Dynamic
Fieldbus Device
MANUAL

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Date: 4/8/2014

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This warranty does not cover the product if it is damaged in the process of being installed or damaged by abuse, accident, misuse, neglect, alteration, repair, disaster, or improper testing.
If the product is found otherwise defective, Dynamic Flow Computers will replace or repair the product at no charge, provided that you deliver the product along with a return material authorization (RMA) number from Dynamic Flow Computers.
Dynamic Flow Computers will not assume any shipping charge or be responsible for product damage due to improper shipping.

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CHAPTER 1: QUICK START 1-1
Introduction: 1-1
Quick Start 1-2
Dynamic FB Characteristics 1-4
Dynamic FB Device Model 1-5
User Application-Blocks 1-6
Transducer Block 1-6
Transducer Block View Objects 1-12
Analog Input FB 14
Channels 15

CHAPTER 1: QUICK START

Introduction:

DynamicFB module features a H1 Foundation Fieldbus Protocol (31.25 Kbps) compliant with ITK 5.0. The module allows for the flow computer integration into a Fieldbus Foundation installation

This device is an approved Foundation™ product and as such complies or exceeds the requirements, among them, polarity insensitivity on the power system, 20mA current draw from the bus, more than 20MOhm impedance on the bus and instance able function blocks.

DynamicFB module converts a regular Modbus flow computer into a 4-wire (Bus + Power) FF able flow computer.

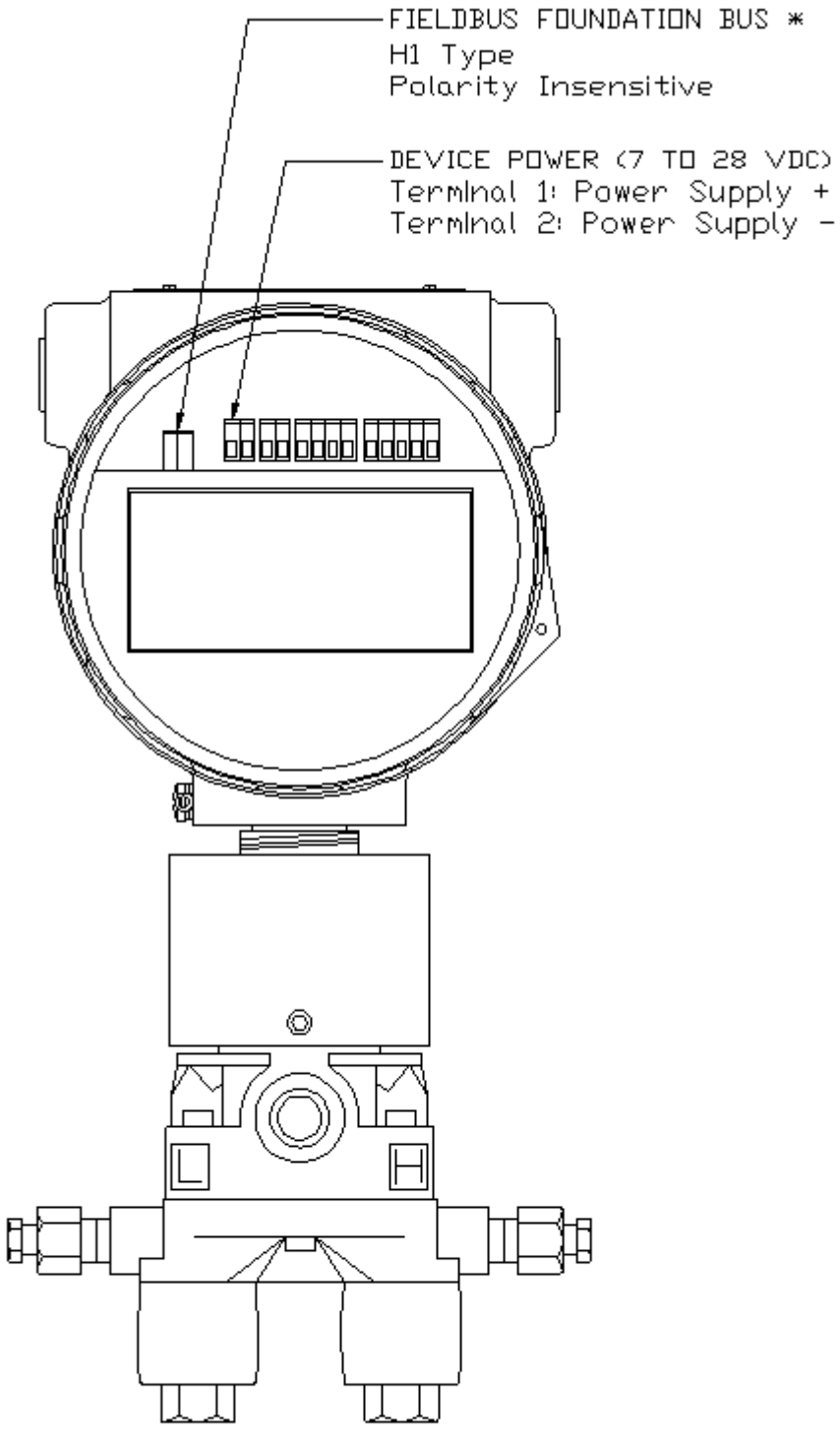
The initial configuration is done through the local port with the same tools our users are used to and then after that the routine configuration can be done via the FF bus.

