING FILTERS</b>	<b>SECTION : D</b>
		<b>REV. NO. 0</b> <b>DATE : 02.12.2009</b>
		<b>SHEET 9 OF 10</b>

a) Design flow  
b) Design and test pressures  
c) Design temperature  
d) Filter section/screen mesh size  
e) Empty and operating weights  
f) Revolving speed of backwash rotor

9.02.00 Each valve shall be provided with a name plate indicating the following :-

a) Service  
b) Design and test pressures  
c) Maximum flow and flow direction  
d) Size  
e) Engineer's Tag Number

Tag numbers will be indicated on the drawing submitted for approval during contract stage.

9.03.00 Each motor / actuator shall be provided with a name plate indicating the following details :

a) Supply conditions.  
b) KW Rating  
c) Make

10.00.00 **DRAWINGS, DATA & INFORMATION TO BE SUBMITTED WITH THE BID**

The bidder shall furnish the following drawings, data and information alongwith the bid without which the offer will be deemed incomplete.

10.01.00 Data sheet-B with all particulars / data duly filled in.

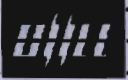
10.02.00 General arrangement / installation drawings of the self-cleaning filter with all accessories, incorporating the principal dimensions and weights of equipment offered, size and location of various nozzle connections, supporting arrangement (if applicable) and scope of supply etc.

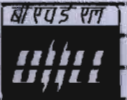
10.03.00 Cross-sectional / detailed drawings of filter housing / body, filter section / screen assemblies, flushing / backwashing unit, differential pressure measuring system, actuators, motors, control panel etc., indicating bill of quantities and materials of construction.

10.04.00 Flow and control logic diagrams for complete filter during normal and flushing / backwashing operations.

10.05.00 Performance evaluation procedure at site.



	TITLE :	SPEC. NO.
		PE-TS- 999-165-N002
2014 10 5 PM	STANDARD TECHNICAL SPECIFICATION	VOLUME : II B
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		REV. NO. 0
		DATE : 02.12.2009
		SHEET 10 OF 10
10.06.00	Control panel layout and list of instruments provided on control panel.	
10.07.00	List of annunciations, protections and interlocks provided.	
10.08.00	Write-up on operation, control, monitoring, interlocks and protection of filter.	
10.09.00	Manufacturer's descriptive and illustrative literature on the equipments / components being offered.	
10.10.00	A detailed experience list about the successful installations of similar equipment of equal or higher inlet / outlet sizes and flow capacities for similar application.	
10.11.00	A comprehensive write-up on the testing facilities, tests to be conducted inspection methods and QA system adopted by the manufacturer.	
10.12.00	Quality plan for the self-cleaning filter and for all its accessories.	
11.00.00	<b><u>DRAWINGS, DATA &amp; INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT :</u></b>	
	The drawings, data and other documents as required in Data Sheet-C shall be furnished after the award of contract.	

	TITLE :	SPECIFICATION NO. PE-TS-317/326-165-N002
	DATA SHEET - C	VOLUME : II - B
	SELF - CLEANING FILTER	SECTION : D
	( Backwash Type )	REV. NO. 02      DATE : 02.12.2009
		SHEET 1 OF 2
1.00.00	<b><u>DRAWINGS, DATA AND INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT :</u></b>	
	After the award of contract, the following drawings, data and information is to be submitted for review / approval of BHEL as per the distribution schedule given in Section -C.	
1.01.00	Within 3 (three) weeks of the date of LOI, the following shall be submitted :	
1.01.01	Data Sheet -B duly revised conforming to accepted bid.	
1.01.02	Final versions of the following drawings to enable BHEL to finalise the layout and to design foundations and structures.	
	a) General arrangement / Installation drawings of the self-cleaning filter with all accessories, indicating the principal dimensions and weights of equipment offered, size and location of various nozzle connections, withdrawal space and scope of supply etc.	
	b) Foundation arrangement drawings (wherever applicable) showing load data on supports, size and location of anchor bolts etc.	
1.02.00	<b><u>With in the stipulated time period as per vendor's drawing/document list, the following shall be submitted :</u></b>	
1.02.01	Cross-sectional/detailed drawings of filter housing/body, filter screen/section assembly, flushing / backwash unit, differential pressure measuring system, actuators, motors, control panel etc. indicating bill of quantities and materials of construction.	
1.02.02	Flow and control logic diagrams for complete filter during normal and flushing operation and system write-up covering all modes of operation.	
1.02.03	Final version of performance evaluation procedures at site.	
1.02.04	Detailed schedule of valves indicating tag numbers, type, make, size, pressure & temperature ratings, materials etc.	
1.02.05	Detailed schedule of power & control cable.	
1.02.06	Detailed schedule of piping and fittings indicating sizes, materials, maximum working pressure & temperatures etc.	
1.02.07	Control panel layout and list of instruments provided on control panel and internal wiring diagrams.	
1.02.08	List of annunciators, protections and interlocks provided.	



	TITLE :	SPECIFICATION NO. PE-TS-317/326-165-N002
8/ 11/ 5 PM	DATA SHEET - C	VOLUME : II - B
	SELF - CLEANING FILTER	SECTION : D
	( Backwash Type )	REV. NO. 02      DATE : 02.12.2009
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- 1.02.09 Detailed drawings of flanges.
- 1.02.10 Quality Plan
- 1.02.11 Material test certificates.
- 1.02.12 Shop tests reports and certificates.
- 1.02.13 Write-up and instruction manuals for erection, operation and maintenance.
- 1.02.14 Storage instructions.
- 1.02.15 Vendor to send 3 sets of final documents (O&M Manual, GA drg, P&ID) direct to site under intimation to PEM.

DMS(BHEL-PEM)  
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Manufacturer's Name & Address		STANDARD QUALITY PLAN		RHEL Doc No.: PE-V4-XXX-165-N08	
P.O. No.		Item :	Vendor O.P. NO.	PROJECT:	
		Self Cleaning Strainer	PACKAGE : SELF CLEANING STRAINER	CUSTOMER:	
			Date :	PURCHASER:	
			Page 01 of 12	CONSULTANT:	
	BL NO.	DESCRIPTION		PAGE NOS.	
	1	SELF CLEANING STRAINER		2-4	
	2	BALL VALVES		5	
	3	BUTTERFLY VALVES		6	
	4	PRESSURE GAUGE, DP GAUGE, DP SWITCH		7	
	5	DP TRANSMITTER		8	
	6	GEAR MOTOR DRIVE & WORM PLANETARY GEAR BOX		9	
	7	ACTUATORS		10	
	8	STARTER PANEL		11	
	9	FASTENERS		12	
		ALL COMPONENT / EQUIPMENT			
		ANNEXURES			
		DRY RUN TEST PROCEDURE		2	
		HYDRO TEST PROCEDURE		2	
		HYDRO STATIC LEAK TIGHTNESS TESTING PROCEDURE		2	
		PACKING PROCEDURE		1	
Note: Items not included in quality plan to be inspected as per Approved datasheet/drawings.					
<b>LEGEND</b> * Records identified with "STAR" shall be essentially included by contractor in QA documentation. ** M : Manufacturer / Sub-contractor C : CONTRACTOR ID : OWNER Indicate : "P" - Perform, "W" - Witness and "V" - Verification					
Manufacturer / Sub-Contractor Signature	Contractor	Name & Sign. Of approving authority & Seal			



STANDARD QUALITY PLAN		Manufacturer's Name & Address		Item :		Vendor Q.P. NO.		BHEL Doc No.: PE-VA-XXX-165-N08	
P.O. No.		Self Cleaning Strainer		Self Cleaning Strainer		PACKAGE : SELF CLEANING STRAINER		PROJECT:	
Date :		Page 02 of 12		Date :		PURCHASER:		CUSTOMER:	
CONSULTANT:		Acceptance Norms		Reference Documents		Format of Record		Agency	
M C O		1		7		5		10	
Remarks		11							
1.0.0	SELF CLEANING STRAINER	2	4	6	8	10	12	14	16
1.1.0	Raw Material	3	5	7	9	11	13	15	17
[a]	Housing Shell, Nozzle flanges & Main flanges/Counter Flange	Chemical properties	Major	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet
		Physical properties	Major	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet
		Surface Defects	Minor	100%	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet
		Sub Surface Defects	Major	100%	ASME A 435/A809	ASME A 435/A809	ASME A 435/A809	ASME A 435/A809	ASME A 435/A809
[b]	Nozzle Pipes	Chemical properties	Major	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet
		Physical properties	Major	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet
		Surface defects	Minor	100%	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet
		Leak tightness	Major	100%	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet
[c]	Screen basket, Nozzle flanges	Chemical properties	Major	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet
		Physical properties	Major	One sample/cast heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet
		Surface Defects	Minor	100%	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet	Approved drg/Data sheet
		Sub-surface defects	Major	100%	ASME A 746	ASME A 746	ASME A 746	ASME A 746	ASME A 746
		Corrosion Resistance	Major	One/Heat	ASTM A 262	ASTM A 262	ASTM A 262	ASTM A 262	ASTM A 262
<b>LEGEND</b> * Records identified with "START" shall be assembly included by contractor in QA Documentation. M: Manufacturer/ Sub-contractor C: COORDINATOR O: OWNER Indicate: "P" - Perform, "WP" - Witness and "V" - Verification									
Manufacturer / Sub-Contractor Signature Contractor Name & Sign. Of approving authority & Seal									

Manufacturer's Name & Address		STANDARD QUALITY PLAN		BHEL Doc No.: PE-V4-XXX-165-N08						
Item 1: Self Cleaning Strainer		Vendor Q.P. NO.		PROJECT:						
P.O. No.		PACKAGE: SELF CLEANING STRAINER		CUSTOMER:						
		Date:		PURCHASER:						
		Page 03 of 12		CONSULTANT:						
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency	Remarks
1	[d] Nozzle Pipes	Chemical properties	Major	Chemical Analysis	One sample/cast / heat / batch	Approved dip/Data sheet	Approved dip/Data sheet	Mil Test Certificate / Lab test report / new material flow sheet	P	11
		Physical properties	Major	Physical test	One sample/cast / heat / batch	Approved dip/Data sheet	Approved dip/Data sheet	Mil Test Certificate / Lab test report / new material flow sheet	P	
		Surface defects	Minor	Visual	100%	Approved dip/Data sheet	Approved dip/Data sheet	Mil Test Certificate / Lab test report / new material flow sheet	P	
		Leak tightness	Major	Hydrostatic test	100%	Approved dip/Data sheet	Approved dip/Data sheet	Mil Test Certificate / Lab test report / new material flow sheet	P	
1.2.0	Inprocess Quality Control									
1.2.1	Welding procedure specification	Comedness	Critical	Scrutiny	100%	ASME Sec. IX	ASME Sec. IX	QW 482 of ASME Sec. IX	P	Welders already qualified by BHEL LRQA / NTPC in the past shall be employed for this job.
1.2.2	Welding procedure qualification	Weld soundness	Critical	Physical test	100%	ASME Sec. IX	ASME Sec. IX	QW 483 of ASME Sec. IX	P	Welding procedure already approved by BHEL LRQA / NTPC shall be followed.
1.2.3	Welder performance qualification	Weld soundness	Critical	Physical test	100%	ASME Sec. IX	ASME Sec. IX	QW 484 of ASME Sec. IX	P	Welders already qualified by BHEL LRQA / NTPC shall be employed for this job.
1.2.4	Fit-up of built weld	Alignment and dimensions	Major	Template, visual	100%	Manufacturing Drawing	ASME Sec. VIII Div. 1	Log book	P	BHEL to witness >20mm thick butt joint.
1.2.5	Fit-up of shell flange and nozzle assembly to shell	Orientation, alignment and dimensions	Major	Template, visual	100%	Manufacturing Drawing	ASME Sec. VIII Div. 1	Log book	P	
1.2.6	Weld quality for Pressure Parts	Surface defects	Major	Penetrant test / Visual	100%	ASME Sec. VIII Div. 1 / sec V	ASME Sec. VIII Div. 1 / sec V	Operation Process Sheet Appendix 8	P	
1.2.7	[e] Completed built welds	1. Surface defects	Major	Penetrant test	100%	ASME Sec. VIII Div. 1 / sec V	ASME Sec. VIII Div. 1 / sec V	Inspection report	P	
		2. Sub-surface defects	Critical	Radiography test	10% of total weld length + 100% of critical weld	ASME Sec. VIII Div. 1 / sec V	ASME Sec. VIII Div. 1 / sec V	Radiographs and inspection report	P	RT films will be reviewed by BHEL
	[b] Completed fillet welds	Surface defects	Major	Penetrant test	100%	ASME Sec. VIII Div. 1 / sec V	ASME Sec. VIII Div. 1 / sec V	Inspection report	P	
<b>LEGEND</b> * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. M : Manufacturer / Sub-contractor C : CONTRACTOR O : OWNER Indicate : "P" - Perform, "W" - Witness and "V" - Verification										
Manufacturer / Sub-Contractor Signature Contractor Signature Name & Sign. Of approving authority & Seal										



