

1500 MW (NOMINAL) PRAGATI – III CCPP

VOLUME – II B & III

**TECHNICAL SPECIFICATION
FOR MANDATORY SPARES OF
PRETREATMENT PLANT
CW TREATMENT PLANT
CHLORINE DIOXIDE SYSTEM
EFFLUENT TREATMENT PLANT
CHLORINATION PLANT
SIDE STREAM FILTRATION
&
SEWAGE TREATMENT PLANT**

SPECIFICATION NO.: PE-TS-314-158-A001M



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

	TITLE:	SPECIFICATION NO. PE-TS-314-158-A001M
	1500 MW PRAGATI – III CCPP	VOLUME - II B & III
	TECHNICAL SPECIFICATION FOR MANDATORY SPARES OF PRETREATMENT PLANT CW TREATMENT PLANT CHLORINE DIOXIDE SYSTEM EFFLUENT TREATMENT PLANT CHLORINATION PLANT SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT	SECTION -
		REV.NO. 0 DATE :

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	CW TREATMENT PLANT	SECTION - A
	CHLORINE DIOXIDE SYSTEM EFFLUENT TREATMENT PLANT CHLORINATION PLANT SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT	REV.NO. 0 DATE :

SECTION - A
INTENT OF SPECIFICATION

	TITLE: 1500 MW PRAGATI – III CCPP TECHNICAL SPECIFICATION FOR MANDATORY SPARES OF PRETREATMENT PLANT CW TREATMENT PLANT CHLORINE DIOXIDE SYSTEM EFFLUENT TREATMENT PLANT CHLORINATION PLANT SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT	SPECIFICATION NO. PE-TS-314- 158-A001M VOLUME - II B SECTION - A REV.NO. 0 DATE :

1.0 SCOPE:

- 1.1 This specification is intended to cover supply and dispatch to power station site, of the mandatory spares for as specified here in after for **PRETREATMENT PLANT, CW TREATMENT PLANT, CHLORINE DIOXIDE SYSTEM, EFFLUENT TREATMENT PLANT, CHLORINATION PLANT, SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT for 1500 MW PRAGATI – III CCPP.**
- 1.2 It is not the intent to specify all the details of the design & manufacturer. However, the equipment shall conform in all respect to high standard of design, engineering & workmanship and shall be capable of performing the required duties in a manner acceptable to Engineer / Owner, who will interpret the meaning of drawing & the specification & shall be entitled to reject any work or material, which is not in full accordance herewith.
- 1.3 General terms & conditions, instructions to the bidder and other attachments referred to elsewhere, made part of tender specification. The bidder shall be responsible for all governed by requirements stipulated hereinafter.
- 1.4 The equipments covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and shipping release issued by BHEL/Customer or BHEL & Customer.
- 1.5 In the event of any conflict between the various sections of the specification, bidder shall bring the same to the attention of the BHEL during pre-bid clarification stage before bid submission.
- 1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under VOL-III of the specification. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of BHEL / Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by BHEL/ Customer as and when brought to their notice either by the bidder or by BHEL/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication to BHEL / Customer.
- 1.7 Pre bid clarification regarding any ambiguity or missing information has to be raise by bidder before bid submission. After submission of bid, clarifications raised by bidder in their offer may be reply by BHEL but no price implication / impact (positive / negative) shall be entertain by BHEL / customer w.r.t. reply given by BHEL for said clarification.
- 1.8 Deviations along with cost of withdrawal (positive or negative), if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with tender specification & there is no deviation. (Price to be given in sealed envelope only.)

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SECTION – B

PROJECT INFORMATION



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SPARES OF PRETREATMENT PLANT
CW TREATMENT PLANT
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CHLORINATION PLANT
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Clause No.	PROJECT INFORMATION
1.03.00	Land Availability The land identified for the project is in physical possession of PPCL. Bidders are advised to visit the plant site for getting acquainted with the conditions prevailing at site.
1.04.00	Fuel Availability RLNG/Natural Gas would be used as the main fuel for the project.
1.04.01	Natural Gas Employer shall make RLNG / Natural Gas available at a pressure of about 40 Kg/cm² at a terminal point near Plant Boundary. Expected composition of RLNG/ Natural Gas shall be as indicated at Annexure-I.
1.05.00	Water Availability Make up water for the plant shall be treated sewage water drawn from Rithala sewage treatment plant.
1.06.00	Quality of Raw Water Raw Water Analysis from above source is enclosed at Annexure - II.
1.07.00	Meteorological Data Important meteorological data as obtained from Safdarjund Obseavatory, Delhi based on observations from year 1951 to 1980 is enclosed at Annexure-III.
1.08.00	Wind Design Criteria Criteria for Wind resistant design of structures and equipment shall be as per Annexure-IV.
1.09.00	Earthquake Design Criteria Criteria for earthquake resistant design of structures and equipment shall be as per Annexure-V.



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Clause No.	PROJECT INFORMATION		
	ANNEXURE - I PAGE 1 OF 1		
	SPECIFICATION OF NATURAL GAS/RLNG :		
S.N	PROPERTY	UNIT	VALUE
1.	COMPOSITION		
	a) Methane (C1)	% Molar	85 - 100
	b) Ethane (C2)	% Molar	0 - 10
	c) Propane (C3)	% Molar	0 - 5
	d) Butane (C4) & heavies	% Molar	0 - 3
	e) Pentane (C5) & heavies	% Molar	0 - 0.5
	f) Nitrogen	% Molar	0 - 1.25
	g) Oxygen (O ₂)	% Molar	0 - 0.5
	h) Total non-hydro carbons	% Molar	0 - 2.0
2.	LOWER HEATING VALUE		
	- Minimum	Kcal/SCM	8100
	- Maximum	Kcal/SCM	9500
3.	SUPPLY PRESSURE	Kg/cm ²	40
4.	SUPPLY TEMPERATURE		
	a) Minimum	Degree C	5
	b) Normal	Degree C	30
	c) Maximum	Degree C	50
5.	CONTAMINANTS		
	a) Trace Metals		
	i) Pb + Zn	ppm (wt)	0.5 (Max)
	ii) Na + K	ppm (wt)	0.3 (Max)
	iii) Vanadium	ppm (wt)	0.5 (Max)
	iv) Calcium	ppm (wt)	2.0 (Max)
	v) Magnesium	ppm (wt)	2.0 (Max)
	vi) Sum of Hevy Metals	ppm (wt)	1.0 (Max)
	b) Liquid	% (wt)	NIL
	c) Moisture	Kg/million SCM	112 (Max)
	d) Hydrogen Sulphide	ppm (wt)	5 (Max)
	e) Total Sulphur	ppm (wt)	15 (Max)



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Clause No.	PROJECT INFORMATION		
	ANNEXURE - II PAGE 1 OF 2		
	RAW WATER ANALYSIS PRAGATI III CCPP		
	The raw water analysis shall be as follows:		
Sl. No.	Parameters Description	Unit	
1.	pH	7.4	
2.	Total Suspended solids	20-500	
3.	Total dissolved Solids	961	
4.	Conductivity at 25 deg C	1456	
5.	Total Hardness (as CaCO ₃)	250	
6.	Calcium Hardness (as CaCO ₃)	153	
7.	Magnesium Hardness (as CaCO ₃)	95	
8.	Sodium (as Na)	200	
9.	Potassium (as K)	20	
10.	Phenolphthalein alkalinity (as CaCO ₃)	Nil	
11.	Methyl Orange alkalinity (as CaCO ₃)	380	
12.	Sulphate (as SO ₄)	104	
13.	Chlorides (as Cl)	197	
14.	Nitrates (as NO ₃)	5	
15.	Total Phosphate (as PO ₄)	12	
16.	Fluoride (as F)	1	
17.	Barium (as Ba)	0.8	
18.	Strontium (as Sr)	0.5	
19.	Total Silica (as SiO ₂)	14	



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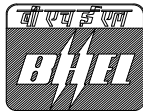
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Clause No.	PROJECT INFORMATION		
	ANNEXURE - II PAGE 2 OF 2		
Sl. No.	Parameters Description	Unit	
20.	Molybdate Reactive Silica (as SiO ₂)	10.5	mg/ltr.
21.	Colloidal / Molybdate Unreactive Silica (as SiO ₂)	1.0	mg/ltr.
22.	Biochemical Oxygen demand at 20° C for 5 days	20-45	mg/ltr.
23.	Chemical oxygen demand	100-120	mg/ltr.
24.	Total Kjeldhal Nitrogen (as N)	20-45	mg/ltr.
25.	Ammoniacal nitrogen (as N)	15-25	mg/ltr.
26.	Residual Chlorine (as Cl ₂)	0.25	mg/ltr.



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Clause No.	PROJECT INFORMATION													
ANNEXURE-III PAGE 1 OF 1	Climatological Table based on the Observations at Saldarjung Observatory (1951-1980)													
	AIR TEMPERATURE							CLOUD Amount						
	RAIN FALL							Relative Humidity						
	Extreme							All cloud						
	Low-est							Monthly total						
	High-est							No. of Rainy days						
	Lowest in the month							mm						
	Highest in the month							Kmph						
	Mean							Oclas						
	Daily max.							%						
	Wet bulb							°C						
	Dry bulb							°C						
	JAN							JAN						
	FEB							FEB						
	MAR							MAR						
	APR							APR						
	MAY							MAY						
	JUN							JUN						
	JUL							JUL						
	AUG							AUG						
	SEP							SEP						
	OCT							OCT						
	NOV							NOV						
	DEC							DEC						

Note : Recent Meteorological data may be collected from Indian Meteorological Department



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Clause No.	PROJECT INFORMATION																												
	ANNEXURE - IV PAGE 1 OF 1 CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT All structures shall be designed for wind forces in accordance with IS: 875 (Part-3) and as specified in this document. The various design parameters, as defined in IS: 875 (Part-3), to be adopted for the project site shall be as follows; <table><tr><td>(a)</td><td>The basic wind speed "V_b" at ten metres above the mean ground level</td><td>:</td><td>47 metres/second</td></tr><tr><td>(b)</td><td>The risk coefficient "K_r"</td><td>:</td><td>1.07</td></tr><tr><td>(c)</td><td>Category of terrain</td><td>:</td><td>Category-1</td></tr></table> Note: Notwithstanding the values of the above mentioned parameters, the design wind pressure so computed at any point shall not be taken less than 1500 N/Sq. metre for all classes of structures, i.e A,B & C, as defined in IS : 875 (Part-3). Along wind forces shall generally be computed by the Peak (i.e. 3 second gust) Wind speed method as defined in the standard. Along wind forces on slender and wind sensitive structures and structural elements shall also be computed, for dynamic effects, using the Gust Factor or Gust Effectiveness Factor method as defined in the standard. The structures shall be designed for the higher of the forces obtained from Gust Factor method and the Peak Wind Speed method. Analysis for dynamic effects of wind must be undertaken for any structure which has a height to minimum lateral dimension ratio greater than "5" and/or if the fundamental frequency of the structure is less than 1 Hz. Susceptibility of structures to across-wind forces, galloping, flutter, ovalling etc. should be examined and designed/detailed accordingly following the recommendations of IS : 875 (Part-3) and other relevant Indian standards. It should be estimated if size and relative position of other structures are likely to enhance the wind loading on the structure under consideration. Enhancement factor, if necessary, shall suitably be estimated and applied to the wind loading to account for the interference effects. Damping in Structures The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for: <table><tr><td>(a)</td><td>Welded steel structures</td><td>:</td><td>1.0%</td></tr><tr><td>(b)</td><td>Bolted steel structures</td><td>:</td><td>2.0%</td></tr><tr><td>(c)</td><td>Reinforced concrete structures</td><td>:</td><td>1.6%</td></tr><tr><td>(d)</td><td>Steel stacks</td><td>:</td><td>As per IS :6533 & CICIND Model Code whichever is more critical</td></tr></table>	(a)	The basic wind speed " V_b " at ten metres above the mean ground level	:	47 metres/second	(b)	The risk coefficient " K_r "	:	1.07	(c)	Category of terrain	:	Category-1	(a)	Welded steel structures	:	1.0%	(b)	Bolted steel structures	:	2.0%	(c)	Reinforced concrete structures	:	1.6%	(d)	Steel stacks	:	As per IS :6533 & CICIND Model Code whichever is more critical
(a)	The basic wind speed " V_b " at ten metres above the mean ground level	:	47 metres/second																										
(b)	The risk coefficient " K_r "	:	1.07																										
(c)	Category of terrain	:	Category-1																										
(a)	Welded steel structures	:	1.0%																										
(b)	Bolted steel structures	:	2.0%																										
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Clause No.	PROJECT INFORMATION												
	ANNEXURE - V PAGE 1 OF 2 CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT FOR PRAGATI -III AT BAWANA All structures shall be designed for seismic forces adopting the site specific seismic information provided in this document and using the other provisions in accordance with IS: 1893 (Part 1) - 2002 and IS: 1893 (Part 41) - 2005. Pending finalization of Partss 2, 3 and 5 of IS: 1893, provisions of part-1 shall be read along with the relevant clauses of IS: 1893 - 1984, for structures other than the buildings and industrial structures including stack like structures. A site specific seismic study has been conducted for the project site. The site specific design acceleration spectra (in units of gravity acceleration 'g') for the various damping ratios are as given at Annexure-EQ1. Vertical acceleration spectral values shall be taken as 2/3rd of the corresponding horizontal values. The site specific design acceleration spectra shall be used in place of the response acceleration spectra, given at figure-2 in IS: 1893 (Part 1) and Annex B of IS: 1893 (Part 4). The site specific acceleration spectra specified in Annexure-EQ1 includes the effect of the zone factor ($Z/2$) for design basis earthquake (DBE). The importance factor (I) and response reduction factor (R) as used in the IS: 1893 (Part- 1 and Part- 4) are to be considered. Damping in Structures The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for: <table><tr><td>(a)</td><td>Steel structures</td><td>:</td><td>2%</td></tr><tr><td>(b)</td><td>Reinforced Concrete structures</td><td>:</td><td>5%</td></tr><tr><td>(c)</td><td>Steel stacks</td><td>:</td><td>2%</td></tr></table> Method of Analysis Since most structures in a power plant are irregular in shape and have irregular distribution of mass and stiffness, dynamic analysis for obtaining the design seismic forces shall be carried out using the response spectrum method. The number of vibration modes used in the analysis should be such that the sum total of modal masses of all modes considered is at least 90 percent of the total seismic mass and shall also meet requirements of IS:1893 (Part-1). Modal combination of the peak response quantities shall be performed as per Complete Quadratic Combination (CQC) method or by an acceptable alternative as per IS:1893 (Part-1).	(a)	Steel structures	:	2%	(b)	Reinforced Concrete structures	:	5%	(c)	Steel stacks	:	2%
(a)	Steel structures	:	2%										
(b)	Reinforced Concrete structures	:	5%										
(c)	Steel stacks	:	2%										



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Clause No.	PROJECT INFORMATION
	ANNEXURE - V PAGE 2 OF 2 In general, seismic analysis shall be performed for the three orthogonal (two principle horizontal and one vertical) components of earthquake motion. The seismic response from the three components shall be combined as specified in IS: 1893 (Part-1). For buildings, If the design base shear (V_B), obtained from modal combination, is less than the base shear (V_B), computed using the approximate fundamental period (T_a) given in IS: 1893, Part-1 and using site specific acceleration spectra, the response quantities (e.g. member forces, displacements, storey shears and base reactions) shall be enhanced in the ratio of V_B / V_B. However, no reduction is permitted if V_B is less than V_B. For regular building less than 12m in height, design seismic base shear and its distribution to different floor levels along the height of the building may be carried out as specified under clause 7.5, 7.6 & 7.7 of IS: 1893 (Part-1) and using site specific design acceleration spectra. The design horizontal acceleration spectrum value (A_h) shall be computed for the fundamental natural period as per clause 7.6 of IS: 1893 (Part-1) using site specific spectral acceleration given in Annexure-EQ1. Further, the spectral acceleration coefficient shall get restricted to the peak spectral value if the fundamental natural period of the structure falls to the left of the peak in the spectral acceleration curve. Design/Detailing for Ductility Structures shall be engineered and detailed in accordance with relevant Indian/ International standards to achieve ductility.



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Clause No.	PROJECT INFORMATION		
	APPENDIX-EQ1 TO ANNEXURE-V PAGE 1 OF 6 Recommended Design Spectral Acceleration Values for 2% and 5% damping		
	Period(sec)	Spectral acceleration (g) Damping ratio	
		2%	5%
	0.01	0.165	0.165
	0.02	0.171	0.171
	0.03	0.182	0.181
	0.04	0.200	0.196
	0.05	0.226	0.215
	0.06	0.258	0.236
	0.07	0.291	0.255
	0.08	0.319	0.272
	0.09	0.341	0.287
	0.10	0.366	0.304
	0.11	0.397	0.327
	0.12	0.431	0.354
	0.13	0.457	0.380
	0.14	0.474	0.401
	0.15	0.481	0.412
	0.16	0.483	0.414
	0.17	0.485	0.412
	0.18	0.483	0.408
	0.19	0.481	0.404
	0.20	0.477	0.393
	0.21	0.472	0.383
	0.22	0.464	0.372
	0.23	0.456	0.362
	0.24	0.447	0.353
	0.25	0.439	0.345
	0.26	0.431	0.337
	0.27	0.424	0.331
	0.28	0.419	0.326
	0.29	0.415	0.322
	0.30	0.412	0.319



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Clause No.	PROJECT INFORMATION		
	APPENDIX-EQ1 TO ANNEXURE-V PAGE 2 OF 6 Recommended Design Spectral Acceleration Values for 2% and 5% damping		
Period(sec)	Spectral acceleration (g) Damping ratio		
	2%	5%	
0.31	0.409	0.316	
0.32	0.406	0.314	
0.33	0.403	0.312	
0.34	0.400	0.310	
0.35	0.395	0.309	
0.36	0.391	0.307	
0.37	0.386	0.306	
0.38	0.380	0.304	
0.39	0.374	0.303	
0.40	0.368	0.302	
0.41	0.362	0.302	
0.42	0.356	0.301	
0.43	0.349	0.301	
0.44	0.344	0.300	
0.45	0.339	0.300	
0.46	0.334	0.300	
0.47	0.330	0.300	
0.48	0.326	0.300	
0.49	0.323	0.300	
0.50	0.320	0.300	
0.51	0.318	0.300	
0.52	0.316	0.300	
0.53	0.315	0.300	
0.54	0.315	0.299	
0.55	0.315	0.299	
0.56	0.315	0.298	
0.57	0.315	0.298	
0.58	0.316	0.296	



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EFFLUENT TREATMENT PLANT
CHLORINATION PLANT
SIDE STREAM FILTRATION
&
SEWAGE TREATMENT PLANT**

Clause No.	PROJECT INFORMATION		
	APPENDIX-EQ1 TO ANNEXURE-V PAGE 3 OF 6 Recommended Design Spectral Acceleration Values for 2% and 5% damping		
	Period(sec)	Spectral acceleration (g) Damping ratio	
		2%	5%
	0.60	0.316	0.295
	0.62	0.317	0.293
	0.64	0.317	0.290
	0.66	0.316	0.287
	0.68	0.314	0.283
	0.70	0.311	0.279
	0.72	0.306	0.274
	0.74	0.301	0.269
	0.76	0.295	0.264
	0.78	0.288	0.258
	0.80	0.281	0.252
	0.82	0.274	0.246
	0.84	0.268	0.241
	0.86	0.262	0.235
	0.88	0.256	0.229
	0.90	0.251	0.224
	0.92	0.246	0.218
	0.94	0.242	0.213
	0.96	0.238	0.207
	0.98	0.236	0.202
	1.00	0.233	0.197
	1.05	0.232	0.192
	1.10	0.231	0.188
	1.15	0.230	0.184
	1.20	0.230	0.180
	1.25	0.231	0.177
	1.30	0.231	0.175
	1.35	0.232	0.173
	1.40	0.232	0.171



TITLE:

1500 MW PRAGATI – III CCPP

SPECIFICATION NO. PE-TS-314-
158-A001M

VOLUME - II B

SECTION - B

REV.NO. 0 DATE :

**TECHNICAL SPECIFICATION FOR MANDATORY
SPARES OF PRETREATMENT PLANT
CW TREATMENT PLANT
CHLORINE DIOXIDE SYSTEM
EFFLUENT TREATMENT PLANT
CHLORINATION PLANT
SIDE STREAM FILTRATION
&
SEWAGE TREATMENT PLANT**

Clause No.	PROJECT INFORMATION		
	APPENDIX-EQ1 TO ANNEXURE-V PAGE 4 OF 6 Recommended Design Spectral Acceleration Values for 2% and 5% damping		
	Period(sec)	Spectral acceleration (g) Damping ratio	
		2%	5%
	1.45	0.232	0.170
	1.50	0.232	0.169
	1.55	0.231	0.167
	1.60	0.230	0.166
	1.65	0.228	0.164
	1.70	0.225	0.162
	1.75	0.222	0.159
	1.80	0.218	0.156
	1.85	0.213	0.152
	1.90	0.207	0.147
	1.95	0.201	0.143
	2.00	0.194	0.137
	2.05	0.187	0.132
	2.10	0.179	0.126
	2.15	0.172	0.121
	2.20	0.163	0.115
	2.25	0.154	0.109
	2.30	0.146	0.103
	2.35	0.138	0.098
	2.40	0.130	0.093
	2.50	0.122	0.088
	2.60	0.115	0.084
	2.70	0.109	0.080
	2.80	0.102	0.076
	2.90	0.097	0.072
	3.00	0.091	0.069
	3.10	0.086	0.067
	3.20	0.081	0.064
	3.30	0.077	0.062



TITLE:

1500 MW PRAGATI – III CCPPSPECIFICATION NO. PE-TS-314-
158-A001M

VOLUME - II B

SECTION - B

REV.NO. 0 DATE :

**TECHNICAL SPECIFICATION FOR MANDATORY
SPARES OF PRETREATMENT PLANT
CW TREATMENT PLANT
CHLORINE DIOXIDE SYSTEM
EFFLUENT TREATMENT PLANT
CHLORINATION PLANT
SIDE STREAM FILTRATION
&
SEWAGE TREATMENT PLANT**

Clause No.	PROJECT INFORMATION		
	APPENDIX-EQ1 TO ANNEXURE-V PAGE 5 OF 6		
	Recommended Design Spectral Acceleration Values for 2% and 5% damping		
Period(sec)	Spectral acceleration (g)		Damping ratio
	2%	5%	
3.40	0.073	0.060	
3.50	0.069	0.058	
3.60	0.065	0.056	
3.70	0.062	0.055	
3.80	0.059	0.053	
3.90	0.057	0.052	
4.00	0.054	0.051	
4.10	0.052	0.049	
4.20	0.050	0.048	
4.30	0.049	0.047	
4.40	0.047	0.046	
4.50	0.046	0.045	
4.60	0.044	0.044	
4.70	0.043	0.043	
4.80	0.042	0.042	
4.90	0.041	0.041	
5.00	0.040	0.040	
5.10	0.039	0.039	
5.20	0.038	0.038	
5.40	0.037	0.037	
5.60	0.036	0.036	
5.80	0.035	0.035	
6.00	0.034	0.034	
6.20	0.033	0.033	
6.40	0.031	0.031	
6.60	0.030	0.030	
6.80	0.029	0.029	
7.00	0.028	0.028	
7.30	0.027	0.027	



TITLE:

1500 MW PRAGATI – III CCPPSPECIFICATION NO. PE-TS-314-
158-A001M

VOLUME - II B

SECTION - B

REV.NO. 0 DATE :

**TECHNICAL SPECIFICATION FOR MANDATORY
SPARES OF PRETREATMENT PLANT
CW TREATMENT PLANT
CHLORINE DIOXIDE SYSTEM
EFFLUENT TREATMENT PLANT
CHLORINATION PLANT
SIDE STREAM FILTRATION
&
SEWAGE TREATMENT PLANT**

Clause No.	PROJECT INFORMATION		
	APPENDIX-EQ1 TO ANNEXURE-V PAGE 6 OF 6		
	Recommended Design Spectral Acceleration Values for 2% and 5% damping		
	Period(sec)	Spectral acceleration (g)	
		Damping ratio	
		2%	5%
	7.60	0.026	0.026
	8.00	0.025	0.025
8.50	0.024	0.024	
9.00	0.022	0.022	
9.50	0.021	0.021	
10.00	0.020	0.020	



TITLE:

1500 MW PRAGATI – III CCPP

SPECIFICATION NO. PE-TS-314-
158-A001M

VOLUME - II B

SECTION - C

REV.NO. 0 DATE :

**TECHNICAL SPECIFICATION FOR MANDATORY
SPARES OF PRETREATMENT PLANT
CW TREATMENT PLANT
CHLORINE DIOXIDE SYSTEM
EFFLUENT TREATMENT PLANT
CHLORINATION PLANT
SIDE STREAM FILTRATION
&
SEWAGE TREATMENT PLANT**

SECTION – C

SPECIFIC TECHNICAL REQUIREMENTS



TITLE:

1500 MW PRAGATI – III CCPPSPECIFICATION NO. PE-TS-314-
158-A001M

VOLUME - II B

SECTION - C

REV.NO. 0 DATE :

**TECHNICAL SPECIFICATION FOR MANDATORY
SPARES OF PRETREATMENT PLANT
CW TREATMENT PLANT
CHLORINE DIOXIDE SYSTEM
EFFLUENT TREATMENT PLANT
CHLORINATION PLANT
SIDE STREAM FILTRATION
&
SEWAGE TREATMENT PLANT**

1. INTRODUCTION

This document gives the description of the mandatory spares for **PRETREATMENT PLANT, CW TREATMENT PLANT, CHLORINE DIOXIDE SYSTEM, EFFLUENT TREATMENT PLANT, CHLORINATION PLANT, SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT** for **1500 MW PRAGATI – III CCPP**.

2. SCOPE OF SUPPLY

2.1 The items to be supplied by bidder as described in the below list:

SL. NO.	INSTRUMENT / ITEM	TYPE	RANGE	UNIT	END CONNECTION	QTY	MODEL NO.	MAKE
1.	PG	DIRECT BOURDON	0-4	KG/CM2	1/2" NPT (M)	5	8A-BD	GLUCK
2.	FT	ULTRASONIC	0-2000	M3/HR	100 NB ANSI B 16.5, 150 # FF	4	3102HA 1FRCNAST	EMERSON
3.	FT	DIFF. PRESSURE TYPE	0-4300	M3/HR	25 NB, DIAPHRAGM VALVE	4	3051CD2A0 2A1AH2B1 M5Q4	EMERSON
4.	ORIFICE PLATE	ORIFICE	0-4300	M3/HR	TAP SIZE 1/2: NPT (F) LINE SIZE 800 MS	2	--	MICROPRE CISION
5.	COND ANALYSER	2 wire	0-1000	μS/Cm	Low flow cell suitable for 12 MM OD tube connection	1	TX :1181C-06-10-07-11 ELECTROD E :400-13-55	EMERSON
6.	ORIFICE PLATE	ORIFICE	0 -350	M3/HR	LINE SIZE 500 NB CS TAP SIZE -1/2: NPT (F)	1	--	MICROPRE CISION
7.	LI	FLOAT & BOARD	2600	MM	40 NB ANSI B 16.5, 150 # FF	5	MLI-166-2600	LEVCON
8.	LI	FLOAT & BOARD	4900	MM	40 NB ANSI B 16.5, 150 # FF	1	MLI-166-4900	LEVCON
9.	LG	REFLEX	1300	MM	25 NB ANSI B 16.5, 150 # FF	5	RS 446-1116	LEVCON
10.	LS	CAPACITANCE	--	--	100 NB ANSI B 16.5, 150 # FF	15	ALC 541	NIVO CONTROL
11.	LS	SIDE MOUNTED MAGNETIC FLOAT TYPE	--	--	65 NB ANSI B 16.5, 150 # FF	7	137EA 2 7 T SA 2 S000-	SBEM
12.	PH TRANSMITTER	2 - WIRE	0-14	pH	2" PIPE MOUNTING	3	1181 PH-06-07-11	EMERSON
13.	PH SENSOR	Flow Through PH Sensor	0-14	pH	SAMPLE IN/OUT CONNECTION 1/4" NPT (F)	3	399-01	EMERSON
14.	PG	CHEMICAL SEAL THRD	0-16	Kg/cm2	1/2"NPT(M)	5	CS-S-TH + 8 A-BD	GLUCK
15.	PS	DIRECT MOUNTING	0-10	Kg/cm2	40 NB , ANSI B 16.5, 150 # FF	5	GM-201-02-A7K-33-3-Z	SWITZER
16.	PS	DIRECT MOUNTING	1.6-16	Kg/cm2	40 NB , ANSI B 16.5, 150 # FF	2	GM-201-02-A8K-33-3-Z	SWITZER



TITLE:

1500 MW PRAGATI – III CCPP

**TECHNICAL SPECIFICATION FOR MANDATORY
SPARES OF PRETREATMENT PLANT
CW TREATMENT PLANT
CHLORINE DIOXIDE SYSTEM
EFFLUENT TREATMENT PLANT
CHLORINATION PLANT
SIDE STREAM FILTRATION
&
SEWAGE TREATMENT PLANT**

SPECIFICATION NO. PE-TS-314-
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17.	TEMP. ELEMENT	RTD (PT 100)	0-50	DEG. CEL	FLANGED 150#, 50 NB ANSI B 16.5 RF	1	--	TEPMSENS
18.	TEMPERATURE TRANSMITTER	2 wire	0-50	DEG. CEL	HEAD MOUNTED	1	644HANA J8 M5C4Q4	EMERSON
19.	ORIFICE PLATE	FLANGED TAPPING	0 - 13	M3/HR	LINE SIZE 50 CS TAP SIZE 1/2: NPT (F)	1	--	MICRO PRECISION
20.	PG	CHEMICAL SEAL FLGD	0-10	KG/CM2	25 NB ANSI B 16.5, 150 #FF	22	CS-S-RF + 8 AG-BD	GLUCK
21.	LG	REFLEX	1600	MM	25 NB ANSI B 16.5, 150 #FF	5	RS519-1119	LEVCON
22.	LI	FLOAT & BOARD TYPE	TANK HEIGHT 2450 mm	MM	40 NB , ANSI B 16.5 150 # FF	1	131T L 1 2 3 3 4 1 3 0 H=2450mm	SBEM
23.	LS	TOP MOUNTED DISPLACER TYPE	ROPE LENGTH 2450 mm	MM	100 NB , ANSI B 16.5 150 # FF	2	137D 1 2 1 X 1 1 4 2 L=2450mm	SBEM
24.	LT	ULTRASONIC	2875	MM	100 NB ANSI B 16.5, 150 #FF	5	3102HA1FR CNA ST	EMERSON
25.	FI	BY-PASS	44 -220	M3/HR	25 NB ANSI B 16.5, 150 #FF	2	BPD-CS-200-PG-3	EUREKA
26.	ACTUATOR MOTOR OPERATED	ELECTRIC	--	--	--	1	SA3 E22	AUMA
27.	DIGITAL INPUT CARDS	-	-	-	-	6	IC200MDL6 50	GE
28.	DIGITAL OUTPUT CARDS	-	-	-	-	5	IC200MDL7 50	GE
29.	ANALOG INPUT CARDS	-	-	-	-	2	IC200ALG2 64	GE
30.	ANALOG OUTPUT CARDS	-	-	-	-	2	IC200ALG3 28	GE
31.	PC (MONITOR, CPU, KEYBOARD & OPTICAL MOUSE) LOADED WITH SOFTWARE (OPERATING SYSTEM)	As per datasheet attached	--	--	--	1	--	DELL / HP
32.	POWER SUPPLY MODULE	As per datasheet attached	--	--	--	4	--	--
33.	TFT MONITOR	As per datasheet attached	--	--	--	1	--	--
34.	PRINTER	As per datasheet attached	--	--	--	1	--	--
35.	HDD	160 GB	--	--	--	2	--	DELL / HP
36.	KEY BOARD	104 keys standard keyboard	--	--	--	2	--	DELL / HP
37.	POWER SUPPLY FOR COMPUTER (SMPS)	For desktop PC	--	--	--	4	--	Reputed Make

3. PACKING

	TITLE: 1500 MW PRAGATI – III CCPP TECHNICAL SPECIFICATION FOR MANDATORY SPARES OF PRETREATMENT PLANT CW TREATMENT PLANT CHLORINE DIOXIDE SYSTEM EFFLUENT TREATMENT PLANT CHLORINATION PLANT SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT	SPECIFICATION NO. PE-TS-314- 158-A001M VOLUME - II B SECTION - C REV.NO. 0 DATE :
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Bidder to note that proper packing shall be provided ensuring safety to the instruments.

4. DRAWINGS / DOCUMENTS AND OTHER REQUIREMENTS

- 4.1 Bidder to note that engineering documents like Technical Data sheet & Quality Plan needs not be submitted by bidder during detailed engineering. However, bidder to ensure supply of instruments / items as per actual already supplied items / equipment attached under Section – D.
- 4.2 Spares for which datasheet is not attached, bidder has to supply as per make and model number etc. given above.
- 4.3 In case, there are some comments marked in attached datasheets, bidder has to supply spares complying the comments.
- 4.4 That all spares supplied will be new and in accordance with the contract document and will be free from defects in design, material and workmanship and shall further guarantee as under.
- 4.5 Further in case of discontinuance of supply of spares by the vendors or his sub-vendors, the vendor will provide such spares with other equivalent makes and model that should be easily interchangeable.

4.6 INSPECTION & TESTING

Bidder to furnish the Certificate of Conformance & other test certificates as required by end customer during acceptance of material. Also, bidder to withstand the guarantees as specified in commercial part of specification.

4.7 SCOPE OF SERVICE

Nil.

4.8 CIVIL SCOPE

Nil.

4.9 TERMINAL POINT

Not applicable.

4.10 ABBREVIATION

PG	Pressure Gauge
FT	Flow Transmitter
LI	Level Indicator
LG	Level Gauge
LS	Level Switch
LT	Level Transmitter
FI	Flow Indicator
HDD	Hard disc drive (Internal)

	TITLE: 1500 MW PRAGATI – III CCPP TECHNICAL SPECIFICATION FOR MANDATORY SPARES OF PRETREATMENT PLANT CW TREATMENT PLANT CHLORINE DIOXIDE SYSTEM EFFLUENT TREATMENT PLANT CHLORINATION PLANT SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT	SPECIFICATION NO. PE-TS-314- 158-A001M VOLUME - II B SECTION - D REV.NO. 0 DATE :

SECTION – D

TECHNICAL DATASHEETS OF SPARES

CW II

PRE-TREATMENT PLANT

CEI-152

19.01.2010

— Please Indicate Manufacturer
Name on data sheet.

Cat - II

0	8/10/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By
PROJECT		PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).			
CUSTOMER:		PRAGATI POWER CORPORTION LIMITED (PPCL)			
CONSULTANT:		NTPC LIMITED, CONSUTANCY WING			
BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			
THERMAX LIMITED PUNE		THERMAX LIMITED PUNE			
DATA SHEET FOR PRESSURE GAUGES					
THERMAX DOC.NO.: WHJAA00066		BHEL DOC. NO. : PE-VO-314-158-A300		OC.NO. 630128 REV. NO : 0001	



PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL).(PT PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-VO-314-158-A300
THERMAX OC NO: 630128

REPLIES TO THE COMMENT ON DATA SHEET

PRESSURE GAUGE DOC NO. WHJAA00066

S.NO.	COMMENT	THERMAX REPLY	REMARKS
I	Chemical seal & gauge isolation valve to be provided	Chemical seal is considered as per process requirement. 3 way gauge cock for threaded connection & diaphragm valve for flanged connection is considered for isolation.	

Note: Same data sheet is attached for approval

PRESSURE GAUGES (CHEMICAL SEAL TYPE)							
SPECIFICATION FOR PRESSURE GAUGE							
1. TYPE	Direct	10. BEZEL RING	SCREWED				
2. MOUNTING	Local	11. SOCKET MATERIAL	SS - 316				
3. DIAL SIZE	150MM	12. MOVEMENT	SS - 304				
4. DIAL COLOUR	White with black inscription	13. RUPTURE DISC	Yes				
5. CASE MAT & ENCLOSURE CLASS	DI-Cast AL Weatherproof & dust proof as per NEMA - 4	14. OVERRANGE PROTECTION	130 % of FSD				
6. PRESS. ELEMENT	Bourdon	15. ACCESSORIES	A) Snubber 1/2" NPT(M) X 1/2" NPT(F)-SS-316 B) GLYCERINE FILLED CASING				
7. ELEMENT MAT.	SS316	16. GLASS	SHATTER PROOF TYPE.				
8. ACCURACY	± 1% of FSD	17. Max. working temp	50 Deg. Celcius.				
9. ZERO ADJUST.	Micrometer Pointer with Epoxy coated Screw adj.						
SPECIFICATION FOR CHEMICAL SEAL							
1. TOP CHAMBER	CARBON STEEL	4. PACKING MATERIAL- FIBRE ASBESTOS ACID PROOF					
2. BOTTOM CHAMBER	CS + PTFE	5. DIAPHRAGM-SS316+PTFE					
3. TRANSMITTING FLUID	SILICON OIL	6. PROCESS CONNECTION- 25 NB ANSI B 16.5, 150 # FF					
TAG NO	RANGE Kg/cm2	OPER. PRESS. Kg/cm2	OPER. TEMP. DEG. C	MEDIUM	LOCATION	MODEL NO	ACCESSORIES
PG - 101	0 - 2.5	1.5	AMB	LIME	DISCHARGE OF P-1010 A	CS-S-RF + 8 AG-BD	B
PG - 102	0 - 2.5	1.5	AMB	LIME	DISCHARGE OF P-1010 B	CS-S-RF + 8 AG-BD	B
PG-103	0 - 2.5	1.5	AMB	LIME	DISCHARGE OF P-1020 A	CS-S-RF + 8 AG-BD	B
PG-104	0 - 2.5	1.5	AMB	LIME	DISCHARGE OF P-1020 B	CS-S-RF + 8 AG-BD	B
PG-105	0 - 2.5	1.5	AMB	FeCL3	DISCHARGE OF P-1030 A	CS-S-RF + 8 AG-BD	B
PG-106	0 - 2.5	1.5	AMB	FeCL3	DISCHARGE OF P-1030 B	CS-S-RF + 8 AG-BD	B
PG-107	0 - 2.5	1.5	AMB	FeCL3	DISCHARGE OF P-1030 C	CS-S-RF + 8 AG-BD	B
PG-108	0 - 2.5	1.5	AMB	PE	DISCHARGE OF P-1040 A	CS-S-RF + 8 AG-BD	B
PG-109	0 - 2.5	1.5	AMB	PE	DISCHARGE OF P-1040 B	CS-S-RF + 8 AG-BD	B
PG-110	0 - 2.5	1.5	AMB	PE	DISCHARGE OF P-1040 C	CS-S-RF + 8 AG-BD	B
<i>Name & Vendor - ?</i>							
NOTES : 1. The Tag plate should be in engraved phenolic laminated to be marked on the dial.							
QTY :- 10 NOS		PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI					
MAKE :- GLUCK				1	8/10/2009	SKS	APU
THERMAX LIMITED		O.C NO: 630128		0	17/08/2009	SKS	APU
Water & Waste Solutions		OWNER: PRAGATI POWER CORPORATION LTD, DELHI		Rev	Date	Prepd by	Chkd by
Sai Chambers, Wakadewadi		CLIENT : BHARAT HEAVY ELECTRICALS LTD		Specification No		Plant	
Pune 411 003 (INDIA)		CONSULTANT:- NTPC - CONSULTANCY WING		WHJAA00066		PT	
						SH NO	
						2 OF 3	

PRESSURE GAUGES (DIRECT BOURDON TYPE)							
GENERAL INFORMATION							
1. TYPE	Direct			10. BEZEL RING	SCREWED		
2. MOUNTING	Local			11. SOCKET MATERIAL	SS-316		
3. DIAL SIZE	150MM			12. CONNECTION	1/2" NPT (M) Bottom		
4. DIAL COLOUR	White with black inscription			13. MOVEMENT	SS - 304		
5. CASE MAT & ENCLOSURE CLASS	DI-Cast AL Weatherproof & dust proof as per NEMA - 4			14. RUPTURE DISC	Yes		
6. PRESS. ELEMENT	Bourdon			15. OVERRANGE PROTECTION	130 % of FSD		
7. ELEMENT MAT.	SS316			16. ACCESSORIES	A) Snubber 1/2" NPT(M) X1/2" NPT(F) - SS-316 B) GLYCERINE FILLED CASING		
8. ACCURACY	± 1% of FSD			17. GLASS	Shatter Proof Type		
9. ZERO ADJUST.	Micrometer Pointer with Epoxy coated Screw adj.			18. MAX. WORKING TEMP.	80 Deg. Celcius.		
TAG NO	RANGE Kg/cm2	OPER. PRESS. Kg/cm2	OPER. TEMP. DEG. C.	MEDIUM	LOCATION	MODEL NO	ACCESSORIES
PG-111	0 - 4	2.5	AMB	WATER	DISCHARGE OF P-1050 A	8A-BD	A
PG-112	0 - 4	2.5	AMB	WATER	DISCHARGE OF P-1050 B	8A-BD	A
NOTES : 1. The Tag plate should be in engraved phenolic laminated to be marked on the dial. 2. 3way gauge cock & Snubber shall be supplied separately by THERMAX.							
QTY :- 02 NOS		PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI					
MAKE :- GLUCK				1	8/10/2009	SKS	APU AVS
THERMAX LIMITED		O.C NO: 630128		0	17/08/2009	SKS	APU AVS
Water & Waste Solutions		OWNER: PRAGATI POWER CORPORATION LTD.,DELHI		Rev	Date	Prepd by	Chkd by App by
Sai Chambers, Wakadewadi		CLIENT : BHARAT HEAVY ELECTRICALS LTD		Specification No		Plant	SH NO
Pune 411 003 (INDIA)		CONSULTANT:- NTPC - CONSULTANCY WING		WT-JAA00066		PT	3 OF 3



Gluck (India) Mfg. Co.

Pressure Gauge Selection

General Information

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

- *Gauge Measuring Principles*

Bourdon tube pressure gauges

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

Diaphragm pressure gauges

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

Capsule pressure gauges

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

Bourdon tube pressure gauges with chemical seals

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

- *Gauge Types*



Gluck (India) Mfg. Co.

Pressure Gauge Selection	General Information
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General Purpose Gauges

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

Industrial Gauges

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

Process Gauges

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

Precision & Test Gauges

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

Low Pressure Gauges

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

Specialty Pressure Gauges

Special gauges designed for specific applications

- *Gauge Size*

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

- *Gauge Mounting and Connection*

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



Gluck (India) Mfg. Co.

Pressure Gauge Selection

General Information

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

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

Process Connection

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

• Gauge Pressure Range

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

• Pressure fluid composition

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

• Gauge case/Housing

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

• Gauge Front ring/Bezel and Window

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



Gluck (India) Mfg. Co.

Pressure Gauge Selection

General Information

• Gauge Dial/Pointer

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

• Gauge Accuracy

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

Accuracy Grades as per ASME B40.100 1998			
Accuracy Grade	Permissible Error (± Percent of Span)		
	Lower ¼	Middle ½	Upper ¼
4A *	0.1	0.1	0.1
3A	0.25	0.25	0.25
2A	0.5	0.5	0.5
1A	1.0	1.0	1.0
A	2.0	1.0	2.0
B	3.0	2.0	3.0
C	4.0	3.0	4.0
D	5.0	5.0	5.0
* Grade 4A gauges must remain within specified tolerance before and after lightly tapped.			

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

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

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

• Liquid Filled Option

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

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

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

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



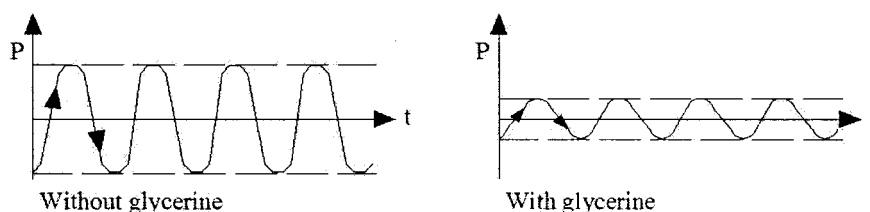
Gluck (India) Mfg. Co.

Pressure Gauge Selection	General Information
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Operation

With applications incurring frequent pressure changes, pressure peaks and external vibration, general purpose or dry case pressure gauges are subjected to rapid wear. Under such conditions, the moving parts of the gauge suffer oscillations, the amplitude is often higher than the natural frequency of the acting forces. This may lead to a fracture of the measuring element. Simultaneously, transmission parts, bearings and gears are warmed up and abraded. An exact reading is usually impossible due to pointer oscillations. To provide effective protection against such conditions, pressure gauges are filled with glycerine. The dampening effect of the liquid, thus reduces the amplitude of the vibrations.

Principle of oscillation dampening



The lubrication provided by the glycerine reduces the abrasion of pinion and shafts and considerably extends the gauge life. Additionally, the filling prevents the formation of condensed water within the case and the entry of unwanted aggressive gases. The equalization of pressure within the case is provided by a bleeder.

- *Shock, Vibration & Pulsation*

Consider liquid filled gauges to enhance the reliability and integrity of the measuring system when operating for long periods under extreme operating conditions. In addition pulsation snubbers are used to minimize effects from pulsation and pressure spikes/surges. The snubber helps keep accurate data flowing by dampening pulsation and spikes/surges. Gauge life is also extended by reducing gauge wear. Further, mounting option become an important consideration for elimination of mechanical vibration between mechanical equipment and the pressure gauge. In some application it may be appropriate to connect the pressure gauges to the mechanical device using flexible hose and tubing so that equipment's mechanical vibration is dampened by structural components. **gluck** offers a wide range of dial sizes, mounting options and case styles to fit customer's gauge mounting needs.

- *Operating Temperature & Ambient conditions*

The normal ambient temperature range for most standard dry or silicone filled gauges is -40 to $+140^{\circ}\text{F}$. The normal temperature range for glycerine filled gauges is -4 to $+140^{\circ}\text{F}$. Steam and other hot media raise the safe working limits of the gauge, such temperature change effects the stiffness of elastic element (Bourdon Tube) and change in stiffness of element will effect gauge accuracy. In these cases, siphons, cooling towers or chemical seals may be used to trap condensed steam or other vapor to isolate the gauge from the heat source I.e. making liquid seal in the line to the gauge for preventing high temperature reaching the gauge internals.



Gluck (India) Mfg. Co.

MODEL Decoding of Bourdon Type Gauges	General Information
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For understanding the Model decoding please refer to an example of Model **8A-BD** where the alphabets is to be divided in to parameter “8”, “A-” & “BD” and for values of each parameter refer table 1, 2 & 3 respectively as under.

Table – 1 : Specifies the dial size and general MOC of the wetted parts i.e. Bourdon tube & Shank (Socket or Process Connection)

15	1-1/2" (40mm) Dial Size, Copper Alloy internals
5	2" (50mm) Dial size, Copper Alloy internals
9	2-1/2" (63mm) Dial size, Copper Alloy internals
1	4" (100mm) Dial size, Copper Alloy internals
2	6" (150mm) Dial size, Copper Alloy internals
4	10" (250mm) Dial size, Copper Alloy internals
3	2-1/2" (63mm) Dial size, Steel Alloy internals
7	4" (100mm) Dial size, Steel Alloy internals
8	6" (150mm) Dial size, Steel Alloy internals
6	10" (250mm) Dial size, Steel Alloy internals

Notes:

- 1) Copper Alloys : Brass, Ph. Bronze
- 2) Steel Alloys : SS-304, SS-316, SS-316L, SS-316Ti, Monel

Table – 2 : Specifies utility, construction in general, case MOC and case option (Dry or filled case)

-	General Purpose, Non Weather Proof
E-	General Purpose, Economic, Non Weather Proof
A-	Industrial Purpose, Weather Proof, Aluminium Black Coated Casing (Dry Case)
S-	Industrial Purpose, Weather Proof, SS Casing (Dry Case)
M-	Industrial Purpose, Weather Proof, Steel Black Coated Casing (Dry Case)
AG-	Industrial Purpose, Weather Proof, Aluminium Black Coated Casing (Filled Case)
SG-	Industrial Purpose, Weather Proof, SS Casing (Filled Case)
MG-	Industrial Purpose, Weather Proof, Steel Black Coated Casing (Filled Case)

Table – 3 : Specifies Mounting

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

From the taken example of Model no. **8A-BD** gauge categories as under:

6" (150mm) Dial size Steel Alloy internals X Industrial Purpose, Weather Proof, Aluminium Black Coated Casing (Dry Case) X Bottom Entry Direct Mounting type Bourdon operated Gauge



Gluck (India) Mfg. Co.

Industrial Weather Proof SS Case Bourdon Gauge with Stainless Steel Alloys

PART – 6	Spec. Series : BTW-S
XS – XXX	: Dry Version
XSG – XXX	: Filled Version

Universal Stainless Steel Bourdon Type Gauge: Many applications require pressure gauges, which must remain fully functional under extreme operating condition such as aggressive fluids under pressure or aggressive environments. In this case the materials used for the pressure gauges components must be selected with particular care.

Gluck high quality pressure gauges are built with stainless, chrome- nickel steels (i.e. S.S.316). They can be used under all operational conditions, practically without limitations. Their concept combines sturdy design and high measuring accuracy.

The pressure gauges are suitable for extreme measuring conditions. Variable designs and materials enable them to meet the requirements of virtually all-international pressure gauge standards. The gauges can be used for all liquids and gases used in processes except for those having a high viscosity, or which are liable to crystallized.

Nominal Size

63, 100, 150 mm

Accuracy

63 mm: Class 1.6 / 2.5 as per EN-837-1 or Class II as per IS-3624

100 and 150 mm: Class 1 as per EN-837-1 or Class IB as per IS-3624

Scale Ranges

0...0.6 to 0...800 Kg/Cm² for 100 and 150 mm

0...1 to 0...400 Kg/Cm² for 63 mm

or equivalent other units of pressure or vacuum

Working Pressure

Steady: 3/4 of full scale value

Fluctuating: 2/3 of full scale value

Short Duration: Full scale value

Over Pressure Safety

1.25 X Full scale value. (Up to scale range 100 Kg/Cm²)

1.15 X Full scale value. (For scale range > 100 & ≤ 400 Kg/Cm²)

1.10 X Full scale value. (For scale range > 400 Kg/Cm²)

Enclosure or Weather Protection

IP 65 as per IS 13947 (Part-1)-1993

Operating Temperature

Ambient: -20...+60° C

Medium: +200° C

Temperature Error (Reference temperature +29° C)

Deviation of indication per 10° C about +0.3 % of indicated value for higher temperatures, about -0.3 % of indicated value for lower temperatures.

The temperature used for the correction of the indication is the temperature of the measuring system, and not the temperature of the fluid under pressure.

Standard Features

Pressure Connection (Shank)

Material: Stainless Steel 316

Thread Size: 1/8", 1/4" BSP(M) / BSPT(M) / NPT(M), 14mm Flat for 63mm

1/4", 3/8", 1/2" BSP(M) / BSPT(M) / NPT(M), 22mm Flat for 100, 150 & 250mm

Pressure Element

Material: Stainless Steel 316

< 100 Kg/Cm²: C-type

≥ 100 Kg/Cm²: Helical type



Gluck (India) Mfg. Co.

Industrial Weather Proof SS Case Bourdon Gauge with Stainless Steel Alloys

PART – 6
XS – XXX : Dry Version
XSG – XXX : Filled Version
Spec. Series : BTW-S

Movement

Stainless Steel 304

Dial

White Aluminium or ABS Plastic with black lettering

Pointer

Black Aluminium or Tin

Mounting

-) Bottom Entry Direct Mounting (BD)
-) Bottom Entry Surface Mounting (BS) for 100, 150 and 250mm
-) Side Back Entry Direct Mounting (SBD)
-) Side Back Entry Bracket Mounting (SBB)
-) Center Back Entry Direct Mounting (CBD)
-) Center Back Entry Bracket Mounting (CBB)

Case

Stainless Steel 304 Semi Glossy Finish

Bezel Ring

Stainless Steel 304 Bayonet lock type

Window

Laminated safety glass (Shatter Proof Glass) for 100 & 150mm
 Clear plain glass for 63 mm

Blow Out Protection

Neoprene Disc at back of the case for 100 and 150 mm
 Bleeder at top of the case for 63mm
 (For filled version bleeder shall be provided on the top of the case for all dial sizes.)

Zero Adjustment

Provided on the pointer for 100 and 150 mm
 Not available for 63 mm

Optional Features

-) Accuracy class 0.6 as per EN-837-1 or class 1A as per IS 3624 for 150mm
-) Pressure connection and element material of Stainless Steel 316 L, Monel (Availability to be confirmed with factory)
-) Liquid filled version available. For 63 mm window shall be acrylic glass. (For details on glycerine filling refer Pressure Gauges Selection)
-) Other process connection.
-) Metal Bush bearing movement, Stainless Steel 316 movement (available for 100 and 150 mm).
-) Scale graduation with °C for refrigerant R717 (NH₃) Ammonia Pressure Range -1-0-16 Kg/Cm² and -1-0-25 Kg/Cm².
-) Specific custom required scale.
-) Acrylic window, Toughened Glass window.

Nom. Size	Model No.		Mounting					
	Dry Version	Filled Version	Bottom Entry Direct	Bottom Entry Surface	Side Back Entry Direct	Side Back Entry Bracket	Center Back Entry Direct	Center Back Entry Bracket
63 mm	3S	3SG	BD	NA	NA	NA	CBD	CBB
100 mm	7S	7SG	BD	BS	SBD	SBB	NA	NA
150 mm	8S	8SG	BD	BS	SBD	SBB	NA	NA

NA: Not Available



Gluck (India) Mfg. Co.

Chemical Seals

Diaphragm Seals, Inline Seals, Capsule Seals

General Information

Modern chemical processing and process manufacturing procedures demand ever greater accuracy and reliability from their pressure and level measuring instruments. In order to minimize costs, both rejection level and production down time must be kept to the absolute minimum.

In some applications it is necessary to isolate the pressure measuring instrument from the process medium in order to maintain these accuracy and reliability objectives; the **Gluck** range of Chemical Seals are specifically designed for this purpose.

If a particular instrument and/or chemical seal are needed, user should be aware of the material characteristics, operating conditions for the instrumentation and the method of installation.

The following general information about features, applications and function of our chemical seal is relevant all our Models/Types. Furthermore, you will find user instructions and our advice about how to order in this leaflet. **Detailed information, dimensional data and drawings can be found on the separate data sheets of the individual models.**

• **Application**

Chemical seals separate the measuring system from the process medium. This way they enlarge the possible applications for pressure gauges, pressure switches, pressure transducers and pressure transmitters a lot. Chemical seals are used and recommended as separators,

- When the process medium is corrosive and requires special corrosion resistance. Bourdon tubes are only available in certain standard materials. When none of these materials suits for the medium, a chemical seal made out of a suitable special material is a reasonable solution.
- When the process medium is thick or viscous fluid, pressure measuring element or bourdon tube shall be suitably protected.
- When process medium tends to crystallize, solidifies or polymerize causing the connection / inlet of the pressure instrument to be obstructed and can generate dead volumes in pressure measuring element.
- When process medium is Heterogeneous fluid with fibrous content, where deposits take place in dead zones.
- When process medium contains suspended solids it should be restricted to enter a measuring element such as bourdon tube.
- When process medium temperature or the ambient temperature at the measuring point is high this would affect the pressure instrument performance if in direct contact.
- For hygienic reasons often found in food or pharmaceutical where no dead space is allowed. Here bacteria zone conform which are sometimes difficult to clean.
- When measurement situations are difficult where either pressure instrument is difficult to read or install.
- For atmospheric or environmental contamination problem where adequate measurement must be made for safety reasons.
- When high over range protection is required.

• **Function**

Chemical seals are mainly used on pressure gauges with Bourdon tubes, pressure switches, pressure transmitters or pressure transducers. They can be directly attached to measuring instrument, or through a capillary line or a cooling element can be mounted between measuring instrument and chemical seal.

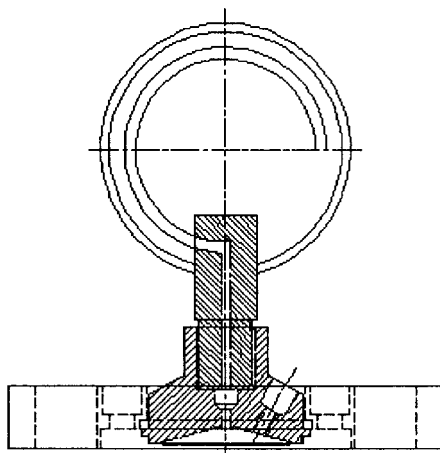
The essential part of a chemical seal is a \the separating element. This can be a membrane (Diaphragm Seal), a tube (Inline seal) or an immersion tube shaft (Capsule seal), compare the simplified drawings of these three basic types below.



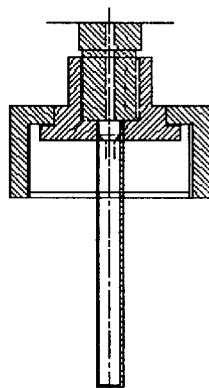
Gluck (India) Mfg. Co.

Chemical Seals
Diaphragm Seals, Inline Seals, Capsule Seals

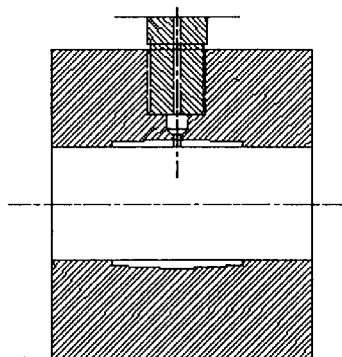
General Information



Diaphragm Seal Mounted to a Bourdon tube Pressure Gauge



Capsule Seal



Inline Seal

The most current version is a diaphragm seal mounted to a Bourdon tube pressure gauge. Therefore we use this version as an example to describe construction and function:

The pressure element of the gauge and the space behind the membrane form a completely sealed system, evacuated and then filled with a suitable filling liquid. The process medium reaches the membrane which deflects under pressure and causes a volume change inside the system.

The membrane has to displace as much volume as the measuring element needs to indicate the pressure. The deflection of the membrane must stay below its limit of elasticity which is determined by material, form, thickness and diameter of the membrane.

The volume displaced by the membrane is called "displacement volume" or "operation volume". The volume that is necessary to cause the element to indicate the pressure is called "control volume" or "driving volume".



Gluck (India) Mfg. Co.

Chemical Seals <i>Diaphragm Seals, Inline Seals, Capsule Seals</i>	General Information
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- *Particulars*

The influence of a chemical seal on the measuring result should be as small as possible. Therefore it is important to take all operating conditions into consideration when choosing a chemical seal, to find the most suitable version for an optimized measurement.

Temperature

The system is filled at ambient temperature, approx +27°C. A different temperature of the medium or the ambience at the measuring point causes a volume change, which changes the pressure inside of the filled system and may cause a significant indication error.

This influence can be minimized by using the best suitable filling fluid. The volume respectively the space behind the membrane of the chemical seal should be as small as possible to reduce temperature caused errors. Also the diameter of the membrane is important for the temperature effect. The bigger the diameter the better the compensation of temperature caused volume change.

For temperature higher than +100°C a capillary line or a cooling element between measuring instrument and chemical seal is recommended, so that the measuring instrument can stay remote from the measuring point. Cooling elements as well as capillary lines reduce temperature arriving at the measuring instrument.

Response Time

Generally a chemical seal retards the reading of the instrument. This can be desired for a better dampening effect on the indicating instrument.

The response time depends on the volume of the filling medium, the viscosity, the pressure range of the measuring instrument, the inner diameter and the length of a capillary line.

Height Difference

When the measuring instrument and the chemical seal are not mounted on the same level, this difference in height influences the measurement through the hydrostatic pressure of the fluid column. Please specify a level difference when ordering, so we can take this into consideration for the calibration.

Filling Fluid

The filling fluid has to be suitable for working and ambient temperature, namely as well as for the possible minimum temperature as for the possible maximum temperature. Furthermore the filling liquid has to be compatible to the medium, especially when the instrument is used for oxygen or chlorine services or in food and dairy industries. It can never be fully precluded that through a damaged membrane filling fluid might drip into the process medium.

Material

The standard and common special materials for chemical seals resp. wetted parts are specified in our data sheets. If you don't find the suitable material for your requirement, please contact us. We shall be pleased to offer individually on your specification.

Capillary Line

Capillary lines are made of stainless steel with protection at both the ends. Optionally the capillary line can be supplied with flexible armour (stainless steel). The maximum possible length of the capillary line depends upon the pressure range and the chemical seal model.



Gluck (India) Mfg. Co.

Chemical Seals <i>Diaphragm Seals, Inline Seals, Capsule Seals</i>	General Information
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Attachment of outside bought Measuring Instruments

Upon request we also attach measuring instrument from other manufacturers to our seals. Therefore we need a detailed description and user instruction of the instrument, so we can verify the suitability of the displacement volume of the selected seal.

User Instruction

Unfortunately chemical seals are often damaged by incorrect handling. The repair of instruments with chemical seals is very time consuming and expensive. Measuring instruments with chemical seal should therefore be handled very carefully.

Please note especially the following notes:

- Avoid touching the membrane in expert. It is very thin. Any contact with sharp instruments causes' damage. Chemical seal should never be cleaned with high pressure water or sharp instruments.
- Do not open any connection of the system.
- All those chemical seal supplied with filling screws which is sealed shall not be opened.
- When the capillary line is not welded but screwed to the chemical seal, this connection are also not allowed to be opened.
- Do not use capillary at all for carrying or moving the instrument. The welding connections are not allowed to be stressed. The capillary line may never be buckled or bended. Buckling or bending causes an increased response time or even a leak, this means to damage the complete system.
- Before you send an instrument back for repair service, please pay attention to clean all wetted parts carefully from the process medium, especially from any health effecting substances. You should state on the delivery notes for which medium the instrument was used.

• How to Order

Besides the specification of the required measuring instrument enquiry or order needs to contain the following information:

- Model/Type of chemical seal (If already chosen; otherwise we will be pleased to help you selecting the suitable model)
- Material of construction for wetted parts
- Process connection
- Required Transmitting fluid
- Operating and maximum pressure
- Temperature at the chemical seal; if changing: from ____ upto ____ °C or °F
- Ambient temperature
- Minimum and maximum temperature in case of flush or other cleaning procedures
- When capillary extension is required, please specify further details as under;
 - Length of extension
 - Any difference in height between chemical seal and measuring instrument
 - Mounting of the measuring instrument
 - Bottom entry surface mounting i.e. Rear flange at the instrument
 - Bottom entry yoke mounting i.e. Pipe clamp mounted on back of the case
 - Back entry panel mounting i.e. Front flange at the instrument
 - Back entry bracket mounting i.e. Bracket at the instrument and Case MOC shall be Aluminium black only.



Gluck (India) Mfg. Co.

Chemical Seals

Diaphragm Seals, Inline Seals, Capsule Seals

General Information

In our data sheets you find information about our standard models and configurations. Besides that we developed in close cooperation with our customer numerous INDIVIDUAL TECHNICAL SOLUTIONS for pressure measurements.

Please do not hesitate to contact us, it shall be our privilege to find the most suitable solution to your individual pressure measuring requirements.

Gluck chemical seals are basically designed and categorized as under:

- | | |
|---------------------------------------|-------------------|
| • Sandwich Diaphragm Seals | Prefixed as CS-S |
| • Welded Diaphragm One Piece Design | Prefixed as CS-W1 |
| • Welded Diaphragm Two Piece Design | Prefixed as CS-W2 |
| • Welded Diaphragm Three Piece Design | Prefixed as CS-W3 |

Please refer decoding information on each type of above seals for the general available option for its selection parameters. For every selection's detailed information refer Data / Specification sheets.



Gluck (India) Mfg. Co.

MODEL & Item Code Decoding of Chemical Seals (Sandwich Diaphragm Seals)	General Information
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Considering large permutation and combination of various parameters for chemical seals it is must to have MODEL reference for identifying type of chemical seal in **general** with respect to its construction & type of process connection. All the chemical seals under Sandwich Diaphragm Seals type are prefixed with CS-S i.e. Chemical Seal – Sandwich type. Second parameter specifies construction & type of seal i.e. CS-S-XX where XX₁ has to be replaced as per Table-1 hereunder.

Table-1 : Specifies construction & Seal Type (XX₁)	
TH	Threaded Connection Seals (Male or Female)
RF	Regular Flanged Connection Seals
IF	I-Section Flanged Connection Seals
MT-TH	Most Tapper Threaded Connection Seals (For High Viscous Application)
TH-FL	Threaded Connection Seals with flushing arrangements (Male or Female)
OF	Open Type Flanged Connection Seals (Flush Diaphragm)
TGF	Tongue & Groove Flanged Connection (For High Pressure)

Further to MODEL reference it is must to identify the other parameters for the seal and the same are defined below which form the specific item code for the seal.

Item Code Generation: CS-S-XX₁-XX₂-XX₃-XX₄-XX₅-XX₆-XX₇-XX₈

Please refer Table-2 to 8 hereunder for values of each parameter to be replaced for XX₂ to 8 respectively.

Table-2 : Specifies MOC of Top Housing (XX₂)	
MSB	Carbon Steel Black Coated
MSP	Carbon Steel Plated
S4	Stainless Steel 304
S6	Stainless Steel 316
FRG	Forged Flange (For the Forging grade data sheet is to be referred)

Table-3 : Specifies MOC of Bottom Housing (XX₃)	
MSB	Carbon Steel Black Coated
MSP	Carbon Steel Plated
S4	Stainless Steel 304
S4L	Stainless Steel 304L
S6	Stainless Steel 316
S6L	Stainless Steel 316L
MN	Monel
HC	Hest alloy 'C'

Table-4 : Specifies Protection on Bottom Housing (XX₄)	
NA	Not Applicable
PTC	PTFE Coated
PTL	PTFE Lined
PVC	PVC Coated
PVL	PVC Lined
RL	Rubber Lined

**Gluck (India) Mfg. Co.**

MODEL & Item Code Decoding of Chemical Seals (Sandwich Diaphragm Seals)	General Information
--	----------------------------

Table-5 : Specifies MOC of Diaphragm (XX₅)	
S6	Stainless Steel 316
S6L	Stainless Steel 316L
MN	Monel
HC	Hest alloy 'C'
IN	Inconel
N2	Nickle-200
N4	Nickle-400
TA	Tantalum

Table-6 : Specifies Protection on Diaphragm (XX₆)	
NA	Not Applicable
PTC	PTFE Coated
PTL	PTFE Lined
ETL	Halar (High Grade Teflon – ECTFE) Lined

Table-7 : Specifies Gasket MOC / Grade (XX₇)	
A-GR	Asbestos of various Grade
T	Teflon
P	PVC
NR	Neoprene Rubber

Table-8 : Specifies Seal Range Note (XX₈)	
L	Low Pressure Range of 0.6 Kg/cm ²
R	Regular Pressure 0-1 up to 25 Kg/cm ²
M	Medium Pressure 0-30 up to 60 Kg/cm ²
H	High Pressure 0-70 up to 160 Kg/cm ²
VH	Very High Pressure 0-210 up to 400 Kg/cm ²

For understanding item code refer an example of item code:

CS-S-TH-MSB-S6-NA-S6-PTC-A60-R

This specifies Chemical Seal Parameters as under:

- o CS : Chemical Seal
- o S : Sandwich Diaphragm Type
- o TH : Threaded Connection (For Size and Type Data/Specification sheet to refer)
- o MSB : Top Housing CS Black Coated
- o S6 : Bottom Housing Stainless Steel 316
- o NA : Bottom Housing Protection not Applicable
- o S6 : Diaphragm (Membrane) of Stainless Steel 316
- o PTC : Diaphragm protected with Teflon Coating
- o A54 : Asbestos Gasket of Grade-60 of Champion Make Acid Proof Temp. 210°C & Pressure 150 Kg/cm².
- o R : Regular Pressure Range i.e. 0-1 up to 25 Kg/cm²

In addition to above for filling fluid, mounting information, Bourdon Gauge type to be attached to the seal refer specific data sheet.

PRE-TREATMENT PLANT

Cat IV

C8I 254
6/5/10

PDR



1	2/3/2010	REVISED AS PER NTPC COMMENT	SKS	APU	AVS
0	9/12/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By
PROJECT		PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).			
CUSTOMER: 		PRAGATI POWER CORPORTION LIMITED (PPCL)			
CONSULTANT: 		NTPC LIMITED, CONSUTANCY WING			
		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			
		THERMAX LIMITED PUNE			
DATA SHEET FOR ULTRASONIC FLOW TRANSMITTER					
THERMAX DOC.NO.: WHJBE00006		BHEL DOC. NO. : PE-VO-314-158-A302		OC.NO. 630128 REV. NO : 01	



PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL),(PT PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-VO-314-158A302
THERMAX OC NO: 630128

REPLIES TO THE COMMENT ON DATA SHEET

ULTRASONIC FLOW TRANSMITTER DOC NO. WHJBE00006

S.NO.	COMMENT	THERMAX REPLY	REMARKS
I	Electrical connections / Conduit entry size shall be in Plug & socket type	Noted & confirmed, data sheet is revised accordingly	

INDEX SHEET																						
GENERAL INFORMATION																						
ITEM		ULTRASONIC FLOW METER -PARSHALL FLUME																				
TAG NO.		FT 503	FT 504	FT 505																		
LOCATION		T-1030 A	T-1030 B	T-1030 C																		
SERVICE		RAW WATER																				
OPERATING CONDITIONS																						
1. MEDIUM		RAW WATER																				
2. PRESSURE (MAX)		BY GRAVITY																				
3. TEMPERATURE		AMB																				
4. LINE SIZE		N.A.																				
NOTE 1]SS TAG PLATE SHALL BE PROVIDED 2]NICKEL PLATED BRASS DOUBLE COMPRESSION CABLE GLAND SHALL BE PROVIDED BY THERMAX AT SITE 3] 4" counter flange of 2" NPT(F) threaded connection for fitting the instrument shall be supplied (Thermax WWS scope)																						
<table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">TAG</th> <th style="text-align: center;">FLOW NORMAL / MAX (m3/hr)</th> <th style="text-align: center;">FLOW RANGE (m3/hr)</th> <th style="text-align: center;">THROAT WIDTH (FEET)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">FT 503</td> <td style="text-align: center;">1660 / 2000</td> <td style="text-align: center;">0 -2200</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">FT 504</td> <td style="text-align: center;">1660 / 2000</td> <td style="text-align: center;">0 -2200</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">FT 505</td> <td style="text-align: center;">1660 / 2000</td> <td style="text-align: center;">0 -2200</td> <td style="text-align: center;">2</td> </tr> </tbody> </table>							TAG	FLOW NORMAL / MAX (m3/hr)	FLOW RANGE (m3/hr)	THROAT WIDTH (FEET)	FT 503	1660 / 2000	0 -2200	2	FT 504	1660 / 2000	0 -2200	2	FT 505	1660 / 2000	0 -2200	2
TAG	FLOW NORMAL / MAX (m3/hr)	FLOW RANGE (m3/hr)	THROAT WIDTH (FEET)																			
FT 503	1660 / 2000	0 -2200	2																			
FT 504	1660 / 2000	0 -2200	2																			
FT 505	1660 / 2000	0 -2200	2																			
QTY :- 03		PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI																				
MAKE :- EMERSON		1	2/3/2010	SKS	APU	AVS																
THERMAX LIMITED		O.C NO: 630128		0	9/12/2009	SKS																
Water & Waste Solutions		OWNER: PRAGATI POWER CORPORATION LTD.,DELHI		Rev	DATE	PREPD. BY																
Sai Chambers, Wakadewadi		CLIENT : BHARAT HEAVY ELECTRICALS LTD		Specification No		PLANT																
Pune 411 003 (INDIA)		CONSULTANT:- NTPC - CONSULTANCY WING		WHJBE00006		PT																
				CHKD. BY		App by																
				SH NO		2 OF 6																

Ultrasonic Flow Transmitter Specification Sheet						
Sr	Identification	Specification				
	General					
1	Make	EMERSON				
2	Model Number	3102HA 1FRCNAST				
	Type	Ultrasonic Type Flow Transmitter				
		SMART with local indication - 2 wire				
	Transmitter					
4	Accuracy	± 0.25 % Of Measured Distance for>1m,2.5mm<1m				
5	Flow Range	Refer index sheet				
6	Maximum Span Limit	0 to 11 m				
7	Output	4-20 mA with HART Communication				
8	Power Supply	12-30 V DC				
9	Level Resolution	Better than 1 mm				
10	Blanking Distance / Dead Zone	0.3 m				
11	Process Pressure Rating	-0.25 to 3 bar				
12	Process Temperature	-30 to 70 °C				
13	Update Interval	1 second				
14	Beam Angle	3°				
15	Temperature Compensation	Automatic Integral. Optinal remote sensor for dynamic comp.				
16	Local Indication	Digital LCD Indication in Engineering Unit				
17	Process connections	2 "NPT Thread				
18	Electrical connections / Conduit Entry Size	PLUG & SOCKET TYPE X 2Nos.				
	Material Of Construction					
19	Sensing Element	PVDF				
20	Cover Seal	Silicon Rubber				
21	Sensor Body	EPDM				
22	Enclosure / Housing	NEMA 4X ,IP66, Polyurethane-covered Aluminum				
	Accessories					
23	Tag Plate	Stainless Steel engraved Tag Plate				
	Cetificates					
24	Cetificates	No Certificates - Standard				
</						

PARSHALL FLUME HEIGHT Vs FLOW DETAILS

TAG NO: FT 503/504/505

Parshall Flume , Flow rate = 1660 m³ / hr

Throat Width : 2 feet

 $Q = 4WHa^{1.522w0.026}$ (FPS UNIT)

W = 2 feet

 $Q = 1660 \text{ m}^3/\text{hr} = 16.28399 \text{ cuft /sec}$ $Q = 8H^{1.55} \text{ ft}^3/\text{sec}$

ULTRASONIC FLOW METER TO BE CALIBRATED BASED ON FOLLOWING HEIGHT Vs FLOW DETAILS

Height (meter)	Height (feet)	Flow (ft ³ /sec)	Flow (m ³ /hr)
0.2	0.66	4.16	424.43
0.3	0.98	7.81	795.70
0.35	1.15	9.91	1010.46
0.4	1.31	12.19	1242.81
0.45	1.48	14.63	1491.73
0.46	1.51	15.14	1543.43
0.47	1.54	15.65	1595.75
0.475	1.56	15.91	1622.14
0.476	1.56	15.96	1627.43
0.477	1.56	16.02	1632.73
0.478	1.57	16.07	1638.04
0.479	1.57	16.12	1643.36
0.48	1.57	16.17	1648.68
0.481	1.58	16.23	1654.01
NORMAL FLOW RATE			
0.483	1.58	16.33	1664.68
0.488	1.60	16.59	1691.46
0.49	1.61	16.70	1702.22
0.492	1.61	16.80	1713.00
0.494	1.62	16.91	1723.81
0.496	1.63	17.02	1734.64
0.498	1.63	17.12	1745.49
0.5	1.64	17.23	1756.37
0.51	1.67	17.77	1811.11
0.52	1.71	18.31	1866.45
0.53	1.74	18.86	1922.38
0.54	1.77	19.41	1978.89
0.55	1.80	19.97	2035.98
0.56	1.84	20.54	2093.65
0.58	1.90	21.69	2210.68

NORMAL FLOW RATE

THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI					
	O.C NO: 630128	1	2/3/2010	SKS	APU	AVS
	OWNER: PRAGATI POWER	0	9/12/2009	SKS	APU	AVS
	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Rev	DATE	PREPD. BY	CHKD. BY	App by
	CONSULTANT:- NTPC - CONSULTANCY WING	Specification No		PLANT		SH.NO

HEIGHT Vs FLOW DETAILS

TAG NO: FT 506

MEASURING WEIR CALCULATION

For width(b) = 2000 mm

Q(m3/hr)	Q(m3/sec)	b (mtr)	h(mm)
2000	0.55556	2	283.88
2300	0.63889	2	311.57
2500	0.69444	2	329.36
2800	0.77778	2	355.19
3000	0.83333	2	371.89
3100	0.86111	2	380.10
3125	0.86806	2	382.14
3150	0.87500	2	384.17
3175	0.88194	2	386.20
3200	0.88889	2	388.22
3225	0.89583	2	390.24
3250	0.90278	2	392.25
3275	0.90972	2	394.26
3300	0.91667	2	396.26
3350	0.93056	2	400.25
3375	0.93750	2	402.23
3400	0.94444	2	404.22
3425	0.95139	2	406.19
3450	0.95833	2	408.16
3475	0.96528	2	410.13
3500	0.97222	2	412.09
3550	0.98611	2	416.01
3600	1.00000	2	419.90
3700	1.02778	2	427.63
3800	1.05556	2	435.30
3900	1.08333	2	442.89
4000	1.11111	2	450.42
4100	1.13889	2	457.89
4200	1.16667	2	465.30

NORAMAL FLOW

Measuring flow range(0-3320M³/hr)
Max.flow:(3800M³/hr)

	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI					
		1	2/3/2010	SKS	APU	AVS
THERMAX LIMITED	O.C NO: 630128	0	9/12/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	DATE	PREPD. BY	CHKD. BY	App by
Sal Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		PLANT	SH.NO	
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJBE00006		PT	6 OF 6	

Product Data Sheet

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August 2007

Rosemount 3100 Series

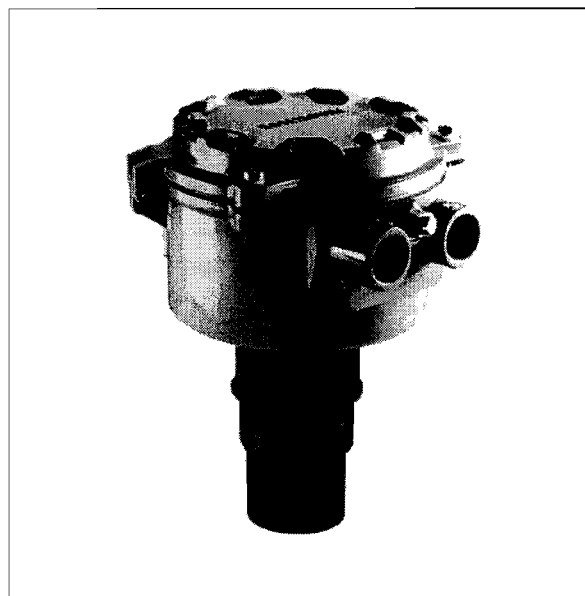
Rosemount 3100 Series

Ultrasonic Level Transmitters

The Rosemount 3100 Series is a loop-powered ultrasonic transmitter designed for reliable continuous level measurement.

