ABB MEASUREMENT & ANALYTICS | INTERFACE DESCRIPTION | COM/FCB400/FCH400/FCD400/PB-EN REV. C

CoriolisMaster FCB400, FCH400, FCD400

Coriolis mass flowmeter

PROFIBUS-DP protocol
FCB400, FCH400: Valid as of software version 01.06.00
FCD400: Valid as of software version 01.11.00

Measurement made easy

FCB400 / FCH400
FCD400

Additional Information

Additional documentation on CoriolisMaster FCB400, FCH400, FCD400 is available for download free of charge at www.abb.com/flow.
Alternatively simply scan this code:

Table of contents

1 Introduction

The following interface description is a supplement to the operating instruction of the CoriolisMaster FCx4xx.
The safety instructions it includes are valid and must be observed.

These instructions offer additional information about the supported PROFIBUS functionalities and gives information about the configuration.

This description applies to the entire CoriolisMaster series FCx4xx.
All device versions have this same ID number and refer to the same GSD file (equipment master data).

The transmitter FCx4xx corresponds to the PROFIBUS DP profiles DPV0 / DPV1.
The PROFIBUS DP application layer corresponds to the profile PA Devices 3.02.

2 Specification

PROFIBUS DP interface	
Terminals	V1 / V2
Configuration	Via the PROFIBUS DP interface or via the local operating interface in connection with a corresponding Device Type Manager (DTM)
Transmission	Based on IEC 61158-2
Baud rate	9.6 kbps, 19.2 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5 Mbps The baud rate is automatically detected and does not need to be configured manually
Device profile	PA Profile 3.02
Bus address	Address range 0 to 126 Factory setting: 126

For commissioning purposes, you will need a device driver in EDD (Electronic Device Description) or DTM (Device Type Manager) format plus a GSD file.

You can download EDD, DTM and GSD from www.abb.com/flow.

The files required for operation can also be downloaded from www.profibus.com.

ABB provides three different GSD files which can be integrated in the system.

ID number	**GSD file name**	
0x9741	PA139741.gsd	2xAI, 1xTOT
0x9742	PA139742.gsd	3xAI, 1xTOT
0x3434	ABB_3434.gsd	8xAI, 3xTOT, 2xAO, 1xDI, 3xDO

Users decide at system integration whether to install the full range of functions or only part. Switching is made using the ‘Ident Nr. Selector’ parameter.

Refer to **ID number** on page 4.

… 2 Specification

Limits and rules when using ABB fieldbus accessories

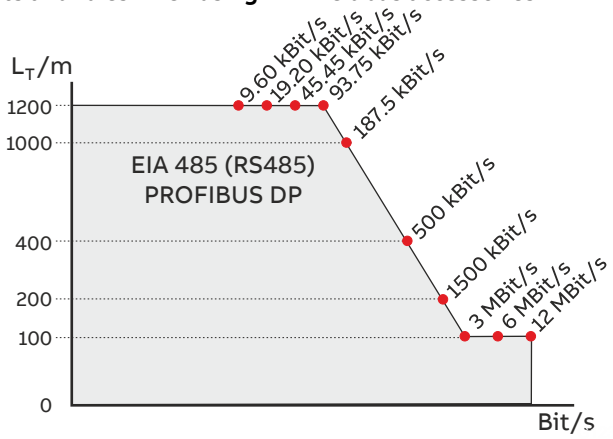

Figure 1: Bus cable length depends on the transmission rate

Pro PROFIBUS Line

(Line = Starts at DP Master and goes to last DP/PA Slave)

- Approximately 4 to 8 DP segments through the repeater (see repeater data sheets)
- Recommended DP transfer rate 500 to 1500 kBit/s
- The slowest DP node determines the transfer rate of the DP line
- Number of PROFIBUS DP and PA nodes ≤ 126 (addresses 0 to 125)

Per PROFIBUS DP segment

- Number of DP nodes ≤ 32
  (Node = Devices with / without PROFIBUS address)
- Bus termination required at the beginning and end of each DP segment!
- Trunk cable length (L_T) see diagram (length dependent on transfer rate)
- Cable length of at least 1 m between two DP nodes at ≥ 1500 kBit/s!
- Spur cable length (L_S), at ≤ 1500 kBit/s: LS ≤ 0.25 m, at > 1500 kBit/s: LS = 0.00 m!
- At 1500 kBit/s and ABB DP cable type A:
  - Sum of all spur cable lengths (L_S) ≤ 6.60 m, trunk cable length (L_T) > 6.60 m, total length = L_T+ (Σ L_S) ≤ 200 m, maximum 22 DP nodes (= 6.60 m / (0.25 m + 0.05 m spare))

ID number

Every PROFIBUS device has been assigned a unique ident number by the PNO.

Device-specific profile

The device-specific profile is connected with the ident number 0x3434.
The associated device master file (GSD) ABB_3434.gsd is delivered with the device.

Applying the device-specific profile number enables the entire scope of functions offered by the device to be used.

The device-specific profile contains eight AI blocks, three totalizer blocks, two AO blocks, one DI block as well as three DO blocks.

Parameter	Quantity	Description
Max_Module	17	8xAI, 3xTOT, 2xAO, 1xDI, 3xDO
Max_Input_Len	57	8x5(AI) + 3x5(TOT) + 1x2(DI)
Max_Output_Len	22	3x2(TOT) + 2x5(AO) + 3x2(DO)
Max_Data_Len	79	MaxInput + MaxOutput

Table 1: Parameter of the device-specific profile

General Profiles

The PNO has set general profiles with their own ident numbers.
The FCx4xx supports the following general profiles:

- Profile 0x9741 (two AI blocks and one totalizer block)
- Profile 0x9742 (three AI-blocks and one totalizer block)

The associated device master files (GSD) PA139741.gsd and PA139742.gsd can be downloaded under www.abb.com/flow.

The advantage of these profiles is the cross-manufacturer interchangeability if the devices support these general profiles. The disadvantage is the restricted functionality. This is due to the fact that not all special capabilities of a device can fit into a general profile.

Profile Selection via Ident Number

The parameter IDENT_NUMBER_SELECTOR (index 24) in the physical block can be used to select the corresponding ident number and thus the profile.

Value	Ident. no.	Description / functions
0	0x9741	Profile-specific / 2AI + 1TOT PA139741.GSD
1	0x3434	Manufacturer-specific FCx4xx / 8AI+3TOT+2AO+1DI+3DO ABB_3434.GSD
127	–	Adaptation mode (obligatory) for PA3.02. The device can communicate with several ident numbers in adaptation mode.
128	0x9742	Profile-specific / 3AI + 1TOT PA139742.GSD

Table 2: Available ident numbers

Parameterize

Before a master can go into the cyclical data exchange with a slave, the device must be parameterized.

For this purpose, the master transmits a ‘Set_Parameter Telegram’ that can be used to transmit standard and device-specific parameters to the device.

The ‘Set_Parameter Telegram’ is made up of at least 7 and a maximum of 244 bytes of user data.

- The first seven bytes of the parameter are prescribed in the standard. They transmit information, such as watchdog activation, identification number, etc.
- Extensions for DPV1 are transmitted in the bytes 8 to 10.
- All other bytes are device-specific.

In the GSD file, the transmitter defines a manufacturer-specific parameter that makes it possible to choose between the Classic Status and the Condensed Status during parameterization.

Parameter	Description
Condensed Status	0 Disabled: Classic status byte encoded in accordance with PA profile 3.0 1 Enabled, condensed status byte encoded in accordance with PA Profile 3.02, Amendment 2

Table 3: Parameter ‘Condensed Status’

Detailed information regarding Condensed Status can be found in the PA-profile 3.02.

… 2 Specification

Configuration string - Modules and slots

During configuration, a configuration string is sent to the DP slave. It defines the data for the cyclic data exchange.
The configuration strings are described with the help of various modules.
Accordingly, each module has a configuration string. This says in coded form how many bytes are cyclically transferred from the master to the slave, and vice versa from the slave to the master.

0x94 means, for example, 5 bytes slave→master, 0 bytes master→slave. What is transported in this data is given by the function block specification.

No.	Module designation	Configuration string	Module description
1	Not used (Empty Module)	0x00	This module does not transmit any data.
2	Analog input (AI)	0x42, 0x84, 0x08, 0x05	The OUT parameter of the AI Block is cyclically transmitted from the slave to the master. These are 5 bytes: Value = Float = 4 bytes + status = 1 byte
3	Totalizer (TOTAL)	0x41, 0x84, 0x85	The TOTAL parameter of the totalizer block is cyclically transmitted from the slave to the master. These are 5 bytes: Value = Float = 4 bytes + status = 1 byte
4	Totalizer (TOTAL, SET)	0xC1, 0x80, 0x84, 0x85	The TOTAL parameter of the totalizer block is cyclically transmitted from the slave to the master (5 bytes) and the SET_TOT parameters of the totalizer block (1 byte) are cyclically transmitted from the master to the slave.
5	Totalizer (TOTAL, SET, MODE)	0xC1, 0x81, 0x84, 0x85	The TOTAL parameter of the totalizer block is cyclically transmitted from the slave to the master (5 bytes) and the SET_TOT and MODE_TOT parameters of the totalizer block (together 2 bytes) are cyclically transmitted from the master to the slave.
6	Analog output (AO)	0x82, 0x84, 0x08, 0x05	The SP parameter of the AI block is cyclically transmitted from the master to the slave. These are 5 bytes: Value = Float = 4 bytes + status = 1 byte
7	Discrete input (DI)	0x91	The OUT_D parameter of the AI block is cyclically transmitted from the slave to the master. These are 2 bytes: Value = 1 byte + status = 1 byte
8	Discrete Output (D0)	0xA1	The OUT_D parameter of the DO block is cyclically transmitted from the master to the slave. These are 2 bytes: Value = 1 byte + status = 1 byte

Table 4: Modules defined in the gsd file

The supported modules are assigned to specific slots, i.e. the order in which specific data are transmitted is fixed. One slot can support several modules.
The FCx4xx with the ident number 0x3434 supports 17 communications slots.

Slot no.	Slot designation	Default modules no.	Supported modules no.
1	AI1	2	1, 2
2	AI2	3	1, 2
3	AI3	3	1, 2
4	AI4	2	1, 2
5	AI5	2	1, 2
6	AI6	2	1, 2
7	AI7	2	1, 2
8	AI8	2	1, 2
9	TOT1	3	1, 3, 4, 5
10	TOT2	3	1, 3, 4, 5
11	TOT3	3	1, 3, 4, 5
12	AO1	2	1, 6
13	AO2	6	1, 6
14	DI	8	1, 7
15	DO1	8	1, 8
16	DO2	8	1, 8
17	DO3	8	1, 8

Table 5: Slots defined in the gsd file

If configuration data should be transmitted that does not comply with the supported module order, the device returns a ‘Cgf_Fault’ to the control system (for example, slot 1 is configured with the totalizer module (TOTAL)).

Additional Configuration Strings

In accordance with the PA Profile, a short configuration string and a long configuration string (Extended Identifier Format) are available for the AI and AO function blocks. The FCx4xx transmitter accepts both versions.

… 2 Specification

Address setting

The PROFIBUS DP/PA address can be set via the bus or at the transmitter, but only when no cyclical communication is running (as specified with PA).

Setting the address via the LCD display on the transmitter

In the sub-menu '**… / Communication / …Profibus**', there is the parameter 'Address'.
The current address is shown here. The address can be adjusted if no cyclical communication is running.

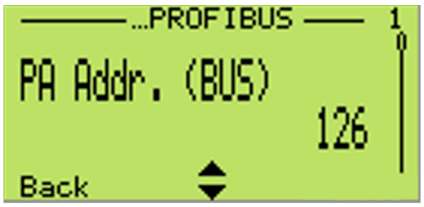

Figure 2: Parameter 'PA address'

Adjusting the address via the fieldbus

In accordance with the PA specifications, only addresses between 0 and 125 can be set via the bus.
It is not permissible to reset the address to its default value 126 with the „Set_Slave_Addresstelegram'.

Adjusting the address via the fieldbus is **not** possible if one or both of the following conditions apply:

- When cyclic communication is running.
- NO_ADDRESS_CHANGE When is TRUE

Resetting the address to the default value

It is possible to reset the address to 126 as follows:

- By writing 'Reset Bus Adresse' (2712 decimal / 0A98 hex) in Factory_Reset (physical block rel. index 19).
- On the transmitter with no running cyclical communication.

NO_ADDRESS_CHANGE (NO_ADD_CHG)

Address setting via the bus is done by means of the Set_Slave_Addresstelegram.
It contains the Boolean variable NO_ADDRESS_CHANGE. It this variable is TRUE, no further address changes can be made with the Set_Slave_Addresstelegram.

Changing the address via the fieldbus is then only possible by writing 2712 decimal (= 0A98 hex) into Factory Reset (physical block, rel. index 19).
In the process, the address is reset to the default value of 126 and the variable NO_ADDRESS_CHANGE it set to FALSE.
Then the address can be freely set again.

3 Block overview

The FCx4xx transmitter contains the following blocks, depending on the ID number:

Block	Supported PA ID ident. number		
	0x3434 **FCx4xx** **PA 3.02**	**0x9741** **Profile Specific** **(2AI + 1TOT)**	**0x9742** **Profile Specific** **(3AI + 3TOT)**
Physical Block	Slot 0	Slot 0	Slot 0
Analog Input Block	Slot 1	Slot 1	Slot 1
Analog Input Block	Slot 2	Slot 2	Slot 2
Analog Input Block	Slot 3	–	Slot 3
Analog Input Block	Slot 4	–	–
Analog Input Block	Slot 5	–	–
Analog Input Block	Slot 6	–	–
Analog Input Block	Slot 7	–	–
Analog Input Block	Slot 8	–	–
Totalizer Block	Slot 9	Slot 3	Slot 4
Totalizer Block	Slot 10	–	–
Totalizer Block	Slot 11	–	–
Analog output block	Slot 12	–	–
Analog output block	Slot 13	–	–
Discrete Input Block	Slot 14	–	–
Discrete output block	Slot 15	–	–
Discrete output block	Slot 16	–	–
Discrete output block	Slot 17	–	–
Transducer Block - Flow	Slot 18	Slot 4	Slot 5
Transducer Block - DeviceInfo	Slot 19	Slot 5	Slot 6
Transducer Block - Special Function	Slot 20	Slot 6	Slot 7
Transducer Block - Display	Slot 21	Slot 7	Slot 8
Transducer Block - Diagnostics	Slot 22	Slot 8	Slot 9

Table 6: Available blocks

The physical block, the transducer block – flow as well as all integrated functional blocks correspond to the PROFIBUS PA profile 3.02. Manufacturer-specific enhancements have been made at the physical block and at the transducer block – Flow.
The following table provides a short description of the supported manufacturer-specific transducer blocks.