BHEL Doc No.: PE-V4-XXX-165-N08		PROJECT:		CUSTOMER:		PURCHASER:		CONSULTANT:		AGENCY:		Remarks	
P.O. No.		Item 1		Reference Documents		Acceptance Norms		Format of Record		M U C O			
Manufacturer's Name & Address		Type of Check		Quantity of Check		IS : 10117		Log Book		P			
Characteristics Checked		Class		Type of Check		IS : 10117		Log Book		P			
Component / Operation		Class		Type of Check		IS : 10117		Log Book		P			
1.2.5	Pickling and Passivation	Major	Visual	100%	IS : 10117	Manufacturing Drawing	Log Book	IS : 10117	Log Book	P			
1.2.9	Fabricated Shell (Prior to sand blasting)	Major	Measurement by visual	100%	ASME Sec. VIII Div. 1	Manufacturing Drawing	Inspection report	ASME Sec. VIII Div. 1	Inspection report	P			
1.3.0	Final tests (completed equipments) - 1. Dimensions, orientation, workmanship & finish	Critical	Hydrostatic Pr. @ 1.5 times design pr. (positive) (Duration 30 minutes)	100%	ASME Sec. VIII Div. 1	ASME Sec. VIII Div. 1	Inspection report	ASME Sec. VIII Div. 1	Inspection report	P			
1.3.0	Final tests (completed equipments) - 2. Leak tightness for assembly	Major	Measurement by visual	100%	ASME Sec. VIII Div. 1	ASME Sec. VIII Div. 1	Inspection report	ASME Sec. VIII Div. 1	Inspection report	P			
1.4.0	Rubber Lining ( Shell )	Critical	Leak test @ design pr. (positive) (Duration 30 minutes)	100%	ASME Sec. VIII Div. 1	ASME Sec. VIII Div. 1	Inspection report	ASME Sec. VIII Div. 1	Inspection report	P			
1.4.1	Rubber Formulation	Major	Physical test	100%	ASME Sec. VIII Div. 1	ASME Sec. VIII Div. 1	Inspection report	ASME Sec. VIII Div. 1	Inspection report	P			
1.4.2	Surface preparation of items to be lined	Major	Immersion test (One per lot)	100%	ASTM D 471	ASTM D 471	Inspection report	ASTM D 471	Inspection report	P			
1.4.3	Vulcanising	Major	Visual	100%	SA 2.5	SA 2.5	Inspection report	SA 2.5	Inspection report	P			
1.4.4	Vulcanised Rubber Lined Items	Major	Process monitoring	100%	Manufacturer's procedure	Manufacturer's procedure	Inspection report	Manufacturer's procedure	Inspection report	P			
		Major	Chip test	One per lot	Approved Drawing BS 6374/Equivalent	Approved Drawing BS 6374/Equivalent	Inspection report	Approved Drawing BS 6374/Equivalent	Inspection report	P			
		Major	Measurement, Visual Inspection	100%	Approved Drawing BS 6374/Equivalent	Approved Drawing BS 6374/Equivalent	Inspection report	Approved Drawing BS 6374/Equivalent	Inspection report	P			
		Major	Spark test for Pin Holes at 5 kV/mm	100%	Approved Drawing BS 6374/Equivalent	Approved Drawing BS 6374/Equivalent	Inspection report	Approved Drawing BS 6374/Equivalent	Inspection report	P			
<b>LEGEND</b> * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : CONTRACTOR O : OWNER Indicate : "P" - Perform, "W" - Witness and "V" - Verification													
Manufacturer / Sub-Contractor Signature Contractor Name & Sign. Of approving authority & Seal													

Manufacturer's Name & Address			STANDARD QUALITY PLAN			BHEL Doc No.: PE-V4-XXX-165-N08			
Item :			Vendor Q.P. NO.			PROJECT:			
P.O. No.			PACKAGE : SELF CLEANING STRAINER			CUSTOMER:			
			Date :			PURCHASER:			
			Page 05 of 12			CONSULTANT:			
Sl. No.	Component / Operation	Characteristic Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Remarks
1	2	3	4	5	6	7	8	9	11
2.0	Ball valves								
2.1	Materials								
	Body end Tail end pieces								
2.1.1	Ball	Chemical properties	Major	Chemical properties	One Sample/Case / heat	Approved dtp/Data sheet	Approved dtp/Data sheet	Manufacturer's T.C.	*
		Physical properties	Major	Physical properties	One Sample/Case / heat / batch	Approved dtp/Data sheet	Approved dtp/Data sheet	Manufacturer's T.C.	*
		Chemical properties	Major	Chemical properties	One Sample/Case / heat	Approved dtp/Data sheet	Approved dtp/Data sheet	Manufacturer's T.C.	*
		Physical properties	Major	Physical properties	One Sample/Case / heat / batch	Approved dtp/Data sheet	Approved dtp/Data sheet	Manufacturer's T.C.	*
2.1.2	Stem	Chemical properties	Major	Chemical properties	One Sample/Case / heat	Approved dtp/Data sheet	Approved dtp/Data sheet	Manufacturer's T.C.	*
		Physical properties	Major	Physical properties	One Sample/Case / heat / batch	Approved dtp/Data sheet	Approved dtp/Data sheet	Manufacturer's T.C.	*
2.2	In-process inspection								
2.2.1	Ball	Hardness	Major	Hardness Testing	Random	Approved Dtp. / Data Sheet	Approved Dtp. / Data Sheet	Manufacturers TC	*
2.3	Assembly	a) Dimensions	Major	Measurement	100%	Approved dtp/Data sheet	Approved dtp/Data sheet	Manufacturer's T.C.	*
		b) Opening / Closing	Major	Operation	100%	As per approved data sheet	As per approved data sheet	-	P - V
2.4	Testing								
	a) Body	Leakage	Critical	Hydraulic test	100%	EN 12286-162	EN 12286-162 / Appl. Data sheet	Manufacturer's T.C.	*
	b) Seat test	Leakage	Critical	Hydraulic test	100%	EN 12286-162	EN 12286-162 / Appl. Data sheet	Manufacturer's T.C.	*
	c) Seat	Leakage	Critical	Air test	100%	EN 12286-162	EN 12286-162 / Appl. Data sheet	Manufacturer's T.C.	*
<b>LEGEND</b> * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. **M : Manufacturer/ Sub-contractor C : CONTRACTOR O : OWNER Indicate : "P" - Perform, "W" - Witness and "V" - Verification									
Manufacturer / Sub-Contractor Signature			Contractor Signature			Owner Signature			Home & Sign. Of approving authority & Seal



Manufacturer's Name & Address		Item 1		STANDARD QUALITY PLAN		BHEL Doc No.: PE-V4-XXX-165-N08	
P.O. No.		Self Cleaning Strainer		Vendor P.P. NO.		PROJECT:	
Characteristics Checked		Quantum of Check		Acceptance Norms		PURCHASER:	
Class		Type of Check		Reference Documents		CONSULTANT:	
3		4		7		M C O	
2		6		8		10	
1		5		9		11	
3.0.0	Butterfly valves	Chemical properties	Major	One Sample/Cast	Approved drp/Data sheet	Manufacturer's T.C.	P V V
3.1.0	Body and Disc	Physical properties	Major	One Sample/Cast	Approved drp/Data sheet	Manufacturer's T.C.	P V V
3.1.1	Shaft	Chemical properties	Major	One Sample/Cast	Approved drp/Data sheet	Manufacturer's T.C.	P V V
3.1.2	Seal	Physical properties	Major	One Sample/Cast	Approved drp/Data sheet	Manufacturer's T.C.	P V V
3.1.3	Stem	Chemical properties	Major	One Sample/Cast	Approved drp/Data sheet	Manufacturer's T.C.	P V V
3.2.0	Assembly	Physical properties	Major	One Sample/Cast	Approved drp/Data sheet	Manufacturer's T.C.	P V V
	a) Dimensions	Measurement	Major	100%	EN ISO 17292/Approved data sheet	Manufacturer's T.C.	P V V
	b) Opening / Closing	Operation	Major	100%	As per approved data sheet	-	P -
3.3.0	Testing						
	(a) Body	Leakage	Critical	100%	EN 12286-1&2/API 598 & 142/API 598	Manufacturer's T.C.	P V V
	(b) Seat test	Leakage	Critical	100%	EN 12286-1&2/API 598 & 142/API 598	Manufacturer's T.C.	P V V
	(c) Seat	Leakage	Critical	100%	EN 12286-1&2/API 598 & 142/API 598	Manufacturer's T.C.	P V V
<b>LEGEND</b> * Records identified with "STAR" shall be essentially induced by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor O : OWNER Indicates : "P" - Perform, "V" - Witness and "Y" - Verification							
Manufacturer / Sub-Contractor Signature				Name & Sign. Of approving authority & Seal			







Manufacturer's Name & Address				Item : Actuators				Manufacturing Quality Plan				BHEL Doc No.: PE-V4-XXX-165-N08			
P.O. No.				Vendor Q.P. NO.				PACKAGE : SELF CLEANING STRAINER				PROJECT:			
Characteristics Checked				Quantum of Check				Reference Documents				PURCHASER:			
Class				Type of Check				Acceptance Norms				CONSULTANT:			
3				1				7				M C O			
2				5				9				10			
1				6				8				11			
6.0.0	Actuators	Functional test	Major	Electrical test	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd Test certificate	P	V	V					
		Make, Range, Model	Major	Visual	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd Inspection Report	P	-	-					
		Assembly check along with values	Major	Visual	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd Inspection Report	P	-	-					
		Functional check along with settings / Auxiliary Contacts	Major	Visual	100%	Supplier catalogue	Supplier catalogue/Appd Inspection Report	P	-	-				Review of TC's	
<p><b>LEGEND</b></p> <p>* Records identified with "STAR" shall be essentially included by contractor in QA Documentation.</p> <p>** M : Manufacturer / Sub-contractor C : CONTRACTOR O : OWNER Indicate : "P" - Perform, "W" - Witness and "V" - Verification</p>															
Manufacturer / Sub-Contractor Signature												Name & Sign. Of approving authority & Seal			

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Manufacturer's Name & Address		Manufacturing Quality Plan		BHEL Doc No.: PE-V4-XXX-165-N08							
Item 1: Starter Panel		Vendor Q.P. NO.		PROJECT:							
P.O. No.		PACKAGE: SELF CLEANING STRAINER		CUSTOMER:							
		Date: Page 10 of 12		PURCHASER:							
				CONSULTANT:							
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency Record	Remarks	
1	2	3	4	5	6	7	8	9	10	11	
7.0.0	Starter panel										
7.1.0	Incoming Material										
7.1.1	Fabricated & Painted Panel	Dimension	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	P	7 Test treatment before painting	
		Panel G.A.	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	P		
		Paint colour	Major	Visual	100%	Approved Drgs.	Approved Drgs.	Inspection report	P		
		Paint thickness	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	P		
		Paint Shade, Adhesion	Major	Visual	Sample	Approved Drgs.	Approved Drgs.	Inspection report	P		
7.1.2	Wire	Size / Colour / Rating / Surface Defects	Major	Visual / Dimension	Sample	IS 694	Specifications drawings	Inspection report	P	(B) Marked wire	
7.1.3	Panel Mounting	Make, Functional, Type & Rating	Major	Visual / Electrical	100%	Approved BOM	Approved BOM	---	P	For bolt let refer starter panel document Part - II	
7.2.0	In Process Inspection										
7.2.1	Name Plate, Component Mounting, Etc.	Workmanship, Finish, Correctness	Major	Visual	100%	Approved Drgs.	Approved drawings	Inspection report	P		
7.2.2	Electrical Wiring of Panels	Continuity, Colour of wires, Bundling and Grouping	Major	Visual	100%	Mounting Drawing	Approved drawings	Inspection report	P		
7.2.3	Ferruling of Cables	Start & End	Major	Visual	100%	Manufacturer's drawing	Manufacturer's drawing	Inspection report	P		
7.3.0	Final Inspection										
7.3.1	Workmanship, Finish & Paint shade / Thickness	Visual	Major	Visual	100%	G.A. Drawing	Approved drgs.	Inspection report	P		
7.3.2	Overall Dimension, G.A. of starter panel	Measurement	Major	Visual	100%	G.A. Drawing	Approved drgs.	Test Certificate	P		
7.3.3	Component Identification	Visual	Major	Visual	100%	G.A. Drawing	Approved drgs.	Inspection report	P		
7.3.4	IR - HV - IR	Electrical	Critical	Electrical	100%	Mfg. Procedure	Mfg. Procedure	Inspection report	P		
7.3.5	Functional & Continuity	Functional	Major	Functional	100%	Appd Drawing	Appd Drawing	Inspection report	P		
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Manufacturer / Sub-Contractor Signature										Name & Sign. Of approving authority & Seal	


Manufacturer's Name & Address		Manufacturing Quality Plan		BHEL Doc No.: PE-V4-XXX-1.65-N08						
Item 1 Fasteners		Vendor Q.P. NO.	PROJECT:							
P.O. No.		PACKAGE : SELF CLEANING STRAINER	CUSTOMER:							
		Date :	PURCHASER:							
		Page 11 of 12	CONSULTANT:							
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency	Remarks
1	8.1.0 Internal Fasteners - SS		4						M C O	11
8.1.1	Stainless Steel Fasteners	Chemical properties	Major	Chemical analysis	1 Per heat/HT Batch	Approved Drawing	Approved Drawing	Test certificate/Compliance certificate	P V	V
		Physical properties	Major	Physical test	1 per heat	Approved Drawing	Approved Drawing	Test certificate/Compliance certificate	P V	V
		Visual workmanship finish	Major	Visual	Sample	Approved Drawing	Approved Drawing	Inspection report	P V	V
		Dimensions	Major	Measurement	Sample	Approved Drawing	Approved Drawing	Inspection report	P V	V
8.2.0	Carbon steel fasteners	Visual	Major	Visual	Sample	Approved Drawing	Approved Drawing	Manufacturer's certificate / Lab Report	P V	V
		Dimensions	Major	Measurement	Sample	Approved Drawing	Approved Drawing	Manufacturer's certificate / Lab Report	P V	V
		Physical properties	--	Physical test	1 sample per IS / 1367 heat	IS : 1367	IS : 1367	Manufacturer's certificate / Lab Report	P V	V
				a) Tensile						
				b) Yield						
				c) Elongation						
				d) Proof load						
<b>LEGEND</b> * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. -- M : Manufacturer Sub-contractor C : CONTRACTOR IO: OWNER Indicate "P" - Perform, "V" - Witness and "Y" - Verification										
Manufacturer / Sub-Contractor Signature _____ Contractor _____										
Name & Sign. Of approving authority & Seal										