THE 3100 SERIES FEATURES:

- *Non-contacting measurement with no moving parts.*
- *Integral LCD and push-buttons as standard for on-site programming,*
- *Continuous measurement of level or distance-to-surface. Volume or open channel flow calculations for models 3102 and 3105.*
- *2 integral signal relays for model 3102.*
- *Easy to install and configure.*
- *Rugged aluminum housing and PVDF wetted material.*
- *2-wire dc loop-powered.*

**Contents**

Measurement Principle	page 2
Special Features	page 2
Selecting a Rosemount 3100 Series transmitter	page 4
System Integration	page 5
Installation Best Practices	page 6
Specifications	page 8
Temperature and Pressure Ratings	page 10
Load Limitations	page 10
Product Certifications	page 11
Dimensional Drawings	page 13
Ordering Information	page 14

ROSEMOUNT

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EMERSON
Process Management

Rosemount 3100 Series

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Reliability in a Universal Package

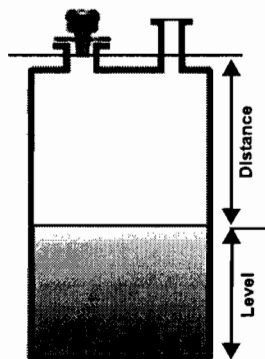
The Rosemount 3100 Series is a liquid level transmitter based on ultrasonic technology making it suitable for many liquid applications.

MEASUREMENT PRINCIPLE

Ultrasonic pulse signals are transmitted from the face of the transmitter, and are then reflected from the liquid surface. The transmitter 'listens' for these reflected signals (echoes) and measures the time-delay between transmitting and receiving.

The distance to the liquid surface is automatically calculated by using the computed time-delay.

$Distance = Speed\ of\ sound\ in\ air * (Time-delay / 2)$



An integral temperature sensor continuously measures the air temperature around the transmitter, and uses this to compute the *speed of sound in air*, thereby automatically compensating *Distance* for temperature effects.

Models 3102 and 3105 have the option of a Remote Temperature Sensor for dynamic temperature compensation.

The Distance measurement can be output through the 4-20mA or HART output.

Level Measurement

When programmed with the bottom reference of the application - usually the bottom of a tank - the transmitter will calculate the liquid depth (Level).

The calculated Level can be output through the 4-20mA or HART output.

Volume Measurement

Models 3102 and 3105 can also calculate the volume of liquid in a tank. The transmitter has a library of profile shapes for selection.

The calculated Volume can be output through the 4-20mA or HART output.

Open Channel Flow Measurement

Models 3102 and 3105 can also calculate the rate of liquid flow in an open channel. The transmitter has a library of standard open channel flow structure profiles, but can also support a user-defined flow profile that is plotted or calculated.

The calculated Flow Rate can be output through the 4-20mA or HART output.

It is possible to enter a 10-point strapping table for non-standard tank shapes and flow structures.

SPECIAL FEATURES

Advanced software features

- Learn routine (false echo registration)
Manually teach the transmitter to ignore up to four false echoes, caused by the pulse signal reflecting off obstructions, until the actual level is seen.
- Empty tank mapping
When a tank is empty, automatically teach the transmitter up to four false echoes, without the need for user interaction.
- Present depth
When the tank is not empty, the bottom reference can be automatically reset to be the sum of a user-entered (known) present depth and the distance to the surface.
- Set as empty
When the tank is known to be empty, the bottom reference can be automatically reset to be the measured distance.
- Distance offset
The distance to the surface can be adjusted by a user-entered positive or negative offset value.
- Level offset
The level can be adjusted by a user-entered positive or negative offset value.
- Bottom blanking
If there is an obstruction on the bottom of a tank, the false echoes can be avoided by specifying an area to ignore.

Relays on model 3102

- Two integral relays for control functionality.

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Rosemount 3100 Series**Integral display and push buttons (all models)**

The central area of the display allows up to five alphanumeric characters to be displayed. This is either the measurement or data to assist when programming.

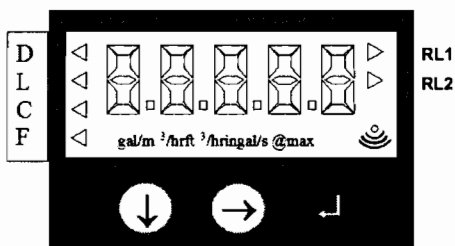
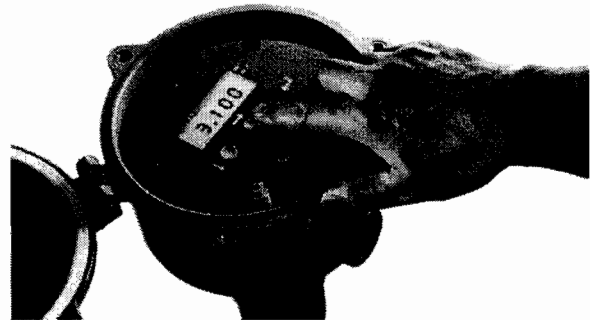
To the left of the central area, on Model 3102 and 3105 only, there are **four arrow icons**, only one of which will be illuminated at any one time to indicate the duty chosen by the user:

- D (Distance-to-surface)
- L (Level)
- C (Content / Volume)
- F (Flow)

To the right of the central area, on Model 3102 only, there are **two arrow icons** that indicate the status of the transmitter relay outputs RL1 and RL2. When illuminated, they indicate that the relay contact is closed.

Under the central area is a list of units of measurement. The transmitter will illuminate only those characters applicable to the units of measurement chosen.

To the right of the measurement units is an **echo received icon** made up of 3 arc segments that continuously indicate the strength of the echo received (minimum, average, and good).



Integral push-buttons and display

Rosemount 3100 Series

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Selecting a Rosemount 3100 Series transmitter

Overview of models

Choose model 3101 for simple level or distance measurements over a range of 1 - 26 ft (0.3 - 8 m), and a 4-20mA signal output.

Choose model 3102, with 2 integral relays, for level or distance measurements over a range of 1 - 36 ft (0.3 - 11 m). Also features volume and open channel flow calculations, and a 4-20mA / HART output.

Choose the Intrinsically Safe certified model 3105 for level or distance measurements over a range of 1 - 36 ft (0.3 - 11 m) in hazardous areas. Also features volume and open channel flow calculations, and a 4-20mA / HART output.

Housing

The housing is available in aluminum, and has two 1/2-inch NPT cable/conduit entries.

Option of M20 x 1.5 conduit/cable adaptors.

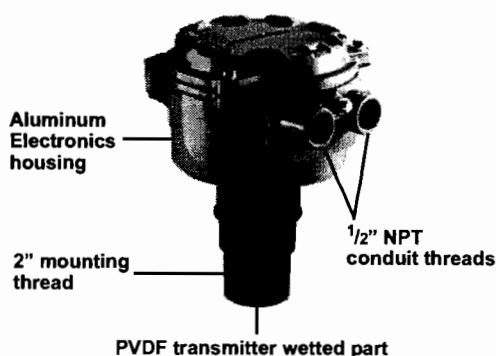
Wetted parts are made of corrosion resistant PVDF.

Process Connection

Threaded Connection

Threads: 2-inch BSPT or 2-inch NPT.

Optional flange accessories: See page 17.



Electrical connections

(For full specification, see page 8)

Power supply

The 3100 Series requires an external power supply:

3101: 12 - 30 Vdc

3102: 12 - 40 Vdc

3105: 12 - 40 Vdc, (12 - 30 Vdc in hazardous area).

Signal output

Model 3101 has an analog 4-20mA output, which is powered by the voltage supplied to the transmitter.

Models 3102 and 3105 have a 4-20mA output with HART® communication. This is powered by the voltage supply to the transmitter.

Relay outputs

Model 3102 has two relay outputs, which are powered by the voltage supply to the transmitter.

Remote temperature sensor

All models have an integrated temperature sensor for automatically compensating for temperature effects.

Models 3102 and 3105 have support for connecting a Rosemount Remote Temperature Sensor, which is an optional accessory (see page 17). When used, it automatically overrides the integral sensor and provides dynamic temperature compensation.

Measurements and Calculations

3101: Level, or distance to the surface.

3102: Level (or distance), volume, open channel flow.

3105: Level (or distance), volume, open channel flow.

Measurement range

3101: 1 - 26 ft (0.3 - 8 m)

3102: 1 - 36 ft (0.3 - 11 m)

3105: 1 - 36 ft (0.3 - 11 m)

Product certifications

(For a summary of certifications, see page 11.)

Non-hazardous area installation

3101 and 3102 are available for:

- FM and CSA Ordinary Location installation.

Hazardous area installation

3105 is available for:

- FM Intrinsically Safe/Non-incendive installation.
- CSA Intrinsically Safe/Non-incendive installation.
- ATEX and IECEx Intrinsically Safe installation.

NOTE:

Product certifications are selected using the Ordering Information (see page 14 onwards).

Product Data Sheet

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August 2007

Rosemount 3100 Series**System Integration**

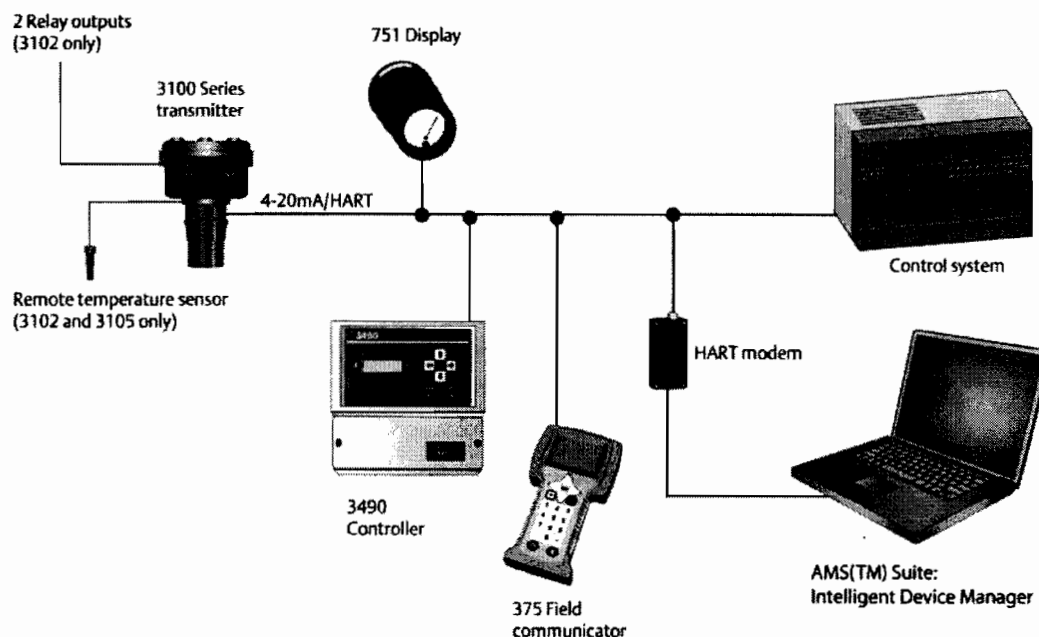
The Rosemount 3100 Series transmitter uses the same two wires for power supply and communication.

Measurement data is transmitted as an analog 4-20mA signal as standard.

On models 3102 and 3105, a digital HART® signal superimposed on the 4-20mA signal.

The 3100 Series requires an external power supply:

- 3101: 12 to 30 Vdc
- 3102: 12 to 40 Vdc
- 3105: 12 to 40 Vdc (30 Vdc in hazardous area).



The Rosemount 3100 Series transmitter powers PlantWeb® with easier configuration, lower installation costs, higher reliability and device diagnostics that enable predictive intelligence, reduce operating costs and improve plant availability.

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Rosemount 3100 Series

Product Data Sheet

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August 2007

Installation Best Practices

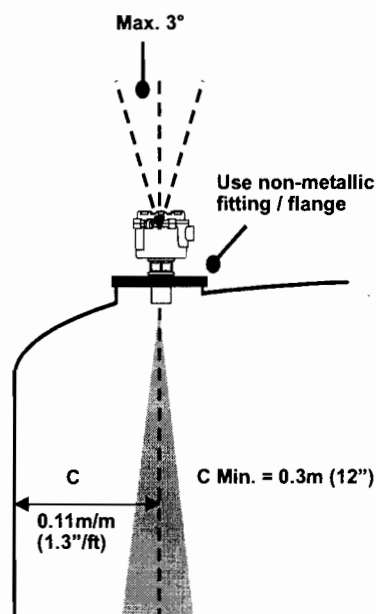
Correct location of the transmitter is essential for the reliable operation of any ultrasonic level measurement system.

NOTE:

The Rosemount 3100 Series is designed to be mounted in a *non-metallic fitting or flange*. Please check optional PVC flange accessories on page 17.

Mounting considerations

- The transmitter should be mounted above the liquid surface using the 2-inch thread provided. To facilitate mounting, optional flanges are available as an accessory - see page 17.
- Mount the transmitter as near vertical as possible to ensure a *good echo* from the liquid surface for *maximum echo size* received.
- Obstructions within the beam angle generate strong "false-echoes"; wherever possible, the transmitter should be positioned such that false echoes are avoided.
- To avoid detecting unwanted objects in the tank or well, it is advisable to maintain a distance of at least 4.3 inches (0.11 metres) from the centre line of the transmitter for every metre range to the obstruction.
- It is recommended not to mount the transmitter closer than 12 inches (0.3 metres) to the wall to avoid losing echo size.
- Avoid applications where heavy condensation could form on the transducer face.
- If the transmitter is mounted in a stand-off or nozzle, it is always preferable that the transmitter face protrudes at least 5mm into the tank. If this is not possible, see "Mounting in a nozzle" on page 7.
- In environments where direct sunlight can cause high surface temperatures on exposed instruments, it is recommended to use a suitable sun-shade.



Liquid surface conditions

- Foaming liquids can reduce the size of the returned echo as foam is a poor ultrasonic reflector. It is always preferable to mount an ultrasonic transmitter over an area of clear liquid.
- Beware of mounting the transmitter directly over any inlet stream.
- Liquid surface turbulence is not normally a problem unless it is excessive. In most cases, the effects of turbulence are minor, with excessive turbulence being catered for by fine-tuning the transmitter on site if necessary.
- A still-pipe can be used to avoid foam and turbulence.

In-tank effects

- Stirrers or agitators can cause a vortex. Always try to mount the transmitter off-centre of any vortex to maximise the return echo.
- As stirrer blades become uncovered, they will create echoes as they pass through the ultrasonic beam. The transmitter can be tuned on-site to ignore these false echoes.

Product Data Sheet

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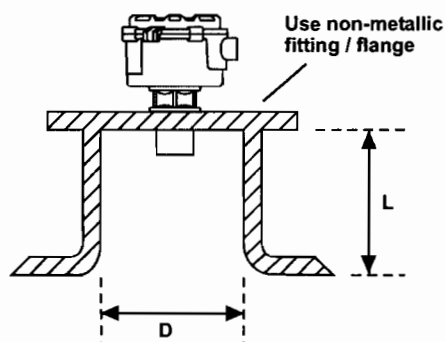
Rosemount 3100 Series**Mounting in a nozzle**

TABLE 1.

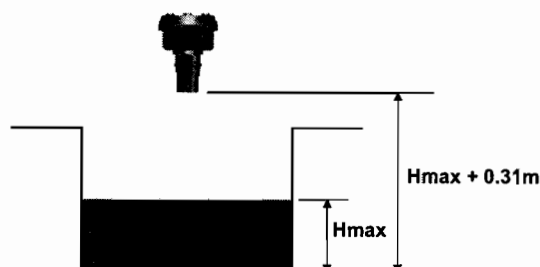
Nozzle Diameter Size (D)	Maximum Nozzle Length (L)
DN50 (2 inch)	18mm (3/4")
DN80 (3 inch)	100mm (4")
DN100 (4 inch)	100mm (4")
DN125 (5 inch)	200mm (8")
≥DN150 (6 inch)	350mm (14")

**Open Channel Flow installations
(Models 3102/3105)**

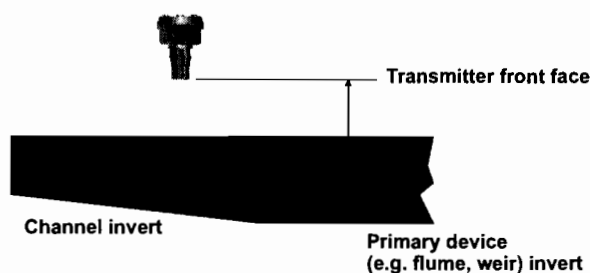
There are normally two distinct parts to an open channel flow measurement system; the primary element (flow structure) and the secondary element (head measurement instrumentation). For accurate open channel flow measurement, both parts of the system must be installed accurately.

The transmitter should be positioned at the correct distance upstream from the flow structure at a height that is at least equal to the maximum flow depth plus the blanking distance (dead zone) of the transmitter (see below).

A minimum distance of 0.31m is recommended.



It is important that the *bottom reference* of the transmitter is related to the centre of the invert of the primary device (see below), and NOT the distance to the channel bottom directly below the transmitter.

**NOTES:**

- The liquid surface at the point of measurement must have a stable, smooth surface and uniform approach velocity. It must not be affected by baffles, foam, hydraulic jumps or any other object likely to cause flow disruption.
- The primary element should be free from any situation where it is likely to 'drown' (refer to relevant Standard for further information)

Rosemount 3100 Series

Specifications

General	
Product	Rosemount 3100 Series level transmitters; Model 3101 for Level and Distance measurement. Model 3102 for Level, Distance, Volume, and Open channel flow measurement with 2 integral signal relays. Model 3105 for Level, Distance, Volume, and Open channel flow measurement for hazardous locations.
Measurement principle	Ultrasonic, time-of-flight.
Measuring performance	
Measurement range	Model 3101: 1 - 26 ft (0.3 - 8 m) Model 3102: 1 - 36 ft (0.3 - 11 m) Model 3105: 1 - 36 ft (0.3 - 11 m)
Level resolution	Better than $\frac{1}{16}$ " (1 mm)
Level accuracy	Model 3101: ± 0.2 in. (5 mm) for <3.3 ft (1 m), $\pm 0.5\%$ of measured distance for >3.3 ft (1 m) Models 3102 and 3105: ± 0.1 in. (2.5 mm) <3.3 ft (1 m), $\pm 0.25\%$ of measured distance for >3.3 ft (1 m) under reference conditions ⁽¹⁾
Blanking distance (Dead Zone)	12" (0.3m)
Update interval	1 second
Display / Configuration	
Integral Display	4/5 digit display for live measurement, and for configuration purposes.
Output Units	For Level or distance-to-surface: m, ft, in, or none For Contents: l, m ³ , gal, or ft ³ For Flow: l/s, l/m, m ³ /hr, gal/s, gal/m, ft ³ /m (cfm), ft ³ /hr, or none
Output Variables	Model 3101: Level, or distance-to-surface Model 3102: Level (or distance-to-surface), Content (Volume), and Flow. Model 3105: Level (or distance-to-surface), Content (Volume), and Flow.
Configuration tools	Standard integral push-buttons with LCD. Rosemount hand-held communicator Model 375. Rosemount 3490 Series Universal Control Unit. Rosemount AMS(TM) Suite
Electrical	
Power supply	Loop-powered (2-wire) Model 3101: 12 - 30 Vdc Model 3102: 12 - 40 Vdc Model 3105: 12 - 40 Vdc (non-hazardous area), 12 - 30 Vdc (hazardous area).
Earthing	None required.
Current Output	Model 3101: Analog 4-20 mA Model 3102: Analog 4-20 mA, HART®. Model 3105: Analog 4-20 mA, HART®.
Signal on alarm	Standard: Low = 3.75 mA. High = 21.75 mA. Namur NE43: Low = 3.6 mA. High = 22.5 mA
Saturation levels	Standard: Low = 3.9 mA. High = 20.8 mA. Namur NE43: Low = 3.8 mA. High = 20.5 mA
Relay output (on 3102 model)	2 integral signal relays, SPST rated 1A @ 30VDC (inductive) and 2A @ 30VDC (resistive)
Electrical parameters	$U_i = 30$ V, $I_i = 120$ mA, $P_i = 0.82$ W, $L_i = 108\mu$ H, $C_i = 0$ nF.
Cable entry	$\frac{1}{2}$ " - 14 NPT conduit entries for cable glands. Option: M20 x 1.5 conduit/cable adaptor.
Output Cabling	Single twisted-pair and shielded, min. 0.22 mm ² (24 AWG), max. 1.5 mm ² (15 AWG).
Materials of construction	
Wet-side material	PVDF.
Body and cover material	Polyurethane-covered Aluminum.
Cover seal	Silicone rubber.
Cover screws	316 Stainless Steel.
Transducer body seal	EPDM.

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Rosemount 3100 Series

Mechanical	
Mounting thread size	2" NPT, or 2" BSP. Optional flange accessories available.
Measuring	
Temperature compensation	Model 3101: Automatic Integral temperature compensation. Model 3102: Automatic Integral temperature compensation. Optional remote temperature sensor for dynamic temperature compensation. ⁽²⁾ Model 3105: Automatic Integral temperature compensation. Optional remote temperature sensor for dynamic temperature compensation. ⁽²⁾
Environment	
Ambient temperature	Model 3101: -4 °F to +158 °F (-20 °C to +70 °C) Models 3102 and 3105: -40 °F to +158 °F (-40 °C to +70 °C) ⁽³⁾
Process temperature	Model 3101: -4 °F to +158 °F (-20 °C to +70 °C) Models 3102 and 3105: -22 °F to +158 °F (-30 °C to +70 °C)
Process pressure	-4 to +44 psi (-0.25 to 3.0 bar)
Ingress protection	NEMA 4X, IP 66.
Electromagnetic compatibility	EN61326 (Class B)
Certifications	CE-mark, FM, CSA, ATEX, or IECEx - dependent on order code.

⁽¹⁾ Temperature: 20°C, Pressure: 101.3 kPa (atmospheric pressure), and Relative Humidity: 65%.⁽²⁾ See page 17 for optional accessories.⁽³⁾ See page 11 onwards for approval temperature ranges.

Rosemount 3100 Series

Product Data Sheet

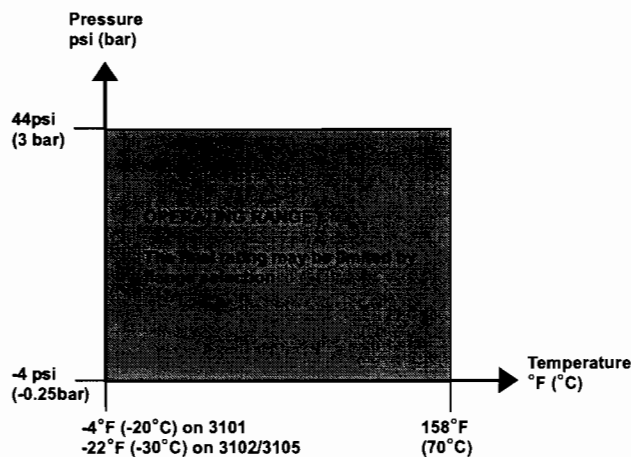
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Temperature and Pressure Ratings

The process temperature/pressure rating depends on the design of the transmitter in combination with the flange materials.

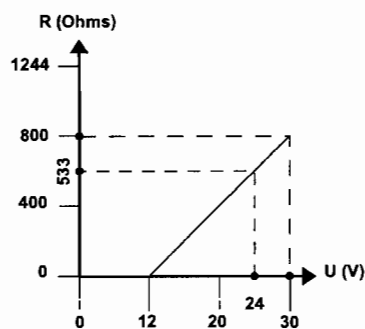


Process temperature and pressure diagram for Rosemount 3100 Series

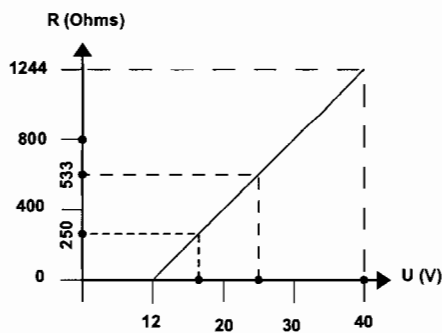
Load Limitations

A HART® Communicator requires a minimum load resistance of 250 Ohm within the loop in order to function properly. Communication with Rosemount 3490 Universal Controller does not require additional resistance. The maximum load resistance can be determined from these diagrams:

Non-Intrinsically Safe Installations

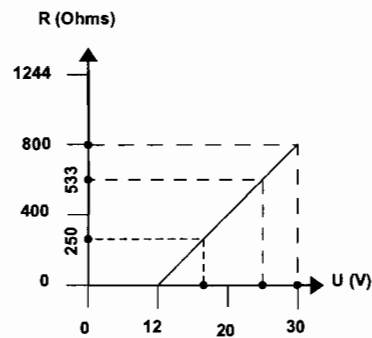


Model 3101



Models 3102 and 3105

Intrinsically Safe Installations



Model 3105

NOTE

R = Maximum Load Resistance

U = External Power Supply Voltage

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Rosemount 3100 Series

Product Certifications

ORDINARY LOCATION CERTIFICATION FOR FM (MODELS 3101/3102)

G5 Project ID: 3024095

The transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

ORDINARY LOCATION CERTIFICATION FOR CSA (MODELS 3101/3102)

G6 Project ID: 1878089

The transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by CSA, a nationally recognized testing laboratory as accredited by the Standards Council of Canada (SCC).

EUROPEAN DIRECTIVE INFORMATION

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting your local sales office.

ATEX Directive (94/9/EC)

Complies with the ATEX Directive.

Pressure Equipment Directive (PED) (97/23/EC)

3100 Series is outside the scope of PED Directive.

Electro Magnetic Compatibility (EMC) Directive

EN61326 (Class B)

CE-mark

Complies with applicable directives

3101, 3102 (EMC)

3105 (EMC, ATEX)

HAZARDOUS LOCATIONS CERTIFICATIONS (MODEL 3105)

Factory Mutual (FM) Approvals

Factory Mutual (FM) Intrinsically Safe Approval

I5 Project ID: 3024095

Intrinsically Safe for Class I, Div. 1, Groups A, B, C and D

Intrinsically Safe for Class I, Zone 0, AEx ia IIC

Temperature Code: T4 at +60°C, max ambient

Temperature Code: T6 at +55°C, max ambient

Control Drawing: 71097/1216

Ui = 30 V, Ii = 120 mA, Pi = 0.82 W, Li = 108 µH, Ci = 0 µF.

Factory Mutual (FM) Non-Incendive Approval

I5 Project ID: 3024095

Non-Incendive for Class I, Div. 2, Groups A, B, C and D

Non-Incendive for Class I, Zone 2, AEx nA IIC

Temperature Code: T4 at +60°C, max ambient

Temperature Code: T6 at +55°C, max ambient

Control Drawing: 71097/1216

Ui = 30 V, Ii = 120 mA, Pi = 0.82 W, Li = 108 µH, Ci = 0 µF

Canadian Standards Association (CSA) Approvals

Canadian Standards Association (CSA) Intrinsically Safe Approval

I6 Project ID: 07 CSA 1878089

Intrinsically Safe for Class I, Div. 1, Groups A, B, C, and D

Intrinsically Safe for Class 1, Zone 0, Ex ia IIC

Temperature Code:

T4 (T_{amb} -40°C to +60°C)

T6 (T_{amb} -40°C to +55°C)

Control Drawing: 71097/1218

Ui = 30 V, Ii = 120 mA, Pi = 0.82 W, Li = 108 µH, Ci = 0 µF

Canadian Standards Association (CSA) Non-Incendive Approval

I6 Project ID: 07 CSA 1878089

Non-Incendive for Class I, Div. 2, Groups A, B, C, and D

Non-Incendive for Class I, Zone 2, Ex nL IIC

Temperature Code:

T4 (T_{amb} -40°C to +60°C)

T6 (T_{amb} -40°C to +55°C)

Control Drawing: 71097/1218

Ui = 30 V, Ii = 120 mA, Pi = 0.82 W, Li = 108 µH, Ci = 0 µF

Product Data Sheet

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Rosemount 3100 Series**ATEX Intrinsically Safe Approval**

- I1 Certificate: Sira 06ATEX2260X
 Intrinsically Safe for II 1 G, EEx ia IIC
 Temperature Class:
 T4 (T_{amb} -40°C to +60°C)
 T6 (T_{amb} -40°C to +55°C)

$U_i = 30\text{ V}$, $I_i = 120\text{ mA}$, $P_i = 0.82\text{ W}$, $L_i = 108\text{ }\mu\text{H}$, $C_i = 0\text{ }\mu\text{F}$

Special conditions for safe use:

1. All transmitter models have external plastic parts, which could present a risk of ignition due to electrostatic charge build-up. They shall not be directly installed in any process where its enclosure might be charged by the rapid flow of non-conductive media.
2. All transmitter models shall only be cleaned with a damp cloth.
3. When the transmitter housing uses aluminum alloy in its construction, this presents a risk of ignition due to impact and shall be taken into consideration on installation and use.

IECEx Approval

- I7 Certificate: IECEx SIR 06.0068X
 Intrinsically Safe for Zone 0, Ex ia IIC
 Temperature Class:
 T4 (T_{amb} -40°C to +60°C)
 T6 (T_{amb} -40°C to +55°C)

$U_i = 30\text{ V}$, $I_i = 120\text{ mA}$, $P_i = 0.82\text{ W}$, $L_i = 108\text{ }\mu\text{H}$, $C_i = 0\text{ }\mu\text{F}$

Special conditions for safe use:

1. All transmitter models have external plastic parts, which could present a risk of ignition due to electrostatic charge build-up. They shall not be directly installed in any process where its enclosure might be charged by the rapid flow of non-conductive media.
2. All transmitter models shall only be cleaned with a cloth.
3. When the transmitter housing uses aluminum alloy in its construction, this presents a risk of ignition due to impact and shall be taken into consideration on installation and use.

Product Data Sheet

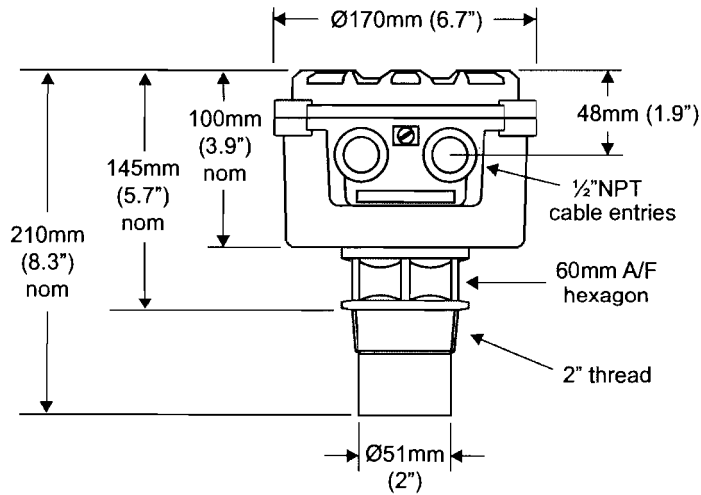
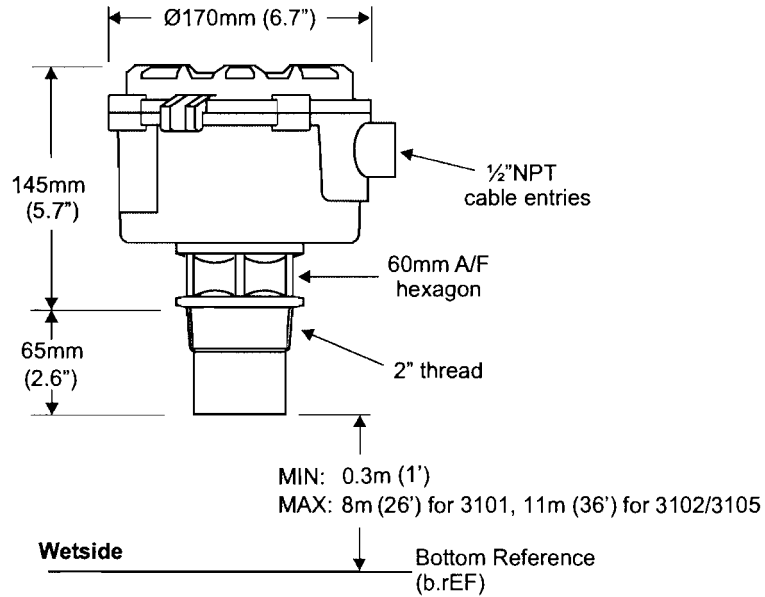
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Rosemount 3100 Series

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Dimensional Drawings

Threaded Mounting



Rosemount 3100 Series

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Ordering Information

Model Code 3101, Level of liquids

Model	Product Description
3101	Ultrasonic level transmitter
Code	Signal Output
L	4-20 mA
Code	Housing Material
A	Polyurethane-covered Aluminum
Code	Conduit / Cable Threads
1	½ - 14 NPT
2	M20 x 1.5 adaptor
Code	Wet-side material
F	PVDF
Code	Process Connection
RC	2" NPT thread ⁽¹⁾
SC	2" BSPT thread ⁽²⁾
Code	Certificates
NA	No certification
G5	FM Ordinary Location
G6	CSA Ordinary Location
Code	Options
Tag Plate	
ST	Stainless Steel engraved tag plate
WT	Laminated paper tag plate

(1) Choosing this option implies US (Imperial) units of measurement are required for the default configuration.

(2) Choosing this option implies Metric units of measurement are required for the default configuration.

Example model order code: 3101-L-A-1-F-RC-G5-ST

Product Data Sheet

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Rosemount 3100 Series

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Model Code 3102, Level, Volume or Flow of liquids

Model	Product Description
3102	Ultrasonic level transmitter with 2 integral relays
Code	Signal Output
H	4-20 mA with HART® communication
Code	Housing Material
A	Polyurethane-covered Aluminum
Code	Conduit / Cable Threads
1	½ - 14 NPT
2	M20 x 1.5 adaptor
Code	Wet-side material
F	PVDF
Code	Process Connection
RC	2" NPT thread ⁽¹⁾
SC	2" BSPT thread ⁽²⁾
Code	Certificates
NA	No certification
G5	FM Ordinary Location
G6	CSA Ordinary Location
Code	Options
Alarms	
C4	Namur alarm and saturation levels; high alarm.
C5	Namur alarm and saturation levels; low alarm.
C8	Low alarm setting with standard Rosemount alarm and saturation levels.
Tag Plate	
ST	Stainless Steel engraved tag plate
WT	Laminated paper tag plate

⁽¹⁾ Choosing this option implies US (Imperial) units of measurement are required for the default configuration.⁽²⁾ Choosing this option implies Metric units of measurement are required for the default configuration.

Example model order code: 3102-H-A-1-F-RC-G5-C4-ST

Product Data Sheet

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Rosemount 3100 Series

Model Code 3105, Level, Volume or Flow of liquids

Model	Product Description
3105	Ultrasonic level transmitter for hazardous areas
Code	Signal Output
H	4-20 mA with HART® communication
Code	Housing Material
A	Polyurethane-covered Aluminum
Code	Conduit / Cable Threads
1	½ - 14 NPT
2	M20 x 1.5 adaptor
Code	Wet-side material
F	PVDF
Code	Process Connection
RC	2" NPT thread ⁽¹⁾
SC	2" BSPT thread ⁽²⁾
Code	Certificates
I1	ATEX Intrinsically Safe
I5	FM Intrinsically Safe and Non-Incendive
I6	CSA Intrinsically Safe and Non-Incendive
I7	IEC Ex Intrinsically Safe
Code	Options
Alarms	
C4	Namur alarm and saturation levels; high alarm.
C5	Namur alarm and saturation levels; low alarm.
C8	Low alarm setting with standard Rosemount alarm and saturation levels.
Tag Plate	
ST	Stainless Steel engraved tag plate
WT	Laminated paper tag plate

(1) Choosing this option implies US (Imperial) units of measurement are required for the default configuration.

(2) Choosing this option implies Metric units of measurement are required for the default configuration.

Example model order code: 3105-H-A-1-F-RC-I5-ST

Product Data Sheet00813-0100-4840, Rev. AB
August 2007**Rosemount 3100 Series****Spare Parts and Accessories**

Code	Accessory/Spare
Accessories	
03100-1001-0001	2" NPT to 2" ANSI #150 PVC Flange
03100-1001-0002	2" NPT to 3" ANSI #150 PVC Flange
03100-1001-0003	2" NPT to 4" ANSI #150 PVC Flange
03100-1001-0004	2" NPT to 6" ANSI #150 PVC Flange
03100-1002-0001	2" BSPT to DN50 PN16 PVC Flange
03100-1002-0003	2" BSPT to DN80 PN16 PVC Flange
03100-1002-0004	2" BSPT to DN100 PN16 PVC Flange
03100-1002-0005	2" BSPT to DN150 PN16 PVC Flange
03100-0001-0001	Remote Temperature Sensor (3102, 3105 only)
03100-0001-0002	1/2"NPT to M20 x 1.5 Conduit Adaptor (Pack of two)

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Rosemount 3100 Series

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NOTES:

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Rosemount 3100 Series

NOTES:

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Rosemount 3100 Series

Rosemount Level Solutions

Emerson provides a complete range of Rosemount products for level measurement applications.

Pressure – Level or Interface Measurement

Emerson has a complete line of Rosemount pressure transmitters and remote seals for measuring level or interfaces in liquid applications. Optimize performance with direct mount, Tuned Seal systems:

- Rosemount 3051S_L, 3051L, and 1151LT Liquid Level Transmitters
- Rosemount 1199 Remote Diaphragm Seals with direct mount or capillary connections

Vibrating Fork Switches – Point Level Detection

The Rosemount 2100 Series is developed for reliable point level detection of liquids and consists of:

- Rosemount 2110 Compact Vibrating Fork Liquid Level Switch
- Rosemount 2120 Full-featured Vibrating Fork Liquid Level Switch

Guided Wave Radar – Level and Interface Measurement

Multivariable, loop-powered Guided Wave Radar transmitters with a wide range of probe styles to fit different liquids and solids applications. The product line consists of:

- Rosemount 3300 Series – Versatile and easy-to-use transmitter with proven reliability
- Rosemount 5300 Series – Accurate, high performance transmitter with FOUNDATION™ fieldbus support

Non-contacting Radar – Level Measurement

The Rosemount non-contacting radar family consists of:

- Rosemount 5400 Series Transmitters – Loop-powered transmitter with a wide range of antennas, for liquid level measurement in most applications and process conditions
- Rosemount 5600 Series Transmitters – Transmitters with ultra-high sensitivity for measurement of level in liquids and solids, even for the most challenging applications

Non-contacting Ultrasonic – Level Measurement

The Rosemount 3100 Series ultrasonic level transmitters provide continuous non-contacting level measurement of liquids. The range consists of:

- Rosemount 3101 for simple continuous level measurement
- Rosemount 3102 for continuous measurement with two integral relays for local control functionality
- Rosemount 3105 Intrinsically safe certified version for hazardous areas

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DeltaV is a registered trademark of Emerson Process Management group of companies.
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Standard Terms and Conditions of Sale can be found at www.rosemount.com/terms_of_sale

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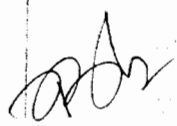


EMERSON
Process Management

PRE-TREATMENT PLANT

Cat II

TRANS NO. (21-152)
 DATE 19.01.2010
 SUBJECT TO OLD PROJECT
 REQUESTED FOR APPROVAL



1	14/12/2009	REVISED AS PER BHEL COMMENTS	SKS	APU	AVS
0	8/10/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By
PROJECT		PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).			
CUSTOMER:		 PRAGATI POWER CORPORTION LIMITED (PPCL)			
CONSULTANT:		 NTPC LIMITED, CONSUTANCY WING			
		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			
		THERMAX LIMITED PUNE			
DATA SHEET FOR DIFF. PRESSURE FLOW TRANSMITTER					
THERMAX DOC.NO.:		BHEL DOC. NO. :		OC.NO. 630128	
WHJBC00009		PE-VO-314-158-A303		REV. NO : 01	

[illegible]

PRE-TREATMENT PLANT

Submitted
17/11/2009

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

TRANS NO. **C81-293**
18-7-10

APPROVED FOR FABRICATION/CONSTRUCTION
APPROVED FOR FABRICATION/CONSTRUCTION
SUBJECT TO INCORPORATION OF COMMENTS/
MODIFICATIONS AS NOTED IN SUPPLY REVISED
DRAWING DOCUMENT

ON NOT APPROVED IN SUPPLY REVISED DRAWING DOCUMENT
AFTER INCORPORATION OF COMMENTS/MODIFICATIONS
AS NOTED.

FOR INFORMATION AND RECORDS
DATE REVISED AND REVISION FOR VIT 3/11/10

ISSUED FOR APPROVAL OF CONSTRUCTION DESIGN DETAILS ASSEMBLY
SPECIFICATIONS, APPROVED COMMENTS AND CONFIRMATION OF THE SUPPLIES WITH THE
SPECIFICATIONS, APPROVED COMMENTS AND CONFIRMATION OF THE SUPPLIES WITH THE
SPECIFICATIONS, APPROVED COMMENTS AND CONFIRMATION OF THE SUPPLIES WITH THE

Rev. No	Date	Description	Prepared By	Reviewed By	Released By
3	27/2/2010	ISSUED FOR APPROVAL OF CONSTRUCTION DESIGN DETAILS ASSEMBLY SPECIFICATIONS, APPROVED COMMENTS AND CONFIRMATION OF THE SUPPLIES WITH THE SPECIFICATIONS, APPROVED COMMENTS AND CONFIRMATION OF THE SUPPLIES WITH THE	SKS	APU	AVS
2	31/3/2010	ISSUED FOR APPROVAL OF CONSTRUCTION DESIGN DETAILS ASSEMBLY SPECIFICATIONS, APPROVED COMMENTS AND CONFIRMATION OF THE SUPPLIES WITH THE SPECIFICATIONS, APPROVED COMMENTS AND CONFIRMATION OF THE SUPPLIES WITH THE	SKS	APU	AVS
1	22/12/2009	REVISION FOR COMMENTS	SKS	APU	AVS
0	17/11/2009	FOR APPROVAL	SKS	APU	AVS

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

CUSTOMER: PRAGATI POWER CORPORATION LIMITED (PPCL)

CONSULTANT: NTPC LIMITED, CONSULTANCY WING

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

THERMAX LIMITED
PUNE

DATA SHEET FOR ORFICE PLATE

THERMAX DOC NO.: WH1BB00009	BHEL DOC NO.: PE-VO-314-158-A 305	SHEET NO: 1 OF 2	QC NO. 630128 REV. NO : 03
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PROJECT:- PRAGATI-II COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL) (PT PLANT)
 OWNER: PRAGATI POWER CORPORATION LIMITED (PECL)
 CLIENT: BHARAT HEAVY ELECTRICALS LTD
 CONSULTANT: NTPC LIMITED, CONSULTANCY WING
 CLIENT DOC NO: PE-VO-314-158-A12 REV NO.01
 THERMAX OC NO: 639128

REPLIES TO THE COMMENT ON DATA SHEET

ORIFICE PLATE DOC NO. WHJBH000029

S.NO.	COMMENT	THERMAX REPLY	REMARKS
I	Only two flow elements 501A, 501B are appearing in data sheet, however in Flange assembly drawing there are 04 no.	Noted, flange assembly drawing is revised accordingly	
II	Beta ratio indicating in orifice sizing calculation is more than 0.7, where in data sheet it is mentioned as 0.4 to 0.7	Noted, data sheet note no.01 is revised for beta ratio range & supporting document ISO 5167 is attached.	

ORifice Plate (FMS)			
GENERAL	1	TAG NO.	FE-501A
	2	SUPPLY	ORifice PLATE
	3	MAKE TO	BS-1042 (LATEST REV.) / ISO-5167
	4	PLATE MATERIAL	SS 316
	5	PIPE MATERIAL	MS
	6	TAP	FLANGED TAPPING
	7	TAP SIZE	1/2 NPT (F)
	8	LOCATION	OUTLET OF RAW WATER PUMP HOUSE
	9	LINE SIZE AND MATERIAL	800 MS
OPERATING CONDITIONS	10	FLUID	WATER
	11	MAX. FLOW M ³ /HR	3600
	12	NOM. FLOW M ³ /HR	3000
	13	METER MAX M ³ /HR	4000
	14	PRESS. OPERATING KG/CM ²	1.5
	15	PUMP OPERATING COS. GEN	AMB
	16	SLIP AT 15 DEG GEN	5
	17	PROCESS MAX. PRESS. KG/CM ²	2.5
	18	PROCESS PIPE MATERIAL	B-3068 GR 410, ERW LATEST EDN'S MS/NOM/THK
PLATE DETAILS	19	TYPE	CONCENTRIC
	20	ORifice BORE	600 IT
	21	PIPE O.D. MAX & MIN	812.8 / 796.8 mm
	22	FLANGE SIZE AND TYPE	ANSI B-16.5-150B
	23	INDICATOR TYPE	DIFFERENTIAL PRESSURE TYPE
	24	DIFF. RANGE (mm of H ₂ O)	2500
	25	VENT HOLE	YES
	26	PLATE THICKNESS	4.85 mm
	27	QUANTITY	2

NOTES >

1. ALL DIMENSIONS ARE TO BE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
2. TOLERANCE FOR ORifice BORE SHALL BE ± 0.05 mm.
3. ARE TO BE ENGRAVED ON THE UPSTREAM SIDE OF INTERNAL MARKINGS FOR ALL ORifice PLATES.
4. COMPLETE ASSEMBLY OF ORifice PLATE WITH ANSI 3008 WELD NECK FLANGES ONLY TAPPED WILL BE IN THE SUPPLY OF INSTRUMENT SECTION.
5. NO OF TAP HOLES = 2
6. THE ROOT VALVE SHALL NOT BE USED BY THERMAX



REV. NO.	1	30/09/10	DAE	APU	AVE
	2	20/02/11	DAE	APU	AVE
	3	23/12/2006	DAE	APU	AVE
	4	18/12/2009	DAE	APU	AVE
	5	17/11/2008	DAE	APU	AVE
BY : 02	1	15/06/2004	DAE	APU	AVE
	2	15/06/2004	DAE	APU	AVE
PROJECT : BANGALORE HEAVY ELECTRICALS LTD		OPERATION : 14	PLANT	BANK	
CONTRACTOR : HREC - CONSULTANCY WRO		WATERWORKS	PT	2 OF 2	

MICRO PRECISION PRODUCTS PVT. LTD. Faridkot

Bore Calculation as per ISO 5167

CUSTOMER M/S THERMAX LIMITED
PROJECT/CONSULTANT PRABATI - 111 CCPH 1500MH (NOMINAL)

P.O./Enq.No. E-MAIL ENQUIRY DT 09.09.2009
TAG/ITEM No. FE-501A
MICRO Job No./ Quote No. Q98741

Service WATER
Flow Element and Type O-PLATE, CONC. SQ. ED
Material of Flow Element SS316
Material of Pipe MS
Material of Flange AISI
Pipe Size 80 (mm) / ID (mm) 812.00 / 796.00

Type of Tapping FLANGE TAP
No. of Tapping 3 PAIRS
Maximum Flow 3600.00000000 m3/Hr (Q1)
Normal Flow 3320.00000000 m3/Hr (Qn)
METER MAX (Design Flow) 4300.00000000 m3/Hr (Qm)

Temperature Operating Division (t) 20.00000000
Upstream Pressure (Operating Condition) Kp/cm2 (P1abs) 2.53320000

Density (Operating Condition) Kg/m3 RDH (p1) 1000.00000000
Viscosity (Operating Condition) (poise) MuLu 0.01000000

Diff Pressure at METER MAX mm of HC (hm) 2500.00000000
Diff Pressure at Normal Flow (hn) 1490.31909141

I.D. of Pipe at 20 deg. C mm (D) 796.00000000
Coeff. of Expan.-Flow Element mm/mm-C (alpha) 0.0000173
Coeff. of Expan.-Pipe mm/mm-C (alpha) 0.0000120
Correction Factor for Pipe I.D. at t deg C (Fp) 1.00000000
Temp. Corr. Factor for Orifice Plate (Fop) 1.00000000

Reynold Number RDH (n) 1473063.9730639
Therefore Approx. Beta = d/D (Approx. Beta (B)) 0.7036645

Discharge Coefficient (C) 0.6012567

Beta Updated (B1) 0.7031000

Corrected at 20 deg C dcd/Fop mm (dc) 860.2371053

Vent Hole Diameter mm (B) 12.70000000
Vent Hole Location mm (D-B)/2 392.05000000
d (After Vent Hole Correction) mm (dv) 360.0787625
Pressure Loss at (METER MAX) mm WC (w) 1225.9320055
Pressure Loss at (NORMAL FLOW) mm WC (w1) 730.8124259
Pressure Loss at (MAXIMUM FLOW) mm WC (w2) 603.3147546

DATE 10/09/09
Revision no: A. DT 21.12.2009; PIPE ID REVISED, TYPE & NO. OF TAPPINGS
Reference no. Q98741-D/FE-501A

CROSS CHECK OF RESULTS USING CALCULATED VALUES BUT UNITS AS UNDER: -
Qv : $3.14/4 \times C \times (d/d1) \times \sqrt{2 \times \Delta P} \times (p1)$ where $p1$ in kg/m3
Qv in m3/sec ; Delta(P) in Pa ; d1(d/1000) in meters ; $E=1/\sqrt{1 - (B1)^4}$
Qv (m3/sec) = 1.19339859 Qn (m3/Hr) = 4296.09091240

Calculation done by : SSV/SK Calculation checked by : J

ADDITIONAL REVISED, TYPE & NO. OF TAPPINGS

MICRO PRECISION PRODUCTS PVT. LTD. Faridabad

Bore Calculation as per ISO - 5167

CUSTOMER: M/S THERMAX LIMITED
 PROJECT/CONSULTANT: PRAGATI - III CAPP 1500MM (NOMINAL)

P.O./Eng.No.: E-MAIL ENQUIRY DT 09.09.2009
 TAG/ITEM No.: FE-501B
 NICRO Job No./Quote No.: Q90741

Service: WATER
 Flow Element and Type: O-PLATE, CONC. SQ. EE
 Material of Flow Element: SS316
 Material of Pipe: MS
 Material of Flange: A105
 Pipe Size: OD (mm) / ID (mm) 812.80 / 796.80

Type of Tapping: FLANGE TAPS
 No. of Tapping: 3 PAIRS
 Maximum Flow: m³/Hr (Q_m) 3650.9000000
 Normal Flow: m³/Hr (Q_n) 3320.0000000
 METER MAX (Design Flow): m³/Hr (Q_m) 4300.0000000

Temperature Operating: Celsius (t) 20.0000000
 Upstream Pressure (Operating Condition): Kg/cm² (P)abs 2.5332000

Density (Operating Condition): Kg/m³ RDH (p)t 1000.0000000
 Viscosity (Operating Condition): (poise) Mu(u) 0.0100000

Diff Pressure at METER MAX: mm of WC (hm) 2300.0000000
 Diff Pressure at Normal Flow: (hn) 1490.3190914

I.D. of Pipe at 20 deg. C: mm (D) 796.0000000
 Coeff. of Expan.-Flow Element: mm/mm-C (a)pe 0.0000173
 Coeff. of Expan.-Pipe: mm/mm-C (a)p 0.0000120
 Correction Factor For Pipe I.D. at 4 deg. C: (Fp) 1.0000000
 Temp. Corr. Factor For Orifice Plate: (Fop) 1.0000000

Reynold Number: RD(n) 1473063.9730639
 Therefore Approx. Beta = d/D: (Approx. Beta)XB 0.7036645

Discharge Coefficient: (C) 0.6012567

Beta Updated: (B1) 0.7031000

d (corrected) at 20 deg C dcd/Fop: mm (dc) 560.2371053

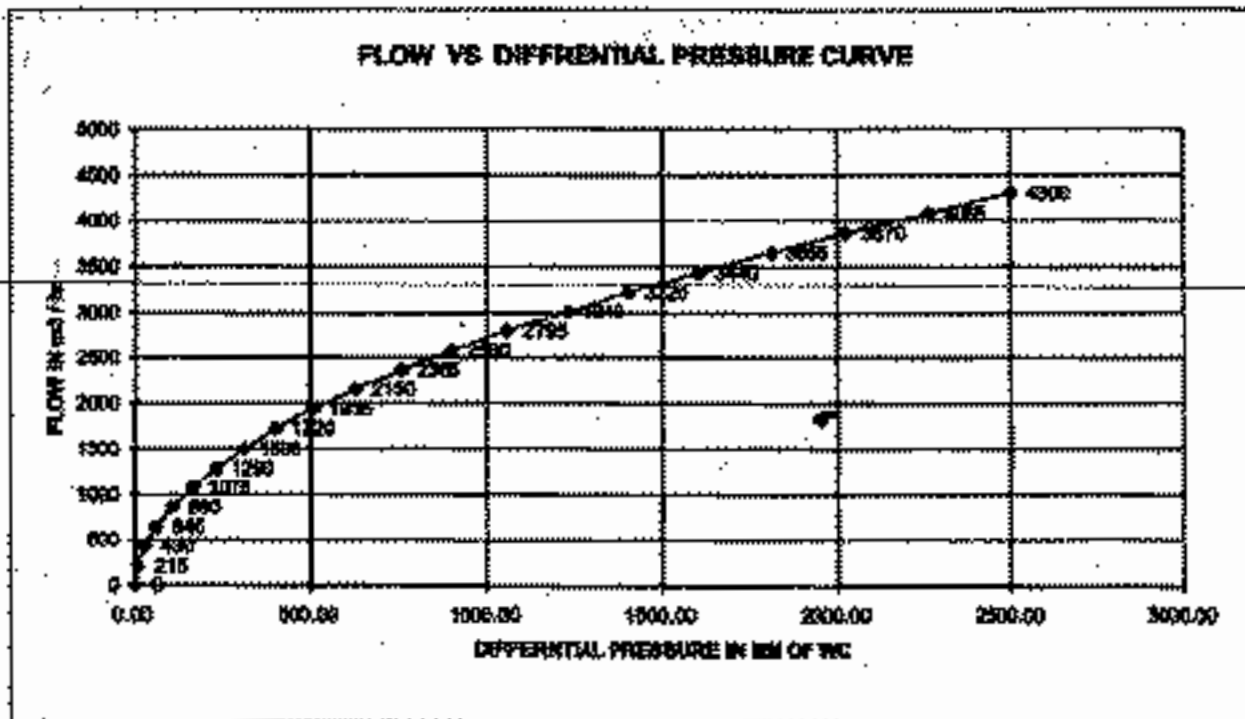
Vent Hole Diameter: mm (B) 12.7000000
 Vent Hole Location: mm (D-B)/2 392.0500000
 d (After Vent Hole Correction): mm (dv) 560.0707623
 Pressure Loss at (METER MAX): mm WC (w) 1225.9320051
 Pressure Loss at (NORMAL FLOW): mm WC (w1) 730.0124255
 Pressure Loss at (MAXIMUM FLOW): mm WC (w2) 803.3147549

DATE: 10/09/09
 Revision no: A, DT 21.12.2009; PIPE ID REVISED, TYPE & NO. OF TAPPINGS
 Reference no: Q90741-D/FE-501B

CROSS CHECK OF RESULTS USING CALCULATED VALUES BUT UNITS AS UNDER: -
 $Q_v = 3.14/4 * C * E * (d1/d2) * \sqrt{2 * \Delta P / \rho}$ where ρ is in kg/m³
 Q_v in m³/sec : ΔP in Pa : $d1/d2$ in mm : $E = 1/\sqrt{1 - \beta^4}$
 Q_v (m³/sec) = 1.1933539 Q_m (m³/Hr) = 4296.09091240

Calculation done by: BSV/SK

Calculation checked by: J
 PABOOL BAYAL, M.TECH



1 CUSTOMER :	M/S THERMAX LIMITED
2 P.O. NO. :	E-MAIL ENQUIRY DT 09.09.2009
3 PROJECT :	PRAGATI - III CCPP 1500 MW (NOMINAL)
4 JOB NO. :	
5 TAG NO. :	FE-601A
6 SERVICE :	WATER

7 O-PLATE I.D. 560.07 mm

8 FLOW EQUATION WITH CONSTANT DENSITY OF 1000.00 KG/M³

$$W = K \times \sqrt{DP} \quad \text{WHERE DP IS IN MM OF WC \& FLOW IN M}^3\text{/HR}$$

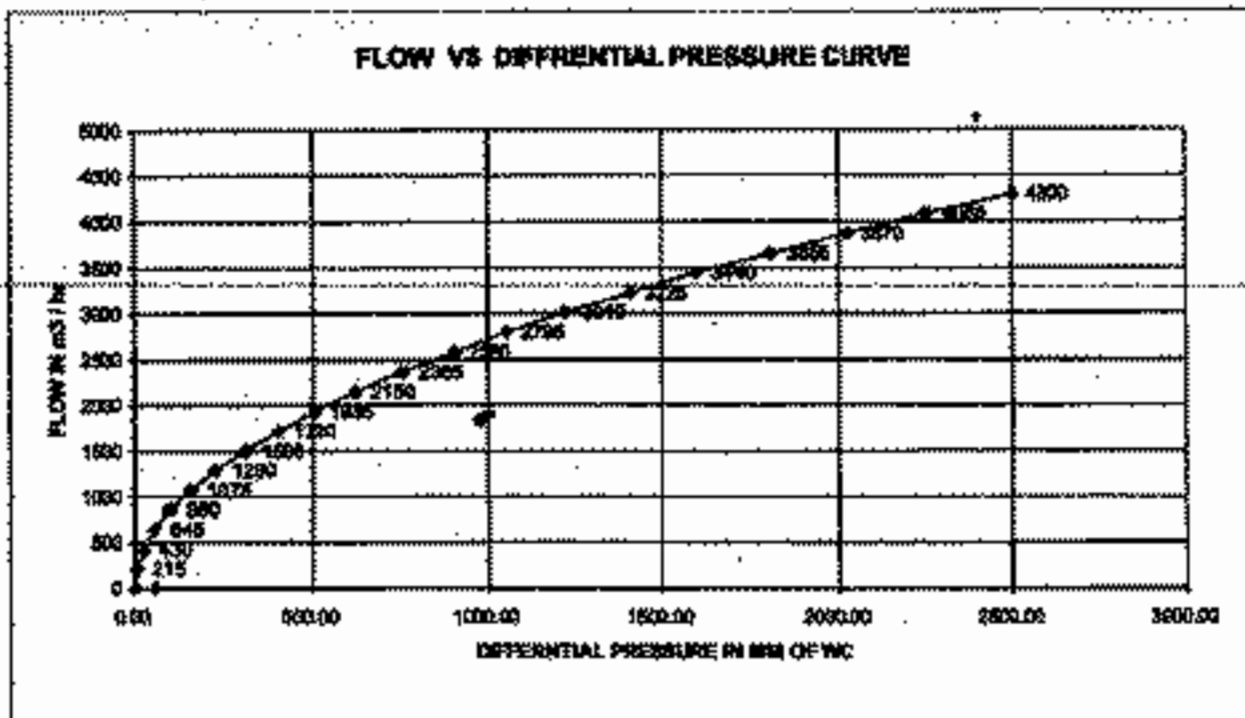
$$= 88 \times \sqrt{DP}$$

9 FLOW EQUATION WITH CHANGE IN DENSITY

$$W = K \times \sqrt{DP} \times \sqrt{ROH} \quad \text{WHERE ROH IS IN KG/M}^3$$

$$= 2.719558 \times \sqrt{DP} \times \sqrt{ROH}$$





1 CUSTOMER :	M/S THERMAX LIMITED
2 P.O. NO. :	E-MAIL ENQUIRY DT 09.09.2009
3 PROJECT :	PRAGATI - II COOP. 1600 MW (NOMINAL)
4 JOB NO. :	"
5 TAG NO. :	FE-S01B
6 SERVICE :	WATER

7 O-PLATE I.D. 580.07 mm

8 FLOW EQUATION WITH CONSTANT DENSITY OF 1000.00 KG/M³

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

$= 88 \pm \text{SQRT}(DP)$

9 FLOW EQUATION WITH CHANGE IN DENSITY

$W = K \times \text{SQRT}(DP) \times \text{SQRT}(\rho/\rho_0)$ WHERE ρ/ρ_0 IS IN KG/M³

$= 2.716559 \times \text{SQRT}(DP) \times \text{SQRT}(\rho/\rho_0)$



ISO 5167-2:2003(E)

5.2.3.10 The diameter of the pipe shall be measured as specified in 6.4.2, the carrier being as part of the primary device. This also applies to the distance requirement given in 6.4 measured from the upstream edge of the recess formed by the carrier ring.

5.3 Coefficients and corresponding uncertainties of orifice plates

5.3.1 Limits of use

Standard orifice plates shall only be used in accordance with this part of ISO 5167 under the following conditions.

For orifice plates with corner or with D and $D/2$ pressure tapplings:

- $d \geq 12,5$ mm;
- $50 \text{ mm} \leq D \leq 1\,000$ mm;
- $0,1 \leq \beta \leq 0,75$;
- $Re_D \geq 5\,000$ for $0,1 \leq \beta \leq 0,56$;
- $Re_D \geq 16\,000 \beta^2$ for $\beta > 0,56$.

For orifice plates with flange tapplings:

- $d \geq 12,5$ mm;
- $50 \text{ mm} \leq D \leq 1\,000$ mm;
- $0,1 \leq \beta \leq 0,75$.

Both $Re_D \geq 5\,000$ and $Re_D \geq 170 \beta^2 D$

where D is expressed in millimetres.

The pipe internal roughness shall satisfy the following specification if the uncertainty values in this ISO 5167 are to be met, i.e. the value of the arithmetical mean deviation of the roughness profile, R_a , such that $10^4 R_a/D$ is less than the maximum value given in Table 1 and greater than the minimum value in Table 2. The discharge coefficient equation (see 5.3.2.1) was determined from a database collected in Table 2. The discharge coefficient equation (see 5.3.2.1) was determined from a database collected in Table 2.

which Tables 1 and 2 are listed is β and Re_D and $10^4 R_a/D$.

Table 1 — Maximum value of $10^4 R_a/D$

$\beta \leq 0,20$	15	15	15	15	15	15	15	15	15
0,30	15	15	15	15	15	15	15	15	15
0,40	15	15	10	7,2	5,2	4,1	3,5	3,1	2,7

EFFLUENT TREATMENT PALNT

Cat IV

Note : Please ensure plug & socket electrical connection.

Rev. No. C8T
285
Date 21/06/10

APPROVED FOR RELEASE
DATE 21/06/10
Cat IV

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

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

CUSTOMER:
 PRAGATI POWER CORPORTION LIMITED (PPCL)

CONSULTANT:
 NTPC LIMITED, CONSUTANCY WING

 BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

 THERMAX LIMITED
PUNE

DATA SHEET FOR CONDUCTIVITY ANALYSER

THERMAX DOC.NO.: WHJEB00011	BHEL DOC. NO. : PE-VO-314-164-A 171	OC.NO. 630128 REV. NO : 01
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PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL). (ETP PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-VO-314-164-A206
THERMAX DOC NO: WHJMD00002 REV NO.01
THERMAX OC NO: 630128

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

CONDUCTIVITY ANALYSER

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

Conductivity Analyser Specification Sheet		
Sr	Identification	Specification
General		
1	Make	EMERSON
Transmitter		
2	Model Number	7387C-05-13-03-17
3	Type	Conductivity Transmitter 2 wire with Local Indication
4	Conductivity Range	Refer Instruction sheet
5	Measurement Span Limit	5 to 2000 uS/cm at 25 °C
6	Display	Digital display
7	Accuracy	± 1 % OF F.S. Scale
8	Power Supply	24 VDC
9	Input	Single sensor input
10	Output	4-20 mA Analog DC
11	Temperature Compensation	Automatic
12	Range	5 to 45 °C
13	Element	10 X 7 °C
14	Mounting Bracket	2" Pipe (NPT) / Surface Mount
15	Electrical connections / Cable Entry Size	1/2 - 1 1/4 NPT (IPX 2) max.
REACTRONS		
16	Model Number	400-13-50
17	Type	Flow through
18	Cell Constant	1
19	Operating Temperature Range	0 to 135 °C
20	Operating Pressure Range	7.4 Pa to 230 Pa/g
21	Electrode Material	Teflon
22	Electrode Body Material	SS 316
23	O-Rings	EPDM
24	Process Connections	1/4" NPT
Accessories		
25	Cable Between Sensors to Transmitter	10 Feet (3.1 m) Integrated to sensor
26	Wiring type	SS 316
27	Flow Through Chamber Material	Low flow rate suitable for 1/2" NPT tube connection. Suitable connector will be provided by THERMAX WWSB.

	PROJECT: PRAGATI - III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI	2	10/02/2010	SKS	APU	AVS
		1	04/10/2009	SKS	APU	AVS
THERMAX LIMITED	O.C. NO: 63052R	0	7/10/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD, DELHI	Rev	Date	Prep'd by	Chkd by	App'd by
Bai Chambers, Wakadewadi	CLIENT : BILWAAS HEAVY ELECTRICALS LTD	Specification No		Plant		S/N NO
Pune 411 008 (INDIA)	CONSULTANT: NTPC - CONSULTANCY WING	WHEB00011		ETP		2 OF 2

Page 84 of 204

Product Data Sheet

PDS 71-1181CT/rev.A

February 2000

Model 1181 C/T

Conductivity Two-Wire Transmitters

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



FEATURES AND APPLICATIONS

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

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

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

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

continued on page 2

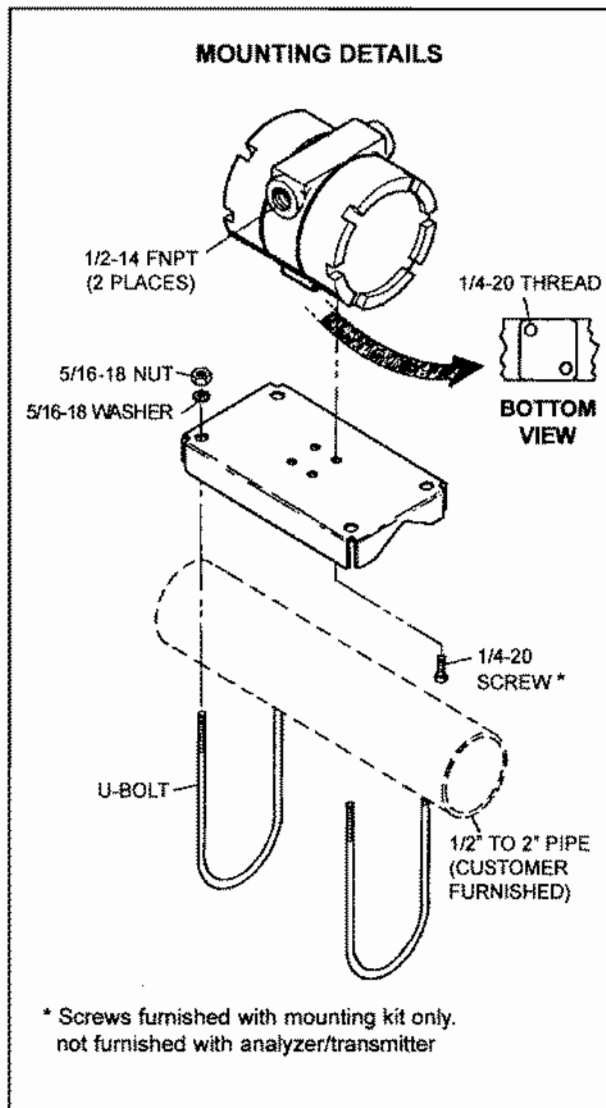
ROSEMOUNT
Analytical


EMERSON
Process Management

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

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

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



PHYSICAL SPECIFICATIONS – GENERAL

Enclosure: NEMA 4X, weatherproof and corrosion-resistant

NEMA 7B, explosion proof

Hazardous Area Classification:

Explosion Proof:

FM: Class I, Groups B, C, & D, Div. 1

Class II, Groups E, F, & G, Div. 1

Class III, Div. 1

CSA: Class I, Groups C & D, Div. 1

Class II, Groups E, F, & G, Div. 1

Class III, Factory Sealed, Div. 1

Class I, Groups A, B, C, & D, Div. 2

Enclosure: Type 4

Intrinsic Safety:

FM: Class I, II, & III, Div. 1

CSA: Class I, Groups A, B, C, & D, Enc 4, Class 1, Div. 1

Temperature Code T4

BASEEFA: EEx ia IIB T4, TAMB = 55°C

Display:

Blind: (Code 02)

Analog: plug in, 90 degree, 2.5 inch diameter

1181C: single scale, 0-100%

1181T: single scale, 0-100%

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

Recommended Cable: Transmitter to Power Supply

Two Wire, 18 AWG, shielded, Belden 8760 or equal (Rosemount Analytical P/N 9200001)

Weight/Shipping Weight:

1181C, T:

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

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

INSTRUMENT SPECIFICATIONS – GENERAL

Power Supply Requirements: (See Load/Supply Chart)

Lift Off Voltage: Blind & Analog: 10 VDC

Digital: 12.5 VDC

Maximum Operating Power: 40 milliwatts

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

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

Input/Output Isolation: 600 Volts

Ambient Temperature: -25° to 70°C

Relative Humidity: 0-99%

Digital Display Accuracy: 0.1% reading ±1.0 count

Analog Display Accuracy: ±2.0%

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

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

Shock: 10G maximum for 10 milliseconds

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

EMC/RFI:

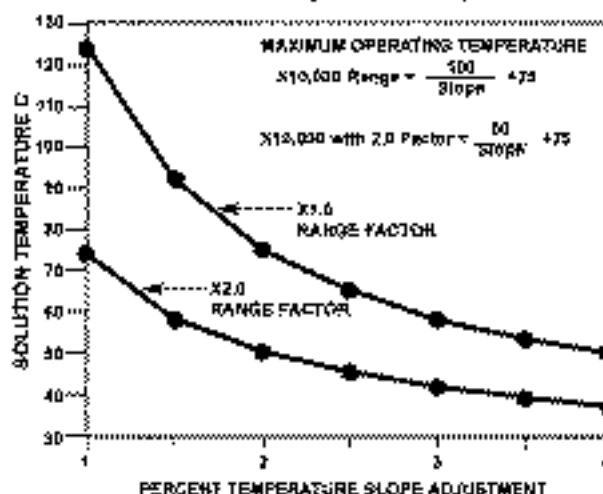
EN50081-1

EN50082-2



MAXIMUM OPERATING TEMPERATURE MODEL 1181C ONLY

For X10,000 Range Multplier Only



Rosemount Analytical J

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

INSTRUMENT SPECIFICATIONS @ 25°C

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

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

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

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

Repeatability: $\pm 0.5\%$ full scale

Temperature Coefficient: 0.1%/°C

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

Temperature Slope Adjust: 0-4%/°C

Maximum Operating Temperature of Sensor:

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

RECOMMENDED SENSORS:

Model 140 Conductivity
Model 150 Insertion/Submersion
Conductivity
Model 400 series Conductivity

* Not applicable for conductivity less than 10 $\mu\text{S}/\text{cm}$. See Models 3081C/81C, 3054RLC, or 1055C product data sheets for these applications

MODEL 1181C

		CELL CONSTANT							
		0.01 CM*	0.1	0.2	0.5	1.0	2.0	5.0	
RANGE FACTOR	X500	X0.5	1.0	10	25	50	100	250	
	X1.0	1.0	10	25	50	100	200	500	
	X2.0	2.0	20	40	100	200	400	1,000	
X1,000	X0.5	5.0	50	100	250	500	1,000	2,500	
	X1.0	10.0	100	200	500	1,000	2,000	5,000	
	X2.0	20.0	200	400	1,000	2,000	4,000	10,000	
X10,000	X0.5	50	500	1,000	2,500	5,000	10,000	25,000	
	X1.0	100	1,000	2,000	5,000	10,000	20,000	50,000	
	X2.0	200	2,000	4,000	10,000	20,000	40,000	100,000	
FULL SCALE MICROSIEMENS/CM									

*CM = Centimeter

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

INSTRUMENT SPECIFICATIONS @ 25°C

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

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

Accuracy: $\pm 0.5\%$ full scale

Stability: $\pm 1\%$ per year

Repeatability: $\pm 0.1\%$ full scale

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

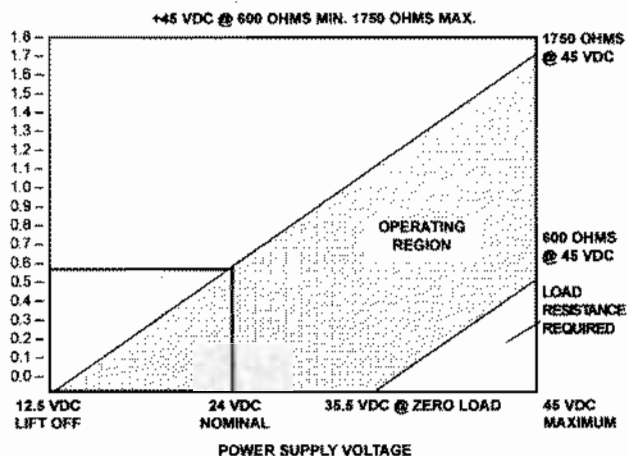
Temperature Slope Adjust: 0-4%/°C

Automatic Temperature Compensation: 0-200°C

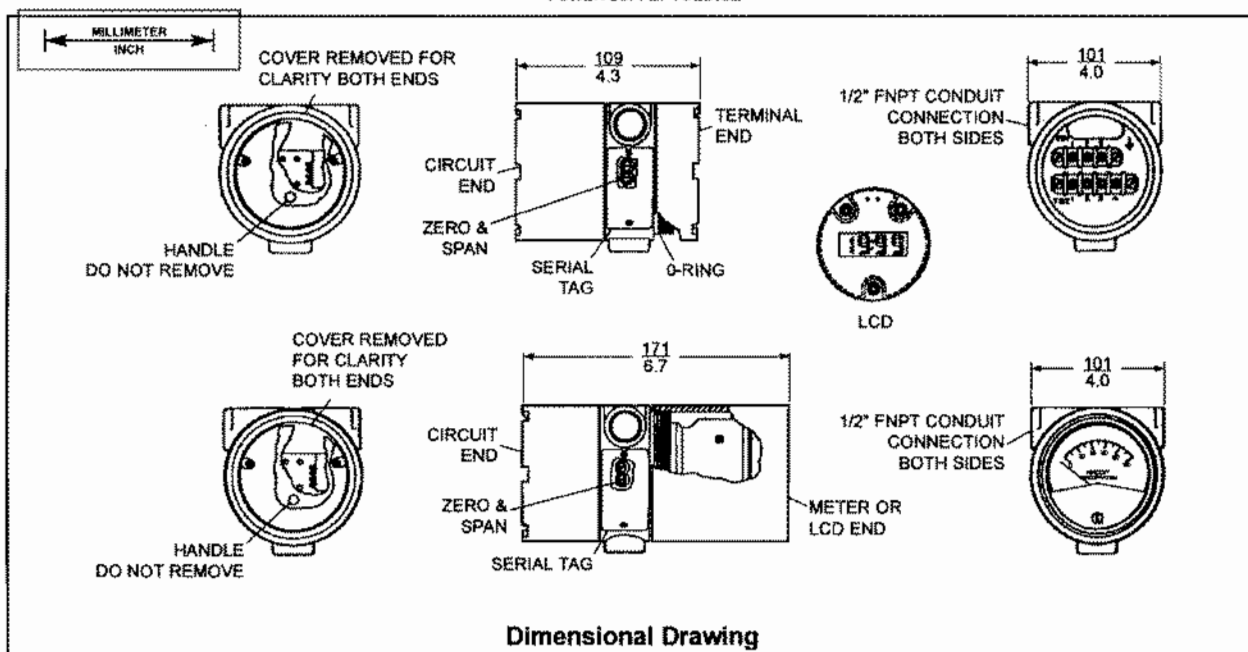
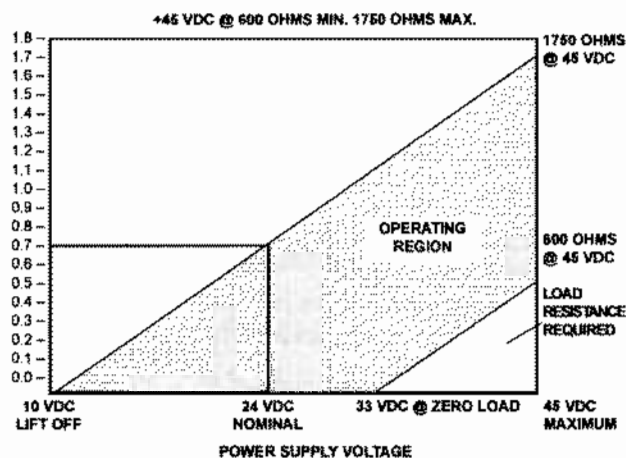
RECOMMENDED TOROIDAL SENSORS:

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

DIGITAL DISPLAY LOAD/POWER SUPPLY REQUIREMENTS



BLIND & ANALOG DISPLAY LOAD/POWER SUPPLY REQUIREMENTS



ORDERING INFORMATION

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

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

Former Options

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



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Emerson Process Management

Rosemount Analytical Inc.,
2000 Barrows Parkway
Houston, TX 77060-1834
Tel: (281) 757-8500
Fax: (281) 474-7230

<http://www.ra.usnibc.com>

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EMERSON
Process Management

Product Data Sheet

PDS 71-400/rev.G

February 2006

Model 400 and 400VP Series

ENDURANCE® General Purpose Conductivity Sensors

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

APPLICATIONS

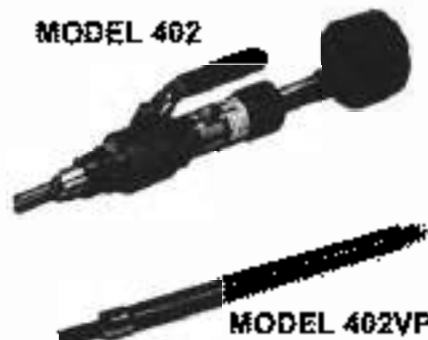
The Model 400/400VP, 401, 402/402VP, and 404 sensors are intended for the determination of electrolytic conductivity in applications ranging from high purity water to cooling water. The sensors are ideal for use in clean, non-corrosive, samples having conductivity less than about 20,000 $\mu\text{S}/\text{cm}$.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

FEATURES

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

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

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



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Process Management

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

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

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

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

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

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

SPECIFICATIONS (Models 400 and 400VP)

Cell constants: 0.01, 0.1, and 1.0/cm

Wetted materials:

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

Process connection: 3/4 inch MNPT

Temperature: 32 – 221°F (0 – 105°C)

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

Pressure: 250 psig (1825 kPa abs) maximum

Vacuum: 7.4 psia (51 kPa abs)

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

SPECIFICATIONS (Model 401)

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

Wetted materials:

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

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

Process connection (option -15): 1 inch MNPT

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

Pressure: 200 psig (1481 kPa abs) maximum

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

SPECIFICATIONS (Models 402 and 402VP)

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

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

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

Wetted materials (10/cm cell):

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

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

Temperature: 32 – 212°F (0 – 100°C)

Pressure: 200 psig (1481 kPa abs) maximum

Retraction pressure: 64 psig (542 kPa abs) maximum

Cable length (Model 402 only): 10 ft (3.1 m).
For longer cable length, choose option -80
(integral junction box) and order interconnecting
cable separately.

