



Offshore Design Section
Engineering Services
ISO – 9001:2000

Functional Specifications
ONLINE RETRACTABLE TYPE
(SENIOR) ORIFICE PLATE ASSEMBLY

Spec. No. 3205

Rev. No. 4

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


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FUNCTIONAL SPECIFICATION

FOR

ONLINE RETRACTABLE TYPE (SENIOR)
ORIFICE PLATE ASSEMBLY

4

PREPARED / REVISED BY	REVIEWED BY	APPROVED BY	TOTAL No. OF PAGES	DATE	REV. No.
			8	29.04.16	4
MD	ARD	KM	8	29.04.2016	4
TKK	ARD	AKR	5	27.08.2009	3
VS	SRS	GRP	5	18.02.2008	2
ET	RS	GRP	7	28.03.2007	1
ET	MC	AC	7	25.08.2003	0

FORMAT No. ODS/SOF/023	Ref. PROCEDURE No. ODS/SOP/017	ISSUE No. 02	REV. No. 00	REV. DATE: 21.07.2010
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FORMAT No.
ODS/SOF/023

Ref. PROCEDURE No.
ODS/SOP/017

ISSUE No.
02

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 **Online Retractable Type (Senior) Orifice Plate Assembly** for the intended service.

2.0 CODES & STANDARDS:

2.1 **Applicable Codes & Standards:** Latest editions of applicable codes & standards as enlisted in Cl. 3.6.3.1, Instrumentation Design Criteria.

2.2 Reference Documents and Specifications:

- a) Basic Bid Work
- b) Design Criteria - Process & Instrumentation
- c) Project P & IDs
- d) Process Data Sheets for Instruments / Instrument List with Process Parameters

3.0 SCOPE OF SUPPLY: Δ


- 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 of the **Online Retractable Type (Senior) Orifice Plate Assembly** 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. This FS shall be read in conjunction with the Instrument Design Criteria.
- 3.3 The **Online Retractable Type (Senior) Orifice Plate Assembly** shall include Orifice Plates, sliding valve, equalizer, stuffing box, plate carrier, sealing unit, flanges, senior orifice fittings, studs, bolts, nuts, hand wrench, plugs and all the accessories to make the system complete. Chamber venting with vent valve shall be possible for Online Retractable type (Senior) Orifice Plate Assembly.
- 3.4 No. of Orifice plates to be supplied along with the Senior Orifice assembly shall be as per the Process data sheet to cover the complete range and each plate shall be sized for the range of 3:1 or less as per AGA 3 with AGA 8 (for Gas).

4.0 **ONLINE RETRACTABLE TYPE (SENIOR) ORIFICE PLATE ASSEMBLY:**

4.1 Application:

- 4.1.1 Online Retractable Type (Senior) Orifice Plate Assembly shall be used as the flow-measuring element wherever dictated by the process requirements.
- 4.1.2 Online Retractable Type (Senior) Orifice Plate Assembly shall be used to provide periodic checking / changing of orifice plates without disturbing normal operation.

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4.2 **General:** Δ

- 4.2.1 Fabrication of the orifice plate shall be in accordance with AGA – Gas Measurement Committee, Report No. 3, latest edition for gas measurement.
- 4.2.2 The Orifice meter shall in general comprise of a concentric square edged orifice plate designed for flange tap except for particular process requirements. (*Eccentric, segmental or quadrant edged orifices may be used for special services such as slurry, wet gas or highly viscous service*).
- 4.2.3 The Orifice Plate Assembly shall be capable of withstanding differential pressure equal to full line pressure without zero or calibration change.
- 4.2.4 Orifice plate beta ratio (orifice diameter/ inside pipe diameter) in general shall be between 0.2 and 0.75.
- 4.2.5 On line retractable orifice Plate Assembly shall be capable of withstanding differential pressure equal to full line pressure without zero or calibration change.

4.3 **Material:** Δ

The material requirements for orifice plates shall in general be according to clause 3.6.4.5 of Instrumentation Design Criteria and the material selection chart provided in Annexure I of this specification.

4.4 **Range:** Δ

- 4.4.1 Range Differential ranges for orifice flow meters shall not exceed 5000 mm (200 inches) of water. Typical meter ranges for gas, steam, or vapour, streams shall be as follows:

STATIC PRESSURE

(Kg / cm² g (PSIG))

0.35 to 2.5 (5-35)

2.5 to 6 (35 - 85)

Above 6 (Above 85)

DIFFERENTIAL PRESSURE

(mm of Water (inches))

500 - 1250 (20 - 50)

1250 - 2500 (50 - 100)

As per AGA-3 guidelines.


