



Offshore Design Section
Engineering Services
ISO – 9001:2008

**FUNCTIONAL
SPECIFICATION FOR
FLOW TRANSMITTER
(ELECTRONIC)**

Spec. No.	3202
Rev. No.	7
Discipline	Instt.
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FUNCTIONAL SPECIFICATIONS

FOR

**FLOW TRANSMITTER
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PREPARED / REVISED BY	REVIEWED BY	APPROVED BY	TOTAL No. OF PAGES	DATE	REV. No.
<i>MD</i>	<i>ARD</i>	<i>K. Madhukar</i>		28.01.16	7
MD	ARD	KM	9		
MD	ARD	AKR	10	28.08.2012	6
MD	ARD	AKR	9	30.03.2011	5A
MD	ARD	AKR	9	16.07.2011	5
VS	SRS	GRP	8	18.02.2008	4
ET	RS	GRP	12	28.03.2007	3
AK	BK	GRP	12	31.08.2006	2
ET	MC	RK	12	23.06.2005	1
ET	MC	AC	12	25.08.2003	0

FORMAT No.
ODS/SOF/023

Ref. PROCEDURE No.
ODS/SOP/017

ISSUE No.
01

REV. No.
00

REV. DATE:
21.07.2010

FORMAT No.
ODS/SOF/023

Ref. PROCEDURE No.
ODS/SOP/017

ISSUE No.
01

REV. No.
00

REV. DATE:
21.07.2010



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1.0 SCOPE OF THIS DOCUMENT:

This functional specification describes the essential design considerations for the selection of Electronic Flow Transmitter for the intended service.

2.0 REFERENCE DOCUMENTS AND SPECIFICATIONS:

- a) Instrumentation / Process Design Criteria
- b) Basic Bid Work
- c) Project P & ID
- d) Instrument / Process Data Sheets


3.0 SCOPE OF SUPPLY:

- 3.1 The quantity to be supplied and installed shall be as per the requirements indicated in the Basic Bid Work, Design Criteria and the P & IDs.
- 3.2 The vendor shall be responsible for the selection and supply of the Flow Transmitter suitable for measurement range, accuracy, MOC & standard accessories including Quality valve manifold for its intended application. Δ
- 3.3 The procurement, tagging, packing, testing & calibration, preparation for shipment, along with accessories, spares, and assistance where required for its installation & commissioning at site shall be come under vendor's responsibility.

4.0 SMART TYPE FLOW TRANSMITTERS:

4.1 General:

- 4.1.1 Flow Transmitters shall be of differential pressure type. HART (Latest edition) type FT shall be SIL 2 Certified. Δ
- 4.1.2 The transmitter shall be mounted local, on a yoke. All mounting accessories required for 2" pipe shall be provided.
- 4.1.3 Cable entry to the transmitter shall be 1/2" NPTF.
- 4.1.4 The flow transmitter shall be provided with a close coupled, single block 5 ways – 5 valve manifold. The Manifold shall be supplied by the same Instrument vendor or outsourced by the instrument vendor from a reliable manufacturer. Δ
- 4.1.5 The transmitter shall have 130% (static pressure) over-range protection.
- 4.1.6 The Flow transmitter shall be intrinsically safe and certified by statutory body like UL/FM/BASIEFA/CCOE/PESO. Δ
- 4.1.7 The transmitter shall have integrated digital display (with engineering units) visible from grade. Where the display is not visible from grade, blind transmitter (intrinsically safe) with separate loop powered indicator shall be provided. Same shall be suitable for use in the hazardous area Class I, Div II, Gr. C&D or Equivalent. Δ