¹ Kynar is a registered trademark of E.I. du Pont de Nemours and Company, Inc.

SPECIFICATIONS (Model 404)

Cell constants: 0.01 and 0.1/cm

Wetted materials (option -16):

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

Wetted materials (option -17):

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

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

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

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

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

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

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

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

SPECIFICATIONS (Flow cell for Model 400/400VP, PN 24091-02)**Wetted Materials:**

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

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

Temperature: 122°F (50°C) maximum

Pressure: 65 psig (549 kPa abs) maximum

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

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

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

Temperature: 32 – 212°F (0 – 100°C).

Pressure: 200 psig (1481 kPa abs) maximum

Retraction pressure: 64 psig (542 kPa abs) maximum

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

SENSOR AND INSTRUMENT SELECTION GUIDELINES

Instrument	Recommended for range for cell constant (µS/cm)		
	0.01/cm	0.1/cm	1.0/cm
1055	0-50	0.1-2500	10-2000
540C	0-50	0.1-2000	10-12,000
60B1-C	0-50	0.1-500	10-20,000
Xmt-C	0-50	0.1-500	10-20,000

WEIGHTS AND SHIPPING WEIGHTS

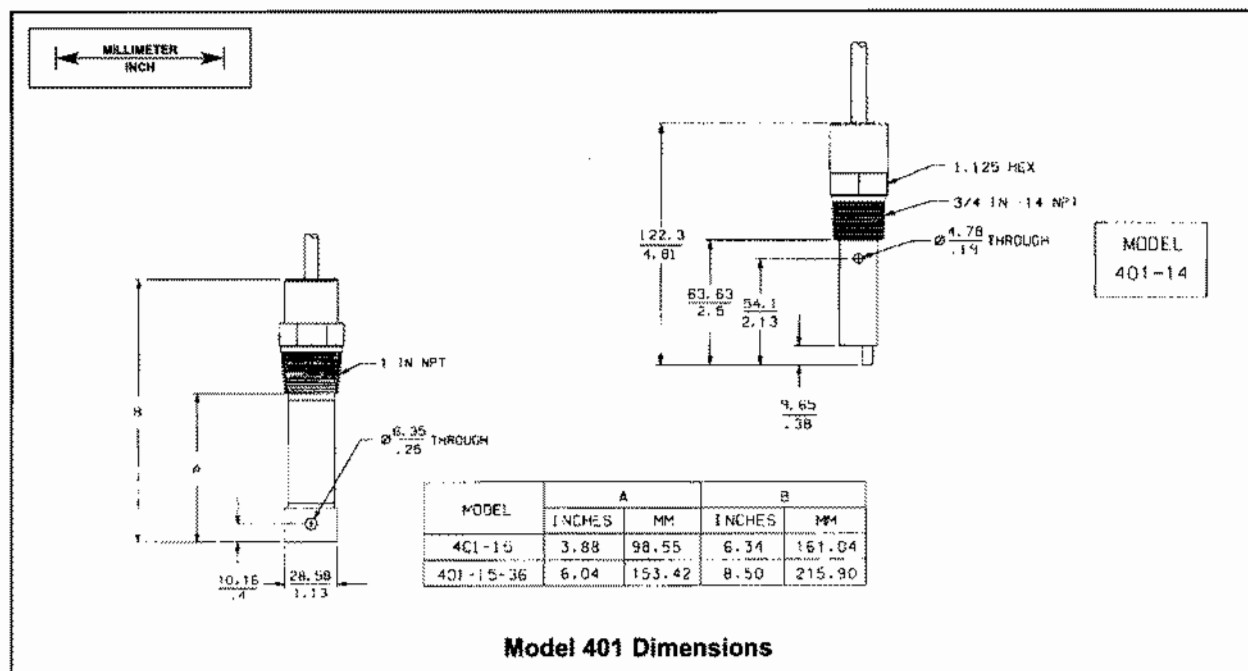
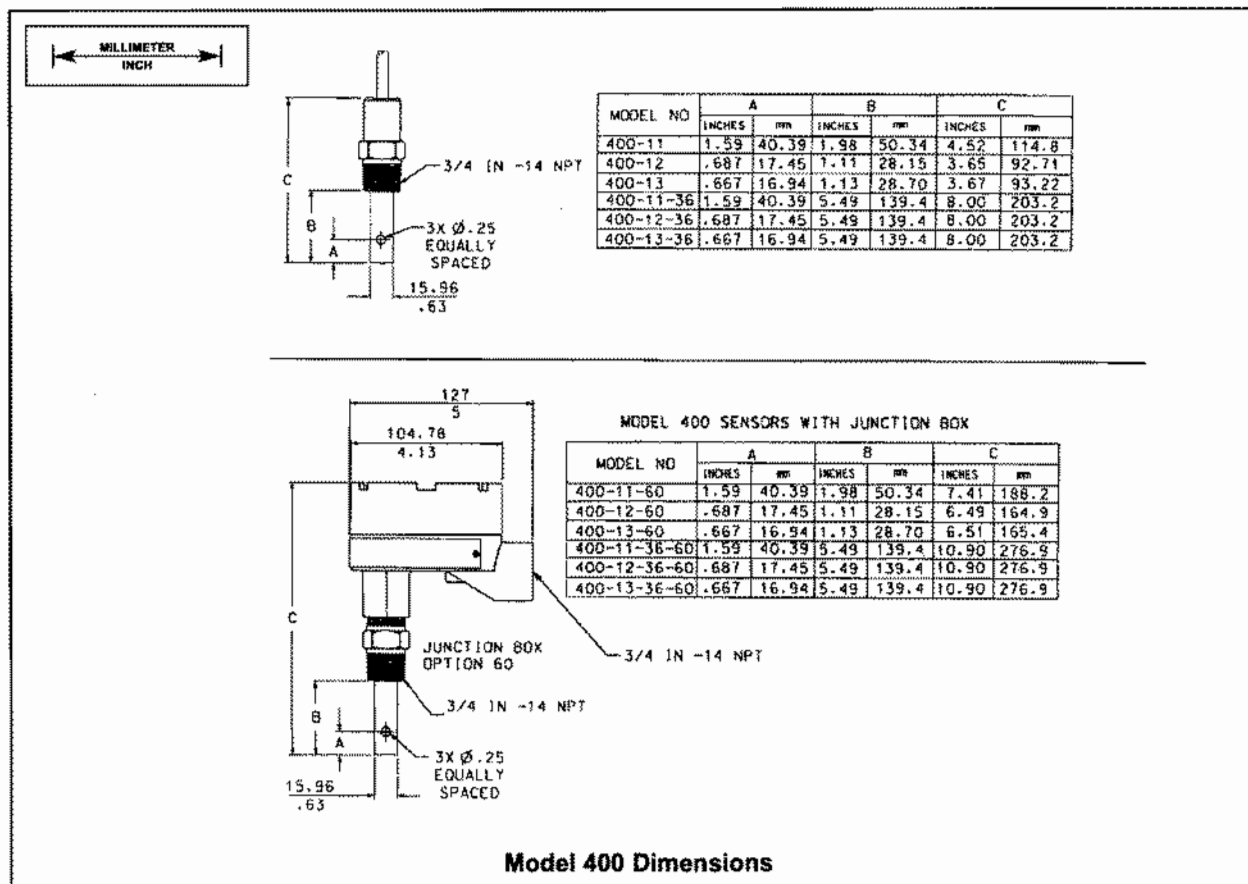
MODEL	WITH 10 ft (3.1 m) CABLE		WITH 50 ft CABLE		WITH JUNCTION BOX	
	Weight	Shipping Weight	Weight	Shipping Weight	Weight	Shipping Weight
400	1 lb (0.5 kg)	2 lb (1.0 kg)	4 lb (2.0 kg)	5 lb (2.5 kg)	3 lb (1.5 kg)	4 lb (2.0 kg)
401-14	1 lb (0.5 kg)	2 lb (1.0 kg)	—	—	—	—
401-15	1 lb (0.5 kg)	2 lb (1.0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

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

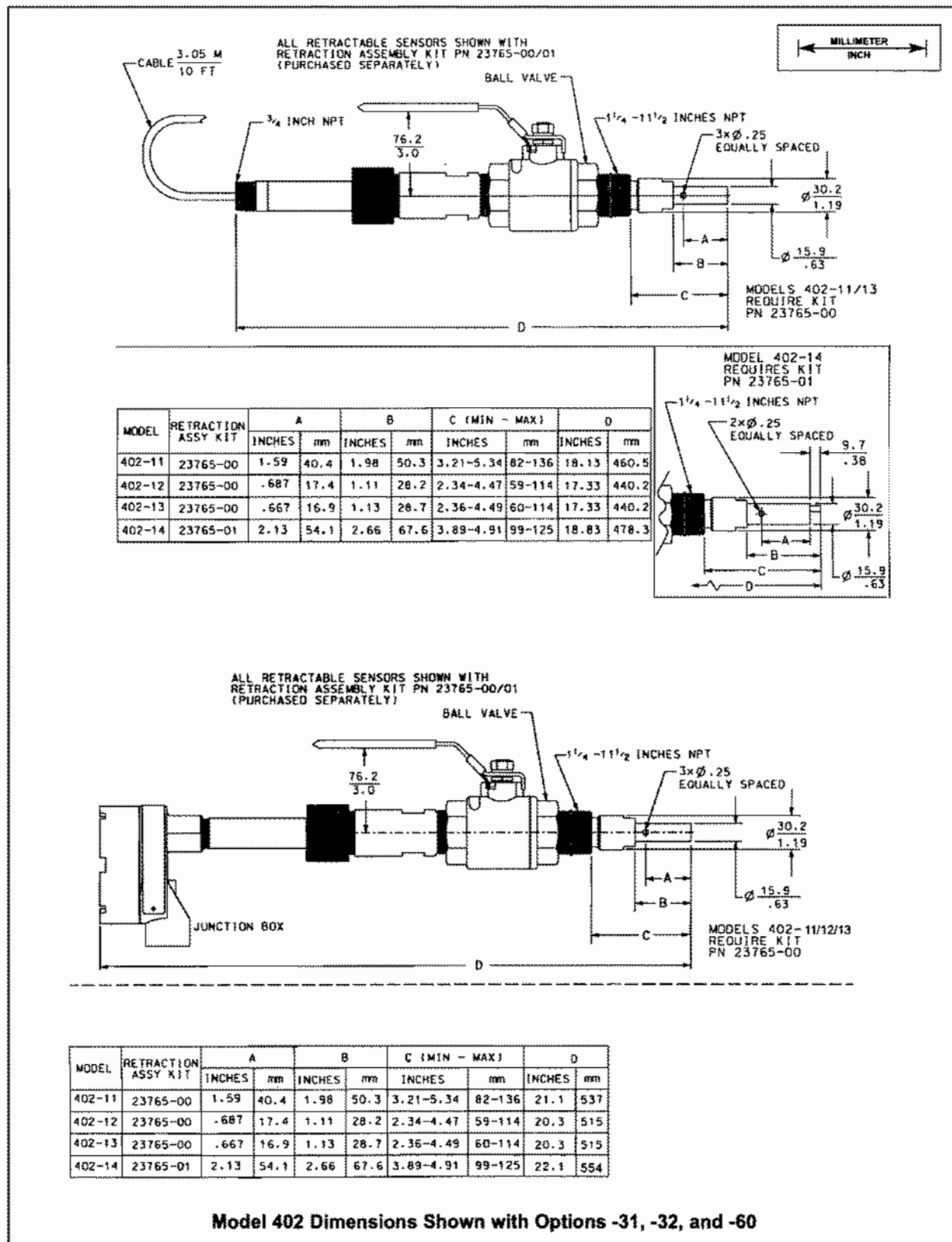
Interconnecting cable weighs 0.6 lb/10 ft (1.0 kg/10 m).
 For shipping weight add 1 lb (0.5 kg)

Rosemount Analytical 3

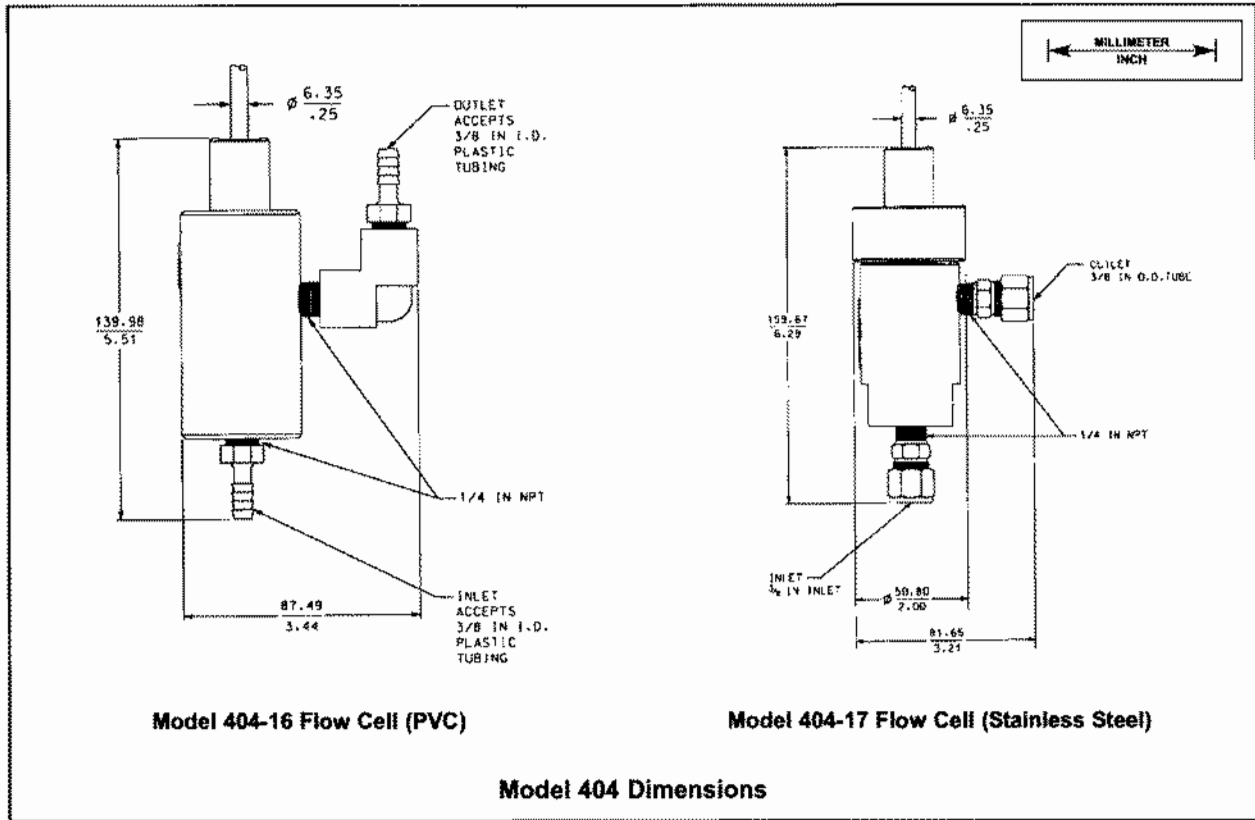
ENDURANCE SENSOR DIMENSIONS



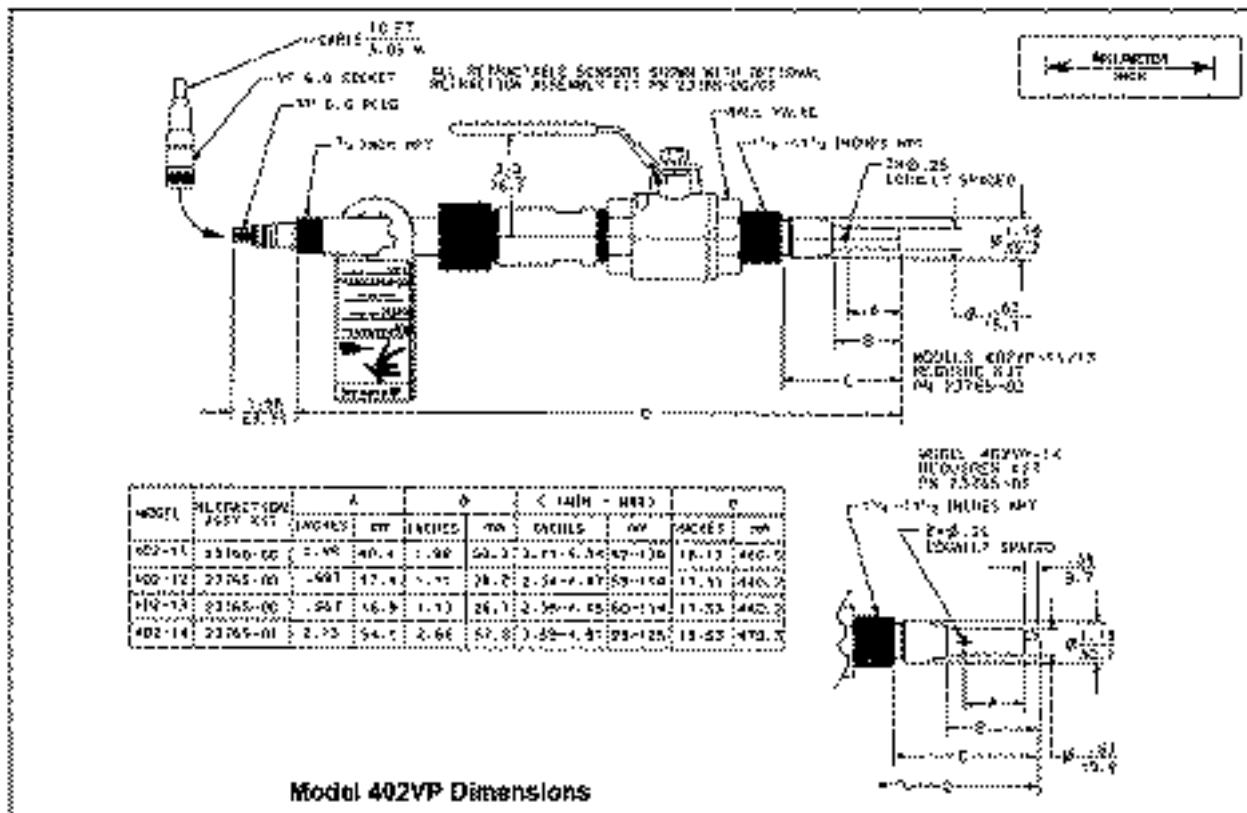
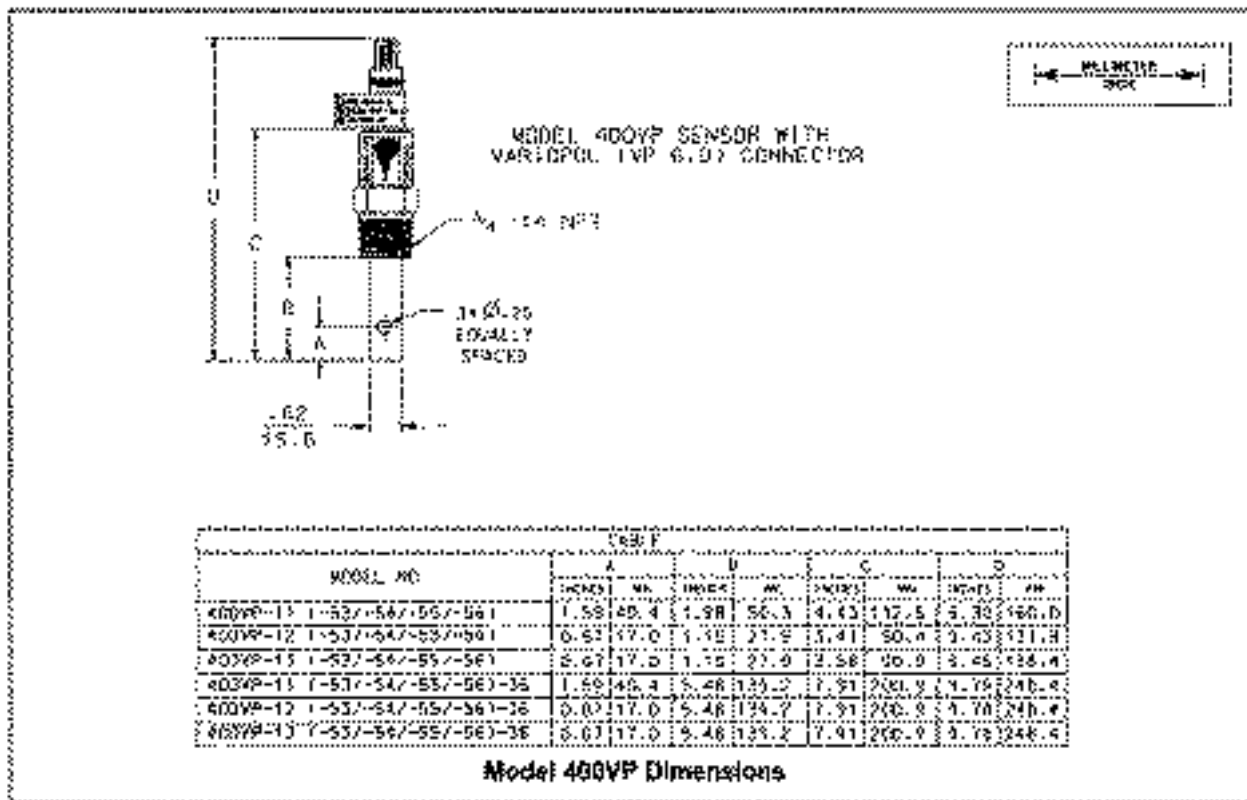
ENDURANCE SENSOR DIMENSIONS



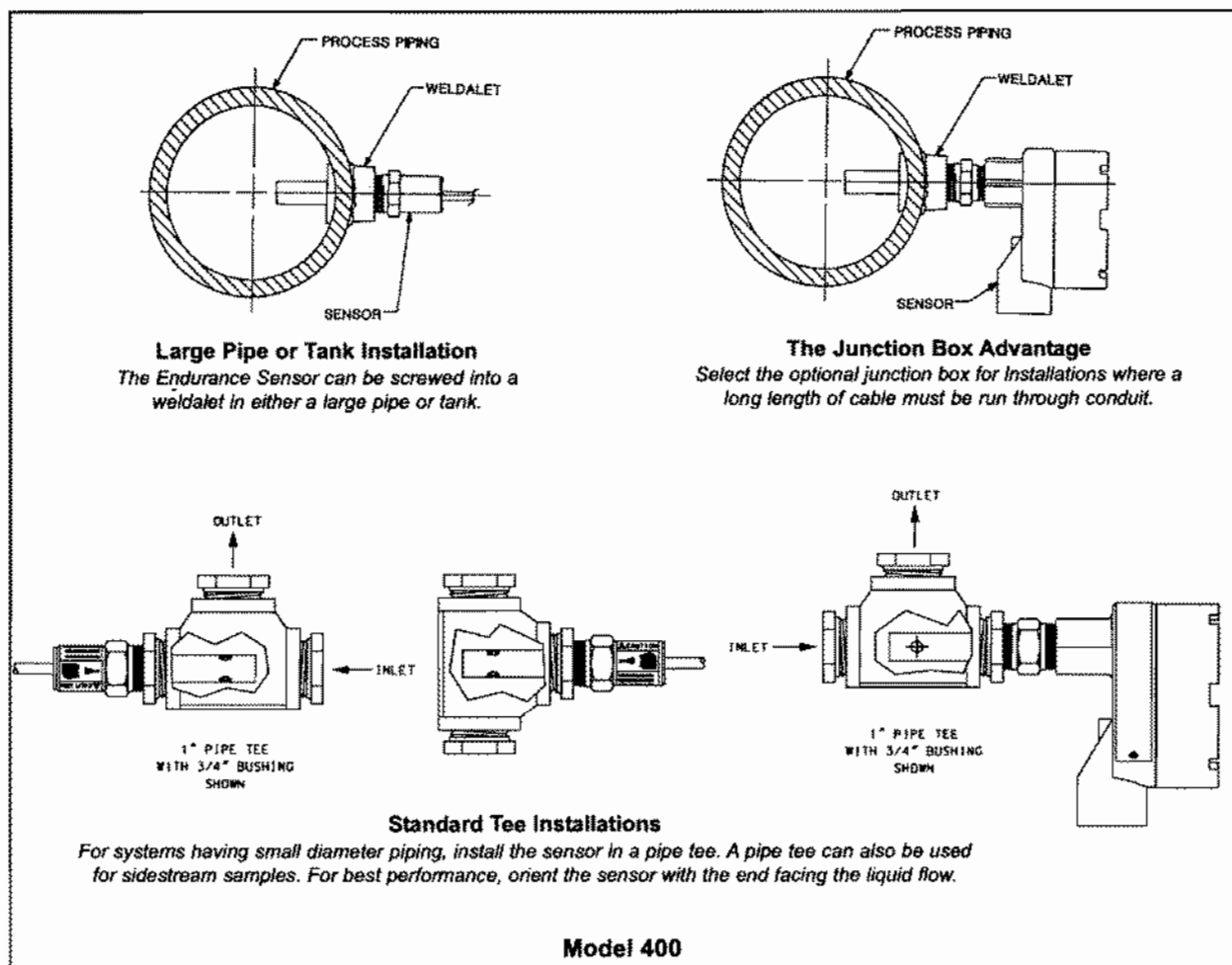
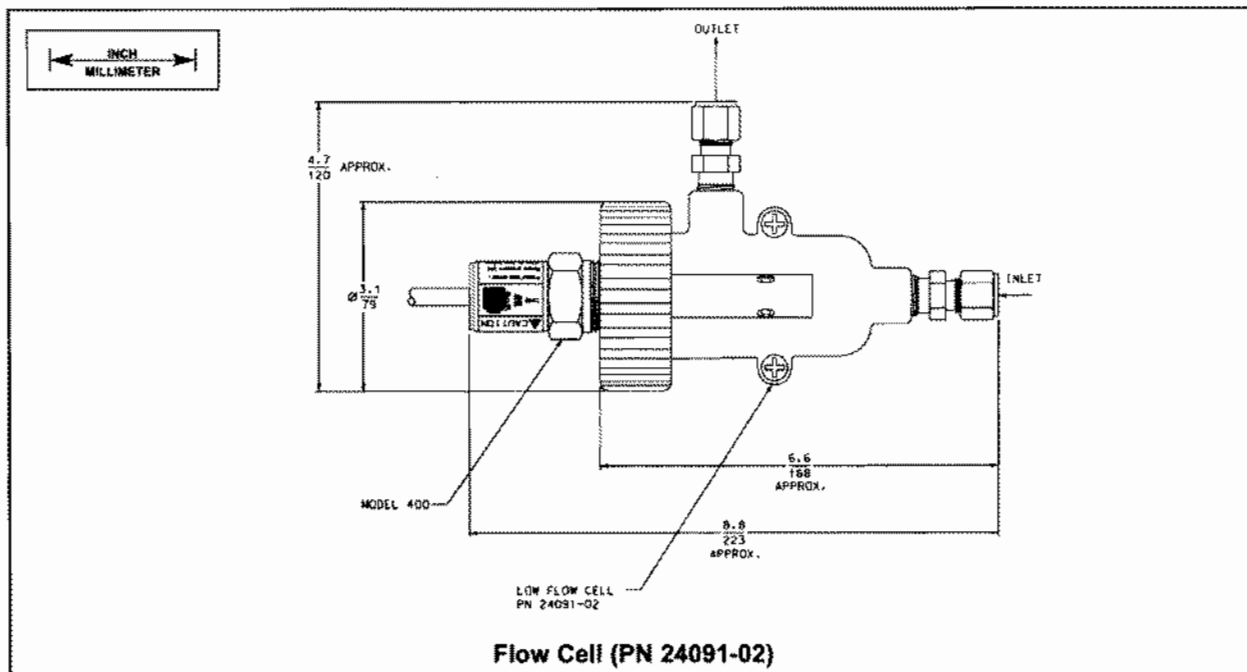
ENDURANCE SENSOR DIMENSIONS



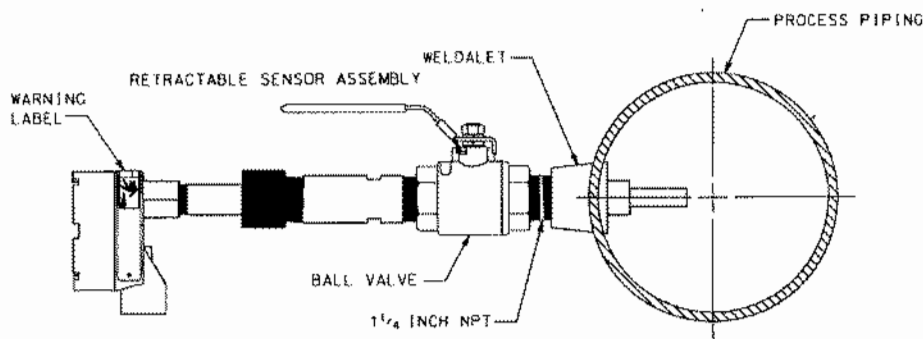
ENDURANCE SENSOR DIMENSIONS



ENDURANCE INSTALLATION DETAILS

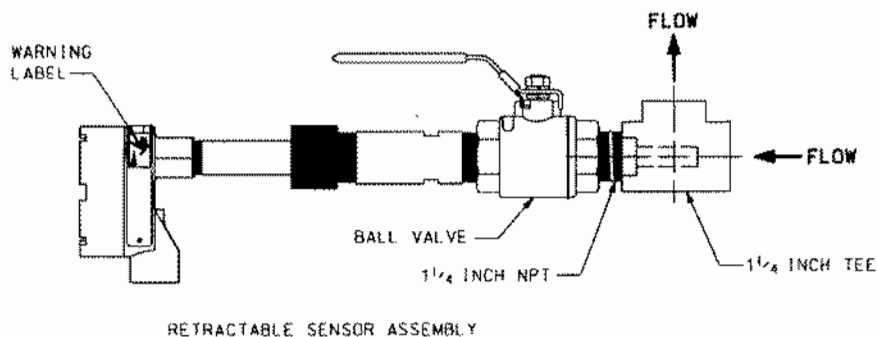


ENDURANCE INSTALLATION DETAILS



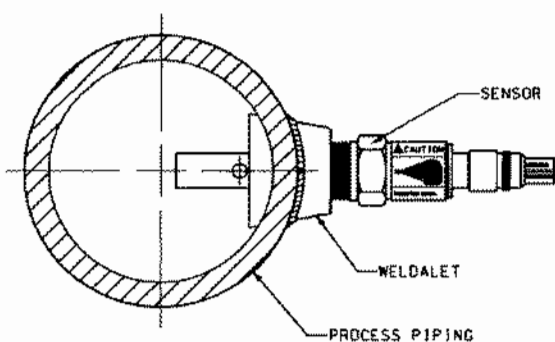
Model 402 Retractable Sensor Installed In a Large Pipe or Tank

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



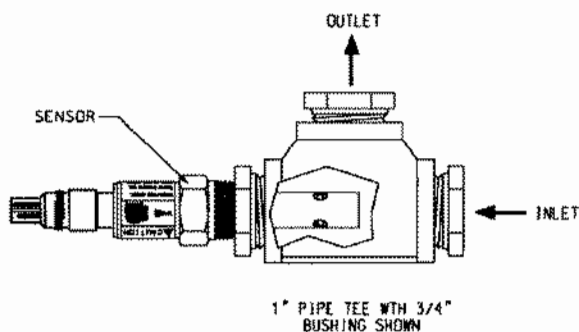
Model 402 Retractable Sensor Installed In a Standard Tee

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



Large Pipe or Tank Installation

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

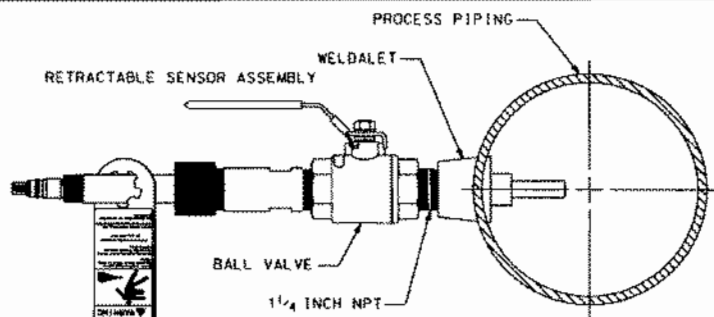


Standard Tee Installations

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

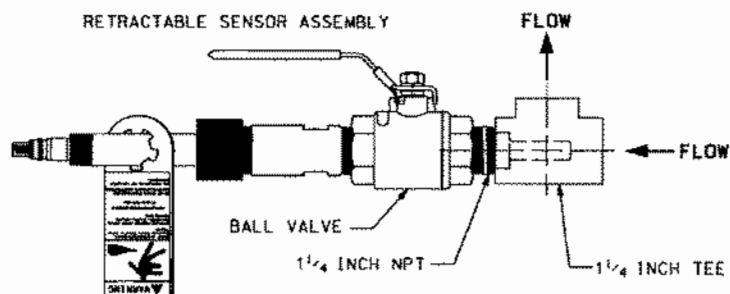
Model 400VP

ENDURANCE INSTALLATION DETAILS



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

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



Model 402VP Retractable Sensor Installed in a Standard Tee

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

Model 402VP

ORDERING INFORMATION

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

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

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

ORDERING INFORMATION

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

Interconnecting cable must be ordered separately. See ACCESSORIES.

MODEL 400VP SCREW-IN CONDUCTIVITY SENSOR	
CODE	Cell Constant (required selection)
11	0.01/cm
12	0.1/cm
13	1.0/cm
CODE Temperature Measurement	
--	Pt 1000 for 1054BLC, 1054BR, 1054BDC, 1055, 54C, 54eC, 3081C, 4081C, 5081-C, and Xmt-C
54	Pt 100 for 1054C, 1054AC, 1054BC, 2081C, and 2054C
55	10K ohm TC for 1181C-08 or -10
56	100K ohm TC for 1181C-09
CODE	Additional Options (optional selection)
36	Extended insertion length (5 in from inside face of flange to end of sensor, option -11 only)
400VP	13 EXAMPLE

Cat IV

EFFLUENT TREATMENT PLANT		NTPC Limited (A Govt. of India Enterprise) CONSULTANCY WING			
 BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGINEERING MANAGEMENT (MECHANICAL AUXILIARY)		DRAWS NO. CBI-185 DATE 22/12/2010 (SIGNATURE) (DATE)	☐ I. APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION ☐ II. APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION SUBJECT TO INCORPORATION OF COMMENTS/ MODIFICATIONS AS NOTED/RESUBMIT REVISOR DRAWING DOCUMENT Cat IV ☐ III. NOT APPROVED/RESUBMIT REVISOR DRAWING DOCUMENT AFTER INCORPORATION OF COMMENTS/ MODIFICATIONS AS NOTED. ☒ IV. FOR INFORMATION AND RECORDS. ☐ V. REVISE AND RESUBMIT FOR INFO & REC.		
This approval status shall be indicated as laid down in the contract and it shall not release the contractor from his contractual obligations.		I. APPROVAL CONVEYED HEREIN NEITHER RELIEVES THE CONTRACTOR OF HIS CONTRACTUAL OBLIGATION AND RESPONSIBILITIES FOR CORRECTING DEFICIENCIES, MATERIAL OR CONSTRUCTION DESIGN DETAILS ASSIGNED PER PERFORMANCE PARTICULARS AND CONFORMANCE OF THE SUPPLIES WITH THE SPECIFICATIONS, APPROVED SCHEMES AND STATUTORY LAWS. HE SHALL NOT LOSE THE PROPOSED RIGHT UNDER THE CONTRACT.			
APPROVAL CAT I = Approved CAT II = Approved With Comments as Noted CAT III = Not Approved CAT IV = Rejected Drawing	DATE 18/03/10 APPROVED BY AKS NAME AKS SIGNATURE AKS				
Rev. No	Date	Description	Prepared By	Reviewed By	Released By
1	22/12/2009	REVISED AS PER NTPC COMMENTS	SKS	APU	AVS
0	17/11/2009	ISSUED FOR APPROVAL	SKS	APU	AVS
PROJECT		PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).			
CUSTOMER:		PRAGATI POWER CORPORATION LIMITED (PPCL)			
CONSULTANT:		NTPC LIMITED, CONSULTANCY WING			
		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			
		THERMAX LIMITED PUNE			
DATA SHEET FOR ORIFICE PLATES.					
THERMAX DOC.NO.: WHIJB00010		BHEL DOC. NO. : PE-VO-314-164-A172		OC.NO. 630128 REV. NO : 01	



PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1580MW (NOMINAL), (ETP PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NEFC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-YO-314-164-A172
THERMAX OC NO: 630128

REPLIES TO THE COMMENT ON DATA SHEET

ORIFICE PLATE DOC NO. WHJBH00010

S.NO.	COMMENT	THERMAX REPLY	REMARKS
I	3 Pairs of tapping is required as per specs clause no.11.01.00 sec VI part ch I4 pg19 / 21	Noted & confirmed.	
II	Please indicate root valve size & material type	Root valve: 1/2" NPT (F) SS 316 ball valve is provided.	
III	Please submit the flow VS DP curve	Noted & same is submitted in revised data sheet.	

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

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M

M I C R O P R E C I S I O N P R O D U C T S P V T. L T D. Faridabad.

Bore Calculation as per ISO - 5167

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

P.O./Enq.No. E-MAIL ENQUIRY DT 07.10.2009

TAG/ITEM No. FE-507

MICRO Job No./ Quote No. Q90813

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

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

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

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

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

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

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

Discharge Coefficient (C) 0.60129356

Beta Updated (Bi) 0.40447827

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

Vent Hole Diameter mm (G) 7.14000000
Vent Hole Location mm (D-G)/2 242.43000000
d (After Vent Hole Correction) mm (dv) 198.86241380
Pressure Loss at (METER MAX) mm WC (w) 1432.6376043
Pressure Loss at (NORMAL FLOW) mm WC (w1) 1096.8631658
Pressure Loss at (MAXIMUM FLOW) mm WC (w2) 1292.9554379

DATE 08/10/09

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

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

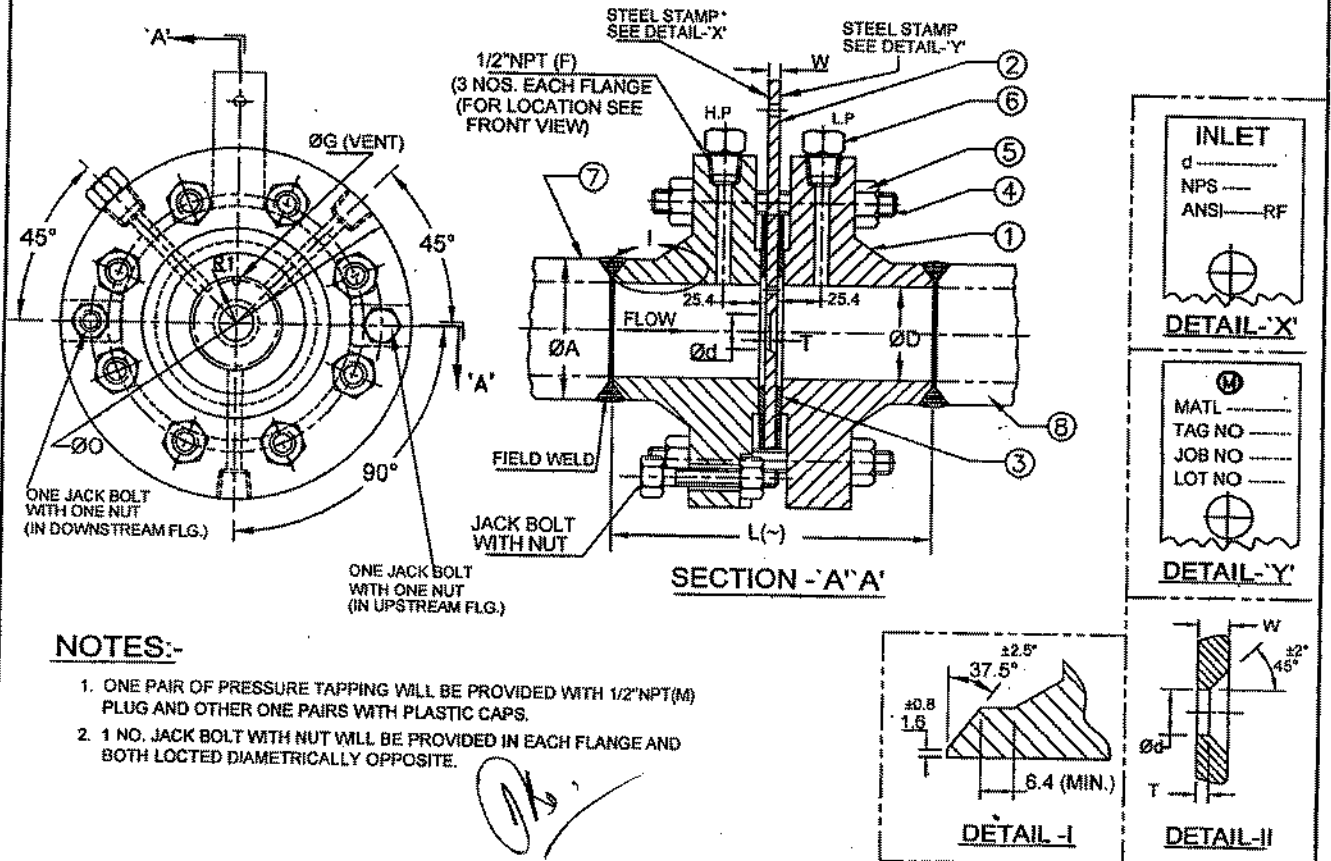
Qv : $3.14/4 * C * E * (d_i * d_i) * \text{SQRT}(2 * \text{DELTA}(P) * (p) t)$ where (p)t in kg/m3
Qv in m3/sec : Delta(P) in Pa : $d_i = (d/1000)$ in meters : $E = 1/\text{SQRT}(1 - (B_i^4))$
Qv (m3/sec) = 0.11101010 Qm (m3/Hr) = 399.63636394

Calculation done by : SSV/SK

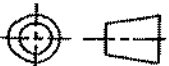
Calculation checked by : J

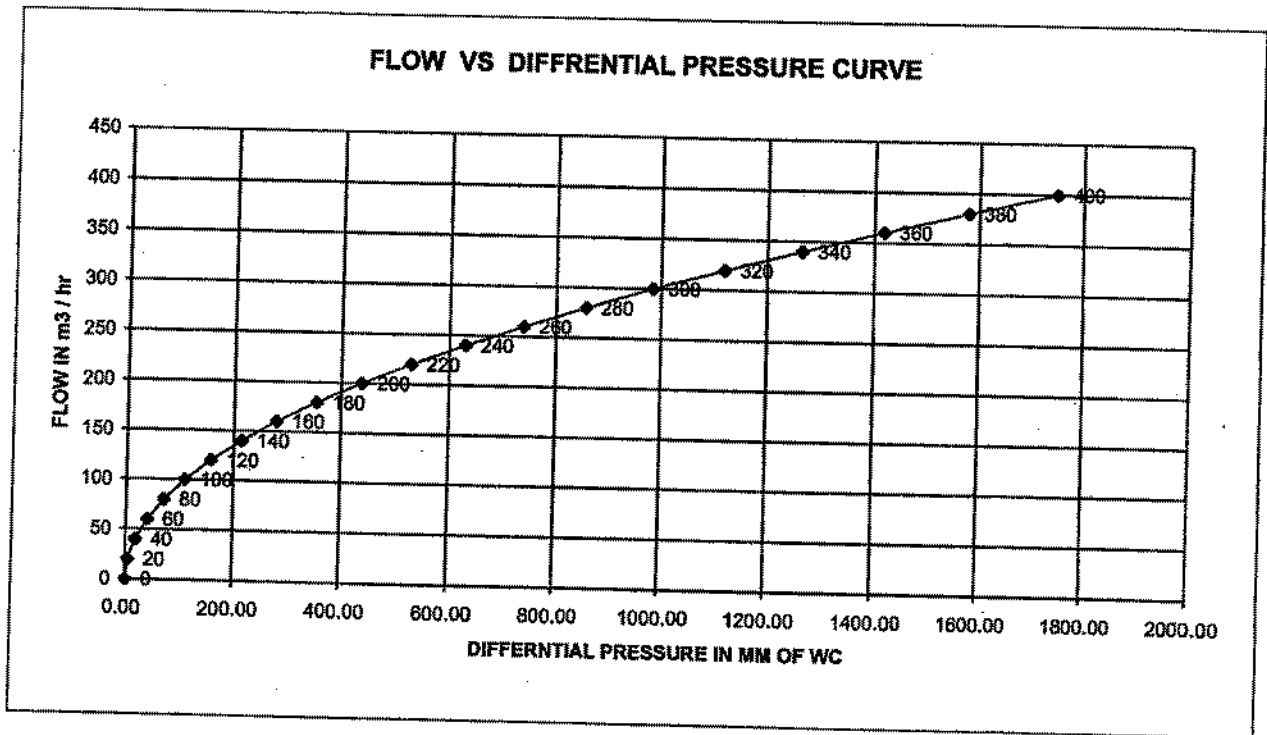
F/DSG/01 REV.00 dt. 01/12/2009

REF:-D/DRG-1/JOB/OFA/MOFA10-4619



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

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



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

7 O. PLATE I.D. 198.86 mm

8 FLOW EQUATION WITH CONSTANT DENSITY OF 1000.00 KG/M3

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

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

9 FLOW EQUATION WITH CHANGE IN DENSITY

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

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



Signature
5/11/2009

TRAN NO. C-1-105

DATE 18/11/09

(SIGNATURE) [Signature]

(DATE)

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

☐ I APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION

☐ II APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION

☐ III NOT APPROVED/REVISIT REVISED DRAWING/DRAWING DOCUMENT AFTER INCORPORATION OF COMMENTS/MODIFICATIONS AS NOTED.

☐ IV FOR INFORMATION AND RECORDS

☐ V REVISE AND RESUBMIT FOR INF. & REC.

I APPROVAL CONVEYED HERE IN NEITHER RELIVES THE CONTRACTOR OF HIS CONTRACTUAL OBLIGATION AND RESPONSIBILITIES FOR CORRECTNESS OF DIMENSIONS, MATERIAL OF CONSTRUCTION, DESIGN DETAILS/ASSEMBLY, PERFORMANCE PARTICULARS AND CONFORMITY OF THE SUPPLIES WITH THE SPECIFICATIONS, APPROVED SCHEMES AND STATUTORY LAWS, NOR PURCHASER'S RIGHT UNDER THE CONTRACT.

RECEIVED BY [Signature] DATE 18/11/09

EFFLUENT TRETMENT PALNT

Pl. ensure that the top cover shall be made approved P&ID and Pl. send one copy of approved P&ID to us.

0	5/11/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By
PROJECT		PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).			
CUSTOMER:		 PRAGATI POWER CORPORTION LIMITED (PPCL)			
CONSULTANT:		 NTPC LIMITED, CONSUTANCY WING			
 BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA					
 THERMAX LIMITED PUNE					
DATA SHEET FOR FLOAT & BOARD TYPE LEVEL INDICATOR.					
THERMAX DOC.NO.: WHJCB0008		BHEL DOC. NO.: PE-VO-314-164-A212		OC.NO. 630128 REV. NO : 00	

Page 108 of 284

FLOAT & BOARD TYPE LEVEL INDICATOR							
GENERAL INFORMATION							
FLOAT	SS-316						
FLOAT DIAMETER	150 MM UPTO 0 - 4 M / 200 MM 4 - 6 M						
GUIDE WIRE	SS-316						
TENSION ASSEMBLY	Cd PLATED STEEL						
ANCHOR	SS 316						
FLOAT CABLE	SS-316						
BOARD	AL EPOXY PAINTED						
MARKINGS	SCALE & NUMERICALS IN BLACK COLOUR(LC=50mm)						
	RED COLOUR						
CONNECTING ASSEMBLY	G.I.CLASS "B"						
INDICATOR/ POINTER	AL (EPOXY PAINTED)						
INSTRUMENT CONNECTION	40NB ANSI B 16.5, 150 # FF						
TAG NO	LOCATION	OPERATING CONDITIONS				TANK HEIGHT	TYPE OF TANK
		PRESSURE	TEMP	FLUID	SP.GRAVITY		
LIB - 621 A	LIME DOSING TANK-T3140 A	ATM	AMB	WATER	0.998	1900	RCC
LIB - 621 B	LIME DOSING TANK-T3140 B	ATM	AMB	WATER	0.998	1900	RCC
LIB - 623 A	LIME DOSING TANK-T3180 A	ATM	AMB	LIME	0.998	1400	RCC
LIB - 623 B	LIME DOSING TANK-T3180 B	ATM	AMB	LIME	0.998	1400	RCC
LIB - 626	OVERHEAD WATER STORAGE TANK-T-3110	ATM	AMB	WATER	1	1400	RCC
LIB - 627	THICKENER OVERFLOW COLLECTION SUMP-T-3100	ATM	AMB	WATER	1	2600	RCC
LIB - 629 A	CMB-I,T-3020	ATM	AMB	WATER	1	4900	RCC
LIB - 629 B	CMB-II,T-3020	ATM	AMB	WATER	1	4900	RCC

TAG NO.	MAKE	MODEL NO
LIB - 621 A	LEVCON	ML-108-1900
LIB - 621 B		ML-108-1900
LIB - 623 A		ML-108-1400
LIB - 623 B		ML-108-1400
LIB - 626		ML-108-1400
LIB - 627		ML-108-2600
LIB - 629 A		ML-108-4900
LIB - 629 B		ML-108-4900

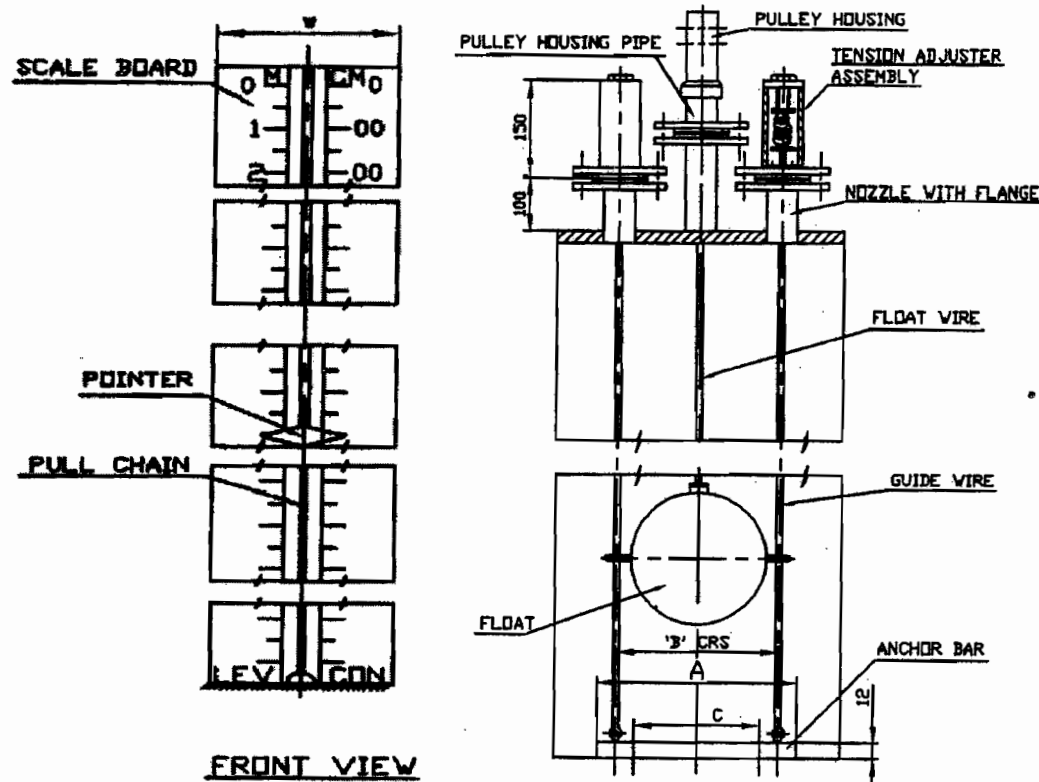
NOTE: GUIDE / MEASURING NOZZLE ARRANGEMENT ALONG WITH COUNTER FLANGES SHALL BE SUPPLIED BY VENDOR .

QTY :- 08 NOS	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI					
MAKE :-LEVCON		5/11/2009	SKS	APU	AVS	
THERMAX LIMITED	O.C NO: 630128	0	30/10/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	Date	Prepd by	Chkd by	App by
Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	SH NO	
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJC80008		ETP	2 OF 2	



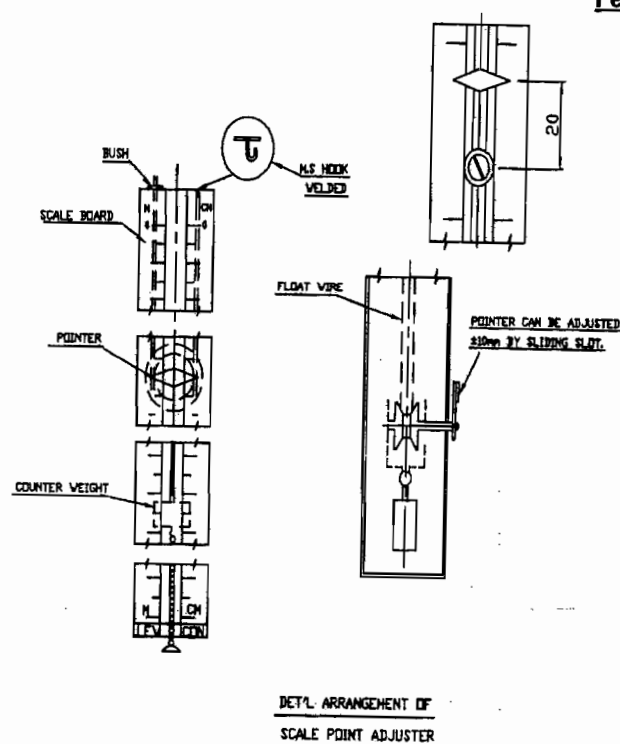
Mechanical Level Indicator

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



Features :

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



DETL. ARRANGEMENT OF
SCALE POINT ADJUSTER

Applications :

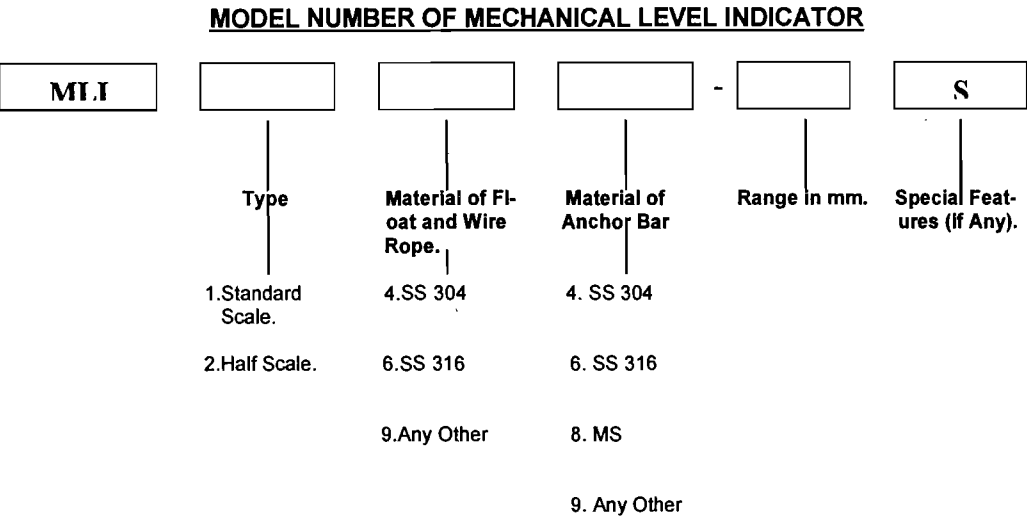
Local Indication of Level in non-pressurised tanks containing water, oil etc.

Principle of Operation :

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

Specifications :**Materials of Construction :**

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



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

Head Office Address : "RajKamal" Bldg, 6 th Floor, 13, Camac Street, Kolkata – 700017, Tel : (033)2283-2764/66,(033)2280-7180 Fax : (033)2283-2719/2280-9645.E-mail : levconh@vsnl.net , levconw@vsnl.net .
Mumbai Branch Address : 301, Protprima Chambers, 1 Suren Road,Andheri East, Mumbai-400093, Tel : (022)2683-2127/ 2683-3015, Fax : (022)2683-3015

LI/MLI/01 (Dt. 17.06.2003).

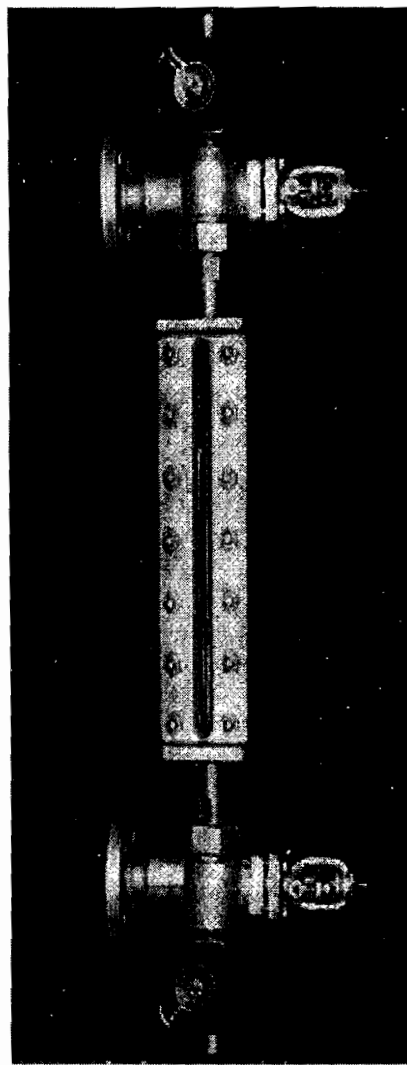
LEVEL GAUGES (REFLEX TYPE)						
SERVICE COND'S.	1	TAG NO.	LG 620 A/B	LG 622 A/B	LG 624 A/B	LG 625 A/B/C/D
	2	LOCATION	T - 3150 A/B	T - 3130 A/B	T - 3160 A/B	T - 3170 A/B
	3	TANK HEIGHT IN MM	1400	1900	1400	2000
	4	TYPE OF TANK	RCC	RCC	RCC	RCC
	5	UPPER LIQUID	PE	ALUM	HCL	DWPE
	6	PRESS OPERAT. 1 MAX Kg/Sq.cm	ATM			
	7	TEMP OPERAT. 1 MAX DEG CEN	AMB			
	8	SP.GRAVITY	1	1.1293	1.104	1
GAUGE DETAILS	9	TYPE	---REFLEX---			
	10	NO. OF SECTIONS	3	4	3	3
	11	CENTER-CENTER DISTANCE IN MM	1000	1300	1000	900
	12	CONN. SIZE	--- 25 NB FLANGED ---			
	13	FLANGE STANDARD	AS PER ANSI-B-16.5-150# FF			
	14	CONN. LOCATION	REAR X REAR			
	15	SCALE	AL SCALE (LC-10 MM)			
	16	GLASS MATL	TOUGHENED BORO SILICATE			
	17	GLASS DIMENSION	34mm wide x 17mm thick			
	18	SPINDLE	SS - 316	SS - 316	PP	SS - 316
	19	GLASS COVERS	SS - 316	SS - 316	PVC	SS - 316
	20	SEAT & TRIP	SS - 316	SS - 316	PP	SS - 316
GAUGE COCK	21	BODY MATERIAL	SS 316	SS 316	PP	SS 316
	22	VESSEL CONNECTION	FLANGED SS 316		FLANGED PP	FLANGED SS 316
	23	BALL CHECK : GLASS	YES	YES	YES	YES
	24	PACKING	PTFE			
	25	MINIMUM RATING Kg/Sq.cm	2	2	2	2
	26	DRAIN VALVE	½" NPT Ball Valve in SS 316.	½" NPT Ball Valve in SS 316.	1/2"BSP Ball Valve in PP	½" NPT Ball Valve in SS 316.
	27	VENT VALVE	½"NPT with Plug in SS 316	½"NPT with Plug in SS 316	½"BSP with Plug in PP	½"NPT with Plug in SS 316
	28	QUANTITY	2	2	2	4
	29	MODEL NO.	RS 446-1116	RS 446-1116	RS 619-1119	RS 446-1116
	30	MAKE	LEVCON			
NOTE : SS TAG PLATE SHALL BE SUPPLIED ALONG WITH GAUGES.						



Levcon INSTRUMENTS PRIVATE LIMITED

Reflex Level Gauge

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



Features :

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

Applications :

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

Principle of Operation:

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

Specifications :

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

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

MODEL NUMBER OF REFLEX LEVEL GAUGES

RS	Type	Design of Gauge Body.	Pressure Class	Gauge Body Material	Types of Valves & Combinations.	Top Valve Design	Bottom Valve Design	Material of Valves etc.	S
	RS-Reflex Standard.	4.40/45 mm wide.	1.Nominal Pressure.	4.SS 304	1.Offset type at Top & Bottom.	0.Without Valves.		4.SS 304	Spherical Union Heating Jackets, Antifrost block, End Tube Type Connections, Chain Operated Valves etc.
		5.90/100 mm wide.	4.10/15 Kg/Cm ²	6.SS 316	2.Offset type at Top Side & Bottom Side.	1.Globe Type Handwheel operated.		6.SS 316	
		6.120/130 mm wide.	5.20/30 Kg/Cm ²	8.Carbon Steel.	4.Straight type at Top & Bottom.	2.Do (High Pr.)	3.Globe type Push Button Operated.	8.Carbon Steel.	
		7.150/160 mm wide.	6.50/65 Kg/Cm ²	9.Others including PVC/ PP.	5.Straight type at Top & Bottom Side.		4.Globe type Wt. Lever Operated.	9.Others including PVC/ PP.	
		8.Large Chamber.	7.80/110 Kg/Cm ²		6.Straight type at Top Side & Bottom.				
		9.Large Chamber (Lined/Coated)	8.High Pr. Type		7.Straight type at Top Side & Bottom Side.		9.Others.		
All combinations are not possible. Please refer to the Manufacturers for concurrence. Special Materials under designated category will be differentiated by 'S'. For instance, In case SS 316L construction, number ' 6 ' will be used with 'S' at end.					8.Expansion Loop at Top Side only.	Pressure Class 4, 5, 6 and 7 are basically 150/ 300/ 600/ 900 ANSI Classes & hence max.pressures may be higher than the figures indicated.			
					9.Expansion Loops at Top & Bottom.				

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

Head Office Address: "RajKamal" Bldg, 6 th Floor, 13, Camac Street, Kolkata – 700017, Tel : 033)2283-2766/3022-5767/3022-9368 Fax : (033)2283-2719/2280-9645. E-mail : info@levcongroup.com , levconh@vsnl.net , levcon@ricmail.com .
Mumbai Branch Address : 301, Protprima Chambers, 1 Suren Road, Andheri East, Mumbai-400093, Tel : (022)2683-2127/ 2683-3015, Fax : (022)2683-3015. E-mail : levconm@airtelmail.in

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

EFFLUENT TREATMENT PLANT

NTPC

(A Govt. of India Enterprise)
CONSULTANCY

CBI-185

22/2/2010

Cat-IV

Cat-IV

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

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

APPROVAL CATEGORY AWARDED = I

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

BHEL - PENDING APPROVED BY

NAME AKS

SIGNATURE

DATE

13/03/10

1. APPROVAL CONVEYED HEREIN NEITHER RELIEVES THE CONTRACTOR OF HIS RESPONSIBILITIES FOR CORRECT DIMENSIONS, MATERIALS, CONSTRUCTION DESIGN DETAILS AS PERFORMANCE PARTICULARS, QUALITY OF THE SUPPLIES WITH IT SPECIFICATIONS. APPROVED BY STATUTORY LAWS, NOT IT LIMIT THE PURCHASERS LIABILITY IN CONTRACT. MADE IN APPROVED DRAWING ONLY. LIABILITY IN CONTRACT.

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

PROJECT

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

CUSTOMER:



PRAGATI POWER CORPORATION LIMITED (PPCL)

CONSULTANT:



NTPC LIMITED, CONSULTANCY WING



BHARAT HEAVY ELECTRICALS LTD

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA



THERMAX LIMITED

PUNE

DATA SHEET FOR CAPACITANCE TYPE LEVEL SWITCH

THERMAX DOC.NO.:

WHJCD00025

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

OC.NO. 630128

REV. NO : 01



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

CAPACITANCE TYPE LEVEL SWITCH DOC NO. WHJCE00026

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

INDEX FOR CAPACITANCE TYPE LEVEL SWITCH						
SR NO.	TAG NO	LOCATION	FLUID	TANK HEIGHT mm	ACTIVE PROBE LENGTH mm	REMARK
1	LSH-720 A	HRSG AREA-1 & 2 ES-1	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
2	LSL-720 B	HRSG AREA-1 & 2 ES-1	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
3	LSH-721 A	HRSG AREA-3 & 4 ES-2	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
4	LSL-721 B	HRSG AREA-1 & 2 ES-2	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
5	LSH-722 A	STG AREA-1, STG AREA-3 & 2 ES-4	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
6	LSL-722 B	STG AREA-1, STG AREA-1 & 2 ES-4	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
7	LSH-723 A	GTG AREA-3, 4, STG AREA-2 ES-5	EFFLUENT	3450	3550	FOR SPECIFICATION REFER SHEET NO.04
8	LSL-723 B	GTG AREA-2, 4, STG AREA-2 ES-5	EFFLUENT	3450	3550	FOR SPECIFICATION REFER SHEET NO.04
9	LSH-724 A	GTG WASH WATER WAGO ES-6	EFFLUENT	2900	2050	FOR SPECIFICATION REFER SHEET NO.04
10	LSL-724 B	GTG WASH WATER WAGO ES-6	EFFLUENT	2950	2050	FOR SPECIFICATION REFER SHEET NO.04
11	LSH-725 A	STG MAINTENANCE DRY ES-7	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
12	LSL-725 B	STG MAINTENANCE DRY ES-7	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
13	LSH-726 A	GTG WATER WASTE-3 & 4 ES-8	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
14	LSL-726 B	GTG WATER WASTE-3 & 4 ES-8	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
15	LSH-727 A	T-3010	WASTE WATER	1000	1700	FOR SPECIFICATION REFER SHEET NO.04
16	LSL-727 B	T-3010	WASTE WATER	3200	3100	FOR SPECIFICATION REFER SHEET NO.04
17	LSH-728 A	T-3010	WASTE WATER	3200	3700	FOR SPECIFICATION REFER SHEET NO.04
18	LSL-728 B	T-3010	WASTE WATER	3200	3100	FOR SPECIFICATION REFER SHEET NO.04
19	LSH-729 A	SSP BACKWASH SLUMP	BACKWASH	3200	1700	FOR SPECIFICATION REFER SHEET NO.04
20	LSL-729 B	SSP BACKWASH SLUMP	BACKWASH	3200	3100	FOR SPECIFICATION REFER SHEET NO.04
21	LSH-730 A	T-3020	WATER	2450	000	FOR SPECIFICATION REFER SHEET NO.04
22	LSL-730 B	T-3020	WATER	2450	2250	FOR SPECIFICATION REFER SHEET NO.04
23	LSH-732 A	HRSG-1, ES-14	EFFLUENT	2050	1050	FOR SPECIFICATION REFER SHEET NO.04
24	LSL-732 B	HRSG-1, ES-14	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
25	LSH-733 A	HRSG-2, ES-15	EFFLUENT	2050	1050	FOR SPECIFICATION REFER SHEET NO.04
26	LSL-733 B	HRSG-2, ES-15	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
27	LSH-734 A	HRSG-3, ES-15	EFFLUENT	2050	1050	FOR SPECIFICATION REFER SHEET NO.04
28	LSL-734 B	HRSG-3, ES-15	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04
29	LSH-735 A	HRSG-4, ES-17	EFFLUENT	2050	1550	FOR SPECIFICATION REFER SHEET NO.04
30	LSL-735 B	HRSG-4, ES-17	EFFLUENT	2050	2050	FOR SPECIFICATION REFER SHEET NO.04

DATE: 08/06/2024	PROJECT: INTEGRATED COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT DAMUGA, ODISHA	2	202211	SKN	APU	AVS
MADE BY: NTPC CONSULTANT		1	22100303	SKS	APU	AVS
THIRUMAX LIMITED	D.C. NO: 00024	0	2100001	SKS	APU	AVS
Water & Waste Division	OWNER: PRASANT POWER CORPORATION LTD., DELHI	Rev	DATE	PREP. BY	CHG. BY	App. by
3rd Chamber, Wajodipara	CLIENT: BHARAT HEAVY ELECTRICALS LTD.	Specification No		PLANT	SHEET	
Pyne 411 903 (INDIA)	CONSULTANT: NTPC - CONSULTANCY WFO	WJH0000001		ETP	1 OF 4	

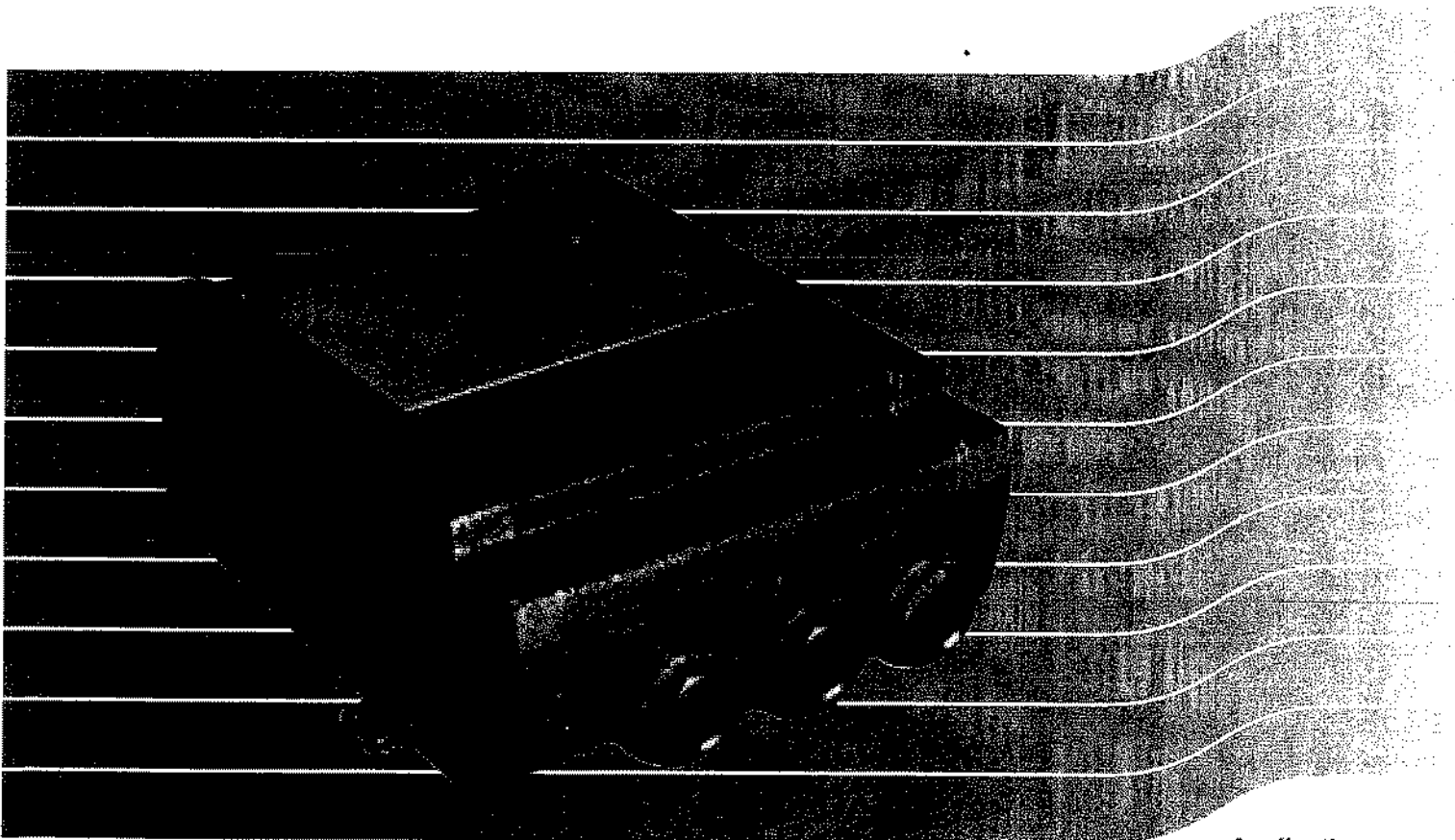
INDEX FOR CAPACITANCE TYPE LEVEL SWITCH																																											
SR NO.	TAG NO	LOCATION	FLUID	TANK HEIGHT mm	ACTIVE PROBE LENGTH mm	REMARK																																					
01	LSH-739 A	T-3100 A	LIME	1400	700	FOR SPECIFICATION REFER SHEET NO.04																																					
02	LSL-739 B	T-3100 A	LIME	1400	1200	FOR SPECIFICATION REFER SHEET NO.04																																					
03	LSH-739 C	T-3100 B	LIME	1400	700	FOR SPECIFICATION REFER SHEET NO.04																																					
04	LSL-739 D	T-3100 B	LIME	1400	1200	FOR SPECIFICATION REFER SHEET NO.04																																					
05	LSH-741 A	TREATED WATER SUMP-ES-13	TREATED WATER	2800	500	FOR SPECIFICATION REFER SHEET NO.04																																					
06	LSL-741 A	TREATED WATER SUMP-ES-13	TREATED WATER	2000	2700	FOR SPECIFICATION REFER SHEET NO.04																																					
07	LSH-742 A	SLUDGE COLLECTION SUMP-ES-6	SLUDGE	3400	700	FOR SPECIFICATION REFER SHEET NO.04																																					
08	LSL-742 A	SLUDGE COLLECTION SUMP-ES-6	SLUDGE	3400	1800	FOR SPECIFICATION REFER SHEET NO.04																																					
09	LSH-743 A	CLARIFIER SLUDGE SUMP-ES-10	SLUDGE	3500	2000	FOR SPECIFICATION REFER SHEET NO.04																																					
09	LSL-743 B	CLARIFIER SLUDGE SUMP-ES-10	SLUDGE	3000	3700	FOR SPECIFICATION REFER SHEET NO.04																																					
41	LSH-737 A	T-3140 A	LIME	1700	500	FOR SPECIFICATION REFER SHEET NO.04																																					
42	LSL-737 B	T-3140 A	LIME	1700	5500	FOR SPECIFICATION REFER SHEET NO.04																																					
43	LSH-737 C	T-3140 B	LIME	1700	500	FOR SPECIFICATION REFER SHEET NO.04																																					
44	LSL-737 D	T-3140 B	LIME	1700	1500	FOR SPECIFICATION REFER SHEET NO.04																																					
45	LSH-744 A	T-3200 CENTRAL MONITORING BASIN COMP-1	WATER	1000	700	FOR SPECIFICATION REFER SHEET NO.04																																					
46	LSL-744 B		WATER	1500	1300	FOR SPECIFICATION REFER SHEET NO.04																																					
47	LSL-744 C		WATER	1500	700	FOR SPECIFICATION REFER SHEET NO.04																																					
48	LSH-744 D		WATER	1500	1300	FOR SPECIFICATION REFER SHEET NO.04																																					
49	LSH-744 E	T-3200 CENTRAL MONITORING BASIN COMP-1	WATER	1500	700	FOR SPECIFICATION REFER SHEET NO.04																																					
50	LSL-744 F		WATER	1500	1300	FOR SPECIFICATION REFER SHEET NO.04																																					
51	LSL-744 G		WATER	1500	700	FOR SPECIFICATION REFER SHEET NO.04																																					
52	LSH-744 H		WATER	1000	1300	FOR SPECIFICATION REFER SHEET NO.04																																					
53	LSH-745 A	THICKENED SLUDGE SUMP-ES-12	SLUDGE	3000	2900	FOR SPECIFICATION REFER SHEET NO.04																																					
54	LSL-745 B	THICKENED SLUDGE SUMP-ES-12	SLUDGE	3300	3700	FOR SPECIFICATION REFER SHEET NO.04																																					
55	LSH-747 A	OWT TREATMENT W-PT ES-11	EFFLUENT	2000	1500	FOR SPECIFICATION REFER SHEET NO.04																																					
56	LSL-747 B	OWT TREATMENT W-PT ES-11	EFFLUENT	2800	2400	FOR SPECIFICATION REFER SHEET NO.04																																					
57	LSH-749 A	T-3100	WATER	2600	500	FOR SPECIFICATION REFER SHEET NO.04																																					
58	LSL-749 B	T-3100	WATER	3600	2400	FOR SPECIFICATION REFER SHEET NO.04																																					
59	LSH-750 A	T-3150	DRAIN SUMP-I	1000	300	FOR SPECIFICATION REFER SHEET NO.04																																					
60	LSL-750 B	T-3150	DRAIN SUMP-I	1000	300	FOR SPECIFICATION REFER SHEET NO.04																																					
61	LSH-751 A	T-3200	DRAIN SUMP-II	1000	300	FOR SPECIFICATION REFER SHEET NO.04																																					
62	LSL-751 B	T-3200	DRAIN SUMP-II	1000	300	FOR SPECIFICATION REFER SHEET NO.04																																					
63	LSH-748 A	T-3110	WATER	1350	850	FOR SPECIFICATION REFER SHEET NO.04																																					
64	LSL-748 B	T-3110	WATER	1350	1250	FOR SPECIFICATION REFER SHEET NO.04																																					
<table border="1"> <tr> <td rowspan="6"> QTY: 02 MAKE: HIND COOLING THIRUVANANTHURUPPI Water & Waste Solutions 8th Chembur, Maharashtra Phone: 411 000 0000 </td><td>PROJECT: PRAGATI POWERED CYCLIC POWER PROJECT 1500 MW (Phase-I) at SHIRANGAPPA</td><td>2</td><td>22/02/2020</td><td>SRS</td><td>APU</td><td>AVS</td></tr> <tr> <td></td><td>1</td><td>22/02/2020</td><td>SRS</td><td>APU</td><td>AVS</td></tr> <tr> <td>DR. NO: 100/03</td><td>3</td><td>07/03/2020</td><td>SRS</td><td>APU</td><td>AVS</td></tr> <tr> <td>OWNER: PRAGATI POWER CORPORATION LTD, COLEP</td><td>Rev</td><td>DATE</td><td>PREP. BY</td><td>CHECK BY</td><td>App By</td></tr> <tr> <td>CLIENT: PRAGATI HEAVY ELECTRICALS LTD</td><td colspan="2">Drawing No</td><td>PLANT</td><td colspan="2">SHEET</td></tr> <tr> <td>CONSULTANT: AISC - CONSULTANCY WORK</td><td colspan="2">KT003/001</td><td>ETP</td><td colspan="2">1 OF 1</td></tr> </table>							QTY: 02 MAKE: HIND COOLING THIRUVANANTHURUPPI Water & Waste Solutions 8th Chembur, Maharashtra Phone: 411 000 0000	PROJECT: PRAGATI POWERED CYCLIC POWER PROJECT 1500 MW (Phase-I) at SHIRANGAPPA	2	22/02/2020	SRS	APU	AVS		1	22/02/2020	SRS	APU	AVS	DR. NO: 100/03	3	07/03/2020	SRS	APU	AVS	OWNER: PRAGATI POWER CORPORATION LTD, COLEP	Rev	DATE	PREP. BY	CHECK BY	App By	CLIENT: PRAGATI HEAVY ELECTRICALS LTD	Drawing No		PLANT	SHEET		CONSULTANT: AISC - CONSULTANCY WORK	KT003/001		ETP	1 OF 1	
QTY: 02 MAKE: HIND COOLING THIRUVANANTHURUPPI Water & Waste Solutions 8th Chembur, Maharashtra Phone: 411 000 0000	PROJECT: PRAGATI POWERED CYCLIC POWER PROJECT 1500 MW (Phase-I) at SHIRANGAPPA	2	22/02/2020	SRS	APU	AVS																																					
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	CLIENT: PRAGATI HEAVY ELECTRICALS LTD	Drawing No		PLANT	SHEET																																						
	CONSULTANT: AISC - CONSULTANCY WORK	KT003/001		ETP	1 OF 1																																						

LEVEL SWITCH (CAPACITANCE TYPE)										
TYPE		CAPACITANCE TYPE								
1.PROBE										
1.1 MOUNTING		FLANGED TO 4 " ANSI 150 # FF								
1.2 MOC		WIRE ROPE IN SS316 WITH FEP INSULATION								
2.PRE AMPLIFIER		SOLID STATE ELECTRONIC MODULE TO BE MOUNTED ON PROBE HEAD								
2.1 PROTECTION CLASS		IP -65								
2.2AMBIENT TEMP		0 Deg.C. to 80 Deg.C. (AUTOMATIC TEMP.COMPENSATED.).								
3. CONTROL UNIT		WALL MOUNTING - REMOTE								
3.1 MOUNTING		IP-65,WEATHERPROOF								
3.2 PROTECTION		24 VDC								
3.3 POWER SUPPLY		2 SPDT SNAP ACTION DRY CONTACT PER SET POINT								
3.4 SWITCH / CONTACT TYPE		5 AMP AT 240 V AC RESISTIVE LOAD								
3.5 CONTACT RATING		LESS THAN 0.3 Sec								
3.6 RESPONSE TIME		3/4" ET (F) X 3 NOS								
3.7 CABLE ENTRY		ONE								
SET POINTS		RCC								
TYPE OF TANK										
NOTE: 1.SS TAG PLATE SHALL BE SUPPLIED ALONG WITH SWITCHES. 2.FOR TANK HEIGHT& ACTIVE ROPE LENGTH REFER INDEX SHEET										
<table border="1"> <thead> <tr> <th>MAKE</th> <th>MODEL NO.</th> </tr> </thead> <tbody> <tr> <td>NIVO CONTROL</td> <td>ALC 541F</td> </tr> </tbody> </table>		MAKE	MODEL NO.	NIVO CONTROL	ALC 541F					
MAKE	MODEL NO.									
NIVO CONTROL	ALC 541F									
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)		PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI		2	2/2/2010	SKS	APU	AVS		
				1	22/12/2009	SKS	APU	AVS		
		O.C NO: 630128		0	6/10/2009	SKS	APU	AVS		
		OWNER: PRAGATI POWER CORPORATION LTD.,DELHI		Rev	DATE	PREPD. BY	CHKD. BY	App by		
		CLIENT : BHARAT HEAVY ELECTRICALS LTD		Specification No		PLANT		SH NO		
CONSULTANT:- NTPC - CONSULTANCY WING		WHJEG00001		ETP		4 OF 4				

Capacitance Level Controller



NIVOLARM ALC 511/512/521/541



Applications:

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

HIGH DURABILITY AND SYSTEM RELIABILITY

No Moving Parts, Interference Free Signal from Sensor

CALIBRATION FROM REMOTE LOCATION

Controller can be mounted far away from Sensor

IGNORES BUILD UP

Uses Ground / Energized Shield Probe

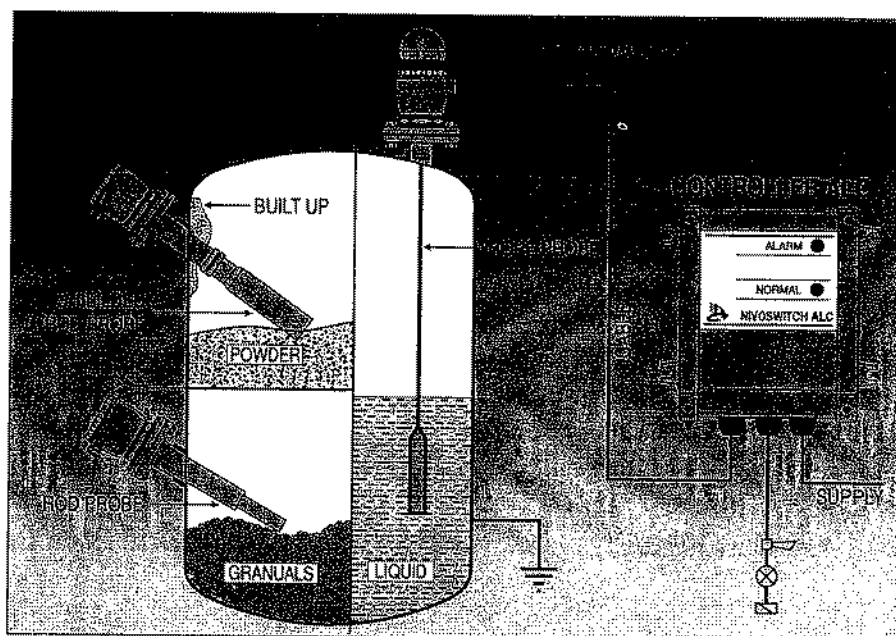
LOW INSTALLATION COST

Uses ordinary Multi-Core Cable

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

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

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



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

Different models and their output:

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

Optional:

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

Dimension & Weight:

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

For detailed specifications please refer data sheet.

