
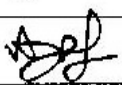
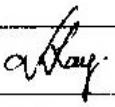
	Design Division Engineering Services 11 - High, Mumbai ISO 9001: 2000	<u><b>Functional Specifications</b></u> <u><b>ELECTRO-MAGNETIC</b></u> <u><b>FLOW METER</b></u>	Spec #	3213
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## **FUNCTIONAL SPECIFICATION**

### **FOR**

## **ELECTRO-MAGNETIC FLOW METER**

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## 1.0 SCOPE OF THIS DOCUMENT:

- 1.1 This functional specification describes the essential design considerations for the selection of Electro-Magnetic Flow Meter for the intended process application .

## 2.0 CODES & STANDARDS:

### 2.1 Reference Documents and Specifications:

- Instrumentation Design Criteria
- Basic Bid Work
- Project P & IDs / Process Design Criteria / Instrument Process Data Sheets

## 3.0 SCOPE OF SUPPLY:

- The quantity to be supplied and installed shall be as per the requirements indicated in the Basic Bid Work and P & IDs.
- The vendor shall be responsible for the selection of the Electro-Magnetic Flow meter suitable for its intended application, its procurement, tagging, packing, testing & calibration, preparation for shipment, along with accessories, spares, and assistance where required for its installation & commissioning at site.
- The **Electro-Magnetic Flow Meter Assembly** shall include ~~sensors~~ electrode sub assembly, converters, pre-amplifier / transmitter, indicator, totalizer and all the accessories necessary to make the measurement system complete.

## 4.0 ELECTRO-MAGNETIC FLOW METERS:


### 4.1 Application:

- 4.1.1 Electro-Magnetic Flow Meters shall be used as the flow-measuring system ~~element~~ wherever dictated by the process requirements.

### 4.2 General:


- 4.2.1 The Electro-Magnetic flow meters shall be provided with flanged end connections primarily as per ANSI B 16.5, the rating and facing of which shall be as per the piping specifications.
- 4.2.2 The flow direction shall be clearly stamped or cast on the body to avoid polarity errors. Meter shall have forward & reverse measurement functions and reverse flow shall be confirmed by status output / indication.
- 4.2.3 Meter signal / power cable entry shall be ½” / ¾” NPTF respectively, as per ANSI B 2.1.
- 4.2.4 As a minimum, Transmitter shall be ‘SMART’ type, 4 – 20 mA / HART output with a local indicator. In addition, the meter shall be capable of providing the output in other required form (pulse, serial, contact, etc.).
- 4.2.5 The meter’s enclosure housing the electrical parts, shall be suitable for the hazardous area classification. Unless otherwise specified, the enclosure shall be Explosion Proof (NEMA 7) & Weather proof to NEMA 4X / IP 65 or better. The whole system shall be certified by a statutory body (like FM / UL / BASEEFA / PTB / CMRI / DGMS). The vendor shall furnish certificate(s) for the same.

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- 4.2.6 The Electro-Magnetic Meter's field coils shall be hermetically sealed. Coil insulation shall be class F suitable for high temperature. Suitable grounding type system and material shall be selected for the metering element.
- 4.2.7 Field coils may operate on the alternating supply voltage. Replaceable electrodes / Frequency excitation methods are also acceptable where the magnetic flow meter is operated on AC / DC voltages. Vendor shall indicate the power supply requirements and furnish the power consumption for the meter (sensor, transmitter, display, etc.) along with the sizing calculations for the selected meter. Standard Signal types and communication protocols shall be offered. Appropriate EMI / RFI protection for the meter shall be considered.
- 4.2.8 Meter shall not necessarily be of the line size indicated in the P&ID, but shall be sized for range of flow regime and the conductivity /velocity requirement desired for the meter. However, the meter shall be 'Full bore' meter with respect to its meter run. Straight run requirement shall be sized as per the manufacturer's recommendations. Meeting the flow profile requirement for the meter by providing necessary straighteners / flow conditioners etc., shall be vendor's responsibility.
- 4.2.9 Magnetic Flow Meter shall be Microprocessor based system, in explosion proof housing. Meter shall have a non-volatile memory for data access and data transfer to remote controllers / indicators / DCS. There shall be no data loss upon the loss of the power supply to the meter.
- 4.2.10 Where the process fluid may result in coating of the electrodes, suitable measures / special installation requirements to minimize such coating shall be a part of the design consideration in selection of meters. Monitoring of such adhesions [Electrode scaling/ Electrode corrosion], Electrode leakage, Liner deformation, gas bubbles and solid identification, shall be a part of the meter diagnostics. Meter shall also have diagnostics features such as incorrect installation and partial filled meter . Electrodes shall be replaceable type.
- 4.2.11 Where the fluid is having low conductivity / contain solids in the streams (like slurries containing magnetic particles), vendor shall offer system with suitable circuitry for compensating the signal changes so induced by the permeable solids.
- 4.2.12 The 'minimum' fluid conductivity shall be specified for which the meter performance is within specified values.
- 4.2.13 The configuration capabilities of the meter shall be for LCD display of indication of actual flow rate, forward, reverse, sum total flow indications, conductivity, temperature, status indications. The same shall be available as user selectable parameter on the LCD display of the meter.
- 4.2.14 The 'local' 2 line, 6 ½—(min.) digit alphanumeric backlit LCD display shall be provided 'integral' with the meter / transmitter and shall be easily visible from grade.
- 4.2.15 Software security shall be provided in the meter. Upscale / downscale alarms & Engineering units shall be user selectable. Programming for range , alarms, display settings shall be possible through front face of the meter and without opening the

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transmitter housing in hazardous area. The programming method shall be touchpad keys / magnetic keys / optical key.