Adding a separate power supply allowed us to retain all the features such as Analog Inputs and Outputs, Modbus Master Capability and PID loop output that could be otherwise compromised by the power requirements of the FF bus.

The DynamicFB Module is compatible with any of our EChart Family Flow Computer products.

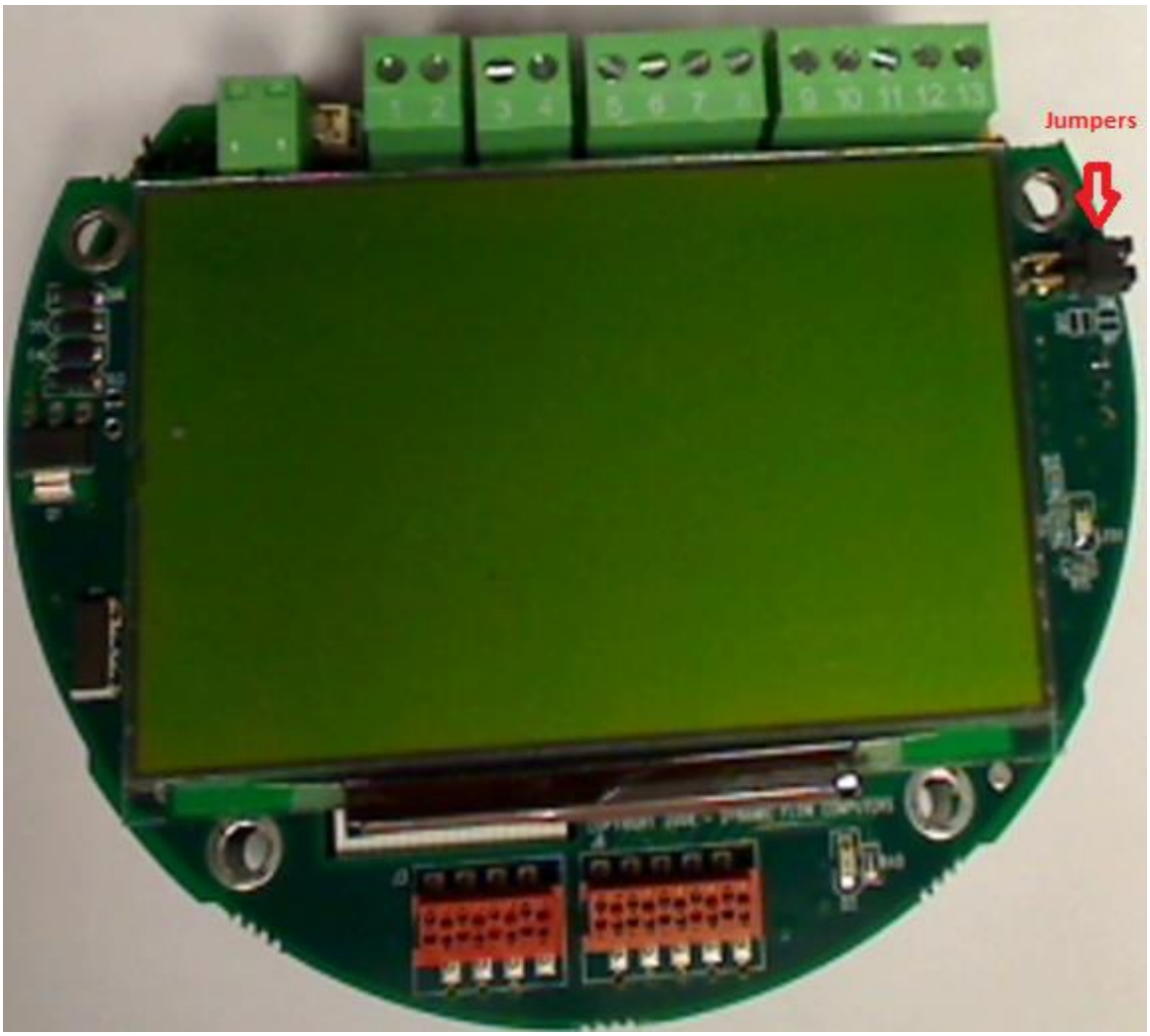
These flow computers comply with all the standards required for Oil and Gas measurement and can interface with a variety of primary elements such as Orifice Plate, Venturi, V-Cone, Ultrasonic, Coriolis, Turbine Meters, among others.