Block	Description
Transducer Block – Flow	Up to index 52 a ‘Flow transducer block’ in accordance with PA profile 3.02. The parameters comply with the profile of the Coriolis flowmeter. From index 53 on the manufacturer-specific parameters are added.
Transducer Block – DeviceInfo	Provides detailed information about the device.
Transducer Block – Special Function	Contains parameters for configuring the switch / pulse output and the internal device counter.
Transducer Block – Display	Contains parameters for configuring the device display.
Transducer Block – Diagnostics	Contains parameters for configuring and recording process and device diagnoses.

Table 7: Description of the manufacturer-specific transducer blocks

... 3 Block overview

Block Table Legend

The following tables list, among other things, the following attributes:

Rel. Index / Abs. Slot Index
Relative index of the parameter within the block and absolute slot index.
In accordance with the PA profile, all blocks begin with the absolute index 16.
BLOCK_OBJECT, for example, is on the relative index 0 in every block and, thus, on the slot index 16.

Data Type
Data type of the parameter. Some parameters are structures (DS-xx). The structures are described under . For detailed information on the standard data types, refer to the PA Profile.

Bytes
Size of the parameter in bytes.

Storage Type
- **Cst**: Constant Parameter. The parameter never changes.
- **S**: Static parameters are stored permanently (in the non-volatile memory). When writing a static parameter, the Static Revision Counter ST_REV of the corresponding block (index 1 in each block) is incremented by one.
- **N**: Non-volatile parameters are stored permanently (in the non-volatile memory). When writing a non-volatile parameter, ST_REV remains unchanged.
- **D**: Dynamic parameters are lost when the device is switched off.

Access
- **r:** The parameter can be read.
- **w:** The parameter can be written.

Default Values
Default settings of the parameters.
The parameter FACTORY_RESET (index 19 in the physical block), selection ‘Restart with defaults’, can be used to reset the physical block, the function blocks and some of the transducer block parameters to their default settings.

Standard block parameter

The following section describes the standard block parameters. Every block, whether physical, transducer or functional block, must contain the following parameters. For a detailed description of the standard block parameters, refer to the PROFIBUS PA profile 3.02.

Relative index	Parameter Name	Object type	Data Type	Store	Bytes	Access	Default Values
0	BLOCK_OBJECT	Record	DS-32	Cst	20	r	-
1	ST_REV	Simple	Unsigned16	N	2	r	0
2	TAG_DESC	Simple	OctetString	S	32	r,w	”
3	STRATEGY	Simple	Unsigned16	S	2	r,w	0
4	ALERT_KEY	Simple	Unsigned8	S	1	r,w	0
5	TARGET_MODE	Simple	Unsigned8	S	1	r,w	Auto
6	MODE_BLK	Record	DS-37	D	3	r	8, 8, 8
7	ALARM_SUM	Record	DS-42	D	8	r	0, 0, 0, 0

Parameter	Description
BLOCK_OBJECT	This structure contains general information about the block, for example, the block type, profile number, and so on.
ST_REV	Revision counter for static variables. Each time when a static variable changes, the revision counter is incremented by one.
TAG_DESC	A text description of this block. It must be unique within a fieldbus.
STRATEGY	This parameter can be used to group blocks by assigning the same code number to each block of the group.
ALERT_KEY	This parameter is used as an identification number for a plant part.
TARGET_MODE	The wanted operating mode of the block. 0x08: Auto 0x10: Man 0x80: Out Of Service
MODE_BLK	The current, allowed and normal operating modes of the block.
ALARM_SUM	This parameter contains a summary of the block alarms.

… 3 Block overview

Physical Block – Slot 0

The physical block contains general specifications of the fieldbus device, for example, the manufacturer, device type, version number and information about manufacturer-specific enhancements regarding other devices.

Physical Block – Parameters

Relative index	Parameter Name	Object type	Data Type	Store	Bytes	Access	Default Values
0 to 7	Standard block parameter						
8	SOFTWARE_REVISION	Simple	VisibleString	Cst	16	r	–
9	HARDWARE_REVISION	Simple	VisibleString	Cst	16	r	–
10	DEVICE_MAN_ID	Simple	Unsigned16	Cst	2	r	26 (ABB)
11	DEVICE_ID	Simple	VisibleString	Cst	16	r	0x3434
12	DEVICE_SER_NUM	Simple	VisibleString	Cst	16	r	–
13	DIAGNOSIS	Simple	OctetString	D	4	r	0; 0; 0; 0
14	DIAGNOSIS_EXTENSION	Simple	OctetString	D	6	r	0; 0; 0;0; 0; 0
15	DIAGNOSIS_MASK	Simple	OctetString	Cst	4	r	–
16	DIAGNOSIS_MASK_EXTENSION	Simple	OctetString	Cst	6	r	0xFF; 0xFF; 0xFF; 0xE7; 0xFF; 0x03
17	DEVICE_CERTIFICATION	Simple	VisibleString	Cst	32	r	‘ATEX, IEC, cFMus’
18	WRITE_LOCKING	Simple	Unsigned16	N	2	r, w	–
19	FACTORY_RESET	Simple	Unsigned16	S	2	r, w	–
20	DESCRIPTOR	Simple	OctetString	S	32	r, w	–
21	DEVICE_MESSAGE	Simple	OctetString	S	32	r, w	–
22	DEVICE_INSTAL_DATE	Simple	OctetString	S	16	r, w	–
23	LOCAL_OP_ENA	Simple	Unsigned8	N	1	r, w	1
24	IDENT_NUMBER_SELECTOR	Simple	Unsigned8	S	1	r, w	127
25	HW_WRITE_PROTECTION	Simple	Unsigned8	D	1	r	–
26	FEATURE	Record	DS-68	N	8	r	–
27	COND_STATUS_DIAG	Simple	Unsigned8	S	1	r, w	1
28	DIAG_EVENT_SWITCH	Record	Diag_Event_Switch	S	50	r, w	–
29 to 32	Reserved by the PNO						
33	DIAG_ALARM_HISTORY	Simple	Unsigned8	D	6	r	0; 0; 0; 0; 0; 0
34	DIAG_CLEAR_ALARM_HISTORY	Simple	Unsigned8	D	1	r, w	
35	DIAG_ALARM_SIMULATION	Simple	Unsigned8	D	1	r, w	
36	DIAG_MASK_MAINTENANCE	Simple	Unsigned8	S	1	r, w	
37	DIAG_MASK_CHECK_FUNCTION	Simple	Unsigned8	S	1	r, w	
38	DIAG_MASK_OFF_SPECIFICATION	Simple	Unsigned8	S	1	r, w	
39	DIAG_MASK_INDIVIDUAL_ALARM	Simple	Unsigned8	S	6	r, w	
40	DIAG_CONDITION_IDX	Simple	Unsigned8	D	1	r, w	
41	DIAG_IDX_DETAILS_CLASS	Simple	Unsigned8	D	1	r	
42	DIAG_IDX_DETAILS_GROUP	Simple	Unsigned8	D	1	r	
43	DIAG_IDX_DETAILS_PRIORITY	Simple	Unsigned8	D	1	r	
44	DIAG_IDX_DETAILS_HISTORY	Record	Diag_Detail_History	D	14	r	
45	DIAG_CONDITION_ALARM_VALID	Simple	Unsigned8	D	1	r	
46 to 77	Reserved for future use						

Physical Block – Parameter Description

Parameter	Description
SOFTWARE_REVISION	Software revision of the device.
HARDWARE_REVISION	Hardware revision of the device.
DEVICE_MAN_ID	Identification code for the device manufacturer. (26 = ABB)
DEVICE_ID	Manufacturer name for the device (0x3430)
DEVICE_SER_NUM	Serial number of the device as a string.
DIAGNOSIS	Current alarm information for the device, coded bitwise.
DIAGNOSIS_EXTENSION	Additional manufacturer-specific alarm information for the device.
DIAGNOSIS_MASK	Mask with the supported DIAGNOSIS bits: 0: Bit is not used. 1: Bit is used.
DIAGNOSIS_MASK_EXTENSION	Mask with the supported DIAGNOSIS)EXTENSION bits: 0: Bit is not used. 1: Bit is used.
DEVICE_CERTIFICATION	Certifications, etc.
WRITE_LOCKING	Software write protection 0: No acyclic writing allowed, except on WRITE_LOCKING. 2457: All writable parameters can be written.
FACTORY_RESET	Reset command: 1: Reset to default values. The address is not changed. 2506: Warm start. 2712: Reset the bus address, only.
DESCRIPTOR	A user-definable description of the application.
DEVICE_MESSAGE	A user-definable message.
DEVICE_INSTAL_DATE	Installation date of the device.
LOCAL_OP_ENA	Local operation enable.
IDENT_NUMBER_SELECTOR	The supported PROFIBUS ident. numbers: 0: 0x9741 Profile-specific 1: 0x3434 manufacturer-specific FCx4xx 127: Adaptation mode (obligatory) for PA3.02. 128: 0x9742 Profile-specific
HW_WRITE_PROTECTION	Status of the hardware write protection switch. When the switch is set, no write access is possible via the bus.
FEATURE	Indication of optionally supported device properties.
COND_STATUS_DIAG	Mode of the status and diagnostic output of the device: 0: Extended diagnosis status is used 1: Condensed status is used
DIAG_EVENT_SWITCH	Indicates / controls the reaction of the device on device specific diagnostic events if FEATURE.Enabled.Condensed_Status = 1.
DIAG_ALARM_HISTORY	Provides the alarm history.
DIAG_CLEAR_ALARM_HISTORY	Deletes the alarm history information.
DIAG_ALARM_SIMULATION	A variety of alarm messages and output conditions can be simulated. Refer to .

… 3 Block overview

… Physical Block – Slot 0

Parameter	Description
DIAG_MASK_MAINTENANCE	Masking of the alarm groups: • Maintenance • Check Function • Out Off Specification With active masking there is no alarm signaling from the corresponding group. Alarms from the ‘Failure’ group cannot be masked.
DIAG_MASK_CHECK_FUNCTION	
DIAG_MASK_OFF_SPECIFICATION	
DIAG_MASK_INDIVIDUAL_ALARM	Single alarm masking
DIAG_CONDITION_IDX	With activated masking there is no alarm signaling.
DIAG_IDX_DETAILS_CLASS	Refer to .
DIAG_IDX_DETAILS_GROUP	
DIAG_IDX_DETAILS_PRIORITY	
DIAG_IDX_DETAILS_HISTORY	Provides additional alarm information about the selected DIAG_CONDITION_IDX.
DIAG_CONDITION_ALARM_VALID	Indicates whether a time stamp was set in the device.

Analog Input Function Block – Slot 1, 2, 3, 4, 5, 6, 7, 8

Measured value calculation is done in the transducer block. The transducer block internally provides the measured values. Cyclic outward of the measured value output is realized via the analog input block (AI block).
The transmitter FCx4xx supports 8 AI blocks.

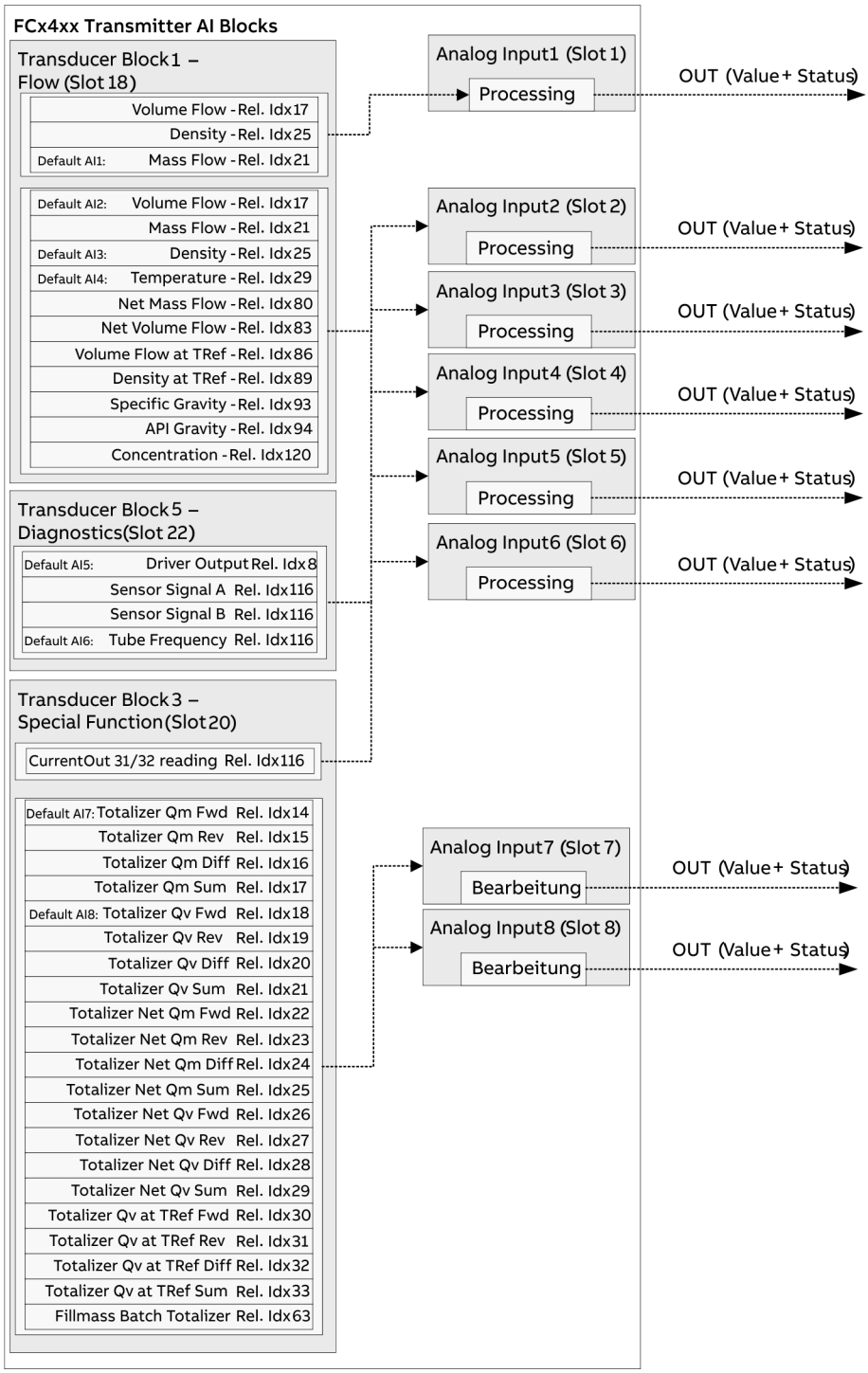

Figure 3: Overview – AI-blocks

… 3 Block overview

… Analog Input Function Block – Slot 1, 2, 3, 4, 5, 6, 7, 8

It is possible for all AI blocks to output different measured values via the channel parameter.
The default values are marked in the overview .
The channel is selected via the bus.

