



Offshore Design Section  
Engineering Services  
ISO – 9001:2000

**Functional Specifications**  
**FLOW COMPUTER**

Spec. No.	3211
Rev. No.	5
Discipline	Instt
Page: 1 OF 7	



Offshore Design Section  
Engineering Services  
ISO – 9001:2000



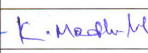
**Functional Specifications**  
**FLOW COMPUTER**

Spec. No.	3211
Rev. No.	5
Discipline	Instt
Page: 1 OF 7	

**FUNCTIONAL SPECIFICATION**

**FOR**

**FLOW COMPUTER**

Prepared / Revised by	Reviewed by	Approved by	Total No. of Pages	Date	Rev No.
					
VKS	ARD	KM	7	25.02.2016	5
SSK	ARD	AKR	7	28.09.2009	4
VS	SRS	GRP	6	18.02.2008	3
AK	BK	GRP	9	28.03.2007	2
AK	BK	GRP	9	31.09.2006	1
ET	MC	AC	9	13.05.2003	0

FORMAT No. ODS/SOF/004B	Ref. PROCEDURE No. ODS/SOP/008 to 015	ISSUE No. 03	REV. No. 00	REV. DATE: 02.12.2008
----------------------------	--	-----------------	----------------	--------------------------

FORMAT No. ODS/SOF/004B	Ref. PROCEDURE No. ODS/SOP/008 to 015	ISSUE No. 03	REV. No. 00	REV. DATE: 02.12.2008
----------------------------	--	-----------------	----------------	--------------------------



**CONTENTS**

Sl.No.	ITEM	PAGE NO.
1	Scope of this Document	3
2	Codes & Standards	3
3	Scope of Supply	4
4	Flow Computer	4
	4.1 Purpose	4
	4.2 General Requirements	4
	4.3 Diagnostics	6
	4.4 Accuracy	6
Annexure - I	Data Sheet	7




## 1.0 SCOPE OF THIS DOCUMENT:

- 1.1 This functional specification describes the essential design considerations for the selection of Flow Computer for the intended purpose.

## 2.0 CODES & STANDARDS:

- 2.1 The following codes and standards (latest edition) are referenced to and make a part of this specification.

Numbers	Description
AGA -3	Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids
AGA-Report 7	Report No. 7, Measurement of Gas by Turbine Meters,
AGA-8	Compressibility factor of Natural Gas and other related Hydrocarbon Gases
AGA- Report 9	Measurement of Natural Gas by Ultrasonic Meter
AGA- Report 10	Speed of Sound in Natural Gas & other related Hydrocarbon Gas, May2003
AGA-Report 11	Measurement of Natural Gas by Coriolis Meter
API MPMS 11.1	Physical Properties Data Section 1—Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils
API MPMS Chapter 12	Manual of Petroleum Measurement Standards Chapter 12—Calculation of Petroleum Quantities
API MPMS 21.1	Flow measurement using electronic metering system section-1 Electronic gas measurement
API MPMS 21.2	Flow measurement using electronic metering system section-2 - Inferred mass.
ASTM D 1250	Standard Guide for Use of the Petroleum Measurement Tables
ISO 5167	Measurement of fluid flow by means of pressure differential devices
ISO 5168: 1998	Measurement of fluid flow – Evaluation of Uncertainties.
ISO 6976	Natural gas - Calculation of calorific values, density, relative density and Wobbe index from composition
ISO 10723	Natural Gas-Performance Evaluation for On-line Analytical Systems

	<b>Offshore Design Section</b> <b>Engineering Services</b> <b>ISO – 9001:2000</b>	<b>Functional Specifications</b> <b><u>FLOW COMPUTER</u></b>	<b>Spec. No.</b>	<b>3211</b>
			<b>Rev. No.</b>	<b>5</b>
			<b>Discipline</b>	<b>Instt</b>
			<b>Page: 4 OF 7</b>	

## 2.2 Reference Documents and Specifications:

- a) Instrumentation Design Criteria
- b) Basic Bid Work
- c) Project P & IDs / Process Design Criteria / Process Instrumentation 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 and the P & IDs.
- 3.2 The vendor shall be responsible for the selection of the Flow Computer 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.

## 4.0 FLOW COMPUTER:

### 4.1 PURPOSE:

- 4.1.1 The purpose of Flow Computer is to perform flow calculations, data archival, data retrieval and data transmission to the required destination.
- 4.1.2 For Gases, Flow Computer shall be used obtaining compensated flow, instantaneous flow, cumulative flow and compensation parameters (Pressure and Temperature) , Molecular weight , & Totalized flow ( Mass / Volume ) .
- 4.1.3 For Liquids , Flow Computer shall be used for obtaining uncompensated flow , Compensated flow , Instantaneous Flow , Compensation Parameters (Temperature, Viscosity) , Density , Totalized flow ( Mass / Volume ) and Net Oil and water cut ,wherever applicable.

### 4.2 GENERAL REQUIREMENTS:

- 4.2.1 Flow Computer shall be wall mounted or field mounted in case of Unmanned Platforms and for Process Platform flow computer shall be Panel mounted in Central Control Room.
- 4.2.2 Wall Mounted Flow Computer shall be mounted in the TIC room on unmanned platforms. It shall have an enclosure suitable for use in safe area with rating of IP 54.
- 4.2.3 Field Mounted Flow Computer shall be provided with an enclosure with NEMA 4 X or equivalent rating and shall be certified for use in hazardous area by a statutory body as defined in Clause 3.6.4.4.5 of Instrumentation Design criteria. Necessary certifications shall be attached with Purchase Specification.
- 4.2.4 Field Mounted Flow Computer can be of the following types:

FORMAT No.	Ref. PROCEDURE No.	ISSUE No.	REV. No.	REV. DATE:
ODS/SOF/004B	ODS/SOP/008 to 015	03	00	02.12.2008



- **With integral solar cells:** This type of Field Mounted Flow Computer shall be provided where power availability is a constraint.
- **Without integral solar cells:** This type of Field Mounted Flow Computer shall be provided where power is available from the existing / new power supply system.

4.2.5 Deleted.

4.2.6 Deleted.



4.2.7 For field mounting, mounting accessories required for Flow Computer shall be 316SS or better. All instrument supports for installation shall be galvanized.

4.2.8 Flow Computer shall be capable of archiving data for a minimum of 15 (fifteen) days for a minimum of 10 (Ten) parameters.

4.2.9 The time interval of data capturing / frequency of data logging shall be user-programmable with standard 1 hour, 10 minutes and 1 minute intervals.

4.2.10 Flow Computer shall be capable of providing data of trends displays over user selectable time base.

4.2.11 Flow Computer shall have facility for changing the range selection, multiplication factor.

4.2.12 Necessary software shall be provided with the flow computer as per application.

#### 4.2.13 Power Supply:

4.2.13.1 Flow Computer shall operate on 24 V DC supply.

4.2.13.2 Flow Computer shall have Li-ion or equivalent permanent battery back-up with battery life for three years continuous operation of data archival etc.

#### 4.2.14 Inputs to Flow Computer:

4.2.14.1 The Flow Computer shall be capable of accepting the following inputs:

- 4 – 20 mA signals ( HART)
- Pulse inputs
- Digital inputs
- RTD inputs
- 0 – 5 V signals
- Serial input (RS 232, RS 485, and Modbus or Ethernet TCP/IP protocol )



Specific inputs that are to be connected to Flow Computer shall be as per P & IDs and process requirement.

#### 4.2.15 Outputs from Flow Computer:

4.2.15.1 Flow Computer shall be capable of generating following outputs:

- 4 – 20 mA analog signals
- Digital signals
- RS-232C / RS 485 Modbus or Ethernet TCP/IP protocol for RTU / DCS



The specific outputs that are required from Flow Computer shall be as per P & IDs and process requirements.

#### **4.2.16 Display Requirements:**

4.2.16.1 Flow Computer shall have in general two displays with LCD backlit screens, one resettable for indicating instantaneous flow, compensated flow and compensation parameters (minimum 6 digit) and other non resettable ( min 8 digits).

4.2.16.2 Flow computer shall have facility to configure engineering units required for display as per requirement. Flow Computer unit shall have a user-friendly keypad for selection of functions and displays. Calling up a function or a display shall not require more than 3 key presses. The keypad shall suitable for performing simple programming / customization of Flow Computer software. It shall be possible to configure certain keys on keypad for launching quick functions.

4.2.16.3 The flow computer shall also have facility to input quality parameter such as N2, CO2, specific gravity and detailed composition C1 to C6+ using keypad inputs etc.

#### **4.3 DIAGNOSTICS:**

4.3.1 Flow Computer shall be capable of performing self-diagnostics of electronics and software. It shall also provide relevant error display.

4.3.2 'Low battery' indication shall be generated on LCD screen.

#### **4.4 ACCURACY:**

4.4.1 The accuracy of the Flow Computer shall be  $\pm 0.025\%$  or better.



**Functional Specifications**  
**FLOW COMPUTER**

**ANNEXURE – I : DATA SHEET FOR FLOW COMPUTER**

FLOW COMPUTER						
UNITS: Flow	Liquid – M <sup>3</sup> /HR.	Gas – NM <sup>3</sup> /HR.	Pressure – Kg/cm <sup>2</sup>	Temperature – °C	Level/Length - M	
GENERAL	1	Tag Number				
	2	Display Capability:				
	a)	Instantaneous Flow Data			Required	
	b)	Compensated Flow Data			Required	
	c)	Cumulative Flow Data			Required	
	d)	Compensation Parameters			Required	
TYPE OF FLOW COMPUTER	e)	Others (Specify)				
	3	Control Panel Mounted			Yes / No	
		Wall Mounted			Yes /No	
	4	Field Mounted ( suitable for area classification)			Yes / No	
	a)	With Integral Solar Cell Array			Yes / No	
	b)	Without Integral Solar Cell Array			Yes / No	
FLOW COMPUTER CHARACTERISTICS	c)	With Integral Multi Variable Sensor			Yes / No	
	5	Display:				
	a)	No. of lines of display				
	b)	No. of characters per line				
	c)	Alphanumeric display			Yes / No	
	6	Programmable Keypad			Required	
POWER SUPPLY & BATTERY BACK-UP	7	Diagnostics				
	8	Power Supply				
	9	Battery Back-Up Type				
INPUT TO FLOW COMPUTER	10	If Permanent Battery, life of battery				
	11	4 – 20 mA signal (mention quantity of such I/O)				
	12	Pulse inputs (mention no. of such I/O)				
	13	Digital inputs (mention no. of such I/O)				
	14	RTD inputs (mention no. of such I/O)				
	15	0 – 5 V signal (mention no. of such I/O)				
OUTPUT FROM FLOW COMPUTER	16	Serial inputs/Others, if any, with comm., protocol				
	17	4 – 20 mA signal (mention no. of such I/O)				
	18	Digital outputs (mention no. of such I/O)				
	19	Communication Port (i.e. RS-232, etc.)with protocol				
DATA ARCHIVING	20	Others, if any, with no. of such I/O				
	21	No. of days for which data can be stored				
MATERIAL	22	Frequency of data logging permissible				
	23	Enclosure				
ENCLOSURE	24	Rating				
ACCURACY	25	Flow Computer Accuracy				
SERVICE CONDITIONS	26	Fluid	State			
	27	Flow Min.	Maximum			
	28	Flow Normal				
	29	Inlet Pressure	Operating	Maximum		
	30	Temperature	Operating	Maximum		
	31	Sp. Gr. at Oper. Temp.				
	32	Molecular Weight				
	33	Operating Viscosity (CP)				
	34	Corrosive Content				
ITEM DETAILS	35	IS Certification				
	36	Manufacturer				
	37	Model Number				
	38	Remarks				
VENDOR SEAL AND SIGNATURE						