Quick Start



* Flow Computer must be ordered with FOUNDATION FIELDBUS interface.

PART Number – **WDF** (Foundation Fieldbus Interface)



Preinstalled jumpers (Mandatory)

Dynamic FB Characteristics

Protocol: Foundation Fieldbus H1

ITK: 5.0

Baud Rate: 31.25 Kbps

Polarity Sensitive: No

4-Wire Device: Bus + 24VDC Power

Current Draw from Bus: 20mA quiescent / 30mA Start up.

Available Device files: .sym, .ffo, .cff
(Can be downloaded from DFC website)

Device Resistance on Bus: Greater than 20MOhms

Support for Backup LAS functionality: YES.

Firmware Update via Fieldbus: NO

Function Blocks: 5 AI

Block Class: Enhanced

Block Execution Time: 50mS

Resource Block: Enhanced

Link Objects: 30

Total VCRs: 20

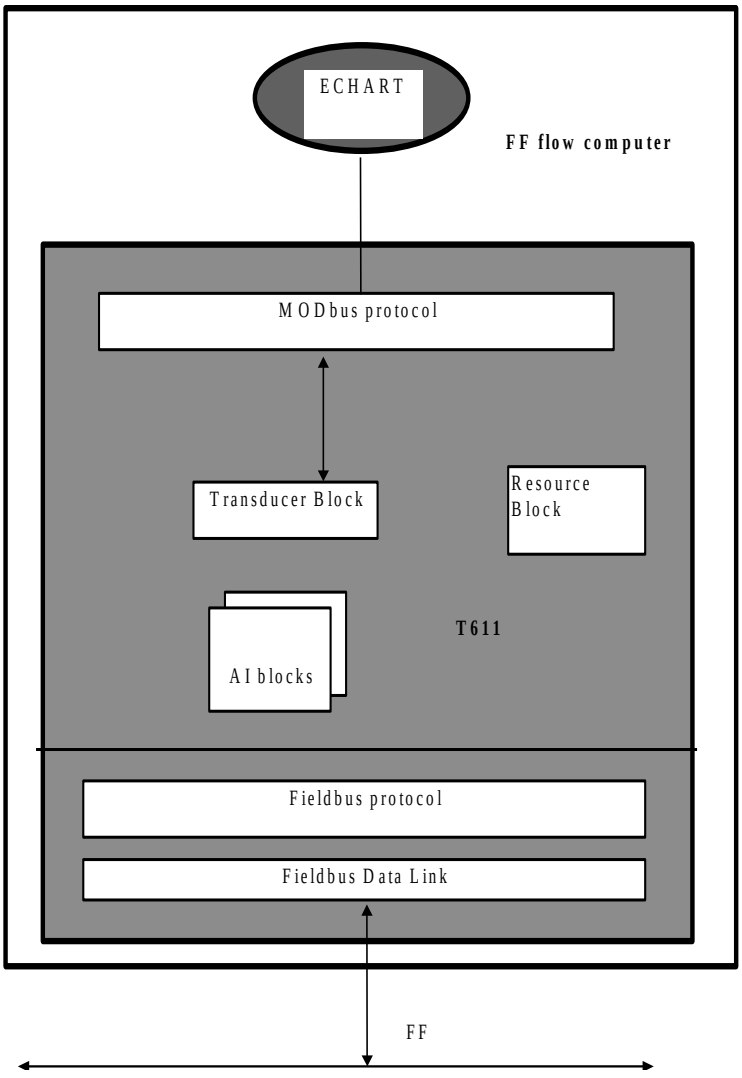
Fixed VCRs for user configuration: 19