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<p>4.1.8</p> <p>4.1.9</p> <p>4.1.10</p> <p>4.1.11</p> <p>4.1.12</p> <p>a)</p> <p>b)</p> <p>c)</p> <p>d)</p> <p>e)</p> <p>4.2</p> <p>4.2.1</p> <p>4.2.2</p> <p>4.2.3</p>	<p>Flow Transmitters shall have a means for calibration that permits zero and span adjustment. Δ</p> <p>Flow Transmitters shall be five (5) point bench calibrated using a hydraulic or dead weight tester or precision pneumatic calibrator prior to installation as well as after installation at site. All calibration shall be carried out with certified master calibrators (valid and proved by reputed accredited testing labs) or with calibrators tested and traceable to the standard labs for calibration.</p> <p>‘Universal Hand Held Configurator’ shall be supplied for transmitters’ calibration/Configuration/diagnostics. The number of Configurators shall be two per process platform & one per well platform. Δ</p> <p>All vent and drains of the transmitter/tubing/valve manifolds shall be routed to the Drain Header. If the meter is on the sour service and harmful fluids like chemicals etc, then it will be routed to close drain header with suitable isolation. Δ</p> <p>Transmitters shall be immune to Radio frequency interference due to walkie-talkie, paging system, communication system etc. All electronic modules shall be designed for short circuit protection.</p> <p>Manifold (5-valve, 5 way manifold) shall be integral type (mono block) unit, supplied by the Transmitter vendor or outsourced by the instrument vendor from a reliable manufacturer.</p> <p>Transmitter with the Instrument valve manifold shall be assembled in the transmitter vendor factory, leak tested and hydro tested [1.5 times MAWP (Max. allowable working pressure) –IDC] with random witnessed to be done by TPI. Selected manifold & valves shall be as per ANSI B16.5 & tested in accordance with standard - MSS-SP-99-2010.</p> <p>MOC shall be as per the wetted parts requirements for the transmitter, with material traceability certificates with heat & lot no., as per standard (EN 102043.1) and same shall be submitted during inspection, to CA/TPI (ONGC).</p> <p>Manifold details shall be filled in the data sheet for review and approvals of the PS.</p> <p>Reputed make 5-way Valve Manifold shall be supplied by the transmitter vendor. Δ. Transmitter vendor shall take the responsibility of the whole system.</p> <p>Sensor type:</p> <p>The pressure element in the measuring unit shall be Diaphragm / Delta cell Type.</p> <p>For measurement of slurries, viscous & corrosive fluid, very high pressures (# 1500 Class or more), Diaphragm Seals shall be used. Wherever Diaphragm seals are used, they shall be “Liquid Filled System” type with a 1½” Flanged process connection and flexible armor (steel). The diaphragm seal flange shall also have a flushing filling connection with plug.</p> <p>The process connection of the transmitter shall be ½” NPTF.</p>
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4.3 Material:

4.3.1 The material requirements for Flow Transmitters shall be in general according to the Material Selection Chart provided in at Annexure – I of this document. Δ

4.3.2 The element material of the measuring unit shall be suitable for the process conditions. The Wetted parts of the diaphragm seal type FT shall be same as that of the element material. The capillary material of diaphragm seal type FT shall be SS 316 and the armour material shall be as a minimum SS 304. It is transmitter vendor's responsibility to select, test & supply of total system. Δ

4.3.3 Wetted parts shall be suitable for intended process application. Associated piping, pipe fitting & piping valves etc. shall be according to FS-2004A for Piping Design (2008) & Piping Material Specification. Δ

4.4 Accuracy: Δ

Flow Transmitters shall have an accuracy of ± 0.1 % of span or better. For remote seal transmitters, accuracy shall be $\pm 0.2\%$ or better of the span.

4.5 Output Signal:

4.5.1 Output signal shall be 2 wired 4-20 mA DC, and capable of delivering the rated current signal into external load of around 600 ohms when powered with nominal 24V DC (negative earthed).

4.5.2 Transmitters shall have HART / FF (Where applicable) protocol for communication for remote calibration and diagnostics from FF/HART maintenance system Δ

4.6 Repeatability:

Flow Transmitters shall have a repeatability of $\pm 0.1\%$.

4.7 Stability: Δ

$\pm 0.1\%$ of URL per 5 years as minimum

4.8 Enclosure Class: Δ

The transmitter shall be weatherproof (IP 65 or better). Aluminium enclosure for FT shall be certified as copper free i.e. less than 0.4% copper by mass, and suitably coated for harsh offshore environment.



ANNEXURE – I

Flow Transmitter/ MVT – Material Selection Chart^Δ

S. No.	Piping Class	Transmitter	
		Sensor	Wetted Part & Valve Manifold
1	A1, B1, D1, E1, F1, XF1, F1, PA1, PB1, PD1, PE1, PXF1, PF1, A2, B2, D2, E2, XG1, A1H, A3, B3, A8	SS 316L or better	SS 316
2	Raw Sea Water / Produced water /Water Injection.	MONEL	MONEL/ Super Duplex Steel
3	A4, A6, A9, B9, D9, E9	HASTALLOY C	SS 316
4	A5	MONEL	MONEL
5	A7	TITANIUM	HASTALLOY C
6	** A1N, B1N, D1N, E1N, F1N, XF1N, PA1N, PB1N, PD1N, PF1N, XG1N	SS 316L	SS 316L
7	A10, B10, D10, E10, F10	HASTALLOY C	SS 316 L
8	A11, B11, D11, E11, F11, PA11, PB11, PD11, PE11, PF11	TITANIUM	HASTALLOY C

[** All Process wetted parts shall be as per NACE MR-01-75 (Latest Edition) as minimum]

The MOC shall be as indicated above or better, suiting the Process Conditions.