TITLE :		SPECIFICATION NO. SPEC. NO. PE-TS-387-165-N003	
 <b>DATA SHEET - A2 FOR SELF CLEANING STRAINERS (SCS)</b>		VOLUME : II B	
		SECTION : D	
		REV. NO. 00 DATE : 12.02.2013	
		Page 1 of 8	
S. No.	DESCRIPTION	UNITS	2X660MW NTPC MOUDA STPP STAGE-II STG PKG
1.0	GENERAL		
1.1	Type of Strainers/ Filters	-	Self Cleaning Strainers
1.2	No. of Strainers/ Filters required	Nos.	Total 4 Sets for 2 units viz. i.e.( 1 Working + 1 Standby) per unit
1.3	Inlet connection	mm Nb	700
1.3	Outlet connection	mm Nb	700
1.4	Filter type/ duty	-	On line / continuous
1.5	Location	-	ACW Pump discharge Header
1.6	Liquid handled	-	Clarified Water as per analysis attached in Project information in section-B
2.0	DESIGN DATA		
2.1	Operating pressure	Bar (g)	3.5 to 4.5
2.2	Design pressure	Kg/cm <sup>2</sup>	7
2.3	Design temperature	Deg. C	60
2.4	Flow rate through filter a) Normal b) Maximum		3160 3800




TITLE :		SPECIFICATION NO.    SPEC. NO.    PE-TS-387-165-N003	
		DATA SHEET - A2 FOR SELF CLEANING STRAINERS (SCS)	
		VOLUME :    II B SECTION :    D	
		REV. NO.    00    DATE :    12.02.2013	
		Page 2 of 8	
S. No.	DESCRIPTION	UNITS	2X660MW NTPC MOUDA STPP STAGE-II STG PKG
2.5	Design differential pressure for filter section/ screen	Bar (g)	1.5 (Min.)
2.6	Type of suspended matter likely to enter the filter	-	Typical debris encountered in closed circuit CW system with Cooling Tower
2.7	Differential pressure measuring system set • For initiating flushing/ backwashing • For alarm/ annunciation	mbar mbar	110 160
2.8	Filter section/ screen perforation size	mm	2 mm (Max)
2.9	Free flow area in the screen basket	-	At least 120 % of pipe inlet area
3.0	GUARANTEED PERFORMANCE REQUIREMENT		
3.1	Pressure drop across the filter (i.e. between inlet and outlet connection) at normal flow	-	

<div></div> <div>TITLE : DATA SHEET – A2 FOR SELF CLEANING STRAINERS (SCS)</div>		SPECIFICATION NO.		SPEC. NO.		PE-TS-387-165-N003	
		VOLUME :		II B			
		SECTION :		D			
		REV. NO.		00		DATE : 12.02.2013	
				Page 3 of 8			
S. No.	DESCRIPTION	UNITS	2X660MW NTPC MOUDA STPP STAGE-II STG PKG				
	a) Clean condition	mbar	Refer Section – C of specification  Not to exceed 110				
	b) Partially (50%) choked condition	mbar					
3.2	Debris discharge flow during flushing period	Cub m/ Hr.	Not to exceed 2.5% of total flow rate				
4.0	MATERIALS OF CONSTRUCTION						
4.1	Filter body/ housing	-	IS:210 Gr. FG 260 or ASTM –A-515 Gr. 75/IS:2062 with epoxy painted inside				
4.2	Filter screen/ section	-	SS-316				
4.3	Shaft	-	SS-316				
4.4	Supporting cage	-	SS-316				
4.5	Differential measuring system	-	SS-316				
4.6	Flushing/ backwashing unit	-	SS-316				
4.7	Backwash rotor shoes	-	Neoprene				
4.8	Any other internal hardware /pipes etc.	-	SS-316 or eq.				





		<b>TITLE :</b> <b>DATA SHEET - A2 FOR</b> <b>SELF CLEANING STRAINERS (SCS)</b>		<b>SPECIFICATION NO.</b> <b>SPEC. NO.</b> <b>PE-TS-387-165-N003</b>	
				<b>VOLUME :</b> <b>II B</b> <b>SECTION :</b> <b>D</b>	
				<b>REV. NO.</b> <b>00</b> <b>DATE :</b> <b>12.02.2013</b>	
				<b>Page 4 of 8</b>	
<b>S. No.</b>	<b>DESCRIPTION</b>	<b>UNITS</b>	<b>2X660MW NTPC MOUDA STPP STAGE-II STG PKG</b>		

4.9	Valves	-	
4.9.1	Check Valves (all sizes)		
	a) Body & Bonnet	-	CI, IS 210 Gr. FG 260/ BS 1452 Gr. 14, Flanged ends
	b) Seating surface & rings	-	13% Chromium Steel
	c) Disc for Check Valve	-	CI, IS 210 Gr. FG 260/ BS 1452 Gr. 14
	d) Hinge Pin for Check Valve	-	AISI - 316
	e) Backseat for check valve		13% Chromium Steel
4.9.2	Globe Valves 50 Nb & Below		
	Body, Bonnet & trim		SA 351 CF8M (SS-316)
4.9.3	➤ BF Valves (65 Nb & above)		
	➤ Body & Disc		2% Ni Cl as per IS 210, FG 260B, epoxy coated
	➤ Shaft		AISI SS 410/ BS 970 431 S-291
	➤ Seal		Nitrite Rubber
	➤ Sealing, Retaining segment & internals		18-8-SS
	➤ Bearings		Self Lubricating
	➤ Companion Flange		CS:IS 2062, Gr. B

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				<b>VOLUME :</b> <b>II B</b> <b>SECTION :</b> <b>D</b>	
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				<b>Page 5 of 8</b>	
				<b>2X660MW NTPC MOUDA STPP STAGE-II STG PKG</b>	
<b>S. No.</b>	<b>DESCRIPTION</b>	<b>UNITS</b>			
	<b>C) Ball valves</b> i) Body ii) Ball iii) Stem		SA 351 CF8M SA 351 CF8M SS 316		
4.10	Piping	-	By Bidder		
	Material a) upto 150 Nb		<ul style="list-style-type: none"> <li>Carbon steel ERW, IS:1239 (Heavy Grade)</li> </ul>		
	a) 200 Nb and above		<ul style="list-style-type: none"> <li>carbon steel (IS:2062), Rolled &amp; Welded confirming to IS:3589</li> </ul>		
4.11	Inspection hole	-	Required, 600NB		
5.0	COUNTER FLANGES		In Bidder's Scope		
5.1	Material				
	Flanges		IS 2062, Gr. B, epoxy painted		
5.2	Drilling Standard	-	BS 4504 or equivalent		
6.0	Connecting pipe size (OD & Thk)	mm	711 X 7		
7.0	<b>PAINTING</b>				




		<b>TITLE :</b> <b>DATA SHEET - A2 FOR</b> <b>SELF CLEANING STRAINERS (SCS)</b>		<b>SPECIFICATION NO.</b> <b>SPEC. NO.</b> <b>PE-TS-387-165-N003</b>	
				<b>VOLUME :</b> <b>II B</b> <b>SECTION :</b> <b>D</b>	
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<b>S. No.</b> <b>DESCRIPTION</b> <b>UNITS</b>		<b>2X660MW NTPC MOUDA STPP STAGE-II STG PKG</b>			
7.1	External Surface	-			
	a) Surface preparation	-	SA 2.5 of Swedish Specification SIS 05.5900.197		
	b) Primer		Epoxy based Zinc Phosphate		
	c) Intermediate		Epoxy based TiO2 pigmented coat		
	d) Final paint		Synthetic enamel paint to achieve DFT of 175 to 200 microns. Colour code shall be as per IS-1904 (Appendix-A)		
7.2	Internal Surface				
	a) Surface preparation		SA 2.5 of Swedish Specification SIS 05.5900.197		
	b) Primer		One coat of epoxy resin based primer		
	c) Final paint		Applicable no. Of coats of coal tar epoxy paint to achieve total DFT of 200 to 250 microns		
8.0	<b>SHOP TEST</b>				
8.1	Hydrostatic test				
	a) Test Pressure	bar (g)	1.5 times design pressure		
	b) Test duration	min.	30		
8.2	Leakage test				
	a) Test Pressure	bar (g)	Design Pressure		
	b) Test duration	min.	30		

		<b>TITLE :</b> <b>DATA SHEET – A2 FOR</b> <b>SELF CLEANING STRAINERS (SCS)</b>		<b>SPECIFICATION NO.</b> <b>SPEC. NO.</b> <b>PE-TS-387-165-N003</b>	
				<b>VOLUME :</b> <b>II B</b> <b>SECTION :</b> <b>D</b>	
				<b>REV. NO.</b> <b>00</b> <b>DATE :</b> <b>12.02.2013</b>	
				<b>Page 7 of 8</b>	
<b>S. No.</b>	<b>DESCRIPTION</b>	<b>UNITS</b>	<b>2X660MW NTPC MOUDA STPP STAGE-II STG PKG</b>		
	# Bidder to note that electrical power supply shall be provided by purchaser based on electrical load list of bidder furnished at tender stage and any changes or additional requirement of electrical load by bidder during contract stage shall be provided by BHEL(purchaser) with cost repercussions to the bidder				

9.0	Adequate provision for future installation of cathodic protection required		YES
10.0	Flow straightener for streamlining the ACW flow in SCS		If required as per bidder's design – the same to be incorporated by bidder in its constructional feature.
11.0	Performance Guarantee & Bid Evaluation		
11.1	Performance Parameters to be Guaranteed		
	❖ Pressure drop SCS		As per Guarantee schedule of bidder
11.2	Bid evaluation Criteria & Liquidated damages		As per clause no. 8.00.00 of section C1
11.3	Bid evaluation rate		@ Rs 9.0 Lacs per 0.4 MWC pr. Drop across each SCS
11.4	Liquidated damages		Twice the bid evaluation rate
12.0	Whether automatic flushing/ back- washing operation effected by the following :  i. Differential pressure ii. Adjustable timer iii. Push button		YES  YES YES



		<b>TITLE :</b> <b>DATA SHEET - A2 FOR</b> <b>SELF CLEANING STRAINERS (SCS)</b>		<b>SPECIFICATION NO.</b> <b>SPEC. NO.</b> <b>PE-TS-387-165-N003</b>	
				<b>VOLUME :</b> <b>II B</b> <b>SECTION :</b> <b>D</b>	
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				<b>Page 8 of 8</b>	
<b>S. No.</b>		<b>DESCRIPTION</b>	<b>UNITS</b>	<b>2X660MW NTPC MOUDA STPP STAGE-II STG PKG</b>	
13.0	Whether provision for manual flushing / backwashing operation is made in the event of control system failure.		YES		
14.0	Whether built in flushing arrangement complete with flushing pump, valves, and associated piping, is provided.		YES (if required)		
15.0	Mandatory Spare to be supplied under this specification		Not Applicable		

<b>Pipe Size Table</b> (Refer Cl. No. 6.2, Section C1, Vol-IIB)		
NB	Pipe CS	Thick
	OD	
<b>15</b>	21.80	3.2
<b>25</b>	34.20	4.0
<b>50</b>	60.80	4.5
<b>100</b>	115.00	5.4
<b>150</b>	166.50	5.4
<b>200</b>	219.10	6.0
<b>250</b>	273.00	6.0
<b>300</b>	323.90	6.0
<b>350</b>	355.60	6.0
<b>700</b>	711.00	7.0
<b>800</b>	813.00	8.0
<b>900</b>	914.00	10.0
<b>1000</b>	1016.00	10.0
<b>1100</b>	1118.00	10.0
<b>1200</b>	1219.00	11.0
<b>1400</b>	1422.00	14.2





**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS- 387-165-N001**

**VOLUME : IIB**

**SECTION : D**

**REV. NO. 0**

**DATE : 04.02.2013**

**SHEET 1 of 1**

## **SECTION D2**

### **STANDARD TECHNICAL SPECIFICATION FOR ELECTRICAL SYSTEMS**

CLAUSE NO.	LT SWITCHGEAR (Starters Panel)
1.00.00	<p>CODES AND STANDARDS</p> <p>IEC 947, IS 13947</p>
2.00.00	<p>TYPE</p> <p>Circuit Breakers Shall be air break, three pole, spring-charged, horizontal drawout type, suitable for electrical operation.</p> <p>Switchgear Fully drawout type single front</p> <p>MCC Fully drawout type single front/Double front.</p> <p>ACDB/DCDB Fixed type single front</p>
3.00.00	<p>SYSTEM PARAMETERS</p> <p>415VAC <math>\pm 10\%</math> (SOLIDLY GROUNDED)</p> <p>50 Hz <math>\pm 3\%</math>-5%</p> <p>45KA RMS / 1 SEC (FAULT LEVEL)</p> <p>220V DC NOMINAL (190V DC-240V DC) ISOLATED TYPE</p>
4.00.00	<p>TEMPERATURE RISE</p> <p>The temperature rise of the horizontal and vertical busbars and main bus link including all power drawout contacts when carrying 90% of the rated current along the full run shall in no case exceed 55 deg. C with silver plated joints and 40 deg. C with all other types of joints over an ambient of 50 deg C.</p>
5.00.00	<p>OPERATIONAL REQUIREMENTS</p>
5.01.00	<p>Breakers</p>
5.01.01	<p>Breakers shall have anti-pumping feature.</p>
5.01.02	<p>The incomer and bus coupler breakers for switchgear shall be electrically operated with over current releases or relays.</p>
5.01.03	<p>Breakers shall have inherent fault making and breaking capacities. They shall have shunt trip coils. In case releases are offered, the same shall have contact for energisation of lockout relay. All breakers shall have built in interlocks for equipment and personnel safety.</p>
5.01.04	<p>Paralleling of two supplies shall be avoided by interlocking except for switchgear where auto-changerover is provided. Breaker contact multiplication, if required, shall be through latch relay.</p>