For AI1, the channel (index30) is selected via the bus by:

Channel	HEX	DEC
VOLUME_FLOW	0x0111	273
MASS_FLOW	0x0115	277
DENSITY	0x0119	281

For AI2 … AI6, the channel (index30) is selected via the bus by:

Channel	HEX	DEC
VOLUME_FLOW	0x0111	273
MASS_FLOW	0x0115	277
DENSITY	0x0119	281
TEMPERATURE	0x011D	285
NET_MASS_FLOW	0x0150	336
NET_VOLUME_FLOW	0x0153	339
VOLUME_FLOW_AT_TREF	0x0156	342
DENSITY_AT_TREF	0x0159	345
SPECIFIC_GRAVITY	0x015D	349
API_GRAVITY	0x015E	350
CONCENTRATION	0x0178	376
DRIVER_OUTPUT	0x0508	1288
SENSOR_SIGNAL_A	0x0509	1289
SENSOR_SIGNAL_B	0x050A	1290
TUBE_FREQUENCY	0x050B	1291
CURR_OUT_31_32_OUTPUT_READING	0x034E	846

For AI7 / AI8, the channel (index30) is selected via the bus by:

Channel	HEX	DEC
TOTALIZER_QM_FWD	0x030E	782
TOTALIZER_QM_REV	0x030F	783
TOTALIZER_QM_DIFF	0x0310	784
TOTALIZER_QM_SUM	0x0311	785
TOTALIZER_QV_FWD	0x0312	786
TOTALIZER_QV_REV	0x0313	787
TOTALIZER_QV_DIFF	0x0314	788
TOTALIZER_QV_SUM	0x0315	789
TOTALIZER_NET_QM_FWD	0x0316	790
TOTALIZER_NET_QM_REV	0x0317	791
TOTALIZER_NET_QM_DIFF	0x0318	792
TOTALIZER_NET_QM_SUM	0x0319	793
TOTALIZER_NET_QV_FWD	0x031A	794
TOTALIZER_NET_QV_REV	0x031B	795
TOTALIZER_NET_QV_DIFF	0x031C	796
TOTALIZER_NET_QV_SUM	0x031D	797
TOTALIZER_QV_AT_TREF_FWD	0x031E	798
TOTALIZER_QV_AT_TREF_REV	0x031F	799
TOTALIZER_QV_AT_TREF_DIFF	0x0320	800
TOTALIZER_QV_AT_TREF_SUM	0x0321	801
FILLMASS_BATCH_TOTALIZER	0x033F	831

All AI blocks receive their measured values from the above-shown transducer block objects. It is possible to select different units for the mass and volume flow and for the internal forward / reverse totalizer (see the description of the transducer blocks). If the unit is changed, the AI blocks receive the measured value in the selected unit.

The unit conversion can also take place in the AI block itself. This is done via the input and output scaling (PV_SCALE & OUT_SCALE).

Analog Input Block Diagram

An AI block performs various tasks, such as rescaling, alarm handling, simulation, and so on.

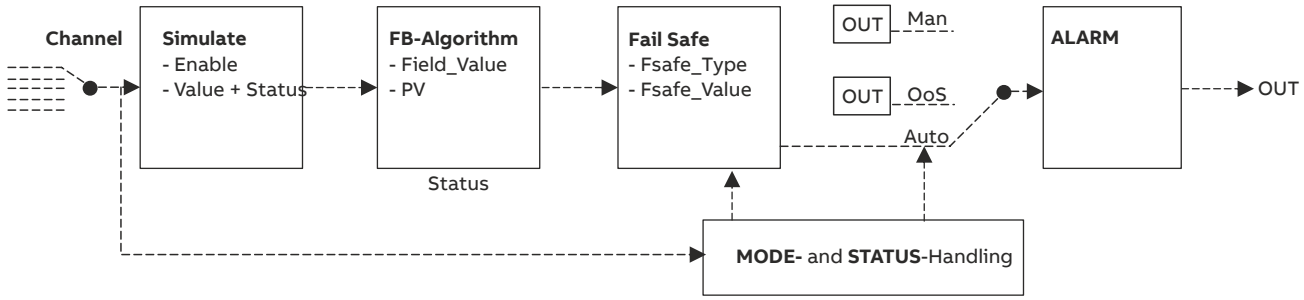

Figure 4: Setup of the AI-block

Task	Description
Channel	The channel parameter (index 14) is used to select which measured value is to be transmitted from the transducer block. See .
Simulate	The Simulate Parameter is a structure. The 'Simulate Enable' sub-parameter can be used to activate the simulation. The 'Simulate Value' sub-parameter will then generate the simulation value that will be processed instead of the channel value.
FB-Algorithm	The input value is scaled to a percentage using the PV_SCALE structure. This percentage is called the FIELD VALUE and only exists internally within the block. It cannot be accessed by communication: FIELD_VALUE = 100 * (Channel-Value – PV_SCALE.EU0%) / (PV_SCALE.EU100% - PV_SCALE.EU0%)
	This percentage is scaled to the PV value by the OUT_SCALE structure: PV = (FIELD_VAL / 100) * (OUT_SCALE.EU100% - OUT_SCALE.EU0%) + OUT_SCALE.EU0%
	The PV_FTIME parameter (index 16) permits to define a damping time in seconds. The filtered measured value is called OUT. OUT = Filter (PV)
Fail-Safe	FSAFE_TYPE (index 17) defines the behavior in the event of a fault. If FSAFE_TYPE=0, FSAVE_VALUE (index 18) is output in the event of a fault. If = 1, the last 'usable' value is output. If = 2, the faulty values are output.
Mode	If Mode = Auto, the value determined so far is output. If Mode = Man, the OUT parameter is output. The OUT parameter can be written cyclically in Man mode. If Mode = Out of Service, the OUT parameter is output.
Alarm	There are four alarm thresholds (index 21, 23, 25, 27) • High-High-Limit • High-Limit • Low-Limit • Low-Low-Limit There are alarm messages (index 30 ... 33) available for each of these alarm thresholds and will be tripped when the alarm threshold is exceeded or undershot. • High-High-Alarm • High-Alarm • Low-Alarm • Low-Low-Alarm ALARM_HYS (index 19) can be used to define a hysteresis for the alarm thresholds.

For a detailed description of the functions and parameters of an analog input block, refer to the PA Profile 3.02.

... 3 Block overview

Totalizer Function Block – Slot 9, 10, 11

In the totalizer block, the measured flow values are totalized (integrated) in order to determine the flow rate (counter reading). The totalizer block receives the measured value from the transducer block. Both totalizer blocks are firmly connected to the volume flow parameter in the transducer block.

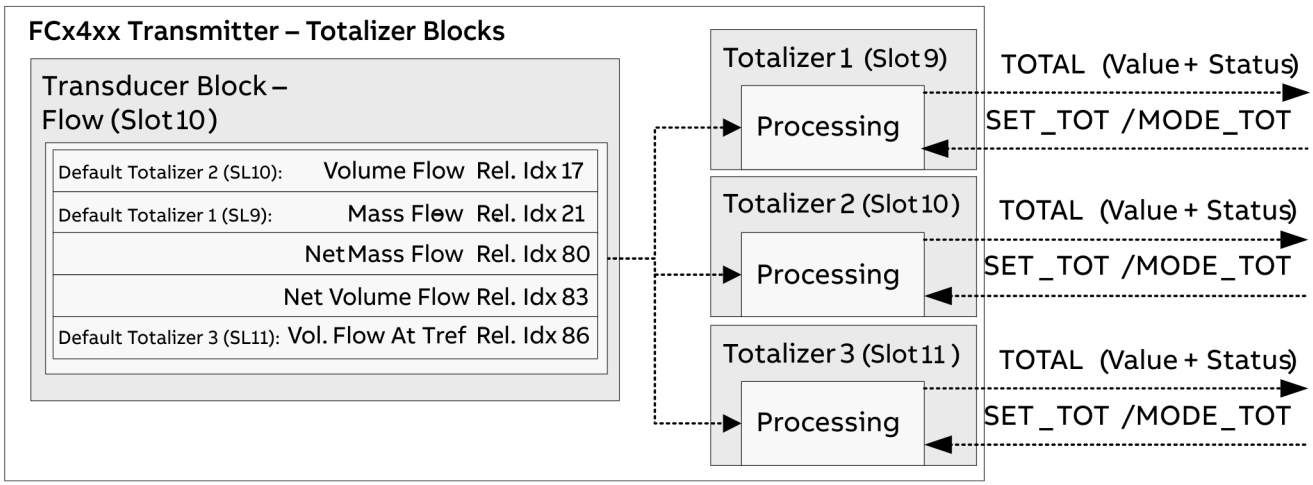

Figure 5: Overview - Totalizer-blocks

The totalizers integrate the value delivered by the transducer block, depending on the block configuration. The flow rate is unit-weighted by the transducer. If the flow unit of the volume flow is changed in the transducer, the totalizer blocks receive the measured value in the newly set unit.
As both totalizers can integrate the same measured value, a forward / reverse flow totalizer can be realized, for example by using the MODE_TOT parameter.

Depending on the configuration string, the totalizer can cyclically communicate the following parameters:
- TOTAL
- SET_TOT
- MODE_TOT

Totalizer blocks and internal totalizers of the transmitter
The FCx4xx transmitter has no DP communication as a standard device.
For this reason, the transmitter contains own internal totalizers that have nothing to do with the DP totalizer blocks. These internal totalizers are also included int he DP device and can, for example, be read on the LCD display on the device in the sub-menu ‘totalizer.’

The internal totalizers are firmly connected to the AI blocks 7 and 8 and can also be read out cyclically (see).
Only the flow rate (volume or mass flow) (index 17, 21, 80, 83, 86) can be used as a channel for the totalizer blocks, not the internal totalizers! The totalizer totalize the volume flow to obtain the totalizer status. It would not make sense to totalize the internal totalizer again.

Note
Index 80, 83 and 86 can first be used after being activated by a feature code.

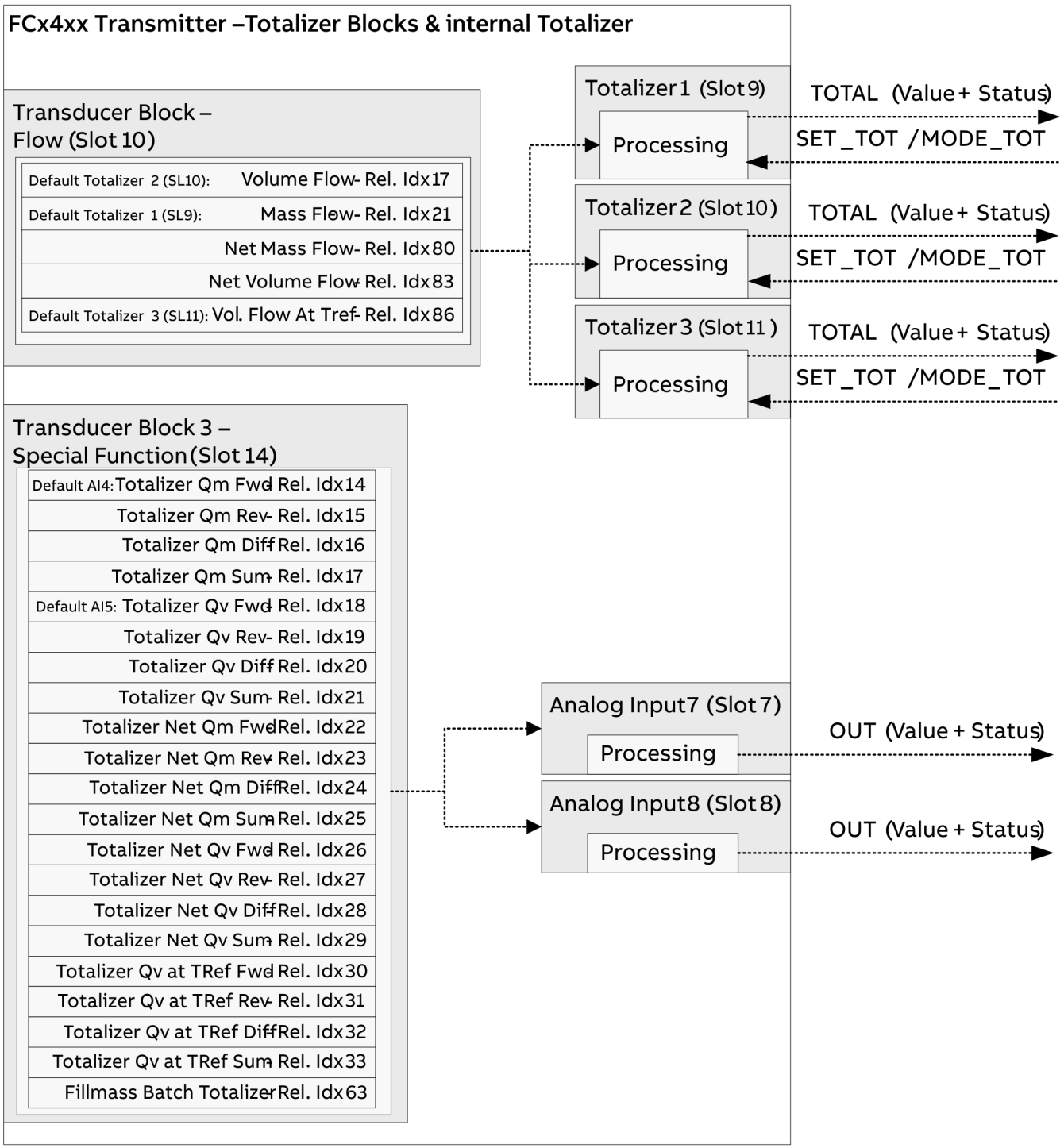

Figure 6: Overview - Internal totalizer

The internal totalizers and the totalizer blocks are independent of each other, can be set differently (regarding units, mode, etc.) and can also be reset at different times. As a result, the totalizer values may differ.
As the Totalizer Block totalizes the volume flow, the totalizer unit corresponds to the flow unit, but without the time.
Example: Flow rate m^3/h → totalizer m^3.
The FCx4xx does not automatically set the totalizer unit UNIT_TOT (index 11) to the corresponding unit value, for example, when the flow unit is changed.

… 3 Block overview

… Totalizer Function Block – Slot 9, 10, 11

Totalizer Block Diagram

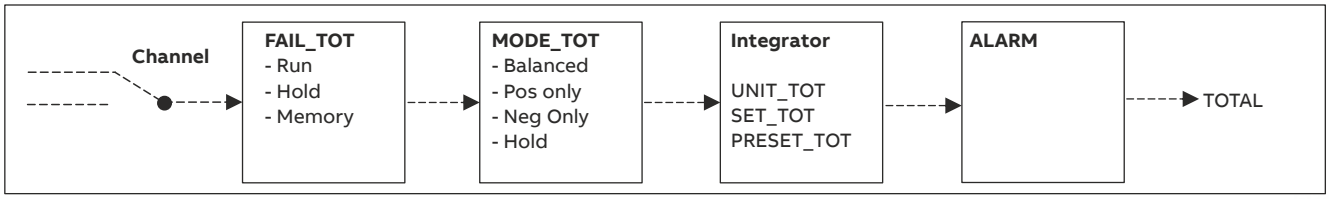

Figure 7: Setup of Totalizer-Block

Task	Description
Channel	The Channel Parameter (index 12) is used to select the measured value to be processed from the Transducer Block.
FAIL_TOT	(Index 15) determines the behavior in the event of channel values with the 'BAD' status. In this case, it is possible to let the totalizer continue to Run and ignore the bad values, to stop the totalizer or to add the last good value (from memory).
MODE_TOT	(Index 14) determines, whether both flow directions, only positive or only negative flow values are to be totalized. With 'Hold' the totalizer can be stopped.
Integrator	The flow values are continuously added to the TOTAL value (index 10) to calculate the totalizer status. UNIT_TOT (index 11) specifies the unit. It is not checked, and UNIT_TOT is not considered for the calculation. SET_TOT (index 13) allows for resetting or presetting of the TOTAL value: 0: **Totalize** means that the totalizer is operating 'normally' and totalizes values. 1: **Reset** Resets the totalizer to 0. 2: **Preset** Sets the totalizer to PRESET_TOT (index 16). As long as SET_TOT is set to 1 or 2, the reset or preset status is maintained. Only when SET_TOT is reset to 0, 'normal' totalizing starts again.
Alarm	There are four alarm thresholds (index 18 … 21) • High-High-Limit • High-Limit • Low-Limit • Low-Low-Limit There are alarm messages (index 22 … 25) available for each of these alarm thresholds and will be tripped when the alarm threshold is exceeded or undershot. • High-High-Alarm • High-Alarm • Low-Alarm • Low-Low-Alarm ALARM_HYS (index 17) can be used to define a hysteresis for the alarm thresholds.

Analog Output Function Block – Slot 12, 13

In the manufacturer-specific profile, the transmitter FCx4xx supports two analog output function blocks. As a result, a pressure correction can be fed cyclically to the transmitter.
This is used to compensate for the pressure impact on the mass and density measured value.
In addition, external variables can be shown on the transmitter display via the AO blocks.

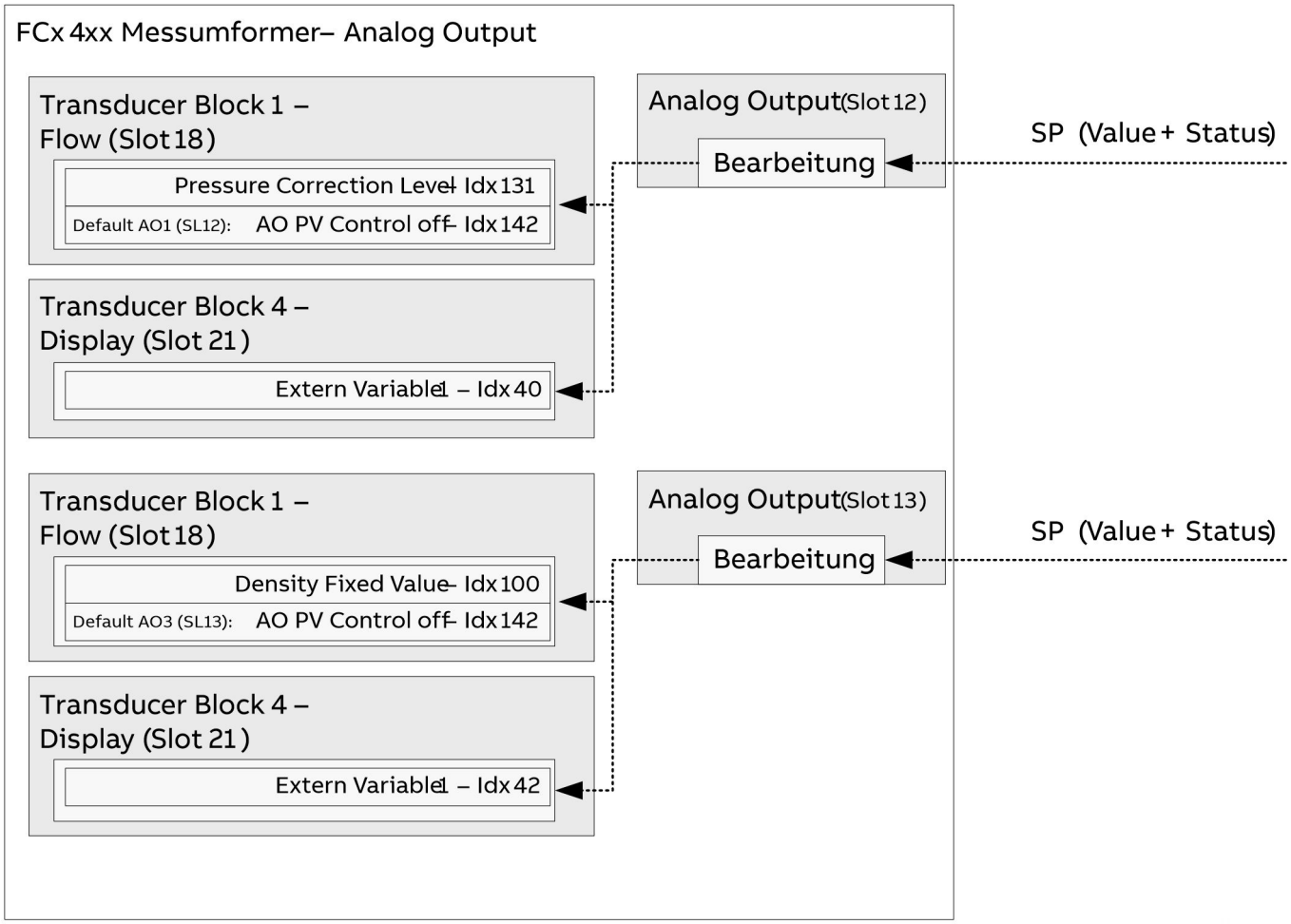

Figure 8: Overview – Analog Output

The channel selection for the corresponding AO block occurs via OUT_CHANNEL, index 22.

Channel – Analog Output 1 (Slot 12)	HEX	DEC
PRESSURE_CORRECTION_LEVEL	0x0183	387
EXTERN_VARIABLE_1	0x0428	1064
AO_PV_CONTROL_OFF	0x018E	398

… 3 Block overview

… Analog Output Function Block – Slot 12, 13

Channel 'Pressure_Correction_Level'
The pressure value (pressure correction level) in the transducer has the default unit 'bar' and will only be accepted in the input limits from 0 to 1000 bar. Before writing the density value, the transducer verifies whether the value status is 'good' or higher.

Should the measured value status be 'bad' or 'uncertain', the transducer will discard the measured value. The unit for the pressure value can be changed in the transducer block 1, index 130 (PRESSURE_CORRECTION_UNIT). Valid units are:

PROFIBUS no.	HEX	Name	Code
1610	0x064A	pascal	Pa
1616	0x0650	kilo pascal	kPa
1137	0x0471	bar	Bar
1138	0x0472	milli bar	mBar
1141	0x0475	pound per square inch	psi

The input limits are automatically adapted to the aforementioned limits according to the unit. If these are not sufficient, it is possible to perform a unit conversion via the scaling of the analog input block.

Channel 'External Variable 1'
An external value can be issued via this channel in the transmitter display, which is supplied via the AO block.
No conversion of this input variable exists and the input variable also does not affect the function of the measured value transmitter. It is possible to enter an 8 character long unit name. An entry is provided for this purpose in the transducer block 4, index 41 (CUSTOM_NAME_VARIABLE_1).

Channel 'AO_PV_CONTROL_OFF'
With this channel selection, all of the values sent to the transmitter will not be processed and will be discarded. The AO block is switched off, so to speak.

Channel - Analog Output 2 (Slot 13)	HEX	DEC
DENSITY_FIXED_VALUE	0x0164	356
EXTERN_VARIABLE_2	0x042A	1066
AO_PV_CONTROL_OFF	0x018E	398

Channel 'DENSITY_FIXED_VALUE'
The density value (DENSITY_FIXED_VALUE) in the transducer and the default unit g/cm³ will only be accepted in the input limits from 0.0001 to 3.5 g/cm³.
Before writing the density value, the transducer verifies whether the value status is 'good' or higher. Should the measured value status be 'bad' or 'uncertain', the transducer will discard the measured value.

The unit for the density value can be changed in the transducer block 1, index 26 (DENSITY_UNITS). Valid units are:

PROFIBUS no.	HEX	Name	Code
1100	0x044C	gram per cubic centimeter	g/cm³
1097	0x0449	kilogram per cubic meter	kg/m³
1104	0x0450	gram per milliliter	g/ml
1105	0x0451	gram per liter	g/l
1103	0x044F	kilogram per liter	kg/l
1107	0x0453	pounds per cubic feet	lb/ft³
1108	0x0454	pounds per us gallons	lb/ugal
1527	0x05F7	specific gravity	SG
1523	0x05F3	custom selectable	xx/yy

The input limits are automatically adapted to the aforementioned limits according to the unit.
If this should not be sufficient, the scaling function of the analog input block can be used to convert the units or to select a user-specific unit in the transmitter.
Refer to the operating instructions for further information here.

Channel 'External Variable 2'
An external value can be issued via this channel in the transmitter display, which is supplied via the AO block.
No conversion of this input variable exists and the input variable also does not affect the function of the measured value transmitter.
It is possible to enter an 8 character long unit name. An entry is provided for this purpose in the transducer block 4, index 43 (CUSTOM_NAME_VARIABLE_3).

Channel 'AO_PV_CONTROL_OFF'
With this channel selection, all of the values sent to the transmitter will not be processed and will be discarded. The AO block is switched off, so to speak.

Note
It is not necessary to select an IN_CHANNEL (index 21) for both AO channels. A read-back function via the IN_CHANNEL in relation to the available OUT_CHANNEL is not necessary for the device and is not implemented.

... 3 Block overview

Discrete Input Function Block – Slot 10

A discrete input (DI) function block is considered as a switch by the control system. Binary signals are cyclically transmitted to the control system here.
The DI block in the FCx4xx transmitter allows for cyclic transfer of device-specific alarm information to the control system.
This is done in addition to the alarm options already specified in the PROFIBUS, for example Get_Diag or status messages.

The following choice of channels is available for the DI Block.

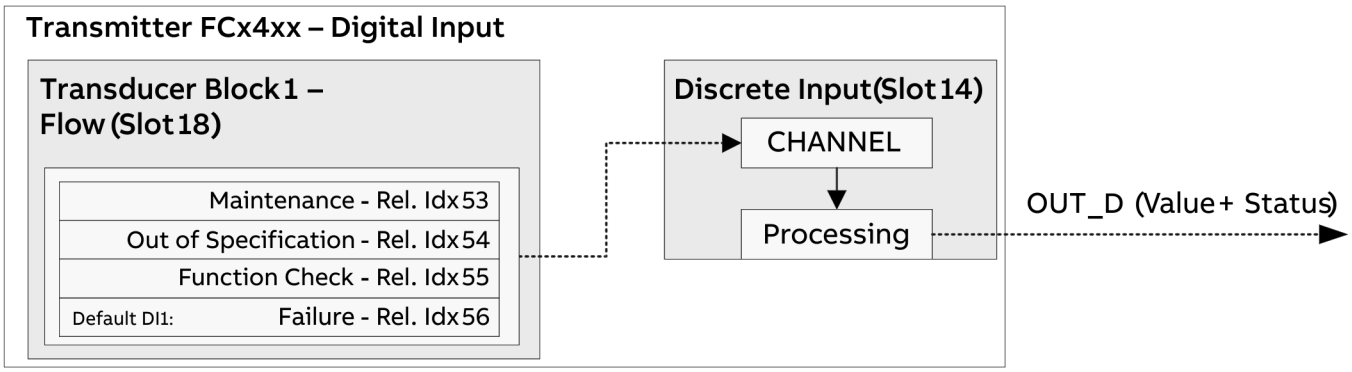

Figure 9: Overview – Digital Input

The channel is selected via the bus.
The following parameters are available to select the channel for the DI:#

Channel	Value
Maintenance (Maintenance required)	0x0135 (dec. 309)
Out of Specification (Outside of the specification)	0x0136 (dec. 310)
Function Check (Function check)	0x0137 (dec. 311)
Failure (Error / failure)	0x0138 (dec. 312)

Every device-specific alarm message of the Fcx4xx transmitter is allocated to an alarm group. This means that each channel represents one alarm group. If an alarm is set in one of the groups, cyclic signaling to the control system occurs when the corresponding channel is selected.

The following table lists the output value of the DI Block (OUT_D.value) in dependence of the selected channel and a set alarm in the alarm groups:

Channel	Alarm in group			
	Maintenance	**Out of Spec.**	**Function Check**	**Failure**
DI_PV_DIAG_MAINTENANCE	1	1	1	1
DI_PV_DIAG_OUT_SPEC	0	1	1	1
DI_PV_DIAG_FUNC_CHECK	0	0	1	1
DI_PV_DIAG_FAILURE	0	0	0	1

As can be seen, there is a hierarchy within the groups.
A set alarm in the ‘Failure’ group is signaled when any channel is selected, whereas a ‘Maintenance Alarm’ reaches the control system only when a ‘Maintenance Channel’ is selected.
See for a detailed description of the existing alarm of the transmitter.

Note
Independent of any alarm messages existing in the transmitter, the status message of the above-shown channel parameters always returns the value ‘Good.’

... 3 Block overview

Discrete Output Function Block – Slot 9

In the manufacturer-specific profile, the transmitter FCx4xx supports three discreet output function blocks.
These blocks are used for cyclic transfer of binary switching operations from the control system to the transmitter. These start / stop specific transmitter actions like adjustment and others.
The transducer block verifies whether the status of the value is (good) or higher. Should the status of the DI switch be (bad) or (uncertain), the transducer will discard it.

The following channel selection for the DO blocks occurs via (OUT_CHANNEL, index 35):

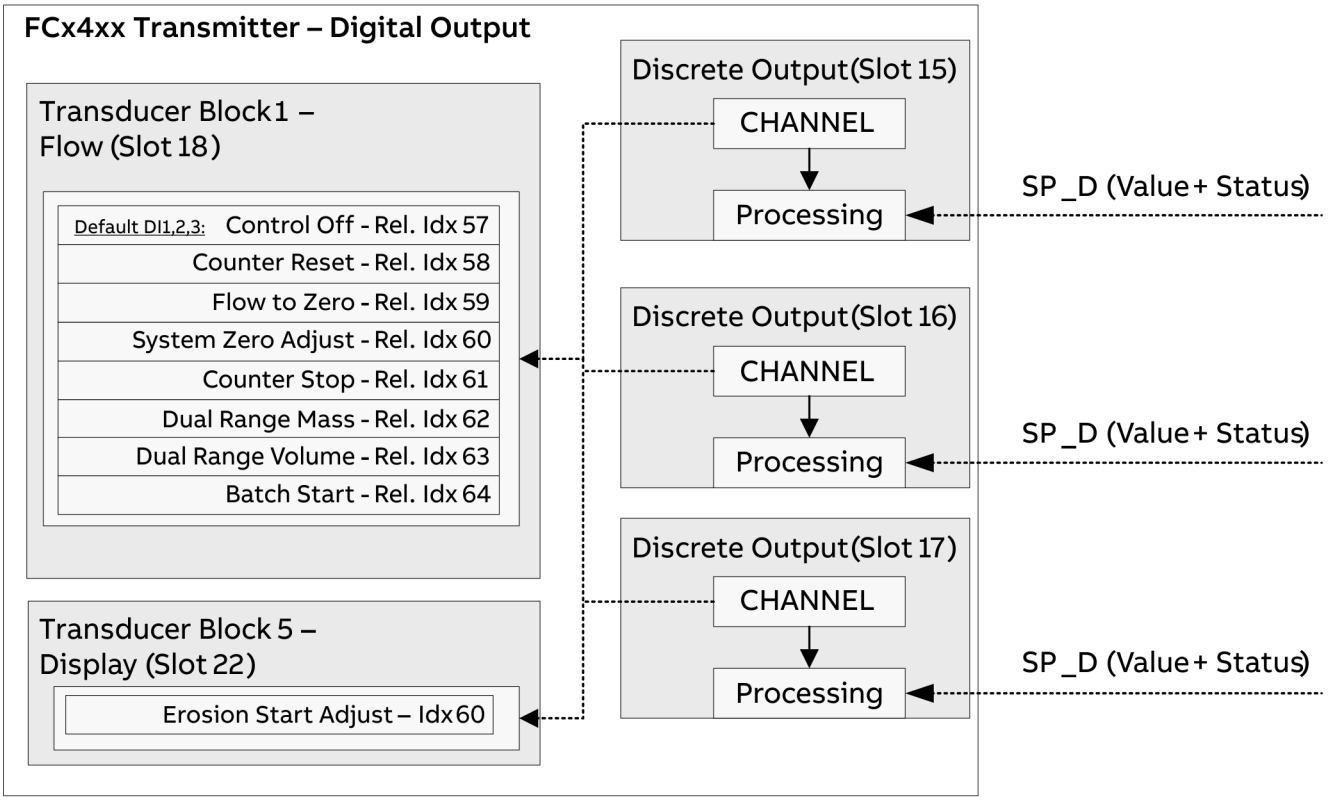

Figure 10: Overview – Digital Output

The selection of the operating mode of the DO block occurs via the bus:

Channel	Hexadecimal value	Decimal value
Control Off	0x0139	313
Counter Reset	0x013A	314
Flow to Zero	0x013B	315
System Zero Adjust	0x013C	316
Counter Stop	0x013D	317
Dual Range Mass	0x013E	318
Dual Range Volume	0x013F	319
Batch Start	0x0140	320
Erosion Start Adjust	0x053C	1340

Table 8: Selection of the operating mode

The transducer in the transmitter expects to receive a binary signal from the control system as an input variable:

1 Starts device functionalities.

0 Stops device functionalities or prevents another execution.

The following table describes the functions of the selectable DO block channels.

Channel	Description
DO_PV_CONTROL_OFF	No function.
DO_PV_COUNTER_RESET	Reset of all internal totalizers to zero. This does not reset the totalizer blocks to zero.
DO_PV_FLOW_TO_ZERO	The flow signal is set to zero.
DO_PV_SYSTEM_ZERO_ADJUST	Starts the system zero point.
DO_PV_COUNTER_STOP	Stops the integration of the internal totalizers. This does not stop the totalizer blocks.
DO_PV_DUAL_RANGE MASS	Change over between two measuring ranges (Q_mMax and Q_mMax2).
DO_PV_DUAL_RANGE VOLUME	Change over between two measuring ranges (Q_vMax and Q_vMax2).
DO_PV_BATCH_START	Starts a fill operation.
EROSION_START_ADJUST	Starts the automatic adjustment of the erosion monitor.

Table 9: Functions of the DO block channel

Note

It is not necessary to choose an IN_CHANNEL (index 17) for the DO channel

A read-back function via the IN_CHANNEL in relation to the available OUT_CHANNEL is not necessary for the device and is not implemented.

… 3 Block overview

Transducer Block 1 – Flow – slot 18

The transducer block contains all device-specific parameters and functions that are required for flow measurement and flow calculation. The values that are measured and calculated are available as transducer block output values, and are called by the function blocks. It is only possible to read out measured values cyclically via function blocks. It is, however, also possible to read the transducer block values acyclically from the corresponding index.

Up to the index 52 the 'Flow' transducer block is a 'Flow transducer block.' The parameters correspond to the Coriolis profile. From the index 53 on, the manufacturer-specific parameters are added to the transducer block. The manufacturer-specific parameters apply to standard measurement operation.

Transducer Block 1 – Flow – parameters

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
BLOCK_OBJECT	18	0	16	Record	DS-32	Cst	20	r	–
ST_REV	18	1	17	Simple	Unsigned16	N	2	r	–
TAG_DESC	18	2	18	Simple	Octet String	S	32	r,w	–
STRATEGY	18	3	19	Simple	Unsigned16	S	2	r,w	–
ALERT_KEY	18	4	20	Simple	Unsigned8	S	1	r,w	–
TARGET_MODE	18	5	21	Simple	Unsigned8	S	1	r,w	–
MODE_BLK	18	6	22	Record	DS-37	D	3	r	–
ALARM_SUM	18	7	23	Record	DS-42	D	8	r	–
CALIBR_FACTOR	18	8	24	Simple	Float	S	4	r,w	Sets the correction factor for field optimization of the mass flow measurement. The value is entered as a percentage of the current measured value. This factor can be used to perform optimization in the field in order to achieve a degree of accuracy in the flow measurement that closely approximates or even exceeds a repeatability of at least 0.1 % of the measured value.
LOW_FLOW_CUTOFF	18	9	25	Simple	Float	S	4	r,w	Sets the switching threshold for the low flow cut-off. If the flow rate is below the switching threshold, there is no flow measurement. The setting of 0 % deactivates the low flow cut-off. Setting range: 0.0 to 10.0 %
MEASUREMENT_MODE	18	10	26	Simple	Unsigned8	S	1	r,w	Set the measuring direction for the sensor. 0: Only forward flow: The device measures only forward flow direction. 1: Forward and Reverse: The device measures in both flow directions. 2: Only reverse flow: The device measures only reverse flow direction.
FLOW_DIRECTION	18	11	27	Simple	Unsigned8	S	1	r,w	Inverts the flow direction displayed. 0: Normal 1: Inverted
ZERO_POINT	18	12	28	Simple	Float	S	4	r,w	Manually sets the value for zero point adjustment in % of Q_{max}DN

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
ZERO_POINT_ADJUST	18	13	29	Simple	Unsigned8	N	1	r,w	Starts the automatic zero point balancing. The result can be read out via ZERO_POINT: 0: Cancel 1: Start (starts adjust) 2: Execute (read only) 3: Ready (Adjust successful finalized) 4: Failed (Adjustment failed)
ZERO_POINT_UNIT	18	14	30	Simple	Unsigned16	S	2	r,w	Selects the unit for the parameter ZERO_POINT. 1342: %
NOMINAL_SIZE	18	15	31	Simple	Float	S	4	r,w	Nominal diameter of sensor.
NOMINAL_SIZE_UNITS	18	16	32	Simple	Unsigned16	S	2	r,w	Selects the unit for the parameter NOMINAL_SIZE. 1013: mm 1019: in.
VOLUME_FLOW	18	17	33	Record	DS-101	D	5	r	Process variable - volume flow Qv.
VOLUME_FLOW_UNITS	18	18	34	Simple	Unsigned16	S	2	r,w	Selects the unit for the parameter VOLUME_FLOW. Refer to .
VOLUME_FLOW_LO_LIMIT	18	19	35	Simple	Float	S	4	r,w	Minimal volume flow (lower range value). Standard value: 0
VOLUME_FLOW_HI_LIMIT	18	20	36	Simple	Float	S	4	r,w	Maximum volume flow ($Qv_{Max}DN$) for the selected nominal diameter.
MASS_FLOW	18	21	37	Record	DS-101	D	5	r	Process variable – mass flow Qm.
MASS_FLOW_UNITS	18	22	38	Simple	Unsigned16	S	2	r,w	Selects the unit for the parameter MASS_FLOW. Refer to .
MASS_FLOW_LO_LIMIT	18	23	39	Simple	Float	S	4	r,w	Minimal mass flow (lower range value). Standard value: 0
MASS_FLOW_HI_LIMIT	18	24	40	Simple	Float	S	4	r,w	Maximum mass flow ($Qm_{Max}DN$) for the selected nominal diameter.
DENSITY	18	25	41	Record	DS-101	D	5	r	Process variable – Measuring medium density.
DENSITY_UNITS	18	26	42	Simple	Unsigned16	S	2	r,w	Selects the unit for the parameter DENSITY. Refer to .
DENSITY_LO_LIMIT	18	27	43	Simple	Float	S	4	r,w	Sets the maximum / minimum density to be measured. This value
DENSITY_HI_LIMIT	18	28	44	Simple	Float	S	4	r,w	is used to calculate the percentage density value. The parameters are only available if the density output ‘Density [unit]’ was selected when configuring the power and digital outputs.

… 3 Block overview

… Transducer Block 1 – Flow – slot 18

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
TEMPERATURE	18	29	45	Record	DS-101	D	5	r	Process variable – Measuring medium temperature.
TEMPERATURE_UNITS	18	30	46	Simple	Unsigned16	S	2	r,w	Selects the unit for the parameter TEMPERATUR. Refer to .
TEMPERATURE_LO_LIMT	18	31	47	Simple	Float	S	4	r,w	Sets the maximum / minimum temperature to be measured.
TEMPERATURE_HI_LIMT	18	32	48	Simple	Float	S	4	r,w	This value is used to calculate the percentage temperature value. These parameters are only available if the temperature output 'Temperature [unit]' was selected when configuring the power and digital outputs.
–	18	33 to 42	49 to 58	–	–	–	–		Not supported.
–	18	43 to 52	59 to 68	–	–	–	–	–	Reserved by the PNO.
DI_PV_DIAG_ MAINTENANCE	18	53	69	Record	DS-102	D	2	r	Alarms from the transmitter. See and for additional information.
DI_PV_DIAG_OUT_SPEC	18	54	70	Record	DS-102	D	2	r	
DI_PV_DIAG_FUNC_CHECK	18	55	71	Record	DS-102	D	2	r	
DI_PV_DIAG_FAILURE	18	56	72	Record	DS-102	D	2	r	
DO_PV_CONTROL_OFF	18	57	73	Record	DS-102	D	2	r	DO channel: No function
DO_PV_COUNTER_RESET	18	58	74	Record	DS-102	D	2	r	Reset all totalizers in the transmitter to zero (forward flow, reverse flow and difference totalizer).
DO_PV_FLOW_TO_ZERO	18	59	75	Record	DS-102	D	2	r	DO channel: Output shutdown; Sets the flow measurement to zero.
DO_PV_SYSTEM_ZERO_ADJUST	18	60	76	Record	DS-102	D	2	r	DO channel: Start external zero point balancing
DO_PV_COUNTER_STOP	18	61	77	Record	DS-102	D	2	r	DO channel: External totalizer stop for all totalizers (forward, reverse and difference totalizer).

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
DO_PV_DUAL_RANGE_ MASS	18	62	78	Record	DS-102	D	2	r	Two measuring ranges Qm: change over Qm Max / Qm Max 2.
DO_PV_DUAL_RANGE_ VOLUME	18	63	79	Record	DS-102	D	2	r	Two measuring ranges Qv: change over Qv Max / Qv Max 2
DO_PV_BATCH_START_ STOP	18	64	80	Record	DS-102	D	2	r	Filler on / off: Start / stop filling (only with activated FillMass function).
RANGE_MODE_CONFIG	18	65	81	Simple	Unsigned8	S	1	r,w	Activation of the second measuring range for the mass and volume flow. The setting can be performed separately for the mass flow rate (Qm) and volume flow (Qv). Thus you have the possibility to quickly switch between two measuring ranges (e.g. Qm Max and Qm Max2). Switching is performed via the parameters 'DO_PV_DUAL_RANGE_ MASS','DO_PV_DUAL_RANGE_ VOLUME' or via the correspondingly configured digital input. 0x00: Deactivated – Second measuring range for mass and volume flow rate deactivated. 0x01: Qm and Qv – Second measuring range for mass and volume flow rate activated. 0x02: Only Qm – Second measuring range for mass flow activated. 0x03: Only Qv – Second measuring range for volume flow activated.
MASS_FLOW_QM_MAX	18	66	82	Simple	Float	S	4	r,w	Setting of the upper measuring range value 1 for the mass flow for forward flow and reverse flow. The value is also used to calculate the corresponding percentage value. This parameter is only available if the mass flow output 'Qm [unit]' was selected when configuring the power and digital outputs.
MASS_FLOW_QM_MAX2	18	67	83	Simple	Float	S	1	r,w	Setting of the upper measuring range value 2 for the mass flow for forward flow and reverse flow. The value is also used to calculate the corresponding percentage value. This parameter is only available if the value 'Qm Max 2' has been selected for the parameter 'Qm measuring range.'

… 3 Block overview

… Transducer Block 1 – Flow – slot 18

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
MASS_FLOW_QM_ RANGE_MODE	18	68	84	Array	Unsigned8	S	4	r,w	Manual switchover between the measuring ranges (Qm Max / Qm Max 2) for the mass flow measurement. This parameter is only available if the value 0x01 or 0x02 as been selected for the parameter 'RANGE_MODE_CONFIG'.
MASS_FLOW_RATIO	18	69	85	Simple	Float	D	4	r	Process variable – Mass flow in %
MASS_FLOW_QM_ RANGE_MAX	18	70	86	Simple	Float	N	4	r	Output of measuring range (maximum / minimum) for the mass flow Qm.
MASS_FLOW_QM_ RANGE_MIN	18	71	87	Simple	Float	N	4	r	
VOLUME_FLOW_QV_MAX	18	72	88	Simple	Float	S	4	r,w	Setting of the upper measuring range value 1 for the volume flow for feed flow and reverse flow. The value is also used to calculate the corresponding percentage value. This parameter is only available if the volume flow output 'Qv [unit]' was selected when configuring the power and digital outputs.
VOLUME_FLOW_QV_MAX2	18	73	89	Simple	Float	S	4	r,w	Setting of the upper measuring range value 2 for the volume flow for feed flow and reverse flow. The value is also used to calculate the corresponding percentage value. This parameter is only available if the value 'Qv Max 2' has been selected for the parameter 'Qv measuring range.'
VOLUME_FLOW_QV_ RANGE_MODE	18	74	90	Simple	Unsigned8	S	1	r,w	Manual switchover between the measuring ranges (Qm Max / Qm Max 2) for the volume flow measurement. This parameter is only available if the value 0x01 or 0x03 as been selected for the parameter 'RANGE_MODE_CONFIG.'
VOLUME_FLOW_RATIO	18	75	91	Simple	Float	D	4	r	Process variable – Volume flow in %
VOLUME_FLOW_QV_ RANGE_MAX	18	76	92	Simple	Float	N	4	r	Output of measuring range (maximum / minimum) for the volume flow Qv.
VOLUME_FLOW_QV_ RANGE_MIN	18	77	93	Simple	Float	N	4	r	
TEMPERATURE_RATIO	18	78	94	Simple	Float	D	4	r	Measured value of the measuring medium temperature in %
DENSITY_RATIO	18	79	95	Simple	Float	D	4	r	Measured value of the measuring medium density in %
NET_MASS_FLOW	18	80	96	Record	DS-101	D	5	r	Net mass flow measured value
NET_MASS_FLOW_ QM_MAX	18	81	97	Simple	Float	S	4	r,w	Setting of the maximum net mass flow. The values are also used to calculate the corresponding percentage value. The parameters are only available when the DensiMass function is activated

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
NET_MASS_FLOW_RATIO	18	82	98	Simple	Float	D	4	r	Process variable – Net mass flow in %
NET_VOLUME_FLOW	18	83	99	Record	DS-101	D	5	r	Process variable – Net volume flow.
NET_VOLUME_FLOW_ QV_MAX	18	84	100	Simple	Float	S	4	r,w	Setting of the maximum net volume flow. The values are also used to calculate the corresponding percentage value. The parameters are only available when the DensiMass function is activated
NET_VOLUME_ FLOW_RATIO	18	85	101	Simple	Float	D	4	r	Process variable – Net volume flow in %.
VOLUME_FLOW_AT_TREF	18	86	102	Record	DS-101	D	5	r	Process variable – Volume flow at a reference temperature.
VOLUME_FLOW_ QV_MAX_AT_TREF	18	87	103	Simple	Float	S	4	r,w	Setting the maximum volume flow of the measuring medium at the reference temperature T_{ref}. The value is also used to calculate the corresponding percentage value. The parameter is only available when the DensiMass function is activated.
VOLUME_FLOW_AT_TREF_R ATIO	18	88	104	Simple	Float	D	4	r	Process variable – Volume flow in % at a reference temperature.
DENSITY_AT_TREF	18	89	105	Record	DS-101	D	5	r	Process variable – Measuring medium density at a reference temperature.
DENSITY_MAX_AT_TREF	18	90	106	Simple	Float	S	4	r,w	Sets the minimum and maximum density of the measuring medium at the reference temperature T_{ref}. The values are also used to calculate the corresponding percentage value. The parameters are only available when the DensiMass function is activated.
DENSITY_MIN_AT_TREF	18	91	107	Simple	Float	S	4	r,w	
DENSITY_AT_TREF_RATIO	18	92	108	Simple	Float	D	4	r	Process variable – Measuring medium density in % at a reference temperature.
SPECIFIC_GRAVITY	18	93	109	Record	DS-101	D	5	r	Process variable – Specific weight for liquids.
API_GRAVITY	18	94	110	Record	DS-101	D	5	r	Process variable – Crude oil density in API degrees
SENSOR_LOCATION_TAG	18	95	111	Simple	Visible String	S	20	r,w	Entry of the measuring point tag for the sensor. Alphanumeric, max. 20 characters
SENSOR_TAG	18	96	112	Simple	Visible String	S	20	r,w	Enter the TAG number for the measuring sensor. Alphanumeric, max. 20 characters.
DAMPING_QM	18	97	113	Simple	Float	S	4	r,w	Sets the damping for measuring mass flow. The value set here relates to 1 τ (Tau). The value refers to the response time for a stepwise mass flow change.

… 3 Block overview

… Transducer Block 1 – Flow – slot 18

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
DAMPING_DENSITY	18	98	114	Simple	Float	S	4	r,w	Sets the damping for measuring density. The value set here relates to 1 τ (Tau). The value refers to the response time for a stepwise density change.
DENSITY_MODE	18	99	115	Simple	Unsigned8	S	1	r,w	Selection of operating mode for density measurement. 0x01: Measured density – The density of the measuring medium is calculated by the transmitter. 0x00: Fixed density – The density of the measuring medium is specified as a constant in parameter 'DENSITY_FIXED_VALUE.' The 'Fixed density' operating mode can be used to enable standard volumes to be calculated.
DENSITY_FIXED_VALUE	18	100	116	Simple	DS-101	S	5	r,w	Sets the density of the measuring medium, for example, when measuring the standard volume of gases.
LOW_FLOW_HYSTERESIS	18	101	117	Simple	Float	S	4	r,w	Sets the hysteresis for the low flow cut-off as defined in the parameter 'DENSITY_CUT_OFF.' Factory setting: 20 %
DENSITY_CUT_OFF	18	102	118	Simple	Float	S	4	r,w	Sets the switching threshold for the low flow cut-off. If the flow rate is below the switching threshold, there is no flow measurement. The setting of 0 % deactivates the low flow cut-off. Factory setting: 0.5 %
TX_LOCATION_TAG	18	103	119	Simple	Visible String	S	20	r,w	Entry of the measuring point tag for the transmitter. Alphanumeric, max. 20 characters
TX_TAG	18	104	120	Simple	Visible String	S	20	r,w	Entry of the TAG number for the transmitter. Alphanumeric, max. 20 characters
PLANT_DATA_SYNC	18	105	121	Simple	Unsigned8	S	1	r,w	The transmitter saves its configuration in the 'SensorMemory'. The data is stored redundantly on the motherboard (MB) of the transmitter and on the frontend board (FEB) of the sensor. This means the configuration can be restored quickly if any components are replaced. 0x02: FEB > MB – Loading the configuration from the frontend board (FEB) of the sensor. 0x01: MB > FEB – Loads the configuration from the motherboard (MB) in the transmitter.
DEVICE_RESET	18	106	122	Simple	Unsigned8	S	1	w	Restarts the device. Compensates for a short interruption of the power supply.
RESTORE_FACTORY_ DEFAULTS	18	107	123	Simple	Unsigned8	S	1	w	All user-accessible parameters will be reset to the factory default settings.

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
DENSIMASS_ON_OFF	18	108	124	Simple	Unsigned8	D	1	r	Indicates whether the DensiMass function is active.
DENSIMASS_CODE	18	109	125	Simple	Unsigned16	S	2	r,w	Sets the device-specific code for activating the DensiMass function. To use this function subsequently, contact the ABB service team or sales organization. After entering the code, restart the device (for example using the parameter 'DEVICE_RESET' or by briefly switching off the power supply).
FILLMASS_ON_OFF	18	110	126	Simple	Unsigned8	D	1	r	Indicates whether the FillMass function is active.
FILLMASS_CODE	18	111	127	Simple	Unsigned16	S	2	r,w	Sets the device-specific code for activating the FillMass function. To use this function subsequently, contact the ABB service team or sales organization. After entering the code, restart the device (for example using the parameter 'DEVICE_RESET' or by briefly switching off the power supply).
VERIMASS_ON_OFF	18	112	128	Simple	Unsigned8	D	1	r	Indicates whether the VeriMass function is active.
VERIMASS_CODE	18	113	129	Simple	Unsigned16	S	2	r,w	Sets the device-specific code for activating the VeriMass function. To use this function subsequently, contact the ABB service team or sales organization. After entering the code, restart the device (for example using the parameter 'DEVICE_RESET' or by briefly switching off the power supply).
CONCENTRATION_UNIT	18	114	130	Simple	Unsigned8	S	1	r,w	Selection of unit for concentration measurement. Refer to .
CONCENTRATION_MAX	18	115	131	Simple	Float	S	4	r,w	Sets the minimum and maximum concentration of the measuring medium. The values are also used to calculate the corresponding percentage value. The value depends on the selected matrix. The parameters are only available when the DensiMass function is activated.
CONCENTRATION_MIN	18	116	132	Simple	Float	S	4	r,w	
CONCENTRATION_ MEDIUM	18	117	133	Simple	Unsigned8	S	1	r,w	Selection of measuring medium for concentration measurement using the DensiMass function. 0x01: Variable matrix 0x02: Sodium hydroxide 0x03: Alcohol in water 0x03: Wheat starch 0x04: Corn starch 0x05: Sugar in water 0x80: °API gravity

… 3 Block overview

… Transducer Block 1 – Flow – slot 18

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
CONCENTRATION_SUB_MATRIX_SELECT	18	118	134	Simple	Unsigned8	S	1	r,w	Selection of sub-matrix for concentration measurement. Only available if the matrix selected from Medium has two sub-matrices. 0x01: Sub_Matrix 1 0x02: Sub_Matrix 2
CONCENTRATION_REFERENCE_TEMP	18	119	135	Simple	Float	S	4	r,w	Setting of the reference temperature for calculating the process variables 'Qv @Tref' and 'Density @Tref[unit].'
CONCENTRATION	18	120	136	Record	DS-101	D	5	r	Process variable – Concentration
CONCENTRATION_RATIO	18	121	137	Simple	Float	D	4	r	Process variable – Concentration in the selected unit in %
CONCENTRATION_PERCENT	18	122	138	Simple	Float	D	4	r	Process variable – Concentration in the selected unit in %
CONCENTRATION_ZERO_MATRIX_1	18	123	139	Simple	Float	S	4	r,w	Setting indicating the correction factor for concentration measurement.
CONCENTRATION_ZERO_MATRIX_2	18	124	140	Simple	Float	S	4	r,w	This factor can be used to perform optimization in the field in order to achieve a degree of accuracy in the concentration measurement that closely approximates or even exceeds the repeatability. This value acts as a correction value for the current concentration measured value. The correction factor is entered in the unit that is currently set for concentration. The correction value is based on the concentration matrix currently selected. In the case of one fixed matrix, only one correction value is available. In case of variable matrices, both correction values are available. The parameter is only available when the DensiMass function is activated.
FIELD_OPT_DENSITY_CORRECTION	18	125	141	Simple	Float	S	4	r,w	Sets the correction factor for field optimization of the density measurement. This factor can be used to perform optimization in the field in order to achieve a degree of accuracy in the density measurement that closely approximates a repeatability of 0.0001 g/ml.
FIELD_OPT_QM_CORRECTION	18	126	142	Simple	Float	S	4	r,w	Sets the correction factor for field optimization of the mass flow measurement. The value is entered as a percentage of the current measured value. This factor can be used to perform optimization in the field in order to achieve a degree of accuracy in the flow measurement that closely approximates or even exceeds a repeatability of at least 0.1 % of the measured value.
HLGV_HOLD_TIME	18	127	143	Simple	Float	S	4	r,w	Entry of the time for the function 'Keep last value.' The function is deactivated by the setting of '0'.
HLGV_THRESHOLD_RELEASE	18	128	144	Simple	Float	S	4	r,w	Sets the switching threshold for the function 'Keep last value.' The last valid measured value for the duration of the set hold time is displayed if the sensor voltage is below the set value.

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
HLGV_THRESHOLD_HOLD	18	129	145	Simple	Float	S	4	r,w	Sets the switching threshold for the function ‘Keep last value.’ The current measured value is displayed if the sensor voltage is above the set value.
PRESSURE_CORRECTION_UNIT	18	130	146	Simple	Unsigned8, Unsigned16	S	1	r,w	Selection of the unit for the pressure (for example for the associated parameters and the corresponding process values). Refer to . Factory setting: bar
PRESSURE_CORRECTION_LEVEL	18	131	147	Simple	DS-101	S	5	r,w	Input of the process pressure of the medium in the meter tube. The value is used to compensate for the influence of pressure on the measurement of the mass flow and the density.
USER_UNIT_MASSFLOW_QM_NAME	18	132	148	Simple	Visible String	S	8	r,w	Sets the name or abbreviation of the user-defined unit for mass flow.
USER_UNIT_MASSFLOW_QM_FACTOR	18	133	149	Simple	Float	S	4	r,w	Sets the factor of the user-defined unit for mass flow in kg / seconds.
USER_UNIT_VOLUMEFLOW_QV_NAME	18	134	150	Simple	Visible String	S	8	r,w	Sets the name or abbreviation of the user-defined unit for volume flow.
USER_UNIT_VOLUMEFLOW_QV_FACTOR	18	135	151	Simple	Float	S	4	r,w	Sets the factor of the user-defined unit for volume flow in liters/seconds.
USER_UNIT_DENSITY_NAME	18	136	152	Simple	Visible String	S	8	r,w	Sets the name or abbreviation for the user-defined density unit.
USER_UNIT_DENSITY_FACTOR	18	137	153	Simple	Float	S	4	r,w	Sets the factor for the user-defined density unit in liters/seconds.
USER_UNIT_TEMPERATURE_NAME	18	138	154	Simple	Visible String	S	8	r,w	Sets the name or abbreviation for the user-defined temperature unit.
USER_UNIT_TEMPERATURE_FACTOR	18	139	155	Simple	Float	S	4	r,w	Sets the factor for the user-defined temperature unit in °C.
ARBITRARY_OBJ_ACCESS_SPEC	18	140	156	Record	Idx_Config	S	7	r,w	Reserved by ABB
ARBITRARY_OBJ_ACCESS_RW	18	141	157	Array	Unsigned8	S	32	r,w	Reserved by ABB
AO_PV_CONTROL_OFF	18	142	158	Record	DS-101	S	5	r	OFF function for AO function blocks
NET_MASS_FLOW_QM_RANGE_MAX	18	143	159	Simple	Float	N	4	r	Output of measuring range (maximum / minimum) for the net mass flow.
NET_MASS_FLOW_QM_RANGE_MIN	18	144	160	Simple	Float	N	4	r	
NET_VOLUME_FLOW_QV_RANGE_MAX	18	145	161	Simple	Float	N	4	r	Output of measuring range (maximum / minimum) for the net volume flow.
NET_VOLUME_FLOW_QV_RANGE_MIN	18	146	162	Simple	Float	N	4	r	

… 3 Block overview

… Transducer Block 1 – Flow – slot 18

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
CORIOLIS_CONTROL_ ON_OFF	18	147	163	Simple	Unsigned8	D	1	r	CoriolisControl function active?* 0: Off: CoriolisControl function deactivated. 1: On: CoriolisControl function activated. This parameter is read only.
CORIOLIS_CONTROL_ CODE	18	148	164	Simple	Unsigned16	S	2	r,w	Set the device-specific code for activating the CoriolisControl function. After entering the code, restart the device (e.g. using parameter “DEVICE_RESET”, see page 34, or by briefly switching off the power supply).
MEASURING_MODE	18	149	165	Simple	Unsigned8	S	1	r, w	Selection of the measurement mode (liquid / gas). The measurement method for liquids and gases can be optimized by selecting the measurement mode. 0: Automatic: automatic detection of the measurement mode. Selection with changing measuring media. 1: Gases: selection in the case of pure gas measurement. 2: Liquids: selection in the case of pure liquid measurement.
CORIOLIS_CONTROL_ ECC_MODE	18	150	166	Simple	Unsigned8	S	1	r, w	Activate the “Extended Coriolis Control Mode” for applications with fast density changes, e.g. for gas bubbles in the measuring medium and filling applications 0: Off 1: On
CORIOLIS_CONTROL_ ECC_LEVEL	18	151	167	Simple	Unsigned8	S	1	r, w	Selection of interval for frequency estimation 0: Low 1: Medium 2: High
CORIOLIS_CONTROL_ FLOW_NOISE_REDUC	18	152	168	Simple	Unsigned8	S	1	r, w	Selection of the dead time for the noise filter for mass / density measurement.
CORIOLIS_CONTROL_ DENSITY_NOISE_R	18	153	169	Simple	Unsigned8	S	1	r, w	0: Off 1: Filter 1 (0.5 s) 2: Filter 2 (1.0 s) 3: Filter 3 (2.0 s) 4: Filter 4 (4.0 s) 5: Filter 5 (8.0 s)

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
PRESSURE_CORRECTION_PECI_STATUS	18	154	170	Simple	Unsigned8	S	1	r, w	Selection of the pressure compensation mode. According to the API, the following states can be set. 1: CT – compensation in the Coriolis flowmeter based on the actual pressure entered in the parameter “Pressure Level” 2: TD – compensation in the Coriolis flowmeter switched off – compensation is performed externally (Tertiary Device) 3: OS – Compensation in the Coriolis flowmeter switched off – compensation is not performed on site (Off Site) 4: NA – Compensation in the Coriolis flowmeter switched off – compensation is not considered necessary as the device operates at the pressure at which it was tested (proved).
PRESSURE_COMPENSAT_FACTOR_FLOW	18	155	171	Simple	Float	N	4	r	Output of the current flow compensation factor used in the device to calculate the mass flow.
PRESSURE_COMPENSAT_FACTOR_DENSIT	18	156	172	Simple	Float	N	4	r	Output of the current density compensation factor used in the device to calculate the mass flow.
PRESSURE_COMPENSATION_UNIT	18	157	173	Simple	Unsigned8	N	1	r	Output of the current unit of the flow and density compensation factor. Subject to the pressure unit set. 101: %/Pa 104: %/kPa 108: %/Bar 109: %/mbar 165: %/psi

… 3 Block overview

Transducer Block 2 – Device Info – slot 19

The transducer block - device info is a manufacturer-specific transducer block.
It contains additional information about the transmitter. All parameters in this block are read-only.

Transducer Block 2 – Device Info – parameters

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
BLOCK_OBJECT	19	0	16	Record	DS-32	Cst	20	r	–
ST_REV	19	1	17	Simple	Unsigned16	N	2	r	–
TAG_DESC	19	2	18	Simple	OctetString	S	32	r,w	–
STRATEGY	19	3	19	Simple	Unsigned16	S	2	r,w	–
ALERT_KEY	19	4	20	Simple	Unsigned8	S	1	r,w	–
TARGET_MODE	19	5	21	Simple	Unsigned8	S	1	r,w	–
MODE_BLK	19	6	22	Record	DS-37	D	3	r	–
ALARM_SUM	19	7	23	Record	DS-42	D	8	r	–
SENSOR_TYPE	19	8	24	Simple	Unsigned8	N	1	r	Sensor type.
METER_SIZE	19	9	25	Simple	Unsigned8	N	1	r	Nominal diameter of sensor.
FEATURE_SERIES	19	10	26	Simple	Unsigned8	N	1	r	Sensor model. DensiMass and FillMass functions are only available in models FCB450 / FCH450/FCD450.
SPAN_FORWARD	19	11	27	Simple	Float	N	4	r	Calibration value (range) in the forward flow and return flow
SPAN_REVERSE	19	12	28	Simple	Float	N	4	r	direction of the sensor.
ZERO_SENSOR	19	13	29	Simple	Float	N	4	r	Calibration value (zero point) of the sensor for the selected nominal diameter.
FREQ_AT_EMPTY_PIPE	19	14	30	Simple	Float	N	4	r	Meter tube frequency and density during calibration with an
DENSITY_AT_EMPTY_PIPE	19	15	31	Simple	Float	N	4	r	empty or full meter tube.
FREQ_AT_FULL_PIPE	19	16	32	Simple	Float	N	4	r	Calibration with an empty meter tube is performed using air;
DENSITY_AT_FULL_PIPE	19	17	33	Simple	Float	N	4	r	calibration with a full meter tube is performed using water.
SENSOR_ID	19	18	34	Simple	Unsigned32	N	4	r	ID number of the sensor.
SENSOR_SERIAL_NR	19	19	35	Simple	Visible String	N	20	r	Serial number of the sensor.
SENSOR_RUN_HOURS	19	20	36	Simple	Unsigned32	N	4	r	Operating hours of the sensor.
SENSOR_FIRST_CAL_DATE	19	21	37	Array	Unsigned8	N	3	r	Date of first calibration of sensor (calibration of new device).
SENSOR_LAST_CAL_DATE	19	22	38	Array	Unsigned8	N	3	r	Date of last calibration of sensor.
SENSOR_CAL_CERT_NR	19	23	39	Simple	Visible String	N	20	r	Identification (number) of the relevant calibration certificate.
SENSOR_FIRST_CAL_ LOCATION	19	24	40	Simple	Visible String	N	20	r	Place of first calibration of the sensor.
SENSOR_LAST_CAL_ LOCATION	19	25	41	Simple	Visible String	N	20	r	Place of last calibration of sensor.

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
TRANSM_TYPE	19	26	42	Simple	Unsigned8	N	1	r	Type of transmitter.
TRANSM_ID	19	27	43	Simple	Unsigned32	N	4	r	ID number of transmitter.
TRANSM_SERIAL_NR	19	28	44	Simple	Visible String	N	20	r	Serial number of transmitter.
TRANSM_RUN_HOURS	19	29	45	Simple	Unsigned32	N	4	r	Run hours of the transmitter.
TRANSM_RESTART_COUNTER	19	30	46	Simple	Unsigned16	N	2	r	Number of device restarts (switching the power supply off and on).
TIME_SINCE_RESTART	19	31	47	Simple	Unsigned32	N	4	r	Device operating hours since the last restart.
TRANSM_FIRST_CAL_DATE	19	32	48	Array	Unsigned8	N	3	r	Date of first calibration of transmitter (calibration of new device).
TRANSM_LAST_CAL_DATE	19	33	49	Array	Unsigned8	N	3	r	Date of last calibration of transmitter.
TRANSM_CAL_CERT_NR	19	34	50	Simple	Visible String	N	20	r	Identification (number) of the relevant calibration certificate.
TRANSM_FIRST_CAL_LOCATION	19	35	51	Simple	Visible String	N	20	r	Place of first calibration of transmitter.
TRANSM_LAST_CAL_LOCATION	19	36	52	Simple	Visible String	N	20	r	Place of last calibration of transmitter.
MANUFACTURER	19	37	53	Simple	Visible String	N	20	r	Name of manufacturer.
STREET	19	38	54	Simple	Visible String	N	20	r	Manufacturer's address (street).
CITY	19	39	55	Simple	Visible String	N	20	r	Manufacturer's address (city).
PHONE	19	40	56	Simple	Visible String	N	20	r	Manufacturer's address (phone number).
FW_VERSION_DEVICE	19	41	57	Array	Unsigned8	N	3	r	Version and item number of device software package.
FW_PART_NR_DEVICE	19	42	58	Simple	Visible String	N	20	r	
FW_VERSION_MOTHERBOARD	19	43	59	Simple	Visible String	N	8	r	Version and checksum (CRC) of motherboard (MB) software in transmitter.
FW_CRC_MOTHERBOARD	19	44	60	Simple	Unsigned16	N	2	r	
FW_VERSION_FRONTEND	19	45	61	Simple	Visible String	N	8	r	Version and checksum (CRC) of frontend board (FEB) software in sensor.
FW_CRC_FRONTEND	19	46	62	Simple	Unsigned16	N	2	r	
HW_VERSION_MOTHERBOARD	19	47	63	Simple	Visible String	N	20	r	Hardware version of motherboard (MB) in transmitter.
HW_VERSION_FRONTEND	19	48	64	Simple	Visible String	N	20	r	Hardware version of frontend board (FEB) in sensor.
BOOTLOADER_VERSION_MOTHERBOARD	19	49	65	Simple	Visible String	N	8	r	Version of motherboard (MB) bootloader in transmitter.
BOOTLOADER_VERSION_FRONTEND	19	50	66	Simple	Visible String	N	8	r	Version of frontend board (FEB) bootloader in sensor.

… 3 Block overview

… Transducer Block 2 – Device Info – slot 19

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
FW_VERSION_CURR_ OUT_31_32	19	51	67	Simple	Visible String	N	8	r	Current output module software version and checksum (CRC).
FW_CRC_CURR_ OUT_31_32	19	52	68	Simple	Unsigned16	N	2	r	
OPTION_CARD_1_TYPE	19	53	69	Simple	Unsigned8	N	1	r	Type of plug-in card present in the slot OC1. 0x0A: Profibus DP (white)
OPTION_CARD_2_TYPE	19	54	70	Simple	Unsigned8	N	1	r	Type of plug-in card present in the slot OC2. 0x02: Digital input, passive (yellow) 0x03: Digital output, passive (green) 0x0D: Slot not occupied 0x0E: Card error 0x81: Current output 4 to 20 mA passive (red), not usable
FW_VERSION_ FIELDBUSCARD	19	55	71	Simple	Visible String	N	8	r	Firmware version of the fieldbus plug-in card.
FW_CRC_FIELDBUSCARD	19	56	72	Simple	Unsigned16	N	2	r	Checksum of the fieldbus plug-in card.
BOOTLOADER_VERSION_ FIELDBUSCARD	19	57	73	Simple	Visible String	N	8	r	Bootloader version of the fieldbus plug-in card.
PRESSURE_LEVEL_AT_ CALIBRATION	19	58	74	Simple	Float	N	4	r	Measuring medium pressure in the selected pressure unit during calibration.
TEMPERATURE_AT_ CALIBRATION	19	59	75	Simple	Float	N	4	r	Measuring medium temperature in °C during calibration.
FW_VERSION_MB_AS_ ARRAY	19	60	76	Array	Unsigned8	N	3	r	Version and checksum (CRC) of motherboard (MB) software in transmitter as an array with 3 bytes.
FW_VERSION_FEB_AS_ ARRAY	19	61	77	Array	Unsigned8	N	3	r	Version and checksum (CRC) of frontend board (FB) software in sensor as an array with 3 bytes.
FW_VERSION_CO31_32_ AS_ARRAY	19	62	78	Array	Unsigned8	N	3	r	Version and checksum (CRC) of the current output module as an array with 3 bytes.
–	19	63 to 72	79 to 88	–	–	–	–	–	Reserved for later use

Transducer Block 3 – Special Function – Slot 20

The transducer block - special function is a manufacturer-specific transducer block.
It contains parameters for configuring the pulse output or switch output and the internal totalizers.