- 4.4.2 The range 2500 mmwc (100 inches WC) is desirable wherever possible in line with AGA-3 guidelines (for Gas) in case of static pressure of 6 Kg/cm²g and above.
- 4.4.3 Meter ranges shall preferably be chosen such that the normal flow is between 60% and 80% of the meter range.

4.5 **Scales:** Δ

- 4.5.1 Scales for orifice metering system shall be 0 - 10 square root with multiplication factor to suit rate of flow requirements for DP (Bellows) type Pneumatic flow meter.

Flow meter with totaliser (with or without pressure correction) shall be provided with a proper multiplication factor in line with the flow calculation as per AGA-3 with AGA-8 (for gas). Linear scale of DPT shall be combined with the Square root scale of Totaliser.

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In case of orifice meter with MVT (with integrated flow computer / separate Flow computer at site) and FT with panel (at CCR) mounted flow computer, the range of process parameters like Pressure, Temperature, Diff. Pressure, Flow etc. shall be as per the Basic Bid Work / approved P & IDs of the respective projects.

4.6 Flanges: Δ

- 4.6.1 Flanges and fittings shall be installed according to AGA - Gas Measurement Committee Report No.3.
- 4.6.2 Orifice flanges shall be in accordance with the standard ANSI B 16.36 with a minimum flange rating of 300# ANSI and a minimum of 1½-inch pipe size.
- 4.6.3 Two pairs of flange taps located diametrically opposite shall be provided. Location of taps & Tap sizes shall be in accordance with the AGA-3 standard, latest edition. The spare tappings shall be plugged with SS 316 as a minimum.
- 4.6.4 Unless otherwise specified, flange shall be RF, weld neck type for low pressure application (< 600# rating). For high pressure application (> or = ANSI # 600), flanges shall be of RTJ type. Based on process requirement, final material and selection of flanges shall be in accordance with the standard ANSI B-16.36 & AGA-3. However, “Senior Orifice fittings” shall be in general weld neck in the upstream and Flanged in the downstream.

4.7 Meter Runs: Δ

- 4.7.1 All meter runs (Upstream & Downstream) shall be designed for flange tap differential measurement unless otherwise specified as per AGA - Gas measurement committee report No. 3, latest edition.
- 4.7.2 Senior Orifice meter runs shall not be for less than 1 - ½” nominal pipe size. Where required, the piping diameter shall be blown up to the required size for installing the meter run / orifice, in line with the applicable standards.
- 4.7.3 The straight length of upstream & downstream pipe works shall be in accordance with the standard AGA-3. No connections shall be made in either the upstream or downstream straight pipe work, other than the orifice flange tapings. In case sufficient straight run is not available for the given piping geometry, meter runs with straightening vanes may be used. These straightening vanes shall be as per AGA 3. The straightening vane material shall be 316 SS or better to suit the process conditions. The location of Temperature sensor (on the downstream only) shall be within 5 to 20 D internal diameter of the pipe run.


4.8 Orifice Plate Sizing: Δ

- 4.8.1 Sizing for Orifice plate to be used in the Plate Online Retractable type (Senior) Orifice Plate Assembly shall be based on AGA Report No. 3 and AGA Report No. 8 for gas service, and ISO 5167 for liquid service. The orifice plate rangeability is to be taken as 1:3 while deciding the number of plates required to cover the entire range. Adequate overlap shall be provided between two consecutive flow ranges. Orifice plate sizing calculations shall be submitted to Company for review.

4.9 MISCELLANEOUS: Δ

The installation of on line retractable orifice fittings assembly shall in general be according to clause 3.6.4.6 of Instrumentation Design Criteria and as mentioned below-