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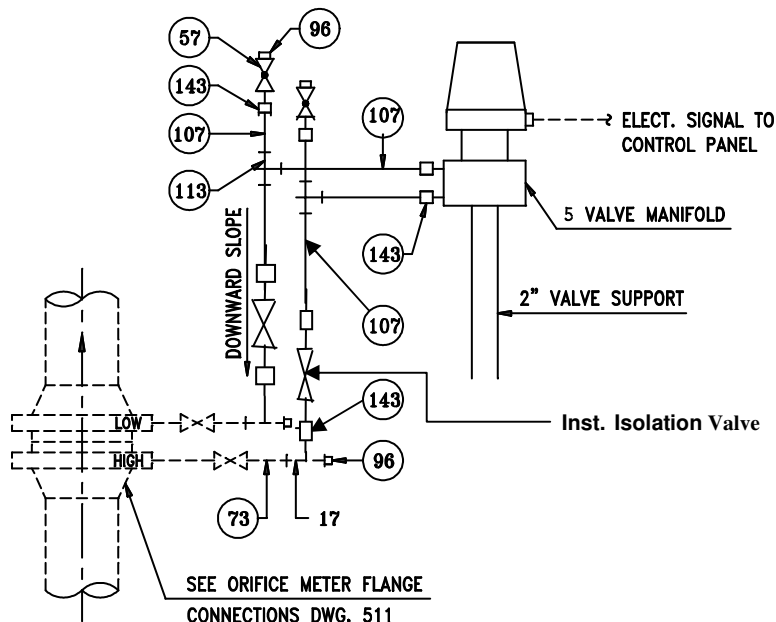
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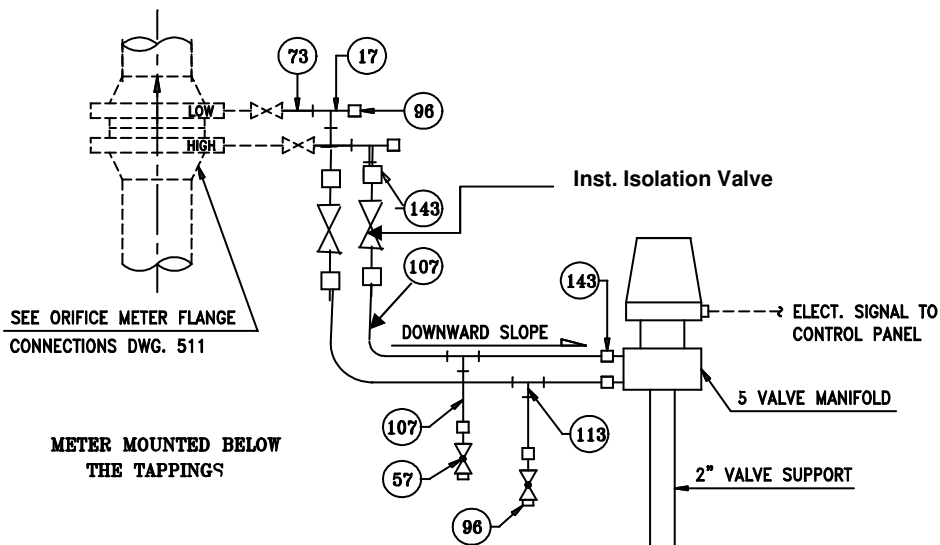
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ANNEXURE – II (Typical Hook-Up Drawings)

(For Gas)



(For Liquid)



BILL OF MATERIAL

ITEM	QTY.	SIZE	DESCRIPTION	MATERIAL
17	2	1/2"	PIPE TEE, THKxTHKxTHK, NPTF	
57	2	1/2"	GLOBE VALVE, SCRD NPTF	
73	2	1/2"	PIPE NIPPLE, SMLS, 3"LONG, PL.xTHK.(OR)THK..xTHK., NPTM	
96	2	1/2"	PIPE PLUG, SCRD NPTM	
107	A/R	1/2"OD.x0.065"THK.	TUBING	
113	2	1/2"ODx1/2"ODx1/2"OD	TUBING TEE	
138	2	1/2"THKx1/2"OD.	MAIN ELBOW TUBING CONNECTOR, NPTM	
143	6	1/2"THKx1/2"OD.	MALE TUBING CONNECTOR, NPTM	
200	—	—	VALVE	BY PIPING
201	—	—	PIPE NIPPLE	BY PIPING



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ANNEXURE – III
Typical Data Sheet For Flow Transmitter