A complete measuring system consists of:

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

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

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

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



Marketed and Supported by

Toshbro Limited

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

Manufactured by
Nivo Controls Private Limited
104-115, Electronic Complex,
Indore 452 010. INDIA
Phones: 0731 553248/49, 558357
Fax: 0731 550075
e-mail: nivoind@bom4.vsnl.net.in

Branches	Phone	Fax	Branches	Phone	Fax
Ahmedabad	079-6578145	6577941	Delhi	011-6752464	5766222
Ajmer	0145-420506	420505	Goa	0832-42692	224904
Bangalore	080-3496143	3396143	Hyderabad	040-294906	291589
Calcutta	033-2454687	2457508	Indore	0731-510120	550075
Chennai	044-8276338	8276338	Lucknow	0522-282825	281277

Branches	Phone	Fax
Nagpur	0712-533859	224362
Pune	0212-310905	317606
Vadodara	0265-422768	428057

CIRCULATING WATER TREATMENT PLANT

(A Govt. of India Enterprise)
CONSULTANCY WING

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

APPROVAL CONVEYED HERE IN NEITHER RELIEVES THE CONTRACTOR OF THE ACTUAL OBLIGATION AND RESPONSIBILITIES FOR CORRECTNESS OF DIMENSIONS, MATERIAL OF CONSTRUCTION. DESIGN DETAILS ASSUMED, PERFORMANCE PARTICULARS AND CONFORMITY OF THE SUPPLIES WITH SPECIFICATIONS, APPROVED SCHEMES AND STATUTORY LAWS. IT DOES NOT LIMIT THE PURCHASERS RIGHT UNDER THE CONTRACT. NO UNAPPROVED DRAWING/DOCUMENTS IS PERMITTED WITHOUT THE

1	22/12/2009	REVISED AS PER NTPC COMMENTS	SKS	APU	AVS
0	25/11/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By

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

CUSTOMER:

**PRAGATI POWER CORPORATION LIMITED (PPCL)**

CONSULTANT:

**NTPC LIMITED, CONSULTANCY WING****BHARAT HEAVY ELECTRICALS LTD**POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA**THERMAX LIMITED**

PUNE

DATA SHEET FOR SIDE MOUNTED MAGNETIC FLOAT TYPE LEVEL SWITCH LTD.

THERMAX DOC.NO.:

WHJCD00023

BHEL DOC. NO.

PE-V0-314-158-A304A

BHARAT HEAVY ELECTRICALS LTD.
PROJECT ENGINEERING MANAGEMENT

DOC.NO. 630128

REV. NO: 00 01

APPROVAL	DATE
CAT I = Approved	
CAT II = Approved With Comments as Noted	
CAT III = Not Approved	
CAT IV = Rejected Drawing	
BHEL - PREPARED BY	APPROVED BY
NAME A.K.C	
SIGNATURE	DATE
	12/12/10



PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL). (CWT PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-V0-314-156-A304A
THERMAX OC NO: 630128

REPLIES TO THE COMMENT ON DATA SHEET

SIDE MOUNTED MAGNETIC FLOAT TYPE LEVEL SWITCH NO. WHJCD00023

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

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

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

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

QTY :- 17 NOS	PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT	2	22/12/2009	SKS	APU	AVS
MAKE :- SBEM	1500 MW (NOMINAL) AT BAWANA, DELHI	1	25/11/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sal Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 830128	0	20/8/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
	CLIENT: BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant		SH NO
	CONSULTANT:- NTPC - CONSULTANCY WING	WHJCD00023		CLO2 & CW		2 OF 3

LEVEL SWITCH (SIDE MOUNTED MAGNETIC FLOAT TYPE)						
TYPE	SIDE MOUNTED FLOAT OPERATED					
DIMENSIONS	MANUFACTURER'S STANDARD					
SWITCH	MICRO SWITCH WITH 2SPDT SNAP ACTION DRY CONTACT					
CONTACT RATING	6 V DC, 5 VA					
ELECTRICAL CONNECTION	PLUG IN SOCKET					
ENCLOSURE	ALUMINIUM WEATHERPROOF-IP-65					
DIFFERENTIAL	25 ±2 mm					
ACCURACY	± 2 mm					
REPEATABILITY	± 1.5 mm					
MATERIAL OF FLOAT	PP					
FLANGE MOC	PP					
CONNECTION LOCATION	SIDE & SIDE					
LEVEL SWITCH FLANGE DETAILS	65 NB, ANSI B 16.5 150 # FF					

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



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

QTY :- 04 NOS	PROJECT: PRAGATI - III COMBINED CYCLE POWER PROJECT	2	22/12/2009	SKS	APU	AVS
MAKE :- SBEM	1500 MW (NOMINAL) AT BAWANA, DELHI	1	25/11/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 530128	0	28/6/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	SH NO	
	CONSULTANT:- NTPC - CONSULTANCY WING	WHJCD00023		CWT	3 OF 3	

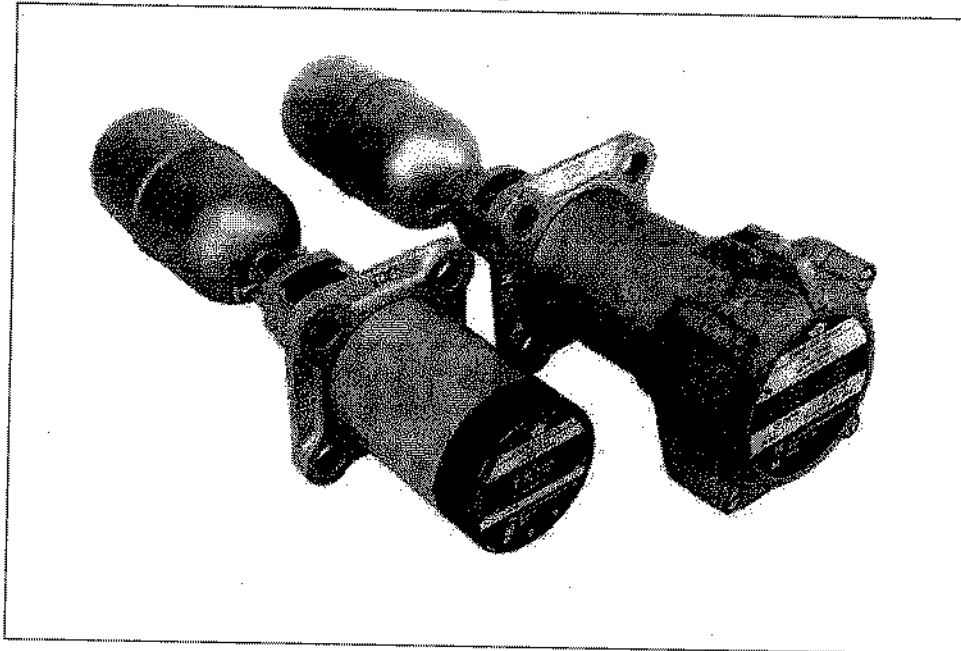
SBEM

Level Measurement & Control Solutions

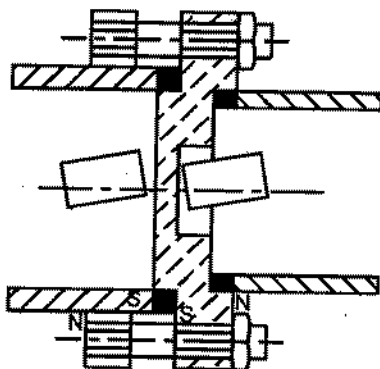
Magnetic Float Switch

Series 137

DM



OPERATING PRINCIPLE:



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

FEATURES:

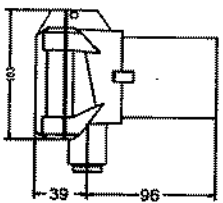
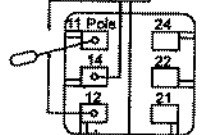
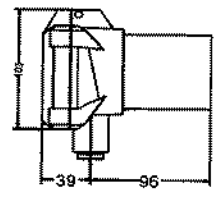
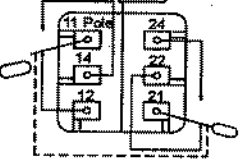
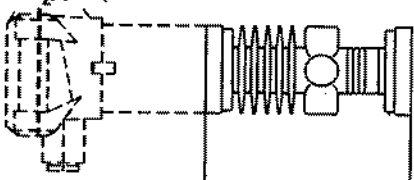
- ☒ Modular construction
 - 1. Switch module
 - 2. Flange module
 - 3. Float module

This means it gives flexibility with unlimited switch combinations to suit individual needs
- ☒ Available in Electric On/Off and pneumatic proportions
- ☒ Electric Switch available in Flameproof version also
- ☒ Available with fixed or adjustable difference
- ☒ High temperature version available
- ☒ All wetted parts in stainless steel
- ☒ Different types of Float Chambers available. For details refer LF-137 Catalog

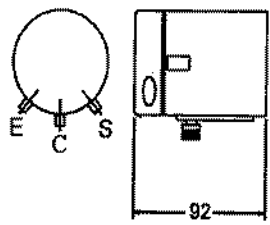
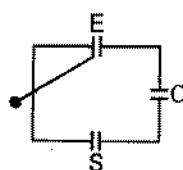
SWITCH MODULES

Type selection depending on application :

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

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

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

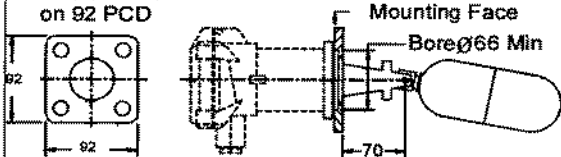
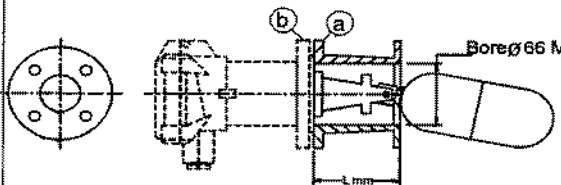
Type Code	Output		Input/Output Diagram and Pressure Ratings	Enclosure Material Of Construction	Max Ambient Temp	Max Operating Temp
PNP	Pneumatic Proportional		E - Exhaust Port S - Input Port 1.4 Kg/cm ² air pressure C - Controlled output port 0.2 to 1.0 Kg/cm ² 	Aluminium	0-70°C	0-300°C

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

FLANGE MODULES:

Type selection depending on :

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

Tank Code	Type		Material Of Construction	Mounting Details
SF	Standard mounting square flange	4 Holes $\varnothing$ 14 on 92 PCD 	Stainless steel casting AISI 316	Direct mounting tank opening Min. $\varnothing$ 66 mounting holes to suit - M 12/ 1/2" BSW
SA	Slip on flange to suit side and top		a - sealing flange (fabricated) AISI 316 b - slip on flange. carbon steel passivated sealing flange.	Slip on flange nozzle mounting range 2 1/2" NB to 6" for ANSI, NB L max. 2 1/2", 3" 70 4", 5" 80 6" 90

ORDERING CODE:**High Temperature Stand off**

- 0- Not Required
 H- Required (only with electric On/OFF)

Output

PNP-Pneumatic Proportional Output

Electronic On/ Off Switch Housing

- EA Aluminium
 -EY Flameproof Aluminium

Changeover Contact

1. One (SPDT)
 2. Two (2 X SPDT)

Degree of protection

5 IP-65 (STD)

Cable Entry Size

F 3/4" UNF (F)
 T 1/2" NPT (F)

Standard Mounting Flange

F-Standard Square Flange

Slip on Flange Standard

A ANSI Standard

Size Of Slip on Flange

- Standard square flange
 2 2 1/2" (65 mm) NB
 3 3" (80 mm) NB
 4 4" (100 mm) NB
 5 5" (125 mm) NB
 6 6" (150 mm) NB

Float Assembly

- S- Standard float assembly
 H- Standard Float with Horizontal Extension
 A- Adjustable Extension
 Z- Z Type extension.

Extension Length

Extension length L in mm

Ballows

1. Nitrile Rubber: 0°C to 100°C
 2. Viton Rubber :0°C to 200°C

ORDERING EXAMPLES MODULE CODES

1. Model Code: H-EA25FSA4S300-

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

2. Model Code: -EA26TSA1Z2001

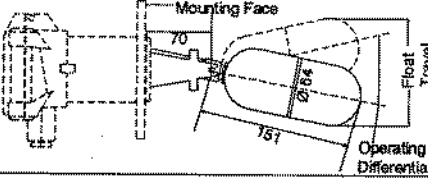
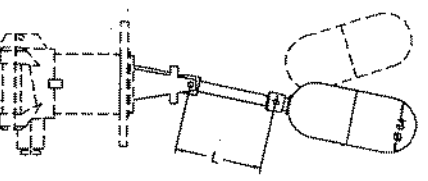
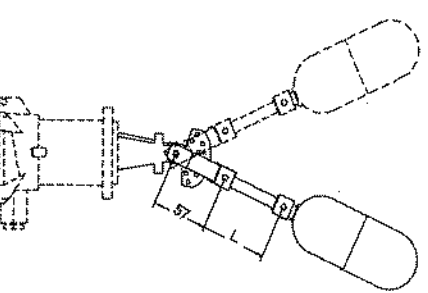
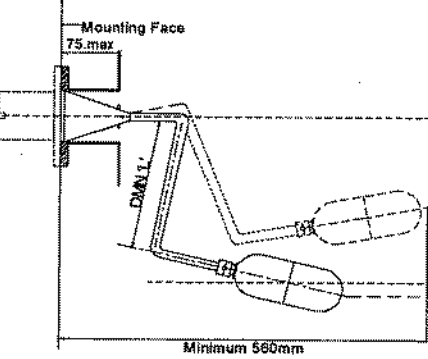
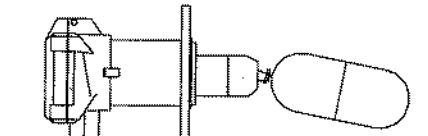
Float switch with Electric ON/OFF, aluminium housing with IP 65 degree of protection with 2 changeover contacts & 1/2" NPT Cable entry. 6" ANSI slip on flange, with a Z-type Float Assembly & extension length=200mm with nitrile rubber bellows.

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

FLOAT MODULES

Type selection depending on :

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

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

Material Of Construction for Wetside Components: AISI 316 Stainless Steel

APPLICATION EXAMPLES

HIGH/LOW ALARMS

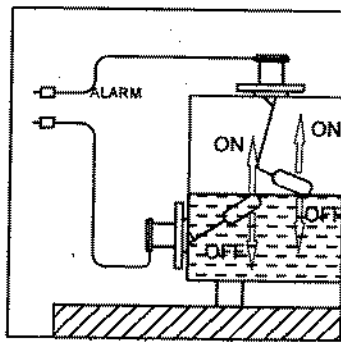


FIG 1

STANDARD HORIZONTAL MOUNTING

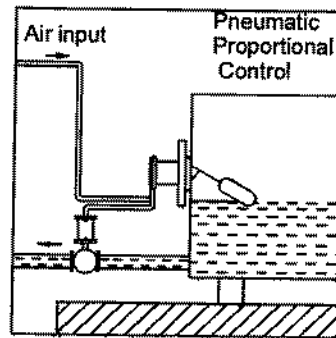


FIG. 2

CONTROL WITH 'Z' TYPE LEVEL SWITCH

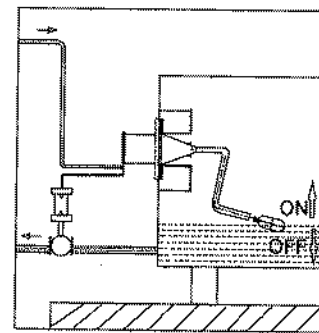


FIG. 3

CONTROL PUMPS OR VALVES WITH ADJUSTABLE DIFFERENTIAL

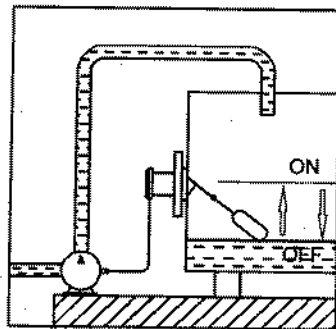


FIG. 4

INTERFACE CONTROL

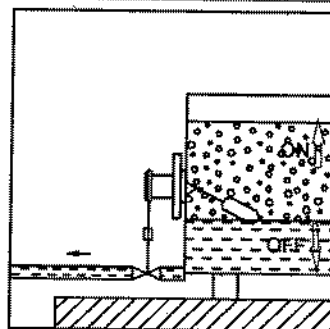


FIG. 5

EXTERNALLY MOUNTED FLOAT SWITCH IN CHAMBER

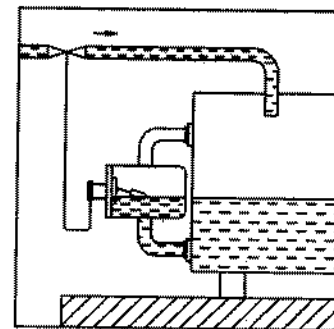


FIG. 6

Minimum information required to quote -

1) Sketch giving details of installation

2) Application details

Fluid

Operating pressure Kg/cm²

Operating temp. °C

Minimum density Kg/dm³

Tank material

Switch mounting position Horizontal/Vertical

3) Switch module

Electric/Pneumatic proportional

Switch housing AISI 316, Aluminium LM6.

Contact rating 5 A/10A, 1 C/o / 2 C/o

Degree of protection IP 65 / IP 67

High temp. stand off. Yes/No.

4) Flange module

Standard square flange/slip on flange

Slip on flange material

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

5) Float module

Std./Hori. extn./Ver. extn./Adj. extn./Ball type float

Operating differential mm.

Extension length horizontal

Extension length vertical

6) Accessories (optional)

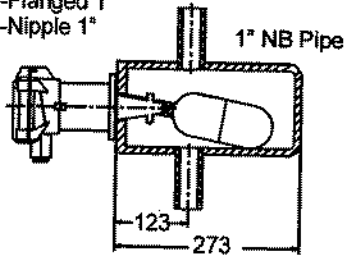
Counter flange standard/extended

Material of counter flange CS/SS316

Float chamber type

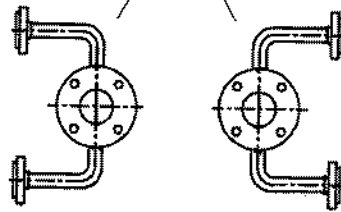
Float chamber material

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



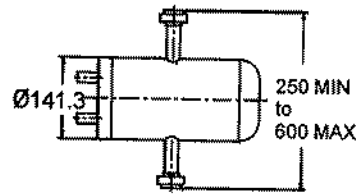
Type A

M 12 STUD
4 NOS. EQIP.
ON 92 P.C.D

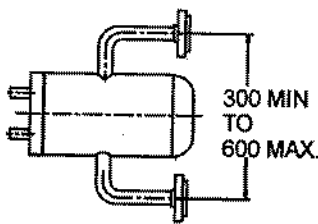


Type B

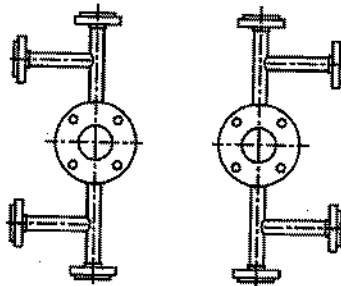
Type C



Type D

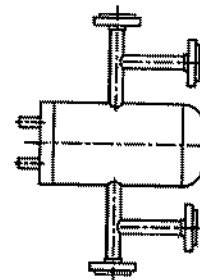


Type E



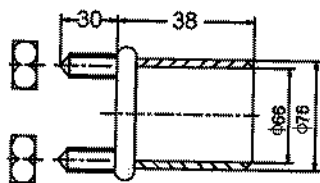
Type F
(LH Connection)

Type G
(RH Connection)

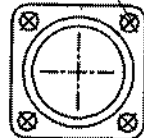


Type H

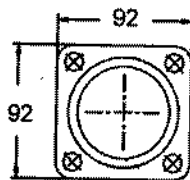
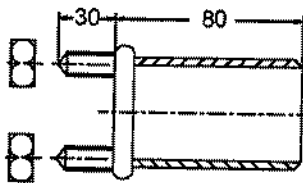
MOUNTING ACCESSORIES



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



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



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

*** Continuous developments may necessitate changes without notice.

LF-137-0807 R07 06/09

SBEM

SBEM Pvt. Ltd.

H.Q. : 39, Electronic Co-Operative Estate, Pune - 411 009 (India)

Tel. : 91-20-4130103, 24220505 Fax : 91-20-24215570

E-mail : sbemsales@sbem.co.in, marketing@sbem.co.in

Web : www.sbem-india.com

Works : Bhamburda Industrial Estate, 891W2, Pune - 411 037 (India); Email : mfg@sbem.co.in

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Fax : 91-22-2702351
Email : mumbai@sbem.co.in

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Email : chennai@sbem.co.in

New Delhi
Tel. : 91-11-26560467
Fax : 91-11-26560679
Email : newdelhi@sbem.co.in

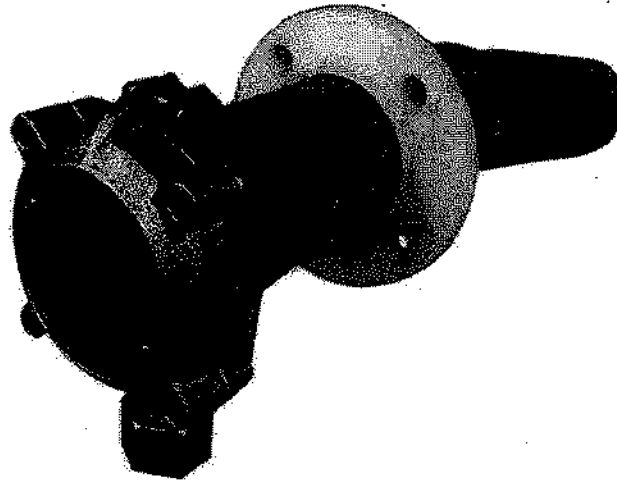
Pune
Tel. : 91-20-24215153
Fax : 91-20-24214083
Email : pune@sbem.co.in

SBEM

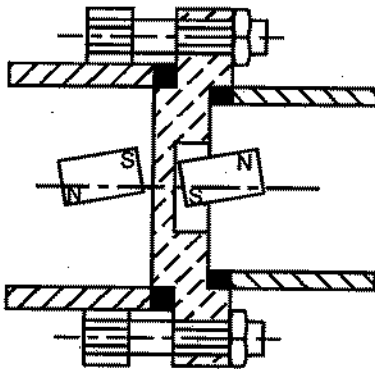
Level Measurement & Control Solutions

MAGNETIC FLOAT SWITCH, SERIES 137-C

FOR CORROSIVE APPLICATIONS



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

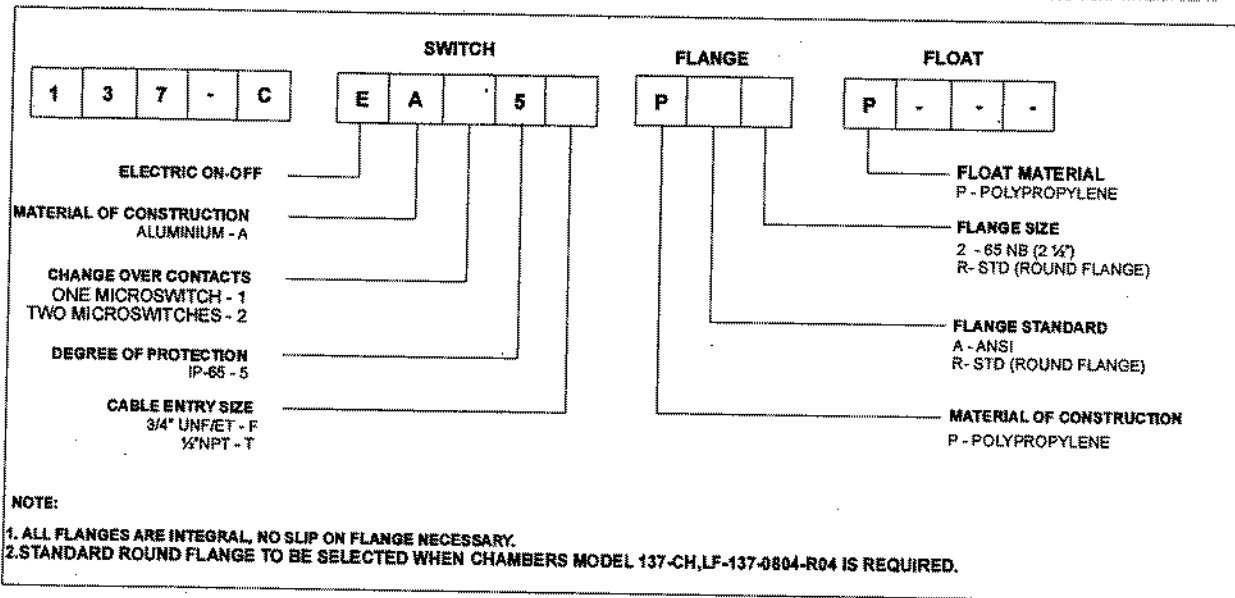


The movement of the float is transmitted through a solid Non magnetic wall by repulsion of like magnetic poles. This ensures that the float magnet imparts a snap action to the microswitch (es). Standard round flange or sealing /slip on type mounting having gland less construction isolates the switch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

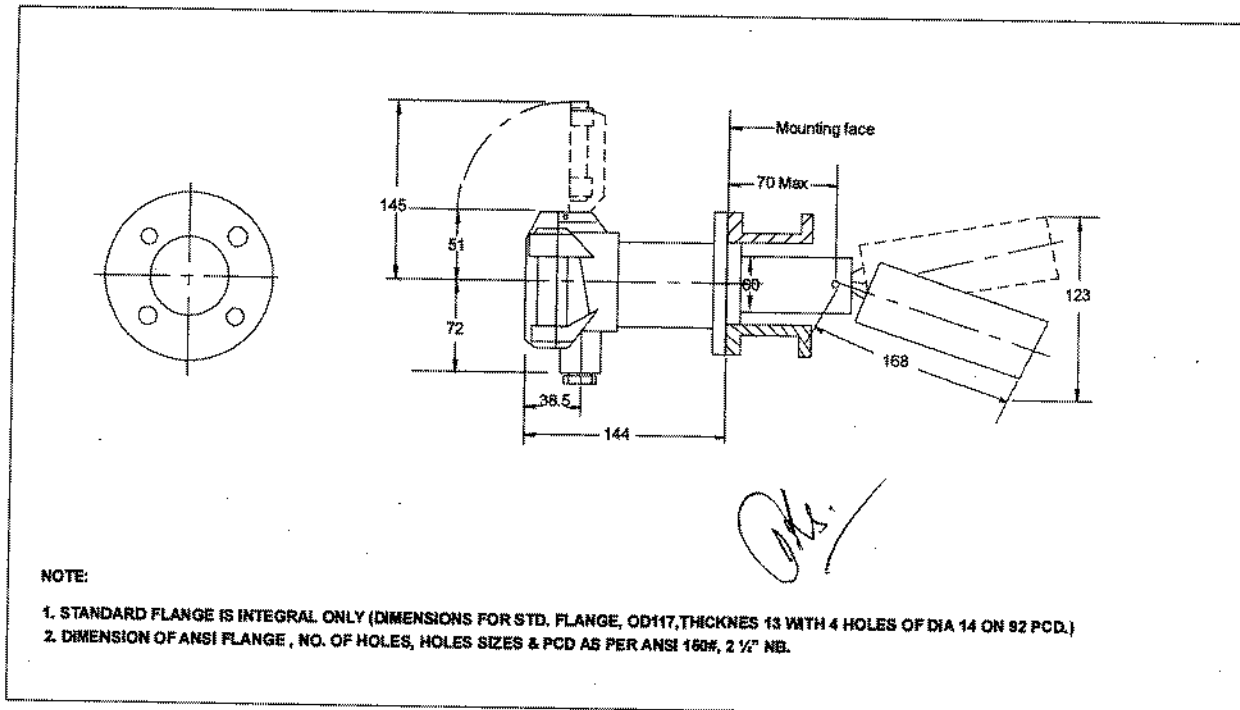
SPECIFICATIONS

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

ORDERING CODE FOR POLYPROPYLENE SWITCH



MECHANICAL DIMENSIONS



*** Continuous developments may necessitate changes without notice.

LF-137-0801 R07 06/2009



SBEM PVT. LTD.

140/39, Electronic Co-Operative Estate, Pune - 411 004 (India)
Tel: 91-20-4130190-24320505 Fax: 91-20-24318670
Email: sbemsales@sbem.co.in marketing@sbem.co.in Web: www.sbem-india.com

Works: Bhamburda Industrial Estate, 63/A7, Pune-Satara Road, Pune - 411 037 (India) Email: pms@sbem.co.in

Office	Mumbai	Chennai	Kovvur	Pune
Tel:	91-22-37623601	91-44-24481225	91-43-2556547	91-20-24218533
Fax:	91-22-27226005	91-44-24485447	91-43-2556575	91-20-24218583
Email:	mumbai@sbem.co.in	chennai@sbem.co.in	kovvur@sbem.co.in	pune@sbem.co.in

SEWAGE TRETMENT PLANT

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

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M

SR NO.	TAG NO	LOCATION	RANGE pH	OPERATING PARAMETERS		REMARK
				TEMP	PRESSURE KG/CM2	
1	AE - 811	DISCHARGE OF TREATED SEWAGE PUMP P-4070 A/B	0-14	AMB	1.5	FOR SENSOR SPECIFICATION REFER SHEET NO.03
2	AT - 811	DISCHARGE OF TREATED SEWAGE PUMP P-4070 A/B	0-14	AMB	1.5	FOR TRANSMITTER SPECIFICATION REFER SHEET NO.04

QTY :- 1 SET MAKE :- AS PER APPROVED VENDOR LIST	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI					
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630128	0	30/10/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	DATE	PREPD. BY	CHKD. BY	App by
	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		PLANT	SH NO	
	CONSULTANT:- NTPC - CONSULTANCY WING	WHJEB00022		STP	Page 137 of 284 2 OF 1	

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M**PH SENSOR SPECIFICATION SHEET**

Sr	Identification	Specification
	General	
1	Make	EMERSON
	Transmitter	
2	Model Number	399-01
3	Analyzer Compatibility	1181PH
4	Type	Flow Through PH Sensor
5	PH Range	Refer Sheet no.1
6	Process Temperature	65°C @ 100Psi
7	Maximum Process Pressure	100 psig @ 65°C
8	Sample Flow Rate	60 to 180 ml/min
9	Process Connections	1 in. MNPT
10	Reference Electrode	Double junction KCl gel Filled, Ceramic Junction
11	Sensor Cable	10 ft cable with integral preamp
12	Sensor Body	Tefzel
13	Sample IN / OUT Connections	1/4" NPT (F)
14	Cell Holder	POLYCARBONATE FLOW THROUGH CHAMBER

THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI					
	O.C NO: 630128	0	30/10/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	DATE	PREPD. BY	CHKD. BY	App by
	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		PLANT	SH NO	
	CONSULTANT:- NTPC - CONSULTANCY WING	WHJEB00022		STP	Page 138 of 284	

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M						
PH TRANSMITTER SPECIFICATION SHEET						
Sr		Identification		Specification		
		General				
1	Make	EMERSON				
		Transmitter				
2	Model Number	1181 PH-06-07-11				
3	Type	2 wire with Local Indication				
4	PH Range	Refer Sheet no.1				
5	Maximum Span Limit	0 to 14 PH				
6	Internal Range Select	Any 2 to 14 PH span in one PH steps				
7	Accuracy	± 0.1 % Of Full Scale or ± 0.05 pH or better				
8	Stability	± 0.1 % / month				
9	Repeatability	± 0.05 % of span or better				
10	Power Supply	24 VDC				
11	Display	Digital Type				
12	Input	Single sensor input				
13	Output	4-20 mA Analog DC Isolated				
14	Temperature Compensation	Automatic				
		Range				
		5 to 85 °C for 399 & 4 to 71 °C for 320HP				
		Temperature Coefficient				
		± 0.0028 PH/°C Full Scale				
15	Mounting Brackets	2" Pipe / Wall / Surface Mount				
16	Enclosure / Housing	NEMA 4X Whether-Proof.				
17	Electrical connections / Conduit Entry Size	1/2 "-14 NPT (F)X 2Nos.				
		Accessories				
18	Nameplate	SS 316				
	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI					
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630128	0	30/10/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	Rev	DATE	PREPD. BY	CHKD. BY	App by
	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		PLANT	SH NO	
	CONSULTANT:- NTPC - CONSULTANCY WING	WHJEB00022		STP	Page 129 of 284	

pH/ORP Sensors

- NEW OPTIONS to meet a variety of application requirements, including:
 - * Low ionic strength water
 - * Processes with hydrofluoric acid, high pH, and reference poisoning elements
- QUICK CABLE-TO-SENSOR RELEASE, provided by the water-tight VP multiple-pin connector, eliminates cable twisting.
- EXTENDED SENSOR LIFE provided by double or triple junction reference cell in process solutions containing poisoning ions.
- OPTIMUM VERSITILITY FOR VARIOUS MOUNTING OPTIONS provided by one-piece construction with process threads in two places.
- MAXIMUM CHEMICAL RESISTANCE provided by rugged tefzel¹ body, completely sealed to eliminate sensor leakage.
- ENHANCED PERFORMANCE AND INCREASED LIFE with minimized glass cracking provided by field-proven AccuGLASS^{TM2} pH glass formulations.



MODEL 399

Insertion/Submersion
Sensor with integral cable



MODEL 399VP

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

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

² AccuGLASS is trademark of Rosemount Analytical.

FEATURES AND APPLICATIONS

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

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

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

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

Continued on following page...

FEATURES AND APPLICATIONS (cont.)

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

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

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

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

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

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

PHYSICAL SPECIFICATIONS

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

Process Connections: 1 in. MNPT, 2 places

Integral Cable:

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

Model 399VP: None; must use mating VP cable

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

Maximum Pressure:

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

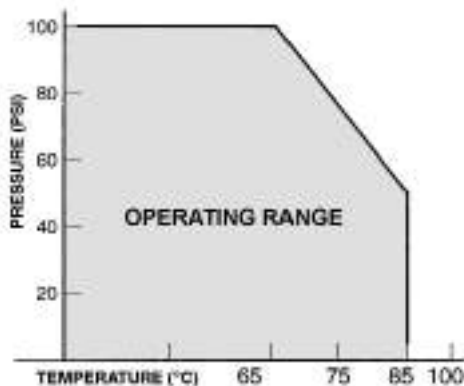
Weight/Shipping Weight: 0.45 kg/0.9 kg (1 lb/2 lb)

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

Percent Linearity Over pH Range:

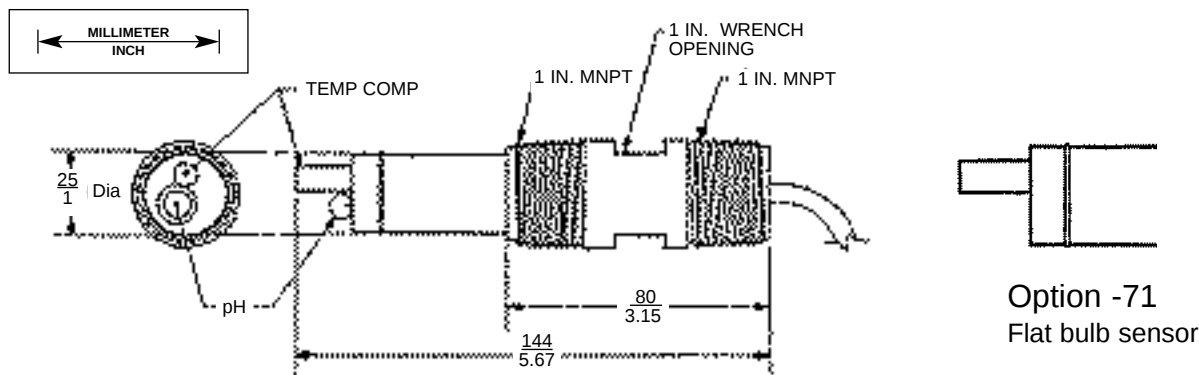
	GPLR Hemi Bulb	Flat Bulb
1-2 pH	94%	93%
2-12 pH	99%	98%
12-13 pH	97%	95%

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



GRAPH 1. Pressure/Temperature Operating Range for Models 399 and 399VP

MOUNTING AND DIMENSIONAL DRAWINGS



THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M

ORDERING INFORMATION

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



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

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

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

Two-Wire Transmitters

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



THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M

FEATURES AND APPLICATIONS

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

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

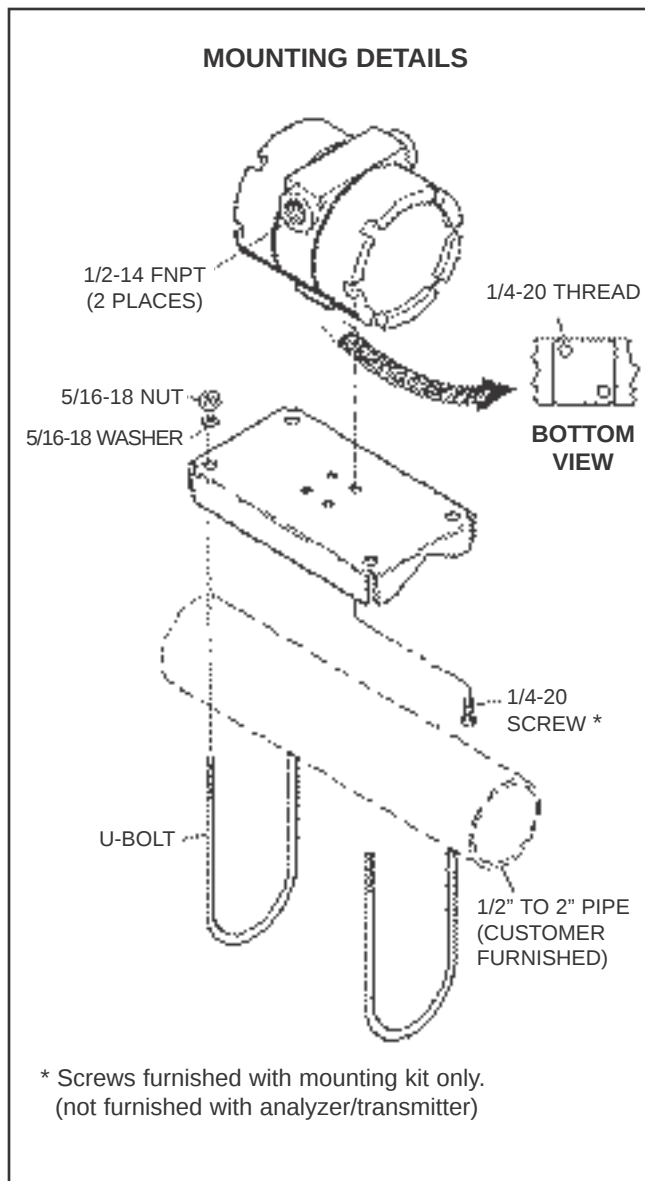
The electronic printed circuits are protected from the environment by the NEMA 4X weatherproof, corrosion resistant enclosure. The printed circuit cards plug into a moisture barrier which is isolated from the field wiring and calibration terminals. Routine field calibration does not require exposing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

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

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

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

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



PHYSICAL SPECIFICATIONS – GENERAL

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

Hazardous Area Classification:

Explosion Proof:

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

Intrinsic Safety:

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

Display:

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

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

Weight/Shipping Weight:

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

PERFORMANCE SPECIFICATIONS – GENERAL

Power Supply Requirements: (See Load/Supply Chart)

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

Maximum Operating Power: 40 milliwatts

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

Input/Output Isolation: 600 Volts

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

Ambient Humidity: 0-99% RH

Digital Display Accuracy: 0.1% reading ±1.0 count

Analog Display Accuracy: ±2.0%

External Zero: ±7.5% full scale

External Span: ±7.5% full scale

Shock: 10G maximum for 10 milliseconds

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

EMI/RFI:

EN50081-1

EN50082-2



THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M

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

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

PERFORMANCE SPECIFICATIONS @ 25°C

(Electronics only)

Measurement Range: 0-14 pH

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

Accuracy: $\pm 0.1\%$ full scale

Stability: $\pm 0.1\%$ /month

Repeatability: ± 0.1 pH

Temperature Coefficient: ± 0.0028 pH/°C full scale

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

RECOMMENDED SENSORS:

Model 300 Retractable pH Sensor

Model 320B Flow Through pH Sensor

Model 320HP High Purity pH Sensor

Model 328A Steam Sterilizable pH Sensor

Model 381 Insertion/Submersion/Flow-Through pH Sensor

Model 385 Retractable pH Sensor

Model 389 Disposable pH Sensor

Model 396 TUpH Disposable Sensor

Model 399 Disposable pH Sensor

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

PERFORMANCE SPECIFICATIONS @ 25°C

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

Zero: 0 to ± 2400 mV in 200 mV steps

Accuracy: $\pm 0.1\%$ full scale

$\pm 0.2.0$ mV full scale

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

± 2.0 mV/month, non-cumulative

Repeatability: $\pm 0.1\%$ full scale

± 2.0 mV/month

Temperature Coefficient: ± 200 ppm/°C full scale

± 0.4 mV/°C full scale

Automatic Temperature Compensations: N/A

RECOMMENDED SENSORS:

Model 300 Retractable ORP Sensor

Model 330B Flow Through ORP Sensor

Model 381 Insertion/Submersion/Flow-Through ORP Sensor

Model 385 Retractable ORP Sensor

Model 389 Disposable pH Sensor

Model 399 Disposable ORP Sensor

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M

ORDERING INFORMATION

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

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

Former Options

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



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Emerson Process Management

Rosemount Analytical Inc.

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<http://www.RAuniloc.com>

Rev. No	Date	Description	Prepared By	Reviewed By	Released By
1	20/2/2010	REVISED AS PER NTPC COMMENT	SKS	APU	AVS
0	17/12/2009	FOR APPROVAL	SKS	APU	AVS
PROJECT PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL). CUSTOMER:  PRAGATI POWER CORPORATION LIMITED (PPCL) CONSULTANT:  NTPC LIMITED, CONSUTANCY WING  BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA  THERMAX LIMITED PUNE					
DATA SHEET FOR PRESSURE GAUGES					
THERMAX DOC.NO.:		BHEL DOC. NO. :		OC.NO. 630128	
WHJAA00068		PE-VO-314-164-A210		REV. NO : 01	



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

PRESSURE GAUGE DOC NO. WHJAA00068

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

PRESSURE GAUGES (CHEMICAL SEAL TYPE)

SPECIFICATION FOR PRESSURE GAUGE

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

SPECIFICATION FOR CHEMICAL SEAL

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

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

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

QTY :- 04 NOS	PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI	2	20/2/2010	SKS	APU	AVS
MAKE :- GLUCK		1	17/12/2009	SKS	APU	AVS
THERMAX LIMITED	O.C NO: 630128	0	30/08/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LT	Specification No		Plant	SH NO	
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJAA00068		ETP	Page 151 of 284 3 OF 6	

PRESSURE GAUGES (CHEMICAL SEAL TYPE)									
SPECIFICATION FOR PRESSURE GAUGE									
1. TYPE	Direct	10. BEZEL RING	SCREWED						
2. MOUNTING	Local	11. SOCKET MATERIAL	SS - 316						
3. DIAL SIZE	150MM	12. MOVEMENT	SS - 304						
4. DIAL COLOUR	White with black inscription	13. RUPTURE DISC	Yes						
5. CASE MAT & ENCLOSURE CLASS	DI-Cast AL Weatherproof & dust proof as per NEMA - 4	14. OVERRANGE PROTECTION	130 % of FSD						
6. PRESS. ELEMENT	Bourdon	15. ACCESSORIES	A) Snubber 1/2" NPT(M) X 1/2" NPT(F)-SS-316 B)GLYCERINE FILLED CASING						
7. ELEMENT MAT.	SS316	16. GLASS	SHATTER PROOF TYPE.						
8. ACCURACY	± 1% of FSD	17. Max. working temp	50 Deg. Celsius.						
9. ZERO ADJUST.	Micrometer Pointer with Epoxy coated Screw adj.								
SPECIFICATION FOR CHEMICAL SEAL									
1.TOP CHAMBER	CARBON STEEL	4. PACKING MATERIAL: FIBRE ASBESTOS ACID PROOF							
2.BOTTOM CHAMBER	CS + PTFE	5. DIAPHRAGM-SS316+PTFE							
3.TRANSMITTING FLUID	SILICON OIL	6.PROCESS CONNECTION- 25 NB, ANSI B 16.5, 150 # FF							
TAG NO	RANGE Kg/cm ²	OPER. PRESS. Kg/cm ²	OPER. TEMP. DEG. C.	MEDIUM	LOCATION	MODEL NO	MAKE	ACCESSORIES	
PG - 120 A	0-6	3	AMB	EFFLUENT	DISCHARGE OF P-3010 A	CS-S-RF + 8 AG-BD	GLUCK	B	
PG - 120 B	0-6	3	AMB	EFFLUENT	DISCHARGE OF P-3010 B	CS-S-RF + 8 AG-BD		B	
PG - 121 A	0-6	2.9	AMB	EFFLUENT	DISCHARGE OF P-3020 A	CS-S-RF + 8 AG-BD		B	
PG - 121 B	0-6	2.9	AMB	EFFLUENT	DISCHARGE OF P-3020 B	CS-S-RF + 8 AG-BD		B	
PG - 122 A	0-10	7	AMB	EFFLUENT	DISCHARGE OF P-3050 A	CS-S-RF + 8 AG-BD		B	
PG - 122 B	0-10	7	AMB	EFFLUENT	DISCHARGE OF P-3050 B	CS-S-RF + 8 AG-BD		B	
PG - 123 A	0-4	2.2	AMB	EFFLUENT	DISCHARGE OF P-3060 A	CS-S-RF + 8 AG-BD		B	
PG - 123 B	0-4	2.2	AMB	EFFLUENT	DISCHARGE OF P-3060 B	CS-S-RF + 8 AG-BD		B	
PG - 124 A	0-10	6.2	AMB	EFFLUENT	DISCHARGE OF P-3070 A	CS-S-RF + 8 AG-BD		B	
PG - 124 B	0-10	6.2	AMB	EFFLUENT	DISCHARGE OF P-3070 B	CS-S-RF + 8 AG-BD		B	
PG - 125 A	0-6	3.6	AMB	EFFLUENT	DISCHARGE OF P-3080 A	CS-S-RF + 8 AG-BD		B	
PG - 125 B	0-6	3.6	AMB	EFFLUENT	DISCHARGE OF P-3080 B	CS-S-RF + 8 AG-BD		B	
PG - 126 A	0-15	7.6	AMB	EFFLUENT	DISCHARGE OF P-3090 A	CS-S-RF + 8 AG-BD		B	
PG - 126 B	0-15	7.6	AMB	EFFLUENT	DISCHARGE OF P-3090 B	CS-S-RF + 8 AG-BD		B	
PG - 127 A	0-10	6.5	AMB	SUMP	DISCHARGE OF P-3030 A	CS-S-RF + 8 AG-BD		B	
PG - 127 B	0-10	6.5	AMB	SUMP	DISCHARGE OF P-3030 B	CS-S-RF + 8 AG-BD		B	
PG - 128 A	0-4	1.8	AMB	SUMP	DISCHARGE OF P-3100 A	CS-S-RF + 8 AG-BD		B	
PG - 128 B	0-4	1.8	AMB	SUMP	DISCHARGE OF P-3100 B	CS-S-RF + 8 AG-BD		B	
PG - 130 A	0-6	3.7	AMB	EFFLUENT	DISCHARGE OF P-3200 A	CS-S-RF + 8 AG-BD		B	
PG - 130 B	0-6	3.7	AMB	EFFLUENT	DISCHARGE OF P-3200 B	CS-S-RF + 8 AG-BD		B	
PG-131 A	0-6	3.4	AMB	EFFLUENT	DISCHARGE OF P-3210 A	CS-S-RF + 8 AG-BD		B	
PG-131 B	0-6	3.4	AMB	EFFLUENT	DISCHARGE OF P-3210 B	CS-S-RF + 8 AG-BD		B	
PG-135 A	0-6	3	AMB	PE	DISCHARGE OF P-3280 A	CS-S-RF + 8 AG-BD		B	
PG-135 B	0-6	3	AMB	PE	DISCHARGE OF P-3280 B	CS-S-RF + 8 AG-BD		B	
PG-150 A	0-6	3	AMB	DWPE	DISCHARGE OF P-3180 A	CS-S-RF + 8 AG-BD		B	
PG-150 B	0-6	3	AMB	DWPE	DISCHARGE OF P-3180 B	CS-S-RF + 8 AG-BD		B	
PG-150 C	0-6	3	AMB	DWPE	DISCHARGE OF P-3180 C	CS-S-RF + 8 AG-BD		B	
NOTES : 1. THE TAG PLATE SHOULD BE IN ENGRAVED PHENOLIC LAMINATED TO BE MARKED ON DIAL.									
QTY : 27 NOS	PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT (1500 MW (NOMINAL) AT BAWANA,DELHI			2	20/2/2010	SKS	APU	AVS	
MAKE : - GLUCK				1	17/12/2009	SKS	APU	AVS	
THERMAX LIMITED	O.C NO: 630128			0	30/08/2009	SKS	APU	AVS	
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD., DELHI			Rev	Date	Prepd by	Chkd by	App by	
Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD			Specification No		Plant	SH NO		
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING			WHJAA00068		ETP	Page 152 of 284 4 OF 6		

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M

PRESSURE GAUGES (CHEMICAL SEAL TYPE)

SPECIFICATION FOR PRESSURE GAUGE

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

SPECIFICATION FOR CHEMICAL SEAL

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

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

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

QTY :- 22 NOS	PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI	2	20/2/2010	SKS	APU	AVS
MAKE :- GLUCK		1	17/12/2009	SKS	APU	AVS
THERMAX LIMITED	O.C NO: 630128	0	30/08/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	Page 153 of 284	
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJAA00068		ETP	5 OF 6	

PRESSURE GAUGES (DIRECT BOURDON TYPE)

GENERAL INFORMATION

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

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

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

QTY :- 08 NOS	PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI	2	20/2/2010	SKS	APU	AVS
MAKE :- GLUCK		1	17/12/2009	SKS	APU	AVS
THERMAX LIMITED	O.C NO: 630128	0	30/08/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	SH NO	
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	WHJAA00068		ETP	Page 154 of 284 8 of 8	



Gluck (India) Mfg. Co.

Pressure Gauge Selection

General Information

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

- *Gauge Measuring Principles*

Bourdon tube pressure gauges

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

Diaphragm pressure gauges

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

Capsule pressure gauges

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

Bourdon tube pressure gauges with chemical seals

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

- *Gauge Types*



Gluck (India) Mfg. Co.

Pressure Gauge Selection	General Information
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General Purpose Gauges

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

Industrial Gauges

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

Process Gauges

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

Precision & Test Gauges

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

Low Pressure Gauges

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

Specialty Pressure Gauges

Special gauges designed for specific applications

- *Gauge Size*

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

- *Gauge Mounting and Connection*

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



Gluck (India) Mfg. Co.

Pressure Gauge Selection	General Information
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Entry & Mounting Styles (Our type abbreviation used in Model Nos.)

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

Process Connection

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

Gauge Pressure Range

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

Pressure fluid composition

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

Gauge case/Housing

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

Gauge Front ring/Bezel and Window

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



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Pressure Gauge Selection

General Information

• Gauge Dial/Pointer

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

• Gauge Accuracy

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

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

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

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

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

• Liquid Filled Option

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

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

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

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



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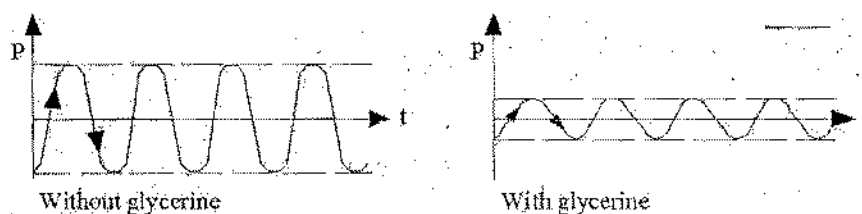
Pressure Gauge Selection

General Information

Operation

With applications incurring frequent pressure changes, pressure peaks and external vibration, general purpose or dry case pressure gauges are subjected to rapid wear. Under such conditions, the moving parts of the gauge suffer oscillations, the amplitude is often higher than the natural frequency of the acting forces. This may lead to a fracture of the measuring element. Simultaneously, transmission parts, bearings and gears are warmed up and abraded. An exact reading is usually impossible due to pointer oscillations. To provide effective protection against such conditions, pressure gauges are filled with glycerine. The dampening effect of the liquid, thus reduces the amplitude of the vibrations.

Principle of oscillation dampening



The lubrication provided by the glycerine reduces the abrasion of pinion and shafts and considerably extends the gauge life. Additionally, the filling prevents the formation of condensed water within the case and the entry of unwanted aggressive gases. The equalization of pressure within the case is provided by a bleeder.

• Shock, Vibration & Pulsation

Consider liquid filled gauges to enhance the reliability and integrity of the measuring system when operating for long periods under extreme operating conditions. In addition pulsation snubbers are used to minimize effects from pulsation and pressure spikes/surges. The snubber helps keep accurate data flowing by dampening pulsation and spikes/surges. Gauge life is also extended by reducing gauge wear. Further, mounting option become an important consideration for elimination of mechanical vibration between mechanical equipment and the pressure gauge. In some application it may be appropriate to connect the pressure gauges to the mechanical device using flexible hose and tubing so that equipment's mechanical vibration is dampened by structural components. *gluck* offers a wide range of dial sizes, mounting options and case styles to fit customer's gauge mounting needs.

• Operating Temperature & Ambient conditions

The normal ambient temperature range for most standard dry or silicone filled gauges is -40 to +140° F. The normal temperature range for glycerine filled gauges is -4 to +140° F. Steam and other hot media raise the safe working limits of the gauge, such temperature change effects the stiffness of elastic element (Bourdon Tube) and change in stiffness of element will effect gauge accuracy. In these cases, siphons, cooling towers or chemical seals may be used to trap condensed steam or other vapor to isolate the gauge from the heat source I.e. making liquid seal in the line to the gauge for preventing high temperature reaching the gauge internals.



Gluck (India) Mfg. Co.

MODEL Decoding of Bourdon Type Gauges

General Information

For understanding the Model decoding please refer to an example of Model **8A-BD** where the alphabets is to be divided in to parameter “8”, “A-” & “BD” and for values of each parameter refer table 1, 2 & 3 respectively as under.

Table – 1 : Specifies the dial size and general MOC of the wetted parts i.e. Bourdon tube & Shank (Socket or Process Connection)

15	1-1/2" (40mm) Dial Size, Copper Alloy internals
5	2" (50mm) Dial size, Copper Alloy internals
9	2-1/2" (63mm) Dial size, Copper Alloy internals
1	4" (100mm) Dial size, Copper Alloy internals
2	6" (150mm) Dial size, Copper Alloy internals
4	10" (250mm) Dial size, Copper Alloy internals
3	2-1/2" (63mm) Dial size, Steel Alloy internals
7	4" (100mm) Dial size, Steel Alloy internals
8	6" (150mm) Dial size, Steel Alloy internals
6	10" (250mm) Dial size, Steel Alloy internals

Notes:

- 1) Copper Alloys : Brass, Ph. Bronze
- 2) Steel Alloys : SS-304, SS-316, SS-316L, SS-316Ti, Monel

Table – 2 : Specifies utility, construction in general, case MOC and case option (Dry or filled case)

-	General Purpose, Non Weather Proof
E-	General Purpose, Economic, Non Weather Proof
A-	Industrial Purpose, Weather Proof, Aluminium Black Coated Casing (Dry Case)
S-	Industrial Purpose, Weather Proof, SS Casing (Dry Case)
M-	Industrial Purpose, Weather Proof, Steel Black Coated Casing (Dry Case)
AG-	Industrial Purpose, Weather Proof, Aluminium Black Coated Casing (Filled Case)
SG-	Industrial Purpose, Weather Proof, SS Casing (Filled Case)
MG-	Industrial Purpose, Weather Proof, Steel Black Coated Casing (Filled Case)

Table – 3 : Specifies Mounting

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

From the taken example of Model no. **8A-BD** gauge categories as under:

6" (150mm) Dial size Steel Alloy internals X Industrial Purpose, Weather Proof, Aluminium Black Coated Casing (Dry Case) X Bottom Entry Direct Mounting type Bourdon operated Gauge



Gluck (India) Mfg. Co.

Industrial Weather Proof SS Case Bourdon Gauge with Stainless Steel Alloys	PART – 6	Spec. Series : BTW-S
	XS – XXX	: Dry Version
	XSG – XXX	: Filled Version

Universal Stainless Steel Bourdon Type Gauge: Many applications require pressure gauges, which must remain fully functional under extreme operating condition such as aggressive fluids under pressure or aggressive environments. In this case the materials used for the pressure gauges components must be selected with particular care.

Gluck high quality pressure gauges are built with stainless, chrome-nickel steels (i.e. S.S.316). They can be used under all operational conditions, practically without limitations. Their concept combines sturdy design and high measuring accuracy.

The pressure gauges are suitable for extreme measuring conditions. Variable designs and materials enable them to meet the requirements of virtually all-international pressure gauge standards. The gauges can be used for all liquids and gases used in processes except for those having a high viscosity, or which are liable to crystallized.

Nominal Size

63, 100, 150 mm

Accuracy

63 mm: Class 1.6 / 2.5 as per EN-837-1 or Class II as per IS-3624

100 and 150 mm: Class I as per EN-837-1 or Class IB as per IS-3624

Scale Ranges

0...0.6 to 0...800 Kg/Cm² for 100 and 150 mm

0...1 to 0...400 Kg/Cm² for 63 mm

or equivalent other units of pressure or vacuum

Working Pressure

Steady: 3/4 of full scale value

Fluctuating: 2/3 of full scale value

Short Duration: Full scale value

Over Pressure Safety

1.25 X Full scale value. (Up to scale range 100 Kg/Cm²)

1.15 X Full scale value. (For scale range > 100 & ≤ 400 Kg/Cm²)

1.10 X Full scale value. (For scale range > 400 Kg/Cm²)

Enclosure or Weather Protection

IP 65 as per IS 13947 (Part-1)-1993

Operating Temperature

Ambient: -20...+60° C

Medium: +200° C

Temperature Error (Reference temperature +29° C)

Deviation of indication per 10° C about +0.3 % of indicated value for higher temperatures, about -0.3 % of indicated value for lower temperatures.

The temperature used for the correction of the indication is the temperature of the measuring system, and not the temperature of the fluid under pressure.

Standard Features

Pressure Connection (Shank)

Material: Stainless Steel 316

Thread Size: 1/8", 1/4" BSP(M) / BSPT(M) / NPT(M), 14mm Flat for 63mm

1/4", 3/8", 1/2" BSP(M) / BSPT(M) / NPT(M), 22mm Flat for 100, 150 & 250mm

Pressure Element

Material: Stainless Steel 316

< 100 Kg/Cm²: C-type

≥ 100 Kg/Cm²: Helical type



Gluck (India) Mfg. Co.

**Industrial Weather Proof SS Case Bourdon
Gauge with Stainless Steel Alloys**

PART – 6

XS – XXX

XSG – XXX

Spec. Series : BTW-S

: Dry Version

: Filled Version

Movement

Stainless Steel 304

Dial

White Aluminium or ABS Plastic with black lettering

Pointer

Black Aluminium or Tin

Mounting

-) Bottom Entry Direct Mounting (BD)
-) Bottom Entry Surface Mounting (BS) for 100, 150 and 250mm
-) Side Back Entry Direct Mounting (SBD)
-) Side Back Entry Bracket Mounting (SBB)
-) Center Back Entry Direct Mounting (CBD)
-) Center Back Entry Bracket Mounting (CBB)

Case

Stainless Steel 304 Semi Glossy Finish

Bezel Ring

Stainless Steel 304 Bayonet lock type

Window

Laminated safety glass (Shatter Proof Glass) for 100 & 150mm
Clear plain glass for 63 mm

Blow Out Protection

Neoprene Disc at back of the case for 100 and 150 mm
Bleeder at top of the case for 63mm
(For filled version bleeder shall be provided on the top of the case for all dial sizes.)

Zero Adjustment

Provided on the pointer for 100 and 150 mm
Not available for 63 mm

Optional Features

-) Accuracy class 0.6 as per EN-837-1 or class IA as per IS 3624 for 150mm
-) Pressure connection and element material of Stainless Steel 316 L, Monel (Availability to be confirmed with factory)
-) Liquid filled version available. For 63 mm window shall be acrylic glass. (For details on glycerine filling refer Pressure Gauges Selection)
-) Other process connection.
-) Metal Bush bearing movement, Stainless Steel 316 movement (available for 100 and 150 mm).
-) Scale graduation with °C for refrigerant R717 (NH₃) Ammonia Pressure Range -1-0-16 Kg/Cm² and -1-0-25 Kg/Cm².
-) Specific custom required scale.
-) Acrylic window, Toughened Glass window.

Nom. Size	Model No.		Mounting					
	Dry Version	Filled Version	Bottom Entry Direct	Bottom Entry Surface	Side Back Entry Direct	Side Back Entry Bracket	Center Back Entry Direct	Center Back Entry Bracket
63 mm	3S	3SG	BD	NA	NA	NA	CBD	CBB
100 mm	7S	7SG	BD	BS	SBD	SBB	NA	NA
150 mm	8S	8SG	BD	BS	SBD	SBB	NA	NA

NA: Not Available



Gluck (India) Mfg. Co.

Chemical Seals

Diaphragm Seals, Inline Seals, Capsule Seals

General Information

Modern chemical processing and process manufacturing procedures demand ever greater accuracy and reliability from their pressure and level measuring instruments. In order to minimise costs, both operation level and production down time must be kept to the absolute minimum.

In some applications it is necessary to isolate the pressure measuring instrument from the process medium in order to maintain these accuracy and reliability objectives: the *Gluck* range of Chemical Seals are specifically designed for this purpose.

If a particular instrument and/or chemical seal are needed, user should be aware of the material characteristics, operating conditions for the installation and the method of installation.

The following general information about features, applications and function of our chemical seal is relevant to our Model/Type. Furthermore, you will find user instructions and our advice about how an order is to be filled. *Printed information, dimensional data and drawings can be found on the separate data sheets of the individual models.*

• Application

Chemical seals separate the measuring system from the process medium. This way they enlarge the possible applications for pressure gauges, pressure switches, pressure transducers and pressure transmitters a lot. Chemical seals are used and recommended as separators.

- When the process medium is corrosive and requires special corrosion resistance. Bourdon tubes are only available in certain standard materials. When none of these materials suits for the medium, a chemical seal made out of a suitable special material is a reasonable solution.
- When the process medium is thick or viscous fluid, pressure measuring element or bourdon tube shall be suitably protected.
- When process medium tends to crystallize, solidifies or polymerize causing the connection / inlet of the pressure instrument to be obstructed and can generate dead volumes in pressure measuring element.
- When process medium is heterogeneous fluid with fibrous content, where deposits take place in dead zones.
- When process medium contains suspended solids it should be restricted to enter a measuring element such as bourdon tube.
- When process medium temperature or the ambient temperature at the measuring point is high this would affect the pressure instrument performance if in direct contact.
- For hygienic reasons often found in food or pharmaceutical where no dead space is allowed. Here bacteria are common which are sometimes difficult to clean.
- When measurement situations are difficult where either pressure instrument is difficult to read or install.
- For atmospheric or environmental contamination problems where adequate measurement must be made for safety reasons.
- When high over range protection is required.

• Function

Chemical seals are mainly used on pressure gauges with Bourdon tubes, pressure switches, pressure transmitters or pressure transducers. They can be directly attached to measuring instrument, or through a capillary line or a cooling element can be mounted between measuring instrument and chemical seal.

The essential part of a chemical seal is a tube separating element. This can be a membrane (Diaphragm Seal), a tube (Inline seal) or an immersion tube shaft (Capsule seal). Compare the simplified drawings of these three basic types below.

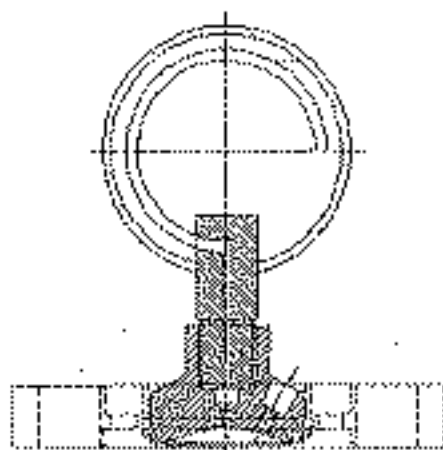


Gluck (India) Mfg. Co.

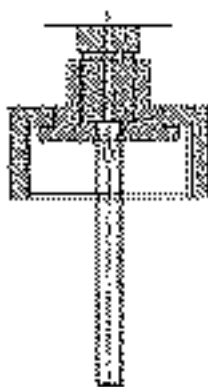
Chemical Seals

Diaphragm Seals, Inline Seals, Capsule Seals

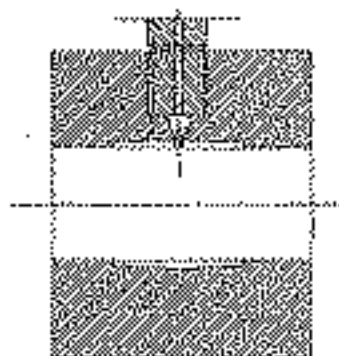
General Information



Diaphragm Seal Mounted to a Bourdon tube Pressure Gauge



Capsule Seal



Inline Seal

The most current version is a diaphragm seal mounted to a Bourdon tube pressure gauge. Therefore we use this version as an example to describe construction and function.

The pressure element of the gauge and the space behind the membrane form a completely sealed system, evacuated and then filled with a suitable filling liquid. The process medium reaches the membrane which deflects under pressure and causes a volume change inside the gauge.

The membrane has to displace as much volume as the measuring element needs to indicate the pressure. The deflection of the membrane must stay below its limit of elasticity which is determined by material, form, thickness and diameter of the membrane.

The volume displaced by the membrane is called "displacement volume" or "operation volume". The volume that is necessary to cover the element to indicate the pressure is called "control volume" or "driving volume".



Gluck (India) Mfg. Co.

Chemical Seals

Diaphragm Seals, Inline Seals, Capsule Seals

General Information

• *Particulars*

The influence of a chemical seal on the measuring result should be as small as possible. Therefore it is important to take all operating conditions in to consideration when choosing a chemical seal, to find the most suitable version for an optimized measurement.

Temperature

The system is filled at ambient temperature, approx. +20°C. A different temperature of the medium or the ambient at the measuring point causes a volume change, which changes the pressure inside of the filled system and may cause a significant indication error.

This influence can be minimized by using the best suitable filling fluid. The volume respectively the space behind the membrane of the chemical seal should be as small as possible to reduce temperature caused errors. Also the diameter of the membrane is important for the temperature effect. The bigger the diameter the better the compensation of temperature caused volume change.

For temperature higher than +160°C a capillary line or a cooling element between measuring instrument and chemical seal is recommended, so that the measuring instrument can stay remote from the measuring point. Cooling elements as well as capillary lines reduce temperature arriving at the measuring instrument.

Response Time

Generally a chemical seal retards the reading of the instrument. This can be desired for a better dampening effect on the indicating instrument.

The response time depends on the volume of the filling medium, the viscosity, the pressure range of the measuring instrument, the inner diameter and the length of a capillary line.

Height Difference

When the measuring instrument and the chemical seal are not mounted on the same level, this difference in height influences the measurement through the hydrostatic pressure of the fluid column. Please specify a level difference when ordering, so we can take this into consideration for the calibration.

Filling Fluid

The filling fluid has to be suitable for working and ambient temperature, namely as well as for the possible minimum temperature as for the possible maximum temperature. Furthermore the filling liquid has to be compatible to the medium, especially when the instrument is used for oxygen or chlorine services or in food and dairy industries. It can never be fully predicted that through a damaged membrane filling fluid might drip into the process medium.

Material

The standard and common special materials for chemical seals resp. wetted parts are specified in our data sheets. If you don't find the suitable material for your requirement, please contact us. We shall be pleased to offer individually on your specification.

Capillary Line

Capillary lines are made of stainless steel with protection at both the ends. Optionally the capillary line can be supplied with flexible armour (stainless steel). The maximum possible length of the capillary line depends upon the pressure range and the chemical seal model.