- 4.2.16 Manual / Auto zeroing (nulling) facility shall be provided for the meter to offset effects of nearby magnetic disturbances in 'no-flow' condition. This shall be done from the meter front face display without opening the cover in the Hazardous area.
- 4.2.17 Wherever specified, a separate meter receiver with 2 line (min.) backlit LCD indicator for instantaneous flow rate, flow totalizer and diagnostic functions shall be shall be provided in the Control room
- 4.2.18 Calibration shall be 5 point ( min ) calibration unless otherwise specified and to be carried out at an accredited lab as per Standard ISO 8316.
- 4.2.19 Vendor shall complete the data sheet enclosed at Annexure-I.

#### 4.3 **Material:**

- 4.3.1 The material requirements for Electro-Magnetic Flow Meters shall in general be according to clause 3.6.4.5 of Instrumentation Design Criteria Internals of the meter shall be SS-316 minimum and HASTALLOY-C for piping class ( A11 , B11 , C11 , D11 , E 11, F11, PA11, PB11, PD11, PE11, PF11). As a minimum, the meter flow tube, electrodes and coil housing should be SS 316. The housing should be fully welded. Bolted coil housing with rubber or plastic gaskets is not acceptable for offshore installation.
- 4.3.2 Tube liners shall be selected to meet the process requirement and shall be proven for the application specified in the basic bid work.
- 4.3.3 The Contractor shall ensure that all wetted parts of Electro-Magnetic assemblies shall meet NACE MR-01-75 (Latest Edition) and are compatible with the process conditions.
- 4.3.4 Transmitter housing and mounting accessories required for meter shall be SS 316 or better. Meter enclosure shall be suitable for hazardous area. All instrument supports shall be galvanized type for installation.


#### 4.4 **Meter Selection:**

- 4.4.1 **Over Range:** Shall be designed for an over-range of at least 130% of Max flow.
- 4.4.2 **Accuracy:**  $\pm 0.5\%$  of the reading or better.
- 4.4.3 **Repeatability:**  $\pm 0.1\%$

#### 4.5 **Miscellaneous**

- 4.5.1 The Electro-Magnetic Flow Meters shall be installed after hydro testing and line flushing.
- 4.5.2 All castings and weldings (other than slip-on welds, which shall be Dye Penetration tested) shall be 100% radio graphed.
- 4.5.3 Inspection, testing & calibration shall be as per the Clause 3.6.4.7 of Design Criteria.

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**ANNEXURE – I - Typical Data Sheet For Electro-Magnetic Flow Meter**

MAGNETIC FLOWMETER										
Units : Flow → Liquid-M <sup>3</sup> /Hr Gas → NM <sup>3</sup> /Hr, Steam → Kg/Hr, Pressure → Kg/Cm <sup>2</sup> G, Temperature → Deg C Level/ Length→ mm										
METERING ELEMENT	1.	Meter Tag No.								
	2.	Service								
	3.	Location								
	4.	CONN'S	Line Size, Sched.							
	5.		Line Material							
	6.		Connection Type							
	7.		Connection Mat'ls							
	8.	METER SENSOR	Tube Material		SS 316					
	9.		Liner Material		PTFE or Eq. suitable for process service					
	10.		Electrode Type		Burn off/ flush /MFR Design with PTR					
	11.		Electrode Matl.		SS 316 / Hastelloy					
	12.		Meter Casing		SS 316					
	13.		Power Supply	Elect. Code	24 V DC from transmitter					
	14.		Grounding, Type & Matl.		*					
	15.		Accuracy		± 0.5% of measured value					
	16.		Enclosure Class		IP65 / NEMA 4X					
	17.	TRANS MITTER	Mounting		Integral / Field					
	18.		Display		*					
	19.		Display parameters		*					
	20.		Outputs		4-20mA HART / Pulse /serial/ Status					
	21.		Communication output		Serial					
	22.		Hazardous area Approval		*					
	23.		Enclosure Class		IP65 / NEMA 4X					
	24.		Housing		SS 316					
	25.		Programming		*					
	26.		Cable entry		*					
	27.		Diagnostic features		*					
	28.	FLUID	Fluid							
	29.		Max, Flow, Units							
	30.		Max, Velocity, Units							
	31.		Maximum Viscosity							
	32.		Norm. Flow M <sup>3</sup> /hr	Min. Flow M <sup>3</sup> /hr						
	33.		Max. Temp. °C	Min. Temp °C.						
	34.		Max.Press Kg/cm <sup>2</sup> g	Oper.PressKg/cm <sup>2</sup>						
	35.		Min. Fluid Conductivity							
	36.		Vacuum Possibility							
ASSOCIA TED INSTRUM ENT	37.	Instrument Tag Number								
	38.	Power Consumption								
	39.	TRANS.	Transmitter Output		*					
	40.		RFI/EMI Protection		*					
	41.	Manufacturer								
	42.	Meter Model Number								
	43.	Instrument Model Number								
	44.	Material Certificate								
	45.	Calibration Certificate from Accredited Lab								

• \* By Vendor

VENDOR'S SIGNATURE WITH SEAL

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