

User's Manual

ROTAMETER RAMC Variable Area Flowmeter FOUNDATION FIELDBUS Communication Type

IM 01R01B02-03E-R, supplementary instructions to standard RAMC User's Manual IM 01R01B02-00E-E



Contents

1. Introduction.....	1-1
1.1 Target Group	1-1
1.2 Applicable Documents	1-1
1.3 General Items.....	1-1
2. FOUNDATION Fieldbus Communication getting started.....	2-1
2.1 Outline.....	2-1
2.2 Internal Structure of RAMC.....	2-1
2.3 Logical Device Structure.....	2-1
3. Installation	3-1
3.1 Wiring System Configuration.....	3-1
3.2 Connection of Devices	3-1
4. Start of Operation	4-1
4.1 Integration of DD.....	4-1
4.2 Important Device Settings	4-1
4.3 Cyclic Data Exchange.....	4-2
4.4 Setting of Write Protection	4-2
4.5 Using the Keys.....	4-2
5. Block Setting	5-1
5.1 Parameters and Initial Settings	5-1
5.2 Resource Block (RB) Parameters.....	5-1
5.3 Analog Input (AI) Block Parameters	5-2
5.4 Transducer Block (AI_TB) Parameters.....	5-3
6. Status and Diagnostic Information	6-1
6.1 Status Description	6-1
6.2 Diagnostics.....	6-2
6.3 Status Impacts of Alarm Settings	6-4

7. Explosion Protected Type Instruments	7-1
7.1 Intrinsically Safe ATEX and IECEx certified electronic Transmitter (/KS1, /ES1)	7-1
7.1.1 Technical Data	7-1
7.1.2 Marking	7-2
7.1.3 Installation	7-3
8. Service	8-1
8.1 FOUNDATION Fieldbus Label	8-1
8.2 Simulation Switch	8-1
Appendix 1. List of Parameters for each Block of RAMC	A-1
A1.1 RESOURCE	A-1
A1.2 ANALOG_INPUT1	A-7
A1.3 AI_TB	A-11
Appendix 2. Application, Setting and Change of basic Parameters	A-11
A2.1 Applications and Selection of Basic Parameters	A-11
A2.2 Setting and Change of Basic Parameters	A-12
A2.3 Setting the AI Function Blocks	A-13

1. Introduction

1.1 Target Group

The following persons are the target group of this manual:

- Technicians
- Engineers

This manual along with its applicable documents enable the target group to complete the following steps:

- Installation
- Commissioning
- Configuration (parametrization)
- Integration of the flow meter into a process control system
- Troubleshooting
- Maintenance and repair

1.2 Applicable Documents

The following documents supplement this manual:

- User's Manual (IM) IM01R01B02-00□-E
- General Specifications (GS) GS01R01B02-00E-E

1.3 General Items

This manual is additional to IM01R01B02-00□-E.

For safety instructions and warranty please see chapter 1 of IM01R01B02-00□-E.

This manual contains a description of the RAMC Metal Rotameter with FOUNDATION Fieldbus Communication Type. FOUNDATION Fieldbus communication type is similar to the HART communication type in terms of basic performance and operation.

This manual describes only those topics that are required for operation of the FOUNDATION Fieldbus communication type and that are not contained in IM01R01B02-00□-E.

Before use, read this manual thoroughly and familiarize yourself fully with the features, operations and handling of Rotameter RAMC to have the instrument deliver its full capabilities and to ensure its efficient and correct use.

2. FOUNDATION Fieldbus Communication getting started

2.1 Outline

Fieldbus is a widely used bi-directional digital communication protocol for field devices that enable the simultaneous output to many types of data to the process control system.

The transmitter of Fieldbus communication type employs the specification standardized by the Fieldbus FOUNDATION and provides interoperability between Yokogawa devices and those produced by other manufacturers. Fieldbus comes with software consisting of one AI function block that enable the flexible implementation of systems.

For information on other features, engineering, design, construction work, startup and maintenance of Fieldbus, refer to “Fieldbus Technical Information” (TI 38K03A01-01E).

2.2 Internal Structure of RAMC

The transmitter contains five blocks providing the following functions:

- Resource block (RB)
 - Manages the status of transmitter.
 - Automatically informs the host of any detected faults or other problems.
- Transducer Block (AI_TB)
 - Converts the sensor output volume flow or mass flow and transfers it to the AI function block.
- Standardized Connection Points TB (SCP)
 - For future use
- Diagnosis Transducer Block (DIAG)
 - Only for service purpose
- Analog Input (AI) function block
 - Conditions raw data from the Transducer block.
 - Outputs volume flow or mass flow via the channel.
 - Carries out scaling and damping.

2.3 Logical Device Structure

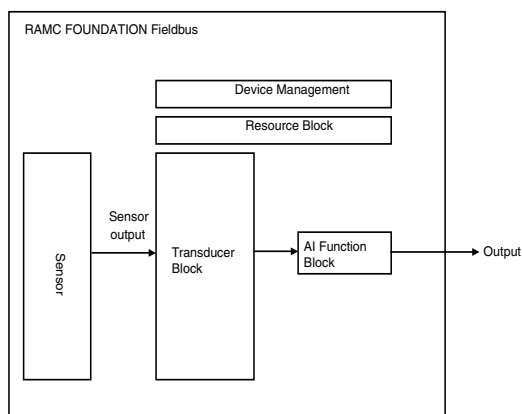


Figure 2.1 Logical Device Structure

3. Installation

3.1 Wiring System Configuration

The number of devices that can be connected to a single bus and the cable length vary depending on system design. When constructing the systems, both the basic and overall design must be carefully considered to achieve optimal performance.

3.2 Connection of Devices

The following instruments are required for use with Fieldbus devices:

- **Power supply:**
Fieldbus requires a dedicated power supply. It is recommended that current capacity be well over the total value of the maximum current consumed by all devices (including the host). Conventional DC power supplies cannot be used.
- **Terminator:**
Fieldbus requires two terminators. Refer to the supplier for details of terminators that are attached to the host.
- **Field devices:**
Connect Fieldbus communication type RAMC.
- **Host:**
Used for accessing field devices. A dedicated host (such as DCS) is used for an instrumentation line while dedicated communication tools are used for experimental purposes. For operation of the host, refer to the instruction manual for each host. No other details on the host are given in this manual.
- **Cable:**
Used for connecting devices. Refer to "Fieldbus Technical Information" (TI 38K03A01-01E) for details of instrumentation cabling. For laboratory or other experimental use, a twisted pair cable two to three meters in length with a cross section of 0.9 mm² or more and a cycle period of within 5 cm (2 inches) may be used. Termination processing depends on the type of device being deployed. Some hosts require a connector.

Refer to Yokogawa when making arrangements to purchase the recommended equipment. Connect the devices as shown in Figure 3.1. Connect the terminators at both ends of the trunk, with a minimum length of the spur laid for connection.

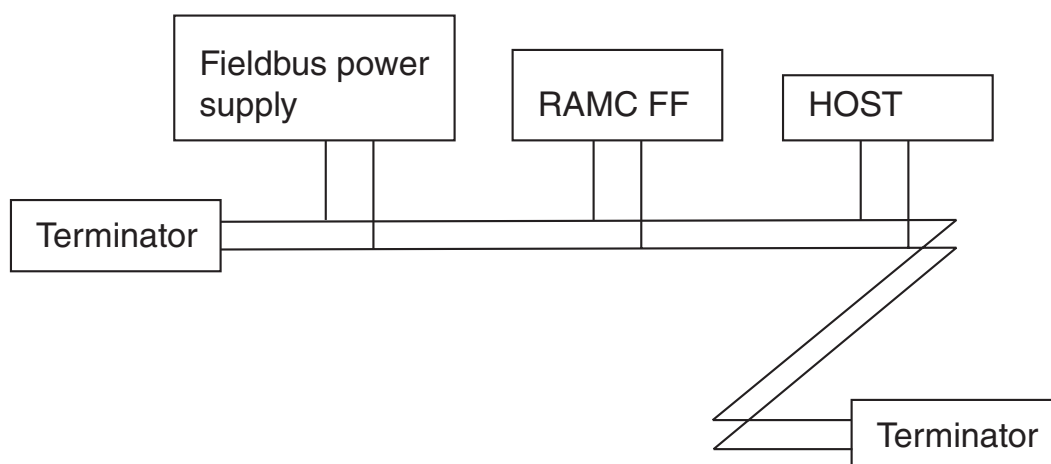


Figure 3.1 Device connection

Digital communication signal based on FOUNDATION Fieldbus protocol. Maximum voltage and correct polarity must be observed for wiring, however the RAMC is polarity independent.

For wiring	Value
Power supply	9 to 32 V _{DC}
Current draw	14 mA (nominal)

Before using a Fieldbus configuration tool other than the existing host, confirm it does not affect the loop functionality in which all devices have been already installed in operation. Disconnect the relevant control loop from the bus if necessary.

**IMPORTANT**

Connecting a Fieldbus configuration tool to a loop with its existing host may cause communication data scrambling resulting in a functional disorder or a system failure.

Connection assignment in RAMC housing:

Connect the cable conductors of the fieldbus cable to the fieldbus terminals 2 and 3.

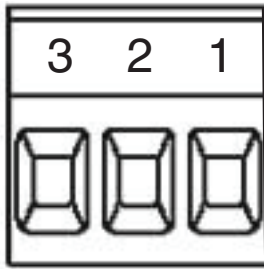


Figure 3.2 Connector at transmitter

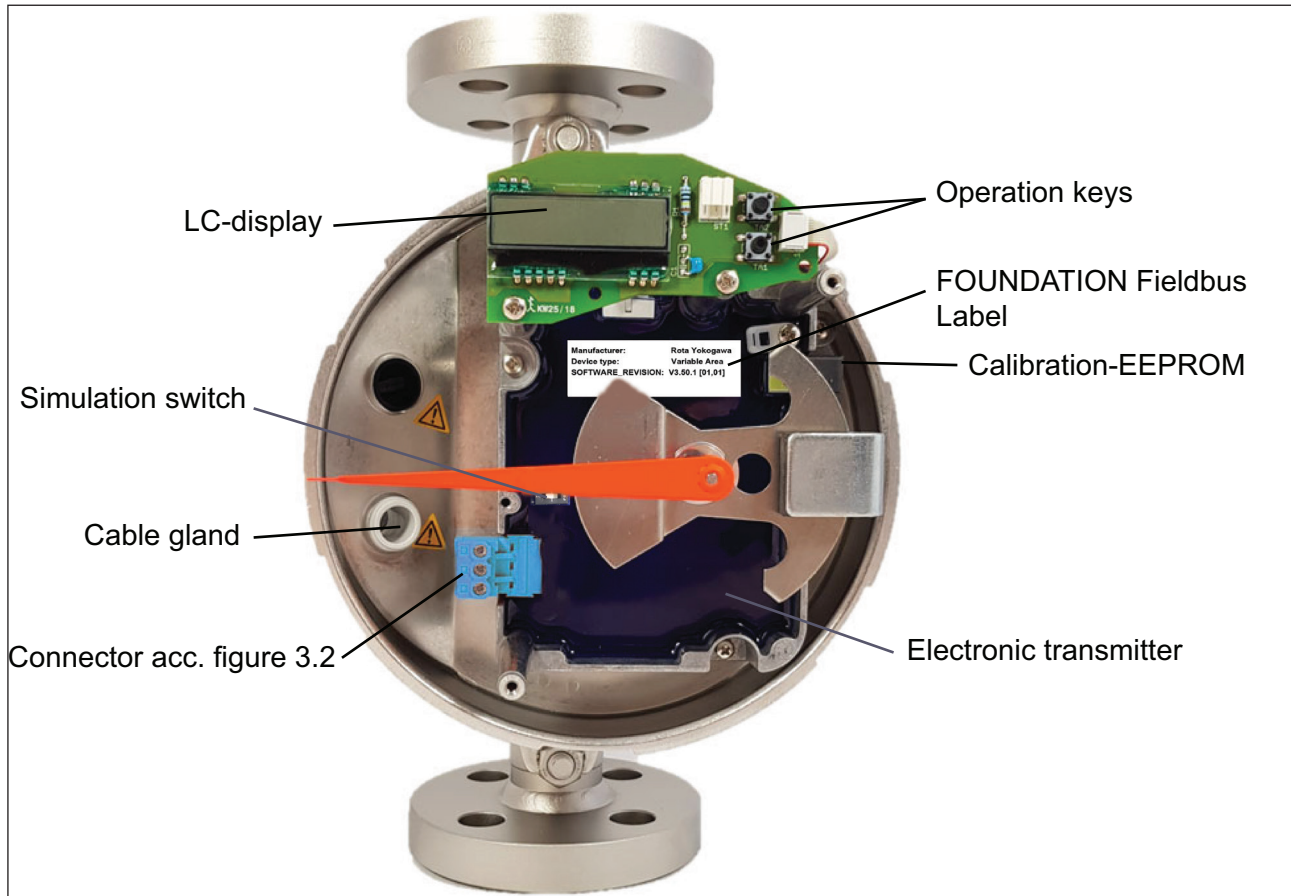


Figure 3.3 RAMC FF Overview

**CAUTION**

- If the fieldbus device is operated at ambient temperatures above +50 °C, the supply voltage of the device must be above 9.5 V.
- For installation in hazardous area chapter 7 must be regarded.