Gluck (India) Mfg. Co.

Chemical Seals

Diaphragm Seals, Inline Seals, Capsule Seals

General Information

Attachment of outside bought Measuring Instruments

Upon request we also attach measuring instrument from other manufacturers to our seals. Therefore we need a detailed description and user instruction of the instrument, so we can verify the suitability of the displacement volume of the selected seal.

User Instruction

Unfortunately chemical seals are often damaged by incorrect handling. The repair of instruments with chemical seals is very time consuming and expensive. Measuring instruments with chemical seal should therefore be handled very carefully.

Please note especially the following notes:

- Avoid touching the membrane in expert. It is very thin. Any contact with sharp instruments causes damage. Chemical seal should never be cleaned with high pressure water or sharp instruments.
- Do not open any connection of the system.
- All those chemical seal supplied with filling screws which is sealed shall not be opened.
- When the capillary line is not welded but screwed to the chemical seal, this connection are also not allowed to be opened.
- Do not use capillary at all for carrying or moving the instrument. The welding connections are not allowed to be stressed. The capillary line may never be buckled or bended. Buckling or bending causes an increased response time or even a leak, this means to damage the complete system.
- Before you send an instrument back for repair service, please pay attention to clean all wetted parts carefully from the process medium, especially from any health effecting substances. You should state on the delivery notes for which medium the instrument was used.

• How to Order

Besides the specification of the required measuring instrument enquiry or order needs to contain the following information:

- Model/Type of chemical seal (If already chosen; otherwise we will be pleased to help you selecting the suitable model)
- Material of construction for wetted parts
- Process connection
- Required Transmitting fluid
- Operating and maximum pressure
- Temperature at the chemical seal; if changing: from ____ upto ____ °C or °F
- Ambient temperature
- Minimum and maximum temperature in case of flush or other cleaning procedures
- When capillary extension is required, please specify further details as under;
 - Length of extension
 - Any difference in height between chemical seal and measuring instrument
 - Mounting of the measuring instrument
 - Bottom entry surface mounting i.e. Rear flange at the instrument
 - Bottom entry yoke mounting i.e. Pipe clamp mounted on back of the case
 - Back entry panel mounting i.e. Front flange at the instrument
 - Back entry bracket mounting i.e. Bracket at the instrument and Case MOC shall be Aluminium black only.

Gluck (India) Mfg. Co.



Chemical Seals <i>Diaphragm Seals, Inline Seals, Capsule Seals</i>	General Information
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*In our data sheets you find information about our standard models and configurations. Besides that we developed in close cooperation with our customer numerous **INDIVIDUAL TECHNICAL SOLUTIONS** for pressure measurements.*

Please do not hesitate to contact us, it shall be our privilege to find the most suitable solution to your individual pressure measuring requirements.

Gluck chemical seals are basically designed and categorized as under:

- | | |
|---------------------------------------|-------------------|
| • Sandwich Diaphragm Seals | Prefixed as CS-S |
| • Welded Diaphragm One Piece Design | Prefixed as CS-W1 |
| • Welded Diaphragm Two Piece Design | Prefixed as CS-W2 |
| • Welded Diaphragm Three Piece Design | Prefixed as CS-W3 |

Please refer decoding information on each type of above seals for the general available option for its selection parameters. For every selection's detailed information refer Data / Specification sheets.



Gluck (India) Mfg. Co.

MODEL & Item Code Decoding of Chemical Seals (Sandwich Diaphragm Seals)	General Information
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Considering large permutation and combination of various parameters for chemical seals it is must to have MODEL reference for identifying type of chemical seal in **general** with respect to its construction & type of process connection. All the chemical seals under Sandwich Diaphragm Seals type are prefixed with CS-S i.e. Chemical Seal – Sandwich type. Second parameter specifies construction & type of seal i.e. CS-S-XX where XX₁ has to be replaced as per Table-1 hereunder.

Table-1 : Specifies construction & Seal Type (XX ₁)	
TH	Threaded Connection Seals (Male or Female)
RF	Regular Flanged Connection Seals
IF	I-Section Flanged Connection Seals
MT-TH	Most Tapper Threaded Connection Seals (For High Viscous Application)
TH-FL	Threaded Connection Seals with flushing arrangements (Male or Female)
OF	Open Type Flanged Connection Seals (Flush Diaphragm)
TGF	Tongue & Groove Flanged Connection (For High Pressure)

Further to MODEL reference it is must to identify the other parameters for the seal and the same are defined below which form the specific item code for the seal.

Item Code Generation: CS-S-XX₁-XX₂-XX₃-XX₄-XX₅-XX₆-XX₇-XX₈

Please refer Table-2 to 8 hereunder for values of each parameter to be replaced for XX₂ to 8 respectively.

Table-2 : Specifies MOC of Top Housing (XX ₂)	
MSB	Carbon Steel Black Coated
MSP	Carbon Steel Plated
S4	Stainless Steel 304
S6	Stainless Steel 316
FRG	Forged Flange (For the Forging grade data sheet is to be referred)

Table-3 : Specifies MOC of Bottom Housing (XX ₃)	
MSB	Carbon Steel Black Coated
MSP	Carbon Steel Plated
S4	Stainless Steel 304
S4L	Stainless Steel 304L
S6	Stainless Steel 316
S6L	Stainless Steel 316L
MN	Monel
HC	Hest alloy 'C'

Table-4 : Specifies Protection on Bottom Housing (XX ₄)	
NA	Not Applicable
PTC	PTFE Coated
PTL	PTFE Lined
PVC	PVC Coated
PVL	PVC Lined
RL	Rubber Lined



Gluck (India) Mfg. Co.

MODEL & Item Code Decoding of Chemical Seal (Sandwich Diaphragm Seal)

General Information

Table-5 : Specifies MOC of Diaphragm (XX)

SS	Stainless Steel 316
SS16	Stainless Steel 316L
Al	Alonel
HC	Hastelloy 'C'
IN	Inconel
N2	Nickle-200
N4	Nickle-400
TA	Tantalum

Table-6 : Specifies Protection on Diaphragm (XX)

NA	Not Applicable
PTC	PTFE Coated
PTL	PTFE Lined
EIL	Elastomer (High Grade Teflon - FEP) Lined

Table-7 : Specifies Gasket MOC / Grade (XX)

A-G8	Asbestos of various Grade
T	Teflon
P	PVC
NR	Neoprene Rubber

Table-8 : Specifies Seal Range Note (XX)

L	Low Pressure Range of 0.6 Kg/cm ²
R	Regular Pressure 0-1 up to 25 Kg/cm ²
M	Medium Pressure 0-30 up to 60 Kg/cm ²
H	High Pressure 0-70 up to 140 Kg/cm ²
VH	Very High Pressure 0-210 up to 420 Kg/cm ²

For understanding Item code refer an example of item code;

CS-S-TH-MSB-S6-NA-S6-PTC-A60-R

This specifies Chemical Seal Parameters as under:

- o CS : Chemical Seal
- o S : Sandwich Diaphragm Type
- o TH : Threaded Connection (For Size and Type Data/Specification sheet to refer)
- o MSB : Top Housing CS Black Coated
- o S6 : Bottom Housing Stainless Steel 316
- o NA : Bottom Housing Protection not Applicable
- o S6 : Diaphragm (Membrane) of Stainless Steel 316
- o PTC : Diaphragm protected with Teflon Coating
- o A54 : Asbestos Gasket of Grade-60 of Champion Make Acid Proof Temp. 210°C & Pressure 150 Kg/cm².
- o R : Regular Pressure Range i.e. 0-1 up to 25 Kg/cm²

In addition to above for filling fluid, mounting information, Bourdon Gauge type to be attached to the seal refer specific data sheet.

Gluck (India) Mfg. Co. Ghatkopar (West), Mumbai - 400 086.		Chemical Seal Unit (Sandwich Diaphragm Type) having threaded process connection		Series REV	CS-S 0
Gluck chemical seals are used wherever it is necessary to avoid direct contact of the pressure gauge with the measured medium, like 1) The process fluid being measured would contain solid particles or viscous which would normally clog the pressure element. 2) Pressure element materials capable of withstanding corrosive effects of certain fluids are not available. 3) The process fluid might freeze due to changes in ambient temperature and damage the element. This is a common occurrence in the chemical, petrochemical, food and paper industries or wherever special process techniques takes place. Chemical seals transmit the pressure from a process fluid to a pressure instrument and act as an isolating element. Bourdon tube pressure gauges or pressure transducers or pressure switches are used for the indication/controlling of measured value. Chemical seals are designed for the pressure ranges 0/0.6 bar (0/10 PSI) to 0/800 bar (0/10000 PSI). In most cases pressure instrument is directly mounted on the chemical seal, but a separation of the chemical seal and pressure instrument is possible. In this case, a flexible connection line or capillary tube is installed between the chemical seal and pressure instrument. The volume in the pressure sensor and in the bourdon tube measuring system is completely filled with a liquid. The pressure acts on the process side of the sensor only. Pressure changes are transmitted to the measuring system of the pressure instrument by the filling liquid i.e. transmitting fluid. As the entire system is filled, the connection between the pressure sensor and pressure instrument can not be separated. Both parts are sealed to avoid tampering.					
MODEL / TYPE		CS-S-TH			
SPECIFICATION					Remark
Type		Direct mounting chemical seal			
Top Housing		S.S. 304			2)
Sensing Element	MOC	Diaphragm / Membrane of S.S. 316			2)
	Protec.	PTFE (Teflon) Coated			
Bottom Housing	MOC	S.S. 316			2)
	Protec.	None			
Packing Material		Fibre Asbestos Acid proof gaskets			
Transmitting Fluid		Silicone Oil (General Use)			
Process Conn.	Type	Threaded Connection			
	Size	1/2" NPT (M)			
Capillary		Not applicable			2)
Capillary Protec.		Not applicable			2)
Pressure Instr.		Seal shall be attached to Bourdon Gauge Model :- 8S-BD			1)
Optional Req.		Not applicable			
Accessories (Suitable to Gauge Conn.)					
Notes & Deviation: 1) For detail specification of Pressure Instrument, please refer attached specification sheet of specified Model. Seal shall be assembled with pressure instrument at our works and shall be supplied as a single unit. 2) For steel alloys offered grade of material is as minimum and better can be offered at our options.					
Our Ref.	YYP/TIL-WWS/Q/E/006/09 Dtd 16.04.2009			ISO 9001:2000 Certified No. 29177	
Yr. Ref.	OC-7833 PO 3841				
Project	M/s. Caim Energy India Pty. Ltd. / Condensate Polishing System			For Gluck (India) Mfg. Co., (Sign)	
Client	M/s. Thermax Limited (WWS/WTP), Pune				
Consultant	L&T Limited., India Faridabad & Baroda				
Representative	Ganu				
Purpose	Final Submission				

Gluck (India) Mfg. Co. Ghatkopar (West), Mumbai - 400 086.		Industrial weather proof stainless steel case bourdon gauge with stainless steel internals		Series REV	BTW-S 0
Universal Stainless Steel Bourdon Type Gauge: Many applications require pressure gauges, which must remain fully functional under extreme operating condition such as aggressive fluids under pressure or aggressive environments. In this case the materials used for the pressure gauges components must be selected with particular care. Gluck high quality pressure gauges are built with stainless, chrome- nickel steels (i.e. S.S.316). They can be used under all operational conditions, practically without limitations. Their concept combines sturdy design and high measuring accuracy. The pressure gauges are suitable for extreme measuring conditions. Variable designs and materials enable them to meet the requirements of virtually all-international pressure gauge standards. The gauges can be used for all liquids and gases used in processes except for those having a high viscosity, or which are liable to crystallized.					
MODEL / TYPE	8S-BD				
SPECIFICATION					Remark
Nominal Dial Size	150 mm (6")				
Case & Bezel	S.S. 304 semi glossy finished case with bayonet lock type S.S. 304 bezel				1)
Enclosure	IP-65 as per IS-13947 (Part-I) - 1993				
Dial & Graduation	Aluminium or ABS Plastic, Black markings on white dial				
Sensing Element	Bourdon Tube of S.S. 316 (<100 Kg/Cm ² : C-type & ≥ 100 Kg/Cm ² : Helical Type)				1)
Shank / Socket	S.S. 316				1)
Movement	S.S. 304 (Ratio ≤16 Kg/Cm ² : 1:11 & > 16 Kg/Cm ² : 1:18)				1)
Pointer	Black, aluminium or tin or SS (Shall depend on range & selected by us)				
Window	Shatter Proof Glass				
Blow Out Prot.	Neoprene at back of the case				
Over Range Safety	130% of FSD (Confirming to IS-3624 Para 14.3)				
Zero Adjustment	Internal, provided on pointer				
Max. Oper. Temp.	Ambient: -20...+60 °C Medium: +200 °C (For higher temperature use siphon)				
Joints	Argon Arc welded and stress relieved				
Accuracy	± 1% of FSD (Class 1 as per EN-837-1 or Class IB as per IS-3624)				
Mounting	Bottom entry direct mounting				
Process Conn.	3/8" BSP (M)				
Accessories (Suitable to Gauge Conn.)					
Notes & Deviation: 1) For steel alloys offered grade of material is as minimum and better can be offered at our options.					
Our Ref.	YYP/TIL-WWS//Q/E/006/09 Dtd 16.04.2009			ISO 9001:2000 Certified No. 29177	 For Gluck (India) Mfg. Co., (Sign)
Vr. Ref.	OC-7833 PO 3841				
Project	M/s. Cairn Energy India Pty. Ltd. / Condensate Polishing System				
Client	M/s. Thermax Limited (WWS/WTP), Pune				
Consultant	L&T Limited, India Faridabad & Baroda				
Representative	Ganu				
Purpose	Final Submission				

Gluck (India) Mfg. Co. <i>Chudhoke (Wazir), Islamabad - 400 000.</i>		Chemical Seal Unit (Sandwich Diaphragm Type) having flanged process connection		Series CS-S	CS-S
				REV	0
Gluck chemical seals are used wherever it is necessary to avoid direct contact of the pressure gauge with the measured medium. 1) The process fluid being measured would contain solid particles or viscous which would normally clog the pressure element. 2) Pressure element materials capable of withstanding corrosive effects of certain fluids are not available. 3) The process fluid might freeze due to changes in ambient temperature and damage the element. This is a common occurrence in the chemical, pharmaceutical, food and paper industries or wherever special process techniques take place. Chemical seals transmit the pressure from a process fluid to a pressure instrument and act as an isolating element. Bourdon tube pressure gauges or pressure transducers or pressure switches are used for the indication/measurement of measured value. Chemical seals are designed for the pressure ranges 0.01 bar (0.14 PSI) to 9000 bar (131 000 PSI). In most cases pressure instrument is directly connected on the chemical seal, but a separation of the chemical seal and pressure instrument is possible. In this case, a flexible connection line or capillary tube is installed between the chemical seal and pressure instrument. The volume in the pressure vessel and in the Bourdon tube measuring system is completely filled with a liquid. The pressure now on the process side of the vessel only. Pressure changes are transmitted to the measuring system of the pressure instrument by the filling liquid i.e. transmitting fluid. As the entire system is filled, the separation between the pressure source and pressure instrument can not be separated. Both parts are sealed in fluid completely.					
MODEL / TYPE		CS-S-RF			
		SPECIFICATION			
Type	Direct transmitting chemical seal				Remark
Top Housing	S.S. 304				2)
Sensing Element	MOQ	Diaphragm / Membrane of S.S. 316			2)
Process Element	Process	PTFE (Teflon) Coated			
Bottom Housing	MOQ	S.S. 316			2)
Housing	Process	None			
Packing Material	Acid proof gaskets				
Transmitting Fluid	Silicone Oil (General Use)				
Process Conn.	Type	Flanged Connection			
	Size	1" (25 NB)	ANSI B 16-5	41.50 lbs	RF
Mounting Info.	Seal shall be mounted on to the flange using nut & bolt. (Not in our scope of supply)				
Capillary	Not applicable				Length: Not applicable
Capillary Protec.	Not applicable				2)
Pressure Instr.	Seal shall be attached to				Bourdon Gauge Model :- BSG-BD
Optional Req.	Not applicable				
Accessories (Specify in Range Code)					
Notes & Deviation: 1) For detail specification of Pressure Instrument, please refer attached specification sheet of specified Model. Seal shall be assembled with pressure instrument at our works and shall be supplied as a single unit. 2) For steel alloys offered grade of material is as minimum and better can be offered at our option.					
Our Ref.	YYP/TL-WWS/QTE/006419			Doc	16.04.2009
Yr. Ref.	OC-7833 PD 3844			CS	01/01/2009
Project	M/s. Cairn Energy India Pte. Ltd / Crude-oil Refining System			OC	01/01/2009
Client	M/s. Bharat Petroleum Limited (WWS/WTP), Pune			 For Gluck India Mfg. Co., (Sign)	
Consultant	L&T Limited, India Faridkot & Ranoda				
Representative	Guru				
Purpose	Final Submission				

Gluck (India) Mfg. Co. Chokkappa (West), Mumbai - 400 086		Industrial weather proof stainless steel case Bourdon gauge with stainless steel internally		Series REV	BTW-5 0
Universal Stainless Steel Bourdon Type Gauge: Many applications require pressure gauges, which must remain fully functional under extreme operating conditions such as aggressive fluids, higher pressure or aggressive environments. In this case the materials used for the pressure gauges components must be selected with particular care. Gluck high quality pressure gauges are built with stainless, glass, nickel steel (10-5-5316). They can be used under all operational conditions, practically without limitations. Their compact machines sturdy design and high measuring accuracy. The pressure gauges are suitable for extreme measuring conditions. Variable designs and materials enable them to meet the requirements of virtually all international pressure gauge standards. The gauges can be used for all liquids and gases used in processes except for those having a high viscosity, or which are thick or crystallized.					
MODEL / TYPE		SSG-BD		REMARK	
NOMINAL DIAT SIZE		SPECIFICATION		REMARK	
Case & Barrel		S.S. 304 grade glass finished case with bayonet lock type S.S. 304 base		1)	
Endurance		IP-65 as per IS-13942 (Part-1) - 1993		1)	
Dial & Graduation		Aluminium or ABS Plastic, Black markings on white dial		1)	
Sensing Element		Bourdon Tube of S.S. 316 ($\leq 100 \text{ Kg/Cm}^2$ C-type & $\leq 100 \text{ Kg/Cm}^2$ radial type)		1)	
Shank / Sockets		S.S. 316		1)	
Movement		S.S. 304 (Rate: $\leq 16 \text{ Kg/Cm}^2$ 1:11 & $> 16 \text{ Kg/Cm}^2$ 1:10)		1)	
Pointer		Dipex, aluminium as size of dial depending on range & selected by user		1)	
Window		Shatter Proof Glass		1)	
Blow Out Prot.		Nitrile Bleeder at top of the case		1)	
Over Range Safety		130% of FSD (Conforming to IS-3624 Para 14.3)		1)	
Zero Adjustment		Internal, provided on pointer		1)	
Max. Oper. Temp.		Ambient: -20 to $+60^\circ\text{C}$ Medium: $+200^\circ\text{C}$ (For higher temperature see option)		1)	
Joints		Argon Arc welded and stress relieved		1)	
Accuracy		$\pm 1\%$ of FSD (Class I as per EN-837-1 or Class II as per IS-3624)		1)	
Mounting		Bottom entry direct mounting		1)	
Process Conn.		1/2" BSP (M)		1)	
Accessories		Glycergel J-Bulb Case		1)	
Gaskets & Gage Case		Built-in gasket		1)	
Notes & Deviations: 1) For steel alloys offered grade of material is as minimum and better can be offered at our option.					
Qty Ref.	YYP/IL-WWSQ/ED006/09	Dtd	16.04.2009	ISO 9001:2008 Certified No. 21027	
Ex. Ref.	OC-7833 PO 341				
Project	M/s. Gauri Engineering Pvt. Ltd. / Condensate Polishing System				
Client	M/s. Dharma Lining (WWSQ/ETP), Bhus				
Consultant	J & T Limited., India (Pune) & Baroda				
Representative	Gauri				
Purpose	Final Submission				
				(Sign)	

EFFLUENT TREATMENT PLANT

Go I

INDEX

- 1.Cover page : Page no.1
- 2.Replies to the comment : Page no.2
- 3.Specification for Pressure switch : Page no. 3 to 4
- 4.Catalogue of Pressure switch - SWITZER : Page no. 5 to 8

Note:- Electrical Connection shall be Plug & Socket type
wherein is reflected in model no. *AB*
2. Contact type shall have De rating along with AC rating. *NS*

3	16/7/2010	FOR APPROVAL	SKS	APU	AVS
2	2/7/2010	FOR APPROVAL	SKS	APU	AVS
1	19/2/2010	FOR APPROVAL	SKS	APU	AVS
0	18/12/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By

PROJECT

PRAGATI-III COMBINED CYCLE POWER PROJECT

CUSTOMER:

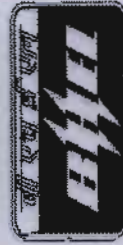


Shree
TRANSACTION NO. *11/6/10*
DATE *11/6/10*
PRAGATI POWER CORPORATION LIMITED (PPCL)
CONSULTANCY WING *One*

CONSULTANT:



(DATE)
NTPC LIMITED, CONSULTANCY WING



DOES IT HAVE THE FOLLOWING:
II NO CHANGE IN THE DESIGN
OWNER'S CONCURRENCE IN VISITING

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA



THERMAX LIMITED
PUNE

DATA SHEET FOR PRESSURE SWITCH

THERMAX DOC.NO.: WHJAC00007	BHEL DOC. NO.: PE-VO-314-164-A201	OC.NO. 630128
	SH NO. 1 OF 4	REV. NO : 03



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

OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)

CLIENT: BHARAT HEAVY ELECTRICALS LTD

CONSULTANT: NTPC LIMITED, CONSULTANCY WING

CLIENT DOC NO: PE-VO-314-164-A201 REV NO.03

THERMAX OC NO: 630128

REPLIES TO THE COMMENT ON DATA SHEET

PRESSURE SWITCH NO. WHJAC00007

S.NO.	COMMENT	THERMAX REPLY	REMARKS
1	Electrical connection shall be in Plug in socket type	Noted & confirmed	

PRESSURE SWITCH							
TYPE	Direct Mounting						
SENSING ELEMENT	SS - 316L BELLOW						
WETTED PARTS	SS316						
ENCLOSURE	Weather proof (IP-66)						
HOUSING	ONE CAST AL. epoxy painted.						
ELECTRICAL CONNECTION	40 NB FLANGE 150# FLANGE from bottom						
ACCURACY	2 NO + 2NC SPOT SNAP ACTION DRY CONTACT						
REPEATABILITY	15A @ 250V AC						
PROCESS CONNECTION	FIXED						
TYPE OF CONTACT	MIN. 130% OF FULL SCALE						
SWITCH RATING	Adjustable throughout the range.						
SWITCHING DIFFERENTIAL							
OVER RANGE							
SET POINT							
TAG NO	PROCESS LIQUID	NORMAL PR. KG/CM ²	SET PR. KG/CM ²	RESET PR. KG/CM ²	RANGE KG/CM ²	SWITCH ACTION	LOCATION
PSH-301	EFFLUENT	3	3.3	3.153	0.8 to 6	ISING	DISCHARGE OF P-3010 A/B
PSH-302	EFFLUENT	2.9	3.19	3.043	0.8 to 6	ISING	DISCHARGE OF P-3020A/B
PSH-303	EFFLUENT	7	7.7	7.553	1 to 10	ISING	DISCHARGE OF P-3030 A/B
PSH-304	EFFLUENT	2.2	2.42	2.27	0.8 to 6	ISING	DISCHARGE OF P-3040 A/B
PSH-305	EFFLUENT	0.2	0.52	0.673	1 to 10	ISING	DISCHARGE OF P-3070 A/B
PSH-306	EFFLUENT	3.6	3.86	3.543	0.8 to 6	ISING	DISCHARGE OF P-3080 A/B
PSH-307	EFFLUENT	7.6	8.36	8.213	1 to 10	ISING	DISCHARGE OF P-3090 A/B
PSH-308	WASTE WATER	1	1.1	1.095	0.2 to 2	ISING	DISCHARGE OF P-3040 A/B/C
PSL-309	SSP BACK WASH WATER	0.5	5.85	5.867	1 to 10	FALLING	DISCHARGE OF P-3030 A/B
PSH-310	AIR SEPARATOR OVERFLOW WATER	1.8	1.88	1.833	0.4 to 4	ISING	DISCHARGE OF P-3100 A/B

DIAPHRAGM TYPE CHEMICAL SEAL UNIT			
Seal type	Direct on instrument	TAG NO.	
Diaphragm type	Replaceable diaphragm	PSH-301	
Process connection	40 NB ANSI 150# RF 304SS flanged	TO	
Diaphragm	316SS with teflon sheet		
Top Housing	304SS		
Bottom Housing	304SS with teflon insert		
Filling	Silicone oil	PSH-310	

TAG NO.	MODEL NO.	ON/OFF DIFFERENTIAL VALUES m BAR
PSH-301		147
PSH-302		147
PSH-303		147
PSH-304		147
PSH-305		147
PSH-306		147
PSH-307		147
PSH-308		48.5
PSL-309		147
PSH-310		147

QTY :- 18 NOS	PROJECT: PRAGATI - 4 COMBINED CYCLE POWER PROJECT 1600 MW (NOMINAL) AT BAWANA, DELHI	O.C. NO: 630126	OWNER: PRAGATI POWER CORPORATION LTD, DELHI
MAKE :- SWITZER			
THERMAX LIMITED			
Water & Waste Solutions			
and Chambers, Wiesbaden			
Pura 411 003 (INDIA)			

CONSULTANT: MTPC - CONSULTANCY WING	Specification No	Print	SH NO
	Raw	Date	Printed by
	0	6/10/2008	APU
	1	18/12/2006	APU
	2	13/2/2010	APU
	3	18/2/2010	APU
	4	18/2/2010	APU
	5	27/2/2010	APU
	6	18/2/2010	APU

3 OF 4

PRESSURE SWITCH									
TYPE	2" pipe / Direct mounting (pls refer notes)								
SENSING ELEMENT	SS - 316L BELLOW/S								
WETTED PARTS	SS316								
ENCLOSURE	Weather proof (IP-66)								
HOUSING	DIE CAST AL epoxy painted								
ELECTRICAL CONNECTION	TERMINAL BLOCK								
ACCURACY	±5 % of FSR								
REPEATABILITY	±0.5% of FSR								
PROCESS CONNECTION	REFER NOTE								
TYPE OF CONTACT	2 NO + 2NC SPDT SNAP ACTION DRY CONTACT								
SWITCH RATING	15A @ 200V AC								
OVER RANGE PROTECTION	FIXED								
SET POINT	MIN. 130% OF FULL SCALE Adjustable throughout the range.								
TAAG NO	PROCESS LIQUID	NORMAL PR. KG/CM2	SET PR. KG/CM2	RESET PR. KG/CM2	RANGE KG/CM2	SWITCH ACTUATION	LOCATION		
PSH-311 A	EFFLUENT	3.7	4.07	3.923	0.6 to 6	RISING	DISCHARGE OF P. 3200 AB		
PSH-311 B	EFFLUENT	3.4	3.74	3.593	0.6 to 6	RISING	DISCHARGE OF P. 3210 AB		
PSH-311 C	EFFLUENT	2.3	2.63	2.383	0.6 to 6	RISING	DISCHARGE OF P. 3220 AB		
PSH-311 D	EFFLUENT	2.6	2.86	2.713	0.6 to 6	RISING	DISCHARGE OF P. 3230 AB		
PSH-312	EFFLUENT	8.8	9.68	9.29	1.6 to 16	RISING	DISCHARGE OF P. 3140 AB		
PSH-313	TREATED WATER	2.5	2.76	2.66	0.6 to 6	RISING	DISCHARGE OF P. 3150 AB		
PSH-314	EFFLUENT	8.2	9.02	8.7275	1.6 to 16	RISING	DISCHARGE OF P. 3160 AB		
PSH-315	THICKNER OVER FLOW	7.6	8.36	8.213	1 to 10	RISING	DISCHARGE OF P. 3190 AB		
PSH-316	SUDGE	1	1.1	1.061	0.2 to 2	RISING	DISCHARGE OF P. 3130 AB		
PSH-317	DRAIN SLUMP WATER	5.4	5.94	5.793	1 to 10	RISING	DISCHARGE OF P. 3310 AB		
PSH-318	DRAIN SLUMP WATER	2.9	3.19	3.043	0.6 to 6	RISING	DISCHARGE OF P. 3320 AB		
PSH-319	WATER	5	5.5	5.402	1 to 10	RISING	DISCHARGE OF P. 3240 AB		

DIAPHRAGM TYPE CHEMICAL SEAL UNIT				TAAG NO.
Seal type	Direct on instrument			PSH-311 A/B/C/D
Diaphragm type	Replaceable diaphragm			PSH-312
Process connection	40 NB ANSI 150# RF 304SS flanged			PSH-314
Diaphragm	316SS with teflon sheath			PSH-315
Top housing	304SS			PSH-316
Bottom Housing	304SS with teflon insert			PSH-317
Filling	Silicone oil			PSH-318

FOR PSH 313 & PSH-319 1/4" TO 1/2" NPT Adapter shall be supplied by Vendor (2" pipe mounting)

TAAG NO.	MODEL NO.	ON /OFF DIFFERENTIAL VALUES in BAR
PSH-311 A		147
PSH-311 B		147
PSH-311 C		147
PSH-311 D		147
PSH-312		202.5
PSH-313		98
PSH-314		202.5
PSH-315		147
PSH-316		48.5
PSH-317		147
PSH-318		147
PSH-319		98

SS tag plate shall be supplied along with switches.					
QTY :- 12 NOS	PROJECT PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANNA,DELHI				
MAKE :- SWITZER	O.C NO: 830128				
THERMAX LIMITED	OWNER: PRAGATI POWER CORPORATION LTD,DELHI				
Water & Waste Solutions	CLIENT : BHARAT HEAVY ELECTRICALS LTD				
S&I Chennai, Madras&del	CONSULTANT:- NTPC - CONSULTANCY WING				
Pune 411 003 (INDIA)	Specification No				
	Rev	Date	Prep'd by	Chkd by	App'd by



PRESSURE SWITCHES

WEATHERPROOF
FLAMEPROOF

SERIES 200

- GOOD REPEATABILITY • TAMPERPROOF SET POINT ADJUSTER WITH LOCKING DEVICE • OVERTRAVEL STOP • RUGGED DESIGN



Model 201 In GK Flameproof Enclosure



Model 204 In GM Weatherproof Enclosure

Series 200 Pressure Switches is a SWITZER mainstream product range for switching upto 75 bar and includes models for vacuum, compound and millibar ranges and high overload protection. Precision mechanisms are of stainless steel for arduous atmospheres and high humidity. Enclosures, sensing elements and switching modes can be combined to offer the

variety needed to suit the demands of rapidly expanding industrial processes. Precise and accurate operation is obtained by using time proven seamless hydraulically formed bellows or diaphragm. Setpoint is continuously adjustable over the instrument range. A scale is provided for approximate switch setting.

GENERAL SPECIFICATIONS

Enclosure	
GM	Pressure die cast Aluminium, weatherproof to IP:66. 316 SS, investment cast, weatherproof to IP:66
GA	Die cast Aluminium, weatherproof to IP:66 flameproof to Gr.IIA, IIB or IIC (Note 1)
GK	Several std. ranges, from full vac. to 75 bar. Phosphor Bronze / 316L SS bellows or 316L SS diaphragm. Refer page 2.
Wetted Parts	± 0.5% FSR for 201 & 203 ± 1.0% FSR for 204, 208, 209, 281 (Note 4)
Repeatability	Electrical
Scale Accuracy	± 5% FSR (Note 6)
Switching Element	Instrument quality SPCCO (SPDT) Microswitch. (Notes 10 & 11)
Differential	Fixed or wideband adjustable. For exact values ask for Differential Tables.
	Max. Working Temperature
	170°C for SS bellows; 110°C for PB bellows; 110°C for 316L SS diaphragm. (Note 15)
	Ambient Temp.
	(-) 10°C to (+)80°C (Note 14)
	Connection
	Process
	1/4" NPT(F) direct for 201, 203 & 281. 1/4" or 1/2" NPT(F) direct for 204. Other sizes through Adaptor. Flanged connection for 208 & 209. For details refer ordering matrix.
	Electrical
	3/4" ET(F) standard & 1/2" NPT(F) optional. Dual Entry on request
	Mounting
	Back panel / wall / field
	Conformity
	Generally to BS 6134 : 1991.

ORDERING MATRIX

ENCLOSURE

Aluminum pressure die cast weatherproof
to IP-66 with NEMA 3R-1K. 316

316 / 316 SS Invaluable cast weatherproof
to IP-66 with external die at 316 SS for
aggressive atmosphere. Fit for offshore. 316

Aluminum die cast weatherproof cast
weatherproof 316 SS approved for 316, 316L,
316 F, 316 Ti or 316 Ti-0.02C for hemipress.
steel and IP-66 for weatherproofness. 316

MODEL

This is the basic pressure switch selected by
a sensitive bellows having close rated non-
adjustable switching differential. 201

Same as 201, but with auxiliary mechanism
providing switching differential adjustment between
5-15% full, to 50% max. without disturbing
the set point. 202

A variant of switch 201, pressure bellows switch
operating a SPST microswitch actuated by a
single contact through a unique linkage thereby
providing two independent adjustable outputs,
each with its own setting scale, spring & switch
fill, separation between setpoints must be more
than sum of setpoint differential of 10% of FSR
whichever is higher. 203

Designed to operate in ambient ranges as 201, except
actuation is by a 316L SS diaphragm which
withstanding overpressures up to 100 bar. For
overpressure up to 200 bar contact factory. 204

Similar to 204 but with ANSI 150 #300 RF or 2"
#150 or 300 RF flange. Direct actuation by a 316L
SS diaphragm. More responsive than using a
chemical seal test system and suitable for
viscous media. 205

Similar to 205 but having 2" nut and SAE grade 8
actuation to SS 4825 Part 4 for the food industry,
use of stainless steel for hygienic purposes. 206

MATERIALS OF WETTED PARTS

Model 201, 203 & 207

Phosphor Bronze bellows with brass wetted parts. 01

316L SS bellows with 316 SS wetted parts. 02

316L SS bellows with 316 SS wetted parts to
NACE MR-01-75. 03

Monel bellows with Monel Wetted Parts. 04

Model 204, 206 & 208

316L SS Diaphragm with 316 SS wetted parts and
316L SS Ring. 04

316L SS Diaphragm with 316 SS wetted parts and
316L SS Ring. 02

316L SS Diaphragm with 316 SS wetted parts and
316L SS Ring. 02

316L SS Diaphragm with 316 SS wetted parts and
316L SS Ring. 02

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316L SS Ring. 02

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316L SS Ring. 02

316L SS Diaphragm with 316 SS wetted parts and
316L SS Ring. 02

316L SS Diaphragm with 316 SS wetted parts and
316L SS Ring. 02

Table-1: RANGE CODE & AVAILABILITY

RANGE CODE	RANGE	201	203	204 / 205 / 208	205
ATK	- 1 to 0 bar	✓	✓	204 only	X
ATK	0.5 to 0.5 bar	✓	✓	204 only	X
ATK	1 to 1.5 bar	✓	✓	204 only	X
ATK	1.5 to 2 bar	✓	✓	204 only	X
ATK	2 to 2.5 bar	✓	✓	204 only	X
ATK	2.5 to 3 bar	✓	✓	204 only	X
ATK	3 to 3.5 bar	✓	✓	204 only	X
ATK	3.5 to 4 bar	✓	✓	204 only	X
ATK	4 to 4.5 bar	✓	✓	204 only	X
ATK	4.5 to 5 bar	✓	✓	204 only	X
ATK	5 to 5.5 bar	✓	✓	204 only	X
ATK	5.5 to 6 bar	✓	✓	204 only	X
ATK	6 to 6.5 bar	✓	✓	204 only	X
ATK	6.5 to 7 bar	✓	✓	204 only	X
ATK	7 to 7.5 bar	✓	✓	204 only	X
ATK	7.5 to 8 bar	✓	✓	204 only	X
ATK	8 to 8.5 bar	✓	✓	204 only	X
ATK	8.5 to 9 bar	✓	✓	204 only	X
ATK	9 to 9.5 bar	✓	✓	204 only	X
ATK	9.5 to 10 bar	✓	✓	204 only	X
ATK	10 to 10.5 bar	✓	✓	204 only	X
ATK	10.5 to 11 bar	✓	✓	204 only	X
ATK	11 to 11.5 bar	✓	✓	204 only	X
ATK	11.5 to 12 bar	✓	✓	204 only	X
ATK	12 to 12.5 bar	✓	✓	204 only	X
ATK	12.5 to 13 bar	✓	✓	204 only	X
ATK	13 to 13.5 bar	✓	✓	204 only	X
ATK	13.5 to 14 bar	✓	✓	204 only	X
ATK	14 to 14.5 bar	✓	✓	204 only	X
ATK	14.5 to 15 bar	✓	✓	204 only	X
ATK	15 to 15.5 bar	✓	✓	204 only	X
ATK	15.5 to 16 bar	✓	✓	204 only	X
ATK	16 to 16.5 bar	✓	✓	204 only	X
ATK	16.5 to 17 bar	✓	✓	204 only	X
ATK	17 to 17.5 bar	✓	✓	204 only	X
ATK	17.5 to 18 bar	✓	✓	204 only	X
ATK	18 to 18.5 bar	✓	✓	204 only	X
ATK	18.5 to 19 bar	✓	✓	204 only	X
ATK	19 to 19.5 bar	✓	✓	204 only	X
ATK	19.5 to 20 bar	✓	✓	204 only	X
ATK	20 to 20.5 bar	✓	✓	204 only	X
ATK	20.5 to 21 bar	✓	✓	204 only	X
ATK	21 to 21.5 bar	✓	✓	204 only	X
ATK	21.5 to 22 bar	✓	✓	204 only	X
ATK	22 to 22.5 bar	✓	✓	204 only	X
ATK	22.5 to 23 bar	✓	✓	204 only	X
ATK	23 to 23.5 bar	✓	✓	204 only	X
ATK	23.5 to 24 bar	✓	✓	204 only	X
ATK	24 to 24.5 bar	✓	✓	204 only	X
ATK	24.5 to 25 bar	✓	✓	204 only	X
ATK	25 to 25.5 bar	✓	✓	204 only	X
ATK	25.5 to 26 bar	✓	✓	204 only	X
ATK	26 to 26.5 bar	✓	✓	204 only	X
ATK	26.5 to 27 bar	✓	✓	204 only	X
ATK	27 to 27.5 bar	✓	✓	204 only	X
ATK	27.5 to 28 bar	✓	✓	204 only	X
ATK	28 to 28.5 bar	✓	✓	204 only	X
ATK	28.5 to 29 bar	✓	✓	204 only	X
ATK	29 to 29.5 bar	✓	✓	204 only	X
ATK	29.5 to 30 bar	✓	✓	204 only	X
ATK	30 to 30.5 bar	✓	✓	204 only	X
ATK	30.5 to 31 bar	✓	✓	204 only	X
ATK	31 to 31.5 bar	✓	✓	204 only	X
ATK	31.5 to 32 bar	✓	✓	204 only	X
ATK	32 to 32.5 bar	✓	✓	204 only	X
ATK	32.5 to 33 bar	✓	✓	204 only	X
ATK	33 to 33.5 bar	✓	✓	204 only	X
ATK	33.5 to 34 bar	✓	✓	204 only	X
ATK	34 to 34.5 bar	✓	✓	204 only	X
ATK	34.5 to 35 bar	✓	✓	204 only	X
ATK	35 to 35.5 bar	✓	✓	204 only	X
ATK	35.5 to 36 bar	✓	✓	204 only	X
ATK	36 to 36.5 bar	✓	✓	204 only	X
ATK	36.5 to 37 bar	✓	✓	204 only	X
ATK	37 to 37.5 bar	✓	✓	204 only	X
ATK	37.5 to 38 bar	✓	✓	204 only	X
ATK	38 to 38.5 bar	✓	✓	204 only	X
ATK	38.5 to 39 bar	✓	✓	204 only	X
ATK	39 to 39.5 bar	✓	✓	204 only	X
ATK	39.5 to 40 bar	✓	✓	204 only	X
ATK	40 to 40.5 bar	✓	✓	204 only	X
ATK	40.5 to 41 bar	✓	✓	204 only	X
ATK	41 to 41.5 bar	✓	✓	204 only	X
ATK	41.5 to 42 bar	✓	✓	204 only	X
ATK	42 to 42.5 bar	✓	✓	204 only	X
ATK	42.5 to 43 bar	✓	✓	204 only	X
ATK	43 to 43.5 bar	✓	✓	204 only	X
ATK	43.5 to 44 bar	✓	✓	204 only	X
ATK	44 to 44.5 bar	✓	✓	204 only	X
ATK	44.5 to 45 bar	✓	✓	204 only	X
ATK	45 to 45.5 bar	✓	✓	204 only	X
ATK	45.5 to 46 bar	✓	✓	204 only	X
ATK	46 to 46.5 bar	✓	✓	204 only	X
ATK	46.5 to 47 bar	✓	✓	204 only	X
ATK	47 to 47.5 bar	✓	✓	204 only	X
ATK	47.5 to 48 bar	✓	✓	204 only	X
ATK	48 to 48.5 bar	✓	✓	204 only	X
ATK	48.5 to 49 bar	✓	✓	204 only	X
ATK	49 to 49.5 bar	✓	✓	204 only	X
ATK	49.5 to 50 bar	✓	✓	204 only	X
ATK	50 to 50.5 bar	✓	✓	204 only	X
ATK	50.5 to 51 bar	✓	✓	204 only	X
ATK	51 to 51.5 bar	✓	✓	204 only	X
ATK	51.5 to 52 bar	✓	✓	204 only	X
ATK	52 to 52.5 bar	✓	✓	204 only	X
ATK	52.5 to 53 bar	✓	✓	204 only	X
ATK	53 to 53.5 bar	✓	✓	204 only	X
ATK	53.5 to 54 bar	✓	✓	204 only	X
ATK	54 to 54.5 bar	✓	✓	204 only	X
ATK	54.5 to 55 bar	✓	✓	204 only	X
ATK	55 to 55.5 bar	✓	✓	204 only	X
ATK	55.5 to 56 bar	✓	✓	204 only	X
ATK	56 to 56.5 bar	✓	✓	204 only	X
ATK	56.5 to 57 bar	✓	✓	204 only	X
ATK	57 to 57.5 bar	✓	✓	204 only	X
ATK	57.5 to 58 bar	✓	✓	204 only	X
ATK	58 to 58.5 bar	✓	✓	204 only	X
ATK	58.5 to 59 bar	✓	✓	204 only	X
ATK	59 to 59.5 bar	✓	✓	204 only	X
ATK	59.5 to 60 bar	✓	✓	204 only	X
ATK	60 to 60.5 bar	✓	✓	204 only	X
ATK	60.5 to 61 bar	✓	✓	204 only	X
ATK	61 to 61.5 bar	✓	✓	204 only	X
ATK	61.5 to 62 bar	✓	✓	204 only	X
ATK	62 to 62.5 bar	✓	✓	204 only	X
ATK	62.5 to 63 bar	✓	✓	204 only	X
ATK	63 to 63.5 bar	✓	✓	204 only	X
ATK	63.5 to 64 bar	✓	✓	204 only	X
ATK	64 to 64.5 bar	✓	✓	204 only	X
ATK	64.5 to 65 bar	✓	✓	204 only	X
ATK	65 to 65.5 bar	✓	✓	204 only	X
ATK	65.5 to 66 bar	✓	✓	204 only	X
ATK	66 to 66.5 bar	✓	✓	204 only	X
ATK	66.5 to 67 bar	✓	✓	204 only	X
ATK	67 to 67.5 bar	✓	✓	204 only	X
ATK	67.5 to 68 bar	✓	✓	204 only	X
ATK	68 to 68.5 bar	✓	✓	204 only	X
ATK	68.5 to 69 bar	✓	✓	204 only	X
ATK	69 to 69.5 bar	✓	✓	204 only	X
ATK	69.5 to 70 bar	✓	✓	204 only	X
ATK	70 to 70.5 bar	✓	✓	204 only	X
ATK	70.5 to 71 bar	✓	✓	204 only	X
ATK	71 to 71.5 bar	✓	✓	204 only	X
ATK	71.5 to 72 bar	✓	✓	204 only	X
ATK	72 to 72.5 bar	✓	✓	204 only	X
ATK	72.5 to 73 bar	✓	✓	204 only	X
ATK	73 to 73.5 bar	✓	✓	204 only	X
ATK	73.5 to 74 bar	✓	✓	204 only	X
ATK	74 to 74.5 bar	✓	✓	204 only	X
ATK	74.5 to 75 bar	✓	✓	204 only	X
ATK	75 to 75.5 bar	✓	✓	204 only	X
ATK	75.5 to 76 bar	✓	✓	204 only	X
ATK	76 to 76.5 bar	✓	✓	204 only	X
ATK	76.5 to 77 bar	✓	✓	204 only	X
ATK	77 to 77.5 bar	✓	✓	204 only	X
ATK	77.5 to 78 bar	✓	✓	204 only	X
ATK	78 to 78.5 bar	✓	✓	204 only	X
ATK	78.5 to 79 bar	✓	✓	204 only	X
ATK	79 to 79.5 bar	✓	✓	204 only	X
ATK	79.5 to 80 bar	✓	✓	204 only	X
ATK	80 to 80.5 bar	✓	✓	204 only	X
ATK	80.5 to 81 bar	✓	✓	204 only	X
ATK	81 to 81.5 bar	✓	✓	204 only	X
ATK	81.5 to 82 bar	✓	✓	204 only	X
ATK	82 to 82.5 bar	✓	✓	204 only	X
ATK	82.5 to 83 bar	✓	✓	204 only	X
ATK	83 to 83.5 bar	✓	✓	204 only	X
ATK	83.5 to 84 bar	✓	✓	204 only	X
ATK	84 to 84.5 bar	✓	✓	204 only	X
ATK	84.5 to 85 bar	✓	✓	204 only	X
ATK	85 to 85.5 bar	✓	✓	204 only	X
ATK	85.5 to 86 bar	✓	✓	204 only	X
ATK	86 to 86.5 bar	✓	✓	204 only	X
ATK	86.5 to 87 bar	✓	✓	204 only	X
ATK	87 to 87.5 bar	✓	✓	204 only	X
ATK	87.5 to 88 bar	✓	✓	204 only	X
ATK	88 to 88.5 bar	✓	✓	204 only	X
ATK	88.5 to 89 bar	✓	✓	204 only	X
ATK	89 to 89.5 bar	✓	✓	204 only	X
ATK	89.5 to 90 bar	✓	✓	204 only	X
ATK	90 to 90.5 bar	✓	✓	204 only	X
ATK	90.5 to 91 bar	✓	✓	204 only	X
ATK	91 to 91.5 bar	✓	✓	204 only	X
ATK	91.5 to 92 bar	✓	✓	204 only	X
ATK	92 to 92.5 bar	✓	✓	204 only	X
ATK	92.5 to 93 bar	✓	✓	204 only	X
ATK	93 to 93.5 bar	✓	✓	204 only	X
ATK	93.5 to 94 bar	✓	✓	204 only	X
ATK	94 to 94.5 bar	✓	✓	204 only	X
ATK	94.5 to 95 bar	✓	✓	204 only	X
ATK	95 to 95.5 bar	✓	✓	204 only	X
ATK	95.5 to 96 bar	✓	✓	204 only	X
ATK	96 to 96.5 bar	✓	✓	204 only	X
ATK	96.5 to 97 bar	✓	✓	204 only	X
ATK	97 to 97.5 bar	✓	✓	204 only	X
ATK	97.5 to 98 bar	✓	✓	204 only	X
ATK	98 to 98.5 bar	✓	✓	204 only	X
ATK	98.5 to 99 bar	✓	✓	204 only	X
ATK	99 to 99.5 bar	✓	✓	204 only	X
ATK	99.5 to 100 bar	✓	✓	204 only	X
ATK	100 to 100.5 bar	✓	✓	204 only	X
ATK	100.5 to 101 bar	✓	✓	204 only	X
ATK	101 to 101.5 bar	✓	✓	204 only	X
ATK	101.5 to 102 bar	✓	✓	204 only	X
ATK	102 to 102.5 bar	✓	✓	204 only	X
ATK	102.5 to 103 bar	✓	✓	204 only	X
ATK	103 to 103.5 bar	✓	✓	204 only	X
ATK	103.5 to 104 bar	✓	✓	204 only	X
ATK	104 to 104.5 bar	✓	✓	204 only	X
ATK	104.5 to 105 bar	✓	✓	204 only	X
ATK	105 to 105.5 bar	✓	✓	204 only	X
ATK	105.5 to 106 bar	✓	✓	204 only	X
ATK	106 to 106.5 bar	✓	✓	204 only	X
ATK	106.5 to 107 bar	✓	✓	204 only	X
ATK	107 to 107.5 bar	✓	✓	204 only	X
ATK	107.5 to 108 bar	✓	✓	204 only	X
ATK	108 to 108.5 bar	✓	✓	204 only	X
ATK	108.5 to 109 bar	✓	✓	204 only	X
ATK	109 to 109.5 bar	✓	✓	204 only	X
ATK	109.5 to 110 bar	✓	✓	204 only	X
ATK	110 to 110.5 bar	✓	✓	204 only	X
ATK	110.5 to 111 bar	✓	✓	204 only	X
ATK	111 to 111.5 bar	✓	✓	204 only	X
ATK	111.5 to 112 bar	✓	✓	204 only	X
ATK	112 to 112.5 bar	✓	✓	204 only	X
ATK	112.5 to 113 bar	✓	✓	204 only	X
ATK	113 to 113.5 bar	✓	✓	204 only	X
ATK	113.5 to 114 bar	✓	✓	204 only	X
ATK	114 to 114.5 bar	✓	✓	204 only	X
ATK	114.5 to 115 bar	✓	✓	204 only	X
ATK	115 to 115.5 bar	✓	✓	204 only	X
ATK	115.5 to 116 bar	✓	✓	204 only	X
ATK	116 to 116.5 bar	✓	✓	204 only	X
ATK	116.5 to 117 bar	✓	✓	204 only	X
ATK	117 to 117.5 bar	✓	✓	204 only	X
ATK	117.5 to 118 bar	✓	✓	204 only	X
ATK	118 to 118.5 bar	✓	✓	204 only	X
ATK	118.5 to 119 bar	✓	✓	204 only	X
ATK	119 to 119.5 bar	✓	✓	204 only	X
ATK	119.5 to 120 bar	✓	✓	204 only	X
ATK	120 to 120.5 bar	✓	✓	2	

—

Spec #	Service Entry	Request Entry
304-57F	A	M
102" AP17F	B	K
304T 4017F	C	D
KAD1 x 1.5 F 404	D	P
M10 x 1.5 F	E	Q
Thermostat connector		
3 pin plug	2	-
7 pin plug	3	-
9 pin plug	4	-

* Cable gland available on request.

** Cable Entry is optional.

Available on request

Table 4: **MARKETWORK WORKBENCH**

MAX. PER. RATING ON EASY		2014	
2015, 2016 & 2017		2014	
NAVSIDE CODE	Element Code	Q1	Q2
A1K	4	4	100
A2K	4	4	100
C0K	4	4	-
D4C	2	2	-
D5C	2	2	-
D6C	2	2	-
A2B	2	2	-
A3C	2	2	-
A3K	4	4	-
A4K	4	4	100
C1K	4	4	-
C2K	4	4	-
A9K	3	3	100
C5K	9	9	-
A7K	15	15	-
A8K	25	25	-
A9K	25	25	-
C4K	36	36	-
B1K	-	50	-
B2K	-	80	-
B3K	-	80	-
B4K	-	-	100
B7K	-	-	100
P0B	-	-	100
D3B	-	-	100
X7K	-	-	100
D4B	-	-	100
X8K	-	-	100
X9K	-	-	100

Note: For Model 2015 & 16, P restricted to
 Flange rating; For Model 2016, MVRP is
 20 Bar.

DIAPHRAGM CHEMICAL SEALS

Despite high chemical costs, it can be provided at a special rate either direct to the farmer or through a local agent. The agent can also offer other materials or services with the fertilizer. For example, a local co-operative, dairy co-operative and feed, with a stable farm herd. This device permits the use of pressure equipment with bedrock cement with a high pH, a high pH and permits higher prices for products. Such a high pH and well be present, when pressure equipment is used.

Written describing its importance to agency's ambient and process water quality, endpoint, maximum protection, relevant legislation, best water conservation and water hard, nature of process modification

NOTES

1. Or 110 or 118 or 12145 as equivalent to MED L1, OR L & D, Or 11C or 152346 as equivalent to MED C2, 3, D1V, 1, GA, A & B.
 2. **Style CHARGE** is waterproof unit if all switches and pilot lights are properly sealed. Style C2 is waterproof only if cover "C" ring is present in special and submerged only if sample fit, it capless glass is used. It is recommended to provide cable glands along with Gek Instruments to avoid leakage of oil in the installation.
 3. **structure Body (B3)** — Pressure switches are designed as single mechanical assemblies for 0-100 B3 345, 0-2.3. Hence 345/100 switches with Gek/DG endusers may be used in laboratory scale systems without certification if not directly tested and tested to 1.20, 0.50 or 2.50 MPa.
 4. Accuracy & repeatability are not different for all style pressure switches. A shift of 0.2% may be observed in vacuum when pressure falls from sea level pressure. Switches may also work with varying temperature.
 5. This instrument is calibrated to the measuring position depicted in the drawing. Mounting in any other direction will cause a minor error with respect to low and occupied ranges. Mounting above 1 bar will not compromise this point.
 6. A pressure switch is a switching device and not a measuring instrument — even though it has a needle in a dial window. For this reason, Test Certificate with not suitable standard DIN-CF6 switching values at different scale readings. Minimum differential observed above will be detected, besides other specifications.
 7. Solid working range of the instrument such that the set value lies in the mid 30% or the range i.e., between 30% and 70% of range span.
 8. For switching differential value pressure may be differential value. Switching differential furnished are nominal values under test conditions at mid-scale and will vary with range settings and operating conditions.
 9. On end of switch should not exceed the upper of lower range value.
 10. Gek/DG switch is achieved by two SPST switches synchronized to perfect times (i.e., 2% of FSR). Switches for DP/DO location are higher than that of SP/DO as torque required to actuate the switches are more. Please refer respective range scale for exact values.
 11. Switch life of mechanical is 5 x 10⁶ switching cycles for nominal load. To ensure DG network, use 20% in practical with induction, ensuring safety. A 10°C tolerance is also recommended with 20% weight to O-ring in air and moisture and "C" valve in Nitro, Fluoride or holding switch in Air/Air.
 12. In model 2011 the unit can be switched on by means of standard microswitch. It is "L" code switch air output from "ON" on firing pressure and in "H" code switch air output from "ON" on firing pressure. These switches can be connected to any of source of firing 7 the maximum. Please consult factory for availability.
 13. Higher nitrogen, nitrogen pressure is available or request for some ranges, but C2-C6F6 delivered as and the higher.
 14. **Ascertained temperature range**: All models are suitable for operating within a range of between approximately from (-) 50°C to (+) 80°C provided the process does not freeze within the range. Below 0°C, precautions should be taken in terms of measures to prevent frost formation inside the instrument from jamming the mechanism. Obstructions occurring beyond the range are possible but accuracy might be impaired. The development is the testing factor which would never exceed the limit (-) 50°C to (+) 80°C.
 15. **Fluid Temperature**: A pressure switch when connected to the process is not subjected to through flow and therefore is not fully exposed to the full operating flow. Use of adequate length of impulse piping will greatly reduce excessive heating at the sensing element. For e.g., connection of 1.5 cm of 1/2 inch bore piping will reduce water temperature of 100°C to 80°C at an ambient temperature of 50°C. Ask industry for temperature maximum for different temperatures.
 16. Ensure that required pressure is applied to the valve on testing element housing and use spacers to hold pressure until handling when installation is made.
 17. For pressure above 15 bar, switch 345/200 series and 345-200 (Bourton Tube operated version) are available. Complementarily installation for differential pressure is available in Series 300.
 18. Custom made instruments are available for special service requirements under Special Engineering Category.
 19. For model 304 & 308, select proper "C" Ring material compatible with process medium.
 20. Accuracy figures are indicative of best adjustment achievable on the claimed values.
 21. All performance data are guaranteed to 95%.
-
- ## OPTIONS / ACCESSORIES
- Pressure case for minimum process pressure — increases instrument's life many times.
 - Breather / Shunt for decomposed atmospheres; blow out due for waterproof enclosure.
 - Shutoff valve, signal syphon, over range protectors.
 - Bore / 3/16 88 double connection cable glands to suit cable OD of 1/2", 3/5
 - 17 mm.
 - Dressing for Oxygen service; special parts for Air/Media service.
 - Protection of the fluid mounting.
- Gek &

OPTIONS / ACCESSORIES

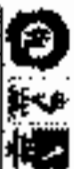
- Drawing ease for minimising pressure points — increased comfort for many bikes.
- Breather / Dyejet for streamlined aesthetics; blow out dirt for wheelguard, sprockets.
- Shocks with pigtail syphon, over-range protectors.
- Brakes / 318 33 double disc, cassette, cable guards to suit cable C25, 1/2", 15 mm.
- Dragging for Croydon terminals & special parts for American service.
- Protection of 3mm flange mounting.

and mother's health to confirm diagnosis and discuss management.

Switching efficiencies for instruments with chemical seal — Apply a multiplication factor of 1.5 for SP-CD and 1.5 for DP-CD to values given in Figure 7 table for QM/GA headrigs and apply a multiplicative factor of 1.2 for SP-CD and 1.5 for DP-CD to values of Differential

Table for GSK, showing...

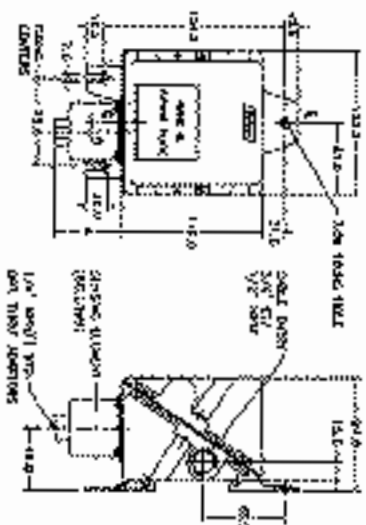
Chemical wastes are kept available in certified storage and ready also for incineration with special equipment.



MOUNTING DIMENSIONS

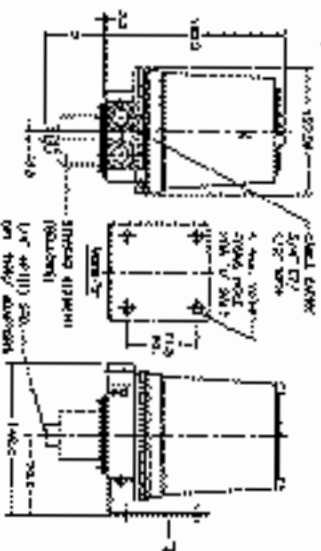
BELOW VERSION

MODEL 201 AND 6 PUL IN ON ENCLOSURES



1. 100mm V. 100mm FROM 42 TO 100mm DEPTH ON SLACK

MODEL 10, 201 & 201 IN ON ENCLOSURES



1. 100mm V. 100mm FROM 42 TO 100mm DEPTH ON SLACK

DISCREET VERSION (FLANGED CONNECTION)

MODEL 201 IN ENVIOR ENCLOSURE



1. 100mm V. 100mm FROM 42 TO 100mm DEPTH ON SLACK

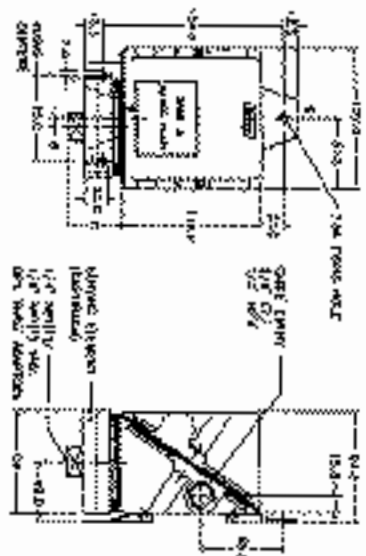
MODEL 201 IN ENVIOR ENCLOSURES



1. 100mm V. 100mm FROM 42 TO 100mm DEPTH ON SLACK

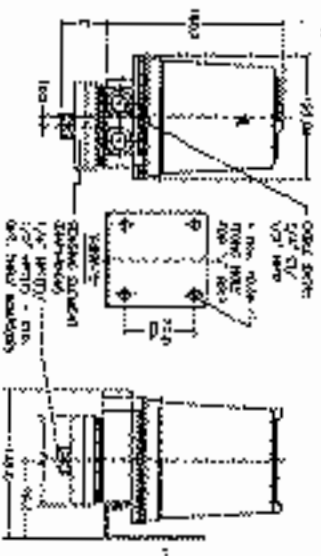
DISCREET VERSION

MODEL 201 IN ON ENCLOSURES



1. 100mm V. 100mm FROM 42 TO 100mm DEPTH ON SLACK

MODEL 201 IN ON ENCLOSURES



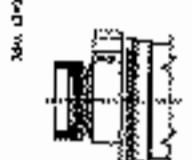
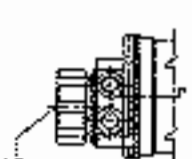
1. 100mm V. 100mm FROM 42 TO 100mm DEPTH ON SLACK

DISCREET VERSION (FLANGED CONNECTION)

MODEL 201 IN ENVIOR ENCLOSURES



1. 100mm V. 100mm FROM 42 TO 100mm DEPTH ON SLACK



1. 100mm V. 100mm FROM 42 TO 100mm DEPTH ON SLACK

1. 100mm V. 100mm FROM 42 TO 100mm DEPTH ON SLACK

Prior notification of changes in specification is impracticable due to continuous development.

FOR SWITZER'S OFFICES IN INDIA

CHECK AT:

<http://www.switzerinstrument.com/offices.htm>

Cat-IV

23/12/10



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

EFFLUENT TREATMENT PLANT

TRANS NO. C81-188

DATE 22/12/2010

(SIGNATURE)
(DATE)

- ☒ APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION
☐ APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION
 SUBJECT TO INCORPORATION OF COMMENTS/ MODIFICATIONS AS NOTED RE-SUBMIT REVISED DRAWING DOCUMENT
☐ NOT APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION
 AT THE INCORPORATION OF COMMENTS/ MODIFICATIONS AS NOTED
☒ FOR INFORMATION AND RECORDS.
 OVER REVISION AND RESUBMIT FOR INFO & REC.

1. APPROVAL CONVEYED HERE IN EITHER RELIEVES THE CONTRACTOR OF ALL CONTRACTUAL OBLIGATIONS AND RESPONSIBILITIES FOR CORRECTING DEFECTS OR MATERIAL OR CONSTRUCTION DESIGN DETAILS ASSIGNED BY THE CONTRACTOR PARTIALLY AND CONFORMITY OF THE SUPPLIES WITH THE REQUIREMENTS APPROVED SCHEMES AND STATUTORY LAWS IN INDIA AND THE PROVISIONS UNDER THE CONTRACT.
 2. THE CONTRACTOR IS NOT PERMITTED TO MAKE ANY MODIFICATIONS TO THE DRAWING DOCUMENTS IS PERMITTED UNDER THE CONTRACT.

BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGINEERING MANAGEMENT (MECHANICAL AUXILIARY)		
This approval status shall be interpreted as laid down in the contract and it shall not release the contractor from his contractual obligations.		
APPROVAL	CATEGORY	AWARDED =
CAT I	= Approved	I
CAT II	= Approved With Comments as Noted	
CAT III	= Not Approved	
CAT IV	= Retained Drawing	
BHEL - PENMAX APPROVED BY:		
NAME		DATE
SIGNATURE		13/03/10

1	5/2/2010	REVISED AS PER NTPC COMMENTS	SKS	APU	AVS
0	18/12/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By
PROJECT		PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).			
CUSTOMER:		 PRAGATI POWER CORPORATION LIMITED (PPCL)			
CONSULTANT:		 NTPC LIMITED, CONSULTANCY WING			
		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			
		THERMAX LIMITED PUNE			
DATA SHEET FOR TEMPERATURE ELEMENT					
THERMAX DOC.NO.: WHJMD00003		BHEL DOC. NO. : PE-VO-314-164-A205		OC.NO. 630128 REV. NO : 01	



PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL) (ETP PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-VO-314-164-A205
THERMAX OC NO: 630128

REPLIES TO THE COMMENT ON DATA SHEET

TEMPERATURE ELEMENT DOC NO. WHEMD00003

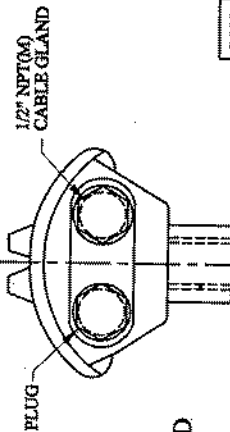
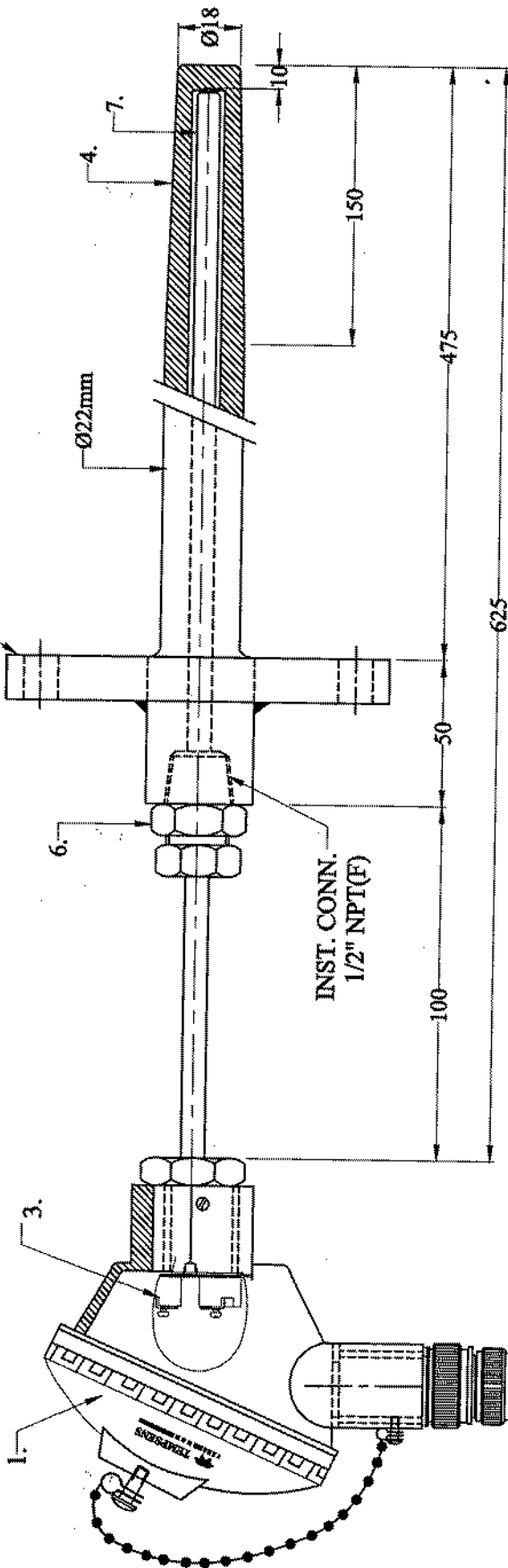
S.NO.	COMMENT	THERMAX REPLY	REMARKS
I	Tag no. TE-801 is not matching with P&ID as well as with data sheet for temp transmitter	Noted & data sheet is revised accordingly	
II	The given arrangement is not envisaged for head mounted temp transmitter pls, clarify	Noted, head assembly is suitable for head mounted temp transmitter, drawing is revised accordingly	

TEMPERATURE ELEMENTS-RTD	
CONSTRUCTIONAL DETAILS	
1. PROBE	SS 316
2. HEAD TYPE	DIE CAST ALUMINIUM, SUITABLE FOR HEAD MOUNTED TEMP TRANSMITTER
3. ENCLOSURE PROTECTION	WEATHER PROOF IP 65
4. AREA CLASSIFICATION	SAFE AREA
5. REFERENCE STANDARDS	DIN-4370 FOR RTD AND ASME PTC-19.3 FOR THERMO-WELL
6. COMPENSATING CABLE	NA
7. TYPE	RTD (PT 100) 100 OHM RESISTANCE AT ZERO DEG.C.
8. CABLE ENTRY	1/2" NPT (F), 2 NOS
TAG NO.	TE-901
MOUNTED ON	THERMOWELL
9. PROCESS CONNECTION	FLANGED 150#, 50 NB ANSI B 16.5 RF
INSTRUMENT CONNECTION	1/2" NPT(M)
10. ELEMENT TYPE,	DUPLEX, 4WIRE
MATERIAL	Metal sheathed, Ceramic packed
11. OP.CONDITIONS	
TEMP.RANGE	0 - 50 DEG.C. MAX
PRESS. OPERATING	REFER TABLE
12. CONTR.DETAIL	
INNER SHEATH	Metal sheathed, Ceramic packed
OUTER SHEATH	Metal sheathed, Ceramic packed
TOTAL INSERTION LENGTH	475 mm
13. RESPONSE TIME	NA
14. MEDIUM	TREATED EFFLUENT
15. THERMOWELL	SS 316
16. THERMOWELL PROCESS CONNECTION	CS FLANGED 150#, 50 NB ANSI B 16.5 RF
17. CABLE BETWEEN TEMP. ELEMENT AND TRANSMITTER	NA

TAG NO	LOCATION	RANGE (DEG. CEL.)	OPERATING PARAMETERS	
			TEMP	PRESSURE KG/CM2
TE-901	DISCHARGE OF COMMON HEADER OF P-3150	0 - 50	AMB	8.2

QTY :- 1 NO.	PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI	2	5/2/2010	SKS	APU	AVS
MAKE :- TEPMSSENS		1	18/12/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630128	0	25/11/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Specification No		Plant	SH NO	
	CONSULTANT:- NTPC - CONSULTANCY WING	WHJED00002		ETP	2 OF 2	

ID NO. FG 5837



CABLE GLAND VIEW

NOTE:- HEAD ASSEMBLY IS SUITABLE FOR HEAD MOUNTED
TEMP. TRANSMITTER (EMERSON MAKE) SHALL BE FITTED
AT SITE, SCOPE IN THERMAX

QTY.:- 01 NOS.

PART NO.: WQGAD01009

TEMP. RANGE.: 0 TO 150°C

TAG NO.: TE-901

YOUR P.O. NO.: 12380 DTD.: 12.11.09

ITEM SR. NO.: 18760

PROJECT: PRAGATI POWER CORPORATION LTD.

S.NO.	DESCRIPTION	MOC
1.	CONNECTION HEAD IP - 65	DIE CAST ALUMINIUM
2.	PLUG & SOCKET WITH 4 PIN CONNECTOR	ALUMINIUM
3.	TEMP. TRANSMITTER (MAKE EMERSON)	(NOT IN OUR SCOPE)
4.	THERMOWELL (DRILLED BAR STOCK)	SS 316
5.	TAPERED, OD X ID: Ø22 TO Ø18 X Ø8.5mm	C.S.
6.	2" ANSI B16.5 150#FF FLANGE, OD: 152.4, PCD: 120.7, 4-H-Ø19.1, THK: 19.6mm	S.S.
7.	ADJ. COMP. FITTING: 1/2" NPT(M)	SS 316
	INSET: PT-100 X 2, DUPLEX, 4 WIRE, M.L.: Ø6mm	

REV. DRN.BY: CHD.BY: DATE: APP.BY: REMARKS

01. B.L.S. S.D.D. 03.02.10 S.D.D.

APP.BY: S.D.D. DEPT: DESIGN

DATE: 25.12.09 SCALE: NTS

PROJECTION



DRN.BY: B.L.SHARMA P.O.NO.:

CHD.BY: S.D.D. PROJ.NO.: 2596

APP.BY: S.D.D. DEPT: DESIGN

DATE: 25.12.09 SCALE: NTS

TEMPSENS INSTRUMENTS (I) PVT.LTD.UDAIPUR 313 003

TITLE:- RTD PT-100 X 2, DUPLEX, 4 WIRE,

CALI: DIN-43760, CLASS- "A"

CUSTOMER:- M/s THERMAX LIMITED. (WATER & WASTE)

DRG.NO.

445837/2596

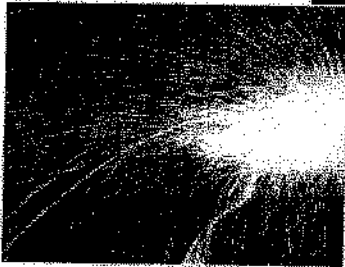
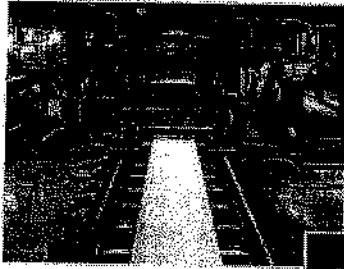
SHEET 1 OF 1 REV.

TEMPSENS

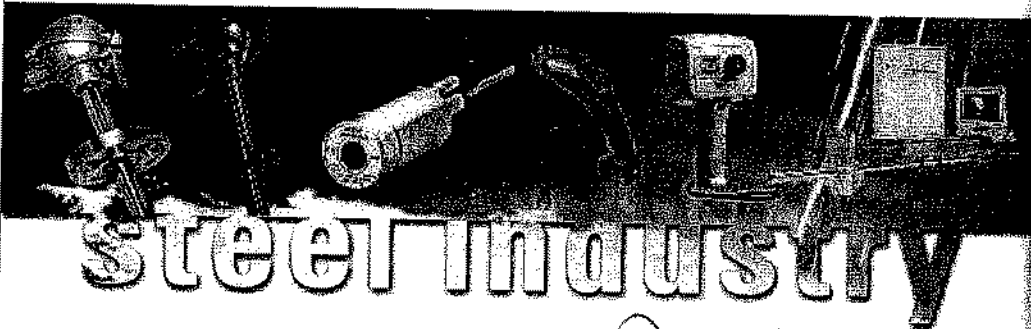
THIS DRAWING AND DESIGN IS THE PROPERTY OF TEMPSENS
INSTRUMENTS (I) PVT.LTD., UDAIPUR 313 003 AND MUST NOT
BE COPIED OR LENT WITHOUT THEIR PERMISSION IN WRITING

DIR. FILE NAME:

NOTE: ALL DIMENSIONS ARE IN mm
TOLERANCE ± 0.2 mm UP TO 10mm
TOLERANCE ± 0.5 mm UP TO 100mm
TOLERANCE ± 0.5 mm UP TO 100mm ABOUT



Temperature Sensors



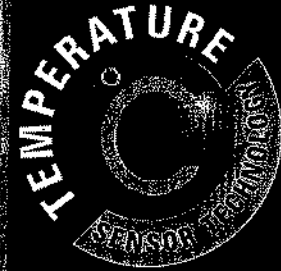
Steel Industry

OK.



TEMPSENS
INSTRUMENTS

www.tempsensindia.com



Thermocouples

RTDs

Compensating Cables

Non Contact Pyrometers

Line Scanner

Furnace Camera

Thermal Imager

Thermography Survey

Temperature Calibration
Equipment

Calibration Services

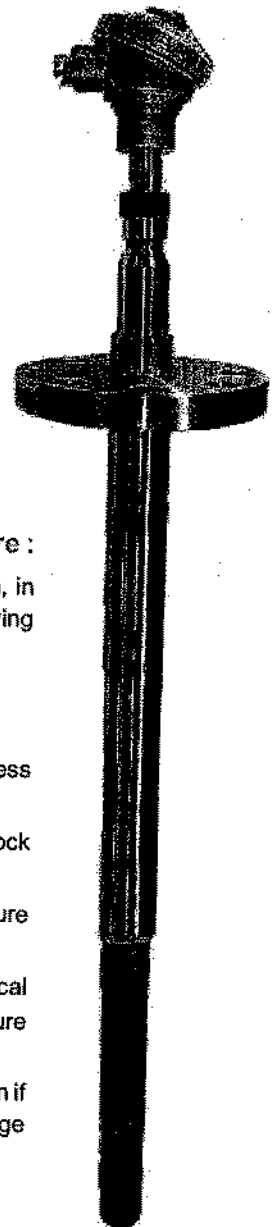
STOVE DOME THERMOCOUPLE

A Blast furnace consist of four major sections

- > Blast furnace
- > Charging unit
- > Gas cleaning equipment
- > Hot blast stove

Stove dome / hot blast stove is one of the most critical section in the steel industry. The hot blast has 3 stage operation, either on gas, on blast or bottled up (ready and waiting to be put on blast).

Temperature is one of the major parameter for controlling of this critical process. The temperature inside the blast furnace is about 1100°C and high pressure. The high temperature and high pressure makes the assembly very critical.