CLAUSE NO.	LT SWITCHGEAR
01.05	Mechanical tripping shall be through red 'Trip' push button outside the panels for breakers, and through control switches for other circuits.
01.06	Provision of mechanical closing of breaker only in 'Test' and 'Withdrawn' position shall be made. Alternatively, mechanical closing facility should be normally inaccessible, accessibility rendered only after deliberate removal of shrouds. It shall be possible to close the door with breaker in test position.
01.07	Clear status indication for each circuit shall be provided through lamps, switch positions or other mechanical means.
01.08	Supervision relay shall be provided for trip coil monitoring.
02.00	Switches, Contactors and Fuses
02.01	Incomers for MCCs and DBs rated upto 630A could be load break isolators.
02.02	Motor starter contactors shall be of air break, electromagnetic type suitable for DOL starting of motor, and shall be of utilisation category AC-3 for ordinary and AC-4 for reversing starters. DC contactor shall be of DC-3 utilisation category.
02.03	Fuses shall be HRC type with operation indicator. Isolating switches shall be of AC 23A category when used in motor circuit, and AC 22A category for other applications. Fuse switch combination shall be provided wherever possible.
02.04	Isolating switches and MCCBs shall have door interlocks and padlocking facility.
02.05	Panels
02.06	All switchgears, MCCs, DBs, panels, modules, local starters and push buttons shall have prominent engraved identification plates.
02.07	Local push button stations shall have metal enclosure of die cast aluminium or rolled sheet steel of 1.6mm thickness & shall have DOP of IP-55. Push buttons shall be of latch type with mushroom knobs.
02.08	Where breaker/starter module front serves as compartment cover, suitable blanking covers, one for each size of modules per switchboard shall be supplied for use when carriage is withdrawn.
02.09	All non-current carrying metal work of boards/panels shall be effectively bonded to earth bus of galvanised steel, extending throughout the switchboard/MCC/DB. Positive earthing shall be maintained for all positions of chassis and breaker frame.
02.10	Suitable trolley arrangement shall be provided for breaker/starter modules. Two trolleys per switchgear room shall be provided so that top most breaker module of all types, sizes and rating can be withdrawn on trolley and lowered for maintenance purpose.
02.11	The incoming connection to transformer of more than 1000KVA and inter-connecting sections between switchboards shall preferably be of busducts. The busduct enclosure

CLAUSE NO.	LT SWITCHGEAR
	shall be made of minimum 3mm thick aluminium alloy. The section of the busduct should have adequate strength to withstand internal and external forces resulting from the various operating conditions. Aluminium sheet hood shall be provided for outdoor busduct enclosure joints to provide additional protection against water ingress. The busduct top shall be sloped to prevent retention of water. The busduct shall have DOP of IP55.
5.03.07	It should be possible to carryout maintenance on a feeder with adjacent feeders alive
5.04.00	Control, Protection & Metering Requirements
5.04.01	Control circuits shall operate at suitable voltage of 110V AC or 220V DC. Necessary control supply transformers having primary and secondary fuses shall be provided for each MCC, 2 x 100% per section. However the breakers shall operate on 220V DC. The auxiliary bus bars for control supply shall be segregated from main bus bars. The control supplies shall be monitored.
5.04.02	Contractor shall fully co-ordinate overload and short circuit tripping of breaker with up-stream and down stream breakers/fuses/MCCBs motor starters. Various equipments shall meet requirement of Type-II class of coordination as per IEC.
5.04.03	All relays and timers shall operate on available DC supply and not have any inbuilt batteries. They shall be provided with hand-reset operation indicator (flags) or LEDs with pushbuttons for resetting.
5.04.04	All equipments shall have necessary protections. However, following minimum protections shall be provided:
	<ol style="list-style-type: none"> <li>1) Contactor controlled motor feeders (Motors up to 150 kW) <ol style="list-style-type: none"> <li>a) Instantaneous short circuit protection on all phases through HRC cartridge type fuses rated to: 20 kA rms (prospective breaking capacity at 415V).</li> <li>b) Thermal overload protection.</li> <li>c) Single phasing protection for motors protected by fuses.</li> </ol> </li> <li>2) Breaker controlled motors feeders (motors rated above 160kW) <ol style="list-style-type: none"> <li>a) Instantaneous short circuit protection on all phases</li> <li>b) Overload protection on two phases</li> <li>c) Over load alarm on third phase</li> <li>d) Earth fault protection</li> <li>e) Under voltage protection</li> </ol> </li> </ol>



CLAUSE NO.	LT SWITCHGEAR
	<ul style="list-style-type: none"> <li>f) hand reset lockout relay with a blue lamp for monitoring.</li> <li>3) Incomers/bus coupler/outgoing breaker feeders other than motor feeders               <ul style="list-style-type: none"> <li>a) Definite time delay short circuit protection</li> <li>b) Hand reset lockout relay with a blue lamp</li> </ul> </li> <li>4) Incomer From DG Set.               <ul style="list-style-type: none"> <li>a) Differential Protection (87) - Three Pole</li> <li>b) Reverse Power Protection.</li> <li>c) Overload Alarm on one phase</li> <li>d) Earth Fault Detection Relay (64)</li> <li>e) Voltage controlled overcurrent relay</li> <li>e) Generator under/over voltage Protection</li> <li>f) Hand Reset/Lockout Relay with a blue lamp.</li> <li>g) 3 Phase Energy Meter having accuracy of 1.0 class.</li> </ul> </li> </ul>
5.04.05	Meters / instruments
	All meters/ instrument shall be flush mounted on front panel, at least 96 sq.mm. size with 90 degree linear scales and accuracy class of 2.0.
5.04.06	All motors of 30kW and above shall have an Ammeter. Bus-section shall have bus VT, voltmeter with selector switch, and other relay and timers required for protection.
	Adequate control and selector switches, push buttons and indicating lamps shall be provided. Thermostatically controlled space heaters with switches shall be provided to prevent condensation.
5.04.07	In case of remote controlled breaker panels, following shall be ensured.
	Each feeder shall have local/remote selector switch. Closing from local shall be possible only in test position whereas closing from remote shall be possible in either service or test position. Tripping from local shall be possible only when local/remote selector switch is in local position. Tripping from remote shall be either breaker in service position or selector switch being in remote position
05.00	Control from Remote
	Necessary hardware shall be provided in the switchgear panel like coupling relays(24V DC, with max burden 2.5VA), auxiliary relays, current & voltage transducers(4-20 mA, dual output) etc. to effect interlocks, exchange information / status and exercise control from remote.

CLAUSE NO.	LT SWITCHGEAR
6.00.00	DESIGN AND CONSTRUCTIONAL FEATURES
6.01.00	<p>All 415V switch gear motor control centers (MCCs), AC &amp; DC distribution boards (DBs), etc shall have following features :</p> <ol style="list-style-type: none"> <li>1) Shall be of metal enclosed, indoor, floor mounted and free standing type.</li> <li>2) All frames and load bearing members shall be fabricated using mild steel structural sections or pressed and shaped cold rolled sheet steel of thickness not less than 2mm.</li> <li>3) Frame shall be enclosed in cold rolled sheet steel of thickness not less than 1.6mm. Doors and covers shall also be of cold rolled sheet steel of thickness not less than 1.6 mm. Stiffeners shall be provided wherever necessary. Removable gland plates of thickness 3mm (hot/cold rolled sheet steel) or 4 mm (non-magnetic material) shall be provided for all panels.</li> <li>4) All switchboards/panels shall be of dust and vermin proof. All cutouts shall have synthetic rubber gaskets.</li> <li>5) For motors above 160kW, remote controlled electrical circuit breakers, and for smaller motors, switch-fuse contactor feeders shall be provided. The other outgoing feeders would be switch-fuse units or moulded case circuit breakers.</li> <li>6) All switchboards, MCCs and DBs shall have following distinct vertical sections. <ol style="list-style-type: none"> <li>a) Completely enclosed bus bar compartment for horizontal and vertical bus bars.</li> <li>b) Completely enclosed switchgear compartments (one for each circuit housing circuit breakers, motor starter or switch-fuse feeder).</li> <li>c) Compartment for cable tray or cable box for power and control cables In case of cable box, they shall be segregated with complete shrouding for individual feeders at the rear for direct termination of cables.</li> <li>d) For cable connection to circuit breaker, a separately enclosed cable compartment shall also be acceptable.</li> <li>e) Compartment for relays and other control devices associated with a circuit breaker, wherever necessary.</li> <li>f) The switchboards/MCC/DBs of 1600A &amp; above rating shall be of DOP IP42 &amp; of IP52 for less than 1600A rating</li> <li>g) All 415V switchgears, MCC's, AC &amp; DC distribution boards etc. shall be painted by powder coating process. Paint shade shall be as follows</li> </ol> </li> </ol>



CLAUSE NO.	LT SWITCHGEAR								
(i)	Front & Back : RAL 9002								
(ii)	Extreme end covers : RAL 5012								
7)	Busbars shall be of high conductivity aluminium alloy or copper.								
8)	Minimum air clearance in air between phases and phase-earth shall be 25 mm for busbars and cable terminations. For all other components, the Clearances shall be at least 10mm. Wherever above is not possible except for horizontal and vertical busbars, insulation shall be provided by anti tracking sleeving or barriers. However for horizontal and vertical busbars, clearances specified above shall be maintained even when busbars are insulated/sleeved. In case of DC DBs/ fuse boards, the busbar system shall be insulated or physically segregated with barriers to prevent interpole short circuit.								
9)	Busbar insulators shall be of track-resistant high strength non-hygroscopic, non-combustible type and suitable to withstand stresses due to over-voltages and short circuit current. Insulators and barrier of inflammable material such as Hylam shall not be accepted.								
10)	All types of relays and timer shall be subject to Employer's approval. They shall be flush mounted with connections from inside, and shall have transparent & dust tight cover, removable from front, drawout construction for easy replacement and testing facility. The auxiliary relays and timer may be provided in fixed cases.								
11)	Maxi terminal /cage clamp type terminal blocks shall be provided for signals to be interfaced with DDCMIS/PLC.								
12)	The switchgears/MCC shall be designed to offer adequate level of safety to operating/maintenance personnel. Means shall be provided to prevent access to the live part to avoid accidents during service as well as maintenance period. Bidder shall bring out the safety means provided to achieve above. A detailed instruction plate suitable for wall mounting shall be provided for each switchgear/MCC room describing various safe operating procedure/safety precautions for safe operation and maintenance of switchgear/MCC.								
13)	All current and voltage transformers as required for metering & protection specified shall be completely encapsulated, cast resin insulated type. Incomers from transformers shall have CTs for transformer REF protection. All current and voltage transformers as required for metering and protection specified shall be completely encapsulated, cast resin insulated type. Incomers from transformers shall have CTs for transformer restricted earth fault protection. The accuracy shall be as follows:								
	<table> <tr> <th data-bbox="628 1599 667 1621">CTs</th><th data-bbox="858 1599 900 1621">PTs</th></tr> <tr> <td data-bbox="389 1644 491 1666">Protection</td><td data-bbox="858 1644 900 1666">3P</td></tr> <tr> <td data-bbox="389 1688 491 1711">Metering</td><td data-bbox="858 1688 900 1711">10</td></tr> <tr> <td data-bbox="389 1733 491 1756">REF</td><td data-bbox="858 1733 900 1756">PS</td></tr> </table>	CTs	PTs	Protection	3P	Metering	10	REF	PS
CTs	PTs								
Protection	3P								
Metering	10								
REF	PS								
Protection	5P20								
Metering	10								
REF	PS								

CLAUSE NO.	LT SWITCHGEAR
6.02.00	Indicating lamps shall be cluster LED type.
6.03.00	20% spare feeders of each type & rating used in the MCC with a minimum one (1) number on each bus section shall be provided.
7.00.00	<p><b>TYPE TESTS</b></p> <p>(a) All equipments to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last five years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.</p> <p>(b) In case the Contractor is not able to submit report of the type test(s) conducted within last five years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests under this contract free of cost to the Owner and submit the reports for approval.</p> <p>(c) All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.</p>
7.01.00	<p><b>L. T. SWITCHGEAR</b></p> <p>The following type test certificates on each type &amp; rating of L.T. Switchgear, MCC panel and distribution boards shall be submitted.</p> <p>(a) Short time withstand test with circuit breaker mounted inside the switchgear panel.</p> <p>(b) Temperature rise test.</p> <p>(c) Type II - Short circuit co-ordination test for any three ratings of MCC module as selected by the Employer.</p> <p>(d) Test sequence -1 &amp; combined test sequence shall be carried out on each rating of circuit breaker mounted inside the panel.</p> <p>(e) Degree of protection tests</p>



## **CABLES SPECIFICATIONS**


### **POWER CABLES:**

1.1 kV grade, power cables with stranded compacted Aluminium conductor, XLPE insulated, PVC type ST2 extruded inner sheathed (no inner sheath for single core cables), Galvanised steel single layer round wire/ formed wire (non magnetic hard drawn aluminium single layer round wire H4 grade for single core cables) as per IS : 3975 (where applicable) and extruded PVC Type ST2 outer sheath with FRLS properties, generally conforming to IS:7098 (Part-1).

### **CONTROL CABLES:**

1.1 kV control cables with stranded plain annealed copper conductor, PVC Type-A insulation, core identification by colour coding (upto five cores)/ number marking (more than five cores), distinct extruded inner sheath of PVC type ST1 material, GS formed/round wire armour as per IS: 3975 (where applicable), and extruded PVC Type ST1 outer sheath with FRLS properties, generally conforming to IS: 1554 (Part-1).