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- 4.9.1 Meter design and installation shall be in accordance with the AGA - Gas Measurement Committee Report No. 3. It is preferred that metering orifices is to be located in horizontal lines.
- 4.9.2 Flanges or meter tubes shall be installed horizontally near the deck or platform for ease of accessibility and safe changing of the orifice plate.
- 4.9.3 Plates shall be installed after line flushing is completed, before hydro testing.
- 4.9.4 Prior to installing the orifice plate, it shall be checked against the Instrument Specification sheet and inspected by the Company's representative.
- 4.9.5 The static pressure element shall be connected to the upstream pressure tap on gas flow measurement.
- 4.9.6 Piping and equipment shall be arranged so that flashing does not occur at or upstream of orifice plates.
- 4.9.7 The piping layout shall always be arranged such that straightening vanes are not required and gas meter runs are self-draining.
- 4.9.8 Upstream elbows in more than one plane shall be avoided to minimize vortices.
- 4.9.9 Orifice plate shall be checked for correct alignment, and correct orientation with respect to the process flow.
- 4.9.10 Plates shall be checked visually for nameplate data and for an upstream sharp edge. Bore shall be callipered to check for compliance with specifications.
- 4.9.11 All socket-weldings shall be 100% Dye penetration / Magnetic particle tested. All other welding shall be 100% radio graphed.
- 4.9.12 The orifice plates shall be suitably marked with tag. Nos. bore size & direction of mounting.
- 4.9.3 Calibration, inspection and testing requirements shall in general be as per clause 3.6.4.7 of Instrumentation Design Criteria.

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ANNEXURE – I Δ

Material Selection Chart for Online Retractable Type (Senior) Orifice Plate Assembly

Sl. No	Piping Class	Senior Orifice Assembly	
		Flange/ Body	Plate
1.	A1, B1, D1, E1, F1, XF1, F1, PA1, PB1, PD1, PE1, PXF1, PF1, A2, B2, D2, E2, XG1, A1H, A3, B3, A8 (EXCEPT WAT. INJ. SERVICE)	CARBON STEEL	SS 316
2.	INJECTION WATER SERVICE	CARBON STEEL	SS 316
3.	A4, A6, A9, B9, D9, E9	SS 316	SS 316
4.	A5	90-10 Cu Ni / MONEL	MONEL
5.	A7	TITANIUM	TITANIUM
6.	A1N, B1N, D1N, E1N, F1N, XF1N, PA1N, PB1N, PD1N, PF1N, XG1N	CARBON STEE	SS 316
7.	A10, B10, D10, E10, F10	SS 316 L	SS 316 L
8.	A11, B11, D11, E11, F11, PA11, PB11, PD11, PE11, PF11	DUPLEX SS	INCONEL 625



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ANNEXURE – II - TYPICAL DATA SHEET FOR ONLINE RETRACTABLE TYPE (SENIOR) ORIFICE PLATE ASSEMBLY

<u>Online Retractable Type (Senior) Orifice Plate Assembly</u>					
UNITS: Flow	Liquid – M ³ /HR.	Gas – NM ³ /HR.	Pressure – Kg/cm ²	Temperature – °C	Level/Length - M
GENERAL	1	Tag Number			
	2	Line Number			
	3	Line Size & Schedule			
	4	Service			
	5	Inlet Line ID	Outlet Line ID		
METER	6	Diff Range In mm H ₂ O			
	7	Meter Maximum			
PLATE	8	Type		Conn. Square Edged	
	9	Sizing As Per		AGA Report No. 3 and AGA Report No. 8 for gas service, and ISO 5167 for liquid service	
	10	Material			
	11	Thickness “W” In Mm			
	12	Beta Ratio d/D			
	13	Bore Dia. ‘d’			
	14	Vent / Drain			
Chamber assembly	15	Center Distance ‘R’			
	16	Type		Upstream : Weld Neck Down Stream : Flange	
	17	Tap Type	Size	Flanged	½” NPT
	18	Number Of Taps Per Flange		Two	
	19	Material			
	20	Size & Rating			
	21	Facing & Finish			
	22	Line ID / OD			
	23	Gasket Thickness Mm			
	24	Gasket Material			
	25	Plate Holder			
	26	Plate Holder Material			
	27	Stud Bolt Material			
OPTIONS	28	Nut Material			
	29	Wetted Part Material		Same As Plate	
	30	Isolation valve / retraction facility			
	31	Flow conditioner / profilors			
SERVICE CONDITIONS	32	Connection			
	33	Material			
	34	Fluid	State		
	35	Flow Min.	Maximum		
	36	Flow Normal			
	37	Inlet Pressure	Operating	Maximum	
	38	Temperature	Operating	Maximum	
	39	Sp. Gr. At Oper. Temp.	15 °C		
	40	Molecular Weight	Cp / Cv		
	41	Operating Viscosity (Cp)			
ITEM DETAILS	42	Compressibility Factor			
	43	Pipe Reynolds Number			
	44	Manufacturer			
VENDOR'S SIGNATURE WITH SEAL					