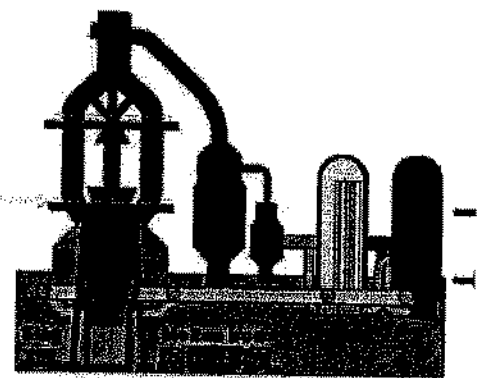


The critical components of Stove dome thermocouple are :

- **Element** : 'S' Type / 'R' type , recommended 0.50 or 0.45mm, in some cases 'N' type thermocouple can be used for cost saving where the temperature is max 1100°C.
- **Inner protection tube** : 99.7% Recrystallised Alumina
- **Outer tube (Options):**
 - **Recrystallised Alumina 99.7%** - High wall thickness recommended
 - **Recrystallised Silicon Carbide** – Better thermal shock resistant
 - **Inconel 600** – Better mechanical strength, temperature limited to 1150°C
 - **Inconel 600 with ceramic coating** – good mechanical strength and good abrasion resistance, temperature limited to 1100°C
- **Glass Sealing** : Glass sealing provides a pressure boundry, even if the bottom of the thermocouple breaks there shall be no leakage from the thermocouple head
- **Holding tube** : SS310
- **Flange** : Welded (recommended) or threaded
- **Head** : Die cast aluminium, Ingress protection IP67



 **TEMPESENS**



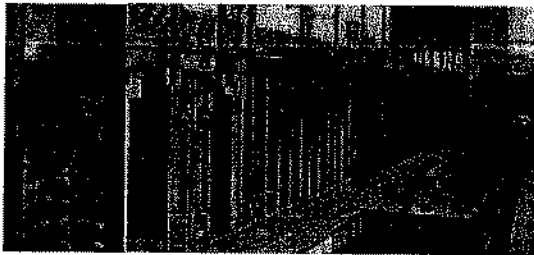
Blast Furnace

COKE OVEN THERMOCOUPLE

Coke is the most important raw material fed into the blast furnace in terms of its effect on blast furnace operation and hot metal quality. The coke making process involves carbonization of coal to high temperatures (1100°C) in an oxygen deficient atmosphere in order to concentrate the carbon. The commercial coke making process can be broken down into two categories: a) By-product Coke making and b) Non-Recovery/Heat Recovery Coke making.

The critical components of Coke oven thermocouple are :

- **Element** : 'S' Type / 'R' type , recommended 0.50 or 0.45mm.
- **Double Protection tube** : 99.7% Recrystallised Alumina with high wall thickness outer and inner tube.
- **Holding tube** : SS310, SS316
- **Head** : Die cast aluminium, Ingress protection IP67



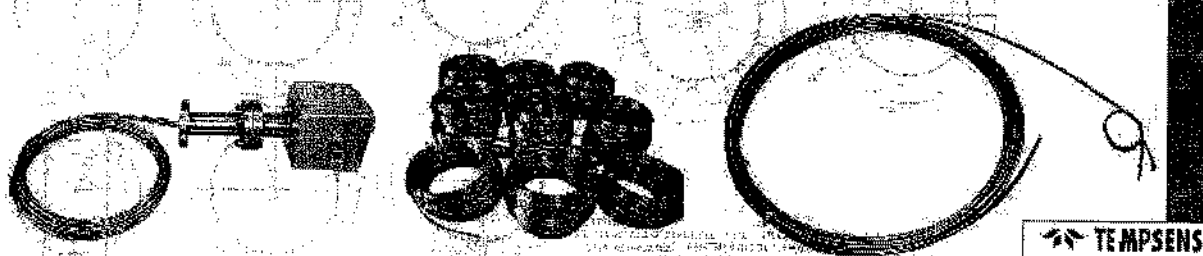
HEARTH REFRACTORY THERMOCOUPLE

Refractory thermocouple (BF thermocouple)

Refractory thermocouples are very important for the startup phase and running phase of the refractory in the steel plants. These are normally very long length thermocouples (upto 40 meters) in mineral insulated construction.

- Thermocouple type : K, Mineral insulated Metal sheathed
- Outer sheath : SS316/SS310/ Inconel 600
- Sheath Dia : 3mm / 4.5mm / 6mm / 8mm
- Length : As per requirement
- Termination : Aluminium Head or Teflon flying leads

Thermocouples of various lengths can be grouped together in a single flange, for a particular area of the furnace.

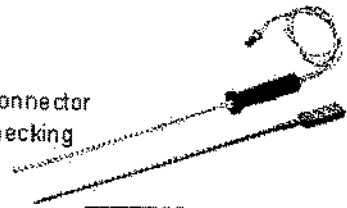


TEMPSENS

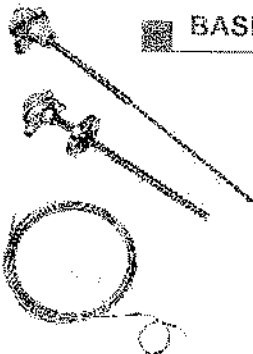
DRI KILN THERMOCOUPLES**Quick Response Thermocouple**

Fast response thermocouple normally K type with miniature or Standard connector for DRI kiln application and normally used with a hand held indicator for checking immediate temperature.

- Thermocouple type K, Mineral insulated
 - Outer sheath : SS316/ SS310 / Inconel 600
 - Sheath Dia : 3mm / 4.5mm / 6mm / 8mm
 - Length : 600, 750, 1000mm (As per req)
 - Termination : miniature or standard connectors
- in dia meter 3mm / 4.5mm or 6mm with SS316 / Inconel sheathing.

**GENERAL THERMOCOUPLE & RTD**

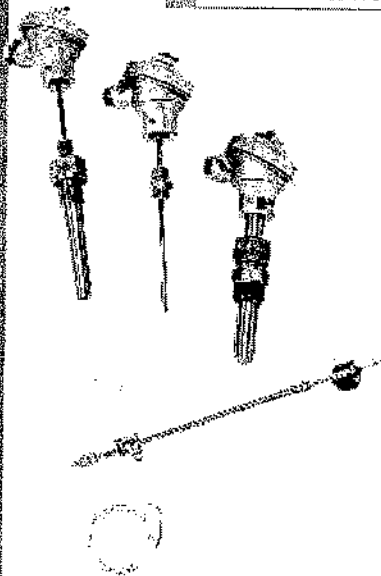
High accurate Thermocouples for variety of application

BASE METAL THERMOCOUPLES

- | | |
|-------------------|---|
| Type | : J, K, T, E, N |
| Element size (MI) | : 1, 1.5, 3, 4.5, 6, 8 (mm) |
| (Non-MI) | : 1.2, 1.6, 2, 2.5, 3.2 (mm) |
| Protection sheath | : Seamless SS 316, SS 310, HRS 446, INCONEL, Nickel, Monel, Hastalloy, Titanium, Ceramic, Silicon carbide etc |
| Configuration | : Simplex / Duplex / Multipoints |

SPECIAL

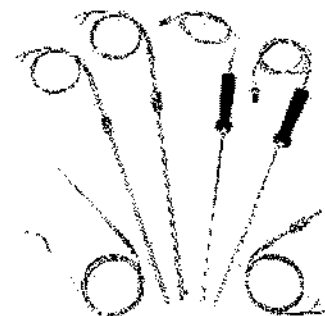
- Coated Thermocouples
- Thermocouples with IBR Approved Thermowells
- Drilled Bar stock

**MINERAL INSULATED RTDs**

- | | |
|-------------------|--|
| Type | : Pt 100, 200, 500, 1000
Copper 50, 53 etc. |
| Element | : Wire wound ceramic encapsulated
Wire wound Glass encapsulated
Thin film ceramic encapsulated |
| Connection | : 2, 3, 4 wire |
| Accuracy | : Class A, B, 1/2, 1/3, 1/5 DIN |
| Protection sheath | : SS 304, SS 316, SS 310, INCONEL, Hastalloy, Monel etc. |

**SPECIAL**

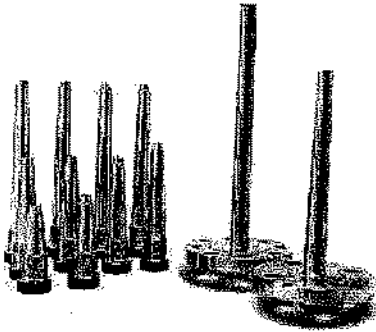
- Slide shoe RTDs
- Vibration proof RTDs for DG sets
- Bearing & Winding temperature RTDs
- Handheld & Probe in various designs
- RTDs with IBR approved Thermowells.



THERMOWELLS AND PROTECTION TUBES

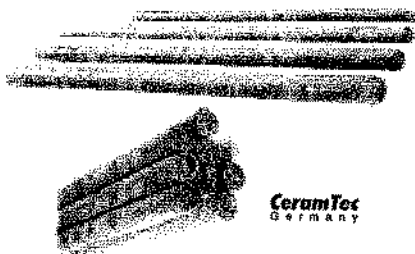
A wide choice of refractory and Stainless Steel protective sheathing is available to suit for various applications.

METAL



Material	: SS304, SS 316, SS 316L, SS 321 : HRS 446, INCONEL 600/800 : Hastalloy, Monel, Alloy 20 : Titanium etc
Type	: Drilled barstock, Fabricated
Construction	: Tapered, Straight
Process connection	: Screwed, Flanged

CERAMICS



Material	: Recrystallised Alumina 99.7%
Type	: KER 710 (C-799)
Length	: 350, 530, 600, 650, 740, 900, 1030, 1200 1430 mm
OD x ID	: 6x4, 8x5, 10x6, 12x8, 15x10, 20x15 24x18mm etc.
Insulating Tubes	: 2/4/6 Holes.
OD	: 2.8, 3.5, 5.5, 8.5, etc.

SPECIAL



Metal Thermowells with Tungsten carbide
/ Ceramic / PTFE / PVDF / PFA coatings
Solid sintered tungsten carbide
Silicon carbide
Platinum thimble
Tantalum, Titanium, Nickel cladding
Graphite Thermowells

CABLE

Compensating cables for thermocouples J,K,T,E,N,R,S,B Types.

Wire Gauge	: 14 to 36 gauge (AWG/SWG)
Conductor	: Solid / Multistrand
Insulation	: Single and double fibre glass, teflon, ceramic fibre, silica fibre, SS braided, PVC etc.
Protection	: Armored / Unarmored



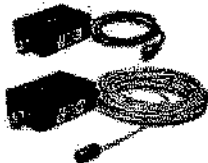
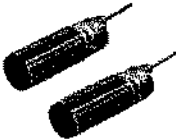
 **TEMPSENS**

NON CONTACT PYROMETER

PORTABLE

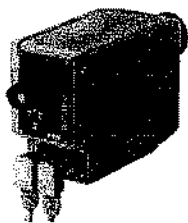
				
Instrument	IN14/ IN15	IGA 15 plus	IS 8 plus	IS 8 GS plus
Temperature ranges (Between.....and....)	-32....600°C -32....900°C	250....1800°C	600....2500°C	1000....2000°C
Spectral range	8....14 µm	1.45....1.8 µm	0.6....1.1µm	0.55 µm
Field of view (minimum spot size in mm)	10:1 15:1 30:1 50:1(min 2.2)	200:1(min 1.25)	Min 300 : 1(min 0.8)	Min 300 : 1(min 0.8)
Response time t_{90}	300 ms 150 ms	20 ms	1 ms	500 ms
Output	-/RS232 or RS232 and analog output	RS232 and Analog output	RS232	RS232

ONLINE

				
Instrument	IN 510, IN 510-N IN 520, IN 520-N	IS/IGA 200	IS/IGA 5	IS 50-LO PLUS IGA 50-LO PLUS
Temperature ranges (Between.....and....)	-40....700°C	650...2500°C 300...1800°C	650...3000°C 250...3000°C	550....3300°C 300....2500°C
Spectral range	8....14 µm	0.8...1.1µm 1.45....1.8 µm	0.8...1.1 µm 1.45...1.8 µm	0.8....1.1µm 1.45....1.8µm
Field of view (minimum spot size ? in mm)	2:1 or 10:1	3 fixed optics Min 200: 1 (min 5) Min 100: 1 (min 6)	Optics N Min 160 : 1 (min 0.5) Optics F Min 200 : 1 (min 1)	Optical head I Min 100:1 (min1.2) Optical head II min 200:1 (min 0.45)
Response time t_{90}	180 ms adjustable up to 30 s	20 ms adjustable up to 10 s	72 ms adjustable up to 10 s	< 1 ms Adjustable up to 10 s
Output	0/4...20 mA, 0...5 V, thermoc. J / k, RS232/ RS485 (switchable)	4...20 mA	0/4... 20 mA, RS232 or RS485, PID-controller (option)	0/4...20 mA, RS232/ RS485 (switchable)

NON CONTACT PYROMETER**TWO COLOUR (RATIO)**

				
Instrument	ISQ 5-LO	ISR/IGAR 12 -LO	ISR 50-LO	ISQ 5
Temperature ranges (Between.....and....)	700...2500°C	600...3300°C 300...2200°C	700...3000°C	600...3000°C
Spectral range	Channel 1: 0.9 µm Channel 2: 1.05µm	0.8...1.1 µm 1.28...1.7 µm	Channel 1: 0.9 µm Channel 2: 1.05µm	Channel 1: 0.9 µm Channel 2: 1.05µm
Field of view (minimum spot size ? in mm)	Optical head I Min 100 : 1 (min1.2) optical head II (focusable) Min 200:1(min 0.45)	Optical head I Min 100 : 1 (min1.2) optical head II (focusable) Min 200:1(min 0.45)	Optical head I Min 100 : 1 (min1.2) optical head II (focusable) Min 200:1(min 0.45)	Min 200 : 1 (min1.5)
Response time t_{90}	?10ms adjustable up to 10 s	2 ms ¹⁾	< 10 ms adjustable up to 10 s	< 10ms adjustable up to 10 s
Output	0/4....20mA, RS232 or RS485 PID-controller (option)	0/4...20mA, RS232 or RS485 (switchable)	0/4...20 mA, RS232 or RS485 (switchable)	0/4...20 mA, RS232 or RS485

SPECIAL ONLINE PYROMETER

IS/IGA 12 with scanner

Fully digital, highly accurate, fast pyrometer with built in scanner, digital display, view finder and optional targeting light, very small spot sizes, variable or fixed optics, analog output, digital interface maximum value storage. For small objects, oscillating wire, moving objects

Temperature ranges (Between.....and....)	550...2500°C 300...1800°C
Spectral range	0.7...1.1µm 1.45...1.8 µm
Field of view (minimum spot size in mm)	6 fixed optics Min 900:1 (min 0.1) 3 focusable optics min 800:1 (min 0.4)
Response time t_{90}	1 ms adjustable up to 10 s
Output	0/4...20mA, RS232 & RS485 (switchable)

PORTABLE TWO COLOUR PYROMETER**Typical Applications**

Hot and molten metals, foundries, forging, annealing, Induction heating etc.

Features

- Two colour technique
- Through-lens sighting
- Sharp focusing on targets
- 0.25% accuracy
- 10 different spectral responses
- Minimum measurable target diameter 0.65mm (0.025") (M90V with close focus lens set)
- Temperature display in eyepiece and rear window
- Outputs for remote recording, printing
- Built-in data logging



Model	Temperature Range °C	Spectral Response µm	Field of View	Accuracy
M90V	800 °C to 3000 °C	0.65 (same as optical pyrometers)	300:1	0.25% of reading
M90R-1	700 °C to 2000 °C	2-colour near 0.9 (µm)	60:1	0.70% of reading
M90R-2	900 °C to 3000 °C		180:1	



FURNACE MONITORING CAMERA



STRAIGHT VIEW (RNV-103, 203, 303)

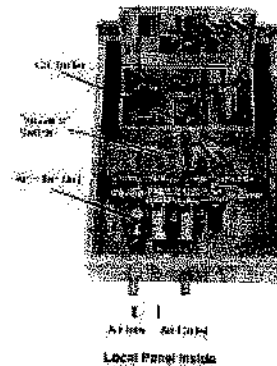
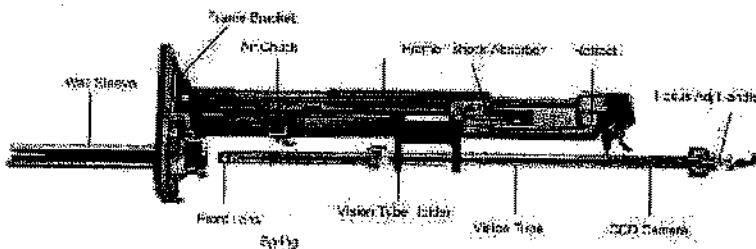
As a standard model of Ro-Ne Vision, it is used for monitoring the front image of the furnace interior and you can select various angles and lengths of the vision tube and this model is suitable for steel reheating furnace, kilns or Power generations etc.

VISION TUBE & WALL SLEEVE

Image Sensor	1 /4" interline transfer CCD
H. Resolution	More than 480 TV Lines
Video Output	Composite Video ,IVp_p ,75 NTSC/PAL
Power Source	DC 12V $\pm$ 10%
Current Consumption	Max.200mA
Angle of View	Horizontal :89°,Vertical:68 ,Digonal:105°
Length	VT-1180:1180mm/VT 980:980mm
Wall Sleeve Length	350/500/600 (mm)
Wall Sleeve Diameter	Outer diameter :58mm Inner diameter :42mm

RETRACT CONTROLLER

Size(mm)	440(W) x225(H)x 160(D)
Power Source for Main	AC 220V
Power Source for Camera	DC 12V
Solenoid Power for Retract	DC24V
Locking Device	Air Chuck



THERMAL VIEW (RNV-503)

With the NIR camera and computer system. This product features an average atmosphere temperature display within any 20-point areas, and date recording/control function in addition to viewing the furnace interior. Each area is adjustable.

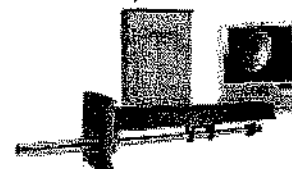
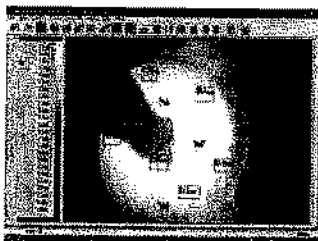
Thermal view is designed to process images by blocking visible images while only receiving infrared image, so it receives clear pictures, and using the software, it is possible to measure the regional temperature by coloring and different shades of infrared image source.

VISION TUBE

Image Sensor	1/2" interline transfer CCD
H. Resolution	More than 600 TV Lines
Power Source	DC 12V
Current Consumption	Max.200mA
Angle of View	Horizontal:89°- Vertical:68°.Digonal: 107°
Length	VT-1100:1100mm

TEMPERATURE MEASUREMENT SYSTEM

CPU	Pentium IV 2.4 GHz
Hard Disk	100GB
RAM	512MB
Monitor	17"
OS	Windows 2000 or XP
Power Source	AC 100 or 220 V
Temperature Range	600 ~ 2000 °C
Measurement Frequency	Min. 1 Sec.
No. of Measurement Place	Max. of 32 places
Measurement Errors	±1% (Standard : black body)
Temperature Display	Celsius or Fahrenheit
Optional	4-20 mA output

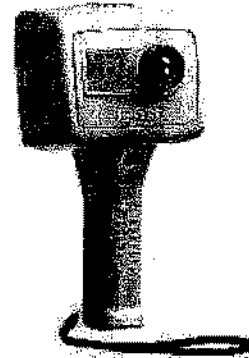


PORTABLE THERMAL IMAGERS & THERMOGRAPHY SERVICES

Affordable portable thermal imagers for predictive and preventive maintenance Thermal Imaging is technique for creating an image of scene based on the invisible thermal radiation emitted from an object. Using this technology, thermal images of faults in mechanical and electrical application can be easily located, before occurrence.

■ THERMAL IMAGERS - For Predictive Preventive Maintenance

Specification	Model IRI 4010	Model IRI 4030
Field of View	20° x 15°	20° x 15°
Focus	Manual	Manual
Thermal Sensitivity	150mK @ 25° C	150mK @ 25° C
Detector	160 x 120 pixels	160 x 120 pixels
Image Storage	Up to 1000 Images	Up to 1000 Images
Display	3½" colour LCD 4 colour palettes	3½" colour LCD 4 colour palettes
Temp. Range	-10°C to + 250°C	200°C to + 900°C
Emissivity	0.2 to 1.0 adjustable	0.2 to 1.0 adjustable
Accuracy	±2% of reading or ± 2°C	±2% of reading or ± 2°C
Interfaces	USB type B	USB type B

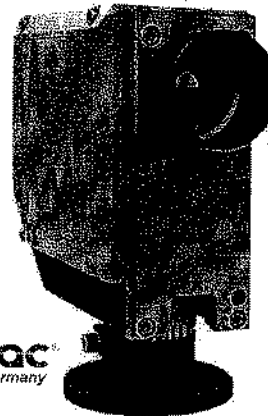


IRISYS®

LINE SCANNERS & ONLINE THERMAL IMAGERS

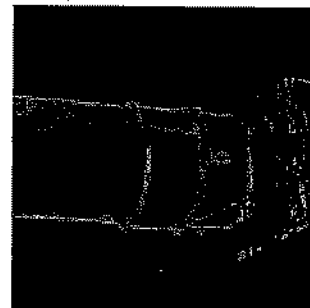
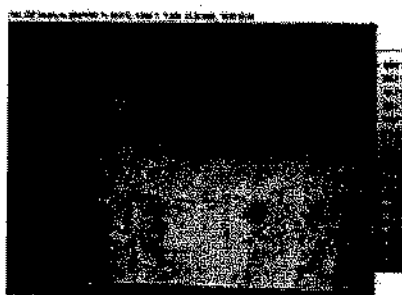
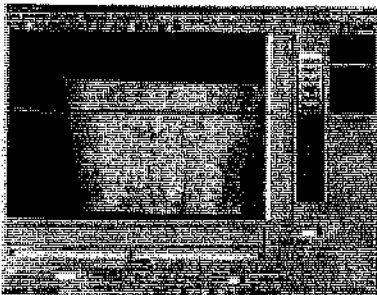
PYROLINE AND PREVIEW CAMERAS

High speed infrared line cameras provide instant non-contact measurement of temperature distribution. Pyroline scanners are useful for temperature profiling of moving objects & processes. For general application scanners at 8...14 µm and for metallic surface scanner at 1.4...1.8 µm.



impac
Germany

Application Picture



TEMPSENS

CALIBRATION BATH, MASTER SENSOR, NABL SERVICE**HIGHLY STABLE TEMPERATURE CALIBRATION BATH -30...1500°C****BATH**

Model	Range	Stability	Medium
Polyscience 9702	-40 ... +200°C	±0.01°C	Liquid Bath
CALsys -30/50	-30 ... +50°C	±0.1°C	Liquid Bath
CALsys 300	50 ... +250°C	±0.1°C	Liquid Bath

FURNACE

CALsys 650	50 ... +650°C	±0.3°C	Dry Block
CALsys 1100	300 ... +1100°C	±0.5°C	Dry Block
CALsys 1200	250 ... +1200°C	±0.5°C	Dry Block
CALsys 1500	400 ... +1500°C	±1°C	Dry Block
CALsys 1700	500 ... +1700°C	±1°C	Dry Block

BLACK BODY SOURCES

CALsys 500.BB	Amb ... +500°C	±0.5°C	Black Body
CALsys 1200.BB	400 ... +1200°C	±1°C	Black Body
CALsys 1500.BB	400 ... +1500°C	±1°C	Black Body
CALsys 1700.BB	500 ... +1700°C	±1°C	Black Body

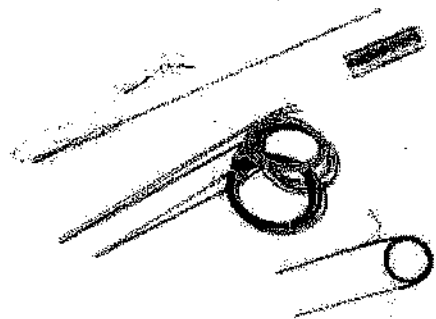
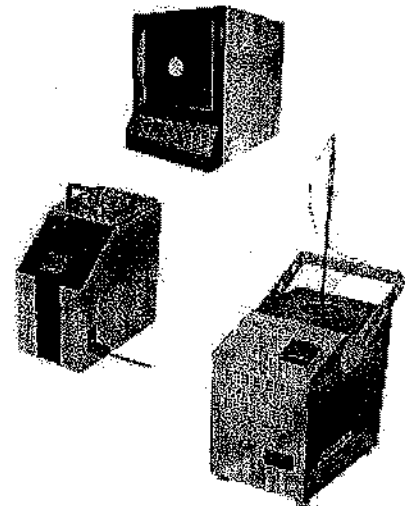
HIGHLY ACCURATE MASTER SENSORS**RTD - Pt 100**

Accuracy : 1/10, 1/5, 1/3, 1/2 DIN, Class A
 Sheath Material : SS316 / Inconel

Thermocouple

Accuracy : K/N/R/S
 Special, Class 1,
 with Cold junction compensation
 Sheath Material : Inconel / Ceramic (KER 710-C 799)
 Cold Junction Probe : J/ K/ E/ N/ R/ S/ B

for Thermocouple Type
 Dual Probe Possible in
 one Housing

**NABL ACCREDITED CALIBRATION CAPABILITIES****IN HOUSE**

S.#	Parameter Measured	Range	B.M.C
1	Contact type temp sensors	-38 ... 250 °C	±0.1°C
	Thermocouples, RTDs,	250 ... 500 °C	±0.14°C
	Digital Temp. Indicator,	500 ... 1000 °C	±1.3°C
	Thermometers	1000 ... 1200 °C	±2.1°C
		1200 ... 1500 °C	±4.2°C
2	Non-contact Infrared pyrometers	50 ... 250°C	±0.4°C
		250 ... 400°C	±0.9°C
		400 ... 500°C	±2.6°C
		500 ... 800°C	±3.5°C
		800 ... 1000°C	±4.1°C
		1000 ... 1200°C	±4.1°C
		1200 ... 1500°C	±5.8°C
3	Contact type temp sensors (For Calibration at fixed point cells)		
		* TPW	0.01°C
		* Ga	29.7646°C
		* Sn	231.928°C
		* Zn	419.527°C
		* AL	660.323°C

ON SITE

S.#	Parameter Measured	Range	B.M.C
1	Contact type temp sensors Thermocouples, RTDs, Digital Temp. Indicator, Thermometers	-25 ... 140°C	0.07°C
		140 ... 500°C	0.14°C
		500 ... 1000°C	1.42°C
		1000 ... 1200°C	2.2°C
2	Non-contact Infrared pyrometers	50 ... 250°C	0.4°C
		250 ... 400°C	0.9°C
		400 ... 500°C	3.3°C
		500 ... 800°C	3.5°C
		800 ... 1000°C	4.1°C
		1000 ... 1200°C	4.1°C



TECHNICAL REFERENCES

THERMOCOUPLES REFERENCE DATA (ITS 90) mV v/s Temperature

TYPE		"T" Cu-CuNi	"J" Fe-CuNi	"K" NiCr-NiAl	"N" NiCrSi-NiSi	"S" PtRh10%-Pt	"R" PtRh13%-Pt	"B" PtRh30%-PtRh6%	"E" NiCr-CuNi
Calibration		IS 2055/ASTME 230	IS 2057/ASTME 230	IS 2054/ASTME 230	ASTME 230	IS 2055/ASTME 230	IS 2055	IS 6728	ASTME 230
Tolerances	Standard	± 1°C or ± 0.75%	± 2.2°C or ± 0.75%	± 2.2°C or ± 0.75%	± 2.2°C or ± 0.75%	± 1.5°C or ± 0.25%	± 1.5°C or ± 0.25%	± 0.5%	± 1.7°C or ± 0.5%
	Special	± 0.5°C or ± 0.4%	± 1.1°C or ± 0.4%	± 1.1°C or ± 0.4%	± 1.1°C or ± 0.4%	± 0.6°C or ± 0.1%	± 0.6°C or ± 0.1%	Over 800°C	± 1°C or ± 0.4%
TEMPERATURE °C	-100	-3,379	-4,633	-3,554	-2,407	-	-	-	-5,237
	0	0	0	0	0	0	0	0	0
	100	4,279	5,269	4,096	2,774	0,646	0,647	0,033	6,319
	200	9,288	10,799	8,138	5,913	1,441	1,469	0,178	13,421
	300	14,862	16,327	12,209	9,341	2,323	2,401	0,431	21,036
	400	20,872	21,848	16,397	12,974	3,259	3,408	0,787	28,946
	500	-	27,393	20,644	16,748	4,233	4,471	1,242	37,005
	600	-	33,102	24,905	20,613	5,239	5,583	1,792	45,093
	700	-	39,132	29,129	24,527	6,275	6,743	2,431	53,112
	800	-	45,494	33,275	28,455	7,345	7,950	3,154	61,017
	900	-	-	37,326	32,371	8,449	9,205	3,957	68,787
	1000	-	-	41,276	36,256	9,587	10,506	4,834	76,373
	1100	-	-	45,119	40,087	10,757	11,850	5,780	-
	1200	-	-	48,838	43,846	11,951	13,228	6,786	-
	1250	-	-	50,644	45,694	12,554	13,926	7,311	-
	1300	-	-	52,410	47,513	13,159	14,629	7,848	-
	1400	-	-	-	-	14,373	16,040	8,956	-
1500	-	-	-	-	15,582	17,451	10,099	-	
1600	-	-	-	-	-	-	11,263	-	
1700	-	-	-	-	-	-	12,433	-	

SHEATH MATERIALS

SHEATH	MELTING POINT °C	USABLE TEMP. °C	CHARACTERISTICS
SS-304	1430	800	High resistance to heat and corrosion
SS-316	1430	900	Excellent resistance to Heat, Acids & Alkalies
SS-321	1400	900	Excellent resistance to corrosion
SS-310	1410	1100	Good oxidation resistance at low temperature and sulphur atmosphere
HRS-446	1400	1150	Excellent oxidation resistance at elevated temperature and sulphur atmosphere
Inconel 600/800	1400	1100	Excellent oxidation resistance (do not use in sulphur atmospheres)
High Alumina 610	-	1500	General purpose
Sintered Alumina 710/C-799	1800	1500	Excellent thermal, mechanical, electrical and corrosion resistant.
Recrystallised Silicon Carbide	1850	1500	Outstanding resistance to thermal shock, good mechanical strength.

COLOUR CODE OF COMPENSATING CABLES & THERMOCOUPLES

Type	BRITISH BS 1843	AMERICAN ASME A23.1	GERMAN DIN 15114	INDIAN IS: 1514	JAPANESE JIS C 1514-1981
K					
T					
J					
E					
R					
S					
B					
N					

Other sheath materials like Titanium, Molybdenum, Graphite, Aluminum etc. are available against specific requirement

TOLERANCE VALUES OF RTD PT-100 (IEC 751)

TEMP (°C)	BASIC VALUES	TOLERANCE			
		CLASS A		CLASS B	
		($\pm$ °C)	($\pm$ Ω)	($\pm$ °C)	($\pm$ Ω)
-200	18.52	0.55	0.24	1.3	0.56
-100	60.26	0.35	0.14	0.8	0.32
0	100	0.15	0.06	0.3	0.12
100	138.51	0.35	0.13	0.8	0.30
200	175.86	0.55	0.20	1.3	0.48
300	212.05	0.75	0.27	1.8	0.64
400	247.09	0.95	0.33	2.3	0.79
500	280.98	1.15	0.38	2.8	0.93
600	313.71	1.35	0.43	3.3	1.06
700	345.28	-	-	3.8	1.17
800	375.70	-	-	4.3	1.28

EMISSION CHART

EMI in %		EMI in %	
"Black body"	100	Oil Paints	85..95
Human skin	98	Asphalt	85
Black matter	95	Textiles	75..95
Carbon black	95	Graphite	75..92
Wood	80..92	Cement	90
Masonry	85..95	Water	95
Chamotte	85..95	Glass	80
Rubber	85..95	Quartz	80
Porcelain	85..95	Steel (Oxidized)	60..80
Ceramics	85..95	Steel (Blank)	10..30
Paper	85..95	Aluminium (Blank)	2..15

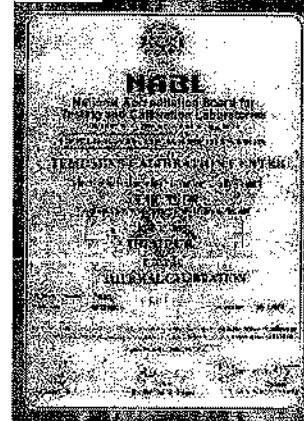
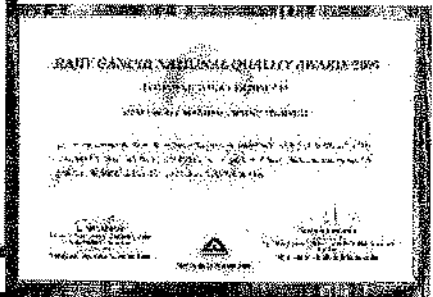
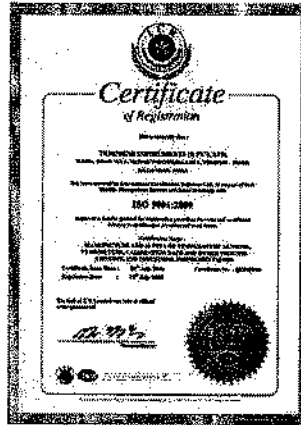
Always one step ahead....Committed to success

TEMPSENS Instruments (I) Pvt. Ltd is a part of Pyrotech group which was established by four technocrats in 1976 at Udaipur, with our first product as Thermocouples and RTDs. To enhance our customer's success we provide high quality products and services for "Temperature solution", tailored to their needs, and delivered to meet their schedule.

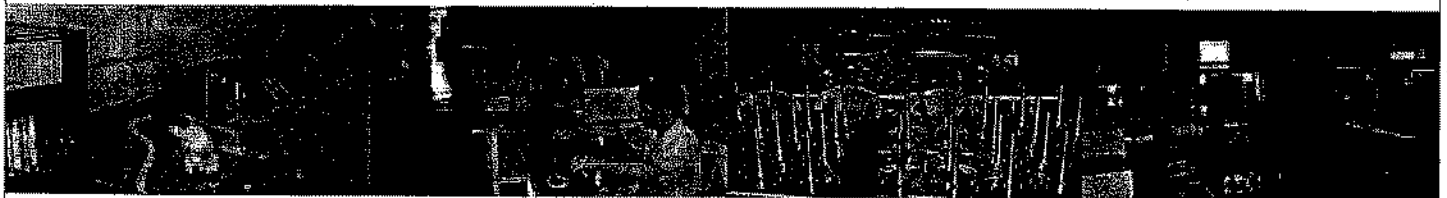
We have tied up with world leaders in Temperature measuring technology for critical components, Non contact Temperature measurement and Thermal imaging solutions. We add value to these products and deliver complete engineered solutions, backed by efficient service and application support.

Today we have strong sales and service network operating from important locations of India. Continuing our constant endeavor of delivering solutions for temperature technology to our large base of over two thousand satisfied customers.

- 35 years of experience
- Large Customer base
- Execute Major Projects of Steel industries in India and Abroad
- Production Expertise- Specialised Team & Facility for Steel T/C's, Pyrometer
- Thermocouple, Pyrometers, Kiln Shell Scanner Camera.
- NABL Accredited Calibration Laboratory upto 1500 °C
- Fixed Point Temperature Calibration - TPW, Ga, Sn, Zn & AL



TOTAL SOLUTION TO TEMPERATURE SENSOR TECHNOLOGY



OUR ASSOCIATES



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18/12/09

एनटीपीसी

NTPC

NTPC Limited

(A Govt. of India Enterprise)

CONSULTANCY WING

TRANS NO. 281-152

DATE 19.01.2010

(SIGNATURE)

(DATE)

☒ I. APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION.

☐ II. APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION

☐ III. NOT APPROVED/RELEASED FOR FABRICATION/CONSTRUCTION

☐ IV. FOR INFORMATION AND RECORDS.

☐ V. REVISE AND RESUBMIT, FOR INF. & REC

I. APPROVAL CONVEYED HEREIN NEITHER RELIVES THE CONTRACTOR OF HIS CONTRACTUAL OBLIGATION AND RESPONSIBILITIES FOR CORRECTNESS OF DIMENSIONS, MATERIAL OF CONSTRUCTION, DESIGN DETAILS AS LAYED, PERFORMANCE PARTICULARS AND CONFORMITY OF THE SUPPLIES TO THE SPECIFICATIONS, APPROVED SCHEMES AND STATUTORY L

II. CHANGE IN APPROVED DRAWING/DOCUMENTS IS PERMITTED WITHOUT

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18/12/2009

FOR APPROVAL

SKS

APU

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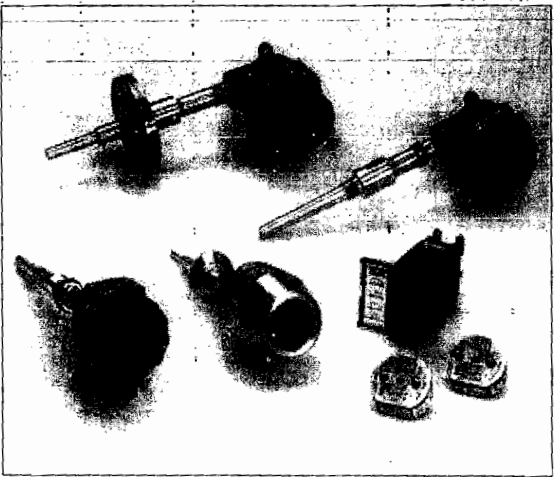
Temperature Transmitter Specification Sheet						
Sr	Identification			Specification		
	General					
1	Make			EMERSON		
2	Model Number			644HANAXAJ8M5C4Q4		
3	Type			Microprocessor based SMART type		
				2 wire with Local Indication -single input Head mounted Temperature transmitter		
	Transmitter					
4	Accuracy			±0.1% Of Span		
5	Temperature Range			Refer index sheet		
6	Integral Square Rooting			NA		
7	Maximum Span Limit			- 20 TO 85 °c		
8	Output			4-20 mA with Digital Signal Based on HART Protocol		
9	Power Supply			24 V DC		
10	Maximum Turn Down Ratio			NA		
11	Static Pressure Rating			NA		
12	Stability			± 0.15 % Of URL		
13	Update time			150 milliseconds		
14	Local Indication			Digital LCD Indication in Engineering Unit		
15	Electrical connections / Conduit Entry Size			1/2 "-14 NPT (F) X 2Nos.		
16	Mounting			field mounted		
17	Enclosure / Housing			NEMA 4X ,IP66, SS316		
	Accessories					
18	Mounting Brackets			2 " Pipe Mounting		
NOTE : MATERIAL OF ACCESSORIES IN SS 316						
		PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI				
				1	18/12/2009	SKS APU AVS
THERMAX LIMITED		O.C NO: 630128		0	7/10/2009	SKS APU AVS
Water & Waste Solutions		OWNER: PRAGATI POWER CORPORATION LTD.,DELHI		Rev	Date	Prepd by Chkd by App by
Sai Chambers, Wakadewadi		CLIENT : BHARAT HEAVY ELECTRICALS LTD		Specification No		Plant SH NO
Pune 411 003 (INDIA)		CONSULTANT:- NTPC - CONSULTANCY WING		WHJMD00002		ETP 3 OF 3

Product Data Sheet
00813-0100-4728, Rev LA
Catalog 2006 - 2007

Rosemount 644

Rosemount 644 Temperature Transmitter

- *Communicates easily using either 4-20 mA/HART® or FOUNDATION™ fieldbus protocol*
- *Meets NAMUR NE 21 recommendation ensuring reliable transmitter performance for head mount products*
- *The Transmitter-Sensor Matching feature improves temperature measurement accuracy by up to 75% when compared to unmatched assemblies*
- *The integral LCD Display conveniently displays the primary sensor input, and diagnostics of the transmitter*
- *An installation-ready solution that provides a variety of mounting options, transmitter configurations, and sensors/thermowells*



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Foundation Fieldbus Transmitter	page 22

ROSEMOUNT

www.rosemount.com


EMERSON
Process Management

High Accuracy and Reliability for Control Applications

The Rosemount 644 temperature transmitter is ideal for critical applications (in many types of process environments). It provides reliability with advanced accuracy for all installations.

The Rosemount 644 can be ordered with either 4–20 mA/*HART* or a completely digital *FOUNDATION* fieldbus protocol. Each unit can be configured for a variety of sensor inputs: RTD, thermocouple, millivolt, or ohm.

DIGITAL FIELD DEVICES THAT POWER PLANTWEB



The advanced 644 powers *PlantWeb*® by communicating important temperature diagnostics and *PlantWeb* alerts to ensure process health and enable economical single-sensor architecture.

TRANSMITTER-SENSOR MATCHING

Entering the temperature-resistance profile specific to the RTD sensor into the 644 transmitter results in transmitter-sensor matching. This eliminates the sensor interchangeability error, which can improve accuracy by up to 75%.

INTEGRAL LCD DISPLAY

Local indication of temperature measurement and diagnostics provides immediate and accurate verification of process conditions.

RELIABLE TRANSMITTER PERFORMANCE

Meeting the NAMUR NE 21 recommendations, the 644 ensures top transmitter performance in harsh EMC environments. In addition, the 644 *HART* transmitter meets NAMUR NE 43 and NE 89 recommendations.

MOUNTING FLEXIBILITY

DIN A style head mount transmitters fits a variety of housings for remote transmitter mounting and can be integral or remote mounted to a sensor. The compact rail mount style is great for DIN rail mounting in the tight spaces of a crowded control room.

Rosemount Temperature Solutions

Rosemount 644 Temperature Transmitter

Head mount styles available with *HART* or *FOUNDATION* fieldbus protocol. Rail mount style available for *HART* protocol.

Rosemount 848T Eight Input Temperature Transmitter

Eight input transmitter available with *FOUNDATION* fieldbus protocol.

Rosemount 3420 Fieldbus Interface Module

Provides an interface between *FOUNDATION* fieldbus instruments and systems without fieldbus capability using standard interface protocols.

Rosemount 248 Temperature Transmitter

Head mount style (DIN B) and Rail mount style with *HART* protocol and complete temperature assembly.

Rosemount 144 Temperature Transmitter

Head mount style (DIN B) PC-programmable transmitter.

Rosemount sensors, thermowells, and extensions

Rosemount has a broad offering of RTD and thermocouples that are designed to meet plant requirements.

Product Data Sheet
00813-0100-4728, Rev LA
Catalog 2006 - 2007

Rosemount 644

Specifications

HART AND FOUNDATION FIELDBUS

Functional Specifications

Inputs

User-selectable; sensor terminals rated to 42.4 V dc. See "Accuracy" on page 7 for sensor options.

Output

Single 2-wire device with either 4–20 mA/HART, linear with temperature or input; or a completely digital output with FOUNDATION fieldbus communication (ITK 4.5 compliant).

Isolation

Input/output isolation tested to 500 V ac rms (707 V dc) at 50/60 Hz

Local Display

The optional five-digit integral LCD Display includes a floating or fixed decimal point. It can also display engineering units (°F, °C, °R, K, Ω, and millivolts), milliampere, and percent of span. The display can be configured to alternate between selected display options. Display settings are preconfigured at the factory according to the standard transmitter configuration. They can be reconfigured in the field using either HART or FOUNDATION fieldbus communications.

Humidity Limits

0–99% relative humidity

Update Time

≤ 0.5 seconds

Accuracy (default configuration) PT 100

HART (0-100 °C): ±0.18 °C

FOUNDATION Fieldbus: ±0.15 °C

Physical Specifications

Electrical Connections

Model	Power and Sensor Terminals
644H	Compression screws permanently fixed to terminal block
644R	Compression screw permanently fixed to front panel
WAGO®	Spring clamp terminals are optional (option code G5)

HART Communicator Connections

Communication Terminals	
644H	Clips permanently fixed to terminal block
644R	Clips permanently fixed to front panel

Materials of Construction

Electronics Housing and Terminal Block	
644H	Noryl® glass reinforced
644R	Lexan® polycarbonate
Enclosure (Option code J5 or J6)	
Housing	Low-copper aluminum
Paint	Polyurethane
Cover O-ring	Buna-N

Mounting

The 644R attaches directly to a wall or a DIN rail. The 644H installs in a connection head or universal head mounted directly on a sensor assembly, apart from a sensor assembly using a universal head, or to a DIN rail using an optional mounting clip.

Weight

Code	Options	Weight
644H	HART, Head Mount Transmitter	96 g (3.39 oz)
644H	FOUNDATION fieldbus, Head Mount Transmitter	92 g (3.25 oz)
644R	HART, Rail Mount Transmitter	174 g (6.14 oz)
M5	LCD Display	38 g (1.34 oz)
J5, J6	Universal Head, Standard Cover	577 g (20.35 oz)
J5, J6	Universal Head, Meter Cover	667 g (23.53 oz)

Enclosure Ratings (644H)

All option codes (S1, S2, S3, S4, J5 and J6) are NEMA 4X, IP66, and IP68. Option code J6 is CSA Enclosure Type 4X.

Rosemount 644

Product Data Sheet
00813-0100-4728, Rev LA
Catalog 2006 - 2007

Performance Specifications

EMC (ElectroMagnetic Compatibility)
NAMUR NE 21 Standard

The 644H HART meets the requirements for NAMUR NE 21 Rating. (Hardware Rev 26 and later for HART devices.)

Susceptibility	Parameter	Influence
ESD	• 6 kV contact discharge	HART
	• 8 kV air discharge	None
Radiated	• 80 – 1000 MHz at 10 V/m AM	< 0.5%
Burst	• 1 kV for I.O.	None
Surge	• 0.5 kV line–line	None
Conducted	• 1 kV line–ground (I.O. tool)	None
	• 150 kHz to 80 MHz at 10 V	< 0.5%

CE Mark

The 644 meets all requirements listed under IEC 61326: Amendment 1, 1998.

Power Supply Effect

Less than ±0.005% of span per volt

Stability

RTDs and thermocouples have a stability of ±0.15% of output reading or 0.15 °C (whichever is greater) for 24 months

Self Calibration

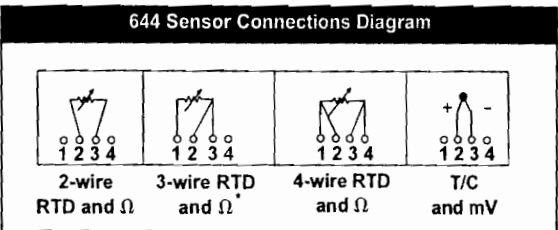
The analog-to-digital measurement circuitry automatically self-calibrates for each temperature update by comparing the dynamic measurement to extremely stable and accurate internal reference elements.

Vibration Effect

The 644 is tested to the following specifications with no effect on performance:

Frequency	Vibration
10 to 60 Hz	0.21 mm displacement
60 to 500 Hz	3 g peak acceleration

Sensor Connections

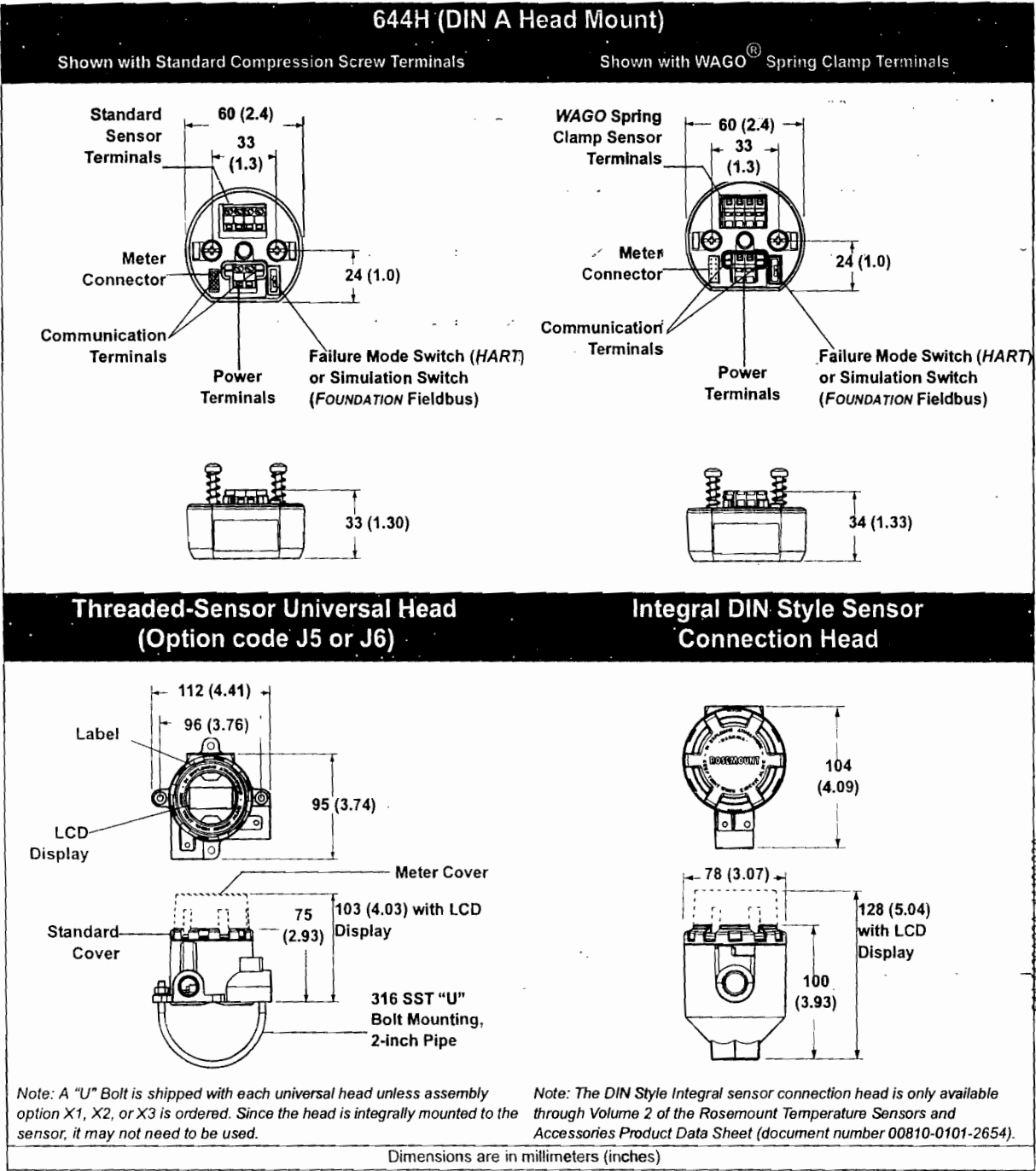


* Rosemount Inc. provides 4-wire sensors for all single element RTDs. You can use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.

Rosemount 644

Product Data Sheet
00813-0100-4728, Rev LA
Catalog 2006 - 2007

Dimensional Drawings



Product Data Sheet

00813-0100-4728, Rev LA
August 2004

Rosemount 644

FOUNDATION FIELDBUS SPECIFICATIONS

Function Blocks

Resource Block

- The resource block contains physical transmitter information including available memory, manufacture identification, device type, software tag, and unique identification.

Transducer Block

- The transducer block contains the actual temperature measurement data, including sensor 1 and terminal temperature. It includes information about sensor type and configuration, engineering units, linearization, reranging, damping, temperature correction, and diagnostics.

LCD Block

- The LCD block is used to configure the local display, if a LCD Display is being used.

Analog Input (AI)

- Processes the measurement and makes it available on the fieldbus segment
- Allows filtering, alarming, and engineering unit changes.

PID Block

- The transmitter provides control functionality with one PID function block in the transmitter. The PID block can be used to perform single loop, cascade, or feedforward control in the field.

Block	Execution Time (milliseconds)
Resource	—
Transducer	—
LCD Block	—
Analog Input 1	45
Analog Input 2	45
PID 1	60

Turn-on Time

Performance within specifications in less than 20 seconds after power is applied, when damping value is set to 0 seconds.

Status

If self-diagnostics detect a sensor burnout or a transmitter failure, the status of the measurement will be updated accordingly. Status may also send the PID output to a safe value.

Power Supply

Powered over FOUNDATION Fieldbus with standard fieldbus power supplies. The transmitter operates between 9.0 and 32.0 VDC, 11 mA maximum. The power terminals are rated to 42.4 VDC (max.).

Alarms

The AI function block allows the user to configure the alarms to HI-HI, HI, LO, or LO-LO with a variety of priority levels and hysteresis settings.

Backup Link Active Scheduler (LAS)

The transmitter is classified as a device link master, which means it can function as a Link Active Scheduler (LAS) if the current link master device fails or is removed from the segment.

The host or other configuration tool is used to download the schedule for the application to the link master device. In the absence of a primary link master, the transmitter will claim the LAS and provide permanent control for the H1 segment.

FOUNDATION Fieldbus Parameters

Schedule Entries	25 ⁽¹⁾
Links	16 ⁽¹⁾
Virtual Communications Relationships (VCR)	12 ⁽¹⁾

(1) Minimum quantity.

FOUNDATION
Fieldbus

Rosemount 644

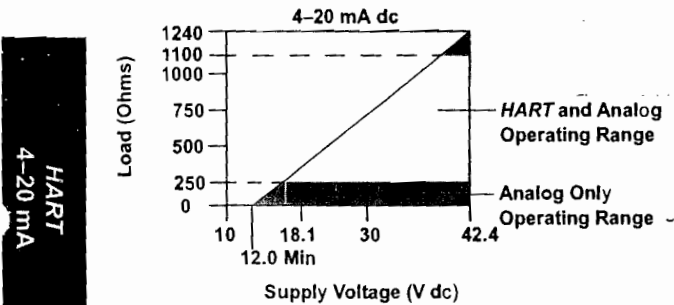
4–20 mA / HART SPECIFICATIONS

Power Supply

External power supply required. Transmitters operate on 12.0 to 42.4 V dc transmitter terminal voltage (with 250 ohm load, 18.1 V dc power supply voltage is required). Transmitter power terminals rated to 42.4 V dc.

Load Limitations

Maximum Load = 40.8 X (Supply Voltage - 12.0)⁽¹⁾



(1) Without transient protection (optional).

NOTE

HART Communication requires a loop resistance between 250 and 1100 ohms. Do not communicate with the transmitter when power is below 12 V dc at the transmitter terminals.

Temperature Limits

	Operating Limit	Storage Limit
With LCD Display	-4 to 185 °F -20 to 85 °C	-50 to 185 °F -45 to 85 °C
Without LCD Display	-40 to 185 °F -40 to 85 °C	-58 to 248 °F -50 to 120 °C

Hardware and Software Failure Mode

The 644 features software driven alarm diagnostics and an independent circuit which is designed to provide backup alarm output if the microprocessor software fails. The alarm direction (HI/LO) is user-selectable using the failure mode switch. If failure occurs, the position of the switch determines the direction in which the output is driven (HI or LO). The switch feeds into the digital-to-analog (D/A) converter, which drives the proper alarm output even if the microprocessor fails. The values at which the transmitter software drives its output in failure mode depends on whether it is configured to standard, custom, or NAMUR-compliant (NAMUR recommendation NE 43, June 1997) operation. Table 1 shows the configuration alarm ranges.

TABLE 1. Available Alarm Range⁽¹⁾

	Standard	NAMUR- NE 43 Compliant
Linear Output:	$3.9 \leq I^{(2)} \leq 20.5$	$3.8 \leq I \leq 20.5$
Fail High:	$21.75 \leq I \leq 23$	$21.5 \leq I \leq 23$
Fail Low:	$3.5 \leq I \leq 3.75$	$3.5 \leq I \leq 3.6$

(1) Measured in milliamperes.

(2) I = Process Variable (current output).

Custom Alarm and Saturation Level

Custom factory configuration of alarm and saturation level is available with option code C1 for valid values. These values can also be configured in the field using a HART Communicator.

Turn-on Time

Performance within specifications in less than 5.0 seconds after power is applied, when damping value is set to 0 seconds.

Transient Protection

The Rosemount 470 prevents damage from transients induced by lightning, welding, or heavy electrical equipment. For more information, refer to the 470 Product Data Sheet (document number 00813-0100-4191).

Product Data Sheet
00813-0100-4728, Rev LA
Catalog 2006 - 2007

Rosemount 644

644 Rail Mount

HART Protocol Only

Sensor Terminals

ROSEMOUNT

Power Terminals

LCD Display

Head Mount Transmitter

Captive Mounting Screws and Springs

Meter Spacer

644H

10 pin Connector

LCD Display

Mounting

Universal Clip for Mounting to a Wall or a Rail
(part number 03044-4103-0001)

G-Rail Grooves

Top Hat Rail Grooves

Screw Holes for Mounting to a Wall

Head Mount

G-Rail (asymmetric)

Top Hat Rail (symmetric)

Mounting Hardware

Transmitter

Rail Clip

Note: Kit (part number 00644-5301-0010) includes mounting hardware and both types of rail kits.

644H Retrofit Kit

Existing Threaded Sensor Connection Head (former option code L1)

Kit includes replacement bracket and screws.

Note: Kit (part number 00644-5321-0010) includes a new mounting bracket and the hardware necessary to facilitate the installation.

15

Page 208 of 284

Rosemount 644

Product Data Sheet

00813-0100-4728, Rev LA

Catalog 2006 - 2007

Ordering Information

● = Available
- = Not Available

Model	Product Description				
644	Smart Temperature Transmitter				
Code	Transmitter Type				
H	Head Mount (suitable for mounting in the field with enclosure options below)				
R	Rail Mount				
Code	Output	Head		Rail	
A	4–20 mA with digital signal based on HART protocol	●	●	●	●
F	Foundation fieldbus digital signal (includes 2 AI function blocks and Backup Link Active Scheduler)	●	●	-	-
Code	Product Certifications	A	F	A	F
Hazardous Locations Certificates (consult factory for availability)					
NA	No approval	●	●	●	-
E5	FM Explosion-Proof	●	●	-	-
I5 ⁽¹⁾	FM Intrinsic Safety (includes standard I.S. and FISCO for Fieldbus units)	●	●	●	-
K5 ⁽¹⁾	FM Intrinsic Safety and Explosion-Proof combination (includes standard I.S. and FISCO for Fieldbus units)	●	●	-	-
I6 ⁽¹⁾	CSA Intrinsic Safety (includes standard I.S. and FISCO for Fieldbus units)	●	●	●	-
K6 ⁽¹⁾	CSA Intrinsic Safety and Explosion-Proof combination (includes standard I.S. and FISCO for Fieldbus units)	●	●	-	-
E1	ATEX Flame-Proof	●	●	-	-
N1	ATEX Type n	●	●	-	-
NC	ATEX Type n Component	●	●	●	-
ND	ATEX Dust Ignition-Proof	●	●	-	-
I1 ⁽¹⁾	ATEX Intrinsic Safety (includes standard I.S. and FISCO for Fieldbus units)	●	●	●	-
E7	SAA Flame-Proof	●	●	-	-
I7 ⁽²⁾⁽¹⁾	SAA Intrinsic Safety (includes standard I.S. and FISCO for Fieldbus units)	●	●	●	-
N7 ⁽²⁾	SAA Type n	●	●	-	-
I2 ⁽²⁾	CEPEL Intrinsic Safety	●	●	-	-
E4 ⁽²⁾	JIS Explosion-Proof	●	●	-	-
I4 ⁽²⁾	JIS Intrinsic Safety	●	●	●	-
Code	Options	A	F	A	F
Plant Web Software Functionality					
A01	Regulatory Control Suite – 1 PID Block	-	●	-	-
Assembly					
XA	Sensor specified separately and assembled to transmitter	●	●	-	-
Local Display (644H only)					
M5	LCD Display	●	●	-	-
Enclosure					
J5 ⁽³⁾	Universal Head (junction box), aluminum alloy with 50.8 mm (2-in.) 316 SST pipe bracket (M20 entries)	●	●	-	-
J6 ⁽³⁾	Universal Head (junction box), aluminum alloy with 50.8 mm (2-in.) 316 SST pipe bracket (1/2–14 NPT entries)	●	●	-	-
J7 ⁽³⁾	Universal Head (junction box), cast SST with 50.8 mm (2-in.) 316 SST pipe bracket (M20 entries)	●	●	-	-
J8 ⁽³⁾	Universal Head (junction box), cast SST with 50.8 mm (2-in.) 316 SST pipe bracket (1/2–14 NPT entries)	●	●	-	-
S1	Connection Head, Polished Stainless Steel (1/2–14 NPT entries)	●	●	-	-
S2	Connection Head, Polished Stainless Steel (1/2–14 NPSM entries)	●	●	-	-
S3	Connection Head, Polished Stainless Steel (M20 x 1.5 conduit and entries)	●	●	-	-
S4	Connection Head, Polished Stainless Steel (M20 x 1.5 conduit entries, M24 x 1.5 head entry)	●	●	-	-
Configuration Options					
C1	Factory configuration date, descriptor, and message fields ("Configuration Data Sheet" on page 21 required).	●	●	●	-
C2	Transmitter-sensor matching, trim to specific Rosemount RTD calibration schedule (CVD constants)	●	●	●	-
A1	Analog output levels compliant with NAMUR-recommendations NE 43: June 1997: high alarm configuration	●	-	●	-
CN	Analog output levels compliant with NAMUR-recommendations NE 43: June 1997: low alarm configuration	●	-	●	-
C8	Low Alarm (standard Rosemount alarm and saturation values)	●	-	●	-
F6	60 Hz line voltage filter	●	●	●	-

Product Data Sheet
 00513-0100-4728, Rev LA
 Catalog 2006 - 2007

Rosemount 644

		● = Available — = Not Available			
		Head		Rail	
		A	F	A	S
Calibration Option					
C4	5-point calibration. (Use calibration code 0490 with factory calibration certificate)	●	●	●	—
Q4	Calibration certificate. 3-Point calibration with certificate	●	●	●	—
Accessory Options					
G1	External ground lug assembly ⁽¹⁾ (see "External Ground Screw Assembly" on page 18)	●	●	—	—
G2	Galvanized ⁽²⁾	●	●	—	—
G3	Cover chain. Only available with enclosure option codes J5 or J6. Not available with LCD Display option code M5.	●	●	—	—
G5	WAGO spring clamp terminal ⁽³⁾	●	●	—	—
Conduit Electrical Connector					
GE ⁽⁴⁾	M12, 4-pin, Male Connector (m12ext ⁽⁵⁾)	●	●	—	—
GM ⁽⁶⁾	A size Mini, 4-pin, Male Connector (m12ext ⁽⁵⁾)	●	●	—	—
Typical Rail Mount Model Number: 644 R A 15					
Typical Head Mount Model Number: 644 H F 15 A01					

(1) When CE approval is required for Foundation Fieldbus, both standard CE and FCC/UL approval is apply. The device label is marked accordingly.

(2) Contact factory for availability.

(3) Suitable for remote mount configuration.

(4) Only available with Enclosure option code J5 or J6. For ATEX approved units the Ground Lug Assembly is included. It is not necessary to choose code G1 for units with ATEX approval.

(5) Only available with Enclosure option code J5.

(6) Available with Intrinsically Safe approval only. For FM Intrinsically Safe or non-hazardous approval choose code M2, consult us at Rosemount for approval. Contact 65055-1250 to ensure correct ATEX rating.

NOTE

For additional options (e.g. "K" codes), please contact your local Emerson Process Management representative.

SEWAGE TREATMENT PLANT		 NTPC Limited (A Govt. of India Enterprise) CONSULTANCY WING			
TRANS NO. C81-29 DATE 13-7-10 SIGNED 		01 APPROVED FOR FABRICATION/CONSTRUCTION 02 APPROVED FOR FABRICATION/CONSTRUCTION SUBJECT TO INCORPORATION OF COMMENTS/ MODIFICATIONS AS NOTED RE SUBMIT REISED DRAWING DOCUMENT 03 NOT APPROVED RE SUBMIT REISED DRAWING DOCUMENT AFTER INCORPORATION OF COMMENTS/ MODIFICATIONS AS NOTED 04 FOR INFORMATION AND RECORDS 05 RE SUBMIT FOR AS L EEC			
IT IS CONVEYED HEREIN NEITHER RELIEVES THE CONTRACTOR OF HIS CONTRACTUAL OBLIGATION AND RESPONSIBILITIES FOR CORRECTNESS OF THIS WORKS' MATERIALS OF CONSTRUCTION DESIGN DETAILS ASSEMBLY PERFORMANCE PARTICULARS AND CONFORMITY OF THE SUPPLIES WITH THE SPECIFICATIONS, APPROVED SCHEMES AND STANDARDS. THEY HAVE NOT DOES IT LIMIT THE PURCHASERS RIGHT UNDER THE CONTRACT. NO CHANGE IN APPROVED DRAWING DOCUMENT IS PERMITTED WITHOUT OWNER'S CONSENT IN WRITING					
3	2/7/2010	FOR APPROVAL	SKS	APU	AVS
2	29/4/2010	REVISED AS PER NTPC COMMENT	SKS	APU	AVS
1	22/12/2009	REVISED AS PER NTPC COMMENT	SKS	APU	AVS
0	5/11/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By
PROJECT		PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).			
CUSTOMER:		 PRAGATI POWER CORPORATION LIMITED (PFCL)			
CONSULTANT:		 NTPC LIMITED, CONSUTANCY WING			
		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			
		THERMAX LIMITED PUNE			
DATA SHEET FOR ORIFICE PLATE					
THERMAX DOC.NO:		BHEL DOC. NO. PE-V0-314-673-A136		OC.NO. 630128	
WH/BB00011		SH NO.1 OF 2		REV. NO : 03	

PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT (SUMP NOMINAL) (STP PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-VO-314-673-A136 Rev. NO.03
THERMAX OC NO: 630128

ORIENTZ FLATE DOC NO. WHBBB00011

S.NO.	PARAMETER	CLARIFICATION	REMARKS
I	Flange assembly drawing is revised for quantity	Flange assembly drawing is revised for quantity as per data sheet.	
II	Beta ratio range	Data sheet note no 01 is revised for beta ratio range & supporting document ISO 5167 is attached.	

MICRO PRECISION PRODUCTS PVT. LTD. Faridabad

Bore Calculation as per ISO - 5167

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

P.O./Enq.No.: E-MAIL ENQUIRY DT 26.09.2009

TAG/ITEM No.: FE-511

MICRO Job No./ Quote No.:

Service: TREATED SEWAGE
Flow Element and Type: G-PLATE, CONC. 50.10
Material of Flow Element: BB316
Material of Pipe: CARBON STEEL
Material of Flange: A193
Pipe Size: 50 (mm) / 10 (mm) 50.30 / 51.30

Type of Tapping: FLANGE TAPS
No. of Tapping: 3 PAIRS
Maximum Flow: 11.00000000 m³/hr (Q)
Normal Flow: 10.00000000 m³/hr (Qn)
METER MAX (Design Flow): 13.00000000 m³/hr (Qm)

Temperature Operating: Celsius (t): 20.00000000
Upstream Pressure (Operating Condition): Kg/cm² (Pabe): 2.53320000

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

Diff Pressure at METER MAX: mm of WC (hm): 2500.00000000
Diff Pressure at Normal Flow: (hn): 1479.28774000

I.D. of Pipe at 20 deg. C: mm (D): 51.30000000
Coeff. of Expan.-Flow Element: mm/mm-C (e) lpe: 0.00001731
Coeff. of Expan.-Pipe: mm/mm-C (e) p: 0.00001201
Correction Factor For Pipe I.D. at 20 deg C: (Ep): 1.00000000
Temp. Corr. Factor for Orifice Plate: (Fop): 1.00000000

Reynold Number: RDH(n): 60915.2735936
Therefore Approx. Beta = d/D: (Approx. Beta KB): 0.61933071

Discharge Coefficient: (C): 0.6123610

Beta Updated: (Bi): 0.6141598

d corrected) at 20 deg C dc=d/Fop: mm (dc): 31.5064002

Vent Hole Diameter: mm (G): 2.30000000
Vent Hole Location: mm (D-G)/2: 24.46000000
d (After Vent Hole Correction): mm (dv): 31.4075101
Pressure Loss at (METER MAX): mm WC (w): 1501.9215050
Pressure Loss at (NORMAL FLOW): mm WC (w1): 800.7104497
Pressure Loss at (MAXIMUM FLOW): mm WC (w2): 1075.3402491

DATE: 29/09/09

Revision no: A, DT 21.12.2009; TYPE & NO. OF TAPPINGS REVISED.

Reference no: THERMAX-D/FE-511

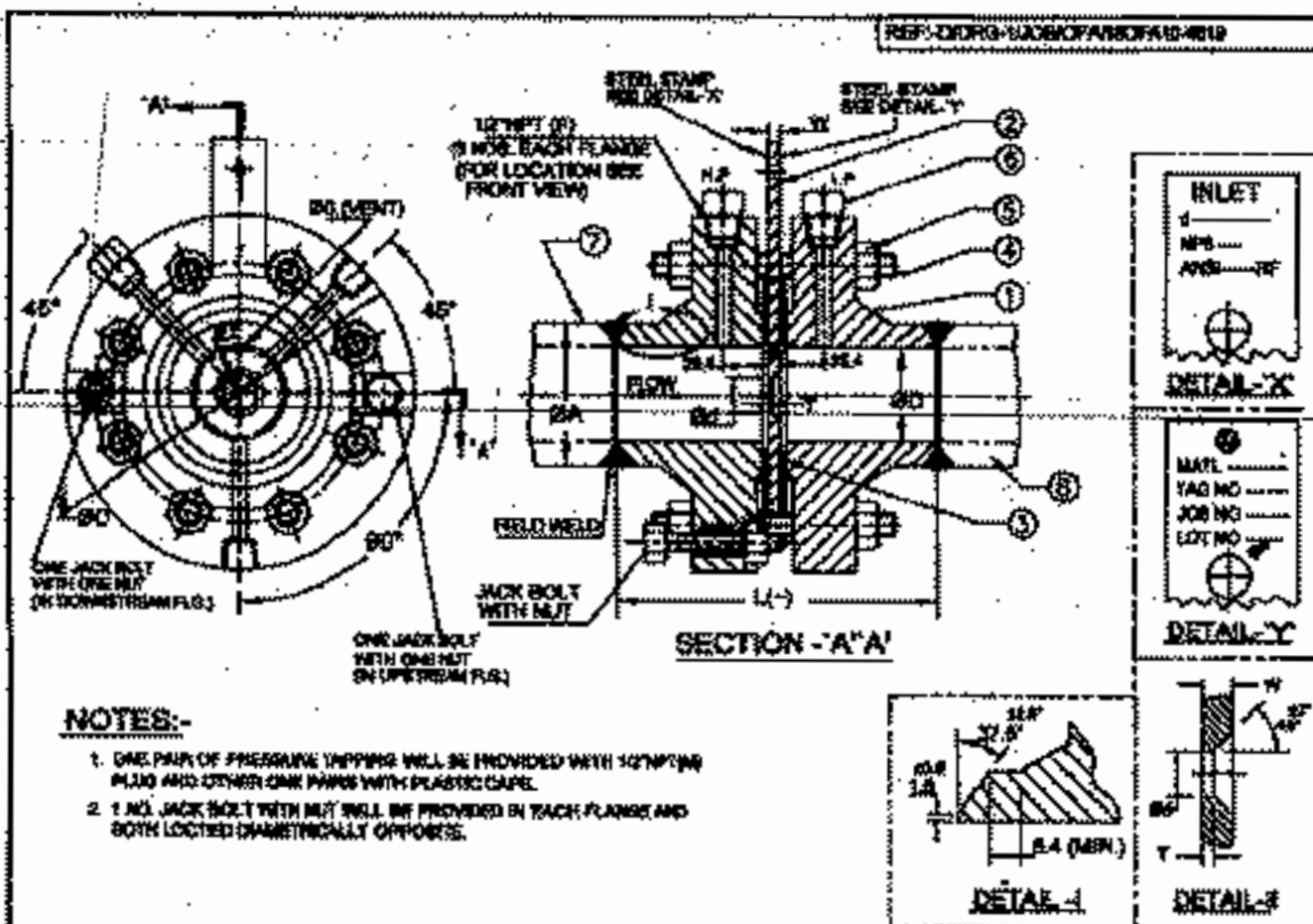
CROSS CHECK OF RESULTS USING CALCULATED VALUES BUT UNITS AS UNDER: -

Qv = 3.14/4 * C * E * (di * d1) * SQRT(2 * DELTA(P) * (p/t)) where (p/t) in Kg/m³Qv in m³/sec = Delta(P) in Pa; di = (d/1000) in meters; E = 1/SQRT(1 - Bi^4);Qv (m³/sec) = 0.00360703 Qm (m³/hr) = 12.98510103

Calculation done by: BBV/SK

Calculation checked by: A

THERMAX MICRO PRECISION



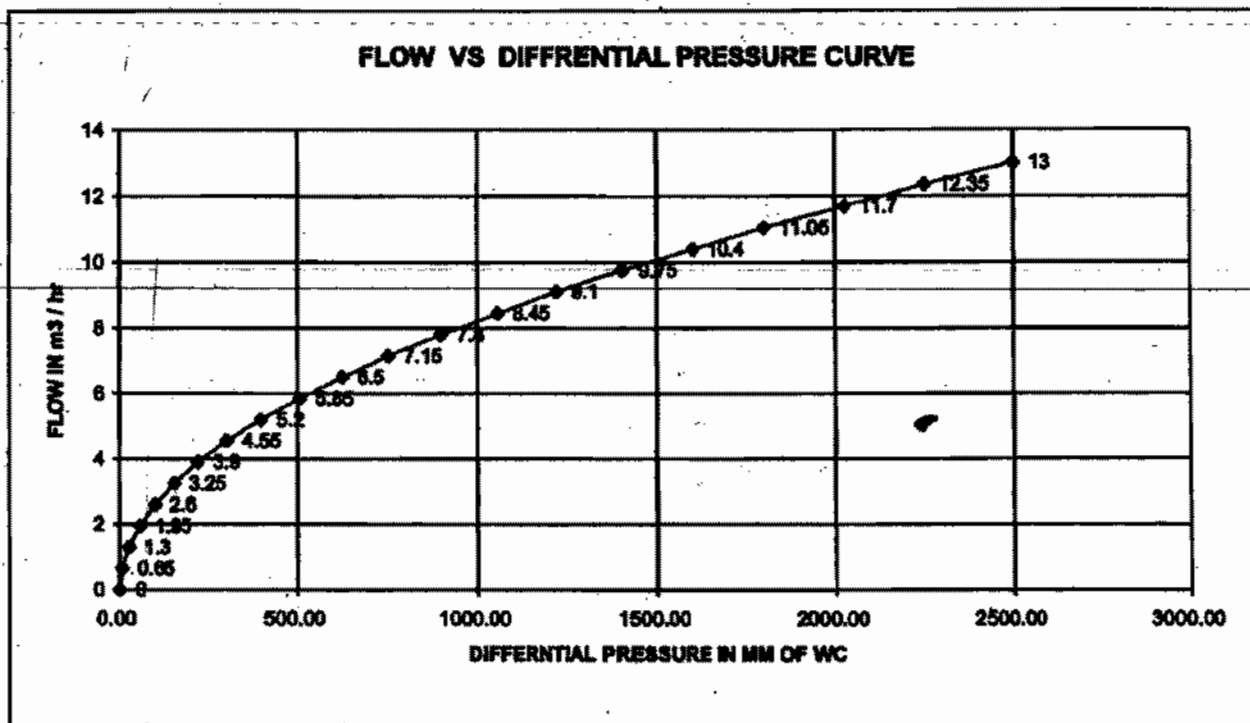
1	FE-511	50	SALE-500 A-100-10-10	1	21.40	51.30	69.3	185.1	184	3.14	0.75	7.38 (VENT)	34.40
B.NO.	TAG NO.	SIZE (INCH)	RATING (AMPI)	QTY. (SET)	BO	BO	BA	BO	LA-1	W	T	SG	RT

8	DOWN STREAM PIPE	1	NOT IN OUR SCOPE	
7	UP STREAM PIPE	1	NOT IN OUR SCOPE	
6	PLUG (1/2" NPT (S))	2	C.S.	
5	NUT	12	ATM GELSH	
4	STUD	12	ATM GELSH	
3	GASKET (1/8" min THK)	2	100% SPIRAL WOUND GRAPHITE FILLER	AME-B 10-20
2	GRIND PLATE (100% RD. 200)	1	BS-304	
1	FLANGE (INNER FACE FINISH 125-250 AARS)	2	A308	

PART NO.	DESCRIPTION	QTY. PER ASSY.	SPECIFICATION	STOCK SIZE	REF. DRG. NO./STD.
----------	-------------	----------------	---------------	------------	--------------------

PROJECT	1200 MM PRACTICE-II EOP PROJECT BANARA	GEN. TOL. EXCEPT AS NOTED
CUSTOMER	M/S. THERMAX LIMITED	ALL DIMENSIONS ARE IN MM EXCEPT AS NOTED
ENG. NO.	E-MAL-ENCL-01 DT. 07.10.2008	APPROVED S.L.S.
JOB NO.		CHECKED S.PAL
TITLE	ORIFICE FLANGE ASSY.	DRAWN A.BHAGI
	(MODEL NO. MOFA10)	DESIGNED
DATE	NO.	DESCRIPTION
		REVISION

SCALE	N.T.S.	MICRO PRECISION PRODUCTS PVT. LTD.	MOFA10/4819
		5, LINK ROAD, SECTOR-23, FARIDABAD	
			SHEET 1 OF 1 REV. 0



1	CUSTOMER	:	M/S THERMAX LIMITED
2	P.O. NO.	:	E-MAIL ENQUIRY DT 28.09.2009
3	PROJECT	:	PRAGATI - III CCPP 1500 MW (NOMINAL)
4	JOB NO.	:	-
5	TAG NO.	:	FE-511
6	SERVICE	:	TREATED SEWAGE

7 O. PLATE I.D. 31.40 mm

8 FLOW EQUATION WITH CONSTANT DENSITY OF 1000.00 KG/M3

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

$$= 0.26 \times \text{SQRT}(DP)$$

9 FLOW EQUATION WITH CHANGE IN DENSITY

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

$$= 0.008222 \times \text{SQRT}(DP) \times \text{SQRT}(ROH)$$



ISO 5167-2:2003(E)

5.2.3.10 The diameter of the pipe shall be measured as specified in 5.4.2, the measurement being made as part of the primary device. This also applies to the distance requirement given in 5.4 measured from the upstream edge of the recess formed by the corner ring.