4. Start of Operation

4.1 Integration of DD

FOUNDATION Fieldbus system requires DD file which describes the device parameters such as the transmission rate supported, input, output data, data format and data length.

The DD files described below are available to RAMC.

You can download the DD file from

<https://www.fieldcommgroup.org/registered-products/2b7f804b-c5ad-eb11-8236-000d3a323d08>

Table 4.1 DD files

DD file name	Tokenizer
0101.ffa; 0101.sym; 010101.cff	DD4
0101.ff5; 0101.sy5; 010101.cff	DD5

4.2 Important Device Settings

The tables below show items (parameters) which need special care to ensure a proper working of the RAMC Fieldbus type.

Table 4.1 General settings

Item	Settings
Node address	Set to 0xF7 (247) by default unless otherwise specified when ordered

In case of unit change (compared to initial ordering) it is recommended to change the OUT_SCALE parameter as described in table 4.3 only. Change of the Process Variable needs in addition the changes described in the tables 4.2 and 4.3.

Table 4.2 Initial settings of Transducer Block

Item	Settings for Volume flow	Settings for Mass flow
Parameter: VOLUME_FLOW_UNITS	Choose unit (initially set to unit specified when ordered)	Not active 1 ("Volume flow passivated")
Parameter: MASS_FLOW_UNITS	Not active 1 ("Mass flow passivated")	Choose unit (initially set to unit specified when ordered)



NOTE

Change of the parameters VOLUME_FLOW_UNITS to MASS_FLOW_UNITS or vice versa needs in addition the adaptation of the parameter CHANNEL inside the AI block, to make the change effective on the OUT parameter.

Table 4.3 Initial settings of AI Function Block

Item	Settings for Volume flow	Settings for Mass flow
Parameter: XD_SCALE Sub-parameter: EU_at_100%	Set upper range limit (set to scale upper range as specified when ordered)	
Parameter: XD_SCALE Sub-parameter: EU_at_0%	Set lower range limit (set to scale lower range as specified when ordered)	
Parameter: OUT_SCALE Sub-parameter: Units_Index	Choose unit (set to unit specified when ordered)	
Parameter: OUT_SCALE Sub-parameter: EU_at_100%	Set upper range limit (set to scale upper range as specified when ordered)	
Parameter: OUT_SCALE Sub-parameter: EU_at_0%	Set lower range limit (set to scale lower range as specified when ordered)	
Parameter: CHANNEL	0x01 Volume Flow	0x02 Mass Flow

4.3 Cyclic Data Exchange

The RAMC is preset in factory and should work after integration into the system. In case of parameter adjustment the items described in former section need special care to ensure cyclic data exchange. The OUT parameter transfers Value and Status of the device.



NOTE

The parameters OUT_SCALE and XD_SCALE need reconfiguration in case of:

- Restart with defaults
 - Unit change of the Process Variable (XD_SCALE)
-

4.4 Setting of Write Protection

A write protection is a function to forbid changing of parameters. It is possible to set the software write protection by the Resource Block parameter WRITE_LOCK. When WRITE_LOCK is "2: Locked", the status of write protect becomes protected mode. When WRITE_LOCK is "1: Not locked", the status becomes unprotected mode.

4.5 Using the Keys

In fieldbus devices there is no local operating menu available.

Pressing the "arrow up" button the indication can be changed between flow, totalizer and temperature. Factory default is totalizer.

Pressing the "arrow right" button an error indication appears on display.

- 00000000 or
- 00000000

A detailed explanation see chapter 6.

5. Block Setting

This chapter contains information on how to adapt the function and performance of the RAMC to suit specific applications. If two or more devices are connected to FOUNDATION Fieldbus, settings including the requirements of all devices need to be determined. The following steps must be taken.

The following section describes each step of the procedure in the order given. Using a dedicated configuration tool allows the procedure to be significantly simplified. This section describes the procedure to be assigned for a master which has relatively simple functions.

5.1 Parameters and Initial Settings

The block parameters of the RAMC are listed and described inside the Appendix 1 “List of parameters for each block of the RAMC”. The initial parameter settings are also described there. Block parameters can be read and set (if writeable) from the host.

5.2 Resource Block (RB) Parameters

All important Resource Block parameters are listed below and described with more details to guide through the settings.

TARGET_MODE:

Indicates what mode of operation is desired for the Resource Block. Two block modes are available:

- Out of Service (O/S)
- Auto (AUTO)

MODE_BLK:

The sub-parameter “Actual” indicates the actual mode which is one of the target modes. The actual mode may differ from the target mode (e.g. affected by block mode setting of Resource Block).

- Out of Service: Whenever a function block MODE_BLK target is Out-of-Service or transducer block MODE_BLK target mode is Out-of-service, the block must not perform or report inter-parameter error checks. If the resource block target mode is Out-of-service, then the resource block and function blocks in the device must not be perform or report interparameter error checks.



NOTE

In case of O/S the target mode of the AI Block is set to O/S too.

- Auto: Block function is set to active.

WRITE_LOCKING:

This parameter allows the protection of the device setting (see also chapter 4.4):

- “1”: Not locked
- “2”: Locked

RESTART:

The parameter allows degrees of initialization of the resource block. The following different resets are available:

- 0: Uninitialized
- 1: Run (no restart)
- 2: Resource
- 3: Defaults
- 4: Processor
- 5: Factory Defaults

5.3 Analog Input (AI) Block Parameters

All important AI Block parameters are listed below and described with more details to guide through the settings.

TARGET_MODE:

Indicates what mode of operation is desired for the AI Function Block. The AI Function Block modes are:

- Out of Service (O/S)
- Manual (MAN)
- Auto (AUTO)

MODE_BLK:

The sub-parameter "Actual" indicates the actual mode which is one of the available modes of the TARGET_MODE. The actual mode may differ from the target mode (e.g. affected by block mode setting of Resource Block):

- Out of Service: The AI Block does not operate.
- Manual: Allows manual setting of the parameter OUT by the user. It does not allow automatic updated.
- Auto: Causes the OUT parameter to be updated automatically.

CHANNEL:

Defines the output parameter of the transducer block to be input to the AI block. AI block is assigned to:

- Volumetric flow rate (in case of VOLUME_FLOW_UNIT)
- Mass flow rate (in case of MASS_FLOW_UNIT)

OUT:

This parameter contains the value and the status used for cyclic data transfer. The content depends on several settings and status handling. It is writable in block mode: MAN.

OUT_SCALE:

Defines the output scale (range and unit). The output range needs setting from 0 % to 100 %. Available units are defined in chapter 5.4.

XD_SCALE:

Defines the input scale from the transducer block. The engineering unit of XD_SCALE high and low scale values are direct related to the VOLUME_FLOW_UNIT resp. MASS_FLOW_UNIT of the Transducer block. The unit is determined by order and printed on the indicator scale. Available units are defined in chapter 5.4.

XD_FTIME:

Sets the time constant of the damping function within AI block (primary delay) in seconds.

5.4 Transducer Block (AI_TB) Parameters

All important Transducer Block parameters are listed below and described with more details to guide through the settings.

TARGET_MODE:

Indicates what mode of operation is desired for the Transducer Block. Two block modes are available:

- Out of Service (O/S)
- Auto (AUTO)

MODE_BLK:

The sub-parameter "Actual" indicates the actual mode which is one of the target modes. The actual mode may differ from the target mode:

- Out of Service: sets the status of the Process Variables to "BAD..."
- Auto: Block function able to work.

NOMINAL_SIZE:

Shows the size of the flow tube in mm or inches.

NOMINAL_SIZE_UNIT:

Sets the unit of the flow tube size (in mm or inches).

VOLUME_FLOW_UNIT:

The units in table 5.5 are selectable. Presetting is determined by order.

LOW_FLOW_CUTOFF:

Sets low cut range for output. Setting range is 5 to 15 % of VOLUME_FLOW_HI_LIMIT or MASS_FLOW_HI_LIMIT. Factory setting: " 5 %"

VOLUME_FLOW:

Indicates the current measured value and status of the Process Variable (volumetric flow). This parameter is an input to the AI Function Block, if a volumetric unit is selected on the scale.

MASS_FLOW_UNIT:

The units in table 5.5 are selectable. Presetting is determined by order.

MASS_FLOW

Indicates the current measured value and status of the Process Variable (mass flow). This parameter is an default input to the AI Function block, if a mass flow unit is selected.

TEMPERATURE_UNIT

The unit in table 5.1 is selectable.

Table 5.1 Units for Indicator temperature

Unit Symbol	Unit Description	Unit Code
°C	Degree Celsius T/K	1001
K	Kelvin SI	1000
°F	Degree Fahrenheit T/K	1002

TEMPERATURE

Indicates the indicator temperature value as selected by TEMPERATURE_UNIT.
This parameter can not be used for cyclic communication on AI Function Block.

TOTALIZER_UNIT

The totalizer unit is defined from the selected flow unit and determined by order. Table 5.2 and 5.3 show the available units as defined in the FOUNDATION Fieldbus standard.

Table 5.2 Totalizer units for volumetric flow

Unit Symbol	Unit Description	Unit Code
m ³	Cubic meter	1034
m ³ normal	Normal cubic meter (0°C, 1atm)	1521
L	Liter	1038
L normal	Normal liter (0°C, 1atm)	1531
ft ³	Cubic foot	1043
ft ³ std.	Standard cubic foot	1053
gal	Gallon (U.S.)	1048
bbl	Barrel (U.S. petroleum)	1051
ImpGal	Gallon (Imperial)	1049
m ³ std.	Standard cubic meter (20°C, 1atm)	1526
L std.	Standard liter (20°C, 1atm)	1536

Table 5.3 Totalizer units for mass flow

Unit Symbol	Unit Description	Unit Code
kg	Kilogram SI	1088
t	Metric ton	1092
lb	Pound (Avoirdupois)	1094
LTon	Long ton	1096
g	Gram	1089

TOTALIZER

Indicates the totalized volumetric or mass flow depending on the selected flow unit.

Changing the flow unit will cause a reset of the actual totalizer value.

The parameter TOTALIZER can not be used for cyclic communication on AI Function Block.

FLOW UNITS

The tables 5.4 and 5.5 show all flow units available for the process variables as defined inside the FOUNDATION Fieldbus standard. These units are also available for the OUT parameter.

Table 5.4 Volume Flow

Unit Symbol	Unit Description	Unit Code
L/h	Liter per hour	1353
L/min	Liter per minute	1352
L/s	Liter per second	1351
m ³ /d	Cubic meter per day	1350
m ³ /h	Cubic meter per hour	1349
m ³ /min	Cubic meter per minute	1348
m ³ /s	Cubic meter per second	1347
ImpGal/d	Gallon (Imperial) per day	1370
ImpGal/h	Gallon (Imperial) per hour	1369
ImpGal/min	Gallon (Imperial) per minute	1368
ImpGal/s	Gallon (Imperial) per second	1367
gal/d	Gallon (U.S.) per day	1365
gal/h	Gallon (U.S.) per hour	1364
gal/min	Gallon (U.S.) per minute	1363
gal/s	Gallon (U.S.) per second	1362
ft ³ /d	Cubic foot per day	1359
ft ³ /h	Cubic foot per hour	1358
ft ³ /min	Cubic foot per minute	1357
ft ³ /s	Cubic foot per second	1356
bbl/d	Barrel per day	1374
bbl/h	Barrel per hour	1373
bbl/min	Barrel per minute	1372
bbl/s	Barrel per second	1371
L/h normal	Normal liter per hour (0°C, 1atm)	1534
L/min normal	Normal liter per minute (0°C, 1atm)	1533
m ³ /h normal	Normal cubic meter per hour (0°C, 1atm)	1524
m ³ /min normal	Normal cubic meter per minute (0°C, 1atm)	1523
ft ³ /h std.	Standard cubic foot per hour	1361
ft ³ /min std.	Standard cubic foot per minute	1360
L/h std.	Standard liter per hour (20°C, 1atm)	1539
L/min std.	Standard liter per minute (20°C, 1atm)	1538
m ³ /h std.	Standard cubic meter per hour (20°C, 1atm)	1529
m ³ /min std.	Standard cubic meter per minute (20°C, 1atm)	1528

Table 5.5 Mass Flow

Unit	Unit Description	Unit Code
kg/d	Kilogram per day	1325
kg/h	Kilogram per hour	1324
kg/min	Kilogram per minute	1323
kg/s	Kilogram per second	1322
g/h	Gram per hour	1320
g/min	Gram per minute	1319
g/s	Gram per second	1318
t/d	Metric ton per day	1329
t/h	Metric ton per hour	1328
t/min	Metric ton per minute	1327
lb/d	Pound per day	1333
lb/h	Pound per hour	1332
lb/min	Pound per minute	1331
lb/s	Pound per second	1330
LTon/d	Long ton per day	1341
LTon/h	Long ton per hour	1340
LTon/min	Long ton per minute	1339

6. Status and Diagnostic Information

Status and Diagnostic Information is an important feature of FOUNDATION Fieldbus communication. This chapter helps to understand important details. The status enables a quality judgement of the delivered information and the Diagnostic allows the analysis of the cause.

In case of event the status byte of the OUT parameter indicates the changed situation. By using the Resource Block parameter FD_FAIL_ACTIVE, FD_OFFSPEC_ACTIVE, FD_MAINT_ACTIVE and FD_CHECK_ACTIVE the user is able to get more information about the cause.

All flagged diagnostic items in the parameters FD_FAIL_MAP, FD_OFFSPEC_MAP, FD_MAINT_MAP and FD_CHECK_MAP respectively FD_FAIL_MASK, FD_OFFSPEC_MASK, FD_MAINT_MASK and FD_CHECK_MASK are supported inside RAMC.

In addition inside the Transducer Block the parameter DEVICE_STATUS1 to DEVICE_STATUS3 indicates several diagnostic information.

6.1 Status Description

The status byte attached to the Process Variables and the OUT parameter consists of two parts:

- Quality: informs about the status
- Substatus: details the status information

The status indication is based on the priority of the status, starting with the highest priority.

The tables below indicates the status information which may arise in case of events:

Table 6.1 Status

Quality	Sub-status	Limits	Value	Priority
Bad	Non-specific	Not limited	0x00	highest
Bad	Device Failure	Not limited	0x0C	
Bad	Sensor Failure	Not limited	0x10	
Bad	Out of Service	Not limited	0x1C	
Uncertain	Substitute	Not limited	0x48	
Uncertain	Sensor Conversion not Accurate	Not limited	0x50	
Uncertain	Engineering Unit Range Violation	Not limited	0x54	
Uncertain	Sub-normal	Not limited	0x58	
Good (NC)	Non-specific	Not limited	0x80	
Good (NC)	Unacknowledged Block Alarm	Not limited	0x90	Lowest

6.2 Diagnostics

The table below indicates the Bit setting in case of Event:

Table 6.2 Event description and the effect on Display and Bit setting

Event description	Blinking bars	Event on display	Bits of parameter						
			DEVICE_STATUS □			FIELD_DIAGNOSTIC (FD)			
			□ = 1	□ = 2	□ = 3	FAIL MAP	OFF-SPEC MAP	MAINT MAP	CHECK MAP
Transducer mode not OK	n.a.	n.a.				0			
Communication loss*	n.a.	n.a.				1			
NV-RAM issue	n.a.	n.a.						2	
Cond03	n.a.	n.a.							
Cond04	n.a.	n.a.							
RAM Error*	-----	0000 0001	0			5			
ADC Error*	-----	0000 0010	1			6			
Adj-EEPROM Error	-----	0000 0100	2			7			
Cal-EEPROM Error*	-----	0000 1000	3			8			
Totalizer Value False	-----	0001 0000	4					9	
Reserved 06	-----	0010 0000	5						
EEPROM Error	-----	0100 0000	6			11			
Float Blocking Error	-----	1000 0000	7				12		
Temperature Error	-----	0000 0001		0			13		
Volume Flow Overrun	-----	0000 0010		1			14		
Mass Flow Overrun	-----	0000 0100		2			15		
Autozero Running	n.a.	0000 1000		3				16	
Power Supply Failure	n.a.	0001 0000		4					
Operate Timer Error	n.a.	0010 0000		5				18	
Reserved 15	-	0100 0000		6					
Float Blocking Active	n.a.	1000 0000		7				20	
Volume Flow Passivated	n.a.	n.a.			0				
Mass Flow Passivated	n.a.	n.a.			1				
Volume Flow Low Limit	n.a.	n.a.			2		23		
Volume Flow High Limit	n.a.	n.a.			3		24		
Mass Flow Low Limit	n.a.	n.a.			4		25		
Mass Flow High Limit	n.a.	n.a.			5		26		
Reserved 23	-	-			6				
Reserved 24	-	-			7				
Reserved 25	-	-							
Reserved 26	-	-							
Reserved 27	-	-							

* Note: In case of missing EEPROM, Display indicates "Cal-EEPROM Error" and BUS generates "Communication loss".

Table 6.3 Diagnostic Parameter initial setting

Label	FD_CHECK_...			FD_MAINT_...			FD_OFFSPEC_...			FD_FAIL_...		
	MAP	AC-TIVE	MASK	MAP	AC-TIVE	MASK	MAP	AC-TIVE	MASK	MAP	AC-TIVE	MASK
Transducer mode not OK	x											
Communication loss										x		
NV-RAM issue				x								
RAM Error										x		
ADC Error										x		
Adj-EEPROM Error										x		
Cal-EEPROM Error										x		
Totalizer Value False				x								
EEPROM Error										x		
Float Blocking Error							x					
Temperature Error							x					
Volume Flow Overrun							x					
Mass Flow Overrun							x					
Autozero Running				x								
Operate Timer Error				x								
Volume Flow Low Limit							x					
Volume Flow High Limit							x					
Mass Flow Low Limit							x					
Mass Flow High Limit							x					

..._MAP

This parameter enables or disables conditions to be detected as active for this alarm category. Thus the same condition may be active in all, some, or none of the 3 alarm categories.

..._ACTIVE

This parameter reflects the error conditions that are being detected as active as selected for this alarm category. It is a bit string, so that multiple conditions may be shown.

..._MASK

This parameter allows the user to suppress any single or multiple conditions that are active in this category from being broadcast to the host through the alarm parameter.

6.3 Status Impacts of Alarm Settings

Within the Analog Input Block the RAMC provides the possibility to set alarms and warnings for indication of limit violations of the OUT parameter. The setting is done with the following parameters:

- HI_HI_LIM
- HI_LIM
- LO_LIM
- LO_LO_LIM

Limit violations of the OUT_VALUE directly affect the status information of the OUT_STATUS.



CAUTION

To avoid unusable alarm status information, the upper alarm /warning limits must always be used above the lower alarm /warning limit.

7. Explosion Protected Type Instruments



WARNING

- Only trained personnel may use the instrument in an industrial location.
- The instrument modification or replacement of parts by other than an authorized Representative of Yokogawa is prohibited and will void the certification.
- Electrostatic charge on painted or other non-metallic surfaces may cause an explosion hazard. Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth on painted surface of the indicator or on potting of electronic transmitter.
- Ignition risks caused by pressure surges, impact or friction must particularly be avoided when light metal measuring units are used.



WARNING

The electronic transmitter RAMC□□-□□□□-□□□□-□□429 /□S1 is an intrinsically safe device.

To ensure intrinsic safety it is not permitted to repair or to modify the electronic transmitter, the display or the calibration EEPROM.

In the case of high fluid temperatures, heated metering tubes or heat radiation by heat tracing, make sure that the temperature in the indicator housing does not exceed the permissible maximum ambient temperature of the transmitter (see below chapter 7.1.1).

7.1 Intrinsically Safe ATEX and IECEx certified electronic Transmitter (/KS1, /ES1)

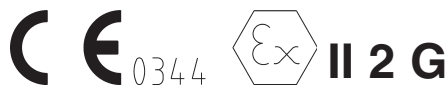
7.1.1 Technical Data

The electronic transmitter is an intrinsically safe device. This device is certified for hazardous areas of zone 1 (category 2) and zone 2 (category 3). It is not homologated for zone 0 (category 1). The classifications in brackets are given according to Directive 2014/34/EU (ATEX).

EU-Type Examination Certificate No.: PTB 12 ATEX 2003 X
IECEx certificate No.: IECEx PTB12.0020X

Applicable standards: EN 60079-0: 2018
EN 60079-11: 2012
IEC 60079-0: 2017 edition 7
IEC 60079-11: 2011 edition 6

Identification in accordance with Directive 2014/34/EU (ATEX):



Type of protection:	Variant #1:	Ex ia IIB/IIC T4 Gb
	Variant #2:	Ex ia IIB/IIC T6 Gb
	Variant #3:	Ex ia IIB T6 Gb
	Variant #4:	Ex ia IIB/IIC T4 Gb
Ambient temperature:	Variant #1:	-40 °C to +70 °C
	Variant #2:	-40 °C to +50 °C
	Variant #3:	-40 °C to +60 °C
	Variant #4:	-40 °C to +70 °C

Parameters of fieldbus terminal:

Table 7.1 Variant #1 and #2:

Type	Fieldbus IIB	Fieldbus IIC	FISCO
Ui	17.5 V	24 V	According IEC 60079-11 Annex G
Ii	380 mA	250 mA	
Pi	1.31 W	1.31 W	
Ci	negligible	negligible	
Li	negligible	negligible	

Table 7.2 Variant #3:

Type	Fieldbus IIB	Fieldbus IIC	FISCO
Ui	17.5 V	---	According IEC 60079-11 Annex G
Ii	380 mA	---	
Pi	0.95 W	---	
Ci	negligible	---	
Li	negligible	---	


Table 7.3 Variant #4:

Type	Fieldbus IIB	Fieldbus IIC	FISCO
Ui	17.5 V	24 V	According IEC 60079-11 Annex G
Ii	380 mA	250 mA	
Pi	2.53 W	2.53 W	
Ci	negligible	negligible	
Li	negligible	negligible	

7.1.2 Marking

Name plates on electronic transmitter:

Rota Yokogawa Rheinstrasse 8 D-79664 Wehr WT-MAG Mat. No. M38 □□□□ Serial No. □□□□□□

Ex ia IIB/IIC T6/T4 Gb PTB 12 ATEX 2003 X See certificate for data FISCO field device   II 2G
--

Ex ia IIB/IIC T6/T4 Gb IECEx PTB12.0020X See certificate for data FISCO field device

7.1.3 Installation

For general installation description chapter 3.1 must be regarded.

Connection in RAMC housing:

Connect the cable conductors of the fieldbus cable to the fieldbus terminals as followed (see also Figure 3.3):

Table 7.4

Variant	Connector ST1		
	Pin 1	Pin 2	Pin 3
#1	X	X	not used
#2	X	X	not used
#3	X	X	not used
#4	not used	X	X

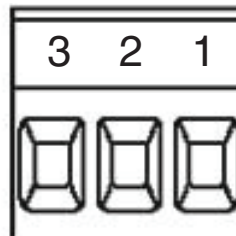


Figure 7.1 FOUNDATION Fieldbus connector



NOTE

If the fieldbus device is operated as variant #1, #2 or #3, the supply voltage must be greater than 9.5 V below an ambient temperature of +50 °C, and greater than 10 V above +50 °C.

If the fieldbus device is operated as variant #4, the supply voltage must be greater than 9.5 V above an ambient temperature of +50 °C.

Grounding connection:

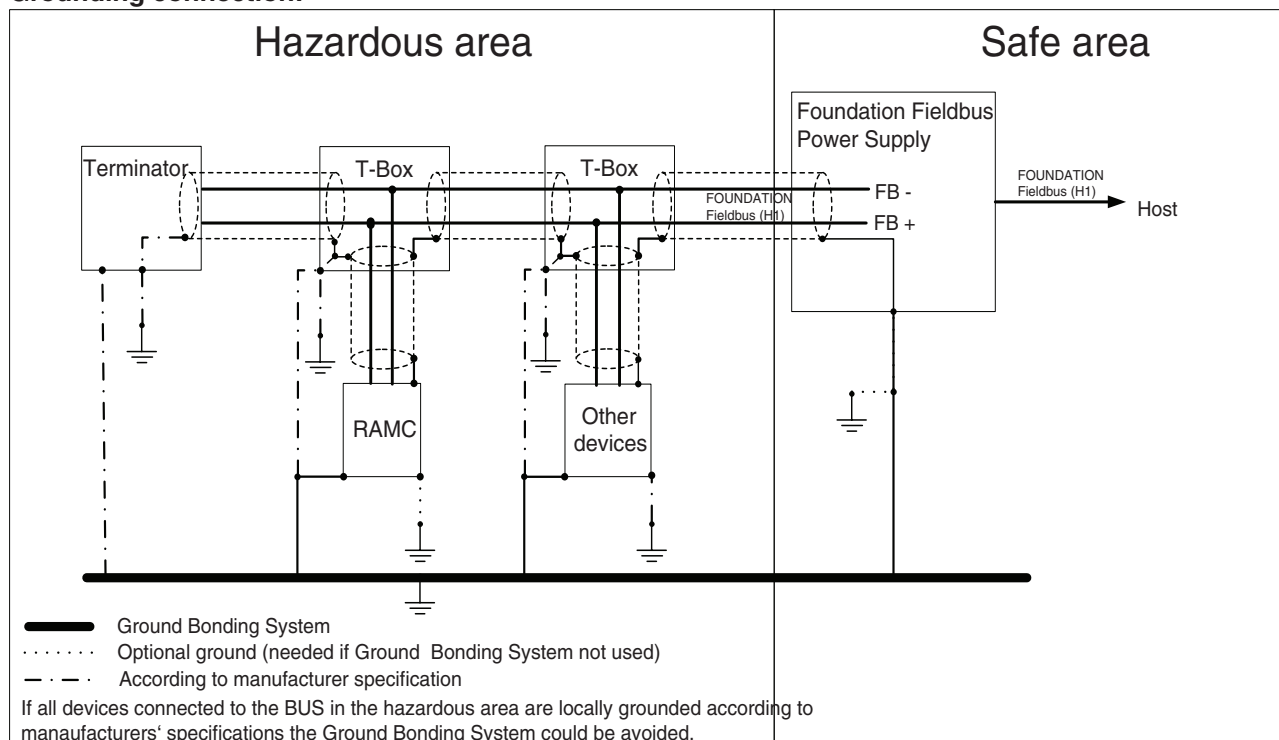


Figure 7.2 Possibility 1: Shield grounded in hazardous and safe area

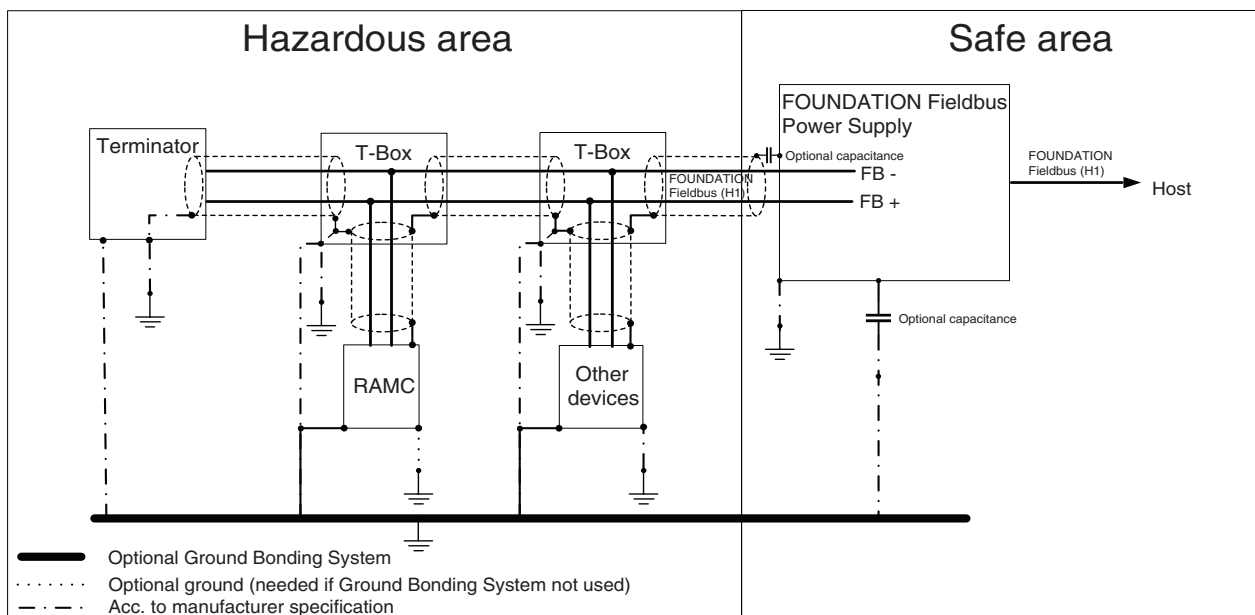


Figure 7.3 Possibility 2: Shield grounded in hazardous area

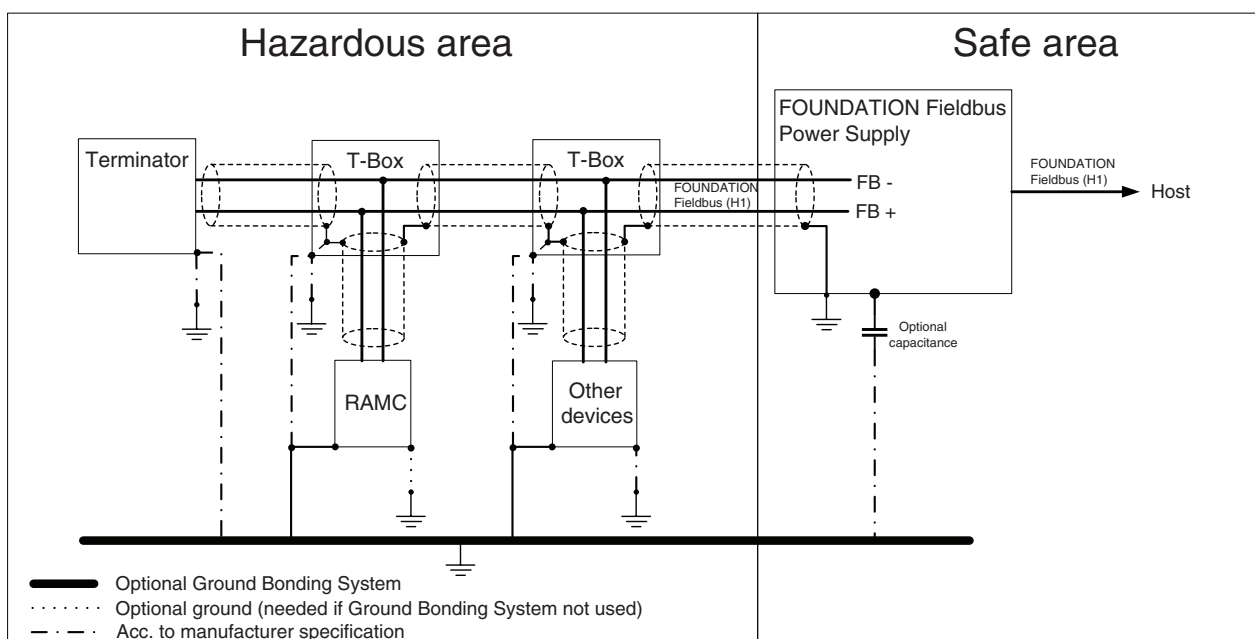


Figure 7.4 Possibility 3: Shield grounded in safe area

8. Service

8.1 FOUNDATION Fieldbus Label

In case of power down or defect electronic the device indicates compatibility information on an equipped label (see figure 3.3 for label position).

Manufacturer:	Rota Yokogawa
Device type:	Variable Area
SOFTWARE_REVISION:	V3.50.1 [01,01]

← **SOFTWARE REVISION-[Dev_Rev, DD_Rev]**

Dev_Rev: Parameter in FW (see Appendix 1)

DD_Rev: Parameter in FW (see Appendix 1)

SOFTWARE REVISION: Parameter in FW (see Appendix 1)

Figure 8.1 FOUNDATION Fieldbus example label

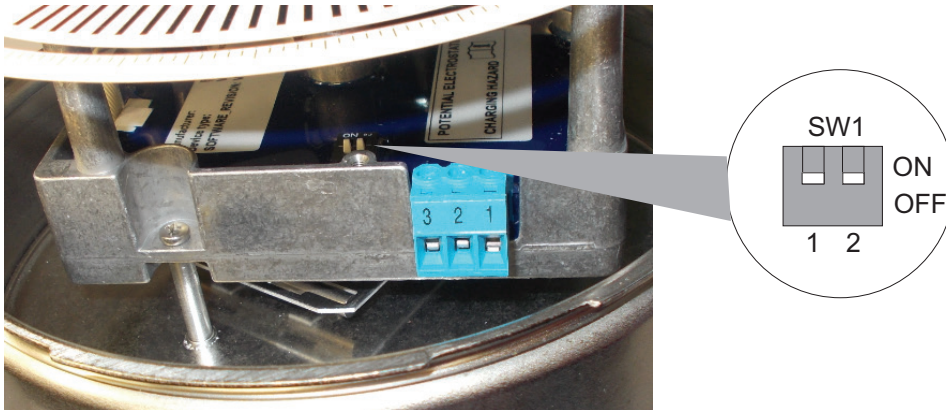
The information enables a compatibility judgement for Device driver's revision (Dev_Rev, DD_Rev).

The Dev_Rev, DD_Rev is integrated in the file name of the DD as number nn, xx, e.g. nnxx.ff5 / nnxx.sy5.

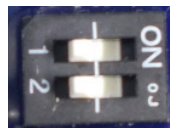
8.2 Simulation Switch

In case of enabling the software simulation function in the "Resource Block" and the "Analog Input Block"

DIP switch SW1 has to be set to ON. Setting DIP Switch SW1 to OFF disables this functionality.



Switch	Position	Simulation Mode
1	ON	Enabled
1	OFF	Disabled
2	OFF	----



Appendix 1. List of Parameters for each Block of RAMC



NOTE

- With "RESTART: Factory Defaults" the parameters XD_SCALE, OUT_SCALE and L_TYPE must be reconfigured.
- When changing flow units, the parameters XD_SCALE and OUT_SCALE must be reconfigured
- Changes to the process variables between mass- and volume flow also require a change of the parameter CHANNEL in the AI block to make this change available in the OUT parameter.
- To avoid unusable alarm status information, the upper alarm/warning limits must always be above the lower alarm/warning limit.

Legend:

- "-": not defined
- "n.a.": not applicable
- R: Read
- W: Write

A1.1 RESOURCE

Block name	Resource Block
Offset	500

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
0	BLOCK_HEADER			DS-64	R/W		Indication and input of block attributes
		BLOCK_TAG	Block Tag	VISIBLE_STRING	R/W	Resource commModxxxxxxx	Defined to be a unique throughout the control system at one plant site. The tag may be changed using the FB_Tag service.
		DD_MEMBER	DD Member Id	UNSIGNED32	R/-	0	A unique number identifying the block function developed as part of its DD
		DD_ITEM	DD Item Id	UNSIGNED32	R/-	2147617520	A unique number identifying the object description developed as part of its DD
		DD_REVIS	DD Revision	UNSIGNED16	R/-	1	The DD revision number assigned to this block
		PROFILE	Profile	UNSIGNED16	R/-	307	Used Profile
		PROFILE_REVISION	Profile Revision	UNSIGNED16	R/-	260	Used Profile version
		EXECUTION_TIME	Execution Time	UNSIGNED32	R/-	0	Total time required for the block algorithm to be executed
		EXECUTION_PERIOD	Period of Execution	UNSIGNED32	R/W	0	Time between initiation of block execution - for periodic execution
		NUM_OF_PARAMS	Number Of Parameters	UNSIGNED16	R/-	74	Number of block parameters and objects
		NEXT_FB_TO_EXECUTE	Next FB To Execute	UNSIGNED16	R/W	0	OD Index of next block object after completion of block execution
		VIEWS_INDEX	Starting Index of Views	UNSIGNED16	R/-	1000	Continuous list of Block views starting with View_1
		NUMBER_VIEW_3	Number of VIEW_3	UNSIGNED8	R/-	1	Number of available View_3 objects in OD
		NUMBER_VIEW_4	Number of VIEW_4	UNSIGNED8	R/-	1	Number of available View_4 objects in OD

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
1	ST_REV		Static Revision	UNSIGNED16	R/-	0	Indicates the revision level of the described block. Increments each time a static parameter (S) changes
2	TAG_DESC		Tag Description	OCTET_STRING	R/W		Block specific TAG for customer use
3	STRATEGY		Strategy	UNSIGNED16	R/W	0	User-specified value e.g. for configuration or diagnostics as a sorting key
4	ALERT_KEY		Alert Key	UNSIGNED8	R/W	0	User-specified value for event allocation e.g. identification of the plant unit
5	MODE_BLK		Block Mode	DS-69	R/W	0	The actual, target, permitted and normal modes of the block
		TARGET	Target	BIT_STRING	R/W	0x08: Auto	Requested mode by operator. Only one mode from those allowed by the permitted mode parameter may be requested.
		ACTUAL	Actual	BIT_STRING	R/-	0x08: Auto	Current mode of the block. It can differ from the target based on operating conditions.
		PERMITTED	Permitted	BIT_STRING	R/W	0x08: Auto 0x80: OOS	Allowed modes for an instance of the block. The permitted mode is configured based on application request.
		NORMAL	Normal	BIT_STRING	R/W	0x08: Auto	Block mode which will be set under normal conditions.
6	BLOCK_ERR		Block Error	BIT_STRING	R/-	0x0000	Error status of the hardware or software components associated with the block. Multiple errors can be shown.
7	RS_STATE		Resource State	UNSIGNED8	R/-	0x04: Online	State of the function block application state machine.
8	TEST_RW			DS-85	R/W		Read/write test parameter - required for conformance test
		VALUE_1	Test Boolean	BOOLEAN	R/W	0	Test parameter for Boolean values (1 Byte)
		VALUE_2	Test Integer8	INTEGER8	R/W	0	Test parameter for Integer8 values (1 Byte)
		VALUE_3	Test Integer16	INTEGER16	R/W	0	Test parameter for Integer16 values (2 Bytes)
		VALUE_4	Test Integer32	INTEGER32	R/W	0	Test parameter for Integer32 values (4 Bytes)
		VALUE_5	Test UNSIGNED8	UNSIGNED8	R/W	0	Test parameter for Integer8 values (1 Byte)
		VALUE_6	Test UNSIGNED16	UNSIGNED16	R/W	0	Test parameter for UNSIGNED16 values (2 Bytes)
		VALUE_7	Test UNSIGNED32	UNSIGNED32	R/W	0	Test parameter for UNSIGNED32 values (4 Bytes)
		VALUE_8	Test Float	FLOATING_POINT	R/W	0.0	Test parameter for Floating_Point values (4 Bytes)
		VALUE_9	Test Visible String	VISIBLE_STRING	R/W		Test parameter for Visible Strings (32 Bytes)
		VALUE_10	Test Octet String	OCTET_STRING	R/W	0x00,0x00,0x00,0x00,...	Test parameter for Octet Strings (32 Bytes)
		VALUE_11	Test Date	DATE	R/W	01/01/00 00:00:00	Test parameter for Date values (7 Bytes)
		VALUE_12	Test Time	TIME_OF_DAY	R/W	01/01/1984 00:00:00	Test parameter for Time values (6 Bytes)
		VALUE_13	Test Time Difference	TIME_DIFFERENCE	R/W	00:00:00	Test parameter for Time differences (6 Bytes)
		VALUE_14	Test Bit String	UNSIGNED16	R/W	0	Test parameter for Bit Strings (2 Bytes)
		VALUE_15	Test Data Link Layer Time	TIME_VALUE	R/W	01/01/1972 00:00:00	Test parameter for Data Link Layer Time (8 Bytes)
9	DD_RESOURCE		DD Resource	VISIBLE_STRING	R/-	" "	Identifies the resource tag which contains the Device Description
10	MANUFAC_ID		Manufacturer Id	UNSIGNED32	R/-	0x594543	Manufacturer identification number - used to locate the DD file
11	DEV_TYPE		Device Type	UNSIGNED16	R/-	0x18	Manufacturer model number. Used to locate the DD file
12	DEV_REV		Device Revision	UNSIGNED8	R/-	1	Manufacturer revision number used to locate the DD file

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
13	DD_REV		DD Revision	UNSIGNED8	R/-	1	Revision DD used to locate the DD file
14	GRANT_DENY			DS-70	R/W		Options for controlling the access of the host computer and local panels for operation, tuning and alarm parameter of the block
		GRANT	Grant	BIT_STRING	R/W	0x00	Depends on the plant, the operator or a higher level devices (HLD), or a local (LOP). It may turn on an item of the Grant attribute - Program, Alarm or Local.
		DENY	Deny	BIT_STRING	R/W	0x00	The denied attribute is provided for use by a monitoring application and may not be changed by operator
15	HARD_TYPES		Hard Types	BIT_STRING	R/-	0x0001: Scalar Input	The types of hardware available as channel numbers
16	RESTART		Restart	UNSIGNED8	R/W	01: Run	Allows a manual restart to be initiated
17	FEATURES		Features	BIT_STRING	R/-	0x0440a	Shows the supported options for the resource block
18	FEATURE_SEL		Feature Selection	BIT_STRING	R/W	0x0002	Used to select the resource block options
19	CYCLE_TYPE		Cycle Type	BIT_STRING	R/-	0x0003	Identifies the available block execution method
20	CYCLE_SEL		Cycle Selection	BIT_STRING	R/W	0x0000	Selects the block execution method
21	MIN_CYCLE_T		Minimum Cycle Time	UNSIGNED32	R/-	8000	Time duration of the shortest cycle interval of which the resource is capable.
22	MEMORY_SIZE		Memory Size	UNSIGNED16	R/-	0	Available configuration memory in the empty resource. To be checked before attempting a download
23	NV_CYCLE_T		Nonvolatile Cycle Time	UNSIGNED32	R/-	0	Interval between writing copies of non-volatile parameters to non-volatile memory. Zero means never
24	FREE_SPACE		Free Space	FLOATING_POINT	R/-	0.0	The percentage of the available memory for further configuration
25	FREE_TIME		Free Time	FLOATING_POINT	R/-	0.0	The block processing free time in percent to process additional blocks
26	SHED_RCAS		Ched Remote Cascade	UNSIGNED32	R/W	640000	Time duration of the writes to function block RCas locations
27	SHED_ROUT		Shed Remote Out	UNSIGNED32	R/W	640000	Time duration of the writes to function block ROut locations
28	FAULT_STATE		Fault State	UNSIGNED8	R/-	1	Setting the condition by loss of the communication to the output block
29	SET_FSTATE		Set Fault State	UNSIGNED8	R/W	1	Initiate manually the fault state
30	CLR_FSTATE		Clear Fault State	UNSIGNED8	R/W	1	Clearing the device fault state
31	MAX_NOTIFY		Max Notify	UNSIGNED8	R/-	12	Maximum allowed number of unconfirmed alerts possible
32	LIM_NOTIFY		Limit Notify	UNSIGNED8	R/W	2	Maximum allowed number of unconfirmed alerts allowed
33	CONFIRM_TIME		Confirm Time	UNSIGNED32	R/W	640000	The minimum allowed time between retries of alert reports
34	WRITE_LOCK		Write Lock	UNSIGNED8	R/W	0x01: Not Locked	If set, no writes are allowed, except to clear WRITE_LOCK. Block inputs will continue to be updated
35	UPDATE_EVT		Update Event	DS-73	R/W		Generation of alerts when static data changes and acknowledgement
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		UPDATE_STATE	Update State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates whether the alert has been reported
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		STATIC_REVISION	Static Rev	UNSIGNED16	R/-	0	Indicates the revision level of the described block. Increments each time a static parameter(s) changes
		RELATIVE_INDEX	Relative Index	UNSIGNED32	R/-	0	OD index of the static parameter whose change caused this alert

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
36	BLOCK_ALM		Block Alarm	DS-72	R/W		Indication and acknowledgment of all configuration, hardware, connection failure or system problems in the block
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alert state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		SUB_CODE	Subcode	UNSIGNED32	R/-	15	Indicates the subcode of the alert
		VALUE	Value	UNSIGNED8	R/-	0	Indicates the value which caused the alarm
37	ALARM_SUM		Alarm Summary	DS-74	R/W		
		CURRENT	Current	BIT_STRING	R/-	0x0000	The active status of each alarm
		UNACKNOWLEDGED	Unacknowledged	BIT_STRING	R/-	0x0000	The unacknowledged state of each alarm
		UNREPORTED	Unreported	BIT_STRING	R/-	0x0000	The unreported state of each alarm
		DISABLED	Disabled	BIT_STRING	R/W	0x0000	The disabled state of each alarm
38	ACK_OPTION		Acknowledge Option	BIT_STRING	R/W	0x0000	Setting the acknowledge behavior of the alarms associated with the function
39	WRITE_PRI		Write Priority	UNSIGNED8	R/W	0	The priority of the alarm generated by clearing the write lock.
40	WRITE_ALM		Write Alarm	DS-72	R/W		
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alert state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		SUB_CODE	Subcode	UNSIGNED32	R/-	0	Indicates the subcode of the alert
		VALUE	Value	UNSIGNED8	R/-	0	Indicates the value which caused the alarm
41	ITK_VER		ITK Version	UNSIGNED32	R/-	6	Major revision number of the interoperability test case used to register the device
42	SOFTWARE_REV		Software Revision	VISIBLE_STRING	R/-	V3.50.1.22985	Shows the software revision
43	HARDWARE_REV		Hardware Revision	VISIBLE_STRING	R/-	cM-MBP V1.04	Shows the revision of the hardware
44	CS_SCRIPT_REV		CommScripter revision	UNSIGNED16	R/-	1285	CommScripter revision
45	CS_CONTENT_REV		CommScripter Content revision	UNSIGNED16	R/-	13	Revision of the commScript content
46	APPL_TUNNEL_STATE		Appl Tunnel State	UNSIGNED8	R/-	0: Idle	State of the application tunnel
47	APPL_TUNNEL_REQ		Application tunnel request buffer	OCTET_STRING	R/W		Request buffer of the application tunnel
48	APPL_TUNNEL_RES		Application tunnel response buffer	OCTET_STRING	R/-		Response buffer of the application tunnel
49	FD_VER		Field Diagnostics Revision	UNSIGNED32	R/-	1	Shows the revision of the field diagnostic
50	FD_FAIL_ACTIVE		Fail Active	BIT_STRING	R/-	0x00000000	Reflects the error condition that is detected as active if selected for this category. It is a bit string, so that multiple conditions may be shown.
51	FD_OFFSPEC_ACTIVE		Offspec Active	BIT_STRING	R/-	0x00000000	Reflects the error condition that is detected as active if selected for this category. It is a bit string, so that multiple conditions may be shown.
52	FD_MAINT_ACTIVE		Maintenance Active	BIT_STRING	R/-	0x00000000	Reflects the error condition that is detected as active if selected for this category. It is a bit string, so that multiple conditions may be shown.

Rel.. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
53	FD_CHECK_ACTIVE		Check Active	BIT_STRING	R/-	0x00000000	Reflects the error condition that is detected as active if selected for this category. It is a bit string, so that multiple conditions may be shown.
54	FD_FAIL_MAP		Fail Map	BIT_STRING	R/W	0x000009e2	Enables or disables conditions to be detected as active for this alarm category. Thus the same conditions may be active in all, some, or none of the 3 alarm categories
55	FD_OFFSPEC_MAP		Offspec Map	BIT_STRING	R/W	0x0780f000	Enables or disables conditions to be detected as active for this alarm category. Thus the same conditions may be active in all, some, or none of the 3 alarm categories
56	FD_MAINT_MAP		Maintenance Map	BIT_STRING	R/W	0x00150204	Enables or disables conditions to be detected as active for this alarm category. Thus the same conditions may be active in all, some, or none of the 3 alarm categories
57	FD_CHECK_MAP		Check Map	BIT_STRING	R/W	0x00000001	Enables or disables conditions to be detected as active for this alarm category
58	FD_FAIL_MASK		Fail Mask	BIT_STRING	R/W	0x00000000	Allows the user to suppress any single or multiple conditions that are active in this category from being broadcasted to the host through the alarm parameters.
59	FD_OFFSPEC_MASK		Offspec Mask	BIT_STRING	R/W	0x00000000	Allows the user to suppress any single or multiple conditions that are active in this category from being broadcasted to the host through the alarm parameters.
60	FD_MAINT_MASK		Maintenance Mask	BIT_STRING	R/W	0x00000000	Allows the user to suppress any single or multiple conditions that are active in this category from being broadcasted to the host through the alarm parameters.
61	FD_CHECK_MASK		Check Mask	BIT_STRING	R/W	0x00000000	Allows the user to suppress any single or multiple conditions that are active in this category from being broadcasted to the host through the alarm parameters.
62	FD_FAIL_ALM		Fail Diagnostic Alarm	DS-87	R/W		
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alert state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		SUBCODE	Subcode	UNSIGNED32	R/-	0	Indicates the subcode of the alert
		VALUE	Value	UNSIGNED8	R/-	0	Indicates the value which caused the alarm
63	FD_OFFSPEC_ALM		Offspec Alarm	DS-87	R/W		
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alert state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		SUB_CODE	Subcode	UNSIGNED32	R/-	0	Indicates the subcode of the alert
		VALUE	Value	UNSIGNED8	R/-	0	Indicates the value which caused the alarm

Rel.. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
64	FD_MAINT_ALM		Maintenance Alarm	DS-87	R/-		
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/-	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alert state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		SUB_CODE	Subcode	UNSIGNED32	R/-	0	Indicates the subcode of the alert
		VALUE	Value	UNSIGNED8	R/-	0	Indicates the value which caused the alarm
65	FD_CHECK_ALM		Check Alarm	DS-87	R/W		
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alert state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		SUB_CODE	Subcode	UNSIGNED32	R/-	0	Indicates the subcode of the alert
		VALUE	Value	UNSIGNED8	R/-	0	Indicates the value which caused the alarm
66	FD_FAIL_PRI		Fail Priority	UNSIGNED8	R/W	0	To specify the priority of this alarm category
67	FD_OFFSPEC_PRI		Offspec Priority	UNSIGNED8	R/W	0	To specify the priority of this alarm category
68	FD_MAINT_PRI		Maintenance Priority	UNSIGNED8	R/W	0	To specify the priority of this alarm category
69	FD_CHECK_PRI		Check Priority	UNSIGNED8	R/W	0	To specify the priority of this alarm category
70	FD_SIMULATE		Field Diagnostic Simulate	DS-89	R/W		Used as the field diagnostic condition when the simulation is enabled.
		DIAGNOSTIC_SIMULATE_VALUE	"Diagnostic Simulate Value"	BIT_STRING	R/W	0x00000000	Sets the simulation condition manually when the simulation is enabled. The simulation jumper has to be enabled
		DIAGNOSTIC_VALUE	Diagnostic Value	BIT_STRING	R/-	0x00000000	Actual diagnostic condition
		ENABLE_DISABLE	"Simulate En/Disable"	UNSIGNED8	R/W	1: Disabled	Enable or disable the simulation.
71	FD_RECOM-MEN_ACT		Recommended Action	UNSIGNED16	R/-	1: No action required	Shows a summarization of the most severe condition or conditions detected
72	HART_DEV_IDENT		HART Device Identifier	Record	R/-		
		HART_DEV_TYPE	HART Device Type	UNSIGNED16	R/-	0x3741	Indicates the HART device type version
		HART_DEV_REV	HART Device Revision	UNSIGNED8	R/-	10	Indicates the HART device type revision
		HART_SW_REV	HART Software Revision	UNSIGNED8	R/-	30	Indicates the HART device software revision
		HART_HW_REV	HART Hardware Revision	UNSIGNED8	R/-	1	Indicates the HART device hardware revision
		HART_DEV_ID	HART Device ID	UNSIGNED32	R/W	Ex.:7212336	Indicates the HART device type ID
73	HART_MESSAGE		Electr. Message	Visible String	R/-	blanks	Indicates and changes the HART message number

A1.2 ANALOG_INPUT1

Block name	Analog Input Function Block
Offset	600

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
0	BLOCK_HEADER			DS-64	R/W		Indication and input of block attributes
		BLOCK_TAG	Block Tag	VISIBLE_STRING	R/W	ANALOG_INPUT1_comm Modxxxxxxxx	Block specific TAG for customer use
		DD_MEMBER	DD Member Id	UNSIGNED32	R/-	0	A unique number identifying the block function developed as part of its DD
		DD_ITEM	DD Item Id	UNSIGNED32	R/-	0x800201D0	A unique number identifying the object description developed as part of its DD
		DD_REVIS	DD Revision	UNSIGNED16	R/-	1	The DD revision number assigned to this block
		PROFILE	Profile	UNSIGNED16	R/-	0x0101	Used Profile
		PROFILE_REVISION	Profile Revision	UNSIGNED16	R/-	260	Used Profile version
		EXECUTION_TIME	Execution Time	UNSIGNED32	R/-	320	Total time required for the block algorithm to be executed.
		EXECUTION_PERIOD	Period of Execution	UNSIGNED32	R/W	32000	Time between initiation of block execution - for periodic execution.
		NUM_OF_PARAMS	Number Of Parameters	UNSIGNED16	R/-	38	Number of block parameters and objects
		NEXT_FB_TO_EXECUTE	Next FB To Execute	UNSIGNED16	R/W	0	OD Index of next block object after completion of block execution
		VIEWS_INDEX	Starting Index of Views	UNSIGNED16	R/-	1050	Continuous list of Block views starting with View_1
		NUMBER_VIEW_3	Number of VIEW_3	UNSIGNED8	R/-	1	Number of available View_3 objects in OD
		NUMBER_VIEW_4	Number of VIEW_4	UNSIGNED8	R/-	1	Number of available View_4 objects in OD
1	ST_REV		Static Revision	UNSIGNED16	R/-	0	Indicates the revision level of the described block. Increments each time a static parameter (S) changes
2	TAG_DESC		Tag Description	OCTET_STRING	R/W		Block specific TAG for customer use
3	STRATEGY		Strategy	UNSIGNED16	R/W	0	User-specified value e.g. for configuration or diagnostics as a sorting key
4	ALERT_KEY		Alert Key	UNSIGNED8	R/W	0	User-specified value for event allocation e.g. identification of the plant unit
5	MODE_BLK		Block Mode	DS-69	R/W		Indication and input of block mode by sub-parameters
		TARGET	Target	BIT_STRING	R/W	0x08: Auto	Indicates the target mode
		ACTUAL	Actual	BIT_STRING	R/-	0x08: Auto	Indicates the current mode
		PERMITTED	Permitted	BIT_STRING	R/W	0x08: Auto 0x10: Man 0x80: OOS	Indicates possible modes
		NORMAL	Normal	BIT_STRING	R/W	0x08: Auto	Indicates the usual mode during normal operation
6	BLOCK_ERR		Block Error	BIT_STRING	R/-	0x0000	Indicates block related error status
7	PV		Process Value	DS-65	R/-		Indicates status and value of primary variable (or derived from)
		STATUS	Status	UNSIGNED8	R/-	0x1C: Out of Service or 0x80: Good (NC) Non-specific	Indicates the status
		VALUE	Value	FLOATING_POINT	R/-	actual value	Indicates the value

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
8	OUT		Output	DS-65	R/W		Indication and input of primary output variable
		STATUS	Status	UNSIGNED8	R/-	0x1C: Out of Service or 0x80: Good (NC) Non-specific	Indicates the status
		VALUE	Value	FLOATING_POINT	R/W	actual value	Indication and input (in manual mode only) of value
9	SIMULATE		Simulate	DS-82	R/W		Simulation of Transducer Block input into the Analog Input Function Block
		SIMULATE_STATUS	Simulate Status	UNSIGNED8	R/W	0x80: Good (NC) Non-specific	Indication of Analog Input's simulation status
		SIMULATE_VALUE	Simulate Value	FLOATING_POINT	R/W	actual value	Indication of Analog Input's simulation value
		TRANSDUCER_STATUS	Transducer Status	UNSIGNED8	R/-	0x80: Good (NC) Non-specific	Indication of transducer's supplied status
		TRANSDUCER_VALUE	Transducer Value	FLOATING_POINT	R/-	actual value	Indication of transducer's supplied value
		ENABLE_DISABLE	Simulate En/Disable	UNSIGNED8	R/W	1: Disabled	Enabling and Disabling simulation mode
10	XD_SCALE		Transducer Scale	DS-68	R/W		Indication and setting of scaling parameter applied to channel input
		EU_100	EU at 100%	FLOATING_POINT	R/W	Det. by ordered scale	Input and indication of the value corresponding to 100 % of scale
		EU_0	EU at 0%	FLOATING_POINT	R/W	0	Input and indication of the value corresponding to 0 % of scale
		UNITS_INDEX	Units Index	UNSIGNED16	R/W	Det. by ordered scale	Indication and setting of the PV scale unit index
		DECIMAL_POINT	Decimal	INTEGER8	R/W	1	Number of valid decimal places that should be used
11	OUT_SCALE		Output Scale	DS-68	R/W		Indication and setting of scaling parameter applied to parameter OUT_VALUE
		EU_100	EU at 100%	FLOATING_POINT	R/W	Det. by ordered scale	Corresponding OUT scale value to 100 %
		EU_0	EU at 0%	FLOATING_POINT	R/W	0	Corresponding OUT scale value to 0 %
		UNITS_INDEX	Units Index	UNSIGNED16	R/W	Det. by ordered scale	Indication and setting of the OUT scale unit index
		DECIMAL_POINT	Decimal	INTEGER8	R/W	1	Number of valid decimal places that should be used
12	GRANT_DENY		Grant Deny	DS-70	R/W		Access control of host and local control panels to particular parameters
		GRANT	Grant	BIT_STRING	R/W	0x00: None	Indication and setting of Grant classification to delegate parameter control.
		DENY	Deny	BIT_STRING	R/W	0x00: None	Indication and setting of Deny classification for turned off permissions
13	IO_OPTS		I/O Options	BIT_STRING	R/W	0x0000: None	Indication and setting of output block processing
14	STATUS_OPTS		Status Options	BIT_STRING	R/W	0x0000: None	Indication and setting of output block's status processing
15	CHANNEL		Channel	UNSIGNED16	R/W	Det. by ordered scale	Reference to the active Transducer Block which provides the measurement value
16	L_TYPE		Linearization Type	UNSIGNED8	R/W	1: Direct	Input and indication of linearization type
17	LOW_CUT		Low Cutoff	FLOATING_POINT	R/W	0.0	Setting of limit value. Below this limit, the flow is set to zero.
18	PV_FTIME		Process Value Filter Time	FLOATING_POINT	R/W	0.0	Time constant of a single exponential filter for the PV, in seconds
19	FIELD_VAL		Field Value	DS-65	R/-		Raw value of the field device in percent of the PV range
		STATUS	Status	UNSIGNED8	R/-	0x1C or 0x80: Good (NC) Non-specific	Indicates the status
		VALUE	Value	FLOATING_POINT	R/-	actual value	Indicates the value in percent

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
20	UPDATE_EVT		Update Value	DS-73	R/W		Generation of alerts when static data changes and acknowledgment.
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		UPDATE_STATE	Update State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates whether the alert has been reported
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		STATIC_REVISION	Static Rev	UNSIGNED16	R/-	0	Indicates the revision level of the described block. Increments each time a static parameter (S) changes
		RELATIVE_INDEX	Relative Index	UNSIGNED16	R/-	0	OD index of the static parameter whose change caused this alert
21	BLOCK_ALM		Block Alarm	DS-72	R/W		Indication and acknowledgment of all configuration, hardware, connection failure or system problems in the block.
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x02: Unacknowledged	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alert state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	acc. to setting	Indicates the time stamp of the alert
		SUB_CODE	Subcode	UNSIGNED16	R/-	0x0000: Other	Indicates the subcode of the alert
		VALUE	Value	UNSIGNED8	R/-	0	Indicates the value which caused the alarm
22	ALARM_SUM		Alarm Summary	DS-74	R/W		Summarizes the status of process alarms
		CURRENT	Current	BIT_STRING	R/-	0x0000: None	Indicates the current status of each alarm
		UNACKNOWLEDGED	Unacknowledged	BIT_STRING	R/-	0x0000: None	Indicates the unacknowledged state of each alarm
		UNREPORTED	Unreported	BIT_STRING	R/-	0x0000: None	Indicates the unreported status of each alarm
		DISABLED	Disabled	BIT_STRING	R/W	0x0000: None	Indication and setting of the disable state of each alarm
23	ACK_OPTION		Acknowledge Option	BIT_STRING	R/W	0x0000: None	Indication and selection of whether block related alarms will be automatically acknowledged
24	ALARM_HYS		Alarm Hysteresis	FLOATING_POINT	R/W	0.5	Amount the PV must return within the alarm limits (in %) before the alarm condition clears.
25	HI_HI_PRI		High High Priority	UNSIGNED8	R/W	0	Priority of the high high alarm
26	HI_HI_LIM		High High Limit	FLOATING_POINT	R/W	+1.#INF	Setting of the high high alarm limit value (in OUT scale unit)
27	HI_PRI		High Priority	UNSIGNED8	R/W	0	Priority of the high alarm.
28	HI_LIM		High Limit	FLOATING_POINT	R/W	+1.#INF	Setting of the high alarm limit value (in OUT scale unit)
29	LO_PRI		Low Priority	UNSIGNED8	R/W	0	Priority of the low alarm.
30	LO_LIM		Low Limit	FLOATING_POINT	R/W	-1.#INF	Setting of the low alarm limit value (in OUT scale unit)
31	LO_LO_PRI		Low Low Priority	UNSIGNED8	R/W	0	Priority of the low low alarm.
32	LO_LO_LIM		Low Low Limit	FLOATING_POINT	R/W	-1.#INF	Setting of the low low alarm limit value (in OUT scale unit)
33	HI_HI_ALM		High High Alarm	DS-71	R/-		State of the high high alarm
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alarm state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		SUB_CODE	Subcode	UNSIGNED16	R/-	0x0000: Other	Indicates the subcode of the alert
		VALUE	Float Value	FLOATING_POINT	R/-	0	Indicates the value which caused the alarm

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
34	HI_ALM		High Alarm	DS-71	R/-		State of the high alarm
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alarm state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		SUB_CODE	Subcode	UNSIGNED16	R/-	0x0000: Other	Indicates the subcode of the alert
		VALUE	Float Value	FLOATING_POINT	R/-	0	Indicates the value which caused the warning alarm
35	LO_ALM		Low Alarm	DS-71	R/-		State of the low alarm
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alarm state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		SUB_CODE	Subcode	UNSIGNED16	R/-	0x0000: Other	Indicates the subcode of the alert
		VALUE	Float Value	FLOATING_POINT	R/-	0	Indicates the value which caused the warning alarm
36	LO_LO_ALM		Low Low Alarm	DS-71	R/-		State of the low alarm
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alarm state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		SUB_CODE	Subcode	UNSIGNED16	R/-	0x0000: Other	Indicates the subcode of the alert
		VALUE	Float Value	FLOATING_POINT	R/-	0	Indicates the value which caused the alarm
37	BLOCK_ERR_DESC_1		Block Error Description	BIT_STRING	R/-	0x00000000	Reporting of more specific details regarding persistent errors

A1.3 AI_TB

Block name	Flow Transducer Block
Offset	900

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
0	BLOCK_HEADER			DS-64	R/-		Indication and input of block attributes
		BLOCK_TAG	Block Tag	VISIBLE_STRING	R/W	AI_TB_comm Modxxxxxxxxx	Block specific TAG for customer use
		DD_MEMBER	DD Member Id	UNSIGNED32	R/-	0	A unique number identifying the block function developed as part of its DD
		DD_ITEM	DD Item Id	UNSIGNED32	R/-	131208	A unique number identifying the object description developed as part of its DD
		DD_REVIS	DD Revision	UNSIGNED16	R/-	1	The DD revision number assigned to this block
		PROFILE	Profile	UNSIGNED16	R/-	32769	Used Profile
		PROFILE_REVISION	Profile Revision	UNSIGNED16	R/-	1	Used Profile version
		EXECUTION_TIME	Execution Time	UNSIGNED32	R/-	0	Total time required for the block algorithm to be executed.
		EXECUTION_PERIOD	Period of Execution	UNSIGNED32	R/W	0	Time between initiation of block execution - for periodic execution.
		NUM_OF_PARAMS	Number Of Parameters	UNSIGNED16	R/-	76	Number of block parameters and objects
		NEXT_FB_TO_EXECUTE	Next FB To Execute	UNSIGNED16	R/W	0	OD Index of next block object after completion of block execution
		VIEWS_INDEX	Starting Index of Views	UNSIGNED16	R/-	1200	Continuous list of Block views starting with View_1
		NUMBER_VIEW_3	Number of VIEW_3	UNSIGNED8	R/-	1	Number of available View_3 objects in OD
		NUMBER_VIEW_4	Number of VIEW_4	UNSIGNED8	R/-	1	Number of available View_4 objects in OD
1	ST_REV		Static Revision	UNSIGNED16	R/-	0	Indicates the revision level of the described block. Increments each time a static parameter (S) changes
2	TAG_DESC		Tag Description	OCTET_STRING	R/W		Block specific TAG for customer use
3	STRATEGY		Strategy	UNSIGNED16	R/W	0	User-specified value e.g. for configuration or diagnostics as a sorting key
4	ALERT_KEY		Alert Key	UNSIGNED8	R/W	0	User-specified value for event allocation e.g. identification of the plant unit
5	MODE_BLK		Block Mode	DS-69	R/W		Indication and input of block mode by sub-parameters
		TARGET	Target	BIT_STRING	R/W	0x08: Auto	Indicates the target mode
		ACTUAL	Actual	BIT_STRING	R/-	0x08: Auto	Indicates the current mode
		PERMITTED	Permitted	BIT_STRING	R/W	0x08: Auto 0x80: OOS	Indicates possible modes
		NORMAL	Normal	BIT_STRING	R/W	0x08: Auto	Indicates the usual mode during normal operation
6	BLOCK_ERR		Block Error	BIT_STRING	R/-	0x0000	Indicates block related error status
7	UPDATE_EVT		Update Value	DS-73	R/W		Generation of alerts when static data changes and acknowledgement.
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x00: Uninitialized	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		UPDATE_STATE	Update State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates whether the alert has been reported
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		STATIC_REVISION	Static Rev	UNSIGNED16	R/-	0	Indicates the revision level of the described block. Increments each time a static parameter (S) changes
		RELATIVE_INDEX	Relative Index	UNSIGNED16	R/-	0	OD index of the static parameter whose change caused this alert

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
8	BLOCK_ALM		Block Alarm	DS-72	R/W		Indication and acknowledgment of all configuration, hardware, connection failure or system problems in the block.
		UNACKNOWLEDGED	Unacknowledged	UNSIGNED8	R/W	0x02: Unacknowledged	Indication of alerts as unacknowledged until state will be changed by interaction of user or other system
		ALARM_STATE	Alarm State	UNSIGNED8	R/-	0x00: Uninitialized	Indicates the alert state
		TIME_STAMP	Time Stamp	TIME_VALUE	R/-	01/01/1972 00:00:00 (MM/DD/YYYY HH:MM:SS)	Indicates the time stamp of the alert
		SUB_CODE	Subcode	UNSIGNED16	R/-	0x0000: Other	Indicates the subcode of the alert
		VALUE	Value	UNSIGNED8	R/-	0	Indicates the value which caused the alarm
9	TRANSDUCER_DIRECTORY			UNSIGNED16	R/-	0	A directory that specifies the number and starting indices of the data collection in the transducer block.
10	TRANSDUCER_TYPE		Transducer Type	UNSIGNED16	R/-	65535: Other	Identifies the transducer that follows
11	TRANSDUCER_TYPE_VER		Transducer Type Version	UNSIGNED16	R/-	65535	Identifies the version of the transducer that follows
12	XD_ERROR		Transducer Error	UNSIGNED8	R/-	0	Indication of the transducer error code (Block Alarm Subcodes).
13	COLLECTION_DIRECTORY			UNSIGNED32	R/-	0	A directory that specifies the number, starting indices and DD items IDs of the data collection in each transducer within a transducer block.
14	CALIBRATION_FACTOR		Calibration Factor	FLOATING_POINT	R/W	1.0	Indication of the calibration factor of the measuring range.
15	LOW_FLOW_CUTOFF		Low Flow Cutoff	FLOATING_POINT	R/W	5 % of flow span	Setting of limit value. Below this limit, the flow is set to zero.
16	LOW_FLOW_CUTOFF_UNIT		Low Flow Cutoff Unit	UNSIGNED16	R/-	Det. by ordered scale	Indicates the unit of low flow cut-off value
17	MEASUREMENT_MODE		Measurement Mode	UNSIGNED8	R/-	0	Indication of the measuring mode, unidirectional or bidirectional
18	FLOW_DIRECTION		Flow Direction	UNSIGNED8	R/-	0	Indication of the direction of the flow in positive or negative direction
19	NOMINAL_SIZE		Nominal Size	FLOATING_POINT	R/W	Det. by ordered device	Indicates the value of the nominal/actual size of the measuring pipe
20	NOMINAL_SIZE_UNIT		Nominal Size Unit	UNSIGNED16	R/W	Det. by ordered device	Indicates the unit of the nominal/actual size of the measuring pipe
21	DEFAULT_CHANNEL		Default Channel	UNSIGNED16	R/-	Det. by ordered scale	Indicates the process variable (index) selected for channel transfer
22	VOLUME_FLOW		-	101	R/-	-	Indicates the measured volume flow
		VALUE	Value	FLOATING_POINT	R/-	-	Volume flow value
		STATUS	Status	UNSIGNED8	R/-	-	Volume flow status
23	VOLUME_FLOW_UNIT		Volume Flow Unit	UNSIGNED16	R/W	Det. by ordered scale	Volume flow unit selection and enabling of measured variable (disables mass flow)
24	VOLUME_FLOW_LO_LIMIT		Volume Flow Low Limit	FLOATING_POINT	R/W	0 % of flow span	Sensor's lower range value (volume flow)
25	VOLUME_FLOW_HI_LIMIT		Volume Flow High Limit	FLOATING_POINT	R/W	100 % of flow span	Sensor's upper range value (volume flow)
26	MASS_FLOW		-	101	R/-	-	Indicates the measured mass flow
		VALUE	Value	FLOATING_POINT	R/-	-	Mass flow value
		STATUS	Status	UNSIGNED8	R/-	-	Mass flow status
27	MASS_FLOW_UNIT		Mass Flow Unit	UNSIGNED16	R/W	Det. by ordered scale	Mass flow unit selection and enabling of measured variable (disables volume flow)
28	MASS_FLOW_LO_LIMIT		Mass Flow Low Limit	FLOATING_POINT	R/W	0 % of flow span	Sensor's lower range value (mass flow)
29	MASS_FLOW_HI_LIMIT		Mass Flow High Limit	FLOATING_POINT	R/W	100 % of flow span	Sensor's upper range value (mass flow)
30	TEMPERATURE		Temperature	FLOATING_POINT	R/-	According to ambient temperature	Measured on-board temperature
31	TEMPERATURE_UNIT		Temperature Unit	UNSIGNED16	R/W	1001: °C	Indicates the on-board temperature value
32	OPER_DENSITY		Density	FLOATING_POINT	R/-	Det. by ordered scale	Indicates fluid's density configuration value

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
33	OPER_DENSITY_UNIT		Density Unit	UNSIGNED16	R/-	Det. by ordered scale	Configured unit of fluid's density
34	OPER_VISCOSITY		Viscosity	FLOATING_POINT	R/-	Det. by ordered scale	Indicates fluid's viscosity configuration value
35	OPER_VISCOSITY_UNIT		Viscosity Unit	UNSIGNED16	R/-	Det. by ordered scale	Configured unit of fluid's viscosity
36	OPER_PRESSURE		Pressure	FLOATING_POINT	R/-	Det. by ordered scale	Indicates fluid's pressure configuration value
37	OPER_PRESSURE_UNIT		Pressure Unit	UNSIGNED16	R/-	Det. by ordered scale	Configured unit of fluid's pressure
38	OPER_PRESSURE_REF		Ref. Pressure	FLOATING_POINT	R/-	Det. by ordered scale	Indicates fluid's pressure reference configuration value
39	OPER_PRESSURE_REF_UNIT		Ref. Pressure Unit	UNSIGNED16	R/-	Det. by ordered scale	Configured unit of fluid's pressure reference
40	OPER_TEMPERATURE		Temperature	FLOATING_POINT	R/-	Det. by ordered scale	Indicates fluid's process temperature configuration value
41	OPER_TEMPERATURE_UNIT		Temperature Unit	UNSIGNED16	R/-	Det. by ordered scale	Configured unit of fluid's process temperature
42	OPER_CONDITION		Oper. Condition	UNSIGNED8	R/-	Det. by ordered scale	Indicates fluid's operation condition
43	OPER_FLUID_PHASE		Fluid Phase	UNSIGNED8	R/-	Det. by ordered scale	Indicates fluid's fluid phase condition
44	OPER_FLOW_REFERENCE		Flow Reference	UNSIGNED8	R/-	Det. by ordered scale	Indicates fluid's operation flow reference
45	DEVICE_SERIAL_NO		Serial Number (S/N)	VISIBLE_STRING	R/-	Det. by ordered device	Indicates the serial number of the device
46	DEVICE_MODEL_CODE		Model Code	VISIBLE_STRING	R/-	Det. by ordered device	Indicates the model code of the device
47	OPER_FLUID_NAME		Fluid Name	VISIBLE_STRING	R/-	Det. by ordered scale	Indicates fluid's name
48	TOTALIZER		Totalizer	FLOATING_POINT	R/-	0	Indicates totalized value (volume or mass) of the enabled process variable
49	TOTALIZER_UNIT		Totalizer Unit	UNSIGNED16	R/-	Det. by ordered scale	Indicates totalizer unit
50	TOTALIZER_RESET		Totalizer Reset	UNSIGNED8	R/W	-	Performs totalizer reset to zero
51	DISPLAY_SELECT		Display Selection	UNSIGNED8	R/W	1: Total Value	Allows variable selection for local display indication
52	DIST_OPTION_A16		Device Version	UNSIGNED8	R/-	Det. by ordered device	Indicates the mechanical indicator version (Distance: option /A16)
53	SCALE_SPAN_VALUE		Scale 100% Value	FLOATING_POINT	R/-	Det. by ordered scale	Indicates flow value printed on scale (at 100 %)
54	SCALE_SPAN_UNIT		Scale Span Unit	UNSIGNED16	R/-	Det. by ordered scale	Indicates the flow unit printed on the scale
55	PERCENT		Flow Percent	FLOATING_POINT	R/-	-	Indicates flow value in % of scale span
56	PERCENT_UNIT		Percent Unit	UNSIGNED16	R/-	1342: %	Fixed unit (%) of the percent indication
57	POINTER_POSITION		Pointer Position	FLOATING_POINT	R/-	-	Indicates flow value in arc length of scale
58	POINTER_POSITION_UNIT		Scale Length Unit	UNSIGNED16	R/-	1013: mm	Fixed unit (mm) of the pointer position.
59	DEVICE_STATUS1		Event Overview 1	BIT_STRING	R/-	None	Indicates 1st part of event overview
60	DEVICE_STATUS2		Event Overview 2	BIT_STRING	R/-	13: Bit 4: Power Failure (active)	Indicates 2nd part of event overview
61	DEVICE_STATUS3		Event Overview 3	BIT_STRING	R/-	17: Bit 0: Volume Flow Passivated or 18: Bit 1: Mass Flow Passivated	Indicates 3rd part of event overview
62	STATUS_HANDLING		Flow Status Handling	UNSIGNED8	R/-	3: Disable Low/High Status	Disables upper and lower measurement range violation events (5 % to 105 %).
63	RESET_ERROR_BIT		Reset Error Bits	UNSIGNED8	R/-	0: Cancel	Execution resets specific error bits
64	SOFT_REVISION		FW Version	VISIBLE_STRING	R/-	e.g. V1.00	Indicates transmitter's firmware version
65	HARD_REVISION		HW Version	VISIBLE_STRING	R/-	e.g. V1.00	Indicates transmitter's electrical hardware version

Rel. Index	Parameter	Sub-Parameter	Label	Data Type/Structure	Read/Write	Initial value	Functional Description
66	EEPROM_REVISION		EEPROM Version	UNSIGNED16	R/-	Cal-EEPROM (low byte): e.g. 0x08: 8 Adj-EEPROM (high byte): e.g. 0x08: 8	Indicates the revision of Cal- and Adj- EEPROM
67	WTM_REVISION		WT-MAG Type	UNSIGNED8	R/-	30	Indicates the transmitter type
68	FBK_REVISION		Module Version	UNSIGNED8	R/-	30	Indicates the communication module version
69	FLOAT_BLOCKING		Float Blocking	Record	R/W	-	Indicates and controls the float blocking function
		BLOCK_ON	Float Blocking On	UNSIGNED8	R/W	0: Off	Enables and disables functionality
		BLOCK_LIMIT	Float Blocking Limit	UNSIGNED8	R/W	0: 5 %	Sets lower limit value of supervision range
		BLOCK_TIME	Float Blocking Time	UNSIGNED8	R/W	0: Turbulent Flow	Sets reaction time according to flow type
		BLOCK_AZ_ON	Float Blocking AZ On	UNSIGNED8	R/W	0: Off	Executes float blocking autozero determination
70	FLOAT_BLOCK_AUTOZERO		Float Blocking Autozero	FLOATING_POINT	R/-	0	Indicates float blocking autozero value
71	OPER_ACT_TIME		Operation Time	Record	R/-	-	Indicates the total powered operation time
		ACT_MINUTES	Operation Time (Minutes)	UNSIGNED8	R/-	Delivery condition	Duration in minutes (0 to 59)
		ACT_HOURS	Operation Time (Hours)	UNSIGNED8	R/-	Delivery condition	Duration in hours (0 to 23)
		ACT_DAYS	Operation Time (Days)	UNSIGNED16	R/-	Delivery condition	Duration in days
72	OPER_SDW_TIME		Operation Time Shadow	Record	R/-	-	Indicates the total powered operation time before last power down
		SDW_MINUTES	Oper. Time Shadow (Minutes)	UNSIGNED8	R/-	Delivery condition	Duration in minutes (0 to 59)
		SDW_HOURS	Oper. Time Shadow (Hours)	UNSIGNED8	R/-	Delivery condition	Duration in hours (0 to 23)
		SDW_DAYS	Oper. Time Shadow (Days)	UNSIGNED16	R/-	Delivery condition	Duration in days
73	HART_CFG_CHANGE_CTR		Configuration Change Counter	UNSIGNED16	R/-	0	Number of configuration changes in sensor electronic
74	HART_LONG_TAG		Electr. Long Tag	VISIBLE_STRING	R/W	blanks	Indicates and changes transmitter's Long Tag Number
75	FINAL_ASSEMBLY_NUMBER		Electr. Assembly No.	UNSIGNED32	R/W	0	Indicates and changes final assembly number

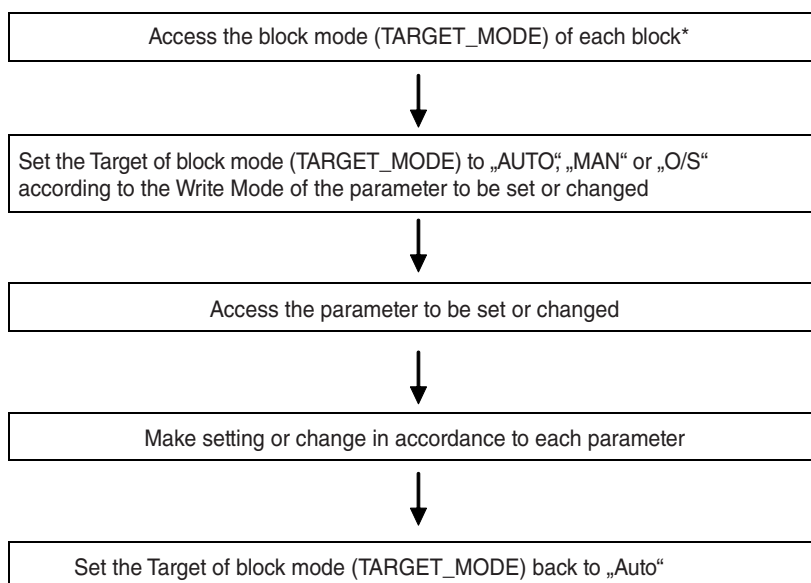
Appendix 2. Application, Setting and Change of basic Parameters

A2.1 Applications and Selection of Basic Parameters

Setting Item (applicable parameters)	Summary
Tag No.	Sets TAG_DESC for each block tag. Up to 32 alphanumeric characters can be set. See appendix 1.
Calibration range setup (XD_SCALE)	Sets the range of input from the transducer block corresponding to the 0 % and 100 % points in operation within the AI Function Block. The calibrated range (0 % and 100 %) is the factory default setting.
Output scale setup (OUT_SCALE)	Sets the scale of output corresponding to the 0 % and 100 % points in operation within the AI function Block. It is possible to set a unit and scale range that differs from the measurement range. Sets the range unit, input value of the 0 % point (lower limit of output scale), input value of the 100 % point (upper limit of output scale).
Simulation setup (SIMULATE)	Performs simulation of the AI Function Block. The input value and status for the Variable Process (channel) can be set. It is recommended to use this parameter for loop checks and other purposes.
Output signal (LOW_FLOW_CUTOFF)	Sets the low cut between 5 % to 15 % of VOLUME_FLOW_HI_LIMIT or MASS_FLOW_HI_LIMIT.

A2.2 Setting and Change of Basic Parameters

This section describes the procedure taken to set and change the parameters for each block. Obtaining access to each parameter differs depending on the configuration system used. For details, refer to the instruction manual for each configuration system.



* It is assumed that write lock is set to unlocked. Otherwise set to unlocked first.



IMPORTANT

Do not turn the power OFF immediately after parameter setting. When the parameters are saved to the EEPROM, the redundant processing is executed for the improvement of reliability. If the power is turned OFF within 60 seconds after setting of parameters, changed parameters are not saved and may return to their original values.

When the consecutive parameter setting to the multiple parameters is not executed via the acyclic data exchange, the time interval between each parameter setting must not be within 2 seconds. Changed parameters may not be written to the device.

Refer to the “List of parameters for each block of the RAMC” for details of the Write Mode for each block.

A2.3 Setting the AI Function Blocks

The AI function block outputs the flow rate signals.

(1) Setting the transducer scale

Access the XD_SCALE parameter.
 Set the necessary unit of output to UNITS_INDEX on XD_SCALE. Set a value corresponding to the higher range value to EU at 100 % on XD_SCALE.
 Set a value corresponding to the lower range value to EU at 0 % on XD_SCALE.
 Optional: Set the decimal position to DECIMAL_POINT.

(2) Setting the output scale

Access the OUT_SCALE parameter.
 Set the necessary unit of output to UNITS_INDEX on OUT_SCALE. Set an output value corresponding to the higher range value to EU at 100 % on OUT_SCALE.
 Set an output value corresponding to the lower range value to EU at 0 % on OUT_SCALE.
 Optional: Set the decimal position to DECIMAL_POINT.

Example:

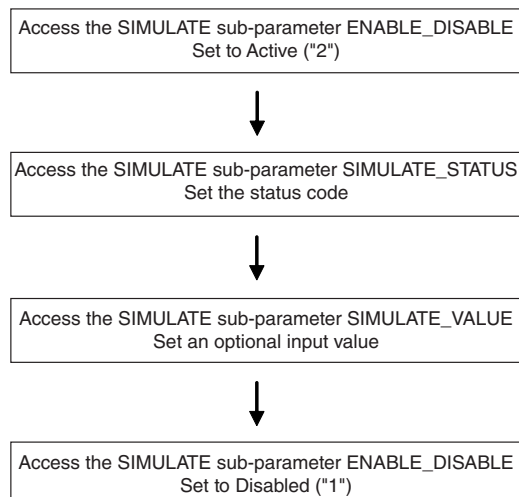
To set the output to 0.00 to 120.00 kg/h (according to MASS_FLOW_UNIT and MASS_FLOW_LIMITS):

1. Set kg/h (1324)* to sub-parameter UNITS_INDEX on parameter XD_SCALE.
2. Set 120 to sub-parameter EU_at_100 % on parameter XD_SCALE.
3. Set 0 to EU at 0% on XD_SCALE.
4. Set 2 to sub-parameter DECIMAL_POINT on parameter XD_SCALE.
5. Set kg/h (1324)* to sub-parameter UNITS_INDEX on parameter OUT_SCALE.
6. Set 120 to sub-parameter EU_at_100 % on parameter OUT_SCALE.
7. Set 0 to EU at 0% on OUT_SCALE.
8. Set 2 to sub-parameter DECIMAL_POINT on parameter OUT_SCALE.
9. Set L_TYPE to "Direct"
10. Set CHANNEL to "Mass Flow"

* Each unit is expressed using a 4-digit numeric code.
 Refer to chapter 5.4 for comparison.

(2) Simulation

The AI Function Block could be simulated by using the simulation functionality.



If simulation is enabled, AI block uses SIMULATE_STATUS and SIMULATE_VALUE as the input, and if disabled, the AI block uses the Status and Value of the TB's Process Variable selected by the channel as input. For hardware activation see chapter 8.2.

Manufacturer:

Rota Yokogawa GmbH & Co. KG
Rheinstr. 8
D-79664 Wehr
Germany

For the actual manufacturing location of your device refer to the model code and/or serial number.

**COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV GL
= ISO 9001 =**