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	<b>TITLE :</b> <b>GENERAL TECHNICAL REQUIREMENTS</b>  <b>FOR</b>  <b>LV MOTORS</b>	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 29/08/2005
		SHEET : 1 OF 1


## GENERAL TECHNICAL REQUIREMENTS

**FOR**  
**LV MOTORS**


**SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00**




	<b>TITLE :</b> <b>GENERAL TECHNICAL REQUIREMENTS</b>  <b>FOR</b>  <b>LV MOTORS</b>	<b>SPECIFICATION NO.</b> PE-SS-999-506-E101 <b>VOLUME NO. :</b> II-B <b>SECTION :</b> D <b>REV NO. : 00</b> <b>DATE :</b> 29/08/2005 <b>SHEET :</b> 1 OF 4																														
<p><b>1.0 INTENT OF SPECIFICATION</b></p> <p>The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer's work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.</p> <p>Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.</p> <p><b>2.0 CODES AND STANDARDS</b></p> <p>Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:</p> <table border="0"> <tr> <td>IS:325</td> <td>Three phase Induction motors</td> </tr> <tr> <td>IS : 900</td> <td>Code of practice for installation and maintenance of induction motors</td> </tr> <tr> <td>IS: 996</td> <td>Single phase small AC and universal motors</td> </tr> <tr> <td>IS: 4722</td> <td>Rotating Electrical machines</td> </tr> <tr> <td>IS: 4691</td> <td>Degree of Protection provided by enclosures for rotating electrical machines</td> </tr> <tr> <td>IS: 4728</td> <td>Terminal marking and direction of rotation rotating electrical machines</td> </tr> <tr> <td>IS: 1231</td> <td>Dimensions of three phase foot mounted induction motors</td> </tr> <tr> <td>IS: 8789</td> <td>Values of performance characteristics for three phase induction motors</td> </tr> <tr> <td>IS: 13555</td> <td>Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment</td> </tr> <tr> <td>IS: 2148</td> <td>Flame proof enclosures for electrical appliance</td> </tr> <tr> <td>IS: 5571</td> <td>Guide for selection of electrical equipment for hazardous areas</td> </tr> <tr> <td>IS: 12824</td> <td>Type of duty and classes of rating assigned</td> </tr> <tr> <td>IS: 12802</td> <td>Temperature rise measurement for rotating electrical machines</td> </tr> <tr> <td>IS: 12065</td> <td>Permissible limits of noise level for rotating electrical machines</td> </tr> <tr> <td>IS: 12075</td> <td>Mechanical vibration of rotating electrical machines</td> </tr> </table> <p>In case of imported motors, motors as per IEC-34 shall also be acceptable.</p> <p><b>3.0 DESIGN REQUIREMENTS</b></p> <p><b>3.1</b> Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage &amp; frequency variation of supply system as defined in Data sheet-A</p> <p><b>3.2</b> Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information        Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage &amp; frequency variation specified above.</p> <p><b>3.3 Starting Requirements</b></p> <p><b>3.3.1</b> Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.</p> <p><b>3.3.2</b> Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.</p>			IS:325	Three phase Induction motors	IS : 900	Code of practice for installation and maintenance of induction motors	IS: 996	Single phase small AC and universal motors	IS: 4722	Rotating Electrical machines	IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines	IS: 4728	Terminal marking and direction of rotation rotating electrical machines	IS: 1231	Dimensions of three phase foot mounted induction motors	IS: 8789	Values of performance characteristics for three phase induction motors	IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment	IS: 2148	Flame proof enclosures for electrical appliance	IS: 5571	Guide for selection of electrical equipment for hazardous areas	IS: 12824	Type of duty and classes of rating assigned	IS: 12802	Temperature rise measurement for rotating electrical machines	IS: 12065	Permissible limits of noise level for rotating electrical machines	IS: 12075	Mechanical vibration of rotating electrical machines
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<p>The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.</p> <p><b>3.3.3</b> The following frequency of starts shall apply</p> <ul style="list-style-type: none"> <li>i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.</li> <li>ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)</li> <li>iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for minimum 20,000 starts during the life time of the motor</li> </ul> <p><b>3.4 Running Requirements</b></p> <p><b>3.4.1</b> Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.</p> <p><b>3.4.2</b> Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.</p> <p><b>3.5 Stress During bus Transfer</b></p> <p><b>3.5.1</b> Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.</p> <p><b>3.5.2</b> Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.</p> <p><b>3.6</b> Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.</p> <p><b>3.7</b> The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.</p> <p><b>4.0 CONSTRUCTIONAL FEATURES</b></p> <p><b>4.1</b> Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy</p> <p><b>4.2</b> Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.</p> <p>Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled</p> <p><b>4.3</b> Motors shall be designed with cooling fans suitable for both directions of rotation.</p>		



	<b>TITLE :</b> <b>GENERAL TECHNICAL REQUIREMENTS</b>  <b>FOR</b>  <b>LV MOTORS</b>	<b>SPECIFICATION NO.</b> PE-SS-999-506-E101 <b>VOLUME NO. :</b> II-B <b>SECTION :</b> D <b>REV NO. : 00</b> <b>DATE :</b> 29/08/2005 <b>SHEET :</b> 3 OF 4
4.4. 4.5. 4.6. 4.7. 4.7.1 4.7.2 4.7.3 4.7.4 4.7.5 4.7.6 4.7.7 4.7.8 4.7.9 4.8. 4.9	<p>Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.</p> <p>Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.</p> <p>In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation. In case of continuous operation at extreme voltage limits the temperature limits specified in table-I of IS:325 shall not exceed by more than 10°C.</p> <p><b>Terminals and Terminal Boxes</b></p> <p>Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.</p> <p>Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".</p> <p>unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.</p> <p>Connections shall be such that when the supply leads R, Y &amp; B are connected to motor terminals A B &amp; C or U, V &amp; W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or U W &amp; V respectively.</p> <p>Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.</p> <p>Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.</p> <p>Degree of protection for terminal boxes shall be IP 55 as per IS 4691.</p> <p>Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.</p> <p>Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.</p> <p>Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.</p> <p>Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.</p> <p><b>General</b></p>	


	<b>TITLE :</b> <b>GENERAL TECHNICAL REQUIREMENTS</b>  <b>FOR</b>  <b>LV MOTORS</b>	<b>SPECIFICATION NO.</b> PE-SS-999-506-E101 <b>VOLUME NO. :</b> II-B <b>SECTION :</b> D <b>REV NO. : 00 DATE :</b> 29/08/2005 <b>SHEET : 4 OF 4</b>
<p>4.9.1 Motors provided for similar drives shall be interchangeable.</p> <p>4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.</p> <p>4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.</p> <p>4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.</p> <p>4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.</p> <p>4.9.6 Name plate with all particulars as per IS: 325 shall be provided</p> <p>4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.</p> <p><b>5.0 INSPECTION AND TESTING</b></p> <p>5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.</p> <p>5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.</p> <p>5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.</p> <p>5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.</p> <p><b>6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT</b></p> <p>a) OGA drawing showing the position of terminal boxes, earthing connections etc.</p> <p>b) Arrangement drawing of terminal boxes.</p> <p>c) Characteristic curves:  <i>(To be given for motor above 55 kW unless otherwise specified in Data Sheet).</i></p> <p>i) Current vs. time at rated voltage and minimum starting voltage.</p> <p>ii) Speed vs. time at rated voltage and minimum starting voltage.</p> <p>iii) Torque vs. speed at rated voltage and minimum voltage.          For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.</p> <p>iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.</p>		



	TITLE	SPECIFICATION NO.
	<b>MOTOR</b>  <b>DATA SHEET - C</b>	VOLUME II B
		SECTION D
		REV NO. 00 DATE 29/08/2005
		SHEET 1 OF 2

S. No.	Description	Data to be filled by successful bidder
<b>A.</b>	<b>General</b>	
1	Manufacturer & country of origin	
2	Motor type	
3	Type of starting	
4	Name of the equipment driven by motor & Quantity	
5	Maximum Power requirement of driven equipment	
6	Rated speed of Driven Equipment	
7	Design ambient temperature	
<b>B.</b>	<b>Design and Performance Data</b>	
1	Frame size & type designation	
2	Type of duty	
3	Rated Voltage	
4	Permissible variation for	
5	a) Voltage	
6	b) Frequency	
7	c) Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)	
9	Synchronous speed & Rated slip	
10	Minimum permissible starting voltage	
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	
13	b) At min starting voltage	
14	Locked rotor current as percentage of FLC (including IS tolerance)	
15	Torque	
	a) Starting	
	b) Maximum	
16	Permissible temp rise at rated output over ambient temp & method	
17	Noise level at 1.0 m (dB)	
18	Amplitude of vibration	
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	
	c) At 75% load	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	<b>TITLE</b>  <b>MOTOR</b>  <b>DATA SHEET - C</b>	<b>SPECIFICATION NO.</b>
		<b>VOLUME</b> II B
		<b>SECTION</b> D
		<b>REV NO. 00</b> <b>DATE 29/08/2005</b>
		<b>SHEET</b> 2 <b>OF</b> 2

S. No.	Description	Data to be filled by successful bidder
	c) At starting	
<b>C.</b>	<b>Constructional Features</b>	
1	Method of connection of motor driven equipment	
2	Applicable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Main terminal box	
	a) Type	
	b) Power Cable details (Conductor, size, armour/unarmour)	
	c) Cable Gland & lugs details (Size, type & material)	
	d) Permissible Fault level ( kArms & duration in sec)	
7	Space heater details (Voltage & watts)	
8	Flame proof motor details (if applicable)	
	a) Enclosure	
	b) suitability for hazardous area	
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
<b>D.</b>	<b>Characteristic curves/ drawings</b> (To be enclosed for motors of rating $\geq 55KW$ )	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			



CUSTOMER :		PROJECT		SPECIFICATION :							
BIDDER/ VENDOR		TITLE		NUMBER :							
SYSTEM CAT.		QUALITY PLAN		SPECIFICATION							
SHEET 1 OF 2		NUMBER PED-506-00-Q-006, REV-01		TITLE							
COMPONENT/OPERATION		ITEM AC ELECT. MOTORS BELOW 55KW (LV)		SECTION							
CHARACTERISTICS		REFERENCE DOCUMENT		AGENCY							
CHECK		EXTENT OF CHECK		P W V							
3		4		5							
2		6		7							
1		8		9							
10		11		12							
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	2	-	-
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	-
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUF'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	2	1	NOTE -1 & NOTE-3
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	NOTE -1 & NOTE-3
BHEL		PARTICULARS		BIDDER/VENDOR							
		NAME									
		SIGNATURE									

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SL. NO.		COMPONENT/OPERATION		QUALITY PLAN		CUSTOMER :		PROJECT TITLE		SPECIFICATION : NUMBER :		
		SHEET 2 OF 2		BIDDER/ VENDOR		BIDDER/ VENDOR		QUALITY PLAN		SPECIFICATION :		
		CHARACTERISTICS CHECK	SYSTEM CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	ITEM AC ELECT. MOTORS BELOW 55KW (LV)	FORMAT OF RECORD	SECTION AGENCY	VOLUME III REMARKS	
										P	W	V
1	2		3	MA	4	5	6	7	8	9	10	11
		3.NAMEPLATE DETAILS		VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-
NOTES:												
<p>1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION. (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER. FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.</p>												
Legends for inspection agency												
1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)  P. PERFORM W. WITNESS V. VERIFY												
BHEL												
PARTICULARS												
NAME												
SIGNATURE												
DATE												
BIDDER'S/VENDORS COMPANY SEAL												





**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS- 387-165-N001**

**VOLUME : IIB**

**SECTION : D**


**REV. NO. 0**

**DATE : 04.02.2013**


**SHEET 1 of 1**

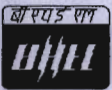
### **SECTION D3**

## **STANDARD TECHNICAL SPECIFICATION FOR C&I SYSTEMS**

	<b>SPECIFICATION FOR MOTORISED VALVE ACTUATOR</b>		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE:
			SHEET	1 OF 3
<b>Data Sheet A &amp; B</b>				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
<b>GENERAL*</b>	* PROJECT	2x660 MW MOUDA STPP, 1X500 MW VINDHYACHAL STPP		
	OFFER REFERENCE			
	* TAG NO. SERVICE			
	* DUTY	<input type="checkbox"/> ON / OFF	<input type="checkbox"/> INCHING	
	* LINE SIZE (inlet/outlet): MATERIAL			
	* VALVE TYPE	<input type="checkbox"/> GLOBE <input type="checkbox"/> GATE <input type="checkbox"/> REG. GLOBE <input type="checkbox"/> BUTTERFLY		
	* OPENING / CLOSING TIME			
	* WORKING PRESSURE			
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%		
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY		
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY		
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY		
	<b>CONSTRUCTION AND SIZING</b>	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF, IP:55	
MECHANICAL POSITION INDICATOR		TO BE PROVIDED FOR 0-100% TRAVEL		
BEARINGS		DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.		
GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION		METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.		
SIZING		OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 90% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING(REGULATING) SERVICE 150 STARTS/HR MINIMUM		
<b>HANDWHEEL</b>	* REQUIRED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
	* ORIENTATION	<input type="checkbox"/> TOP MOUNTED <input type="checkbox"/> SIDE MOUNTED		
	TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.			
<b>ELECTRIC ACTUATOR</b>	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY		
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY		
	MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT.		
	ACTUATOR APPLICABLE WIRING DIAGRAM	<input checked="" type="checkbox"/> ENCLOSED (BIDDER TO CONFIRM) A: <input type="checkbox"/> DRG. NO. 3-V-MISC-24227 R00 B: <input type="checkbox"/> DRG. NO. 3-V-MISC-24550 R00 C: <input checked="" type="checkbox"/> DRG. NO. 3-V-MISC-24283 R00 D: <input type="checkbox"/> DRG. NO. 4-V-MISC-90271 R11		
	COLOUR SHADE	<input checked="" type="checkbox"/> BLUE (RAL 5012) ENAMEL <input type="checkbox"/> .....		
	SHAFT RPM	BIDDER TO SPECIFY		
	OLR SET VALUE	BIDDER TO SPECIFY		
	STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		
	@ PWR SUPP TO MTR / STARTER	415 VAC±10%,3PH,50Hz±5%,3 wire , 10 % (ABSOLUTE) COMBINED VOLTAGE & FREQUENCY VARIATIONS		
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER <input type="checkbox"/> 230 V AC <input checked="" type="checkbox"/> 110 V AC		
	@ ENCLOSURE CLASS OF MOTOR	<input type="checkbox"/> IP 65 <input checked="" type="checkbox"/> IP 67 FOR OUTDOOR <input type="checkbox"/> FLAME PROOF <input checked="" type="checkbox"/> IP 55 FOR INDOOR, TOTALLY ENCL, SELF VENTILATED.		
	@ INSULATION CLASS	<input type="checkbox"/> CLASS-B <input checked="" type="checkbox"/> CLASS-F WITH TEMPERATURE RISE LIMITED TO CLASS-B		



	<b>SPECIFICATION FOR MOTORISED VALVE ACTUATOR</b>		SPECIFICATION NO.:		
			VOLUME		
			SECTION		
			REV. NO.	DATE:	
			SHEET	2 OF 3	
<b>Data Sheet A &amp; B</b>					
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)		
<b>INTEGRAL STARTER</b>	@ WINDING TEMP PROTECTION	<input checked="" type="checkbox"/> THERMOSTAT (3 Nos., 1 IN EACH PHASE) <input type="checkbox"/> _____			
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED			
	INTEGRAL STARTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	TYPE OF SWITCHING DEVICE	<input checked="" type="checkbox"/> CONTACTORS <input type="checkbox"/> THYRISTORS			
	TYPE	<input checked="" type="checkbox"/> CONVENTIONAL <input type="checkbox"/> SMART (NON-INTRUSIVE)			
	IF SMART				
	a) SERIAL LINK INTERFACE	<input type="checkbox"/> INTEGRAL <input type="checkbox"/> FIELD MOUNTED			
	b) SERIAL LINK PROTOCOL	<input type="checkbox"/> FOUNDATION FIELD-BUS <input type="checkbox"/> PROFI-BUS <input type="checkbox"/> TCP/IP <input type="checkbox"/> .....			
	c) SERIAL LINK MEDIA	<input type="checkbox"/> TWISTED PAIR Cu-CBL <input type="checkbox"/> CO-AXIAL Cu-CBL <input type="checkbox"/> OFC			
	d) HAND HELD PROGRAMMER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	e) MASTER STATION	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	f) MASTER STN INTRFACE WITH DCS	<input type="checkbox"/> MODBUS <input type="checkbox"/> TCP/IP			
	g) DETAILS OF SPECIAL CABLE	<input type="checkbox"/> ENCLOSED <input type="checkbox"/> NOT REQUIRED			
	STEP DOWN CONT. TRANSFORMER	<input checked="" type="checkbox"/> REQUIRED			
	OPEN / CLOSE PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	STOP PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	INDICATING LAMPS	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	LOCAL REMOTE S/S	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	STATUS CONTACTS FOR MONITORING	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (O/L RELAY OPERATED, THERMOSTAT OPERATED, CONT./POWER SUPPLY FAILED, S/S IN LOCAL, TORQUE SWITCH OPTD. MID WAY)			
<b>INTERPOSING RELAY</b> (Applicable for integral Starter)	INTERPOSING RELAYS	REQUIRED			
	INTERPOSING RELAY (QUANTITY)	<input checked="" type="checkbox"/> 2 NOs. <input type="checkbox"/> 3 NOs.			
	DRIVING VOLTAGE	<input type="checkbox"/> 20.5 – 24V DC <input checked="" type="checkbox"/> 24 V DC			
	DRIVING CURRENT	<input type="checkbox"/> 125mA MAX <input type="checkbox"/> _____ mA MAX			
	LOAD RESISTANCE	<input type="checkbox"/> > 192 ohms - <25 k ohms <input type="checkbox"/> > _____ ohms - < _____ ohms			
	COIL BURDEN	2.5 VA			
<b>TORQUE SWITCH</b> (Not Applicable for Smart Actuator)	MECHANICAL LATCHING DEVICE	REQUIRED(REFER NOTE-5)			
	MFR & MODEL NO.	BIDDER TO SPECIFY			
	OPEN / CLOSE	<input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos. / <input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos			
	CONTACT TYPE	2 NO + 2 NC			
	RATING	5A 240V AC AND 0.5A 220V DC			
	ENCLOSURE	IP 55			
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE			
	ACCURACY	+3% OF SET VALUE			
<b>LIMIT SWITCH</b> (Not Applicable for Smart Actuator)	MFR & MODEL NO.	BIDDER TO SPECIFY			
	OPEN : INT : CLOSE	<input type="checkbox"/> 1 No <input checked="" type="checkbox"/> 2 Nos.	2 Nos. (ADJ.)	<input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2Nos.	
	CONTACT TYPE	2 NO + 2 NC			
	RATING (AC / DC)	5A ,240V AC AND 0.5A,220V DC			
	ENCLOSURE CLASS	IP 55			

	<b>SPECIFICATION FOR MOTORISED VALVE ACTUATOR</b>	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE:
		SHEET	3 OF 3
<b>Data Sheet A &amp; B</b>			
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)

<b>POSITION TRANSMITTER</b>	POSITION TRANSMITTER (For inching duty)	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	MFR & MODEL NO.	BIDDER TO SPECIFY		
	TYPE	<input type="checkbox"/> ELECTRONIC (2 WIRE) R/I CONVERTER <input checked="" type="checkbox"/> ELECTRONIC (2 WIRE) CONTACTLESS		
	SUPPLY	<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/> .....		
	OUTPUT	<input checked="" type="checkbox"/> 4-20mA		
	ACCURACY	± 1% FS		
<b>SPACE HEATER</b>	@SPACE HEATER	REQUIRED		
	@ POWER SUPPLY			
	@ RATING			
<b>TERMINAL BOX</b>	MOTOR TERMINAL BOX	REQUIRED		
	ACTUATOR TERMINAL BOX	REQUIRED		
	ENCL CLASS MTR T.B. / ACTUATOR T.B.	<input type="checkbox"/> IP 65 <input checked="" type="checkbox"/> IP-67.....	<input type="checkbox"/> IP65 <input checked="" type="checkbox"/> IP-67.....	
	@ EARTHING TERMINAL	REQUIRED		
	PLUG & SOCKET(9 PIN) (ADDITIONAL 1 NO. FOR PoT)	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> 1 NO. <input checked="" type="checkbox"/> 1 NO. ADDITIONAL FOR PoT		
<b>CABLE GLANDS</b>	@ POWER CABLE GLAND	SIZE: _____		
	@ SPACE HEATER CABLE GLAND	SIZE: _____		
	OTHER CONTROL CABLE GLANDS-1	<input type="checkbox"/> 1No. for BFV of CW PUMP(Cable size 2Px1.5mm2)		
	OTHER CONTROL CABLE GLANDS-2	QUANTITY & SIZE : _____		
<b>WEIGHT</b>	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY		_____ Kg.

**NOTES:**

- SCOPE: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY.
- CODES & STANDARDS: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH:  
IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691 AND IS-4722
- TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C.
- CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED.
- THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION. THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE.
- THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.

NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL
				NAME
				SIGNATURE
				DATE

NOTES\* = TO BE FILLED BY MPL (LEAD AGENCY).    @= TO BE FILLED BY ES

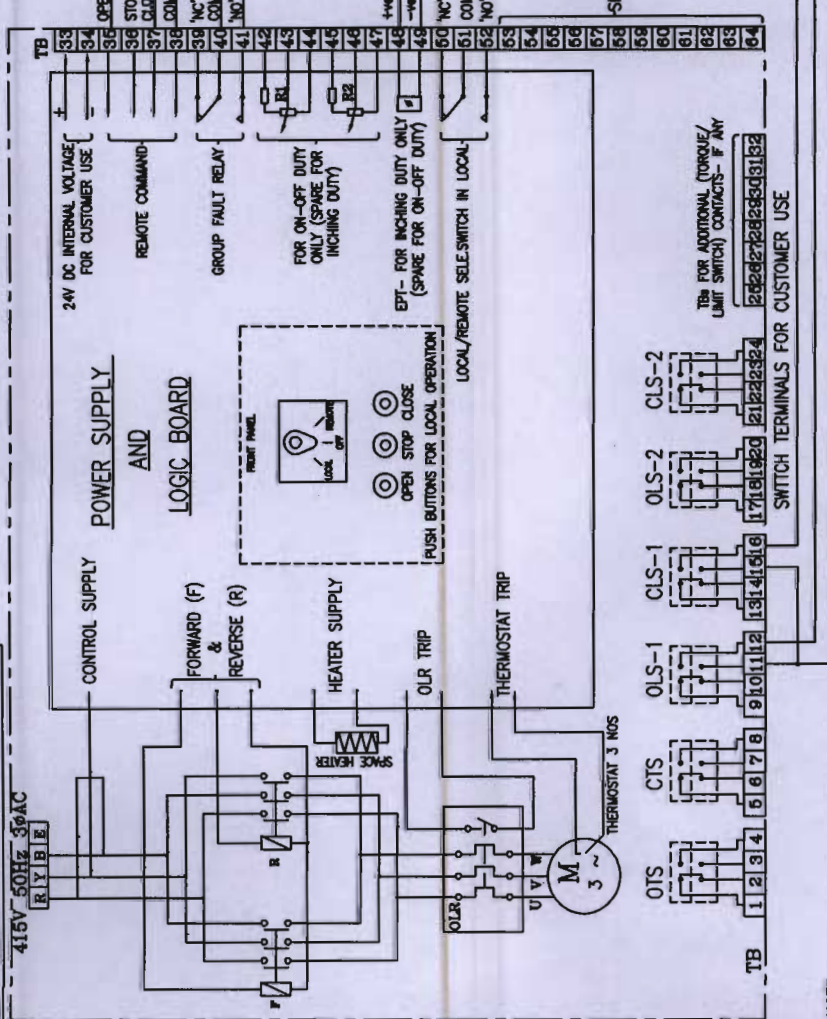


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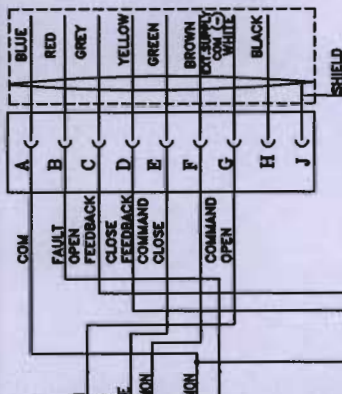
OR ENHANCED

415V 50Hz 3φ AC  
R Y B E

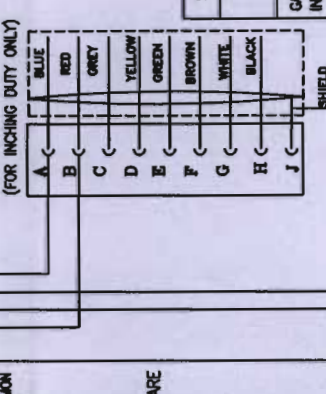
# POWER SUPPLY AND LOGIC BOARD



9 PIN PLUG & SOCKET  
(FOR ALL ACTUATORS)



ADDITIONAL  
9 PIN PLUG & SOCKET  
(FOR INCHING DUTY ONLY)



## CONTACT DEVELOPMENT DIAGRAM

OTS	1-2	OPEN AT OVER TORQUE DURING OPENING TRAVEL
	3-4	CLOSE AT OVER TORQUE DURING OPENING TRAVEL
CTS	5-6	OPEN AT OVER TORQUE DURING CLOSING TRAVEL
	7-8	CLOSE AT OVER TORQUE DURING CLOSING TRAVEL
CLS-1	9-10	
	11-12	
CLS-1	13-14	
	15-16	
CLS-2	17-18	
	19-20	
CLS-2	21-22	
	23-24	
SWITCH	TERMINAL NO.	INTERMEDIATE
		VALVE POSITION
		INDICATES CONTACT CLOSED
		INDICATES CONTACT OPEN

CONTACT RATING: 5A AT 250V AC & 0.5A AT 220V DC

VALVES	OPEN		CLOSE	
	MAIN	BACK UP	MAIN	BACK UP
GATE VALVE OF 100 mm AND ABOVE IN 1500 CL AND ABOVE RATINGS	CLS	OTS	CLS	CTS
ALL OTHER GATE & GLOBE VALVES	CLS	OTS	CTS	#

# - CLS NOT TO BE CONNECTED IN TRIP CIRCUIT  
\* - BYPASS OTS FOR INITIAL 5% OF TRAVEL (FOR GATE VALVES ONLY)

TYPE OF PRODUCT  
OR NAME OF  
CUSTOMER/PROJECT  
ELECTRICAL VALVE ACTUATORS (AC) WITH INTEGRAL STARTERS  
FOR NTPC PROJECTS  
(DRAWN FOR INTERMEDIATE POSITION OF VALVES)

NAME	N.P.ESWAR	SIGN	N.P.	DATE	17.03.05
DESIGN	D.DINAKARAN	SIGN	D.D.	DATE	17.03.05
CHECKED	K.ARUNACHALAM	SIGN	K.A.	DATE	17.03.05
APPROVED		SIGN		DATE	

DEPT	365-121	SCALE	NTS	WEIGHT (KG)	
CODE					
TITLE	WIRING DIAGRAM (TERMINAL PLAN)				
FOR ACTUATOR WITH INTEGRAL STARTER WITH PLUG & SOCKET					

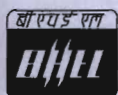
CARD CODE	U 01	DRAWING NO.	3-V-MISC-24283	REV	0
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CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

- NOTE:-
1. ALL TORQUE AND LIMIT SWITCHES (OTS, CTS, OLS1&2, CLS1&2) ARE WITH 2NO+2NC CONTACTS '1NO+1NC' IS TERMINATED IN TBS 1-24, REMAINING CONTACTS ARE FOR INTERNAL USE. ANY SPARE CONTACTS WHICH ARE NOT USED INTERNALLY ARE TO BE TERMINATED IN TBS 25-32
  2. CTS - TORQUE SWITCHES FOR CW ROTATION (CLOSE)
  3. OTS - TORQUE SWITCHES FOR CCW ROTATION (OPEN)
  4. OLS-1, OLS-2 - LIMIT SWITCHES FOR POSITION OPEN
  5. CLS-1, CLS-2 - LIMIT SWITCHES FOR POSITION CLOSE
  6. EPT - ELECTRONIC POSITION TRANSMITTER (CONTACTLESS TYPE, FOR INCHING DUTY)
  7. R1-R2 - POTENTIOMETER 2 x 100 OHMS (FOR ON-OFF DUTY)
  8. FOR COMMANDS & EPT EITHER INTERNALLY GENERATED 24 VDC OR EXTERNAL SUPPLY OF 24VDC CAN BE USED
  9. M - MOTOR 3φ 415V 50 Hz AC SUPPLY
  10. TORQUE SWITCH BYPASS WITH LIMITSWITCH BOTH ON OPEN & CLOSE DIRECTION TO BE DONE INTERNALLY.