5.3 Coefficients and corresponding uncertainty of orifice plates

5.3.1 Limits of use

Standard orifice plates shall only be used in accordance with this part of ISO 5167 under the following conditions:

For orifice plates with corner or with D and D/2 pressure tappings:

- $d \geq 12,5 \text{ mm}$;
- $50 \text{ mm} \leq D \leq 1\,000 \text{ mm}$;
- $0,1 \leq \beta \leq 0,75$;
- $Re_D \geq 5\,000$ for $0,1 \leq \beta \leq 0,58$;
- $Re_D \geq 18\,000 \beta^2$ for $\beta > 0,58$.

For orifice plates with flange tappings:

- $d \geq 12,5 \text{ mm}$;
- $50 \text{ mm} \leq D \leq 1\,000 \text{ mm}$;
- $0,1 \leq \beta \leq 0,75$.

Both $Re_D \geq 5\,000$ and $Re_D \geq 170 \beta^2 D$

where D is expressed in millimetres.

The pipe internal roughness shall satisfy the following specification if the uncertainty values in this ISO 5167 are to be met, i.e. the value of the arithmetical mean deviation of the roughness profile, R_a , shall be less than the maximum value given in Table 1 and greater than the minimum value in Table 2. The maximum recommended roughness value in 5.2.2.11 was determined from a database collected from the literature.

where Tables 1 and 2 are listed in 5.2.2.11.

Table 1 — Maximum value of $10^4 R_a/D$

β	15	10	15	15	15	15	10	10	10	10
0,20	15	15	15	15	15	15	15	15	15	15
0,30	15	15	15	15	15	15	15	15	15	15
0,40	15	15	15	15	15	15	15	15	15	15

PRE-TREATMENT PLANT

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

TRANS NO. **007-299**
DATE **16-7-10**
Alcari
(Signature)

☒ APPROVED/RELEASED FOR FABRICATION
☒ APPROVED/RELEASED FOR FABRICATION
 SUBJECT TO INCORPORATION OF
 MODIFICATIONS AS NOTED
 DRAWING DOCUMENT
☒ NOT APPROVED FOR
 AFTER INCORPORATION
 AS NOTED
☒ FOR INFORMATION AND REF.
 FOR REVISION AND RESUBMIT

ALL INFORMATION CONTAINED HEREIN IS NEITHER HELD BY THE PURCHASER NOR IS IT
 TO BE USED FOR DELIVERY AND RESPONSIBILITY TO THE PURCHASER. THE PURCHASER'S
 DESIGN, MATERIAL OF CONSTRUCTION AND THE QUALITY OF THE SUPPLIES ASSEMBLY
 PERFORMANCE PARTICULARS AND CONFORMANCE OF THE SUPPLIES WITH THE
 SPECIFICATIONS APPROVED SCHEMES AND STATUTORY LAWS NOR
 DOES IT AFFECT THE PURCHASER'S RIGHT UNDER THE CONTRACT

Rev No	Date	Description	Prepared By	Reviewed By	Released By
2		FOR APPROVAL	SKS	APU	AVS
1	25/07/2010	FOR APPROVAL	SKS	APU	AVS
0	8/10/2009	FOR APPROVAL	SKS	APU	AVS

PROJECT	PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).				
CUSTOMER	 PRAGATI POWER CORPORTION LIMITED (PPCL)				
CONSULTANT:	 NTPC LIMITED, CONSUTANCY WING				
	 BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA				
	 THERMAX LIMITED PUNE				
DATA SHEET FOR ULTRASONIC LEVEL TRANSMITTER					
THERMAX DOC.NO. WHICE00017		BHEL DOC NO. PE-VO-314-158-A301		OC.NO. 630128 REV NO 02	



PROJECT: - PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW (NOMINAL). (PT PLANT)
OWNER: PRAGATI POWER CORPORATION LIMITED (PPCL)
CLIENT: BHARAT HEAVY ELECTRICALS LTD
CONSULTANT: NTPC LIMITED, CONSULTANCY WING
CLIENT DOC NO: PE-VO-314-158-A301
THERMAX OC NO: 630128

REPLIES TO THE COMMENT ON DATA SHEET

ULTRASONIC TYPE LEVEL TRANSMITTER DOC NO. WHJCE.00017

S.NO.	COMMENT	THERMAX REPLY	REMARKS
I	Instrument specs should match with tender specs.	Offered instrument is as per tender specs, however pls note that offered accuracy is as per manufacturer standard.	
II	Accuracy not matching with tender specs	We have offered Ultrasonic type level transmitter of EMERSON make which is NTPC/BHEL approved vendor. Offered accuracy is as per manufacturer's standard	

INDEX FOR ULTRASONIC LEVEL TRANSMITTER							
SR NO.	TAG NO	TANK	TANK MOC	TEMP	TANK HEIGHT IN MM	FLUID	REMARK
1	LT-751	LIME SLAKING TANK - T 1070 A	RCC	AMB	2200	LIME	FOR SPECIFICATION REFER SFEET NO.03
2	LT-752	LIME SLAKING TANK - T 1070 B	RCC	AMB	2200	LIME	FOR SPECIFICATION REFER SFEET NO.03
3	LT-753	LIME DOSING TANK - T 1080 A	RCC	AMB	2100	LIME	FOR SPECIFICATION REFER SFEET NO.03
4	LT-754	LIME DOSING TANK - T 1080 B	RCC	AMB	2100	LIME	FOR SPECIFICATION REFER SFEET NO.03
5	LT-755	LIME DOSING TANK - T 1080 C	RCC	AMB	2100	LIME	FOR SPECIFICATION REFER SFEET NO.03
6	LT-756	FeCL3 DOSING TANK - T 1090 A	RCC	AMB	2400	FeCL3	FOR SPECIFICATION REFER SFEET NO.03
7	LT-757	FeCL3 DOSING TANK - T 1090 B	RCC	AMB	2400	FeCL3	FOR SPECIFICATION REFER SFEET NO.03
8	LT-758	FeCL3 DOSING TANK - T 1090 C	RCC	AMB	2400	FeCL3	FOR SPECIFICATION REFER SFEET NO.03
9	LT-759	PE DOSING TANK - T 1100 A	MSRL	AMB	2600	PE	FOR SPECIFICATION REFER SFEET NO.03
10	LT-760	PE DOSING TANK - T 1100 B	MSRL	AMB	2600	PE	FOR SPECIFICATION REFER SFEET NO.03

Note: 4" flange shall be supplied along with the tank. 4" counter flange of 2"

NPT(F) threaded connection for fitting the instrument shall be supplied (Thermax WWS scope)

QTY	2	PROJECT PRASAD INCORPORATED CHOLEPILVER	2	2/3/2010	SKS	APU	AVS
MAKE	TELEPHON	PROJECT PRASAD INCORPORATED AT RAIPUR, JHARKH	1	23/01/2010	SKS	APU	AVS
THERMAX LIMITED	CO NO 630128		0	17/08/2009	SKS	APU	AVS
Water & Waste Treatment	OTHER PROJECTS FOR CORPORATION OF DELHI	For	Date	Prepared by	Checked by	App by	
Sanitation & Sewerage	City of Delhi - Project - RAIPUR	Project Manager	Project Engineer	PLANT	SHR		
Process & Pollution	Project - RAIPUR	Project Engineer	Project Engineer	PT			

Ultrasonic Level Transmitter Specification Sheet							
Sr	Identification	Specification					
General							
1	Make	杭州博微自动化有限公司					
2	Model Number	3172SMART-2-A-1"					
3	Type	Ultrasonic Type Level Transmitter SMART with local indication - 2 wire					
Transmitter							
4	Accuracy	± 0.25 % Of Measured Distance for > 1m ± 2.5 mm < 1m					
5	Level Range	Refer index (sheet no 02)					
6	Maximum Span Limit	0 to 11 m					
7	Output	4-20 mA with HART communication					
8	Power Supply	12 - 30 V DC					
9	Level Resolution	Better than 1 mm					
10	Blanking Distance / Dead Zone	0.3 m					
11	Process Pressure Rating	-0.25 to 3 bar					
12	Process Temperature	-30 to 70 °C					
13	Update Interval	1 second					
14	Beam Angle	3°					
15	Temperature Compensation	Automatic Integral Optimal remote sensor for dynamic					
16	Local Indication	Digital LCD Indication in Engineering Unit					
17	Process connections	2" NPT Thread					
18	Electrical connections / Conduit Entry	PLUG & SOCKET TYPE X 2Nos					
Material Of Construction							
19	Sensing Element	PVDF					
20	Cover Seal	Silicon Rubber					
21	Sensor Body	EPDM					
22	Enclosure / Housing	NEMA 4X, IP66, Polyurethane-covered Aluminum					
Accessories							
23	Tag Plate	Stainless Steel engraved Tag Plate					
Certificates							
24	Certificates	76 Certificates - Standard					

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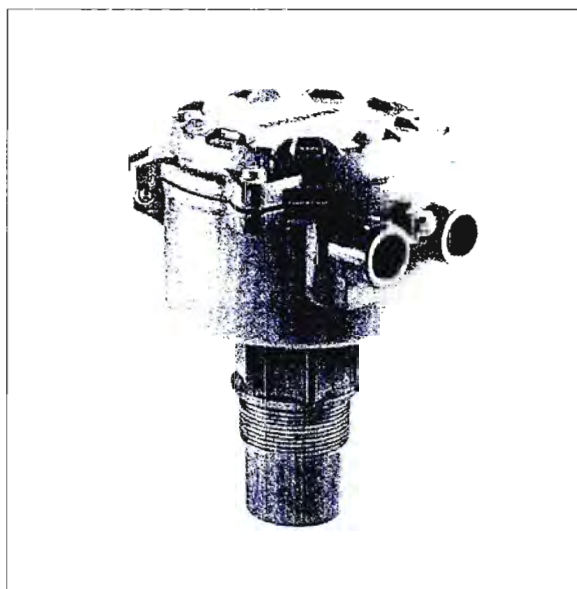
Rosemount 3100 Series

Rosemount 3100 Series Ultrasonic Level Transmitters

The Rosemount 3100 Series is a loop-powered ultrasonic transmitter designed for reliable continuous level measurement.

THE 3100 SERIES FEATURES:

- *Non-contacting measurement with no moving parts.*
- *Integral LCD and push-buttons as standard for on-site programming,*
- *Continuous measurement of level or distance-to-surface. Volume or open channel flow calculations for models 3102 and 3105*
- *2 integral signal relays for model 3102.*
- *Easy to install and configure.*
- *Rugged aluminum housing and PVDF wetted material.*
- *2-wire dc loop-powered.*



Contents

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Load Limitations	page 10
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Rosemount 3100 Series

Reliability in a Universal Package

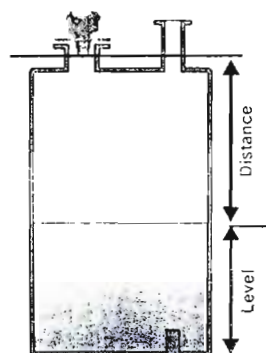
The Rosemount 3100 Series is a liquid level transmitter based on ultrasonic technology making it suitable for many liquid applications.

MEASUREMENT PRINCIPLE

Ultrasonic pulse signals are transmitted from the face of the transmitter, and are then reflected from the liquid surface. The transmitter 'listens' for these reflected signals (echoes) and measures the time-delay between transmitting and receiving.

The distance to the liquid surface is automatically calculated by using the computed time-delay.

$Distance = Speed\ of\ sound\ in\ air * (Time-delay / 2)$



An integral temperature sensor continuously measures the air temperature around the transmitter, and uses this to compute the *speed of sound in air*, thereby automatically compensating *Distance* for temperature effects.

Models 3102 and 3105 have the option of a Remote Temperature Sensor for dynamic temperature compensation.

The Distance measurement can be output through the 4-20mA or HART output.

Level Measurement

When programmed with the bottom reference of the application - usually the bottom of a tank - the transmitter will calculate the liquid depth (Level).

The calculated Level can be output through the 4-20mA or HART output.

Volume Measurement

Models 3102 and 3105 can also calculate the volume of liquid in a tank. The transmitter has a library of profile shapes for selection.

The calculated Volume can be output through the 4-20mA or HART output.

Open Channel Flow Measurement

Models 3102 and 3105 can also calculate the rate of liquid flow in an open channel. The transmitter has a library of standard open channel flow structure profiles, but can also support a user-defined flow profile that is plotted or calculated.

The calculated Flow Rate can be output through the 4-20mA or HART output.

It is possible to enter a 10-point strapping table for non-standard tank shapes and flow structures.

SPECIAL FEATURES

Advanced software features

- Learn routine (false echo registration)

Manually teach the transmitter to ignore up to four false echoes, caused by the pulse signal reflecting off obstructions, until the actual level is seen.
- Empty tank mapping

When a tank is empty, automatically teach the transmitter up to four false echoes, without the need for user interaction.
- Present depth

When the tank is not empty, the bottom reference can be automatically reset to be the sum of a user-entered (known) present depth and the distance to the surface.
- Set as empty

When the tank is known to be empty, the bottom reference can be automatically reset to be the measured distance.
- Distance offset

The distance to the surface can be adjusted by a user-entered positive or negative offset value.
- Level offset

The level can be adjusted by a user-entered positive or negative offset value.
- Bottom blanking

If there is an obstruction on the bottom of a tank, the false echoes can be avoided by specifying an area to ignore.

Relays on model 3102

- Two integral relays for control functionality

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Rosemount 3100 Series

Integral display and push buttons (all models)

The central area of the display allows up to five alphanumeric characters to be displayed. This is either the measurement or data to assist when programming.

To the left of the central area, on Model 3102 and 3105 only, there are **four arrow icons**, only one of which will be illuminated at any one time to indicate the duty chosen by the user:

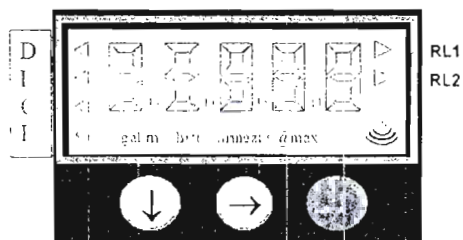
- D (Distance-to-surface)
- L (Level)
- C (Content / Volume)
- F (Flow)

To the right of the central area, on Model 3102 only, there are **two arrow icons** that indicate the status of the transmitter relay outputs RL1 and RL2.

When illuminated, they indicate that the relay contact is closed.

Under the central area is a list of units of measurement. The transmitter will illuminate only those characters applicable to the units of measurement chosen.

To the right of the measurement units is an **echo received icon** made up of 3 arc segments that continuously indicate the strength of the echo received (minimum, average, and good).



Integral push-buttons and display

Rosemount 3100 Series

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Selecting a Rosemount 3100 Series transmitter

Overview of models

Choose model 3101 for simple level or distance measurements over a range of 1 - 26 ft (0.3 - 8 m), and a 4-20mA signal output.

Choose model 3102, with 2 integral relays, for level or distance measurements over a range of 1 - 36 ft (0.3 - 11 m). Also features volume and open channel flow calculations, and a 4-20mA / HART output.

Choose the Intrinsically Safe certified model 3105 for level or distance measurements over a range of 1 - 36 ft (0.3 - 11 m) in hazardous areas. Also features volume and open channel flow calculations, and a 4-20mA / HART output.

Housing

The housing is available in aluminum, and has two 1/2-inch NPT cable/conduit entries.

Option of M20 x 1.5 conduit/cable adaptors.

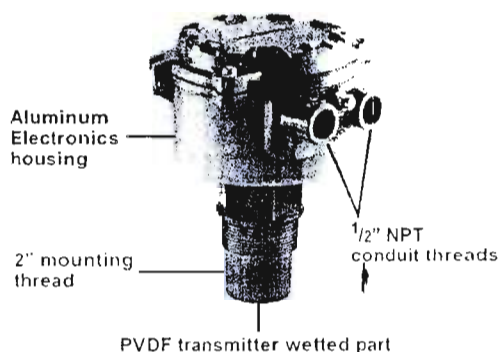
Wetted parts are made of corrosion resistant PVDF

Process Connection

Threaded Connection

Threads: 2-inch BSPT or 2-inch NPT

Optional flange accessories: See page 17.



Electrical connections

(For full specification, see page 8)

Power supply

The 3100 Series requires an external power supply:

3101: 12 - 30 Vdc

3102: 12 - 40 Vdc

3105: 12 - 40 Vdc, (12 - 30 Vdc in hazardous area)

Signal output

Model 3101 has an analog 4-20mA output, which is powered by the voltage supplied to the transmitter.

Models 3102 and 3105 have a 4-20mA output with HART® communication. This is powered by the voltage supply to the transmitter.

Relay outputs

Model 3102 has two relay outputs, which are powered by the voltage supply to the transmitter

Remote temperature sensor

All models have an integrated temperature sensor for automatically compensating for temperature effects.

Models 3102 and 3105 have support for connecting a Rosemount Remote Temperature Sensor, which is an optional accessory (see page 17). When used, it automatically overrides the integral sensor and provides dynamic temperature compensation.

Measurements and Calculations

3101: Level, or distance to the surface.

3102: Level (or distance), volume, open channel flow.

3105: Level (or distance), volume, open channel flow

Measurement range

3101: 1 - 26 ft (0.3 - 8 m)

3102: 1 - 36 ft (0.3 - 11 m)

3105: 1 - 36 ft (0.3 - 11 m)

Product certifications

(For a summary of certifications, see page 11.)

Non-hazardous area installation

3101 and 3102 are available for:

- FM and CSA Ordinary Location installation.

Hazardous area installation

3105 is available for:

- FM Intrinsically Safe/Non-incendive installation
- CSA Intrinsically Safe/Non-incendive installation
- ATEX and IECEx Intrinsically Safe installation

NOTE:

Product certifications are selected using the Ordering Information (see page 14 onwards).

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Rosemount 3100 Series

System Integration

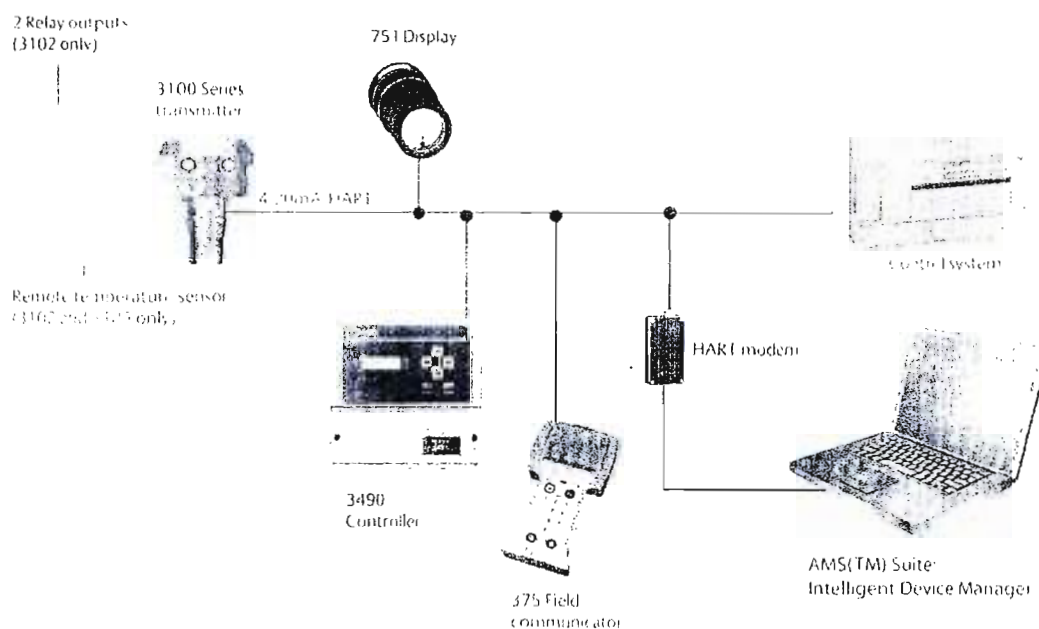
The Rosemount 3100 Series transmitter uses the same two wires for power supply and communication

Measurement data is transmitted as an analog 4-20mA signal as standard.

On models 3102 and 3105, a digital HART® signal superimposed on the 4-20mA signal.

The 3100 Series requires an external power supply

- 3101: 12 to 30 Vdc
- 3102: 12 to 40 Vdc
- 3105: 12 to 40 Vdc (30 Vdc in hazardous area).



The Rosemount 3100 Series transmitter powers PlantWeb® with easier configuration, lower installation costs, higher reliability and device diagnostics that enable predictive intelligence, reduce operating costs and improve plant availability

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Rosemount 3100 Series

Installation Best Practices

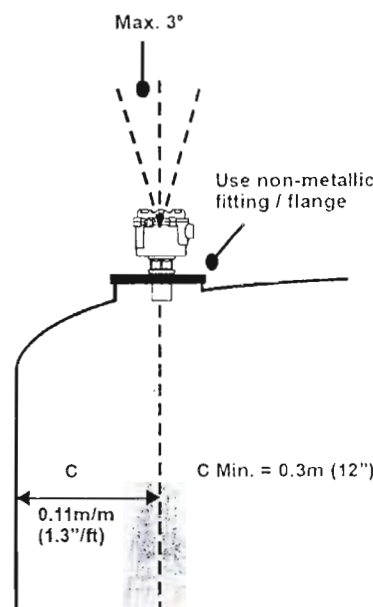
Correct location of the transmitter is essential for the reliable operation of any ultrasonic level measurement system.

NOTE:

The Rosemount 3100 Series is designed to be mounted in a *non-metallic fitting or flange*. Please check optional PVC flange accessories on page 17.

Mounting considerations

- The transmitter should be mounted above the liquid surface using the 2-inch thread provided. To facilitate mounting, optional flanges are available as an accessory - see page 17
- Mount the transmitter as near vertical as possible to ensure a *good echo* from the liquid surface for *maximum echo size* received.
- Obstructions within the beam angle generate strong "false-echoes"; wherever possible, the transmitter should be positioned such that false echoes are avoided.
- To avoid detecting unwanted objects in the tank or well, it is advisable to maintain a distance of at least 4.3 inches (0.11 metres) from the centre line of the transmitter for every metre range to the obstruction
- It is recommended not to mount the transmitter closer than 12 inches (0.3 metres) to the wall to avoid losing echo size.
- Avoid applications where heavy condensation could form on the transducer face.
- If the transmitter is mounted in a stand-off or nozzle, it is always preferable that the transmitter face protrudes at least 5mm into the tank. If this is not possible, see "Mounting in a nozzle" on page 7
- In environments where direct sunlight can cause high surface temperatures on exposed instruments, it is recommended to use a suitable sun-shade.



Liquid surface conditions

- Foaming liquids can reduce the size of the returned echo as foam is a poor ultrasonic reflector. It is always preferable to mount an ultrasonic transmitter over an area of clear liquid
- Beware of mounting the transmitter directly over any inlet stream.
- Liquid surface turbulence is not normally a problem unless it is excessive. In most cases, the effects of turbulence are minor, with excessive turbulence being catered for by fine-tuning the transmitter on site if necessary.
- A still-pipe can be used to avoid foam and turbulence.

In-tank effects

- Stirrers or agitators can cause a vortex. Always try to mount the transmitter off-centre of any vortex to maximise the return echo.
- As stirrer blades become uncovered, they will create echoes as they pass through the ultrasonic beam. The transmitter can be tuned on-site to ignore these false echoes.

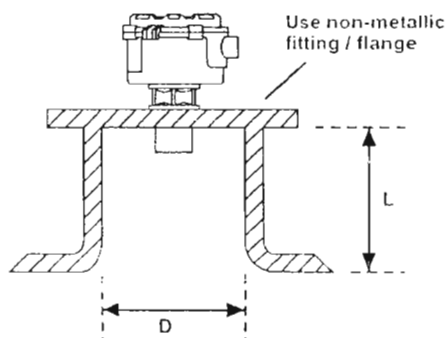
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Rosemount 3100 Series

Mounting in a nozzle



It is important that the *bottom reference* of the transmitter is related to the centre of the invert of the primary device (see below), and NOT the distance to the channel bottom directly below the transmitter.

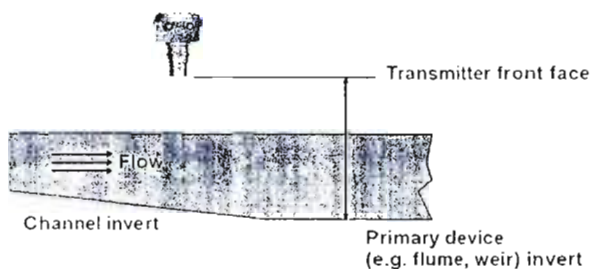


TABLE 1.

Nozzle Diameter Size (D)	Maximum Nozzle Length (L)
DN50 (2 inch)	18mm (3/4")
DN80 (3 inch)	100mm (4')
DN100 (4 inch)	100mm (4')
DN125 (5 inch)	200mm (8")
DN150 (6 inch)	350mm (14")

NOTES:

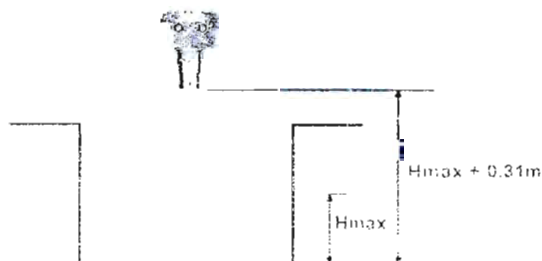
- The liquid surface at the point of measurement must have a stable, smooth surface and uniform approach velocity. It must not be affected by baffles, foam, hydraulic jumps or any other object likely to cause flow disruption
- The primary element should be free from any situation where it is likely to 'drown' (refer to relevant Standard for further information)

Open Channel Flow installations (Models 3102/3105)

There are normally two distinct parts to an open channel flow measurement system; the primary element (flow structure) and the secondary element (head measurement instrumentation). For accurate open channel flow measurement, both parts of the system must be installed accurately.

The transmitter should be positioned at the correct distance upstream from the flow structure at a height that is at least equal to the maximum flow depth plus the blanking distance (dead zone) of the transmitter (see below)

A minimum distance of 0.31m is recommended.



Rosemount 3100 Series

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Specifications

General	
Product	Rosemount 3100 Series level transmitters: Model 3101 for Level and Distance measurement Model 3102 for Level, Distance, Volume, and Open channel flow measurement with 2 integral signal relays. Model 3105 for Level, Distance, Volume, and Open channel flow measurement for hazardous locations.
Measurement principle	Ultrasonic, time-of-flight.
Measuring performance	
Measurement range	Model 3101: 1 - 26 ft (0.3 - 8 m) Model 3102: 1 - 36 ft (0.3 - 11 m) Model 3105: 1 - 36 ft (0.3 - 11 m)
Level resolution	Better than $1/16"$ (1 mm)
Level accuracy	Model 3101: ± 0.2 in. (5 mm) for <3.3 ft (1 m). $\pm 0.5\%$ of measured distance for >3.3 ft (1 m) Models 3102 and 3105: ± 0.1 in. (2.5 mm) <3.3 ft (1 m), $\pm 0.25\%$ of measured distance for >3.3 ft (1 m) under reference conditions ⁽¹⁾
Blanking distance (Dead Zone)	12" (0.3m)
Update interval	1 second
Display / Configuration	
Integral Display	4/5 digit display for live measurement, and for configuration purposes
Output Units	For Level or distance-to-surface: m, ft, in. or none For Contents: l, m ³ , gal, or ft ³ For Flow: l/s, l/m, m ³ /hr, gal/s, gal/m, ft ³ /m (cfm), ft ³ /hr, or none
Output Variables	Model 3101: Level, or distance-to-surface Model 3102: Level (or distance-to-surface), Content (Volume), and Flow. Model 3105: Level (or distance-to-surface), Content (Volume), and Flow.
Configuration tools	Standard integral push-buttons with LCD. Rosemount hand-held communicator Model 275 or 375. Rosemount 3490 Series universal control unit. Rosemount AMS(TM) Suite
Electrical	
Power supply	Loop-powered (2-wire) Model 3101: 12 - 30 Vdc Model 3102: 12 - 40 Vdc Model 3105: 12 - 40 Vdc (non-hazardous area), 12 - 30 Vdc (hazardous area).
Earthing	None required.
Current Output	Model 3101: Analog 4-20 mA Model 3102: Analog 4-20 mA, HART® Model 3105: Analog 4-20 mA, HART®
Signal on alarm	Standard: Low = 3.75 mA, High = 21.75 mA Nimur NE43: Low = 3.8 mA, High = 22.5 mA
Saturation levels	Standard: Low = 3.9 mA, High = 20.8 mA. Nimur NE43: Low = 3.8 mA, High = 20.5 mA
Relay output (on 3102 model)	2 integral signal relays, SPST rated 1A @ 30VDC (inductive) and 2A @ 30VDC (resistive)
Electrical parameters	$U_i = 30$ V, $I_i = 120$ mA, $P_i = 0.82$ W, $L_i = 108 \mu$ H, $C_i = 0$ nF.
Cable entry	$1/2"$ - 14 NPT conduit entries for cable glands. Option: M20 x 1.5 conduit/cable adaptor
Output Cabling	Single twisted-pair and shielded, min. 0.22 mm ² (24 AWG), max. 1.5 mm ² (15 AWG).
Materials of construction	
Wet-side material	PVDF
Body and cover material	Polyurethane covered Aluminum.
Cover seal	Silicone rubber
Cover screws	316 Stainless Steel
Transducer body seal	EPDM.

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Rosemount 3100 Series

Mechanical	
Mounting thread size	2" NPT, or 2" BSP. Optional flange accessories available.
Measuring	
Temperature compensation	Model 3101: Automatic Integral temperature compensation. Model 3102: Automatic Integral temperature compensation. Optional remote temperature sensor for dynamic temperature compensation. ⁽²⁾ Model 3105: Automatic Integral temperature compensation. Optional remote temperature sensor for dynamic temperature compensation. ⁽²⁾
Environment	
Ambient temperature	Model 3101: -4 °F to +158 °F (-20 °C to +70 °C) Models 3102 and 3105: -40 °F to +158 °F (-40 °C to +70 °C) ⁽³⁾
Process temperature	Model 3101: -4 °F to +158 °F (-20 °C to +70 °C) Models 3102 and 3105: -22 °F to +158 °F (-30 °C to +70 °C)
Process pressure	-4 to +44 psi (-0.25 to 3.0 bar)
Ingress protection	NEMA 4X, IP 66
Electromagnetic compatibility	EN61326 (Class B)
Certifications	CE-mark, FM, CSA, ATEX, or IECEx - dependent on order code

⁽¹⁾ Temperature: 20°C, Pressure: 101.3 kPa (atmospheric pressure), and Relative Humidity: 65%⁽²⁾ See page 17 for optional accessories⁽³⁾ See page 11 onwards for approval temperature ranges

Product Data Sheet

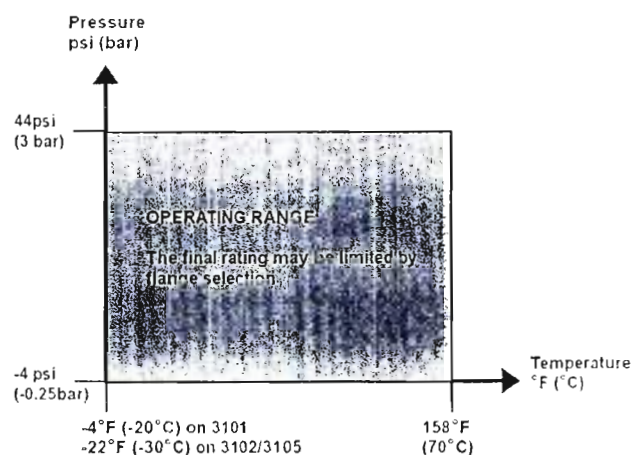
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Rosemount 3100 Series

Temperature and Pressure Ratings

The process temperature/pressure rating depends on the design of the transmitter in combination with the flange materials.

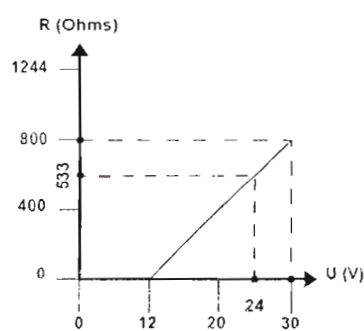


Process temperature and pressure diagram for Rosemount 3100 Series

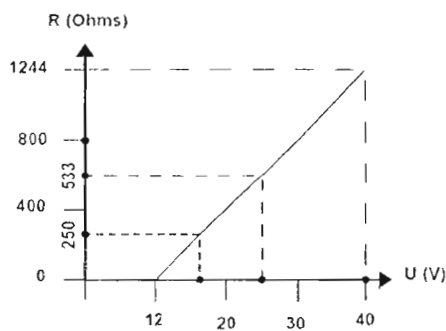
Load Limitations

A HART® Communicator requires a minimum load resistance of 250 Ohm within the loop in order to function properly. Communication with Rosemount 3490 Universal Controller does not require additional resistance. The maximum load resistance can be determined from these diagrams:

Non-Intrinsically Safe Installations

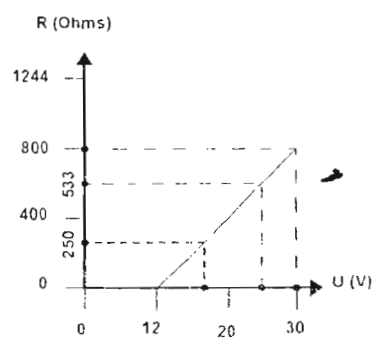


Model 3101



Models 3102 and 3105

Intrinsically Safe Installations



Model 3105

NOTE

R = Maximum Load Resistance

U = External Power Supply Voltage

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Rosemount 3100 Series

Product Certifications

ORDINARY LOCATION CERTIFICATION FOR FM (MODELS 3101/3102)

- APPROVAL PENDING

G5 Project ID: 3024095

The transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

ORDINARY LOCATION CERTIFICATION FOR CSA (MODELS 3101/3102)

G6 Project ID: 1878089

The transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by CSA, a nationally recognized testing laboratory as accredited by the Standards Council of Canada (SCC).

EUROPEAN DIRECTIVE INFORMATION

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting your local sales office.

ATEX Directive (94/9/EC)

Complies with the ATEX Directive.

Pressure Equipment Directive (PED) (97/23/EC)

3100 Series is outside the scope of PED Directive.

Electro Magnetic Compatibility (EMC) Directive

EN61326 (Class B)

CE-mark

Complies with applicable directives

3101, 3102 (EMC)

3105 (EMC, ATEX)

HAZARDOUS LOCATIONS CERTIFICATIONS (MODEL 3105)

Factory Mutual (FM) Approvals

Factory Mutual (FM) Intrinsically Safe Approval

I5 Project ID: 3024095

Intrinsically Safe for Class I, Div. 1, Groups A, B, C and D
Intrinsically Safe for Class I, Zone 0, AEx ia IIC
Temperature Code: T4 at +60°C, max ambient
Temperature Code: T6 at +55°C, max ambient

Control Drawing: 71097/1216

Ui = 30 V, Ii = 120 mA, Pi = 0.82 W, Li = 108 µH, Ci = 0 µF

Factory Mutual (FM) Non-Incendive Approval

I5 Project ID: 3024095

Non-Incendive for Class I, Div. 2, Groups A, B, C and D
Non-Incendive for Class I, Zone 2, AEx nA IIC
Temperature Code: T4 at +60°C, max ambient
Temperature Code: T6 at +55°C, max ambient

Control Drawing: 71097/1216

Ui = 30 V, Ii = 120 mA, Pi = 0.82 W, Li = 108 µH, Ci = 0 µF

Canadian Standards Association (CSA) Approvals

Canadian Standards Association (CSA) Intrinsically Safe Approval

I6 Project ID: 07 CSA 1878089

Intrinsically Safe for Class I, Div. 1, Groups A, B, C, and D
Intrinsically Safe for Class 1, Zone 0, Ex ia IIC
Temperature Code:
T4 (T_{amb} -40°C to +60°C)
T6 (T_{amb} -40°C to +55°C)

Control Drawing: 71097/1216

Ui = 30 V, Ii = 120 mA, Pi = 0.82 W, Li = 108 µH, Ci = 0 µF

Canadian Standards Association (CSA) Non-Incendive Approval

i6 Project ID: 07 CSA 1878089

Non-Incendive for Class I, Div. 2, Groups A, B, C, and D
Non-Incendive for Class I, Zone 2, Ex nL IIC
Temperature Code:
T4 (T_{amb} -40°C to +60°C)
T6 (T_{amb} -40°C to +55°C)

Control Drawing: 71097/1216

Ui = 30 V, Ii = 120 mA, Pi = 0.82 W, Li = 108 µH, Ci = 0 µF

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Rosemount 3100 Series

ATEX Intrinsically Safe Approval

- 11 Certificate: Sira 06ATEX2260X
Intrinsically Safe for II 1 G, EEx ia IIC
Temperature Class
T4 (T_{amb} -40°C to +60°C)
T6 (T_{amb} -40°C to +55°C)

$U_i = 30\text{ V}$, $I_i = 120\text{ mA}$, $P_i = 0.82\text{ W}$, $L_i = 108\text{ }\mu\text{H}$, $C_i = 0\text{ }\mu\text{F}$

Special conditions for safe use:

- 1 All transmitter models have external plastic parts, which could present a risk of ignition due to electrostatic charge build-up. They shall not be directly installed in any process where its enclosure might be charged by the rapid flow of non-conductive media.
- 2 All transmitter models shall only be cleaned with a damp cloth.
- 3 When the transmitter housing uses aluminum alloy in its construction, this presents a risk of ignition due to impact and shall be taken into consideration on installation and use.

IECEx Approval

- 17 Certificate: IECEx SIR 06.0068X
Intrinsically Safe for Zone 0, Ex ia IIC
Temperature Class:
T4 (T_{amb} -40°C to +60°C)
T6 (T_{amb} -40°C to +55°C)

$U_i = 30\text{ V}$, $I_i = 120\text{ mA}$, $P_i = 0.82\text{ W}$, $L_i = 108\text{ }\mu\text{H}$, $C_i = 0\text{ }\mu\text{F}$

Special conditions for safe use:

- 1 All transmitter models have external plastic parts, which could present a risk of ignition due to electrostatic charge build-up. They shall not be directly installed in any process where its enclosure might be charged by the rapid flow of non-conductive media.
- 2 All transmitter models shall only be cleaned with a cloth
- 3 When the transmitter housing uses aluminum alloy in its construction, this presents a risk of ignition due to impact and shall be taken into consideration on installation and use.

Product Data Sheet

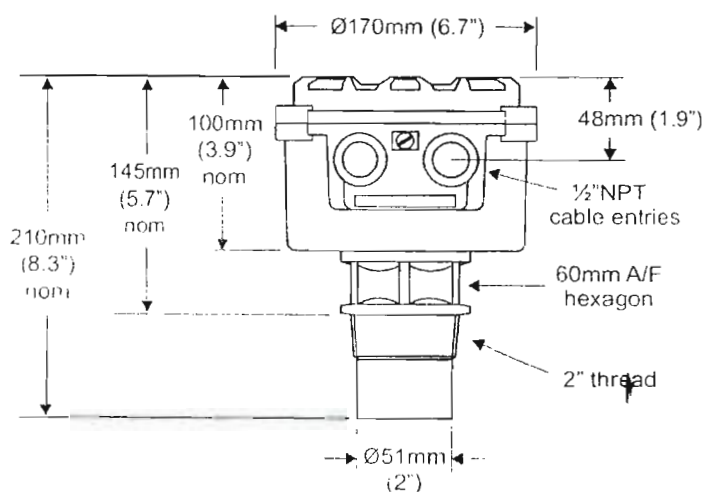
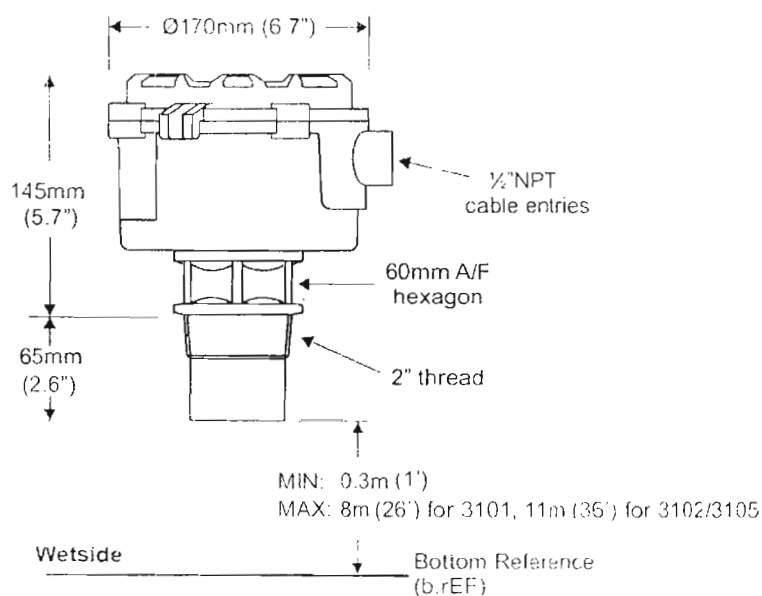
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Rosemount 3100 Series

Dimensional Drawings

Threaded Mounting



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Rosemount 3100 Series

Model Code 3102, Level, Volume or Flow of liquids

Model	Product Description
3102	Ultrasonic level transmitter with 2 integral relays
Code	Signal Output
H	4-20 mA with HART [®] communication
Code	Housing Material
A	Polyurethane-covered Aluminum
Code	Conduit / Cable Threads
1	½ - 14 NPT
2	M20 x 1.5 adaptor
Code	Wet-side material
F	PVDF
Code	Process Connection
RC	2" NPT thread ⁽¹⁾
SC	2" BSPT thread ⁽²⁾
Code	Certificates
NA	No certification
G5	FM Ordinary Location
G6	CSA Ordinary Location
Code	Options
Alarms	
C4	Namur alarm and saturation levels; high alarm.
C5	Namur alarm and saturation levels; low alarm.
C6	Low alarm setting with standard Rosemount alarm and saturation levels.
Tag Plate	
ST	Stainless Steel engraved tag plate
WT	Laminated paper tag plate

⁽¹⁾ Choosing this option implies US (imperial) units of measurement are required for the default configuration.⁽²⁾ Choosing this option implies Metric units of measurement are required for the default configuration

Example model order code: 3102-H-A-1-F-RC-G5-C4-ST



REPLIES TO THE COMMENT ON ROTAMETER. DATA SHEET REV 00 VIDE MAIL DATED 31/08/09

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

CUSTOMER: PRAGATI POWER CORPORATION LIMITED

CONSULTANT: NTPC LIMITED, CONSULTANCY WING

BHEL DOCUMENT NO: PE-VO-314-156-A108

THERMAX DOCUMENT NO: WHJBA00015 REV.00

ROTMETER

S.NO	COMMENT	THERMAX REPLY	REMARKS
I	Pipe material CS	Noted & data sheet is revised accordingly	
II	Tube in SS 316	Borosilicate glass is suitable for application & same is mention in data sheet	
III	Frame & wetted part is in SS 316	Rotameter is for water application. Hence frame is in MS & wetted parts is in CS is suitable for process Application.	
IV	Hosing protection class: IP-55	Noted & Confirmed	

SSF PLANT

1	8/9/2009	REVISED AS PER BHEL COMMENT	SKS	APU	AVS
0	14/8/2009	FOR APPROVAL	SKS	APU	AVS
Rev. No	Date	Description	Prepared By	Reviewed By	Released By

PROJECT	PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL).				
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CUSTOMER: 	PRAGATI POWER CORPORTION LIMITED (PPCL)				
--	--	--	--	--	--

CONSULTANT: 	NTPC LIMITED, CONSULTANCY WING				
--	---------------------------------------	--	--	--	--

	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA				
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	THERMAX LIMITED PUNE				
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DATA SHEET FOR ROTAMETER					
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THERMAX DOC.NO.: WHJBA00015	BHEL DOC. NO. :PE-VO-314-156A-A116			REV. NO : 01	
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THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M

1	TAG NO.		FI-401	FI-402	FI-403
2	LOCATION		INLET OF AVGF - 1	INLET OF AVGF - 2	INLET OF AVGF - 3
3	QTY		1	1	1
4	TYPE		BY-PASS	BY-PASS	BY-PASS
5	PRIMARY ELEMENT		ORIFICE	ORIFICE	ORIFICE
6	FLUID		WATER	WATER	WATER
7	DENSITY OF THE MEDIUM		1	1	1
8	FLOW RATE NOR : MAX m ³ /Hr		163 / 180	163 / 180	163 / 180
9	OPERATING PRESSURE		2 kG/CM2	2 kG/CM2	2 kG/CM2
10	OPERATING TEMP. DEG CEN		AMB	AMB	AMB
11	LINE SIZE NB	MATERIAL	200 CS	200 CS	200 CS
12	ACTUAL DIA OD	& ID mm	219.10 / 206.4	219.10 / 206.4	219.10 / 206.4
13	ACCURACY		± 2% OF FS	± 2% OF FS	± 2% OF FS
14	SCALE GRADUATION		IN M3/HR	IN M3/HR	IN M3/HR
15	LOCATION CONN. & SIZE		25 NB	25 NB	25 NB
16	CONFIGURATION -- INLET		BOTTOM	BOTTOM	BOTTOM
17	CONFIGURATION -- OUTLET		TOP	TOP	TOP
18	SCHEDULE OF PIPE		ANSI B16.9,SCH 20	ANSI B16.9,SCH 20	ANSI B16.9,SCH 20
19	FACE TO FACE DISTANCE		500 MM	500 MM	500 MM
20	TYPE OF BYPASS CONNECTION		D & D/2	D & D/2	D & D/2
21	PIPE CONNECTION		FLANGED	FLANGED	FLANGED
22	PACKING MATERIAL		PTFE	PTFE	PTFE
23	FLOW RANGE Cu.m/Hr		44 - 220	44 - 220	44 - 220
24	TUBE RATING Kg/Sq.cm (G)		20	20	20
25	SCALE MOC		ANODISED ALLUMINIUM	ANODISED ALLUMINIUM	ANODISED ALLUMINIUM
26	SCALE LENGTH		175 - 200	175 - 200	175 - 200
27	PROCESS MAX PRESS. Kg/Sq.cm		5	5	5
28	PROCESS PIPE MATERIAL		CS	CS	CS
29	MAKE		EUREKA	EUREKA	EUREKA
30	MODEL NO.		BPD-CS-200-PG-3	BPD-CS-200-PG-3	BPD-CS-200-PG-3
31	METER SIZE		25 NB	25 NB	25 NB
32	DP ACROSS ROTAMETER (at max flow)		2500 mm H2O	2500 mm H2O	2500 mm H2O
33	FLOAT		SS 316	SS 316	SS 316
34	TUBE		BORO SILICATE	BORO SILICATE	BORO SILICATE
35	FRAME		MS	MS	MS
36	ORIFICE		SS 316	SS 316	SS 316
37	FLANGE CONNECTION		ANSI B 16.5, 150#	ANSI B 16.5, 150#	ANSI B 16.5, 150#
38	HOUSING PROTECTION CLASS		IP 55	IP 55	IP 55
39	WETTED PARTS		CS	CS	CS

QTY :- 03 MAKE: EUREKA	PROJECT: SIDE STREAM FILTRATION PLANT	2	8/9/2009	SKS	APU	AVS
		1	14/8/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630125	0	7/7/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
	CONSULTANT:- NTPC - CONSULTANCY WING	Specification No			SH NO	
		WHJBA00015			Page 238 of 284	

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M

1	TAG NO.		FI-404	FI-405	FI-406
2	LOCATION		INLET OF AVGF - 4	INLET OF AVGF - 5	INLET OF AVGF - 6
3	QTY		1	1	1
4	TYPE		BY-PASS	BY-PASS	BY-PASS
5	PRIMARY ELEMENT		ORIFICE	ORIFICE	ORIFICE
6	FLUID		WATER	WATER	WATER
7	DENSITY OF THE MEDIUM		1	1	1
8	FLOW RATE NOR : MAX m ³ /Hr		163 / 180	163 / 180	163 / 180
9	OPERATING PRESSURE		2 kG/CM2	2 kG/CM2	2 kG/CM2
10	OPERATING TEMP. DEG CEN		AMB	AMB	AMB
11	LINE SIZE NB	MATERIAL	200 CS	200 CS	200 CS
12	ACTUAL DIA OD	& ID mm	219.10 / 206.4	219.10 / 206.4	219.10 / 206.4
13	ACCURACY		± 2% OF FS	± 2% OF FS	± 2% OF FS
14	SCALE GRADUATION		IN M3/HR	IN M3/HR	IN M3/HR
15	LOCATION CONN. & SIZE		25 NB	25 NB	25 NB
16	CONFIGURATION -- INLET		BOTTOM	BOTTOM	BOTTOM
17	CONFIGURATION -- OUTLET		TOP	TOP	TOP
18	SCHEDULE OF PIPE		ANSI B16.9,SCH 20	ANSI B16.9,SCH 20	ANSI B16.9,SCH 20
19	FACE TO FACE DISTANCE		500 MM	500 MM	500 MM
20	TYPE OF BYPASS CONNECTION		D & D/2	D & D/2	D & D/2
21	PIPE CONNECTION		FLANGED	FLANGED	FLANGED
22	PACKING MATERIAL		PTFE	PTFE	PTFE
23	FLOW RANGE Cu.m/Hr		44 - 220	44 - 220	44 - 220
24	TUBE RATING Kg/Sq.cm (G)		20	20	20
25	SCALE MOC		ANODISED ALLUMINIUM	ANODISED ALLUMINIUM	ANODISED ALLUMINIUM
26	SCALE LENGTH		175 - 200	175 - 200	175 - 200
27	PROCESS MAX PRESS. Kg/Sq.cm		5	5	5
28	PROCESS PIPE MATERIAL		CS	CS	CS
29	MAKE		EUREKA	EUREKA	EUREKA
30	MODEL NO.		BPD-CS-200-PG-3	BPD-CS-200-PG-3	BPD-CS-200-PG-3
31	METER SIZE		25 NB	25 NB	25 NB
32	DP ACROSS ROTAMETER (at max flow)		2500 mm H2O	2500 mm H2O	2500 mm H2O
33	FLOAT		SS 316	SS 316	SS 316
34	TUBE		BORO SILICATE	BORO SILICATE	BORO SILICATE
35	FRAME		MS	MS	MS
36	ORIFICE		SS 316	SS 316	SS 316
37	FLANGE CONNECTION		ANSI B 16.5, 150#	ANSI B 16.5, 150#	ANSI B 16.5, 150#
38	HOUSING PROTECTION CLASS		IP 55	IP 55	IP 55
38	WETTED PARTS		CS	CS	CS

QTY :- 03 MAKE: EUREKA	PROJECT: SIDE STREAM FILTRATION PLANT	2	8/9/2009	SKS	APU	AVS
		1	14/8/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630125	0	7/7/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
	CONSULTANT:- NTPC - CONSULTANCY WING	Specification No			SH NO	
		WHJBA00015			Page 239 of 284	

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M

1	TAG NO.		FI-407	FI-408	FI-409
2	LOCATION		OUTLET OF AVGF - 1	OUTLET OF AVGF - 2	OUTLET OF AVGF - 3
3	QTY		1	1	1
4	TYPE		BY-PASS	BY-PASS	BY-PASS
5	PRIMARY ELEMENT		ORIFICE	ORIFICE	ORIFICE
6	FLUID		WATER	WATER	WATER
7	DENSITY OF THE MEDIUM		1	1	1
8	FLOW RATE NOR : MAX m ³ /Hr		163 / 180	163 / 180	163 / 180
9	OPERATING PRESSURE		2 kG/CM2	2 kG/CM2	2 kG/CM2
10	OPERATING TEMP. DEG CEN		AMB	AMB	AMB
11	LINE SIZE NB	MATERIAL	250 CS	250 CS	250 CS
12	ACTUAL DIA OD	& ID mm	273.0 / 260.3	273.0 / 260.3	273.0 / 260.3
13	ACCURACY		± 2% OF FS	± 2% OF FS	± 2% OF FS
14	SCALE GRADUATION		IN M3/HR	IN M3/HR	IN M3/HR
15	LOCATION CONN. & SIZE		25 NB	25 NB	25 NB
16	CONFIGURATION -- INLET		BOTTOM	BOTTOM	BOTTOM
17	CONFIGURATION -- OUTLET		TOP	TOP	TOP
18	SCHEDULE OF PIPE		ANSI B16.9,SCH 20	ANSI B16.9,SCH 20	ANSI B16.9,SCH 20
19	FACE TO FACE DISTANCE		500 MM	500 MM	500 MM
20	TYPE OF BYPASS CONNECTION		D & D/2	D & D/2	D & D/2
21	PIPE CONNECTION		FLANGED	FLANGED	FLANGED
22	PACKING MATERIAL		PTFE	PTFE	PTFE
23	FLOW RANGE Cu.m/Hr		44 - 220	44 - 220	44 - 220
24	TUBE RATING Kg/Sq.cm (G)		20	20	20
25	SCALE MOC		ANODISED ALLUMINIUM	ANODISED ALLUMINIUM	ANODISED ALLUMINIUM
26	SCALE LENGTH		175 - 200	175 - 200	175 - 200
27	PROCESS MAX PRESS. Kg/Sq.cm		5	5	5
28	PROCESS PIPE MATERIAL		CS	CS	CS
29	MAKE		EUREKA	EUREKA	EUREKA
30	MODEL NO.		BPD-CS-250-PG-3	BPD-CS-250-PG-3	BPD-CS-250-PG-3
31	METER SIZE		25 NB	25 NB	25 NB
32	DP ACROSS ROTAMETER (at max flow)		2500 mm H2O	2500 mm H2O	2500 mm H2O
33	FLOAT		SS 316	SS 316	SS 316
34	TUBE		BORO SILICATE	BORO SILICATE	BORO SILICATE
35	FRAME		MS	MS	MS
36	ORIFICE		SS 316	SS 316	SS 316
37	FLANGE CONNECTION		ANSI B 16.5, 150#	ANSI B 16.5, 150#	ANSI B 16.5, 150#
38	HOUSING PROTECTION CLASS		IP 55	IP 55	IP 55
38	WETTED PARTS		CS	CS	CS

QTY :- 03 MAKE: EUREKA	PROJECT: SIDE STREAM FILTRATION PLANT	2	8/9/2009	SKS	APU	AVS
		1	14/8/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630125	0	7/7/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
	CONSULTANT:- NTPC - CONSULTANCY WING	Specification No			SH NO	
		WHJBA00015			Page 240 of 284	

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-314-158-A001M

1	TAG NO.		FI-410	FI-411	FI-412
2	LOCATION		OUTLET OF AVGF - 4	OUTLET OF AVGF - 5	OUTLET OF AVGF - 6
3	QTY		1	1	1
4	TYPE		BY-PASS	BY-PASS	BY-PASS
5	PRIMARY ELEMENT		ORIFICE	ORIFICE	ORIFICE
6	FLUID		WATER	WATER	WATER
7	DENSITY OF THE MEDIUM		1	1	1
8	FLOW RATE NOR : MAX m ³ /Hr		163 / 180	163 / 180	163 / 180
9	OPERATING PRESSURE		2 kG/CM2	2 kG/CM2	2 kG/CM2
10	OPERATING TEMP. DEG CEN		AMB	AMB	AMB
11	LINE SIZE NB	MATERIAL	250 CS	250 CS	250 CS
12	ACTUAL DIA OD	& ID mm	273.0 / 260.3	273.0 / 260.3	273.0 / 260.3
13	ACCURACY		± 2% OF FS	± 2% OF FS	± 2% OF FS
14	SCALE GRADUATION		IN M3/HR	IN M3/HR	IN M3/HR
15	LOCATION CONN. & SIZE		25 NB	25 NB	25 NB
16	CONFIGURATION -- INLET		BOTTOM	BOTTOM	BOTTOM
17	CONFIGURATION -- OUTLET		TOP	TOP	TOP
18	SCHEDULE OF PIPE		ANSI B16.9,SCH 20	ANSI B16.9,SCH 20	ANSI B16.9,SCH 20
19	FACE TO FACE DISTANCE		500 MM	500 MM	500 MM
20	TYPE OF BYPASS CONNECTION		D & D/2	D & D/2	D & D/2
21	PIPE CONNECTION		FLANGED	FLANGED	FLANGED
22	PACKING MATERIAL		PTFE	PTFE	PTFE
23	FLOW RANGE Cu.m/Hr		44 - 220	44 - 220	44 - 220
24	TUBE RATING Kg/Sq.cm (G)		20	20	20
25	SCALE MOC		ANODISED ALLUMINIUM	ANODISED ALLUMINIUM	ANODISED ALLUMINIUM
26	SCALE LENGTH		175 - 200	175 - 200	175 - 200
27	PROCESS MAX PRESS. Kg/Sq.cm		5	5	5
28	PROCESS PIPE MATERIAL		CS	CS	CS
29	MAKE		EUREKA	EUREKA	EUREKA
30	MODEL NO.		BPD-CS-250-PG-3	BPD-CS-250-PG-3	BPD-CS-250-PG-3
31	METER SIZE		25 NB	25 NB	25 NB
32	DP ACROSS ROTAMETER (at max flow)		2500 mm H2O	2500 mm H2O	2500 mm H2O
33	FLOAT		SS 316	SS 316	SS 316
34	TUBE		BORO SILICATE	BORO SILICATE	BORO SILICATE
35	FRAME		MS	MS	MS
36	ORIFICE		SS 316	SS 316	SS 316
37	FLANGE CONNECTION		ANSI B 16.5, 150#	ANSI B 16.5, 150#	ANSI B 16.5, 150#
38	HOUSING PROTECTION CLASS		IP 55	IP 55	IP 55
38	WETTED PARTS		CS	CS	CS

QTY :- 03 MAKE: EUREKA	PROJECT: SIDE STREAM FILTRATION PLANT	2	8/9/2009	SKS	APU	AVS
		1	14/8/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630125	0	7/7/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	Rev	Date	Prepd by	Chkd by	App by
	CONSULTANT:- NTPC - CONSULTANCY WING	Specification No			SH NO	
		WHJBA00015			Page 241 of 284	



EUREKA



BYE PASS ROTAMETER

For reliable flow rate indication



EUREKA INDUSTRIAL EQUIPMENTS PVT. LTD.

REGD. & HEAD OFFICE :
ROYAL CHAMBERS, PAUD ROAD,
PUNE - 411 038, INDIA
TEL : +91-20-25443079/4004551/4004535
FAX : +91-20-25441325
E-MAIL : eureka@rediffmail.com
INTERNET : www.euruskaflo.com

FACTORY
UNIT - I
136, 5 BLOCK, MIDC, BHOSARI,
PUNE - 411 026.
TEL : 27120514, 27120314, 4113756
FAX : +91-20-27120761

UNIT - II
A-501, MIDC, PIMPRI,
PUNE - 411 018.
TEL : 27479086, 4113759

MUMBAI OFFICE :
258, KALINDAS UDYOG BHAVAN,
PRADHADEVI, MUMBAI - 400 025.
TEL : 24229069

BYE PASS ROTAMETER

Eureka Bye Pass Rotameters are suitable for flowrate measurement in pipe sizes 1" NB. and above. The complete assembly consists of carrier rings, bye pass line and a Rotameter as indicator. Isolating valves are provided on request. The Orifice plate dimensions are based on BS / ISO specification. The instruction is simple in construction and reliable in flow rate indication.

MATERIALS OF CONSTRUCTION

Orifice Plate	: 316 SS / Ebonite / Hastelloy 'C'
Carrier Rings	: 316 SS / Mild Steel / C.S.
Pipe Line	: 316 SS / Mild Steel / C.S.
Wetted Parts Of	: 316 SS / Mild Steel / C.S.
The Rotameter	Or Rubber Lined Steel / PTFE Lined Steel.

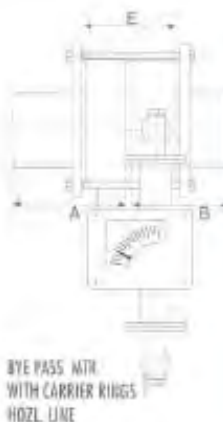
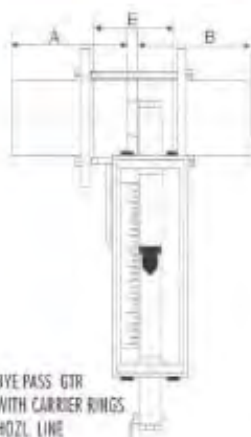
PERFORMANCE

Type of tappings	: Corner tapping (carrier ring.) Flange tapping, D and D/2 tapping.
Accuracy	: $\pm 2\%$ of full flow
Rangeability	: 7:1 or 5:1, 10:1 on request.
Accessories	: High & Low flow alarms.

Metal tube Bye Pass rotameters are available for special applications.

STANDARD RANGE FOR WATER AT 20°C

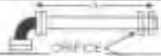
NW	MAXIMUM FLOWRATE (M3/HR)	NW	MAXIMUM FLOWRATE (M3/HR)
25	5	225	450
40	10	250	550
50	20	275	650
80	36	300	800
100	80	350	1000
125	125	400	1200
150	150	---	---
200	320	---	---



CARRIER RING DIMENSIONS

NW	E	NW	E
25	32	225	
40	46	250	
50		275	58
80		300	
100		350	
125	58	400	75
150			
200			

MINIMUM UPSTREAM STRAIGHT LENGTHS REQUIRED

Fittings before straight run	Piping Layout	Diameter Ratio (B)													
		0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65	0.7	0.75	0.8	
Single 90° bend or Tee		10	10	10	12	14	14	14	16	18	22	28	36	46	
Two or more 90° bends in the same plane		14	14	16	16	18	18	20	22	26	32	36	42	50	
Two or more 90° bends in the different planes		34	34	34	36	36	38	40	44	48	54	62	70	80	
Reducers or Expanders		16	16	16	18	16	18	20	20	22	24	26	28	30	
Globe valve fully open		18	18	18	18	20	20	22	24	26	28	32	36	44	
Gate valve fully open		12	12	12	12	12	12	12	14	14	16	20	24	30	
MINIMUM DOWN STREAM STRAIGHT LENGTHS REQUIRED:		4	4	5	5	6	6	6	6	7	7	7	8	8	
VALUES OF THE STRAIGHT LENGTH ARE IN NO OF 'D' B = d / D d = ORIFICE DIAMETER D = INTERNAL DIAMETER OF PIPE															

NOTE

'A' = UPSTREAM STRAIGHT LENGTH 'B' = DOWNSTREAM STRAIGHT LENGTH

Data required for sizing :

- Name of fluid
- Sp. Gr. of fluid at Operating temperature.
- Viscosity of fluid at Operating temperature.
- Temperature.
- Pressure.
- Measuring range
- Material of construction desired.

We reserve the right to modify the Design & Specifications without notice

EUREKA
INDUSTRIAL EQUIPMENTS
PVT. LTD.



CAT CODE CC-04 R1 10-2K

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INDEX SHEET FOR MOTORIZED VALVE

EFFLUENT TREATMENT PLANT

REF ID: A60069

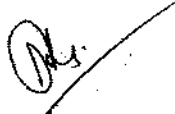
SR NO.	TAG NO.	LOCATION	PROCESS LIQUID	REF.P&ID NO. WFBAA00063.					LINE SIZE
				NOR FLOW IN M3/HR	MAX FLOW IN M3/HR	NOR PRESSURE IN KG/CM2	MAX PRESSURE IN KG/CM2	OUTLET PRESSURE IN KG/CM2	
1	MV-4	DISCHARGE OF P-3010A/B	EFFLUENT	5	6	2.6	4	2	50 NB CS
2	MV-6	DISCHARGE OF P-3020A/B	EFFLUENT	5	6	2.4	4	2	50 NB CS
3	MV-7	INLET OF ES-4	EFFLUENT	25	28	5.9	7	5.5	50 NB CS
4	MV-8	DISCHARGE OF P-3050A/B	EFFLUENT	25	28	5.9	7	5.5	80 NB CS
5	MV-9	INLET OF ES-5	WASTE WATER	25	28	1.6	2.5	1	50 NB CS
6	MV-10	DISCHARGE OF P-3060A/B	EFFLUENT	25	28	1.6	2.5	1	65 NB CS
7	MV-12	DISCHARGE OF P-3070A/B	EFFLUENT	15	18	4.2	5.5	3.5	65 NB CS
8	MV-14	DISCHARGE OF EFFLUENT TRANSFER PUMP P-3080 A/B	EFFLUENT	5	6	3.6	4	3	40
9	MV-15	INLET OF ES-8	WASTE WATER	10	12	7.1	8.5	6.5	40 NB CS
10	MV-16	DISCHARGE OF P-3090A/B	EFFLUENT	14	16	4.6	5.5	4	65 NB CS
11	MV-17	INLET OF ES-14	EFFLUENT	26	29	3.2	4	2.5	50 NB CS
12	MV-18	DISCHARGE OF P-3200A/B	EFFLUENT	26	29	3.2	4	2.5	80 NB CS
13	MV-19	INLET OF ES-15	EFFLUENT	26	29	3.4	4	3	50 NB CS
14	MV-20	DISCHARGE OF P-3210A/B	EFFLUENT	26	29	3.4	4	3	80 NB CS
15	MV-22	DISCHARGE OF EFFLUENT TRANSFER PUMP P-3340 A/B	EFFLUENT	8	11	4.15	5	3.5	50 NB CS
16	MV-23	DISCHARGE OF P-3030A/B	WATER	30	34	6.5	8	6	80 NB CS
17	MV-24	DISCHARGE OF P-3030A/B	WATER	30	34	6.5	8	6	80 NB CS
18	MV-25	DISCHARGE OF P-3040A/B/C	WASTE WATER	100	110	1	2.5	0.5	100 NB CS
19	MV-26	DISCHARGE OF P-3040A/B/C	WASTE WATER	100	110	1	2.5	0.5	200 NB CS
20	MV-27	INLET OF T-3030 A	WATER	25	28	1.8	2.5	1.5	50 NB CS
21	MV-28	DISCHARGE OF P-3100A/B	WATER	25	28	1.8	2.5	1.5	65 NB CS
22	MV-31	INLET OF ES-16	EFFLUENT	26	29	2.3	3.5	1.5	50 NB CS
23	MV-32	DISCHARGE OF P-3220A/B	EFFLUENT	26	29	2.3	3.5	1.5	80 NB CS
24	MV-33	INLET OF ES-17	EFFLUENT	26	29	2.6	3.5	2	50 NB CS
25	MV-34	DISCHARGE OF P-3230A/B	EFFLUENT	26	29	2.6	3.5	2	80 NB CS
26	MV-35	INLET OF CMB-II	EFFLUENT	350	390	8.2	10	7.5	500 NB CS
27	MV-36	INLET OF CMB-II	EFFLUENT	350	390	8.2	10	7.5	500 NB CS
28	MV-37	DISCHARGE OF P-3150A TO H	EFFLUENT	350	390	8.2	10	7.5	500 NB CS
29	MV-38	INLET OF ES-13	TREATED WATER	100	110	2.5	4	2	100 NB CS
30	MV-39	DISCHARGE OF P-3120A/B/C	TREATED WATER	100	110	2.5	4	2	200 NB CS
31	MV-40	DISCHARGE OF P-3190A/B	WATER	140	160	1	2	0.5	100 NB CS
32	MV-41	DISCHARGE OF P-3190A/B	WATER	140	160	1	2	0.5	150 NB CS
33	MV-42	OUTLET OF CMB-I	WATER	350	390	8.2	10	7.5	650 NB CS
34	MV-43	OUTLET OF CMB-II	WATER	350	390	8.2	10	7.5	650 NB CS
35	MV-45	DISCHARGE OF P-3310	EFFLUENT	7	10	5.4	6.5	5	50 NB CS
36	MV-47	DISCHARGE OF P-3320 A/B	WATER	3	4	3	4.5	2.5	40 NB CS
37	MV-48	INLET OF SERVICE WATER TANK	WATER	100	110	2.5	4	2	200 NB CS

OK

QTY :- 37	PROJECT: PRAGATI - III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI	2	12/1/2010	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sal Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630126	1	2/11/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD., DELHI	0	1/10/2009	SKS	APU	AVS
	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Rev	DATE	PREPD. BY	CHKD. BY	App by
	CONSULTANT: NTPC - CONSULTANCY WING	Specification No		PLANT	SH NO	

BUTTERFLY VALVE WITH ELECTRICAL ACTUATOR**VALVE**

A GENERAL		
A.1	TYPE	WAFFER LUGGED TYPE BUTTERFLY VALVE
A.2	VALVE RATING	AWWA-C-504 CLASS 150 OR BS 5155 PN 10 MIN
A.3	VALVES AS PER	MFG STD. - API 609
		TEST STD.- API 598
A.4	DESIGN TEMP.	50 DEG
A.5	END CONNECTION	SUITABLE FOR MOUNTING BETWEEN FLANGES DRILLED AS PER ANSI B 16.5 150# UPTO 650 NB & ANSI B16.47 SERIES B FOR 650 NB.
B MOC		
B.1	BODY	SGI DIN 1693 Gr.GGG40
B.2	DISC	SGI
B.3	SHAFT	ASTM A 296 GR AISI SS 316
B.4	BODY SEAT (BONDED)	EPDM
B.7	BEARING	BEARING STEEL + PTFE
C PROCESS PARAMETERS		
C.1	TAG NO	REFER INDEX SHEET
C.2	PROCESS LIQUID	REFER INDEX SHEET
C.3	FLOW NOR: MAX M3/HR	REFER INDEX SHEET
C.4	LINE SIZE	REFER INDEX SHEET
C.5	LOCATION	REFER INDEX SHEET
C.6	NORMAL PRESSURE	REFER INDEX SHEET
C.7	MAXIMUM PRESSURE	REFER INDEX SHEET
C.8	OUTLET PRESSURE	REFER INDEX SHEET
D TESTING CODE		
D.1	BODY (HYDRO TEST)	API 598
D.2	SEAT (HYDRO TEST)	15 KG/CM2
		11 KG/CM2



QTY :- 37	PROJECT: PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA, DELHI		2	12/1/2010	SKS	APU	AVS
			1	2/11/2009	SKS	APU	AVS
THERMAX LIMITED Water & Waste Solutions Sai Chambers, Wakadewadi Pune 411 003 (INDIA)	O.C NO: 630128		0	1/10/2009	SKS	APU	AVS
	OWNER: PRAGATI POWER CORPORATION LTD., DELHI		Rev	DATE	PREPD. BY	CHKD. BY	App by
	CLIENT : BHARAT HEAVY ELECTRICALS LTD		Specification No		PLANT	SH NO	
	CONSULTANT:- NTPC - CONSULTANCY WING		WHJGH00006		ETP	2 OF 3	

BUTTERFLY VALVE WITH ELECTRICAL ACTUATOR**ACTUATOR INTEGRAL STARTER**

1	TAG NO	REFER INDEX SHEET
2	VOLTAGE FOR MOTOR	415 V, 3-PH, 50 HZ
3	KW RATING	1)0.06 FOR VALVE SIZE 40 NB,50 NB,65 NB,80 NB,100 NB,150 NB. 2)0.12 FOR VALVE SIZE 200 NB 3)0.37 FOR VALVE SIZE 500NB,650 NB
4	VOLTAGE VARIATION	± 1 - 10%
5	FREQUENCY VARIATION	± 1 - 5%
6	COMBINED VOLTAGE & FREQUENCY VARIATION	10 % (SUM OF ABSOLUTE VALUES)
7	MOTOR INSULATION CLASS	F
8	MOTOR SPEED	1)1400 RPM FOR VALVE SIZE 40 NB,50 NB,65 NB,80 NB,100 NB,150 NB,200 NB 2)2800 RPM FOR VALVE SIZE 500 NB,650 NB
9	FULL LOAD CURRENT	1)0.29 A FOR VALVE SIZE 40 NB,50 NB,65 NB,80 NB,100 NB,150 NB 2)0.45 A FOR VALVE SIZE 200 NB 3)0.93 A FOR VALVE SIZE 500 NB,650 NB
10	STARTING CURRENT	1)1.2 A FOR VALVE SIZE 40 NB,50 NB,65 NB,80 NB,100 NB,150 NB. 2)2.3 A FOR VALVE SIZE 200 NB 3)5.5 A FOR VALVE SIZE 500 NB,650 NB
11	NOMINAL CURRENT	1)0.29 A FOR VALVE SIZE 40 NB,50 NB,65 NB,80 NB,100 NB,150 NB 2)0.45 A FOR VALVE SIZE 200 NB 3)0.93 A FOR VALVE SIZE 500 NB,650 NB
12	ENCLOSURE	IP-67
13	MOTOR TYPE	SQUIRREL CAGE
14	OPERATING TIME	1)24 sec FOR VALVE SIZE 40 NB,50 NB,65 NB,80 NB,100 NB,150 NB 2)31 sec FOR VALVE SIZE 200 NB 3)60 sec FOR VALVE SIZE 500 NB 3)144 sec FOR VALVE SIZE 650 NB
15	ACTUATOR OPERATION TYPE	ON-OFF DUTY

ACCESSORY

1	LIMIT SWITCHES	ONE EACH FOR OPEN /CLOSE
2	Integral Starter Disturbed Feedback (Loss of power/control supply, Motor thermostat trip, Thermal O/L, Local/off/Remote S/S in Local or Off mode etc.)	To Be provided
3	TORQUE SWITCH	ONE EACH FOR OPEN AND CLOSE POSITION
4	TYPE & CONTACT RATING OF SWITCHES	5A @ 230 V AC RESISTIVE(WITH 2 NO + 2 NC CONTACTS)
5	VALVE POSITION INDICATOR AT LOCAL	REQD. WITH % OPENING INDICATION (LOCAL INDICATION)
6	HAND WHEEL	FOR EMERGENCY MANUAL OPERATION (MOC-MS + DA GRAY)

Item	Make	Valve size	Model No
Valve	INTERVALVE	FOR VALVE SIZE 40 NB,50 NB,65 NB,80 NB, FOR VALVE SIZE 100 NB,150 NB,200 NB,500 NB,650 NB	IVTLB
Gear Box	PAC	1)FOR VALVE SIZE 40 NB,50 NB,65 NB,80 NB,100 NB,150 NB 2) FOR VALVE SIZE 200 NB 3)FOR VALVE SIZE 500NB	PAC-0AE PAC-02AE PAC-04SGA1E
Actuator	AUMA	1)FOR VALVE SIZE 40 NB,50 NB,65 NB,80 NB,100 NB,150 NB 2)FOR VALVE SIZE 200NB 3)FOR VALVE SIZE 500 NB,650 NB	SA 3 E 22 SA 6 E 22 SA 8 E 45

QTY :- 37	PROJECT:PRAGATI -III COMBINED CYCLE POWER PROJECT 1500 MW (NOMINAL) AT BAWANA,DELHI	2	12/1/2010	SKS	APU	AVS
THERMAX LIMITED	O.C NO: 630128	1	2/11/2009	SKS	APU	AVS
Water & Waste Solutions	OWNER: PRAGATI POWER CORPORATION LTD.,DELHI	0	1/10/2009	SKS	APU	AVS
Sai Chambers, Wakadewadi	CLIENT : BHARAT HEAVY ELECTRICALS LTD	Rev	DATE	PREPD. BY	CHKD. BY	App by
Pune 411 003 (INDIA)	CONSULTANT:- NTPC - CONSULTANCY WING	Specification No	PLANT	SH NO		
		WHJGH00006	ETP	3 OF 3		

REPLIES TO COMMENTS ON ELECTRICAL ACTUATOR

Sr.No	NTPC COMMENTS	THERMAX REPLY
1	Actuator Torque Range	Refer sr no 2 of data sheet
2	Minimum Stall Torque Nm	1.5 for SA3E22 / 3.23 for SA6E22 / 4 for SA6E45
3	Admissible Ambient Temperature	Refer sr no 18
4	Cable Gland Size for power and control cable	Refer 21A & B
5	Gear box lubrication and ratio	Lubrication : Multipurpose Grease Lubricated.
	MODEL	PAC-0AE = G/B Ratio 35 : 1
		PAC-02AE = G/B Ratio 45 : 1
		PAC-04SGA41E = G/B Ratio 180 : 1
		PAC-GS160GZ14 = G/B Ratio 432 : 1
		PAC-0AE = G/B Ratio 35 : 1
6	Position limit switches shall be 4 in nos and torque limit switch shall be 2 in nos having silver plated contact.	Refer Sr.No. 23 & 24
7	Rating of switch for Ac & Dc	Refer Sr.No. 25
8	Position Transmitter detail for inching / On Off duty	Refer 26 A from data sheet
9	Space heater detail	Refer sr no 27 of data sheet
10	Thermostat detail	Refer sr no 28 of data sheet
11	Internal Wiring Detail	Refer Sr no 29 from data sheet
12	Wiring Diagram	Refer Sr no 29 from data sheet
13	Interposing relay current consumption	5-mAMPs
14	Fault indication contacts	Yes Confirmed and Provided in actuator.
15	Frame size of motors	AM 71
16	Power Factor and full load efficiency	Refer sr no 16 & 17 from data sheet
17	Temperature raise over ambient temperature	Refer sr no 19
18	Type of starter provided	Refer Sr no 20 from data sheet
19	Reference Standard And Tolerance	Refer Sr.No 33 from data sheet
20	OLR ranges and set value	Refer Sr no 35 & 34 from data sheet
21	Motor suitable to for inching duty	As per Thermax requirement.
22	No/ of start per hour	Refer Sr.No. 32 from data sheet
23	Plug an socket details	Refer sr no 38 from data sheet
24	Paint shade	Refer Sr no 41 from data sheet
25	Approximate weight	Refer sr no 31 from data sheet
26	colour coding of cabels for 9 pin plug and socket suitable for 4 pair G type cable	Refer sr no 39 from data sheet
27	single phase protection and wrong phase sequence protection feature shall available	Refer sr no 34 from data sheet

REPLIES TO MECHANICAL COMMENTS

Sr.No	NTPC COMMENTS	THERMAX REPLY
1	CYCLE TEST	POD REPLIES SUBMITTED ALONG WITH QAP
2	PERFORMANCE TEST	AS PER QAP SAME SHALL BE OFFERED ALONG WITH DRAWING
3	SEAT LEAKGE TEST	OFFERED VALVES ARE CLASS VI AS PER API-598
4	API CODE IS USED FOR PETROLEUM PRODUCT. IS CODE MAY BE USED FOR TESTING & SAME SHOULD BE INCARPOATED IN DOCUMENT	API CODE IS UNVERSALLY ACCEPTED.API CODE IS MORE STRIGENT THAN IS CODE WHICH IMPROVES THE QUALITY OF VALVE.AS PER MANUFACTURE'S STD API DESIGN VALVES CAN BE DELIVERED FASTER THAN IS CODE SINCE IT IS STD PRODUCT,

DATASHEET**Auma make Motor Actuator for ON-OFF Duty type**

VENDOR NAME : Intervale (India) Ltd., Pune	DATASHEET REV: 00 (Page 1 of 2)
CLIENT :	Contract No.:-
MAIN SUPPLIER : M/s Thermax Ltd., Pune	
PACKAGE:	
NTPC DOCUMENT NO. :	
VALVE TYPE, Model :- Lugged Butterfly Valve (VTLB)	
Valve sizes : 40 NB, 50 NB, 65 NB, 80 NB & 100 NB	

ACTUATOR MODEL – SA 3 E 22 RPM
(With Integral Starters version 'E-pac', ON-OFF Duty)

Sl.No.	DESCRIPTION	UNIT	DATA
1	ACTUATOR MANUFACTURER		AUMA (INDIA) PVT. LTD.
2	TORQUE RANGE & RPM		20-30 Nm, 22 RPM
3	DUTY CYCLE		S2-15 mins.
4	ENCLOSURE (TENV)		IP 67
5	NOMINAL OUTPUT	KW	0.06
6	RATED VOLTAGE	V	415 V AC
7	RATED FREQUENCY	Hz	50
8	No. OF PHASE	ϕ	3
9	ADMISSIBLE VOLTAGE FLUCTUATION	%	± 10
10	ADMISSIBLE FREQUENCY FLUCTUATION	%	± 5
11	ADMISSIBLE VOLTAGE & FREQUENCY VARIATION	%	10 (Absolute)
12	NOMINAL CURRENT	A	0.29
13	STARTING CURRENT	A	1.2
14	FULL LOAD SPEED	RPM	1400
15	INSULATION CLASS		F (Temp. rise limited to Class B)
16	POWER FACTOR		0.6
17	FULL LOAD EFFICIENCY	%	48
18	ADMISSIBLE AMBIENT TEMPERATURE	$^{\circ}\text{C}$	-20 TO +80
19	TEMPERATURE RAISE OVER AMBIENT TEMP 50 $^{\circ}\text{C}$.	$^{\circ}\text{C}$	70 (By resistance method)
20	TYPE OF STARTER PROVIDED		DOL / 3 PHASE / 3 WIRE
21.A	CABLE GLAND SIZE : POWER - 1 NO. (Double Compression)		3/4" BSC (3C x 2.5mm ² , CU / PVC, OD 14 +2 mm)
21.B	CABLE GLAND SIZE : CONTROL - 1 NO (Double Compression)		3/4 " BSC (8C x 0.5mm ² , CU / PVC), Max. OD 18.5 mm
22	GEAR BOX LUBRICATION		GREASE – EP0 (SERVO GEM)
23	POSITION LIMIT SWITCHES	Nos.	2 NO + 2 NC Contacts – 4 nos.
24	TORQUE SWITCHES	Nos.	2 NO + 2 NC Contacts – 2 nos.