FLOW (D.P.) TRANSMITTER										
Units : Flow → □ Liquid-M ³ /Hr, Gas → Kg/Hr, Steam → Kg/Hr, Pressure → Kg/Cm ² G, Temperature → Deg C, Level/ Length → □ mm										
GENERAL				MEASURING UNIT						
1	Function			21	Service					
				22	Element					
2	Type			23	Body Material/ Wetted Parts					
3	Case			24	Element Material					
4	Mounting			25	Process Connection					
5	Electrical area				Proc. connection. location					
	Classification			26	Temperature Element					
6	Enclosure			-	Type					
	Enclosure Class			-	Leads					
7	Intrinsically safe			-	Sheath OD / Material					
8	Power supply				Nipple & Union Material					
9	Cable entry			-	Cable Entry					
10	Accuracy			-	Enclosure					
11	Repeatability			27	Thermo well as per drawing					
12	TRANSMITTER				Pressure Element					
	Output									
13	Trans. Power supply				MISCELLANEOUS					
14	CONTROLLER			28	Over range protection					
	Output			a	OPTIONS					
15	A/M Switch			b	Output Meter					
16	No. of positions			c	Air filter regulator					
	Set point adjustment			d	Mounting accessories					
17	Manual Regulator			e	5 - Way Valve Manifold for FT					
18	Mode			f	Integral Orifice					
19	Instrument Valve MANIFOLD			29	SS Tag Plate					
	Make & Model			30	Load driving capability					
20	RTD				Proportional					
	Make & Model				Derivative					
21	Thermowell				Integral					
	Make & Model			31	Transmitter					
					Make & Model					
Sl. No	Tag. No.	Max. Press.	Oper ./ Max. Temp.	Range		Zero Elev.	Zero Super	Service	Control	Options
				SPAN	SET					

Notes :

- Over range protection shall be 130% of maximum static pressure.
- Local digital Integral output meter shall be intrinsically safe and to be calibrated in engineering unit.
- Environmental protection cover to be provided for each transmitter
- For Extended Diaphragm seal with fill in liquid, data sheet shall be suitably filled up.

VENDOR'S SIGNATURE WITH SEAL



ANNEXURE – IV

Multivariable Transmitter (MVT) with Flow Computation Δ

Type	Integral Display,
Service	To measure Pressure, Differential Pressure & Temperature of line fluid & to calculate flow as per AGA-3 with AGA-8 for Gas & ISO-5167 for Liquid.
Over-range Protection	130% of designed process parameters.
DP range	Maximum calibrated range of DP Transmitter will be of 400 inches of H ₂ O column.
Units	Engineering : T- Deg C, P - Kg/cm ² g, Bar, DP- mmH ₂ O, inches of H ₂ O, PSI
O/P	Analogue: 4-20 mA, HART/RS485/ Modbus TCP/IP
Connection Electrical/Process	½" NPT conduit / ½" NPT
Local Indication	4-1/2 Digit LCD in engineering units at grade level,
Accuracy	±0.1% of FSD or better, repeatability- ± 0.25% or better,
RTD	External, 3-wire platinum-100. MVT vendor shall be responsible for the supply and testing the RTD along with the MVT
Supply	24V DC Typical
Enclosure Class	Weather-proof (NEMA 4X), Explosion-proof to NEMA 7 and certified by third party statutory bodies like UL/FM/BASEefa/ATEX or equivalent for use in hazardous area (CL 1, DIV.1, GR.C&D) or equivalent
Others	<ol style="list-style-type: none">1. Refer FS-3202 for FT for Installation, Hook-up, mounting accessories & general requirement.2. The Calibration / configuration software, as loaded in the MVT, shall also be supplied in DVD/USB drive. Industrial grade Laptop loaded with calibration and configuration software shall be supplied with MVT,3. Selection of Meter shall conform to P&IDs & process Design criteria.4. MVT Vendor shall be responsible for the supply and testing the RTD along with the MVT before despatch.5. Refer RTD Specifications in FS for TT (FS-3302)6. MVT Vendor shall be responsible for the supply of Thermowell (from TG/TT vendor list) along with the wake frequency calculation. Data sheet and wake frequency calculation sheet shall be signed and stamped by the Thermo-well / MVT Vendor.7. Where the MVT is in a flow control loop, the Compensated flow signal from 'MVT with flow computer' to 'Process PLC/RTU' shall be hardwired 4-20 mA for the flow control purpose. Other parameters (pressure, temperature, DP etc.) may be through MODBUS/ HART/FF as applicable.8. Flow computation shall be achieved within the MVT or through a separate flow computer. Where separate flow computer shall be provided same shall be as per Flow Computer FS(FS-3211)9. MVT with separate/ integrated flow computation facility shall have adequate data storage facility (min 7 days).