Size A3





# **DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE**

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 1 OF 2

Data Sheet No.: PE-DC-999-145-1026-A

2x660 MW MOUDA STPP, 1X500 MW VINDHYACHAL STPP

TECHNICAL REQUIREMENTS FOR PRESSURE / DIFFERENTIAL  
PRESSURE GAUGE

TO BE FILLED-UP /CONFIRMED  
BY BIDDER

(TO BE FILLED BY PURCHASER)

<b>GENERAL</b>	MANUFACTURER		
	MODEL NUMBER		
<b>TECHNICAL</b>	SENSING ELEMENT	<input type="checkbox"/> BOURDON <input type="checkbox"/> DIAPHRAGM (BOURDON FOR HIGH PRESS AND DIAPHRAGM FOR LOW PRESS APPLICATION)	
	MATERIAL	SENSING ELEMENT – AISI 316 SS MOVEMENT – AISI 304 SS CASING – <input checked="" type="checkbox"/> DIE CAST AL <input type="checkbox"/> SS	
	ENCLOSURE	CLASS: <input checked="" type="checkbox"/> IP-55 <input type="checkbox"/> IP-65 <input type="checkbox"/> EXPL PROOF PAINT: <input checked="" type="checkbox"/> ENAMEL <input type="checkbox"/> EPOXY	
	DIAL	SIZE: 150 MM COLOR: WHITE NUMERALS: BLACK SCALE: LINEAR, 270° ARC GRADUATED IN METRIC UNITS	
	CASE	COLOUR : BLACK	
	SPAN/ ZERO ADJUSTMENT	INT. MICRO SCREW	
	RANGE SELECTION	SHOULD COVER 125% OF OPERATING PARAMETER	
	OVER RANGE PROTECTION	1.5 TIMES OF FSD	
	BLOW OUT DISC	REQUIRED	
	SWITCHING FACILITY (IF APPLICABLE)	NOT REQUIRED	
	TYPE	<input type="checkbox"/> MICRO SWITCH <input type="checkbox"/> OTHER	
	NO. / TYPE OF CONTACTS	2 NOS. SPDT	
CONTACT RATING	5A 230V AC, 0.25A 220V DC		
SETTING RANGE	FIELD ADJUSTABLE OVER FULL RANGE		
REPEATABILITY	± 1% OF FSR		
POWER SUPPLY	<input type="checkbox"/> 230V AC <input type="checkbox"/> 110V AC		
<b>PERFORMANCE</b>	ACCURACY	± 1% OR BETTER OF FULL SCALE DEFLECTION	
<b>CONNECTION</b>	PROCESS	<input type="checkbox"/> M20 x 1.5 (M) <input checked="" type="checkbox"/> ½" NPT (M) <input type="checkbox"/> ½" NPT (F) <input type="checkbox"/> OTHER	
	LOCATION	BOTTOM	
<b>ACCESSORIES</b>	NAME PLATE / METAL TAG	SS	
	OTHER	SIPHON FOR STEAM, SNUBBER FOR PUMP DISCHARGE, CHEMICAL SEAL DIAPHRAGM FOR CORROSSIVE, OIL SERVICES and SLURRY APPLICATION TO BE PROVIDED	
<b>OTHER REQUIREMENT</b>	INSTRUMENT LIST	INSTRUMENT LIST COMPRISING OF TAG NO., SERVICE, DESIGN/OPERATING PRESSURE & TEMPERATURE TO BE ATTACHED	
<b>QUALITY REQUIREMENT</b>	CHECK LIST FOR PG/DPG	REFER CHECK LIST NO PE-CL-999-145-I 026-0	





**CHECK LIST FOR  
PRESSURE / DIFFERENTIAL PRESSURE GAUGE  
(Mechanical Auxiliary Packages)**

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 2 OF 2

Data Sheet No.: PE-CL-999-145-1026-0


SL NO	TESTS/CHECKS	QUANTM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGEN CY			REMARKS	
				P	W	V		
1.0	CHECK FOR		APPROVED TECHINCAL REQUIREMENT/ DATA SHEET				MFR TO CARRY OUT ROUTINE TEST ON 100%. WHEN MATL CORELATION ARE NOT AVAILABLE MFR'S COMPLIANCE TO BE PROVIDED	
	1.1 DIAL SIZE	100%		M	C	C		
	1.2 MODEL NO/TAG NO	100%		M	C	C		
	1.3 RANGE/SCALE	100%		M	C	C		
	1.4 END CONNECTION	100%		M	C	C		
	1.5 SWITCH CONTACT RATING & NOS	100%		M	C	C		
2.0	CALIBRATION							
	2.1 ACCURACY	100%		M	C	B		
	2.2 REPEATABILITY (FOR SWITCH)	100%		M	C	B		
	2.3 SET POINT ADJUSTMENT FOR SWITCH	100%		M	C	C		
3.0	OVER PRESSURE & LEAK TEST	100%		M	C	C		
4.0	OPERATION OF PR. RELEIF DEVICE	ONE PER TYPE		M	C	C		
5.0	REVIEW OF T.C. FOR MATERIAL OF--							
	5.1 SENSOR	FOR LOT		-	-	B		
	5.2 MOVEMENT			-	-	B		
	5.3 PROCESS CONNECTION			-	-	B		
	5.4 HOUSING			-	-	B		
6.0	REVIEW OF T.C. FOR DEGREE OF PROTECTION	TYPE TEST		-	-	B		
7.0	REVIEW OF T.C. FOR CONTACT RATING OF SWITCH	ONE PER TYPE		-	-	B		
8.0	ACCESSORIES AS APPLICABLE	100%		M	C	C		

**LEGEND:**

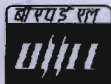
M: MANUFACTURER/ SUB CONTRACTOR, C: CONTRACTOR/ NOMINATED INSP AGENCY, B: BHEL. P: PERFORM, W: WITNESS, V: VERIFICATION.

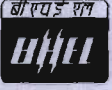
**NOTE:**

CONTRACTOR TO PROVIDE COMPLIANCE CERTIFICATE FOR TESTS/CHECKS VERIFIED BY CONTRACTOR AND SUBMIT THE SAME ALONGWITH TEST CERTIFICATES TO BE VERIFIED BY BHEL.

	<b>DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER</b>  2x660 MW MOUDA STPP, 1X500 MW VINDHYACHAL STPP		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE:
			SHEET 1	OF 3
TAG No. .... Qty.....		Data Sheet No.: PES-145-01-DS1- A		
<b>Data Sheet A &amp; B</b>				
DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
<b>GENERAL</b>	MANUFACTURER			
	MODEL NUMBER			
<b>TECHNICAL</b>	TYPE	TRANSMITTER OF MICROPROCESSOR BASED 2 WIRE TYPE ,HART PROTOCOL COMPATIBLE		
	TRANSMITTER MEASUREMENT	<input type="checkbox"/> PRESSURE <input checked="" type="checkbox"/> DIFF. PRESSURE		
	OUTPUT RANGE	SIGNAL 4-20MA DC (ANALOG) along WITH SUPERIMPOSED DIGITAL SIGNAL (BASED ON HART PROTOCOL )		
	TURN DOWN RATIO	10:1 FOR VACUUM /VERY LOW PRESSURE APPLICATION 30:1 FOR OTHER APPLICATION		
	ACCURACY	± 0.1% OF CALIBRATED SPAN(MINIMUM)		
	STABILITY	± 0.1% OF CALIBRATED SPAN FOR 6 MONTHS FOR RANGE UPTO AND INCLUDING 70 Kg/cm2 ± 0.25% OF CALIBRATED SPAN FOR 6 MONTHS FOR RANGE MORE THAN 70 Kg/cm2		
	LOAD IMPEDANCE	500 OHM (MIN)		
	RESPONSE TIME (TIME TAKEN FROM CHANGE IN PHYSICAL PARAMETER INPUT CHANGE TO TRANSMITTER , OUTPUT REACHING 63.2 % OF IT'S TOTAL CHANGE INCLUDING THAT TIME)	100 ms OR BETTER		
	HOUSING	IP 55(with corrosion resistance epoxy coating)		
	OVER PRESSURE	150 % OF MAX OPERATING PRESSURE		
	CONNECTION (ELECTRICAL)	PLUG & SOCKET TYPE		
	PROCESS CONNECTION	1" , 150# RF		
	ZERO DRIFT & SPAN DRIFT	+/- 0.015 PER DEG C AT AT MAX SPAN +/- 0.11 PER DEG C AT AT MAX SPAN		
	SPAN & ZERO	CONTINUOUS TEMPER PROOF,REMOTE AS WELL AS ADJUSTABLY MANUAL FROM INSTRUMENT WITH ZERO SUPPRESSION & ELEVATION FACILITY		
	DAIGNOSTICS	SELF INDICATING FEATURE		
	POWER SUPPLY	24 V DC ± 10%		



	<b>DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER</b>		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE:
			SHEET 2	OF 3
TAG No. .... Qty.....			Data Sheet No.: PES-145-01-DS1- A 1	
<b>Data Sheet A &amp; B</b>				
DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
	ADJUSTMENT/CALIBRATION/MAINTENANCE	HAND HELD CALIBRATOR/HART .		
	ACCESSORIES	DIAPHRAGM SEAL,PULSATIONS DAMPENERS,SYPHON ETC AS REQUIRED BY SERVICE & OPERATING CONDITION, 2 VALVE MANIFOLD FOR ABSOLUTE PRESSURE TRANSMITTER ( 3 -VALVE MANIFOLD FOR GAUGE /VACUUM PRESSURE TRANSMITTER )AND 5 VALVE MANYFOLD FOR DP /LEVEL/FLOW TRANSMITTER		

	<b>CHECK LIST FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER (Mechanical Auxiliary Packages)</b>			SPECIFICATION NO.:		
				VOLUME		
				SECTION		
				REV. NO.	DATE:	
				SHEET 3	OF 3	
Data Sheet No.: PE-CL-999-145-1026-0						

SL NO	TESTS/CHECKS	QUANTM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGENCY			REMARKS
				M	C	B	
1.0	CHECKS FOR VISULA, MODEL TAG NO.	SEE NOTE-1 BELOW	APPROVED TECHINCAL REQUIREMENT/ DATA SHEET	P	W	V	MFR TO CARRY OUT ROUTINE TEST ON 100%. WHEN MATERIAL CORELATION ARE NOT AVAILABLE MFR'S COMPLIANCE TO BE PROVIDED
2.0	PROCESS CONNECTION	-do-		P	W	V	
3.0	ACCURACY	-do-		P	W	V	
4.0	REPEATEABILITY	-do-		P	W	V	
5.0	HYSTERISIS	-do-		P	W	V	
6.0	EFFECT OF TEMP VARIATION ON ACCURACY	-do-		P	W	V	
7.0	SPAN /ZERO ADJUSTMENT	ONE/TYPE		P	W	V	
8.0	EFFECT OF SUPPLY VOLTAGE VARIATION	ONE/TYPE		P	W	V	
9.0	HIGH PRESSURE TEST	SEE NOTE-1 BELOW		P	W	V	
10.0	BURN IN TEST	ONE/TYPE		P	W	V	
11.0	DEGREE OF PROTECTION	ONE/TYPE		P	W	V	

**LEGEND:**  
M: MANUFACTURER/ SUB CONTRACTOR, C: CONTRACTOR/ NOMINATED INSP AGENCY, B: BHEL. P: PERFORM, W: WITNESS, V: VERIFICATION.

**NOTE:**

1. QUANTUM OF CHECK SHALL BE AS BELOW  
100 % - BY MANUFACTURER  
RANDOM FOR EACH TYPE - BY BHEL & CUSTOMER
2. MANUFACTURER TO MAINTAIN CALIBRATED INSTRUMENT HAVING BETTER ACCURACY THAN THE ITEM UNDER TEST. INSPECTING ENGINEER SHALL CHECK THE SAME.
3. IN CASE OF IMPORTED ITEMS CONTRACTORS SHALL REVIEW TC's AND NOT INSPECT.

CONTRACTOR TO PROVIDE COMPLIANCE CERTIFICATE FOR TESTS/CHECKS VERIFIED BY CONTRACTOR AND SUBMIT THE SAME ALONGWITH TEST CERTIFICATES TO BE VERIFIED BY BHEL.