Contd...2

Auma make Motor Actuator for ON-OFF Duty type

(Page 2 of 2)

Sl.No.	DESCRIPTION	UNIT	DATA																				
25	RATING OF SWITCHES	A	240 V AC – 5 A, 220 V DC – 0.5 A (Inductive)																				
26.A	POSITION TRANSMITTER – ON / OFF DUTY		NOT APPLICABLE																				
27	SPACE HEATER	No.	1 ϕ , 110 V AC, 50 HZ, 10W (1 no.) Space Heater supply will be derived from main power supply available within the actuator																				
28	THERMOSTAT	No.	3 Nos. – ONE IN EACH WINDING																				
29	INTERNAL WIRING		PVC 1.5 mm ²																				
30	CONTROL CIRCUIT DIAGRAM (with integral starters version e-pac)		3 WD/ epac/ 1.1-11231 R1																				
31	WEIGHT (Approx.)	Kg.	65																				
32	MOTOR SUITABLE FOR INCHING / ON-OFF		ON-OFF duty (Max. 60 starts per hr.) (Actuator will be suitable for three successive Open-Close operations or 15 Minutes whichever is higher)																				
33	MOTOR TYPE & REF. STANDARD		Squirrel Cage Induction Motor & Tolerance of Motor Data as per IS 325																				
34	OLR & SINGLE PHASING PROTECTION		Provided																				
35	OLR SET VALUE	A	0.29																				
36	AUTOMATIC PHASE CORRECTION		Provided																				
37	TYPE TEST		Type test is not envisaged for ordered Actuators																				
38	PLUG & SOCKET		2 Nos., 9-Pin Plug and Socket connector. (Suitable for 4 pair 0.5mm ² 'G' type instrumentation cable; Max. OD 18.5 mm)																				
39	THE COLOUR CODING OF CABLES FOR 9 PIN PLUG AND SOCKET SUITABLE FOR 4 PAIR, G – TYPE CABLE		<table><tr><th>Pin No.</th><th>Cable Colour</th></tr><tr><td>A (1)</td><td>Blue</td></tr><tr><td>B (2)</td><td>Red</td></tr><tr><td>C (3)</td><td>Gray</td></tr><tr><td>D (4)</td><td>Yellow</td></tr><tr><td>E (5)</td><td>Green</td></tr><tr><td>F (6)</td><td>Brown</td></tr><tr><td>G (7)</td><td>White</td></tr><tr><td>H (8)</td><td>Black</td></tr><tr><td>J (9)</td><td>Shield</td></tr></table>	Pin No.	Cable Colour	A (1)	Blue	B (2)	Red	C (3)	Gray	D (4)	Yellow	E (5)	Green	F (6)	Brown	G (7)	White	H (8)	Black	J (9)	Shield
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G (7)	White																						
H (8)	Black																						
J (9)	Shield																						
40	MATERIAL OF HANDWHEEL		Malleable Iron / SG Iron /MS Fabricated																				
41	PAINTING SHADE		RAL 5012 (Blue), for both Indoor & Outdoor application																				
42	Position Indicator		Yes, Provided. Local mechanical position indicator (Continuous Type) for 0 to 100% travel																				

Name & Seal of Vendor with Signature

DATASHEET**Auma make Motor Actuator for ON-OFF Duty type**

VENDOR NAME : Intervalve (India) Ltd., Pune	DATASHEET REV: 00 (Page 1 of 2)
CLIENT :	Contract No.:-
MAIN SUPPLIER : M/s Thermax Ltd., Pune	
PACKAGE:	
NTPC DOCUMENT NO. :	
VALVE TYPE, Model :- Lugged Butterfly Valve IVTLB	
Valve size : 200 NB	

ACTUATOR MODEL – SA 6 E 22 RPM
(With Integral Starters version 'E-pac' , ON-OFF Duty)

Sl.No.	DESCRIPTION	UNIT	DATA
1	ACTUATOR MANUFACTURER		AUMA (INDIA) PVT. LTD.
2	TORQUE RANGE & RPM		20-60 Nm, 22 RPM
3	DUTY CYCLE		S2-15 mins.
4	ENCLOSURE (TENV)		IP 67
5	NOMINAL OUTPUT	KW	0.12
6	RATED VOLTAGE	V	415 V AC
7	RATED FREQUENCY	Hz	50
8	No. OF PHASE	ϕ	3.
9	ADMISSIBLE VOLTAGE FLUCTUATION	%	± 10
10	ADMISSIBLE FREQUENCY FLUCTUATION	%	± 5
11	ADMISSIBLE VOLTAGE & FREQUENCY VARIATION	%	10 (Absolute)
12	NOMINAL CURRENT	A	0.45
13	STARTING CURRENT	A	2.3
14	FULL LOAD SPEED	RPM	1400
15	INSULATION CLASS		F (Temp. rise limited to Class B)
16	POWER FACTOR		0.62
17	FULL LOAD EFFICIENCY	%	61%
18	ADMISSIBLE AMBIENT TEMPERATURE	$^{\circ}\text{C}$	-20 TO +80
19	TEMPERATURE RAISE OVER AMBIENT TEMP 50 $^{\circ}\text{C}$	$^{\circ}\text{C}$	70 (By resistance method)
20	TYPE OF STARTER PROVIDED		DOL / 3 PHASE / 3 WIRE
21.A	CABLE GLAND SIZE : POWER - 1 NO. (Double Compression)		$\frac{3}{4}$ " BSC (3C x 2.5mm ² , CU / PVC, OD 14 $\pm$ 2 mm)
21.B	CABLE GLAND SIZE : CONTROL - 1 NO (Double Compression)		$\frac{3}{4}$ " BSC (8C x 0.5mm ² , CU / PVC), Max. OD 18.5 mm
22	GEAR BOX-LUBRICATION		GREASE – EP0 (SERVO GEM)
23	POSITION LIMIT SWITCHES	Nos.	2 NO + 2 NC Contacts – 4 nos.
24	TORQUE SWITCHES	Nos.	2 NO + 2 NC Contacts – 2 nos.

Contd...2

Auma make Motor Actuator for ON-OFF Duty type

(Page 2 of 2)

(Page 2 of 2)

Sl.No.	DESCRIPTION	UNIT	DATA																				
25	RATING OF SWITCHES	A	240 V AC – 5 A, 220 V DC – 0.5 A (Inductive)																				
26.A	POSITION TRANSMITTER – ON / OFF DUTY		NOT APPLICABLE																				
27	SPACE HEATER	No.	1 ϕ , 110 V AC, 50 HZ, 10W (1 no.) Space Heater supply will be derived from main power supply available within the actuator																				
28	THERMOSTAT	No.	3 Nos. – ONE IN EACH WINDING																				
29	INTERNAL WIRING		PVC 1.5 mm ²																				
30	CONTROL CIRCUIT DIAGRAM (with integral starters version e-pac)		3 WD/ epac/ 1.1-11231 R1																				
31	WEIGHT (Approx.)	Kg.	65																				
32	MOTOR SUITABLE FOR INCHING / ON-OFF		ON-OFF duty (Max. 60 starts per hr.) (Actuator will be suitable for three successive Open-Close operations or 15 Minutes whichever is higher)																				
33	MOTOR TYPE & REF. STANDARD		Squirrel Cage Induction Motor & Tolerance of Motor Data as per IS 325																				
34	OLR & SINGLE PHASING PROTECTION		Provided																				
35	OLR SET VALUE	A	0.45																				
36	AUTOMATIC PHASE CORRECTION		Provided																				
37	TYPE TEST		Type test is not envisaged for ordered Actuators																				
38	PLUG & SOCKET		2 Nos., 9-Pin Plug and Socket connector. (Suitable for 4 pair 0.5mm ² 'G' type instrumentation cable; Max. OD 18.5 mm)																				
39	THE COLOUR CODING OF CABLES FOR 9 PIN PLUG AND SOCKET SUITABLE FOR 4 PAIR, G – TYPE CABLE		<table border="1"> <thead> <tr> <th>Pin No.</th><th>Cable Colour</th></tr> </thead> <tbody> <tr><td>A (1)</td><td>Blue</td></tr> <tr><td>B (2)</td><td>Red</td></tr> <tr><td>C (3)</td><td>Gray</td></tr> <tr><td>D (4)</td><td>Yellow</td></tr> <tr><td>E (5)</td><td>Green</td></tr> <tr><td>F (6)</td><td>Brown</td></tr> <tr><td>G (7)</td><td>White</td></tr> <tr><td>H (8)</td><td>Black</td></tr> <tr><td>J (9)</td><td>Shield</td></tr> </tbody> </table>	Pin No.	Cable Colour	A (1)	Blue	B (2)	Red	C (3)	Gray	D (4)	Yellow	E (5)	Green	F (6)	Brown	G (7)	White	H (8)	Black	J (9)	Shield
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H (8)	Black																						
J (9)	Shield																						
40	MATERIAL OF HANDWHEEL		Malleable Iron / SG Iron / MS Fabricated																				
41	PAINTING SHADE		RAL 5012 (Blue), for both Indoor & Outdoor application																				
42	Position Indicator		Yes, Provided. Local mechanical position indicator (Continuous Type) for 0 to 100% travel																				

Name & Seal of Vendor with Signature

DATASHEET**Auma make Motor Actuator for ON-OFF Duty type**

VENDOR NAME : Intervalve (India) Ltd., Pune	DATASHEET REV: 00 (Page 1 of 2)
CLIENT :	Contract No.:-
MAIN SUPPLIER : M/s Thermax Ltd., Pune	
PACKAGE:	
NTPC DOCUMENT NO.:	
VALVE TYPE, Model :- Lugged Butterfly Valve IVTLB	
Valve size : 500, 600 & 650 NB	

ACTUATOR MODEL - SA 6 E 45 RPM
(With Integral Starters version 'E-pac' , ON-OFF Duty)

Sl.No.	DESCRIPTION	UNIT	DATA
1	ACTUATOR MANUFACTURER		AUMA (INDIA) PVT. LTD.
2	TORQUE RANGE & RPM		20-60 Nm, 45RPM
3	DUTY CYCLE		S2-15 mins.
4	ENCLOSURE (TENV)		IP 67
5	NOMINAL OUTPUT	KW	0.37
6	RATED VOLTAGE	V	415 V AC
7	RATED FREQUENCY	Hz	50.
8	No. OF PHASE	ϕ	3
9	ADMISSIBLE VOLTAGE FLUCTUATION	%	± 10
10	ADMISSIBLE FREQUENCY FLUCTUATION	%	± 5
11	ADMISSIBLE VOLTAGE & FREQUENCY VARIATION	%	10 (Absolute)
12	NOMINAL CURRENT	A	0.93
13	STARTING CURRENT	A	5.5
14	FULL LOAD SPEED	RPM	2800
15	INSULATION CLASS		F (Temp. rise limited to Class B)
16	POWER FACTOR		0.76
17	FULL LOAD EFFICIENCY	%	73%
18	ADMISSIBLE AMBIENT TEMPERATURE	$^{\circ}\text{C}$	-20 TO +80
19	TEMPERATURE RAISE OVER AMBIENT TEMP 50 $^{\circ}\text{C}$	$^{\circ}\text{C}$	70 (By resistance method)
20	TYPE OF STARTER PROVIDED		DOL / 3 PHASE / 3 WIRE
21.A	CABLE GLAND SIZE : POWER - 1 NO. (Double Compression)		3/4" BSC (3C x 2.5mm ² , CU / PVC, OD 14 $\pm$ 2 mm)
21.B	CABLE GLAND SIZE : CONTROL - 1 NO (Double Compression)		3/4" BSC (8C x 0.5mm ² , CU / PVC), Max. OD 18.5 mm
22	GEAR BOX LUBRICATION		GREASE - EP0 (SERVO GEM)
23	POSITION LIMIT SWITCHES	Nos.	2 NO + 2 NC Contacts - 4 nos.
24	TORQUE SWITCHES	Nos.	2 NO + 2 NC Contacts - 2 nos.

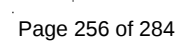
Contd...2

Auma make Motor Actuator for ON-OFF Duty type

(Page 2 of 2)

Sl.No.	DESCRIPTION	UNIT	DATA																				
25	RATING OF SWITCHES	A	240 V AC – 5 A, 220 V DC – 0.5 A (Inductive)																				
26.A	POSITION TRANSMITTER – ON / OFF DUTY		NOT APPLICABLE																				
27	SPACE HEATER	No.	1 ϕ , 110 V AC, 50 HZ, 10W (1 no.) Space Heater supply will be derived from main power supply available within the actuator																				
28	THERMOSTAT	No.	3 Nos. – ONE IN EACH WINDING																				
29	INTERNAL WIRING		PVC 1.5 mm ²																				
30	CONTROL CIRCUIT DIAGRAM (with integral starters version e-pac)		3 WD/ epac/ 1.1-11231 R1																				
31	WEIGHT (Approx.)	Kg.	65																				
32	MOTOR SUITABLE FOR INCHING / ON-OFF		ON-OFF duty (Max. 120 starts per hr.) (Actuator will be suitable for three successive Open-Close operations or 15 Minutes whichever ever is higher)																				
33	MOTOR TYPE & REF. STANDARD		Squirrel Cage Induction Motor & Tolerance of Motor Data as per IS 325																				
34	OLR & SINGLE PHASING PROTECTION		Provided																				
35	OLR SET VALUE	A	0.93																				
36	AUTOMATIC PHASE CORRECTION		Provided																				
37	TYPE TEST		Type test is not envisaged for ordered Actuators																				
38	PLUG & SOCKET		2 Nos., 9-Pin Plug and Socket connector (Suitable for 4 pair 0.5mm ² 'G' type instrumentation cable; Max. OD 18.5 mm)																				
39	THE COLOUR CODING OF CABLES FOR 9 PIN PLUG AND SOCKET SUITABLE FOR 4 PAIR, G – TYPE CABLE		<table><tr><th>Pin No.</th><th>Cable Colour</th></tr><tr><td>A (1)</td><td>Blue</td></tr><tr><td>B (2)</td><td>Red</td></tr><tr><td>C (3)</td><td>Gray</td></tr><tr><td>D (4)</td><td>Yellow</td></tr><tr><td>E (5)</td><td>Green</td></tr><tr><td>F (6)</td><td>Brown</td></tr><tr><td>G (7)</td><td>White</td></tr><tr><td>H (8)</td><td>Black</td></tr><tr><td>J (9)</td><td>Shield</td></tr></table>	Pin No.	Cable Colour	A (1)	Blue	B (2)	Red	C (3)	Gray	D (4)	Yellow	E (5)	Green	F (6)	Brown	G (7)	White	H (8)	Black	J (9)	Shield
Pin No.	Cable Colour																						
A (1)	Blue																						
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D (4)	Yellow																						
E (5)	Green																						
F (6)	Brown																						
G (7)	White																						
H (8)	Black																						
J (9)	Shield																						
40	MATERIAL OF HANDWHEEL		Malleable Iron / SG Iron /MS Fabricated																				
41	PAINTING SHADE		RAL 5012 (Blue), for both Indoor & Outdoor application																				
42	Position Indicator		Yes, Provided. Local mechanical position indicator (Continuous Type) for 0 to 100% travel																				

Name & Seal of Vendor with Signature



Information - A

- Collective fault indication (NO Contact) for
- Thermoswitch trip
 - Torque switch trip
 - Thermal over load relay trip
 - Power supply failure/Single phasing
 - Actuator in Local/Off mode

Legend

- K1 - Open Contactor (Coil voltage 110V AC)
 K2 - Close Contactor (Coil voltage 110V AC)
 Th - Thermoswitch
 RL1 - 24V DC, 6A Relay for OPEN Contactor
 RL2 - 24V DC, 6A Relay for CLOSE Contactor
 RL3 - 24V DC, 6A Relay for Collective Fault Annunciation
 RL4 - 24V DC Relay for power supply failure Annunciation
 M - Motor 3Ph, 415V, 50Hz.
 TSC - Torque switch close
 TSO - Torque switch open
 LSC - Limit switch close
 LSO - Limit switch open
 ISC - Intermediate limit switch -CLOSE
 ISO - Intermediate limit switch -OPEN
 TSC1/TSO1 - Torque switch in tandem operation with TSC/TSO
 LSC1/LSO1 - Limit switch in tandem operation with LSC/LSO
 ISC1/ISO1 - Intermediate limit switch in tandem operation with ISC/ISO
 F, G - Plug in type terminals between basic actuator(Norm) and integral starter(epac)
 Th - Thermoswitch
 SCC - 9 Pin plug/socket connector with one set spare
 TOLR - Thermal over load relay
 L-R,Y,B - Main supply 415V, 3ph, 50Hz AC
 L 1-56 - Terminals for customer connection
 L 47-56 - Spare terminals
 SH - Space heater

DISPLAY BOARD LEGEND:-

Symbol	Type	Description	Symbol	Type	Description
	Status	Actuator in open direction		Fault	Torque switch open
	Status	Actuator in Close direction		Fault	Torque switch close
	Status	Limit switch open		Fault	Thermoswitch trip
	Status	Limit switch close		Fault	Thermal overload relay trip
	Status	Actuator in local mode		Fault	Fault indication
	Status	Actuator in remote mode		Fault	Single phasing
	Status	11V Internal power supply		Status	24V DC For Customer's use
	Status	23V Internal power supply			

DIP SWITCH PARTICULARS:-

Switch No	Switch position-OFF	Switch position-ON	Applicable for version
1	Inching operation in Local mode (non self retaining)	Non-inching operation in Local mode (self retaining)	Applicable
2	-	Emergency shut down to Open	Not-Applicable
3	-	Emergency shut down to Close	Not-Applicable
4	L S O BY PASS	Inhibit Open direction	Applicable
5	-	Inhibit Close direction	Not-Applicable
6	-	Non-Inching operation in Remote mode (self retaining)	Applicable
7	Inching operation in Remote mode (non self retaining)	Limit Seating (Torque Seating)	Applicable
8	Limit switch close Bypass (Closing by torque switch Close)		

Note:-

Torque switches are bypassed in both the end positions with other end Limit switches in the PCB for a duration of 4 seconds

Contact development:-

CONTACT	PARTICULARS	FULL CLOSED	FULL OPEN
L 19-23	TSC		
L 19-23	TSO		
L 19-23	TSC		
L 19-23	TSO		
L 27-30	LSC		
L 27-30	LSO		
L 27-30	LSC		
L 27-30	LSO		
L 39-46	ISC		
L 39-46	ISO		
L 39-46	ISC		
L 39-46	ISO		

* For internal use

Sumal India Pvt Ltd	
TITLE	
DRAWING No.	
3WD/epac/1.1-11231 RI	
DRAWN	SK
CHECKED	IAS
APPROVED	YMI
DATE	12.07.08
SHEET	OF
12.07.08	5.1

VALVE SIZE	ØA	B	C	D	E	F	ØG	H	J	K	QTY	**ACT.MODEL+GEAR BOX	OPERATING TIME	PCD	N	Ød
40	40	33	68	103	478	73	250	350	166	570	02	SA3E22+PAC0AE	24 SEC	98.5	15.7	4
50	50	43	73	113	488	73	250	350	166	570	17	SA3E22+PAC0AE	24 SEC	120.7	19.1	4
65	65	46	80	121	496	73	250	350	166	570	04	SA3E22+PAC0AE	24 SEC	139.7	19.1	4
80	80	46	88	128	503	73	250	350	166	570	09	SA3E22+PAC0AE	24 SEC	152.4	19.1	4
100	100	52	104	146	521	73	250	350	166	570	03	SA3E22+PAC0AE	24 SEC	190.5	19.1	8
150	150	56	138	174	549	73	250	350	166	570	01	SA3E22+PAC0AE	24 SEC	241.3	22.4	8
200	200	60	163	198	590	134	250	417	131	603	02	SA3E22+PAC02AE	31 SEC	298.5	22.4	8
VALVE SIZE	TAG NO															
40	MV15, 14, 47															
50	MV 4, 6, 7, 9, 22, 45, 19, 27, 31, 33, 17, 45															
65	MV 10, 28, 12, 16															
80	MV 8, 18, 20, 23, 24, 32, 34															
100	MV25, 38, 40															
150	MV41															
200	MV26, 39, 48															

SPECIFICATIONS :

FLANGE DRILLING STD:- ANSI B16.5 #150

PRESSURE RATING-PN10

MFG STD - API 609

TEST STD - API 598

HYD TEST PRESS-4) BODY 15 KG/CM2

SEAT LEAKAGE - CLASS VI

2) SEAT 11 KG/CM2

FLOW DIRECTION : BIDIRECTIONAL

CAUTION

1) DO NOT USE FLANGE GASKETS DURING VALVE INSTALLATION

2) ALL DIMENSIONS ARE INDICATIVE EXCEPT FACE TO FACE DIM.

3) CLOCKWISE TO CLOSE & ANTICLOCKWISE TO OPEN.

4) NO.OF LUGS ARE SHOWN FOR INDICATIVE PURPOSE.

12	ELECT. ACTUATOR (W/OPT)	1	AUMA/INTEGRAL STARTER
11	GEAR BOX	1	STD/PAC
10	TOP BUSHING	1	POLYACETAL
9	PLUG	1	C 15
8	TAPER PIN	2	ISI 318
7	O RING PLUG	1	EPDM
6	O RING SHAFT	1	EPDM
5	BEARING	2	STEEL+PTFE
4	SHAFT	1	ISI 316
3	BONDED SEAT	1	EPDM
2	DISC	1	SGI DIN1693 GG40+EPOXY
1	BODY	1	CI IS210 FG260+EPOXY
NO	DESCRIPTION	QTY	MATL./MAKE
IV	NO:-941594		APPO
TQ.NO:-			DT.
IVTLB	BUTTERFLY VALVE WITH		CHKO
WITH ELECT. ACTUATOR			DT.
DRG.NO.	PD31209/MD5016	DRN	SHIP
			DT. 26.10.09

INTERVALVE (INDIA)

PROJECT:- PRAGATI POWER CORPORATION LIMITED.

CLIENT:- BHPL, NOIDA.

CONSULTANT:- M/s NTPC NEW DELHI

CUSTOMER:- THERMAX LIMITED, WVS DIVISION.

P.O. NO:- E-MAIL LOI DT:- 23/10/2009

IF IN DOUBT. SCALE

REV. MOD. NO. DATE SIGN ASK. N.T.S.

VALVE DIMENSIONS

VALVE SIZE	ΦA	B	C	D	E	F	ΦG	H	J	K	QTY	LUG DRILLING DETAILS	OPERATING TIME
500	486	127	355	410	824	218	250	665	124	635	05	PCD N	60 SEC
TAG NO:- MV35,36,37													

SPECIFICATIONS :

FLANGE DRILLING STD:- ANSI B16.5 #150

PRESSURE RATING-PN10

MFG STD - API 609

TEST STD- API 598

HYD TEST PRESS-1) BODY 15 KG/CM2

2) SEAT 11 KG/CM2

SEAT LEAKAGE : CLASS VI

FLOW DIRECTION : BIDIRECTIONAL

CAUTION

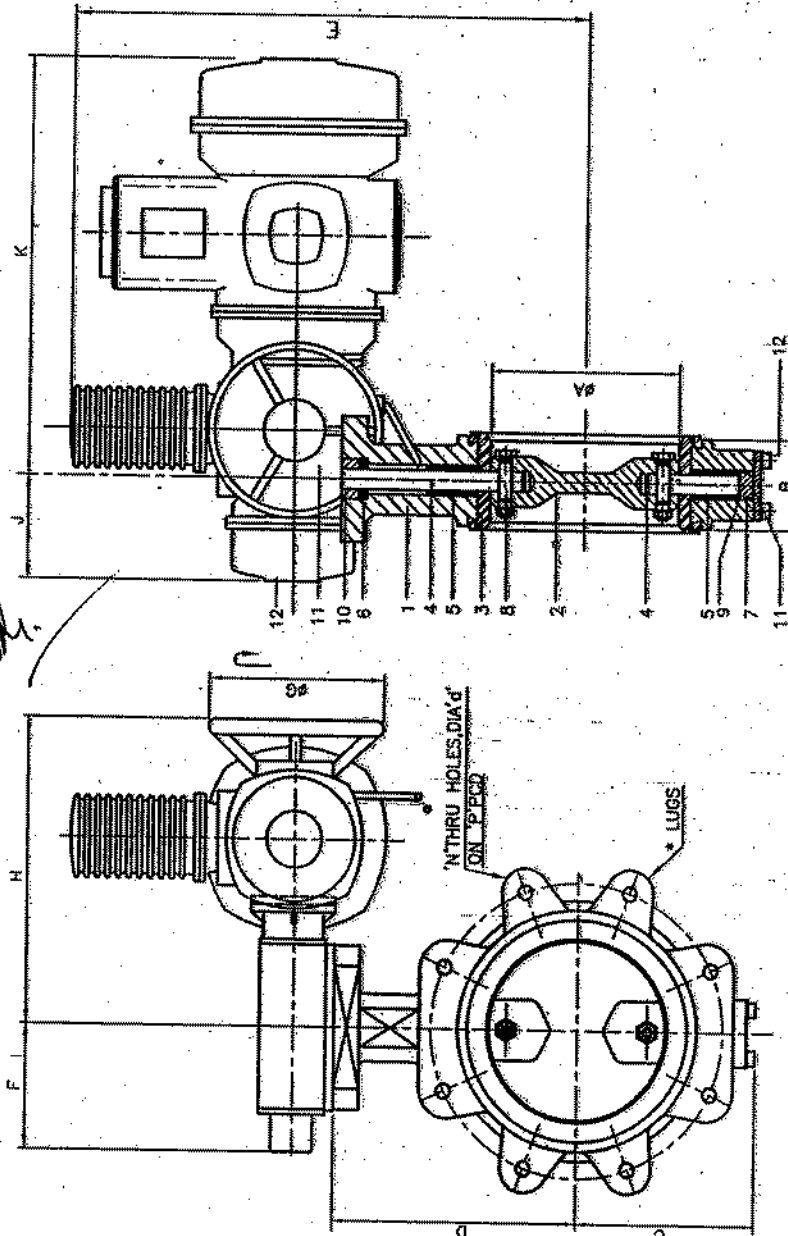
- 1) DO NOT USE FLANGE GASKETS DURING VALVE INSTALLATION
- 2) ALL DIMENSIONS ARE INDICATIVE EXCEPT FACE TO FACE DIM.
- 3) CLOCKWISE TO CLOSE & ANTICLOCKWISE TO OPEN.
- 4) NO. OF LUGS ARE SHOWN FOR INDICATIVE PURPOSE.

14	ELECT. ACTUATOR(ON/OFF)	1	AUMA/SAGSEAS/INTEGRAL STARTER
13	GEAR BOX	1	STD/PAC04SGA41E
12	SOC CAP SCREW	4	AISI 304
11	BOTTOM COVER	1	MS+EPOXY
10	TOP BUSHING	1	POLYACETAL
9	THRUST PAD	1	AL.BRONZE
8	CYLINDRICAL PIN	2	AISI 316
7	O RING THRUST PAD	1	EPDM
6	O RING SHAFT	1	EPDM
5	BEARING	2	STEEL+PTFE
4	SHAFT	2	AISI 316
3	BONDED SEAT	1	EPDM
2	DISC	1	SGI DIN1693 GGG40+EPOXY
1	BODY	1	SGI DIN1693 GGG40+EPOXY

NO	DESCRIPTION	QTY	MATL
IV NO:-941594			APPD
TQ.NO:-			DT.
IVTLB BUTTERFLY VALVE WITH CHKO			
WITH ELECT ACTUATOR			
DT.			

DRG.NO.	PD31210/MDS016	DRN.	SHP
		DT.	26.10.09

INTERVALVE(INDIA)



PROJECT:- PRAGATI POWER CORPORATION LIMITED.

CLIENT:- BHEL, NOIDA

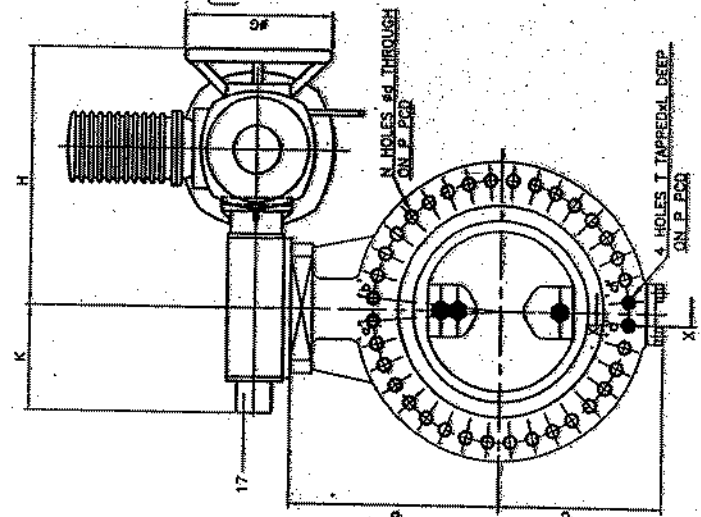
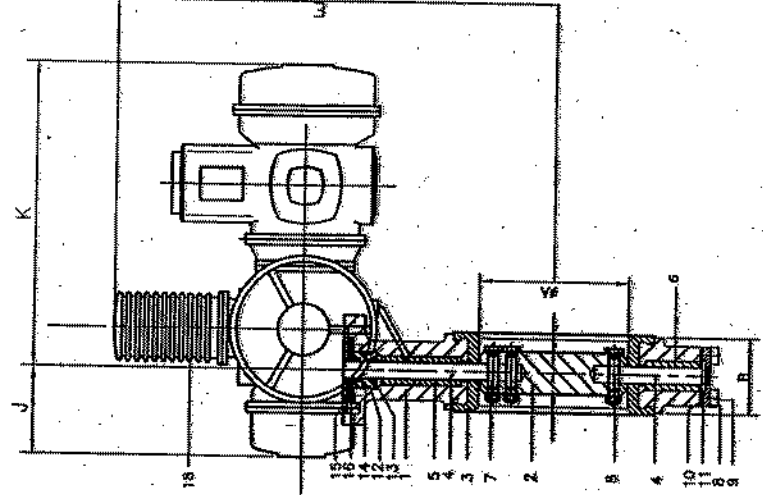
CONSULTANT:- M/s NTPC NEW DELHI

CUSTOMER:- THERMAX LIMITED, WNS DIVISION.

P.O. NO:- E-MAIL LOI DT:- 23/10/2009

REV.	MOD.	NO.	DATE	SIGN	ASK.	SCALE	IF IN DOUBT.
						N.T.S.	

VALVE DIMENSIONS										LUG DRILLING DETAILS				OPERATING TIME		TAG NO	
VALVE SIZE	A	B	C	D	E	F	G	H	J	K	P	Q	R	S	T x L		
650	636	165	485	625	950	340	250	410	173	680	02	744.5	22.35	32	3/4"-10 UNCx30	144 SEC	MV 42.43

17 HOLES 9.5 THROUGH ON P.P.C.D.

4 HOLES 1 TAPEDRAL DEEP ON P.P.C.D.

SECTION X-X FOR S.B.G.

TAP

18

16

15

14

13

12

11

10

9

8

7

6

5

4

3

2

1

SPECIFICATIONS :

FLANGE DRILLING STD:- ANSI B16.47 SERIES B
PRESSURE RATING-PN10

MFG STD - API 609

TEST STD- API 598

HYD TEST PRESS- 1) BODY 15 KG/CM2

2) SEAT 11 KG/CM2

SEAT LEAKAGE - CLASS VI

FLOW DIRECTION : BIDIRECTIONAL

CAUTION

- DO NOT USE FLANGE GASKETS DURING VALVE INSTALLATION.
- ALL DIMENSIONS ARE INDICATIVE EXCEPT FACE TO FACE DIM.
- CLOCKWISE TO CLOSE & ANTICLOCKWISE TO OPEN.
- NO OF HOLES ARE SHOWN FOR INDICATIVE PURPOSE

18	ELECTRICAL (ON/OFF)	1	AUMA/SAGE/5 INTEGRAL STARTER
17	GEAR BOX	1	AUMA/GS160 GZ14
16	GUIDE BUSH	1	AL BRONZE
15	TOP COVER	1	ALSI 304
14	O RING BODY	1	EPDM
13	O RING SHAFT	2	EPDM
12	O RING HOLDER	1	ALSI 304
11	THRUST BEARING	1	AL BRONZE
10	GASKET	1	CAF
9	SOC.HD.CAP SCREW	4	ALSI 304
8	COVER	1	MS+EPOXY
7	CYLINDRICAL PIN	3	ALSI 316
6	BOTTOM BEARING	2	STEEL+PTFE
5	TOP BEARING	2	STEEL+PTFE
4	SHAFT	2	ALSI 316
3	BONDED SEAT	1	EPDM
2	DISC	1	SGI DIN1693 GGG40+EPOXY
1	BODY	1	SGI DIN1693 GGG40+EPOXY
NO DESCRIPTION		QTY	MATL
IV NO:- 941594			APPO DT.
TITLE: INT. BUTTERFLY VALVE WITH AUMA ELECTRICAL ACTUATOR.			CHD DT.
DRG NO. PD31211/MD3036			DRN DT.
			SHIP DT.

INTERVALVE (INDIA)

PROJECT:- PRAGATI POWER CORPORATION LIMITED.
CLIENT:- BHEL, NOIDA.
CONSULTANT:- M/s NTPC NEW DELHI
CUSTOMER:- THERMAX LIMITED. WWS DIVISION.
P.O. NO:- E-MAIL LOI DT:- 23/10/2009

IF IN DOUBT. SCALE N.T.S.
REV. MOD. NO. DATE SIGN ASK.



INTERVALVE (INDIA) LTD.
(WITH DUTCH TECHNOLOGY)



General Purpose Rubber Lined Butterfly Valve With Lugged Body



Yet another real workhorse from the IV stables, IVTL model Butterfly valve incorporates the optimum design features to provide long trouble free service in the field. This general purpose soft seated Butterfly valve has a fully rubber lined single piece body with a centric disc construction and is available in wafer lugged style body pattern to ensure precise location in pipeline.

The body liner which also functions as the soft seat, come either in a replaceable version or an integrally moulded (bonded) version and offers 100 % bi-directional sealing against vacuum to rated pressures of PN 10 or PN16.

The lugged version with threaded holes can be used as end of line valves or terminal end valves.

Conformity to codes and standards :

General design and manufacturing
Valve face to face dimensions

Top flange drilling
Valve inspection and testing
Flange standard conformity

- : API 609 category A/BS 5155/MSS SP-67
- : Short wafer or Wafer lugged as per ISO 5752
- : Tab 5 & API 609 category A
- : ISO 5211 part II
- : API 598
- : ANSI 150, DIN PN6/PN10/PN16,
- : JIS 5K /10 K
- : BS 10 Tab D & E, IS 6392 NP 0.6/1.0/1.6
- : For sizes ≥ 650 ANSI B16.47 Class 150
- : Series A / BS 3293 Class 150 and
- : Series B / API.605

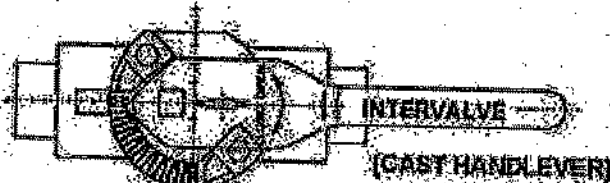
Technical specifications :

1. Valve type
 - : Centric Disc Design Butterfly valve with a single piece Rubber lined body
2. Body type
 - : Wafer lugged (IVTL)
3. Seat type
 - : Replaceable for sizes 50 NB to 600 NB $\leq$ PN 10 rating.
 - : Bonded seat for sizes 40 to 1200 NB for all ratings.
4. End connection
 - : Wafer lugged
5. Size range
 - : 40 NB to 1200 NB
6. Pressure rating
 - : 40 NB to 600 NB-PN 16 (max).
 - : 650 NB to 1200 NB-PN 10 (max).
7. Operating temperature range
 - : -25 C to 200 C (depending on MOC)
8. Seat leakage
 - : Tight shut off
9. Operation
 - : Handlever for sizes from 40 NB to 250 NB
 - : Worm gear boxes for sizes from 40 NB to 1200 NB
 - : Pneumatic / Electric actuator operation-optional
10. Standard Material of Construction (MOC)
 - : Body
 - : Disc
 - : Seat
 - : Shaft
 - : CI / SGI / WCB / CF8 / CF8M
 - : SGI / WCB / CF8 / CF8M
 - : EPDM / Viton / Nitrile / Neoprene / Hypalon / Silicon
 - : AISI 410 / SS 316 SH



DIMENSIONS (in mm.) with Pressed Steel Handlever

40	33	68	103	150	195	5.0
50	43	73	113	160	195	5.5
65	46	80	121	170	195	6.0
80	46	88	128	175	195	7.5
100	52	104	146	195	250	10.5
125	56	116	158	205	250	13.5
150	56	138	174	230	300	15.0



DIMENSIONS (in mm.) with Cast Handlever

200	60	163	198	255	500	18.0
250	68	203	245	300	500	29.0

* Valve Rating up to PN6 only.

DIMENSIONS (in mm.) for PN10 & PN16 with Worm Gear

40	33	68	103	230	195	175	127	9.5
50	43	73	113	240	195	175	127	11.0
65	46	80	121	248	195	175	127	11.5
80	46	88	128	255	195	175	127	13.0
100	52	104	146	273	195	175	127	16.0
125	56	116	158	285	195	175	127	19.0
150	56	138	174	340	242	250	182	22.5
200	60	163	198	365	242	250	182	25.5
250	68	203	245	410	242	250	182	36.5
300	78	228	270	486	285	350	252	52.0
336	78	265	312	528	285	350	252	62.0
386	102	305	360	705	320	600	388	93.5

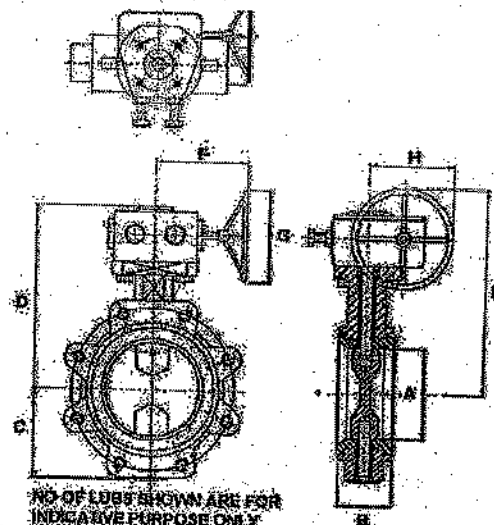
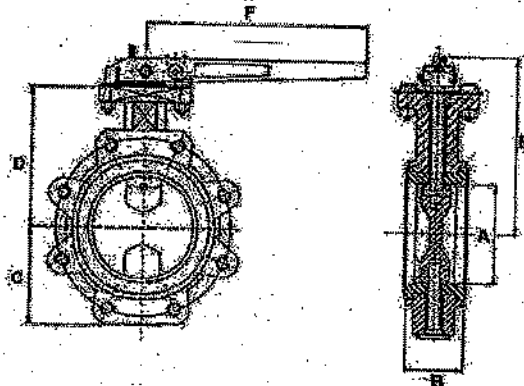
DIMENSIONS (in mm.) for PN10 with Worm Gear

436	114	396	390	735	320	600	388	108.5
486	127	355	410	755	320	600	388	158.5
586	154	435	490	810	395	500	445	242.0

DIMENSIONS (in mm.) for PN16 with Worm Gear

436	114	330	390	765	320	600	432	137.0
486	127	355	410	730	395	500	445	182.0
586	154	435	490	825	420	500	500	296.0

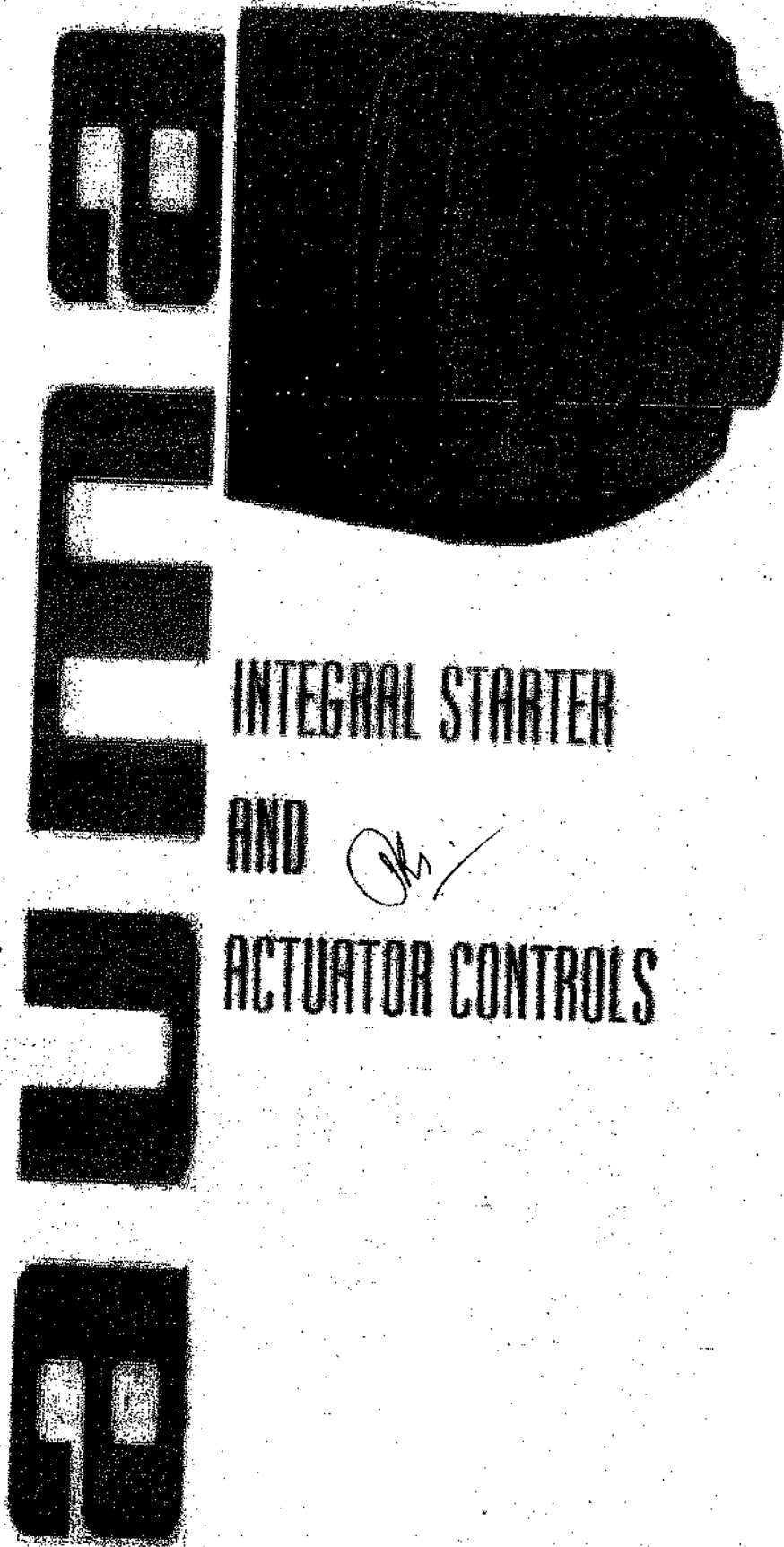
BTL BUTTERFLY VALVE WITH HANDLEVER



NO OF LUGS SHOWN ARE FOR INDICATIVE PURPOSE ONLY

Key features :

- Unique triple sealing system for shaft sealing, eliminates any fugitive emission or secondary leakage.
- Self lubricated PTFE lined bearings for both drive end and non-drive end shaft ensures minimum bearing friction torque.
- Seat liner extending on to the flange contact faces, eliminates the need for separate flange gaskets during installation.
- Controlled compression of the gasket face to offer optimum sealing & prevent gasket face crushing failure.
- Bi-directional valve with tight shut off sealing capability to hold vacuum to rated pressure in either direction.
- Excellent adaptability for actuated operation through standardised top flange mounting dimensions for actuator fitment.
- Suitability for ON /OFF as well as throttling duties.
- Choice of seat and disc materials to suit media conditions and service requirements.
- The lugged wafer pattern ensures precise self centering of valve between mating flanges.
- Possibility of lower seat rating to obtain reduced operating torque and extended seat life for low operating pressures.



INTEGRAL STARTER
AND *OK*
ACTUATOR CONTROLS

FOR ACTUATORS OF TYPE SA AND SAR

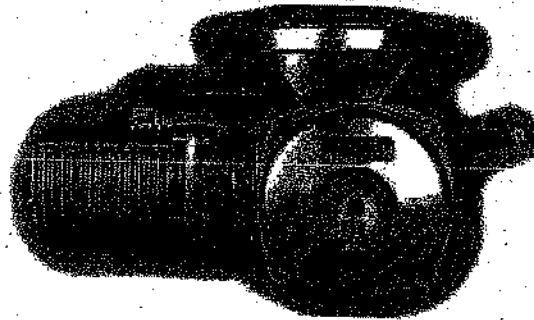
sumo

Contents

An Introduction	1
Integral Starter	2
Control Options	3-4
Safety Features	5-6
About electronic version of Integral starter	7-8

Auma

An Introduction



Auma India Limited in collaboration with
Werner Meister GmbH Co. KG of Germany,
leaders in the field of valve and damper
automation, manufacture Actuators for ON-
OFF & REGULATING duty with Integral
Starters.

Auma India is an ISO 9001 company.

Auma India has a full fledged
manufacturing base in Bangalore backed by
Sales & Service setup through out India.

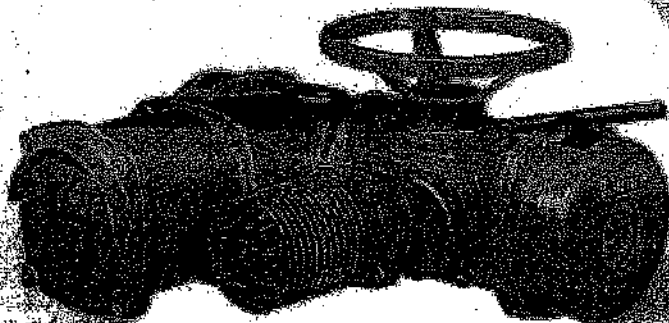
Auma India offers Integral Starters in
Different version to suit various needs of the
Indian Industry. India Integral Starters
are supplied both in hard wired &
soft start version as per customer's

AUMA

Integral Starter

2

Auma India Basic Actuator can house the Motor with three thermostats for protection against burn-out. Drive arrangement, Main gearing for transmission of torque, Valve attachment, Drive system for position sensing devices, Position transmitting devices, Local Position Indicator, End position limit switches, Torque switches in both direction, Space Heaters, Terminal compartment, Handwheel for manual operation, Cable glands for conduit entries, etc.



An Integral control box housing the required reversing contactors wired to the motor of the Actuator, can be attached to the basic actuator.

Auma India Integral Starter can house the required electrical components, and the entire Integral Starter is of the protection class IP 54. The temperature of the Actuator is -20°C .

The Reversing contactors are mechanically interlocked and have a selector switch like selector switch. The Integral Starter has transformers, fuses, Thermal overload boards, Phase protection devices, Dip switches for manual operation, housed in the Integral Starter.

Plug in type can be used between the basic actuator and the Integral Starter for base or optional features.

3

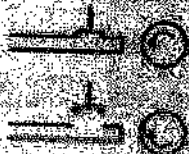
Control

Emergency Shut Down



The closing of Emergency Shut Down contact of the Remote Command Center (RCC) will enable the actuator to move in OPEN / CLOSE direction as programmed locally overriding any existing REMOTE or LOCAL signals.

2-Wire Make / Break



The Remote Command Signal will be through 2 wires. The Make (NO) of these wires will operate the actuator in OPEN / CLOSE direction and the Break (NC) of these wires will operate the actuator in CLOSE / OPEN direction. The required direction of rotation shall be programmed locally.

Timer Board



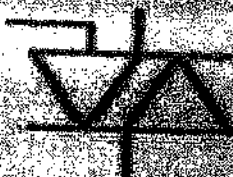
With this option, it will be possible to run the actuator for a pre-defined travel in ON-OFF steps. The ON-OFF intervals shall be adjustable from 1 - 30 seconds for both directions independently. This feature is useful in increasing the operating time in large butterfly valves to prevent water hammer effect.

Inhibit Open / Close



Two wires will be drawn to the Remote Control Center from the actuator. The 'Make' of these wires will prevent the actuator from Opening / Closing. Selection of direction to be inhibited shall be possible at the actuator.

Thyristor Reversing Unit



The integral starter unit can be provided with Solid State Starter (Thyristors) for regulation duty application. The Thyristor comes with inhibit rugged protection circuits.

Negative Switching



Absence of 24V DC remote signal from Remote Command Center will make the actuator run in the required direction. Retaining / Inching / Non-Retaining / Non-Inching mode will be field configurable.

Options

4

The actuator starter unit can be provided in a wall mountable version in which case, the controls of the actuator can be mounted on a nearby wall for bracket to meet certain site requirements.

Wall Mountable Controls



Individual relay contacts can be provided for remote annunciation for facilities like Actuator running in Open, Actuator running in Close, Open torque switch tripped, Close torque switch tripped, Thermoswitch / Thermal overload relay trip etc.,

Remote Annunciation Relays



In case of a power supply failure, an annunciation to indicate the same can be provided.

Power failure annunciation



Integral to the actuator are DIP switches, the programming of which offers a wide range of options to the customer and the customer at site, can configure the actuator to satisfy his requirements like selecting direction of rotation for emergency shut down, selecting direction of rotation for 2-wire make and break, selecting direction of rotation that needs to be inhibited, selection of inching or non-inching mode for the actuator, limit switch by-pass through setting for gate valve application etc.

DIP Switch Programming



Positioner with PWM Control

Regulation duty actuators can be offered with Positioner with Pulse Width Control.



The actuator with this feature, enables the user to stop the actuator by operating the local stop push button even when the actuator is in remote mode.

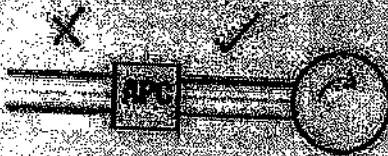
Local Stop



5

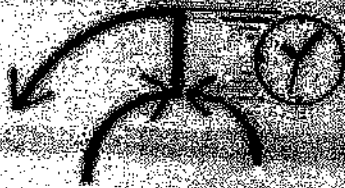
Safety

Automatic Phase Correction



The actuator with Automatic Phase corrector in-built, will check the phase sequence of the supply and correct it, in case wrong sequence is provided. This will set the customer free from wrong sequence connection hassles.

Instantaneous Reversal Protection



This feature ensures that the motor does not get an instantaneous reversal signal. Even if an instantaneous reversal signal is given to the actuator, a time delay of 150 msec is built-in to prevent instantaneous reversal of the motor direction and ensures the safety of the motor and the driven equipment.

Smart Torque Switch

Torque Switch

The torque switches play an important role in protecting the actuator, motor and the valve. In addition to its role of tripping the actuator under abnormal torque requirements, certain special features can also be built-in and the torque switches act smart during the valve unsealing process and prevents nuisance tripping. If the actuator is tripped by the torque switch in a particular direction, it will not allow the actuator to run again in that direction (Anti-Hammer Protection).

Opto-Isolation of Input Signals



All the remote control inputs (OPEN - STOP - CLOSE) to the actuator are isolated optically from the actuator internal electronics to ensure perfect isolation between customer controls and actuator controls.

Features

6

In addition to a thermo switch embedded in each of the windings, this feature protects the actuator motor by cutting off the supply instantaneously to it in case of single phasing of power supply.

Single Phasing Protection



General

The Integral starter in electronic control version, is modular in design, i.e., the Integral starter is made up of 'sub-modules' and all the 'sub-modules' are with plug-in type connection which helps the user in replacement, maintenance and trouble shooting. The whole Actuator Starter is again a module with plug-in type connectors for connection to the basic actuator. This also helps the user in replacement, maintenance and trouble shooting.

Modular Design



The Integral starter in electronic control version, is self-diagnostic with Local green coloured LEDs for status and red coloured LEDs for fault annunciation. This ensures better trouble shooting. These LEDs can be viewed through a view port provided on the Actuator.

Self Diagnostic



The Integral starter can house a control transformer which shall convert the three phase power to single phase and feed it to the cards which generates 24V DC for internal use and 24V DC (isolated) is also provided for the customer for his use.

24V DC

Auma India has the required expertise and facilities to take up challenging jobs in the field of valve and damper automation and in addition to products with the above features, customized products to meet the special requirement of customers are also produced.

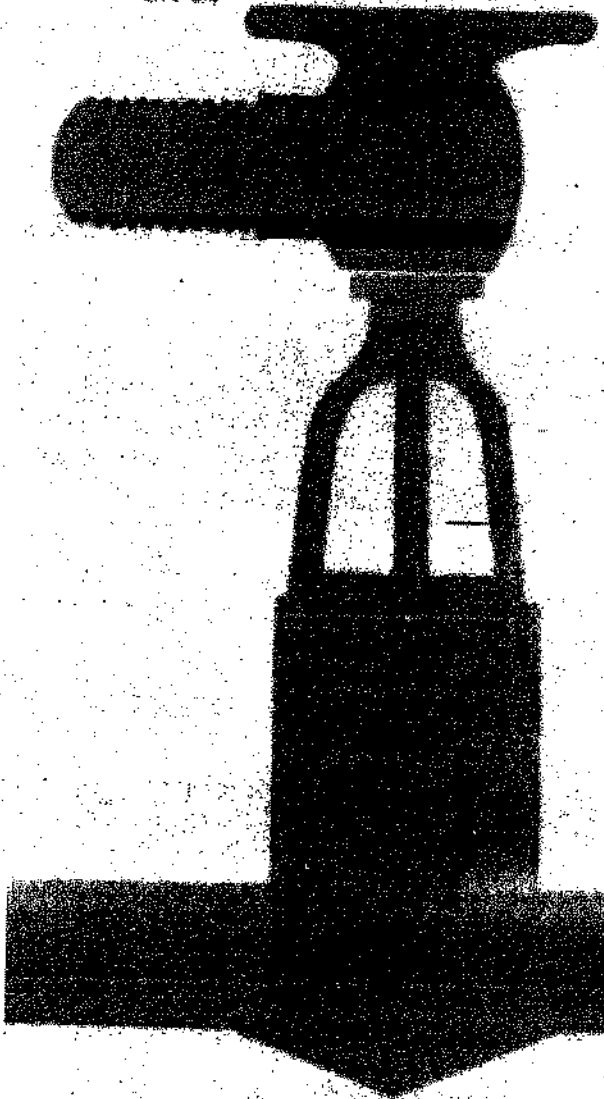
And . . .

7

AUMA**About electronic version of the Integral Starter**

The Electronic version of Auma India Integral starters are modular in construction. The Electronic version of the Integral starter unit consists of the power module, the control module and the starter module.

This modular approach enable easy maintenance and interchangeability at site.



The printed circuit board used CMOS ICs which ensures high noise immunity and low power consumption. Each PCB is a functional unit and is of plug in design, which enables replaceability of a particular functional unit at site.

Availability of DIP switch programming makes it possible to customize the Actuator to meet the requirements easily at site.

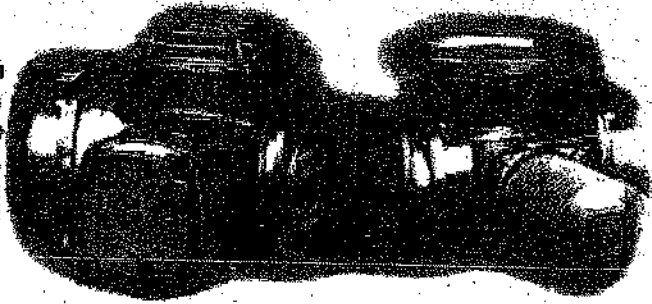
Provision of opto-couplers and annunciation relays enables the Integral Starter unit to interface input and output signals with customer controls.

Opto-couplers ensure isolation of customer command signals from Actuator Electronics while consuming very less power. Similarly fault annunciation relays are provided for both common fault optionally for individual faults.

Local LEDs are provided for both status and fault annunciation to ensure better trouble shooting. These LEDs can be viewed through a view port provided on the Actuator.

AUMA 8

The Integral Starter unit can also be easily detached from the basic Actuator by the virtue of its unique plug in design. This also ensures good maintainability and interchangeability at site.



Auma India Integral Starter unit provides many protection features with optionals, like Automatic phase correction, instantaneous reversal protection, anti-hammer protection, single phasing protection, thermo switch tripped, thermal overload relay trip, etc.

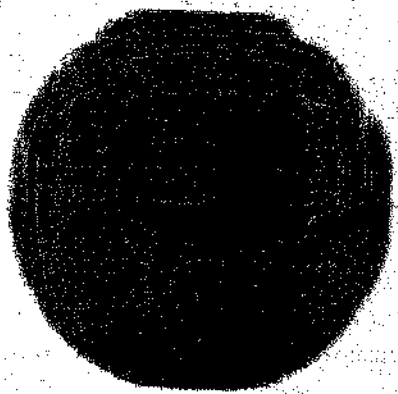
Integral Starter unit can also be provided with solid state starters (thyristors) for regulation duty application. The thyristor control comes with in built rugged protection circuit which are well suited for Indian conditions.

Auma India strives to offer complete solution for valve & damper automation needs of customer. Other special requirement can also be accommodated after a detail discussion.

PK

Note:

Applicable wiring diagrams, terminal plan, contact development diagram, etc., will be furnished on request.



	TECHNICAL SPECIFICATIONS/ DATA SHEET		DS No.	WPP09-007-000-058/BOI																				
			Rev.No.	5																				
			Date	13-Feb-10																				
<table border="0"> <tr> <td style="text-align: right;">ITEM</td> <td>COMPUTER</td> </tr> <tr> <td style="text-align: right;">MAKE</td> <td>HP/DELL</td> </tr> </table>					ITEM	COMPUTER	MAKE	HP/DELL																
ITEM	COMPUTER																							
MAKE	HP/DELL																							
 SPECIFICATIONS Configuration Intel Pentium Processor 2 GB RAM 160 GB HDD 2.8 GHz 48 X DVD Read & Write drive 3 1/2" Floppy Drive Optical Mouse. 104 keys standard keyboard. 2 Ethernet ports 2 Serial port 1 Parallel port 6 USB ports Operating System : Latest windows professional & Antivirus MONITOR as per below specification																								
<table border="1"> <tr> <td>CONSULTANT</td> <td colspan="3">NTPC LIMITED, CONSUTANCY WING</td> </tr> <tr> <td>CUSTOMER</td> <td colspan="3">M/s. BHARAT HEAVY ELECTRICALS LTD</td> </tr> <tr> <td>END USER</td> <td colspan="3">M/s. PRAGATI POWER CORPORATION LIMITED (PPCL)</td> </tr> <tr> <td>PROJECT</td> <td colspan="3">PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL)</td> </tr> <tr> <td>PREPARED</td> <td>SHAN</td> <td>CHKD & APPD</td> <td>KS</td> </tr> </table> This Specification and copyright therein are the property of GE Fanuc Systems Ltd., and all information which it contains is confidential. The Specification must not be reproduced or disclosed, nor must any information taken therefrom be disclosed, without the prior consent in writing of GE Fanuc Systems Ltd.					CONSULTANT	NTPC LIMITED, CONSUTANCY WING			CUSTOMER	M/s. BHARAT HEAVY ELECTRICALS LTD			END USER	M/s. PRAGATI POWER CORPORATION LIMITED (PPCL)			PROJECT	PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL)			PREPARED	SHAN	CHKD & APPD	KS
CONSULTANT	NTPC LIMITED, CONSUTANCY WING																							
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PREPARED	SHAN	CHKD & APPD	KS																					

	TECHNICAL SPECIFICATIONS/ DATA SHEET		DS No.	WPP09-007-000-058/BOI
			Rev.No.	5
			Date	13-Feb-10

ITEM	MONITOR-22 INCH
MAKE	DELL



SPECIFICATIONS

Display Type Flat panel display / TFT active matrix

Display

Diagonal Size 22 in - Widescreen

Viewable Size 22 in

Max Resolution 1680 x 1050

Max Sync Rate (V x H) 75 Hz x 83 KHz

Video Bandwidth 146 MHz

Response Time 5 ms

Display Pos. Adjustments Tilt

Signal Input DVI-D, VGA

Features HDCP

Video Input

Analog video signal RGB

Digital video standard Digital Visual Interface (DVI)

Power

Input Voltage 100-240VAC

Power consumption 90VA

CONSULTANT	NTPC LIMITED, CONSUTANCY WING		
CUSTOMER	M/s. BHARAT HEAVY ELECTRICALS LTD		
END USER	M/s. PRAGATI POWER CORPORATION LIMITED (PPCL)		
PROJECT	PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL)		
PREPARED	SHAN	CHKD & APPD	KS

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	TECHNICAL SPECIFICATIONS/ DATA SHEET	DS No.	WPP09-007-000-058/HW
		Rev.No.	3
		Date	2009-12-18

MODULE CAT No.	IC693PWR331
MODULE NAME	POWER SUPPLY MODULE



Module Specifications

	IC693PWR331
Product Name	Power Supply, 24 VDC
Module Type	Power Supply
Power Source	24 VDC
High Capacity	Yes
Output Source	30 watts total; 30 watts 5 V; 15 watts 24 V relay; 20 watts 24 V isolated
Number of Redundant Power Supplies Supported	N/A
Cable Length to Redundant Power Supply Adapter	N/A
Redundant Power Supply Adapter Rack Compatibility	N/A
24 VDC Output Current Capacity	0.8 A

CONSULTANT	NTPC LIMITED, CONSUTANCY WING		
CUSTOMER	M/s. BHARAT HEAVY ELECTRICALS LTD		
END USER	M/s. PRAGATI POWER CORPORATION LIMITED (PPCL)		
PROJECT	PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL)		
PREPARED	SHAN	CHKD & APPD	KS

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		TECHNICAL SPECIFICATIONS/ DATA SHEET		DS No.	WPP09-007-000-058/BOI
				Rev.No.	5
				Date	13-Feb-10
ITEM MAKE		MONITOR-22 INCH DELL			
					
SPECIFICATIONS					
Display Type		Flat panel display / TFT active matrix			
Display					
Diagonal Size		22 in - Widescreen			
Viewable Size		22 in			
Max Resolution		1680 x 1050			
Max Sync Rate (V x H)		75 Hz x 83 KHz			
Video Bandwidth		146 MHz			
Response Time		5 ms			
Display Pos. Adjustments		Tilt			
Signal Input		DVI-D, VGA			
Features		HDCP			
Video Input					
Analog video signal		RGB			
Digital video standard		Digital Visual Interface (DVI)			
Power					
Input Voltage		100-240VAC			
Power consumption		90VA			
CONSULTANT		NTPC LIMITED, CONSUTANCY WING			
CUSTOMER		M/s. BHARAT HEAVY ELECTRICALS LTD			
END USER		M/s. PRAGATI POWER CORPORATION LIMITED (PPCL)			
PROJECT		PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL)			
PREPARED		SHAN	CHKD & APPD		KS
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	TECHNICAL SPECIFICATIONS/ DATA SHEET	DS No.	WPP09-007-000-058/BOI
		Rev.No.	5
		Date	13-Feb-10
ITEM MAKE	A3 COLOUR INKJET PRINTER HP		
			
SPECIFICATIONS			
Print speed	Draft: up to 21 ppm; laser quality: 6 ppm; Best: up to 3.7 ppm		
Resolution	up to 4800 by 1200-optimized dpi color printing on premium photo papers		
Processor	256 MHz		
Duty cycle	Up to 6,250 pages per month		
Sizes	Width: 3 to 13 in (76 to 330 mm); length: 5 to 100 in (127 to 2540 mm)		
Types	Paper (plain, inkjet, photo), envelopes, transparencies, labels, cards (index, greeting)		
Connectivity	USB 2.0 full speed port, IEEE 1284-compliant parallel port, built-in Ethernet connectivity		
Client operating systems	Microsoft® 2000, XP		
CONSULTANT	NTPC LIMITED, CONSUTANCY WING		
CUSTOMER	M/s. BHARAT HEAVY ELECTRICALS LTD		
END USER	M/s. PRAGATI POWER CORPORATION LIMITED (PPCL)		
PROJECT	PRAGATI-III COMBINED CYCLE POWER PROJECT 1500MW(NOMINAL)		
PREPARED	SHAN	CHKD & APPD	KS
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	TITLE: 1500 MW PRAGATI – III CCPP	SPECIFICATION NO. PE-TS-314- 158-A001M
		VOLUME - III
	TECHNICAL SPECIFICATION FOR MANDATORY SPARES OF PRETREATMENT PLANT CW TREATMENT PLANT CHLORINE DIOXIDE SYSTEM EFFLUENT TREATMENT PLANT CHLORINATION PLANT SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT	SECTION -
		REV.NO. 0 DATE :

VOLUME III

	TITLE: 1500 MW PRAGATI – III CCPP TECHNICAL SPECIFICATION FOR MANDATORY SPARES OF PRETREATMENT PLANT CW TREATMENT PLANT CHLORINE DIOXIDE SYSTEM EFFLUENT TREATMENT PLANT CHLORINATION PLANT SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT	SPECIFICATION NO. PE-TS-314- 158-A001M VOLUME - III SECTION - REV.NO. 0 DATE :

LIST OF DOCUMENTS TO BE SUBMITTED ALONG WITH BID

- Technical pre-bid clarification if any strictly in the enclosed Schedule of pre bid clarifications only with mention of specification clause for which clarification is being asked. (Stamped & Signed).
- Technical Deviation if any strictly in the enclosed Schedule of deviation with cost of withdrawal only with mention of specification clause for which deviation is being asked. (Stamped & Signed).
- No deviation in attached "Schedule of technical deviation and cost of withdrawal" format. (Stamped & Signed).
- Compliance cum confirmation certificate (Stamped & Signed).
- Un Price Schedule duly filled as "Quoted" in each column (Stamped & Signed).

	TITLE: 1500 MW PRAGATI – III CCPP TECHNICAL SPECIFICATION FOR MANDATORY SPARES OF PRETREATMENT PLANT CW TREATMENT PLANT CHLORINE DIOXIDE SYSTEM EFFLUENT TREATMENT PLANT CHLORINATION PLANT SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT	SPECIFICATION NO. PE-TS-314- 158-A001M VOLUME - III SECTION - REV.NO. 0 DATE :

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnishing same with the offer:

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions/ deviations with regard to same.
2. There are no other deviations with respect to specification other than those furnished in the 'Schedule of Deviations'.
3. The offered materials shall be either equivalent or superior to those specified. Also for components where material is not specified it shall be suitable for intended duty, materials shall be subject to approval in the event of order.
4. All sub vendors shall be subject to BHEL/CUSTOMER approval.

	TITLE:	SPECIFICATION NO. PE-TS-314-158-A001M
	1500 MW PRAGATI – III CCPP	VOLUME - III
	TECHNICAL SPECIFICATION FOR MANDATORY SPARES OF PRETREATMENT PLANT CW TREATMENT PLANT CHLORINE DIOXIDE SYSTEM EFFLUENT TREATMENT PLANT CHLORINATION PLANT SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT	SECTION -
		REV.NO. 0 DATE :

PRE BID CLARIFICATION SCHEDULE

All clarification from the Technical Specification shall be filled in by the BIDDER clause by clause in this format only.

VOLUME	SECTION	CLAUSE NO.	PAGE NO.	SPECIFICATIO N REQUIREMENT	CLARIFICATIO N	REASONS FOR CLARIFICATIO N



TITLE:

1500 MW PRAGATI – III CCPP

**TECHNICAL SPECIFICATION FOR MANDATORY
SPARES OF PRETREATMENT PLANT
CW TREATMENT PLANT
CHLORINE DIOXIDE SYSTEM
EFFLUENT TREATMENT PLANT
CHLORINATION PLANT
SIDE STREAM FILTRATION
&
SEWAGE TREATMENT PLANT**

SPECIFICATION NO. PE-TS-314-
158-A001M

VOLUME - III

SECTION -

REV.NO. 0 DATE :

 SCHEDULE OF TECHNICAL DEVIATIONS WITH COST OF WITHDRAWAL									
PROJECT:-1500 MW PRAGATI – III CCPP									
MANDATORY SPARES FOR PRETREATMENT PLANT, CW TREATMENT PLANT, CHLORINE DIOXIDE SYSTEM, EFFLUENT TREATMENT PLANT, CHLORINATION PLANT, SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT									
TENDER ENQUIRY REFERENCE:-									
NAME OF VENDOR:-									
SL NO	VOLUME SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF withdrawal OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF withdrawal OF DEVIATION IS APPLICABLE	NATURE OF COST OF withdrawal OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									
PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE									
NAME		DESIGNATIONS				SIGN & DATE			
NOTES:									
1. For self manufactured items of bidder, cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.									
2. For directly dispatchable items, cost of withdrawal of deviation will be applicable on the basic price including taxes, duties & freight.									
3. All the bidders have to fill out all their Technical & Commercial Deviations (if any) in detail in the above format.									
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.									
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.									
6. Bidder shall furnish price copy of above format along with price bid.									
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.									
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.									
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.									
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.									
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.									
12. Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.									
13. In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.									
14. In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.									



TITLE:

1500 MW PRAGATI – III CCPP

SPECIFICATION NO. PE-TS-314-158-A001M

VOLUME - III

SECTION -

REV.NO. 0 DATE :

**TECHNICAL SPECIFICATION FOR MANDATORY
SPARES OF PRETREATMENT PLANT
CW TREATMENT PLANT
CHLORINE DIOXIDE SYSTEM
EFFLUENT TREATMENT PLANT
CHLORINATION PLANT
SIDE STREAM FILTRATION
&
SEWAGE TREATMENT PLANT**

	TITLE		SPECIFICATION NO.		PE-TS-314-158-A001M	
	SCHEDULE OF PRICES		VOLUME:		III	
			SECTION		DATE 10.11.2015	
			REV. NO.		00 SHEET 1 OF 1	
SL. No.	DESCRIPTIONS OF WORKS OR EQUIPMENT		PRICE (in Lacs of Rs.)			
1.0	1500 MW PRAGATI – III CCPP					
Total lump sum price on FCR site basis for supply and dispatch to power station site of Mandatory Spares of PRETREATMENT PLANT, CW TREATMENT PLANT, CHLORINE DIOXIDE SYSTEM, EFFLUENT TREATMENT PLANT, CHLORINATION PLANT, SIDE STREAM FILTRATION & SEWAGE TREATMENT PLANT as specified below (S.No.2.0) for 1500 MW PRAGATI – III CCPP including freight and inclusive of all prevailing taxes, duties and other levies, complete with all accessories,as required for the total scope defined as per BHEL specification no. PE-TS-314-158-A001M			Total Rs.			
NOTE						
A	Bidder to note that total price indicated above at 1.0 shall be considered for evaluation and hence should be complete in all respect for the full scope defined and considering all terms and conditions agreed.					
B	In case, price indicated above does not match with total of item wise break-up given at 2.0, the higher price so calculated shall be considered for evaluation but in case of order, the same shall be placed at the lowest price.					
2.0	MAJOR BREAK-UP OF PRICES GIVEN IN 1.0 ABOVE		QTY			
2.1	PG (0 - 4 KG/CM2)		5			
2.2	FT ULTRASONIC		4			
2.3	FT DIFF PRESSURE TYPE		4			
2.4	ORIFICE PLATE (0-4300 M3/HR)		2			
2.5	COND ANALYSER		1			
2.6	ORIFICE PLATE (0 -350 M3/HR)		1			
2.7	LI FLOAT & BOARD (2600 MM)		5			
2.8	LI FLOAT & BOARD (4900 MM)		1			
2.9	LS REFLEX TYPE		5			
2.10	LS CAPACITANCE		15			
2.11	LS SIDE MOUNTED MAGNETIC FLOAT TYPE		7			
2.12	PH TRANSMITTER		3			
2.13	PH SENSOR		3			
2.14	PG (0 - 16KG/CM2)		5			
2.15	PS (0 - 16KG/CM2)		5			
2.16	PS (1.6 - 16KG/CM2)		2			
2.17	TEMP ELEMENT		1			
2.18	TEMPERATURE TRANSMITTER		1			
2.19	ORIFICE PLATE (0 -350 M3/HR)		1			
2.20	PG (0 - 10KG/CM2)		22			
2.21	LS CAPACITANCE TYPE		5			
2.22	LI FLOAT & BOARD (2400 MM)		1			
2.23	LS TOP MOUNTED DISPLACER TYPE		2			
2.24	LT		5			
2.25	FI		2			
2.26	ACTUATOR MOTOR OPERATED		1			
2.27	DIGITAL INPUT CARDS		6			
2.28	DIGITAL OUTPUT CARDS		5			
2.29	ANALOG INPUT CARDS		2			
2.30	ANALOG OUTPUT CARDS		2			
2.31	PC (MONITOR, CPU, KEYBOARD & OPTICAL MOUSE) LOADED WITH SOFTWARE (OPERATING SYSTEM)		1			
2.32	POWER SUPPLY MODULE		4			
2.33	TFT MONITOR		1			
2.34	PRINTER		1			
2.35	HDD		2			
2.36	KEY BOARD		2			
2.37	POWER SUPPLY FOR COMPUTER (SMPS)		4			
Bidder shall furnish this price Schedule in his price offer only						
PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE						

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL
------	-------------	-----------	------	--------------

	TITLE:	SPECIFICATION NO. PE-TS-314-158-A001M
	1500 MW PRAGATI – III CCPP	
	TECHNICAL SPECIFICATION FOR MANDATORY SPARES OF PRETREATMENT PLANT	VOLUME - III
	CW TREATMENT PLANT	SECTION -
	CHLORINE DIOXIDE SYSTEM	REV.NO. 0 DATE :
	EFFLUENT TREATMENT PLANT	
	CHLORINATION PLANT	
	SIDE STREAM FILTRATION	
	&	
	SEWAGE TREATMENT PLANT	

*** SCHEDULE OF DECLARATIONS**

* Bidder shall include this schedule both in technical and Price offers

DECLARATION

Icertify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our format proposal number Dated and there is no deviation to the specification.

I hereby certify that I am duly authorized representative of the Bidder's company whose name appears above my signature.

Bidders Company Name

Authorised representative's
Signature

Name

Bidder's Name The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL