

Project Name : M/s.Harinagar Sugar Mills Ltd, Harinagar, Dist W Bihar

Document Name : Specifications for proximity Limit Switches for Grate cylinders.

Document No : PB615AZ S00

Specifications :

Application : Open & Close feedback

Quantity : 10 nos

Termination : 2 wire,with screw connection

Logic : NO

Output : Continuous by sensing metallic object

Supply Voltage : 230VAC and 24V DC both required.

Sensor Diameter : Minimum 15mm

Sensing Distance : 10mm

Documentation:

Supplier to provide following documents

- a) Product catalog
- b) Sensor installation details
- c) Test certificate

Specifications for Draft Gauge

Project: 1x35TPH Pulsating Grate Boiler

Customer: M/s.Harinagar Sugar Mills Ltd, Harinagar, Dist.W.Bihar

Part Code: PB615ATG02

Model: Vendor to Provide

Technical Specifications:

Sensor: Silicon Elastomer Diaphragm

Case: Pressed sheet steel, IP-65

Movement: 304SS pivots

Range: Refer Table Below

Accuracy: $\pm 2\%$ of Span

Over Pressure: Min 150% of Operating Pressure

Max Process Temperature: 80°C

Process connection: 1/4" NPT (F), Back

Mounting: 2" Pipe Mounting

Other Technical Specifications:

Scale: Linear

Input: Differential/Dual

Range Type: Compound Type

Accessory: 2" Pipe mounting bracket shall be supplied with each draft gauge/indicator.

Range Table:

Sr. No.	Tag No.	Service	Range in mmH ₂ O	Qty.
1	DG-192	FD FAN DISCHARGE DRAFT PRESSURE	0 to 400	1
2	DG-194	HOT FD AIR APH OUTLET DRAFT PRESSURE	0 to 350	1
3	DG-200	SA FAN DISCHARGE DRAFT PRESSURE	0 to 1000	1
4	DG-204	HOT SA AIR APH OUTLET DRAFT PRESSURE	0 to 800	1
5	DG-205	PS FAN DISCHARGE DRAFT PRESSURE	0 to 1000	1
6	DG-206	FURNACE DRAFT PRESSURE	-50 to 50	1
7	DG-209	BOILER BANK OUTLET FLUE GAS PRESSURE	-50 to 50	1
8	DG-216	ECONOMIZER OUTLET FLUE GAS PRESSURE	-150 to 150	1
9	DG-217	APH OUTLET FLUE GAS PRESSURE	-300 to 300	1
10	DG-221	ESP OUTLET FLUE GAS PRESSURE	-500 to 500	1
11	DG-225	ID FAN DISCHARGE PRESSURE	-50 to 50	1

Total Quantity

11 No's

Differential Pressure Switch-R0

Project :1 x 35TPH Pulsating Grate Boiler

Client : M/s M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar

EPC Contractor : Uttam Energy Systems Ltd.



PROJECT NAME : 1x35TPH Pulsating Grate Boiler
 CLIENT : M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar
 PART CODE : PT615ASH01

DIFFERENTIAL PRESSURE SWITCH

GENERAL	1	Tag Number	Refer Table below	Qty = 2 no's
	2	Description Of Service	Refer Table below	
	3	PID No.	PB615DCP03	
ENCLOSURE AND BODY	4	Mounting configuration	Field Mounted	
	5	Body Material	Aluminium Pressure Die Cast	
	6	Protection Class	IP66	
	7	Wetted Parts	316 SS	
	8	Diff. Pressure Range	Refer Table below	
	9	Differential	Vendor to suggest	
	10	Scale Accuracy	+/- 5% of FSR	
	11	Repeatability	+/- 1% of FSR	
	12	Process Connection	1/2" NPT(F) Through Adapter	
	13	Ambient Temperature	-10 deg.C to +60 deg.C	
MAGNETIC SWITCH	14	Switching Element	1 Number, Instrument Quality Microswitch	
	15	Contact Rating	6A@24VDC	
	16	Contacts	Single ploe double throw type	
	17	Cable Entry	1/2" NPT(F)	
MAKE	19	Model	Vendor to suggest	
NOTE	20	Accessories	1/4" to 1/2" NPT(F) Process Connection Adapter 3-Valve Manifold(In UEL scope)	
	21	Certificate	1) Material Compliance Certificate.	

S.NO	Tag No.	Service Description	Range	Set Point	Unit	Qty
1	DPS-132	Feed Transfer Pump-A Suction Strainer	0 to 200	150 mbar Rising	mbar	1
2	DPS-133	Feed Transfer Pump-B Suction Strainer	0 to 200	150 mbar Rising	mbar	1

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DOCUMENT TITLE DATA SHEET FOR DIFFERENTIAL PRESSURE SWITCH

	Prepared	HARI
	Checked	DHK
	Approved	DHK
	Revision	R0
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Specification for Float Operated Level Indicator

Project Name : M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar
Service : Refer Below.
Qty : 1 no
Part Code : PB615ATG04

Technical Specifications:-

Type: Float Operated

Application: Used for Liquid Level Gauging of Fixed Roof Storage Tank

Feed Water Tank Data: ID-4000mm, Height-3200mm.

MOC of Tank is - **M.S** and Thickness of tank - 6mm.

Storage Tank Graduation: At every 50/100 mm

Density of Liquid: 958 Kg/m³

Operating Temperature: 100 Deg C (Max)

Material of Construction

Float: SS 316

Guide Wire: SS 316

Tension Spring: SS 304

Anchor Bar: SS 316

Pulley: SS 304

Pulley Housing: Aluminium

Guide Tube: M.S.

Scale: Figures raised in Aluminium Rectangular Blocks

Pointer: Aluminium

Counter Weight: C I

In. Connecting Pipe: 1" GI Pipe

Process Connection: 1" BSP (M) with counter connection 1" BSP(F) shall be provided by supplier / Vendor
standard connections also shall be quoted.

Application: Used for Liquid Level Gauging of Fixed Roof Storage Tank

Vendor Shall Supply Following Documents

- 1) G.A. Drawing.
- 2) Material Compliance Certificate.

Data sheets for Flow Elements-R0

Project :1 x 35TPH Pulsating Grate Boiler

Client : M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar

EPC Contractor : Uttamenergy Ltd.


PROJECT NAME	:	1 x 35TPH Pulsating Grate Boiler			
CLIENT	:	M/s Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar			
CONSULTANT	:	NA			
ITEM:- ORIFICE PLATE					
GENERAL	1	Tag No.	Refer Annexure-I		
	2	Description of Service	Refer Annexure-I		
	3	PID No.	PB615DCP02, PB615DCP03 & PB615DCP09		
	4	Element Type	Square Edge Orifice Plate With Drain/Vent Rrangement		
	5	Pressure Tappings	Flange		
	6	Element Material	SS 316		
	7	Beta Ratio (d/D)	Between 0.4 to 0.7		
	8	Element Bore	Vendor to confirm		
	9	Element Thickness	min. 3 mm		
	10	Flow Accuracy	-/+ 1% of URV		
PIPING DATA	11	Flange	Refer Annexure-I		
	12	Pipe Size and Schedule	Refer Annexure-I		
	13	Pipe ID	Refer Annexure-I		
	14	Flange Material	ASTM A105		
	15	Pipe Material	Refer Annexure-I		
PROCESS DATA	16	Flow Rate	Refer Annexure-I		
	17	Static Pressure	Refer Annexure-I		
	18	Temperature	Refer Annexure-I		
	19	Fluid Name	Refer Annexure-I		
NOTES	20	Scope :- Orifice Plate With Flanges			
	21	Drain/Vent Holes Shall Be Provided On Flanges			
	22	Orifice Bore Sizing Shall Be As Per ISO-5167			
	23	IBR Form IIIC Certificate Required.			
DOCUMENT TITLE		DATA SHEET FOR ORIFICE PLATE			
		Uttamenergy Ltd. Pune		Prepared	HARI
				Checked	DHK
				Approved	DHK
				Rev	0
				Page	2 of 6

PROJECT NAME		1 x 35TPH Pulsating Grate Boiler						M/S UTTAMENERGY LTD, PUNE						Prepared		HARI		
CLIENT		M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar												Checked		DHK		
CONSULTANT		NA												Approved		DHK		
								Rev		0		Page		3 of 6				
								Annexure-I For Flow Elements (Orifice Plate)										
Sr. No.	Flow Element Type	Tag No.	Service	Line Size	Pipe Material	End Connection	Differential Pressure in mmH2O	Operating Flow Conditions				Piping Design Condition		IBR/NIBR	Qty			
								Pressure (Kg/cm2-g)	Temp. (°C)	Flow (Kg/hr) (Normal)	Flow (Kg/hr) (Max)	Pressure (Kg/cm2-g)	Temp. (°C)					
1	Orifice	FE-124	Boiler Feed Water Discharge Flow	80NB , SCH40	SA-106-GR-B	80NB ,ASA-600	3000	72	130	35000	38000	83	140	IBR	1			
2	Orifice	FE-128	Boiler Feed Water to Attemperator Flow	25NB, SCH-40	SA-106-GR-B	25NB, ASA-600	3000	72	130	2000	4000	83	140	IBR	1			

PROJECT NAME	:	1 x 35TPH Pulsating Grate Boiler	
CLIENT	:	M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar	
CONSULTANT	:	NA	
ITEM:- FLOW NOZZLE			
GENERAL	1	Tag No.	Refer Annexure-II
	2	Description of Service	Refer Annexure-II
	3	PID No.	PB615DCP02,PB615DCP03 & PB615DCP09
	4	Element Type	Long Radius Nozzle
	5	Pressure Tappings	Upstream / Radius
	6	Element Material	SS 316
	7	Beta Ratio (d/D)	Between 0.4 to 0.7
	8	Element Bore	Vendor to confirm
	9	Element Thickness	Vendor to confirm
	10	Flow Accuracy	-/+ 2% of URV
PIPING DATA	11	End Connection	Butt Weld
	12	Pipe Size and Schedule	Refer Annexure-II
	13	Pipe ID	Refer Annexure-II
	14	Flange Material	NA
	15	Pipe Material	Refer Annexure-II
PROCESS DATA	16	Flow Rate	Refer Annexure-II
	17	Static Pressure	Refer Annexure-II
	18	Temperature	Refer Annexure-II
	19	Fluid Name	Refer Annexure-II
NOTES	20	IBR Form IIIC Certificate Required.	
	21	Bore Sizing Shall Be As Per ISO-5167	
	22	One set of Pressure Tappings shall be provided with removable caps. One pair shall be plugged.	
	23	Calculations and GA drag shall be send for approval before manufacturing of Nozzle.	
DOCUMENT TITLE		DATA SHEET FOR FLOW ELEMENT (FLOW NOZZLE)	
		Prepared	HARI
		Checked	DHK
		Approved	DHK
		Rev	0
		Page	4 of 6

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		Title	Aerofoil For Boiler Air Flow Measurement					
		Project	1 x 35TPH Pulsating Grate Boiler					
		Client	M/s.Harinagar Sugar Mills Ltd,Harinagar,					
Sr. no	Tag No	Service	Process Data			Inner side Duct Dimensions		Qty.
			Flow (m3/hr)	Pressure (mmH2O)	Temperature(°C)	Height (mm)	Width (mm)	
1	FE-197	Hot FD Air Line To Grate	72000	140	180	1300	1300	1
		Duct Material:	MS,IS2062, 5mm Thick					
		End Connection	Flanged					

		CLIENT : M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar	PB	615	
		PROJECT NAME : 1 x 35TPH Pulsating Grate Boiler	Date .	18/05/2017	
		Instrument Hook-Up IBR Material For PT ,DPT & DPS.	Rev.	0	
Sr. No.	Description	Grade/ Class/Material	APL Qty	UOM	
1	Barrel Nipple Size - 1/2" SCH - 80,Length - 200MM Long, One Side NPTM threading.	A-106 Gr B (CS)	52	Nos	
2	Barrel Nipple - Size - 1/2" SCH - 80,Length - 200MM, One Side NPTM threading.	SA335 P 22 (AS)	9	Nos	
3	Barrel Nipple Size - 1/2" SCH - 80,Length - 150MM Long, One Side NPTM threading.	A-106 Gr B (CS)	8	Nos	
4	Barrel Nipple - Size - 1/2" SCH - 80,Length - 150MM, One Side NPTM threading.	SA335 P 22 (AS)	1	Nos	
5	Condensing Pot, Size-3",Length-300MM Sch 80, 1/2" Socket Weld -2 Nos & 2 Nos - 1/2 NPT thereding.	A-106 Gr B (CS)	8	Nos	
6	Condensing Pot, Size-3",Length-300MM Sch 80, 1/2" Socket Weld -2 Nos & 2 Nos - 1/2 NPT thereding,	SA335 P 22 (AS)	5	Nos	
7	Socket, Size 1/2"NPT(F)40mm	A-106 Gr B (CS)	10	Nos	
8	Socket, Size 1/2"NPT(F)40mm	A-335 Gr-B (AS)	6	Nos	
9	Union Socket, Size -1/2" Socket Weld	A-105 800LBS(CS)	30	Nos	
10	Union Socket Size -1/2" Socket Weld	A335, 3000LBS (AS)	4	Nos	
11	Equal Tee ,Forg., 1/2"NB Socket Weld	A-105 800LBS(CS)	30	Nos	
12	Equal Tee ,Forg., 1/2"NB Socket Weld	A335, 3000LBS (AS)	5	Nos	
13	Bend, Size 1/2", Socket Weld .	A-105 ,3000LBS (CS)	60	Nos	
14	Bend, Size 1/2", Socket Weld .	A-335,3000LBS (AS)	10	Nos	
15	Tube End Cap- WPB , Size 1/2"SCH-80, Threading - NPT(F)	A-105 ,3000LBS (CS)	25	Nos	
16	Tube End Cap , Size 1/2"SCH-80, Threading - NPT(F)	A-335,3000LBS (AS)	5	Nos	
17	Coupling ,1/2" NB (SW)	A-105 ,3000LBS (CS)	45	Nos	
18	Coupling ,1/2" NB (SW)	A-335,3000LBS (AS)	10	Nos	
19	Reducer 1" x 1/2" SW	A-106-GR-B (CS)	5	Nos	
20	Reducer 1" x 1/2" SW	A-335,3000LBS (AS)	5	Nos	

Specification for Large Display Indicator (Indicator at Operating Floor)

PROJECT: M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar

PART CODE: PB615AMS00

Model: Vendor to suggest

Technical Specifications:

Input Signal: 4-20mA from DCS (External resistor not required)

Output Display Range: Site settable

Display Size: 4" Height

Display Specs: 4Digit/7-Segment, LED

Enclosure: Metal Enclosure, IP-55,

Dimensions: Vendor to suggest (W x H X D mm)

Mounting: Wall Mounting

Ambient Temperature: 50°C

Power Supply: 90 to 270 V AC, 50Hz

Scope of Supply:

1. Display : 6 No's (Tag No's: FI-124,LI-147,PI-148,TI-158,PI-160 and FI-161)
2. Mounting Clamp: 2 No's per display

Documentation:


1. Operation and installation manual.
2. Calibration certificate.
3. Test certificate.

Float Operated Level Switch-R0

Project :1 x 35TPH Pulsating Grate Boiler

Client : M/s M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar

EPC Contractor : Uttam Energy Systems Ltd.

	PROJECT NAME : 1x35TPH Pulsating Grate Boiler		
	CLIENT :M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar		
	PART CODE : PT615ASH00		
FLOAT OPERATED LEVEL SWITCH WITH EXTERNAL CHAMBER			
GENERAL	1	Tag Number	LSLL-110
	2	Description Of Service	Deareator Water Level Low Low
	3	PID No.	PT615DCP03
FLOAT & BODY	4	Body material	SS 304
	5	Float	SS 316
	6	Cover	Aluminium
	7	Enclosure Class	Weatherproof IP66
	8	Pressure	Operating- 1.7 Kg/cm2(g) Design- 3.0Kg/cm2(g)
	9	Temperature	Operating- 130 Deg.C Design- 300 Deg.C
	10	End Connection	As per vendors standard
	11	Float	Diameter 60.5 mm (Vendor to suggest)
	12	Mounting Configuration	External Chamber Mounted
	13	Differential	12mm +/- 2 mm (Vendor to suggest)
CHAMBER (SWITCH HOUSING)	14	Material	Carbon Steel SA105
	15	Housing	Made from 150 NB Pipe (Vendor to suggest)
	16	Process Connection	ANSI B16.5,25NB.CI-150,SORF
	17	C to C Distance	350mm
ELECTRICAL	18	Switch Type	1 SPDT Type microswitch with 1NO + 1 NC contact
	19	Contact Rating	4A at 24V DC
	20	Cable entry	1/2" NPT (F)
MAKE	21	Manufacturer	-----
	22	Model	Vendor To Suggest
NOTES	23	Certificate	1) IBR form IIIC certificate.
	24		2) Material Compliance Certificate
DOCUMENT TITLE		DATA SHEET FOR FLOAT OPERATED LEVEL SWITCH	
		Prepared	HARI
		Checked	DHK
		Approved	DHK
		Rev	0
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Specification for Level Switch
(Vibrating Fork Type for Husk Bunker)

PROJECT: M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar

PART CODE: PT615ASH00

DATA SHEET FOR LEVEL SWITCHES

GENERAL	1	Tag Number		LS-234 & LS-235	
	2	Service		Husk Bunker	
	3	Function		Level Indicating	
	4	Mounting		1 ½" Socket with counter socket	
	5	Area Classification		Safe area	
	6	Type		Vibrating fork, Capacitive	
	7	Material for Wetted parts		SS316	
	8	Probe Length		350 mm	
PROCESS CONDITION	9	Fluid		Rice Husk	
	10	Design Pressure	Operating Pressure	0.15 BAR G	0.02 BARG
	11	Design Temp. Max.	Operating Temp.	100°C	45°C
	12	Process connection Location		Bottom (LS-234) & Top (LS-235)	
LEVEL LIMIT SWITCH	13	Enclosure		Aluminum, Weather Proof, Powder Coated	
	14	Enclosure Class		IP-66	
	15	Process connection	Electrical Connection	Thread 1 ½" BSP	2 x PG-11
	16	Switch Point		Single Point Level Switching	
	17	Power up Response		Configurable 05 Second	
	18	Power Supply		Universal 24VDC & 230VAC	
	19	Output Signal		1 DPDT potential free Relay o/p	
	20	Protection Class		(IP-66) as per IS/IEC 60529:2001: Class II	

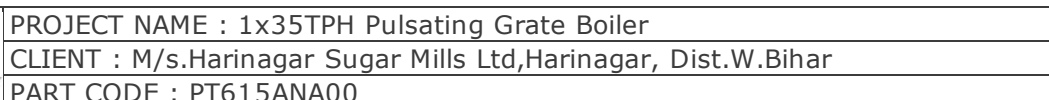
Note: Vendor shall be confirm the location of LSL & LSH on bunker. Bunker height shall be 5 mtrs of square part.

OXYGEN ANALYZER-R0

Project :1 x 35TPH Pulsating Grate Boiler

Client : M/s M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar

EPC Contractor : Uttam Energy Systems Ltd.



ITEM:- OXYGEN ANALYZER

GENERAL TRANSMITTER (ANALYZER)	1	Tag No.	O2A - 213	Qty	1 no
	2	Description of Service	Economizer Outlet Flue Gas		
	3	PID No.	PB615DCP02		
	4	Make	-----		
	5	Model No.	Supplier To Specify		
	6	Type	Online		
	7	Function	Transmit		
	8	Measurement Range	Vendor To Specify		
	9	Calibrated Range	0 to 25		
	10	Accuracy	Minimum 0.25 % O ₂		
	11	Power Supply	85 to 260 VAC, 50/60 Hz		
	12	Output	4-20 mA DC		
	13	Sensor Type	Zirconia Based		
	14	Probe Material	SS316		
	15	Mounting	Flange Type- 2", Class-150.		
	16	Process Temperature	20 to 600 °C		
	17	Probe Length	600 mm		
NOTES	18	Analyzer shall be supplied with counter flange.			
	19	Any special cables,if any, shall be supplied with analyzer. Buyer will provide cables for power supply and 4-20mA output signal.			
	20	Calibration Certificate shall be provided.			
	21	Operation & Installation Manual shall be provided.			
DOCUMENT TITLE		DATA SHEET FOR ONLINE OXYGEN ANALYZER			
		Uttam Energy Systems Ltd. Pune	Prepared	HARI	
			Checked	DHK	
			Approved	DHK	
			Rev	0	
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APL for Pressure Gauges - R0

Project : 1 x 35TPH Pulsating Grate Boiler

Client : M/s.Harinagar Sugar Mills Ltd, Harinagar, Dist.W.Bihar

EPC Contractor : Uttamenergy Ltd.

PROJECT NAME		1 x 35TPH Pulsating Grate Boiler	
CLIENT		M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar	
CONSULTANT		NA	
ITEM:- PRESSURE GAUGE			
GENERAL	1	Tag No.	Refer Table
	2	Description of Service	Steam, Water,Air
	3	PID No.	PT615DCP02,PT615DCP03 & PT615DCP09
GAUGE	4	Type	Direct Mount Bourdon Sensing Pressure Gauge
	5	Range As Per EN-837	Refer Below
	6	Dial Size In mm	150mm or 250mm as given in table
	7	Function	Indicate
	8	Process connection	1/2" NPT(M) Bottom
	9	Dial Lettering/Marking	Black Letter On White Background
	10	Case	Die Cast Aluminium With Screwed Bezel, Epoxy Painted Black
	11	Wetted Parts	SS316 Bourdon
	12	Movement	SS304
	13	Protection	IP67
	14	Over Range	130% Of FSD
	15	Window	Shatterproof Glass
OPTIONS	16	Accuracy	± 1% Of FSD
	17	Scale	In Kg/cm2(g)
	18	Red Mark	Refer Table
	19	Blow Out Protection	Provided At Top
NOTES	20	Zero Setting	Internal Micrometer Pointer
	23	Certificate:-1)Calibration certificate, 2)Material Test Certificate, 3)IBR Certificate as applicable	
DOCUMENT TITLE		DATA SHEET FOR PRESSURE GAUGE	
	UTTAMENERGY LTD. PUNE	Prepared	HARI
		Checked	DHK
		Approved	DHK
		Rev	0
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	Title	Pressure Gauges - R0							
	Project	1x35TPH Pulsating Grate Boiler							
	Customer	M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar							
Sr. No.	PG Tag No.	Service Description	Process Connection	Red Mark	Range	Unit	IBR / NIBR	Dial size	Qty
1	PG-104	TRANSFER PUMP DISCHARGE HDR PRESSURE	1/2"NPT(M)	10	0 to 20	Kg/cm2(g)	NIBR	150mm Dial	1
2	PG-107	DEAREATOR INLET FEED WATER PRESSURE	1/2"NPT(M)	10	0 to 20	Kg/cm2(g)	IBR	150mm Dial	1
3	PG-131	DEAREATOR VESSEL PRESSURE	1/2"NPT(M)	3	0 to 6	Kg/cm2(g)	IBR	150mm Dial	1
4	PG-121	BOILER FEED WATER PUMP-1 RECIRCULATION LINE PRESSURE	1/2"NPT(M)	-	0 to 15	Kg/cm2(g)	IBR	150mm Dial	1
5	PG-122	BOILER FEED WATER PUMP-2 RECIRCULATION LINE PRESSURE	1/2"NPT(M)	-	0 to 15	Kg/cm2(g)	IBR	150mm Dial	1
6	PG-123	BOILER FEED WATER DISCHARGE PRESSURE	1/2"NPT(M)	83	0 to 140	Kg/cm2(g)	IBR	150mm Dial	1
7	PG-127	DEAREATOR PRS UPSTREAM PRESSURE	1/2"NPT(M)	5	0 to 10	Kg/cm2(g)	IBR	150mm Dial	1
8	PG-129	DEAREATOR PRS DOWNSTREAM PRESSURE	1/2"NPT(M)	3	0 to 6	Kg/cm2(g)	IBR	150mm Dial	1
9	PG-141	ECONOMIZER LOWER HDR PRESSURE	1/2"NPT(M)	62	0 to 100	Kg/cm2(g)	IBR	150mm Dial	1
10	PG-144	ECONOMIZER UPPER HDR PRESSURE	1/2"NPT(M)	62	0 to 100	Kg/cm2(g)	IBR	150mm Dial	1
11	PG-149A	STEAM DRUM PRESSURE	1/2"NPT(M)	55.7	0 to 100	Kg/cm2(g)	IBR	250mm Dial	1
12	PG-149B	STEAM DRUM PRESSURE	1/2"NPT(M)	55.7	0 to 100	Kg/cm2(g)	IBR	250mm Dial	1
13	PG-149C	STEAM DRUM PRESSURE-OPERATING FLOOR	1/2"NPT(M)	55.7	0 to 100	Kg/cm2(g)	IBR	250mm Dial	1
14	PG-152	SECONDARY SH INLET HDR PRESSURE	1/2"NPT(M)	52	0 to 80	Kg/cm2(g)	IBR	150mm Dial	1
15	PG-154	SOOT BLOWER PRS INLET STEAM PRESSURE	1/2"NPT(M)	52	0 to 80	Kg/cm2(g)	IBR	150mm Dial	1
16	PG-156	SOOT BLOWER PRS DOWNSTREAM PRESSURE	1/2"NPT(M)	25.4	0 to 60	Kg/cm2(g)	IBR	150mm Dial	1
17	PG-157	MAIN STEAM LINE PRESSURE	1/2"NPT(M)	48.6	0 to 80	Kg/cm2(g)	IBR	250mm Dial	1
18	PG-157	MAIN STEAM LINE PRESSURE-OPERATING FLOOR	1/2"NPT(M)	48.6	0 to 80	Kg/cm2(g)	IBR	250mm Dial	1
19	PG-163	STEAM DIST.HDR PRESSURE	1/2"NPT(M)	48.6	0 to 80	Kg/cm2(g)	IBR	150mm Dial	1
								Total	19

	Title	APL for Syphons							
	Project	1x14MW Co-Generation Power Plant.							
	Customer	M/s Lauh Purush Sardar Vallabh Bhai Patel SSK, Chhattisgarh							
Sr. No.	PG Tag No.	Service Description	Process Connection	Pressure Red Mark in Kg/cm2 (g)	Temperature in Deg.C	Pipe Size	Material	IBR / NIBR	Qty
1	PG-101	DM Pump common discharge	1/2"NPT(F)	-	-	15 NB x SCH40	A 106 Gr B	NIBR	1
2	PG-523	FW Transfer Pump Discharge Header	1/2"NPT(F)	8	85	15 NB x SCH40	A 106 Gr B	NIBR	1
3	PG-522	FW Transfer Pump discharge To Deaerator After NRV	1/2"NPT(F)	4	85	15 NB x SCH40	A 106 Gr B	IBR	1
4	PG-521	De-aerator water storage tank	1/2"NPT(F)	0.4	105	15 NB x SCH40	A 106 Gr B	IBR	1
5	PG-520	Boiler FW Pump Suction Header	1/2"NPT(F)	1.6	105	15 NB x SCH40	A 106 Gr B	IBR	1
6	PG-519	Recirculating line for Boiler FW Pump-1,2&3	1/2"NPT(F)	4.8	105	15 NB x SCH40	A 106 Gr B	IBR	3
7	PG-515	Boiler FW Pump Common Discharge Header	1/2"NPT(F)	139	105	15 NB x SCH160	A 106 Gr B	IBR	1
8	PG-514	Boiler FW To Attenuator	1/2"NPT(F)	139	105	15 NB x SCH160	A 106 Gr B	IBR	1
9	PG-518	PRDS Pump Suction-1&2	1/2"NPT(F)	1.6	105	15 NB x SCH40	A 106 Gr B	IBR	2
10	PG-517	PRDS Pump Discharge-1&2	1/2"NPT(F)	32	105	15 NB x SCH40	A 106 Gr B	IBR	2
11	PG-516	PRDS Pump Discharge Header	1/2"NPT(F)	32	105	15 NB x SCH40	A 106 Gr B	IBR	1
12	PG-513	HP Heater water inlet	1/2"NPT(F)	139	105	15 NB x SCH160	A 106 Gr B	IBR	1
13	PG-512	HP Heater water outlet	1/2"NPT(F)	139	170	15 NB x SCH160	A 106 Gr B	IBR	1
14	PG-511	Steam line To HP Heater inlet	1/2"NPT(F)	10	248	15 NB x SCH40	A 106 Gr B	IBR	1
15	PG-810	Deareator PRS Up stream	1/2"NPT(F)	1.8	133	15 NB x SCH40	A 106 Gr B	IBR	1
16	PG-811	Deareator PRS Down stream	1/2"NPT(F)	0.4	130	15 NB x SCH40	A 106 Gr B	IBR	1
17	PG-HP-12	HP Heater normal drain HDR	1/2"NPT(F)	9.5	111	15 NB x SCH40	A 106 Gr B	IBR	1
18	PG-HP-13	HP Heater EMERGENCY drain HDR	1/2"NPT(F)	9.5	111	15 NB x SCH40	A 106 Gr B	IBR	1
19	PG-HP-10	TG Bleed line to HP Heater after NRV	1/2"NPT(F)	10	248	15 NB x SCH40	A 106 Gr B	IBR	1
20	PG-HP-11	HP Heater shell	1/2"NPT(F)	10	248	15 NB x SCH40	A 106 Gr B	IBR	1
21	PG-510	Boiler FW Flow before Control Station	1/2"NPT(F)	139	170	15 NB x SCH160	A 106 Gr B	IBR	1
22	PG-509	After FW Control Station	1/2"NPT(F)	112	170	15 NB x SCH160	A 106 Gr B	IBR	1
23	PG-509	Economizer Bottom HDR Pressure	1/2"NPT(F)	112	170	15 NB x SCH160	A 106 Gr B	IBR	1
24	PG-508	Economizer Top HDR Pressure	1/2"NPT(F)	109	300	15 NB x SCH160	A 106 Gr B	IBR	1
25	PG-501	Boiler Steam Drum Pressure	1/2"NPT(F)	106	343	15 NB x SCH160	A 106 Gr B	IBR	2

[illegible]

APL for Temperature Elements-R0

Project : 1x35TPH Pulsating Grate Boiler

Client : M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar

EPC Contractor : Uttamenergy Ltd.

PROJECT NAME		1x35TPH Pulsating Grate Boiler	
CLIENT		M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar	
CONSULTANT		NA	
ITEM : RTD, PT-100			
	RTD		
1	Element Type	Pt 100, Duplex	
2	Element OD	12 mm	
3	Sheath Material	SS316	
4	Insulation	Mineral, Compact MgO	
5	Standard	IEC-751	
6	Accuracy	100+/-0.12 Ohm @ 0 Deg. Cel.	
7	Conductor	Copper	
8	Configuration	3 Wire	
9	Head	Die cast Aluminium Head with Screwed Chain	
10	Cable Entry	1/2" NPT(F) Double Entry	
11	Process Connection	1/2" BSP (M), Adjustable Three Piece Compression Fitting	
12	Element Length	Refer Tag List	
13	Protection	Weatherproof, IP-67	
14	CERTIFICATE	1) Calibration Test Certificate 2) Material Compliance Certificate	
DOCUMENT TITLE		DATA SHEET FOR RTD	
		Prepared	HARI
		Checked	DHK
		Approved	DHK
		Rev	0
		Page	2 of 5

PROJECT NAME	1x35TPH Pulsating Grate Boiler
CLIENT	M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar
CONSULTANT	NA

TAG LIST FOR TEMPERATURE ELEMENTS (RTD)

Sr. No.	Tag. No.	Service Description	Element Insertion Length(mm) Below Head	Process Connection	Qty
1	TE-112	BOILER FEED WATER SUCTION TEMPERATURE	330	1/2 " BSP (M)	1
2	TE-130	DEAREATOR PRS DOWNSTREAM TEMPERATURE	330	1/2 " BSP (M)	1
3	TE-143	ECONOMIZER LOWER HDR TEMPERATURE	330	1/2 " BSP (M)	1
4	TE-191	FD FAN DISCHARGE TEMPERATURE	500	1/2 " BSP (M)	1
5	TE-193	HOT FD AIR APH OUTLET TEMPERATURE	500	1/2 " BSP (M)	1
6	TE-199	SA FAN DISCHARGE TEMPERATURE	500	1/2 " BSP (M)	1
7	TE-202	HOT SA AIR APH OUTLET TEMPERATURE	500	1/2 " BSP (M)	1
8	TE-215	ECONOMIZER OUTLET FLUE GAS TEMPERATURE	600	1/2 " BSP (M)	1
9	TE-220	APH OUTLET FLUE GAS TEMPERATURE	600	1/2 " BSP (M)	1
10	TE-223	ESP OUTLET FLUE GAS TEMPERATURE	600	1/2 " BSP (M)	1
11	TE-146	ECONOMIZER UPPER HDR TEMPERATURE	330	1/2 " BSP (M)	1
				TOTAL	11

PROJECT NAME		1x14MW Co-Generation Power Plant	
CLIENT		M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar	
CONSULTANT		NA	
ITEM : THERMOCOUPLE			
1	Element Type	K-Type Thermocouple, Duplex	
2	Element OD	12 mm	
3	Sheath Material	SS316	
4	Insulation	Mineral, Compact MgO	
5	Standard	IEC-584	
6	Junction	Grounded	
7	Head	Die cast Aluminium Head with Screwed Chain	
8	Cable Entry	1/2" NPT(F) Double Entry	
9	Process Connection	1/2" BSP (M), Adjustable Three Piece Compression Fitting	
10	Element Length	Refer Tag List	
11	Protection	Weatherproof, IP-67	
12	CERTIFICATE	1) Calibration Test Certificate 2) Material Compliance Certificate	
DOCUMENT TITLE		DATA SHEET FOR THERMOCOUPLE	
		Prepared	HARI
		Checked	DHK
		Approved	DHK
		Rev	0
		Page	4 of 5

PROJECT NAME	1x35TPH Pulsating Grate Boiler
CLIENT	M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar
CONSULTANT	NA

TAG LIST FOR TEMPERATURE ELEMENTS (THERMOCOUPLE)

Sr. No.	Tag. No.	Service Description	Element Insertion Length Below Head (mm)	Process Connection	Qty
1	TE-176	PRIMARY SH OUTLET HDR TEMPERATURE	400	1/2 " BSP (M)	1
2	TE-150	SECONDARY SH INLET HDR TEMPERATURE	400	1/2 " BSP (M)	1
3	TE-170	SOOT BLOWER PRS DOWNSTREAM TEMPERATURE	330	1/2 " BSP (M)	1
4	TE-158	MAIN STEAM LINE TEMPERATURE	450	1/2 " BSP (M)	1
5	TE-208	FURNACE TEMPERATURE	1000	1/2 " BSP (M)	1
6	TE-210	BOILER BANK OUTLET FLUE GAS TEMPERATURE	1000	1/2 " BSP (M)	1
				Total	6

APL for Temperature Gauges-R0

Project :1 x 35TPH Pulsating Grate Boiler

Client : M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar

EPC Contractor : Uttamenergy Ltd.

	Title	APL for Temperature Gauges -R0						
	Project	1x35TPH Pulsating Grate Boiler						
	Customer	M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar						
BIMETAL and GAS FILLED TYPE TEMPERATURE GAUGE								
Sr. No.	TG Tag No.	Service Description	Dial Size	Process Connection	Range (°C)	STEM LENGTH BELOW HEAD(mm)	STEM OD (mm)	QTY(Nos.)
1	TG-106	DEAREATOR INLET FEED WATER TEMPERATURE	150 mm	1/2" BSP(M)	0 to 200	330	12	1
2	TG-108	DEAREATOR TEMPERATURE	150 mm	1/2" BSP(M)	0 to 300	330	12	1
3	TG-111	BOILER FEED WATER SUCTION TEMPERATURE	150 mm	1/2" BSP(M)	0 to 300	330	12	1
4	TG-134	DEAREATOR PRS UPSTREAM TEMPERATURE	150 mm	1/2" BSP(M)	0 to 500	330	12	1
5	TG-135	DEAREATOR PRS DOWNSTREAM TEMPERATURE	150 mm	1/2" BSP(M)	0 to 500	330	12	1
6	TG-142	ECONOMIZER LOWER HDR TEMPERATURE	150 mm	1/2" BSP(M)	0 to 300	330	12	1
7	TG-145	ECONOMIZER UPPER HDR TEMPERATURE	150 mm	1/2" BSP(M)	0 to 400	330	12	1
8	TG-151	SECONDARY SH INLET HDR TEMPERATURE	150 mm	1/2" BSP(M)	0 to 700	400	12	1
9	TG-177	SOOT BLOWER PRS INLET STEAM TEMPERATURE	150 mm	1/2" BSP(M)	0 to 700	330	12	1
10	TG-178	SOOT BLOWER PRS DOWNSTREAM TEMPERATURE	150 mm	1/2" BSP(M)	0 to 700	330	12	1
11	TG-159	MAIN STEAM LINE TEMPERATURE	150 mm	1/2" BSP(M)	0 to 800	450	12	1
12	TG-162	STEAM DIST.HDR TEMPERATURE	150 mm	1/2" BSP(M)	0 to 800	450	12	1
13	TG-195	HOT FD AIR APH OUTLET TEMPERATURE	150 mm	1/2" BSP(M)	0 to 300	500	12	1
14	TG-201	SA FAN DISCHARGE TEMPERATURE	150 mm	1/2" BSP(M)	0 to 80	500	12	1
15	TG-203	HOT SA AIR APH OUTLET TEMPERATURE	150 mm	1/2" BSP(M)	0 to 300	500	12	1
16	TG-214	ECONOMIZER OUTLET FLUE GAS TEMPERATURE	150 mm	1/2" BSP(M)	0 to 700	600	12	1
17	TG-218	APH OUTLET FLUE GAS TEMPERATURE	150 mm	1/2" BSP(M)	0 to 300	600	12	1
18	TG-222	ESP OUTLET FLUE GAS TEMPERATURE	150 mm	1/2" BSP(M)	0 to 300	600	12	1
							TOTAL	18
<p style="text-align: center;">Specifications for Temperature Gauge :</p> <div style="display: flex; justify-content: space-between;"> <div> <p>Case & Bezzel : SS304, Byonet Type</p> <p>Steam,Bourdon & Socket : SS316,</p> <p>Movement: SS304</p> <p>Note : Gauges upto 500 °C range shall be of bimetal type. Above 500°C ranges shall be with Gas filled.</p> </div> <div> <p>Steam OD : Refer Table</p> <p>Zero Reset : Internal micrometer</p> <p>Window : Shatterproof Glass</p> <p>Dial Size : 150mm & 250mm</p> </div> </div>								

2 of 2

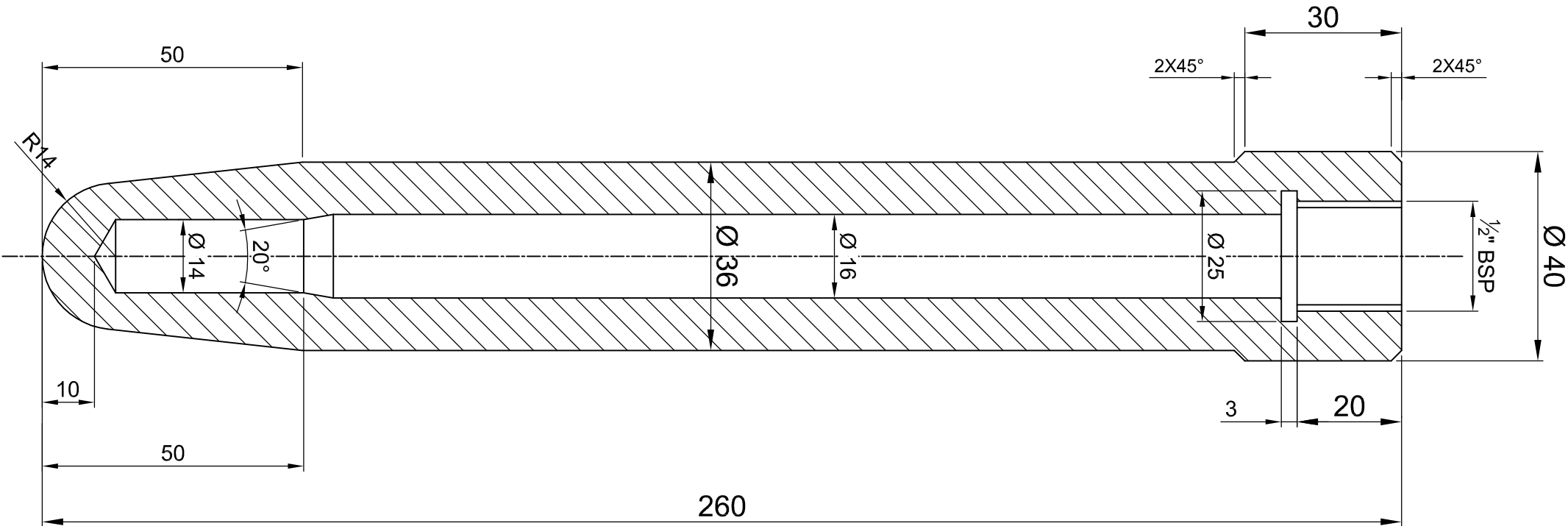
M/s .Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar Thermowell Pockets Annuxure-R0							
S.no	Tag No	Description	Thermowell Length in mm	Thermowell ID in mm	Thermowell OD in mm	Thermowell Material	Drawing No
1	TG-106	DEAREATOR INLET FEED WATER TEMPERATURE	260	16	36	SA105	PBSDTPC002
2	TG-108	DEAREATOR TEMPERATURE	260	16	36	SA105	PBSDTPC002
3	TG-111	BOILER FEED WATER SUCTION TEMPERATURE	260	16	36	SA105	PBSDTPC002
4	TG-134	DEAREATOR PRS UPSTREAM TEMPERATURE	260	16	36	SA105	PBSDTPC002
5	TG-135	DEAREATOR PRS DOWNSTREAM TEMPERATURE	260	16	36	SA105	PBSDTPC002
6	TG-142	ECONOMIZER LOWER HDR TEMPERATURE	260	16	36	SA105	PBSDTPC003
7	TG-145	ECONOMIZER UPPER HDR TEMPERATURE	260	16	36	SA105	PBSDTPC002
8	TG-151	SECONDARY SH INLET HDR TEMPERATURE	320	16	36	SA-182-Gr-F-22-CL-3	PBSDTPA002
9	TG-177	SOOT BLOWER PRS INLET STEAM TEMPERATURE	260	16	36	SA-182-Gr-F-22-CL-3	Non-STD
10	TG-178	SOOT BLOWER PRS DOWNSTREAM TEMPERATURE	260	16	36	SA105	PBSDTPC002
11	TG-159	MAIN STEAM LINE TEMPERATURE	370	16	36	SA-182-Gr-F-22-CL-3	PBSDTPA003
12	TG-162	STEAM DIST.HDR TEMPERATURE	370	16	36	SA-182-Gr-F-22-CL-3	PBSDTPA003
13	TE-112	BOILER FEED WATER SUCTION TEMPERATURE	260	16	36	SA105	PBSDTPC002
14	TE-130	DEAREATOR PRS DOWNSTREAM TEMPERATURE	260	16	36	SA105	PBSDTPC002
15	TE-143	ECONOMIZER LOWER HDR TEMPERATURE	260	16	36	SA105	PBSDTPC002
16	TE-176	PRIMARY SH OUTLET HDR TEMPERATURE	320	16	36	SA-182-Gr-F-22-CL-3	PBSDTPA002
17	TE-150	SECONDARY SH INLET HDR TEMPERATURE	320	16	36	SA-182-Gr-F-22-CL-3	PBSDTPA002
18	TE-170	SOOT BLOWER PRS DOWNSTREAM TEMPERATURE	260	16	36	SA105	PBSDTPC002
19	TE-158	MAIN STEAM LINE TEMPERATURE	370	16	36	SA-182-Gr-F-22-CL-3	PBSDTPA003
S.no	Thermowell Length in mm	Thermowell Material	Drawing No	Actual Qty	Spare qty	Total Qty= Actual + Spare	
1	260	SA105	PBSDTPC002	12 Nos	02 Nos	14 Nos	
2	260	SA-182-Gr-F-22-CL-3	Non-STD	01 Nos	-	01 Nos	
3	320	SA-182-Gr-F-22-CL-3	PBSDTPA002	03 Nos	01 No	04 Nos	
4	370	SA-182-Gr-F-22-CL-3	PBSDTPA003	03 Nos	01 Nos	04 Nos	
						23 Nos	

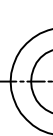

DO NOT SCALE	JOB.NO: PB.- STD.	QTY.
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NOTES :-

- 1) MATERIAL CONSTRUCTION , WORKMANSHIP & DESIGN OF PARTS SHALL BE IN ACCORDANCE WITH I.B.R.-1950 AND ITS LATEST AMENDMENTS.
- 2) REMOVE ALL BURRS.
- 3) MACHINED ALL OVER.

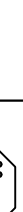
DESIGN DATA	
MAX. WORKING PRESSURE	150 Kg/cm ² (g)
MAX. WORKING TEMP.	426 °C



01.	BAR	Ø40 x 270 LG.		-	1X	2.66		
		SA-105						
PT NO	DESCRIPTION	MATL.SIZE		UW KG	QTY.	TW KG	DRG.NO.	REMARKS
		QUALITY						
DRAWN	G.P.P..	DATE	17.12.2014					TOTAL WEIGHT
CHECKED	S.G.S.	SCALE	1:1					
APPROVED	M.S.G.							
TUTUNOVUT								

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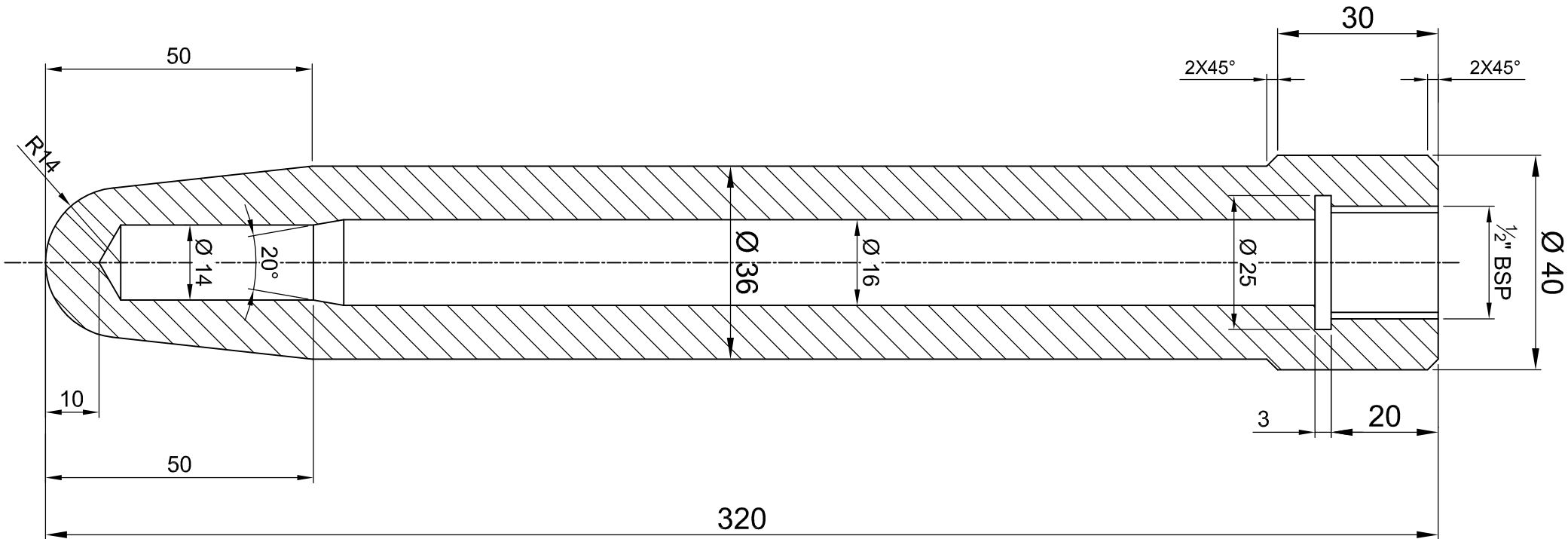
THERMOMETER
POCKET

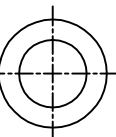
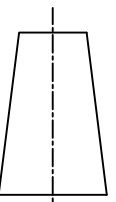
NO.	REVISION	DATE	BY	CHD.	APPD.	<div> LIPi BOILERS LTD. PUNE</div>	DRG.NO.	PBSDTPC002	REV : R0	
							CADFILE	\\PATIL.Z:STD:	SIZE	BD

NOTES :-

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- 3) MACHINED ALL OVER.

DESIGN DATA	
MAX. WORKING PRESSURE	106 Kg/cm ² (g)
MAX. WORKING TEMP.	520 °C

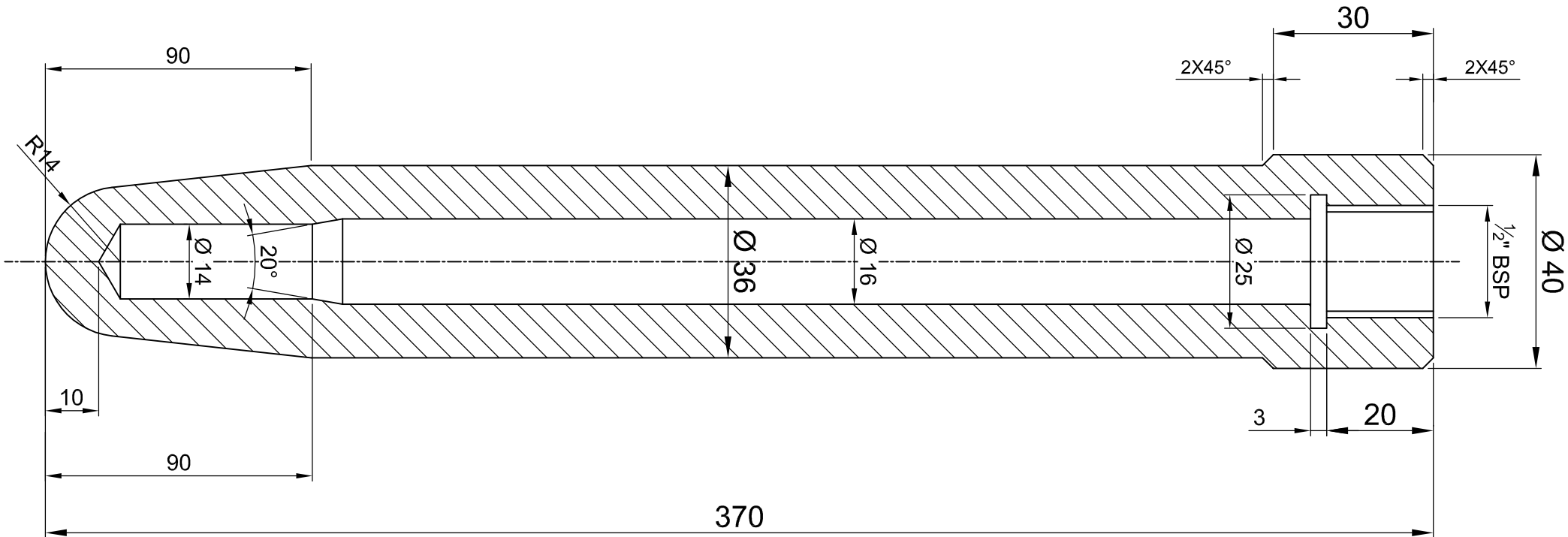


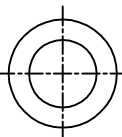
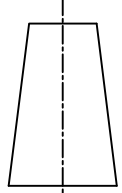
01.	BAR	Ø40 x 330 LG.			-	1X	3.26			
		SA-182-Gr-F-22-CL-3								
PT NO	DESCRIPTION	MATL.SIZE		QUALITY	UW KG	QTY.	TW KG	DRG.NO.		REMARKS
								CODE NO.		
DRAWN	G.P.P..	DATE		17.12.2014					TOTAL WEIGHT	3.26 Kgs
CHECKED	S.G.S.	SCALE		1:1						
APPROVED	M.S.G.									
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<div><div>THERMOMETER</div><div>POCKET</div></div>										

NOTES :-

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- 2) REMOVE ALL BURRS.
- 3) MACHINED ALL OVER.

DESIGN DATA	
MAX. WORKING PRESSURE	106 Kg/cm ² (g)
MAX. WORKING TEMP.	520 °C



01.	BAR	Ø40 x 380 LG.		-	1X	3.75				
		SA-182-Gt-F-22-CL-3								
PT NO	DESCRIPTION	MATL.SIZE		UW KG	QTY.	TW KG	DRG.NO.		REMARKS	
		QUALITY					CODE NO.			
DRAWN	G.P.P..	DATE		17.12.2014					TOTAL WEIGHT	3.75 Kgs
CHECKED	S.G.S.	SCALE		1:1						
APPROVED	M.S.G.									

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THERMOMETER

POCKET

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Transmitters Specification Sheets-R0

Project :1 x 35TPH Pulsating Grate Boiler

Client : M/s M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar

EPC Contractor : Uttamenergy Ltd.



PROJECT NAME : 1 x 35TPH Pulsating Grate Boiler
 CLIENT : M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar
 PART CODE : PT615ATR00

ITEM:- PRESSURE TRANSMITTER


GENERAL	1	Tag No.	Refer Table
	2	Description of Service	Steam, Water
	3	PID No.	PB615DCP02 & PB615DCP03
	4	Model No.	As Per Manufacturer
	5	Type	Electronic , Smart with HART Protocol
	6	Function	Transmit, Indicate
	7	Service	Gauge Pressure
	8	Calibrated Span	Refer Table Below
	9	Adjustable Range	As Per Manufacturer
	10	Over pressure	As Per Manufacturer
	11	Accuracy	0.075% Of Span
	12	Power Supply	24V DC (2-Wire)
	13	Output	4-20 mA DC
BODY	14	Process connection	1/2" NPT-14 (F)
	15	Housing	IP66
	16	Body Material	Polyurethane Covered Aluminium
	17	Mounting	Bracket for 2-in. Pipe Mounting
	18	Conduit Entry Size	Thread NPT 1/2"
ELEMENT	19	Isolating Diaphragm	SS 316L
	20	Fill Fluid	Silicon
OPTIONS	21	Cert/Approval Type	Non-Hazardous Area
	22	Meter	LCD Meter
	23	Zero and Span Adjust	By HART/Buttons
NOTES	24	Scope :- Transmitter + Mounting Bracket	
	25	The installation is outdoor.	
	26	Certificate :- Calibration certificate,	
	27	Operation & Maintenance manual shall be supplied with Transmitter	
	28	Digital communication shall be possible with Hand Held Communicator	
	29	For steam service condensate pot shall be supplied.	
	30	Output 4-20 mA DC shall be superimposed on Digital Signal.	
DOCUMENT TITLE		DATA SHEET FOR PRESSURE TRANSMITTER	
UTTAMENERGY LTD. PUNE			Prepared HKV Checked DHK Approved DHK Rev 0 Sheet 2 of 5

TAG LIST FOR PRESSURE TRANSMITTER

Sr. No.	Tag. No.	Service Description	Calibration Range	Unit	Remark	Qty
1	PT-109	DEAREATOR TANK STEAM PRESSURE	0 to 5	Kg/cm2	-	1
2	PT-126	BOILER FEED WATER DISCHARGE PRESSURE	0 to 120	Kg/cm2	-	1
3	PT-167	ATTEMPERATOR SPRAY INLET WATER PRESSURE	0 to 120	Kg/cm2	Without Display	1
4	PT-136	DEAREATOR PRS DOWNSTREAM PRESSURE	0 to 5	Kg/cm2	-	1
5	PT-148	STEAM DRUM PRESSURE	0 to 80	Kg/cm2	-	1
6	PT-153	SECONDARY SH INLET HDR PRESSURE	0 to 80	Kg/cm2	-	1
7	PT-155	SOOT BLOWER PRS DOWNSTREAM PRESSURE	0 to 40	Kg/cm2	Without Display	1
8	PT-160	MAIN STEAM LINE PRESSURE	0 to 70	Kg/cm2		1
9	PT-280	INSTRUMENT AIR PRESSURE AT DISCHARGE AFTER DRYER	0 to 10	Kg/cm2	-	1
						9

Notes:

- 1) There can be minor change in calibration range, same shall be confirmed before dispatch of Transmitters.
- 2) Some of transmitters are without display type. If in future client have to change without to with LCD display,supplier have to confirm the provision shall be available in transmitter.

	PROJECT NAME : 1 x 35TPH Pulsating Grate Boiler		
	CLIENT : M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar		
	PART CODE : PT615ATR00		
ITEM:- DIFF. PRESSUR TRANSMITTER			
GENERAL	1	Tag No.	Refer Table
	2	Description of Service	Steam/Water/Air
	3	PID No.	PB615DCP02 , PB615DCP03 & PB615DCP09
	4	Model No.	As Per Manufacturer
	5	Type	Electronic , Smart with HART Protocol
	6	Function	Transmit, Indicate
	7	Service	Level Measurement
	8	Calibrated Span	Refer Table Below
	9	Adjustable Range	As Per Manufacturer
	10	Over Pressure	As Per Manufacturer
	11	Accuracy	0.075% Span
	12	Power Supply	24V DC (2-Wire)
	13	Output	4-20 mA DC
	BODY	14	Process connection
15		Housing	IP66
16		Body Material	Polyurethane Covered Aluminium
17		Mounting	Bracket for 2-in. Pipe Mounting
18		Conduit Entry Size	1/2" NPT
ELEMENT	19	Isolating Diaphragm	SS 316L
	20	Fill Fluid	Silicon Oil
OPTIONS	21	Cert/Approval Type	Non-Hazardous Area
	22	Meter	LCD Meter
	23	Zero and Span Adjust	By HART/Buttons
NOTES	24	Scope :- Transmitter + Mounting Bracket	
	25	The installation is outdoor.	
	26	Certificate :- Calibration certificate,	
	27	Operation & Maintenance manual shall be supplied with Transmitter	
	28	Output 4-20 mA DC shall be superimposed on Digital Signal.	
	29	Digital communication shall be possible with Hand Held Communicator	
DOCUMENT TITLE		DATA SHEET FOR DIFF. PRESSURE TRANSMITTER	
		UTTAMENERGY LTD. PUNE	Prepared HKV Checked DHK Approved DHK Rev 0 Sheet 4 of 5



PROJECT NAME : 1 x 35TPH Pulsating Grate Boiler
 CLIENT : M/s.Harinagar Sugar Mills Ltd,Harinagar, Dist.W.Bihar
 PART CODE : PT615ATR00

TAG LIST FOR DIFFERENTIAL PRESURE TRANSMITTER

Sr.no	Tag No	Service Description	Calibration Range	Unit	Remark	Qty
1	LT-105	DEAREATOR WATER LEVEL	-1990 to 0	mmH2O	-	1
2	DPT-114	BOILER FEED WATER PUMP-1 SUCTION STRAINER DIFF.PRESSURE	0 to 200	mbar	Without Display	1
3	DPT-118	BOILER FEED WATER PUMP-2 SUCTION STRAINER DIFF.PRESSURE	0 to 200	mbar	Without Display	1
4	FT-124	BOILER FEED WATER DISCHARGE FLOW	0 to 3000	mmH2O	-	1
5	FT-128	BOILER FEED WATER ATTEMPERATOR FLOW	0 to 3000	mmH2O	-	1
6	LT-147A	STEAM DRUM WATER LEVEL	-610 to 0	mmH2O	-	1
7	LT-147B	STEAM DRUM WATER LEVEL	-610 to 0	mmH2O	-	1
8	FT-161	MAIN STEAM LINE FLOW	0 to 5000	mmH2O	-	1
9	DT-226	FD FAN DISCHARGE DRAFT PRESSURE	0 to 400	mmH2O	Without Display	1
10	DT-196	HOT FD AIR APH OUTLET DRAFT PRESSURE	0 to 400	mmH2O	Without Display	1
11	FT-197	HOT FD AIR FLOW	0 to 100	mmH2O	-	1
12	DT-227	SA FAN DISCHARGE DRFAT PRESSURE	0 to 1000	mmH2O	Without Display	1
13	DT-228	HOT SA AIR APH OUTLET DRAFT PRESSURE	0 to 800	mmH2O	Without Display	1
14	DT-207	FURNACE DRAFT TRANSMITTER	-50 to 50	mmH2O	-	1
15	DT-211	BOILER BANK OUTLET FLUE GAS PRESSURE	-50 to 50	mmH2O	Without Display	1
16	DT-212	ECONOMIZER OUTLET FLUE GAS PRESSURE	-150 to 10	mmH2O	Without Display	1
17	DT-219	APH OUTLET FLUE GAS PRESSURE	-300 to 10	mmH2O	Without Display	1
18	DT-224	ESP OUTLET FLUE GAS PRESSURE	-500 to 10	mmH2O	Without Display	1
						18

Notes:

- 1) There can be minor change in calibration range, same shall be confirmed before dispatch of Transmitters.
- 2) Some of transmitters are without display type. If in future client have to change without to with LCD display,supplier have to confirm the provision shall be available in transmitter.

SPECIFICATION FOR SUPPLY OF DISTRIBUTED CONTROL SYSTEM (DCS)

PART NO : PB615DCS00 REV-00

PROJECT: 1x35 TPH @45 Kg/cm²(g), 515±5°C Pulsating Grate Boiler.

CUSTOMER: M/s. Harinagar Sugar Mills Ltd., Bihar.

DCS system shall be suitable for field instruments and automation instruments for following systems .

1. Boiler System
2. Electrical drive equipment Interfacing and distribution system.
3. Air Compressor
4. Ash Handling System
5. Rice Husk Handling System
6. Burner System

TECHNICAL SPECIFICATIONS FOR DCS

- ⊕ This specification presents all aspects of design, engineering, manufacture, assembly, supply, testing at manufacturer's works, delivery at site, erection & commissioning of DCS based control system required for effective & optimum control & monitoring of boiler , Ash Handling System, Air compressor, Electrical system interfacing equipment, RHHS & Burner System).
- ⊕ The DCS system offered shall be based on open system architecture to enable easy integration with Management Information System for plant wide automation. Instrumentation and control system shall be working on distributed process control technology that combines individual loop controls with centralized operation, display and control functions. The system shall consist of process control station and PC based operator station with color monitor, printers, operator keyboards for centralized supervision, monitoring, acquisition and operation of the boiler,AHS,Air compressor and electric drive equipment's and Burner System.
- ⊕ Distributed Digital Control System shall be provided for the safe and efficient operation of the Boilers , AHS, Air compressor, RHSS, Burner System and electric drives.
- ⊕ The DCS system shall have necessary hardware to hook up the following, through DI/DO or AI/AO or RS 485 on MODBUS protocol, for monitoring from DCS of AHS,Air compressor and electric drive equipment's.
- ⊕ The control function of the system shall be executed through microprocessor based control system having functional distribution and database distribution sub-system wise. The operating system shall be windows based. The system shall have a proven record of successful operation in similar

application for a minimum period of one year outside India. Modular system shall be adopted to facilitate easy system expansion.

- ⌘ The 'type' of modules shall be kept minimum possible in order to have interchangeability and low inventory. On-line replacement of any module shall be possible in such a way that removal and addition of module shall be possible without de-energizing the system. Furthermore, there should not be any interruption of the system while replacing a faulty module wherever redundant modules are provided.
- ⌘ The system design shall ensure that any single failure in system results in no loss in system operation.
- ⌘ The system shall provide safe operation under all plant disturbances and on component failure so that under no condition the safety of plant is jeopardized.
- ⌘ The system shall be internally protected against system errors and hardware damage resulting from electrical transients on power wiring, electrical transients on signal wiring and connecting and disconnecting devices or removing and inserting PCBs in the system.
- ⌘ The system shall be capable of accepting various signal inputs for its direct use while preventing noise errors due to electromagnetic interference or radio frequency.

Spare

IO count mentioned below not covers any spares IOs, supplier need to consider system for 1000 IOs spare on this quantity. The controller and data acquisition racks shall have 10% in-able spare space for installing additional I/O modules in future. In addition, internal wiring for the same shall be completed up to I/O terminal.

Third party system interface facility

DCS / PLC of other system makes will be interfaced with this DCS via MODBUS communication. Supplier shall provide the hardware and software required for this interfacing. Establishment of communication also shall be the responsibility of this DCS supplier.

General

DCS supplier shall furnish the complete list of bought out items with the list of makes for these items. Supplier shall get the make list approved by the buyer priority placement of order for such items.

SCOPE OF SUPPLY:-

The scope of supply of the supplier shall include but not be limited to the following.

Process control station comprising of central processing unit, communicator processor, power supply unit, various types of I/O cards, signal conditioning units and interfacing units. All these plug-in type modules shall be housed in a system cabinet for termination of all process incoming and outgoing signals. Marshalling cabinet housing auxiliary relays and having provision for termination of all process incoming and outgoing signals.

The DCS shall be Common for all Plant Equipment's, viz. Boiler, Ash handling system,Air Compressor.

- ⌘ Redundancy in processor, power supply and in communication level.
- ⌘ The system shall consist of **2 sets of terminals stations** with utility monitors with dedicated keyboards in the Control Room, with the following minimum specifications. The system supplied shall be fulfilling the minimum software requirements of the 2 terminal stations,one shall be operating station and another **one shall be engineering-cum-operating** station.
- ⌘ The system configuration shall be the latest available in the market at the time of supply and shall be complete with DVD writer etc.
- ⌘ 22" commercial grade TFT colour monitors (LCD/LED).
- ⌘ QWERTY key board and mouse.
- ⌘ one no. A4 colour laser printer (HP / Equivalent).
- ⌘ Furniture for placing the systems and printers and chairs.
- ⌘ Desk top panels to house monitors with chairs. Suitable computer furniture of good quality and aesthetic appearance for the engineering station shall also be provided by the supplier.
- ⌘ Complete cabling for inter panel wiring and also for the field wiring between DCS and the UPS.
- ⌘ The basic software to perform on real time.
- ⌘ All time Major functions not limited to the following.
- ⌘ Dynamic mimic display of the plant and process.
- ⌘ Process data display.
- ⌘ Alarm management.
- ⌘ Real time and historical trend display.
- ⌘ Shift report and management report generation.

- ⌘ Historical data storage for minimum duration (three month)
- ⌘ Self-testing of all the sub-systems shall be carried out periodically at the operator station and result shall be displayed on the monitor. It should generate a system alarm in case of any failure. Self-diagnostic features shall cover preferably up to card level.
- ⌘ UPS of suitable capacity , single UPS without redundancy battery backup and UPS output through static switch. The actual battery capacities shall be as per requirement. **3-Phase supply available at site is 415V,50Hz accordingly UPS shall be selected. Desired UPS output voltage is 230VAC,50Hz.**
- ⌘ Power distribution board to distribute UPS power to various users and Input DB shall be considered.
- ⌘ The online modification in logics, interlocking, and changes in report formats and graphics and alarm and tripping set points should be possible without disturbing normal plant operation.
- ⌘ DCS panel engineering including documentation and drawing generation, software development.
- ⌘ FAT of DCS at supplier's work.
- ⌘ Commissioning and SAT of DCS system at site.

SUPPLIER'S RESPONSIBILITY:-

- ⌘ Suppliers shall accept full system guarantee for all supplied hardware and software. The supplier shall involve in site activities such as installation, pre-commissioning and commissioning until successful handover to customer.

The supplier's responsibility shall include but not limited to the following items:

- ⌘ Detailed functional design specification for the hardware and software
- ⌘ System engineering
- ⌘ System hardware
- ⌘ System programming and configuration
- ⌘ System documentation
- ⌘ Recommended spare parts
- ⌘ Factory testing (FAT)
- ⌘ Packing & stripping
- ⌘ Installation services
- ⌘ Loop checking
- ⌘ Warranty
- ⌘ Training

- ☞ Control strategy designs
- ☞ Control configuration
- ☞ Console configuration including operator displays
- ☞ History database & reports
- ☞ Control strategy start up including tuning
- ☞ Operation & maintenance manuals including spare-parts catalogue
- ☞ Supply of original latest version of all applicable licensed software
- ☞ Complete passwords have to be handed over

TECHNICAL REQUIREMENTS OF DCS:-

DCS described in the specification shall be a state of the art microprocessor based process control & data acquisition system.

The DCS shall be used for monitoring, control and data acquisition. The system shall consist of following sub systems.

- ☞ Control sub system
- ☞ Data acquisition sub system
- ☞ Operator cum engineering console sub system
- ☞ Communication sub system
- ☞ Data base sub system

DCS shall be with LCD/LED based operation. The entire system shall be bus organized and the plant operator shall run the equipments through screens and key boards.

High grade quality components and proper design of system electronic are required for the system. The system shall have modular construction and it will be expandable in future by adding additional modules. The type of modules shall be kept to the minimum possible in order to have interchangeability and low spares inventory. The system software shall be governed by the operating system running in a real time mode. It shall meet all functional requirements specified in this specification as a minimum. It shall be possible to study the process dynamics of process control loops, such as response time, dead time, and lead or lag time etc. from operator console. Sufficient and additional software capacity shall be available in the system to take care of spares requirement as specified earlier to meet all functional requirements.

The DCS shall have the controller subsystem which shall be interfaced with field instruments. This subsystem will provide close loop & open controls.

Operator system for monitoring and controlling process parameters and performing other process related functions.

Different control loops shall be able to be operated either in manual mode / cascade mode / auto mode. Mode changeover in either direction shall be procedure-less & bump-less.

It shall be possible to change set point, tuning constant, operating mode, from the operator's interface keyboard. Controller configuration, altering the set points for trip & alarm shall be done from the keyboard. But all control loops shall have adaptive gain feature.

The scan time of closed loops shall be not greater than 200 ms and for other loops it shall not be greater than 500 ms.

The scan time shall be programmable for different values based on loop priority. The system shall have PID control & auto manual control.

PID with cascade control and with ratio control.

Computation of arithmetic functions: (Addition, subtraction, multiplication, division, average & square root). Or, nor, not, nand etc). Sequential control, Time delay, High/low select, Totalizing/integration, Open sensor detection, Linearization & compensation for thermocouple/RTD of cold junction, Thermocouple / RTD burnt out protection, Pressure & temperature compensation for flow measurement, Processing of linear & non-linear analogue inputs, general equation block to perform other functions, Lead-lag along with feed-forward features for certain controls (combustion control of boiler).

Following system features shall also be included.

- ⌘ Watchdog timer to prevent uncontrolled running of programs.
Real time clock.
- ⌘ Memory management & protect hardware.
- ⌘ Floating point arithmetic with at least six digit accuracy.

All analog inputs except temperature inputs shall be 4 - 20 mA only. Any other sensor output shall be converted to 4-20 mA before connecting to DCS Analog input card.

The following graphics displays shall be available as a minimum -

Alarm display (first out facility for annunciation shall be Provided. Different status of alarms and most important alarm also shall be indicated by different colours).

- ⌘ Overview display for monitoring the entire system (P & ID)
- ⌘ Dynamic graphic display to suit Buyer's requirement.
- ⌘ Trend display for both real time and historical data.
- ⌘ Tuning display for tuning parameters.
- ⌘ Operator guide message display.
- ⌘ System build-up and maintenance.
- ⌘ Alarm list storage.

The alarm status on graphics should be indicated by change in colour and flashing accompanied by audible alarm. Provision of configuring alarm setting and single alarm inhibit feature shall be provided. Latest alarm shall appear on the screen irrespective of acknowledgment of previous alarm.

Maintenance function for on-line configuration / reconfiguration for various types of displays and graphics shall also be provided.

Each operator work station shall be provided with 64 key functional keyboard and mouse. Provisions shall exist to assign a 'user's password' key lock to the keyboard to prevent unauthorized access to the data bank. The no. of keystrokes required for accessing loop in alarm, any other loop and group of loops shall be minimum. On-line diagnostic routine shall run continuously or periodically. Detected failure shall be displayed in graphics / terminal with proper description. The following minimum diagnostic checks shall be performed by the system.

- ⌘ Peripheral failure.
- ⌘ Memory failure.
- ⌘ Parity error.
- ⌘ Pregame hang-up.
- ⌘ Power supply failure.
- ⌘ Input failure.
- ⌘ Interface failure.
- ⌘ Output failure.
- ⌘ Short circuit / open circuit.

The operator work station shall have the following functional requirements.

The configuration shall be in such a way that any of the plant graphics can be viewed from any operator station.

It shall be possible to change control assignments to allow control any plant area from any operator work station.

Engineering station shall have the following functional requirements.

- ✧ All the capabilities of the OS.
- ✧ Communication with all the sub systems.
- ✧ Alarm setting.
- ✧ Control loop configuration and changing of Parameters etc.
- ✧ Setting of real time clock.
- ✧ Compiling of logs, reports, historic trends, Points etc.
- ✧ Tuning of control loops.
- ✧ Graphic generation.
- ✧ Report generation.
- ✧ System failure diagnosis.
- ✧ Facility for taking back up via storage media. (CD, DVD, USB port for Pen drive etc.)

1. Reports

The system shall print end-of-the-shift report, and end-of-the-day report, at midnight everyday & shall be stored. The capability shall also be provided to print these reports on operator demand. Also while preparing a shift or day's report there shall be a field which shows the average readings of the shift / day.

2. Post trip analysis log

The post trip analysis shall be provided to record operating data during the Period immediately before and after a unit trip.

The computer shall continue to read data and store data at one minute intervals for 5 minutes after the trip. The data log shall then be printed on demand.

3. Trend display

The system shall be capable of displaying the real time and historical trends for the parameters of variables like measured variable, set point, output, calculated variable, etc.

It shall be possible to display by scrolling or expanding the time base for all the trends. Historical data shall be stored on the non-volatile memory device like hard disc in such a way that such historical data can be utilized for archival storage and subsequent recall. The supplier shall indicate maximum possible period storage. (Minimum 3 year data storage capacity is required).

Historical data trends shall be displayed for a period of minimum up to 3 months for a data-sampling rate of 1 hour. The system should have a sequential event recorder with 1 millisecond time stamping.

4. System loading

The system loading for controllers shall not exceed 60 %. The loading as indicated is the worst case of high system activity referred to the use of memory, CPU time and communication capacity for this sub system. In the mimics, important parameters of boilers shall be displayed in all pages. A start up page showing overall view of the plant shall be displayed. Input to the system shall be through key board also in case of failure of mouse. The communication cable speed shall be designed for min. 10 mbps.

5. Input / output modules

IO Count for DCS system shall be as below..

i) Digital Inputs (Potential Free)	: 366
ii) Digital Output (Potential Free)	: 319
iii) Analog Inputs (4-20mA)	: 102
iv) RTD (PT-100)	: 11
v) Thermocouple (K-Type)	: 10
vi) Analog Outputs (4-20mA)	: 42

Note:

1) Above IO count not includes any spare capacity. **Supplier need to consider the system for 1000 IOs.**

2) RTD and thermocouple signals shall be changed to 4-20mA DC current signal. For RTD and Thermocouple inputs supplier to provide loose din rail mounted temperature converters/transmitters (2-wire loop powered). Purchaser will mount these converters in junction boxes. DCS shall receive 4-20mA signal from all these converters/transmitters.

Data acquisition sub-system shall interface and multiplex analog and discrete inputs from open loops. The inputs shall include 4-20 mA (2 wire and 4 wire) DC, thermocouple, resistance temperature detector and discrete contacts. The I/O modules shall be of intelligent type. The I/O modules shall be capable of processing linear and non-linear analog inputs, linearization and compensation for thermocouple, linearization of RTD inputs, and square root extraction for flow inputs. Each I/O shall be isolated from the external control circuit and shall be of hot swappable.

Each I/O shall be protected from short circuit and reverse polarity of power voltage.

Each processor and each I/O rack shall have a separate independent power supply.

Failure of one power supply shall not affect the system operation. Each I/O shall

be galvanically isolated from external control circuit. Each I/O shall be protected against the reversal of polarity of the power voltage. Each I/O module shall have a LED per channel to indicate the status of each I/O.

Each input shall be provided with filters to filter out any noise in the input line and contact bouncing noise.

Isolation between outputs to field may be achieved through the relays and the same should be mounted in separate relay bases only. Each output shall be short circuit proof and protected by fuse. Visual indication of fuse blown must be provided for each module.

The analog input modules shall be able to power 4 -20 mA field instrumentation loops with loop resistor of 600 ohms. The I/O modules shall be capable of supporting smart transmitters with digital communicators like HART and Foundation Field bus. Contact interrogation voltage for digital inputs shall be 24 D.C. The system shall be capable of detecting digital input transition with duration of 50 milliseconds.

6. Power supply 4 to 20 mA (for transmitters connected directly, 24 V DC shall be fed from the DCS, thermocouple inputs) 4 to 20 mA Potential free inputs (24 V DC fed from DCS) Relay output the system shall normally operate on 230 V AC, 50 Hz uninterrupted power supply. Power supply shall be made available at one point. Further power distribution network shall be designed such that a single power fault in any instrument branch system shall not cause a trip of the entire system. Each consumer shall be provided with a separate switch and fuse for isolation and protection of the system.

All power supplies shall have one to one redundancy and shall be sized for full load. All the controllers shall be provided with redundant power supply with battery backup for RAM memory for a minimum period of 72 hrs in case of power failure. All field mounted transmitters connected to DCS shall have redundant power supply. The power supply cubicle shall be mounted on the racks of the system cabinet.

All transmitters are powered by analog input modules. Each power supply branch shall have a separate switch and fuse.

All electrical terminals inside the system racks and consoles shall be clearly numbered and permanently identified on the terminals and the system wiring drawings.

For 2 wire inductive proximity type sensor the 24 V DC supply for interrogation shall be derived by the supplier. For 4 wire transmitters supplier shall provide individual power supply from power distribution boards with suitable circuit

breakers located in the power supply distribution boards (230V single phase 50Hz from UPS). The power supply board shall be maintained in a separate cabinet.

Electrical wiring shall be in accordance with applicable electrical standards. Wiring diagrams shall be complete with grounds in recommended wire sizes, type and shielding required for the electrical circuits between components that are to be wired.

7. Marshalling and System cabinet

In general all cabinets / racks are to be provided with earthing point. Cabinets to install the different hardware mentioned under various sections shall be made from 2 mm thick HRCA sheet steel and structural steel, totally enclosed, free standing floor mounting type, suitable for indoor use, with bottom cable entry. The system shall be designed for front access to components, terminals and wiring. The cabinet construction shall be bolted type. The components / printed circuit boards shall be suitably mounted within the cabinets for easy access. The cabinets doors shall be provided with sheet steel hinged doors with neoprene gaskets. Hinges shall be concealed. Doors and covers shall be provided with stiffeners, wherever necessary to improve rigidity.

The cabinets shall be provided with 3mm thick bottom glanding plate which shall be removable from inside.

All cabinets power & control / signal wiring shall be of PVC insulated, stranded tinned copper conductors of suitable size. All inter system cabinet's cables are in DCS supplier's scope.

Suitable cabinets lighting shall be provided. All the panels shall have fans for cooling purpose.

The power supply cubicle shall be mounted on the racks of the system cabinet.

I/O Rack shall be with non-conformal coating and comply surge protection conforming to IEEE- 4721 1974 and lightning protection. 20% space shall be made available for accommodating I/O modules in future.

Dedicated remote I/O racks for each MCC I/Os, if planned, shall be kept in the MCC room itself.

8. Cables and Wiring practices

Instrument cubicle/panel wiring shall be such that minimum crossing of signal cables are encountered. Instrument/device located in left (and right) hand side of panel/cubicle should be terminated in left (and right) side terminal block respectively so as to minimize inter crossing of wires in panel / cubicles. Cable

duct provided for cabling inside the DCS panel shall be minimum 100 mm. The terminal block shall be of **single decks** only.

Alternate fused terminal blocks are to be provided for all the input /output signals. All the signal cables shall be screened. All multi core cables shall have individual and overall screening. Only **multi stranded Copper conductor** shall be used.

In the case of multi pair cable copper conductor shall be multi strand and individual pair shall be twisted.

The maximum number of cores for the interconnection between DCS rack and MCC DI / DO marshalling box shall be restricted to 40 only.

For the control cable from field junction box to DCS DI / DO rack, the number of cores may be 24, 12 or 7.

9. Earthing

Each panel, console, cabinet and other equipment in control room shall be provided with an earthing lug which will be completely isolated from the A.C. Mains earthing bus.

10. Inspection & Testing

The supplier shall submit basic guidelines to distributed digital control system for factory testing and acceptance, installation, commissioning and field acceptance of the fully integrated system.

These guidelines shall also be applicable to all sub-systems and hardware supplied by DCS supplier.

Supplier shall submit his own testing, installation, commissioning and acceptance procedures. (For hardware's, the procedures shall include purpose of test. Test definition of input, procedure, results expected and acceptance criteria. For software's, it shall include details of the method, list of tests, sequence of execution, results expected and acceptance criteria). The FAT shall be approved by Buyer / Consultant.

During FAT any specified functions are not completely achieved satisfactorily, supplier to replace/modify the hardware or software, as required. No material or equipment shall be dispatched without proper certification by the buyer.

Supplier shall conduct any other tests required other than the approved FAT procedure at the time of FAT.

If any subsystem or equipment fails / malfunctions during the FAT, the test shall be terminated and the entire procedure shall be repeated after replacement of the malfunctioned / failed subsystem or equipment.

11. Training

The distributed control system training shall include the engineering operator personnel training.

NOTE:- DCS supplier shall strictly follow the above specification. Supplier to submit technical compliance with no deviation letter for above specification. If any deviation required, same shall be get approved from purchaser/consultant/end user on separate document. Approval on technical offer does not mean approval to deviation or approval to scope/specification mentioned given in this document.