Dynamic FB Device Model

The DynamicFB module comprises a FF fieldbus protocol, a FF FB application and a Modbus protocol for communication with the ECHART family products.

The Modbus registers in the ECHART are mapped into the TransducerBlock of the FF module.

The ECHART parameters appear as Transducer Block indexes within the FF module.

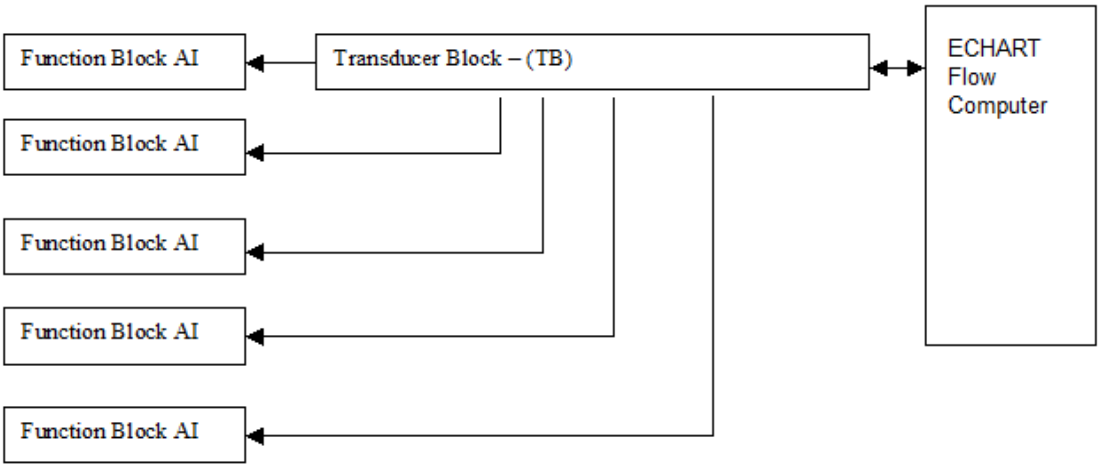


User Application-Blocks

Transducer Block

DynamicFB module supports in total 5 AI

There is one Transducer Block. The dynamic variables are channeled through the TB



The diagram shows how the dynamic variables are routed between the FBs and the TB

The Transducer Block is the image of the ECHART on FF.

The table below describes the Transducer Block indexes. The parameters under Static Revision control are listed in the column S.

Index	Parameter Mnemonic	Label	Obj Type	Data type	Use	Range	Init Value	Units	Mode	Range check	Storage/ MODbus register	S	Size	Comment	Help text
1	ST_REV		R	USign16									2		
2	TAG_DESC		R/W	ASCII								S	32		
3	STRATEGY		R/W	Usign16								S	2		
4	ALERT_KEY		R/W									S	1		
5	MODE_BLK		mix									mix	4		
6	BLOCK_ERR		R									D	2		
7	UPDATE_EVT		R												
8	BLOCK_ALM														
9	TRANDUCER_DIRECTORY		R			1,10	1,10							One dir. Starting at index 10	
10	TRANSDUCER_TYPE														
11	XD_ERROR		R									D			
12	COLLECTION_DIRECTORY														
13	PRIMARY_VALUE_GFR	Gross Flow Rate	R	DS-65	C		0	Gross flow units			7101	D	5		Gross Flow Rate = Mass Flow Rate / Flowing Density
14	PRIMARY_VALUE_NFR	Net Flow Rate	R	DS-65	C		0	Net flow units			7102	D	5		Net Flow Rate = Mass Flow Rate / Base Density
15	PRIMARY_VALUE_MFR	Mass Flow Rate	R	DS-65	C		0	Mass flow rate units			7103	D	5		Flow Rate given in Pounds or Kilograms
16	PRIMARY_VALUE_EFR	Energy Flow Rate	R	DS-65	C		0	65520 =MMBTU/DAY 65519 =MMBTU/HOUR 65518 =MMBTU/MIN 65517 =GJ/DAY 65516 =GJ/HOUR 65515 =GJ/MI			7104	D	5	Unit depends on Unit system selection	Energy Volume = Net Flow Rate x Heating Value
17	PRIMARY_VALUE_DGV	Daily Gross Volume	R	DS-65	C		0	1043 =CF 1034 = M3			7105	D	5		
18	PRIMARY_VALUE_DNV	Daily Net Volume	R	DS-65	C		0	1053 =CF 1526 = M3			7106	D	5		
19	PRIMARY_VALUE_DMV	Daily Mass Volume	R	DS-65	C		0	1092 = Metric ton 1094 = lb			7107	D	5	Unit depends on Unit system selection	
20	PRIMARY_VALUE_DEV	Daily Energy Volume	R	DS-65	C		0	65520 = MMBTU 1171 = GJ			7108	D	5	Unit depends on Unit system selection	
21	PRIMARY_VALUE_CGV	Cum Gross Volume	R	DS-65	C		0	1043 =CF 1034 = M3			7109	D	5		Non-Resetable Gross Totalizer
22	PRIMARY_VALUE _CNV	Cum Net Volume	R	DS-65	C		0	1053 =CF 1526 = M3			7110	D	5		Non-Resetable Net Totalizer
23	PRIMARY_VALUE_CMV	Cum Mass Volume	R	DS-65	C		0	1092 = Metric ton 1094 = lb			7111	D	5		Non-Resetable Mass Totalizer
24	PRIMARY_VALUE_CEV	Cum Energy Volume	R	DS-65	C		0	65520 = MMBTU 1171 = GJ			7112	D	5	Unit depends on Unit system selection	Non-Resetable Energy Totalizer
25	PRIMARY_VALUE_DP	Diff pressure	R	DS-65	C		0	DP units			7113	D	5		Live Differential Pressure
26	PRIMARY_VALUE_TEMP	Temperature	R	DS-65	C		0	degF=1002, degC=1001			7114	D	5	Unit depends on Unit system selection	Live Temperature
27	PRIMARY_VALUE_P	Pressure	R	DS-65	C		0	Pressure units			7115	D	5		Live Pressure

Index	Parameter Mnemonic	Label	Obj Type	Data type	Use	Range	Init Value	Units	Mode	Range check	Storage/ MODbus register	S	Size	Comment	Help text
28	PRIMARY_VALUE_DENS	Density	R	DS-65	C		0	**1107 = LB/FEET3 1097 = KG/M3**			7116	D	5	Unit depends on Unit system selection	Live Density
29	BASE_DENISITY	Base Density	R	DS-65	C		0	1107 = lb/feet3 1097 = kg/m3			7118	D	5	Unit depends on Unit system selection	Density at Base Conditions
30	SPECIFIC_GRAVITY	Specific Gravity	R	DS-65	C		0				7119	D	5		Live Specific Gravity
31	PRIMARY_VALUE_AO	Analog Out	R	DS-65	C		0	1211 = mA			3351	D	5		PID control loop output
32	ORIFICE_ID	Orifice ID	R/W	Float	C		0	1019 = inches 1013 = mm	OoS		7026	S	4	Unit depends on Unit system selection	The inner diameter of the measurement orifice
33	PIPE_ID	Pipe ID	R/W	Float	C		0	1019 = inches 1013 = mm	OoS		7027	S	4	Unit depends on Unit system selection	The inner diameter of the pipe
34	K_FACTOR	K Factor	R/W	Float	C		0	65523 = MCF/pulse 65524 = km^3/pulse	OoS		7028	S	4	Unit depends on Unit system selection	K Factor is the number of pulses per unit volume, i.e. 1000 pulses/CF (us unit), M3 (metric unit). The meter's tag would normally indicate the K Factor.
35	METER_FACTOR	Meter factor	R/W	Float	C		0	No units	OoS		4399-4400	S	4	Convert from long - fixed point 6 decimals Unit depends on Unit system selection	Meter Factor is a correction to the K Factor for this individual meter, applied multiplicatively to the K Factor
36	HEATING_VALUE	Heating Value	R/W	Float	C		0	65521 = BTU/feet3 65522 = MJ/m3	OoS		4657-4658	S	4	Convert from long - fixed point 3 decimals. Unit depends on Unit system selection	Energy flow calculation requires the heating value.
37	TEMP_OVERRIDE	Temp override	R/W	Float	C		0	degF=1002, degC=1001	OoS		4661-4662	S	4	Convert from long - fixed point 2 decimals Unit depends on Unit system selection	This value is entered when no live temperature is available, or when a different value from the live value shall be used.
38	PRES_OVERRIDE	Pres override	R/W	Float	C		0	Pressure units	OoS		4663-4664	S	4	Convert from long - fixed point 2 decimals	Pressure override can be used when no live pressure transmitter is connected to the ECHART Flow computer
39	METER_ID	Meter ID	R/W	ASCII	C		0		OoS		2041-2044	S	8		Used as a Tag to Identify the Meter Stream
40	UNIT_SYSTEM_SEL	Unit System selection	R/W	Integer	C	0=Imperial, 1=Metric Unit	0		OoS	y	2569	S	2		Selects metric or imperial units

Index	Parameter Mnemonic	Label	Obj Type	Data type	Use	Range	Init Value	Units	Mode	Range check	Storage/ MODbus register	S	Size	Comment	Help text
41	PRESSURE_UNIT_SEL	Pressure unit	R/W	Integer	C	1137 = bar 1133 = kPa 1145 = kg/cm2	0		OoS	y	2570	S	2	Translated from FF unit codes to: 0=bar 1=kg/cm2 2=kPa	Selects pressure units
42	DIFF_PRESS_UNIT_SEL	DP unit	R/W	Integer	C	1138 = mbar 1133 = kPa	0		OoS	y	2573	S	2	Translated from FF unit codes to: 0=mbar 1=kPa	Selects the Differential pressure units
43	FLOW_UNIT_SEL	Flow unit	R/W	Integer	C	0 = MCF 1 = km3	0		OoS		2571	S	2		Selects the flow units
44	FLOW_RATE_DISPLAY_SEL	Display time base	R/W	Integer	C	0 = Hour 1 = Day 2 = Min	0		OoS	y	2581	S	2		Select the time base for measuring flow rate
45	GROSS_FLOW_UNIT	Gross flow units	R	Integer	C	1599 = MMSCFD 65525 = MMSCFH 65526 = MMSCFM 65527 = ksm3/day 65528 = ksm3/hour 65529 = ksm3/min							2	Derived from display time base and Flow unit	Engineering unit selected for Net flow
46	NET_FLOW_UNIT	Net Flow unit	R	Integer	C	1599 =MMSCFD 65525 = MMSCFH 65526 = MMSCFM 65527 = ksm3/day 65528 = ksm3/hour 65529 = ksm3/min							2	Derived from display time base and Flow unit	Engineering unit selected for Net flow
47	MASS_FLOW_UNIT	Mass flow units	R	Integer	C	1600 = MLB/H 65530 = MLB/Day 65531 = MLB/Min 1329 = ton/day 1328 = ton/hour 1327 = ton/min							2	Derived from display time base and unit system selection	Engineering unit selected for Mass flow
48	ENERGY_FLOW_UNIT	Energy Flow Unit	R	Integer	C	65520= MMBTU/DAY 65519=MMBTU/HOUR 65518=MMBTU/MIN 65517=GJ/DAY 65516=GJ/HOUR 65515=GJ/MIN							2	Derived from unit system selection	Engineering unit selected for Energy flow
49	DAILY_GROSS_VOL_UNIT	Daily gross vol unit	R	Integer	C	1043 =CF 1034 = M3							2	Derived from unit system selection	

Index	Parameter Mnemonic	Label	Obj Type	Data type	Use	Range	Init Value	Units	Mode	Range check	Storage/ MODbus register	S	Size	Comment	Help text
50	DAILY_NET_VOL_UNIT	Daily net vol unit	R	Integer	C	1053 =CF 1526 = M3							2	Derived from unit system selection	
51	DAILY_MASS_VOL_UNIT	Daily mass vol unit	R	Integer	C	1092 = Metric ton 1094 = lb							2	Derived from unit system selection	
52	DAILY_EN_VOL_UNIT	Daily energy vol unit	R	Integer	C	65520 = MMBTU 1171 = GJ							2	Derived from unit system selection	
53	CUM_GROSS_VOL_UNIT	Cum gross vol unit	R	Integer	C	1043 =CF 1034 = M3							2	Derived from unit system selection	Engineering unit selected for Gross Vol unit
54	CUM_NET_VOL_UNIT	Cum net vol unit	R	Integer	C	1053 =CF 1526 = M3							2	Derived from unit system selection	Engineering unit selected for Net vol unit
55	CUM_MASS_VOL_UNIT	Cum mass vol unit	R	Integer	C	1092 = Metric ton 1094 = lb							2	Derived from unit system selection	
56	CUM_EN_VOL_UNIT	Cum energy vol unit	R	Integer	C	65520 = MMBTU 1171 = GJ							2	Derived from unit system selection	
57	DP_UNIT	DP unit	R	Integer	C	1138 = mbar 1133 = kPa 1146 = inch H2O							2	Derived from Modbus register 2573 and unit selection (index 41) and translated to FF unit codes Metric: 0=mbar 1=kPa Imperial: inchH2O	Differential pressure units
58	TEMP_UNIT	Temp unit	R	Integer	C	degF=1002, degC=1001							2	Derived from unit system selection	Engineering unit selected for Temperature

Index	Parameter Mnemonic	Label	Obj Type	Data type	Use	Range	Init Value	Units	Mode	Range check	Storage/ MODbus register	S	Size	Comment	Help text
59	PRESSURE_UNIT	Pressure unit	R	Integer	C	1137 = bar 1133 = kPa 1145 = kg/cm2 1141 = psi							2	Derived from Modbus register 2570 and unit selection (index 41) and translated to FF unit codes: Metric: 0=bar 1=kg/cm2 2=kPa Imperial: psi	pressure units
60	DENSITY_UNIT	Density unit	R	Integer	C	1107 = lb/feet3 1097 = kg/m3								Derived from unit system selection	
61	BASE_DENSITY_UNIT	Base Density unit	R	Integer	C	1107 = lb/feet3 1097 = kg/m3								Derived from unit system selection	
62	SG_UNIT	SG unit	R	Integer	C	No Unit									
63	AO_UNIT	Analog Out unit	R	Integer	C	1211 = mA									
64	MODBUS_REG	Modbus registers	R/W	Record	C										
65	PASSWORD	Password	W	Integer	C										
66	FINT_FACTORY		R/W	Record	C										
67	SUPPORTED_MODES		R	uint8											