**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS- 387-165-N003**

**VOLUME : IIB**

**SECTION : D**

**REV. NO. 0**

**DATE : 04.02.2013**

**SHEET 1 of 1**

## **LIST OF SUB-VENDORS**

<div style="border: 1px solid black; padding: 5px; text-align: center;">NTPC</div>		PROJECT : 12X660 MW MOUDA STPP STAGE-II 1X500 MW VINHYACHAL STPP					LIST OF ITEMS REQUIRING QP			REF. NO :	
		PACKAGE : TG PACKAGE					APPROVAL & ACCEPTABLE			REVISION NO : 00	
		CONTRACTOR : BHEL - PEM, HYD, EDN, BHOPAL, Trichy					VENDOR AS APPROVED BY			DATE : 11/11/2010	
		CONTRACT NO : 9575-110 and 9586-110									
No.	Major Equipment	QP Inspection Category	QP No. 9575-110/ 9586-110- QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
9	Electronic transmitters (pressure, DP & flow)	III				EMERSON (Rosemount)	USA/Daman	A			
		III				FUJI ELECTRIC YOKOGAWA	JAPAN JAPAN	A A			Testing and Calibration at M/s YIL, Bangalore is also acceptable.
		III				ABB	FARIDABAD	A			Model - 2600 T
		I				ABB	GERMANY	A			Model - 2600 T





NTPC		PROJECT : 2X660 MW MOUDA STPP, STAGE-II 1X600 MW VINHYACHAL STPP					LIST OF ITEMS R. AIRING QP			REF. NO :	
		PACKAGE : TG PACKAGE					APPROVAL & ACCEPTABLE			REVISION NO : 00	
		CONTRACTOR : BHEL - PEM, HYD, EDN, BHOPAL, Trichy					VENDOR AS APPROVED BY			DATE : 11/11/2010	
		CONTRACT NO : 9575-110 and 9586-110									
No.	Major Equipment	QP Inspection Category	QP No. 9575-110/ 9586-110- QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		I				ECIL	Hyderabad	DR *			Record updation - See footnotes
		I				Prammen	Puddukottai	A			
		I				Chemin	Pondicherry	A			
29	Instrument Cables	I				Paramount	Khushkhera	A			PVC,FRLS type,RQP
		I				Polycab	Daman	A			PVC,FRLS type,RQP
		I				Delton	Faridabad	A			PVC,FRLS type,RQP
		I				KEI	Bhiwadi	A			PVC,FRLS type
		I				Elkey Teletlinks	Faridabad	A			PVC,FRLS type
		I				CORDS	Bhiwadi	A			PVC,FRLS type,RQP
		I				RELIANCE	Bangalore	DR*			PVC,FRLS type,RQP
		I				Nicco	Kolkata	A			Record updation - See footnotes
		II				TEW & C	USA	A			PVC,FRLS type
		II				Habia cables	Sweden	A			
		II				Kerpen cables	Germany	A			
		II				Lapp cables	Germany	A			
		II				Thermo electra Bv	Netherland	A			
		I				Universal Cable	Satna	A			PVC,FRLS type
30	Electrical actuator	II				Auma	Germany	A			
		II				Limitorque	USA	A			
		II				Rotorq	UK	A			
		I				Limitorque	Faridabad	A			
		II / I				Rolork	Chennai/ Bangalore	A			For Bangalore - CAT - I
		II				Nippon gear	Japan	A			
		II				Auma	Bangalore	A			
31	Flow nozzle assembly	II				Microprecision	Faridabad	A			Except P-91 Material
		II				SEKO	Austria	A			
		II				TECHNOMATIC	Italy	A			
		II				ABB/H&B	UK	A			





NTPC

PROJECT : 2X660 MW MOUDA STPP, STAGE-II  
4X500 MW VINHYAGHAL STPP

LIST OF ITEMS K... JURING QP

REF. NO :

PACKAGE : TG PACKAGE

APPROVAL &amp; ACCEPTABLE

REVISION NO : 00

CONTRACTOR : BHEL - PEM, HYD, EDN, BHOPAL, Trichy

VENDOR AS APPROVED BY

DATE : 11/11/2010

CONTRACT NO : 9575-110 and 9586-110

No.	Major Equipment	QP Inspection Category	QP No. 9575-110/ 9586-110- QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		II				IL	Palghat	A			
		II				Daniel	USA	A			
		II				Starmech	Pune	A			
		*				MINCO	GOA	DR			
		*				Engg. Specialities Habla cables	Kolkata Sweden	DR A			Except P-91 Material * - Inspection category to be decided during vendor evaluation.
32	HIGH Temp. cable (PTFE/FEP)	III				Lapp cables	Germany	A			
		III				Kerpen cables	Germany	A			
		III				TEW & C	USA	A			
		III				Thermo-Electra Bv	Netherland	A			
		II				HFCL	Goa	A			
		II				R&M	Switzerland	A			
		II				Aksh Fibre	Bhiwadi	A			
		II				Finolex	Pune/Goa	A			
		II				Birla Ericson	Rewa	A			




AP

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NTPC

PROJECTS 2X660 MW MOUDA STPP, STAGE-II  
CONTACTOR 4X560 MW-VINDHYACHAL-STPP

CONTRACT NO:- 9575-110-2

LIST OF ITEMS REQUIRED FOR QUALITY PLAN  
AND SUB-CONTRACTOR'S APPROVALRef. No.  
Revision No.

DATE :

SR NO	ITEM	QP /INS-PN CAT	QP NUMBER	QP SUBMISSION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APPL L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
2	MISC PUMPS -HORIZONTAL CENTRIFUGAL	I				WPIL	GAZIABAD	A			CAPACITY REF NTPC LTR DTD 03.03.08
		I				JYOTI PUMPS	VADODRA	A			CAP UPTO 2350 M3/HR
		I				SULZER PUMPS INDIA	MUMBAI	A			CAP UPTO 1900 M3/HR
		I				BEST & CROMPTON(BEACON WEAR)	CHANNAI	A			
		I				VOLTAS	MUMBAI	A			
		I				SAM	COIMBATORE	A			CAPACITY UPTO 1350 M3/HR
		I				KBL	PUNE	A			

Sulzer Pump  
SV DAM/VD/PEMENDOR  
-IST

NTPC		PROJECTS 2X660 MW MOUDA STPP, STAGE-II CONTACTOR 4X500-MW-VINBHAGHAL STPP		LIST OF ITEMS REQUIRED FOR QUALITY PLAN AND SUB-CONTRACTORS APPROVAL				Ref. No. Revision No.			
CONTRACT NO:- 9575-110-2								DATE:			
SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS /APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
2	MISC PUMPS -HORIZONTAL CENTRIFUGAL	I				BOK MARKETING	HUBLI	DR			
		I				FLOWMORE	GAZIABAD	A			CAPACITY UPTO 2000 M3/HR
		I				KSB	PUNE	A			
		I				MATHER & PLATT	PUNE	A			



NTPC

PROJECTS 2X660 MW MOUDA STPP, STAGE-II  
CONTACTOR 4X500 MW VINDHYACHAL STPP

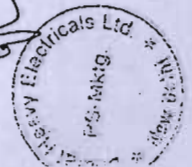
CONTRACT NO:- 9575-110-2

AND SUB-CONTRACTORS APPROVAL

Revision No.

DATE:

SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
13	CCS VALVES OTHER THAN BHEL TRICHY	I				BDK	HUBLI	A			REFER NTPC LETTER DATED 24/02/00 :01/CQA/3520-001/C-04
		I				AUDCO(L&T)	CHENNAI	A			
		I				KSB	COIMBATO RE	A			UPTO 250 NB -600CL : & 400NB -300 CL.; 600NB - 150 CL
		I				FOURESS ENGG.	AURANGAB AD	A			
		I				KBL	PUNE	A			GATE /GLOBE UPTO 300 NB - 600 CL; 600 NB-150 CL; CH
		I				PETROL VALVE	ITALY	A			REFER NTPC LETTER DATED 24/02/00 :01/CQA/3520-001/C-04
14	GM VALVES (UPTO 100 NB)	II									VENDOR APPROVAL BY NTPC NOT ENVISAGED.
	CI VALVES (GATE UPTO 500 NB, GLOBE UPTO 250 NB, NRV UPTO 650 NB)	I				BANKIM	KOLKATTA	A			UPTO 350 NB -PN1.0
		I				KBL	KONDHAPU RI	A			ONLY GATE UPTO 600 NB -PN1.0
		I				H SARKAR	KOLKATTA	A			UPTO 350 NB -PN1.0
		I				LEADER ENGG. WORKS	JULLUNDH ER	A			GATE UPTO 600 NB ; GLOBE /CHECK UPTO 300 NB



NTPC		PROJECTS 2X660 MW MOUDA STPP, STAGE-II CONTACTOR 1X590-MW-VINBHAYAGHAL-STPP				LIST OF ITEMS REQUIRED FOR QUALITY PLAN AND SUB-CONTRACTORS APPROVAL				Ref. No. Revision No.	
		CONTRACT NO:- 9575-110-2				DATE:					
SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
15	BALL VALVES (NON FIRE SAFE TYPE)	I				FLOWCHEM	AHMEDABA D	A			UPTO 350 NBX150#
		I				AUDCO(L&T)	CHANNAI / KANCHIPU RAM	A			
		I				BDK	HUBLI	A			UPTO 400 NBX150#
		I				PEC	NASIK	A			UPTO 400 NBX150#
		I				VAAAS AUTOMATION	CHENNAI	DR			
		I				AKAY INDUSTRIES	HUBLI	A			UPTO 50 NB.
		I				LEADER	JALANDHA R	A			UPTO 50 NB.
		I				MICROFINISH VALVES	HUBLI	A			UPTO 400NB, #300





NTPC

PROJECTS 2X660 MW MOUDA STPP, STAGE-II  
CONTRACTOR 1X660 MW VINHYACHAL-STPP

CONTRACT NO:- 9575-110-2

LIST OF ITEMS REQUIRED FOR QUALITY PLAN  
AND SUB-CONTRACTOR'S APPROVALRef. No.  
Revision No.

DATE :

SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
18	CRH-7.8.9, DEAEERATOR PEGGING VALVES	I				PETROL VALVES	ITALY	A			
19	ANGLE VALVES	I				IL	PALGHAT	A			UP TO 2 INCH SIZE
		I				VELAN INC	CANADA	A			UP TO 2 INCH SIZE
		I				SAMPELL AG	GERMANY	A			
		I				REINEKE	GERMANY	A			
20	BUTTERFLY VALVES IN CI / CCS / CSS CONST(UPTO PN 10 & SUBJECT TO LIFE CYCLE TEST).	I				KBL	KONDHAPURI	A			CI/CCS UPTO 1400 MM SIZE
		I				FOURESS ENGG.	BANGALORE	A			
		I				AUDCO	CHANNAI	A			
		I				BDK PROCESS CONTROL	HUBLI	A			CI/CCS UPTO 1050 MM SIZE
		I				INTERVALVE	PUNE	A			UPTO 500 NB
		I				TYCO	HALOL	A			UPTO 500NB PN16. & UPTO 900NB PN10, (2200NB PN 08



Sudha Mehta

NTPC		PROJECTS 2X660 MW MOUDA STPP, STAGE-II CONTRACTOR 1X500 MW VINDHYACHAL STPP CONTRACT NO:- 8575-110-2				LIST OF ITEMS REQD. AND SUB-CONTRACTORS APPROVAL				Ref. No. Revision No.	
SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
20	BUTTERFLY VALVES IN CI / CCS / CSS CONST(UPTO PN 10 & SUBJECT TO LIFE CYCLE TEST).	I				IL	PALGHAT	A			
		I				STAFFORD CONTROLS	PUNE	DR			
21	AIR RELEASE VALVES	III									BHEL APPROVED SOURCES





1	MOTORS LV	E1027	BHARAT BIJLEE LTD.	PB NO 7011,MILAP NIKETAN	4th FLR 8-A
	BAHADUR SHAH		ZAFAR MARG,N.DELHI-110002	3354613,3319694	
2	MOTORS LV	C02	CROMPTON GREAVES	VANDHANA BUILDING	11, TOLSTOY MARG
	NEW DELHI-110001		3730445,3721534		
3	MOTORS LV	A24	ASEA BROWN BOVERI	IST FLOOR,QUTUB HOTEL	SHAHID JEET
	SINGH MARG	NEW DELHI-110016	6856205,206,208		
4	MOTORS LV	K01	KIRLOSKAR ELECTRIC CO LTD.	P.O. BOX 5555	MALLESWARAM WEST
	BANGALORE 560055		3322111,3322771		
5	MOTORS LV	A35	NGEF	BANK OF BARODA BDG	PBNO.633,16,SANSAD MARG
	DELHI-110001		3320893,3328983		NEW
7	MOTORS LV	S01	SIEMENS	4A, RING ROAD I.P. ESTATE	NEW DELHI 110002
			3318144,3317152		
8	MOTORS LV	M01	MARATHON	708, EROS APARTMENT 56, NEHRU PLACE	NEW DELHI-
			110019	1146519440	
9	MOTORS LV	A35	GE-POWER	150 AIRPORT ROAD	BANGALORE-560017
			5263671,5268413		
10	MOTORS LV	E1115	RAJINDRA ELECT INDUSTRIES	14 SHAH IND.ESTATE	VEERA DESAI
	RD,ANDHERI(W)	MUMBAI-400053	6367943,6367944		
11	MOTORS LV	L04	LAXMI HYDRAULICS PVT. LTD	129/130, INDUSTRIAL ESTATE	PATIL
	NAGAR, HOTGI ROAD	SOLAPUR-413003, MAHARASHTRA			