Transducer Block View Objects

		View 1	View 1_1	View 2	View 3	View 3_1	View 4
1	ST_REV	2		2	2		2
2	TAG_DESC						
3	STRATEGY						2
4	ALERT_KEY						1
5	MODE_BLK	4			4		
6	BLOCK_ERR	2			2		
7	UPDATE_EVT						
8	BLOCK_ALM						
9	TRANDUCER_DIRECTORY						
10	TRANSDUCER_TYPE	2		2	2		2
11	XD_ERROR	1			1		
12	COLLECTION_DIRECTORY						
13	PRIMARY_VALUE_GFR	5			5		
14	PRIMARY_VALUE_NFR	5			5		
15	PRIMARY_VALUE_MFR	5			5		
16	PRIMARY_VALUE_EFR	5			5		
17	PRIMARY_VALUE_DGV	5			5		
18	PRIMARY_VALUE_DNV	5			5		
19	PRIMARY_VALUE_DMV	5			5		
20	PRIMARY_VALUE_DEV	5			5		
21	PRIMARY_VALUE_CGV	5			5		
22	PRIMARY_VALUE _CNV	5			5		
23	PRIMARY_VALUE_CMV	5			5		
24	PRIMARY_VALUE_CEV	5			5		
25	PRIMARY_VALUE_DP	5			5		
26	PRIMARY_VALUE_TEMP	5			5		
27	PRIMARY_VALUE_P	5			5		
28	PRIMARY_VALUE_DENS	5			5		
29	BASE_DENISITY		5			5	
30	SPECIFIC_GRAVITY		5			5	
31	PRIMARY_VALUE_AO		5			5	
32	ORIFICE_ID			4			4
33	PIPE_ID			4			4
34	K_FACTOR			4			4

		View 1	View 1_1	View 2	View 3	View 3_1	View 4
35	**METER_FACTOR**			**4**			**4**
36	**HEATING_VALUE**			**4**			**4**
37	**TEMP_OVERRIDE**			**4**			**4**
38	**PRES_OVERRIDE**			**4**			**4**
39	**METER_ID**			**8**			**8**
40	**Unit_System_Sel**			**2**			**2**
41	**PRESSURE_UNIT_SEL**			**2**			**2**
42	**DIFF_PRESS_UNIT_SEL**			**2**			**2**
43	**FLOW_UNIT_SEL**			**2**			**2**
44	**FLOW_RATE_DISPLAY_SEL**			**2**			**2**
45	**GROSS_FLOW_UNIT**			**2**			**2**
46	**NET_FLOW_UNIT**			**2**			**2**
47	**MASS_FLOW_UNIT**			**2**			**2**
48	**ENERGY_FLOW_UNIT**			**2**			**2**
49	**DAILY_GROSS_VOL_UNIT**			**2**			**2**
50	**DAILY_NET_VOL_UNIT**			**2**			**2**
51	**DAILY_MASS_VOL_UNIT**			**2**			**2**
52	**DAILY_EN_VOL_UNIT**			**2**			**2**
53	**CUM_GROSS_VOL_UNIT**			**2**			**2**
54	**CUM_NET_VOL_UNIT**			**2**			**2**
55	**CUM_MASS_VOL_UNIT**			**2**			**2**
56	**CUM_EN_VOL_UNIT**			**2**			**2**
57	**DP_UNIT**			**2**			**2**
58	**TEMP_UNIT**			**2**			**2**
59	**PRESSURE_UNIT**			**2**			**2**
60	**DENSITY_UNIT**			**2**			**2**
61	**BASE_DENSITY_UNIT**			**2**			**2**
62	**SG_UNIT**			**2**			**2**
63	**AO_UNIT5**			**2**			**2**
64	**MODBUS_REG**						
65	**PASSWORD**						
66	**FINT_FACTORY**						
67	**SUPPORTED_MODES**						
		91	**15**	**88**	**91**	**15**	**91**

Analog Input FB

Parameters of the AI Function Block are according to the standard with the following additional parameter

xducer_val	the dynamic variable as read from the Transducer Block
att_xducer_units	the unit code for the value read from the Transducer Block
block_alm_act	the presently active alarms in the block
supported_modes	the modes supported by the block

Channels

The channels are configurable in the device. Any of the DS – 65 variables can be routed to an AI Function Block. The following channels exist:

Channel no	Dynamic Variable	Default Function block
1	Diff pressure	AI1
2	Temperature	AI2
3	Pressure	AI3
4	Gross Flow rate	AI4
5	Net flow rate	AI5
6	Mass flow rate	
7	Energy Flow rate	
8	Cumulative Gross Volume	
9	Cumulative Net volume	
10	Cumulative Mass volume	
11	Cumulative Energy volume	
12	Daily Gross Volume	
13	Daily Net volume	
14	Daily Mass volume	
15	Daily Energy volume	
16	AO	
17	Density	
18	Base density	
19	Specific gravity	