Transducer Block 3 – Special Function – parameters

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
BLOCK_OBJECT	20	0	16	Record	DS-32	Cst	20	r	–
ST_REV	20	1	17	Simple	Unsigned16	N	2	r	–
TAG_DESC	20	2	18	Simple	OctetString	S	32	r,w	–
STRATEGY	20	3	19	Simple	Unsigned16	S	2	r,w	–
ALERT_KEY	20	4	20	Simple	Unsigned8	S	1	r,w	–
TARGET_MODE	20	5	21	Simple	Unsigned8	S	1	r,w	–
MODE_BLK	20	6	22	Record	DS-37	D	3	r	–
ALARM_SUM	20	7	23	Record	DS-42	D	8	r	–
TOTALIZER_MASS_UNIT	20	8	24	Simple	Unsigned16	S	1	r,w	Selection of unit for the mass counters. Refer to .
TOTALIZER_VOLUME_ UNIT	20	9	25	Simple	Unsigned16	S	1	r,w	Selection of unit for the volume totalizers. Refer to .
USER_UNIT_MASS_TOTAL_ NAME	20	10	26	Simple	Visible String	S	8	r,w	Sets the name or abbreviation of the user-defined unit for the mass counter.
USER_UNIT_MASS_TOTAL_F ACTOR	20	11	27	Simple	Float	S	4	r,w	Sets the factor of the user-defined unit for the mass counter in kg.
USER_UNIT_VOLUME_ TOTAL_NAME	20	12	28	Simple	Visible String	S	8	r,w	Sets the name or abbreviation of the user-defined unit for the volume totalizer.
USER_UNIT_VOLUME_ TOTAL_FACTOR	20	13	29	Simple	Float	S	4	r,w	Sets the factor of the user-defined unit for the volume totalizer in liters.
TOTALIZER_QM_FWD	20	14	30	Record	DS-101	D	5	r	Process variable – Mass flow counter reading in the forward flow direction.
TOTALIZER_QM_REV	20	15	31	Record	DS-101	D	5	r	Process variable – Mass flow counter reading in the reverse flow direction.
TOTALIZER_QM_DIFF	20	16	32	Record	DS-101	D	5	r	Process variable – Mass flow counter reading for forward flow / reverse flow difference.
TOTALIZER_QM_SUM	20	17	33	Simple	DS-101	D	5	r	Process variable – Absolute value from mass flow counter reading in the forward flow and reverse flow direction. The counter cannot be stopped or reset.
TOTALIZER_QV_FWD	20	18	34	Record	DS-101	D	5	r	Process variable – Volume flow counter reading in the forward flow direction.
TOTALIZER_QV_REV	20	19	35	Record	DS-101	D	5	r	Process variable – Volume flow counter reading in the reverse flow direction
TOTALIZER_QV_DIFF	20	20	36	Record	DS-101	D	5	r	Process variable – Volume flow counter reading for forward flow / reverse flow difference
TOTALIZER_QV_SUM	20	21	37	Simple	DS-101	D	5	r	Process variable – Absolute value from volume flow counter reading in the forward flow and reverse flow direction. The counter cannot be stopped or reset.

… 3 Block overview

… Transducer Block 3 – Special Function – Slot 20

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
TOTALIZER_NET_QM_FWD	20	22	38	Record	DS-101	D	5	r	Process variable – Net mass flow counter reading in the forward flow direction.
TOTALIZER_NET_QM_REV	20	23	39	Record	DS-101	D	5	r	Process variable – Net mass flow counter reading in the reverse flow direction.
TOTALIZER_NET_QM_DIFF	20	24	40	Record	DS-101	D	5	r	Process variable – Net mass flow counter reading for forward flow / reverse flow difference.
TOTALIZER_NET_QM_SUM	20	25	41	Simple	DS-101	D	5	r	Process variable – Absolute value from net mass flow counter reading in the forward flow and reverse flow direction. The counter cannot be stopped or reset.
TOTALIZER_NET_QV_FWD	20	26	42	Record	DS-101	D	5	r	Process variable – Net volume flow counter reading in the forward flow direction.
TOTALIZER_NET_QV_REV	20	27	43	Record	DS-101	D	5	r	Process variable – Net volume flow counter reading in the reverse flow direction.
TOTALIZER_NET_QV_DIFF	20	28	44	Record	DS-101	D	5	r	Process variable – Net volume flow counter reading for forward flow / reverse flow difference.
TOTALIZER_NET_QV_SUM	20	29	45	Simple	DS-101	D	5	r	Process variable – Absolute value from net volume flow counter reading in the forward flow and reverse flow direction. The counter cannot be stopped or reset.
TOTALIZER_QV_AT_TREF_FWD	20	30	46	Record	DS-101	D	5	r	Process variable – Volume flow counter reading in forward flow direction at a reference temperature.
TOTALIZER_QV_AT_TREF_REV	20	31	47	Record	DS-101	D	5	r	Process variable – Volume flow counter reading in reverse flow direction at a reference temperature.
TOTALIZER_QV_AT_TREF_DIFF	20	32	48	Record	DS-101	D	5	r	Process variable – Volume flow counter reading for forward flow / reverse flow difference at a reference temperature.
TOTALIZER_QV_AT_TREF_SUM	20	33	49	Simple	DS-101	D	5	r	Process variable – Absolute value from volume flow counter reading in forward flow and reverse flow direction at a reference temperature. The counter cannot be stopped or reset.
TOTALIZER_START_ALL	20	34	50	Simple	Unsigned8	S	1	r,w	Starts all counters.
TOTALIZER_STOP_ALL	20	35	51	Simple	Unsigned8	S	1	r,w	Stops all totalizers.
TOTALIZER_RESET_ALL	20	36	52	Simple	Unsigned8	S	1	r,w	Resets all totalizers to zero.
TOTALIZER_RESET_ALL_QM	20	37	53	Simple	Unsigned8	S	1	r,w	Reset all mass totalizers to zero.
TOTALIZER_RESET_ ALL_QV	20	38	54	Simple	Unsigned8	S	1	r,w	Resets all volume totalizers to zero.

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
TOTALIZER_RESET_QM_FWD	20	39	55	Simple	Unsigned8	S	1	r,w	Resets mass totalizers in forward flow (direction).
TOTALIZER_RESET_QM_REV	20	40	56	Simple	Unsigned8	S	1	r,w	Resets mass totalizers in the reverse flow (direction).
TOTALIZER_RESET_QV_FWD	20	41	57	Simple	Unsigned8	S	1	r,w	Resets volume totalizers in forward flow (direction).
TOTALIZER_RESET_QV_REV	20	42	58	Simple	Unsigned8	S	1	r,w	Resets volume totalizers in the reverse flow (direction).
TOTALIZER_RESET_NET_QM_FWD	20	43	59	Simple	Unsigned8	S	1	r,w	Resets net mass totalizers in forward flow (direction).
TOTALIZER_RESET_NET_QM_REV	20	44	60	Simple	Unsigned8	S	1	r,w	Resets net mass totalizers in the reverse flow (direction).
TOTALIZER_RESET_NET_QV_FWD	20	45	61	Simple	Unsigned8	S	1	r,w	Resets net volume totalizers in forward flow (direction).
TOTALIZER_RESET_NET_QV_REV	20	46	62	Simple	Unsigned8	S	1	r,w	Resets net volume totalizers in the reverse flow (direction).
TOTALIZER_RESET_QV_FWD_AT_TREF	20	47	63	Simple	Unsigned8	S	1	r,w	Resets net volume totalizers with T_{ref} in forward flow (direction).
TOTALIZER_RESET_QV_REV_TREF	20	48	64	Simple	Unsigned8	S	1	r,w	Resets net volume totalizers with T_{ref} in the revere flow (direction).
TOTALIZER_PRESET_QM_FWD	20	49	65	Simple	Float	S	4	r,w	Input from meter readings (for example when replacing the transmitter).
TOTALIZER_PRESET_QM_REV	20	50	66	Simple	Float	S	4	r,w	
TOTALIZER_PRESET_QV_FWD	20	51	67	Simple	Float	S	4	r,w	
TOTALIZER_PRESET_QV_REV	20	52	68	Simple	Float	S	4	r,w	
TOTALIZER_PRESET_NET_QM_FWD	20	53	69	Simple	Float	S	4	r,w	
TOTALIZER_PRESET_NET_QM_REV	20	54	70	Simple	Float	S	4	r,w	
TOTALIZER_PRESET_NET_QV_FWD	20	55	71	Simple	Float	S	4	r,w	
TOTALIZER_PRESET_NET_QV_REV	20	56	72	Simple	Float	S	4	r,w	
TOTALIZER_PRESET_QV_FWD_AT_TREF	20	57	73	Simple	Float	S	4	r,w	
TOTALIZER_PRESET_QV_REV_AT_TREF	20	58	74	Simple	Float	S	4	r,w	

… 3 Block overview

… Transducer Block 3 – Special Function – Slot 20

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
FILLMASS_BATCH_ PROCESS_VALUE	20	59	75	Simple	Unsigned8	S	1	r,w	Selection of process variable used during the filling process. The process variables 'net Qv forward' and 'net Qm forward' are only available when the DensiMass function is activated. 0x00: Off – Filler disabled. 0x40: Volume forward flow (direction) – Volume flow in forward flow (direction) 0x41: Standard volume forward flow (direction) – Standard volume flow in forward flow (direction). 0x42: Mass forward flow (direction): Mass flow in forward flow (direction). 0x43: Net Qv forward: Net volume flow in forward flow (direction). 0x44: Net Qm forward: Net mass flow in forward flow (direction).
FILLMASS_PRESET_ BATCH_TOTALIZER	20	60	76	Simple	Float	S	4	r,w	Sets the fill quantity using the selected unit. When the defined fill quantity is reached, the configured binary output is activated. **Note** Before setting the fill quantity, the corresponding process value must be selected with the parameter FILLMASS_BATCH_PROCESS_VALUE.
FILLMASS_RESET_ CURRENT_BATCH_TOT	20	61	77	Simple	Unsigned8	S	1	r,w	Resets the current fill quantity.
FILLMASS_START_ BATCHING	20	62	78	Simple	Unsigned8	S	1	r,w	Manual start of the filling function. Alternatively, the digital input can be configured for starting / stopping the fill operation.
FILLMASS_BATCH_ TOTALIZER	20	63	79	Record	DS-101	D	5	r	Process variable - Current fill quantity. Once a fill operation has been started, the quantity already filled is shown here. The counter restarts at zero for each fill operation initiated and then counts up to the set fill quantity.
FILLMASS_STOP_ BATCHING	20	64	80	Simple	Unsigned8	S	1	r,w	Manual stop of the filling function. Alternatively, the digital input can be configured for starting / stopping the fill operation.
FILLMASS_BATCH_ COUNTS	20	65	81	Simple	Unsigned32	D	4	r	Process variable – Display of the number of fill operations since the last reset.
FILLMASS_RESET_BATCH_C OUNTS	20	66	82	Simple	Unsigned8	S	1	r,w	Sets the parameter FILLMASS_BATCH_ COUNTS to zero.

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
FILLMASS_LAG_ADJ_ MODE	20	67	83	Simple	Unsigned8	S	1	r,w	Selection of overrun correction. Closing the fill valve takes some time and as a consequence more liquid is added, even though the fill quantity is reached and the contact for closing the valve is actuated. 0x01: Automatic – The overrun quantity is calculated by the transmitter automatically. 0x00: Manual – the overrun quantity must be determined mAnually and entered in the selected unit via the parameter FILLMASS_LAG_ADJ_QUANTITY.
FILLMASS_LAG_ADJ_QUANTITY	20	68	84	Simple	Float	S	4	r,w	Manual entry of the overrun quantity.
FILLMASS_LAG_ADJ_ AUTO_QUANTITY	20	69	85	Simple	Float	S	4	r	Process variable – Overrun quantity automatically calculated by the transmitter.
FILLMASS_LAG_ADJ_ FACTOR	20	70	86	Simple	Float	S	4	r,w	Sets the weighting of the last filling process during automatic calculation of the overrun quantity. The calculation is based on the following formula: New correction value = last correction value + (BatchAuto.Lag Corr.Factor x correction value at the last filling) 0,0: No change to correction value. 1,0: The correction value is immediately adjusted to the overrun quantity calculated during the last fill operation.
FILLMASS_LAG_ADJ_TIME	20	71	87	Simple	Float	S	4	r,w	Sets the time for the overrun quantity correction after the fill valve is closed.
CURR_OUT_31_32_MODE	20	72	88	Simple	Unsigned8	S	1	r,w	Selection of the flow direction for the current output. 0x00: 4 to 20 mA forward – Output of flow in the forward flow (direction). 0x01: 4 ... 12 ... 20 mA – Output flow rate in forward and reverse flow (direction): 4 mA = maximum flow rate in the reverse flow (direction) 12 mA = no flow rate 20 mA = maximum flow rate in the forward flow (direction) 0x02: 4 to 20 mA forward / reverse flow – Output of flow rate in the forward and reverse flow direction without a distinction of the flow rate 0x03: 4 to 20 mA reverse flow – Output of flow in the reverse flow direction.

… 3 Block overview

… Transducer Block 3 – Special Function – Slot 20

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
CURR_OUT_31_32_ ALARM_BEHAVIOUR	20	73	89	Simple	Unsigned8	S	1	r,w	Selection of status of the current output in error condition. 0x00: High_Alarm 0x01: Low_Alarm
CURR_OUT_31_32_ LOW_ALARM	20	74	90	Simple	Float	S	4	r,w	Sets the current for Low Alarm.
CURR_OUT_31_32_ HIGH_ALARM	20	75	91	Simple	Float	S	4	r,w	Sets the current for High Alarm.
CURR_OUT_31_32_ LOW_BEHAVIOUR	20	76	92	Simple	Unsigned8	S	1	r,w	Behavior of the current output if 3.8 mA is not reached. 0x00: Hold last value – The last measured value is retained and issued. 0x01: High alarm – The high alarm current is issued. 0x02: Low alarm – The low alarm current is issued. The parameter is not available '0x02' was selected for the parameter CURR_OUT_31_32_MODE.
CURR_OUT_31_32_ HIGH_BEHAVIOUR	20	77	93	Simple	Unsigned8	S	1	r,w	Behavior of current output if 20.5 mA is exceeded. 0x00: Hold last value – The last measured value is retained and issued. 0x01: High alarm – The high alarm current is issued. 0x02: Low alarm – The low alarm current is issued.
CURR_OUT_31_32_ OUTPUT_READING	20	78	94	Record	DS-101	D	5	r	Output for current output 1
CURR_OUT_31_32_ SCALE_4_MA	20	79	95	Simple	Float	D	4	r,w	Calibration value of current output 1 for 4 mA
CURR_OUT_31_32_ SCALE_20_MA	20	80	96	Simple	Float	D	4	r,w	Calibration value of current output 1 for 20 mA
DIG_OUT_41_42_MODE	20	81	97	Simple	Unsigned8	S	1	r,w	Selection of the operating mode for the digital output 41 / 42. 0x00: Off – Digital output 41 / 42 deactivated. 0x01: Binary – Digital output 41 / 42 as a binary output (for example as an alarm output). 0x03: Pulse – Digital output 41 / 42 as a pulse output. In pulse mode, pulses are output per unit (for example 1 pulse per m3). 0x02: Frequency – Digital output 41 / 42 as a frequency output. In frequency mode, a frequency is issued that is proportional to the flow rate. The maximum frequency can be configured in accordance with the upper range value.

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
DIG_OUT_41_42_OUT_FLOW_DIRECTION	20	82	98	Simple	Unsigned8	S	1	r,w	Selection of flow direction in which the pulse / frequency output issues the selected process value. The parameter is only available if the digital output has been configured as a pulse or frequency output. 0x00: Forward and reverse flow – Pulses for both flow directions are output via digital output 41 / 42. 0x01: Forward flow (direction) – Only pulses in the forward flow (direction) (flow in direction of arrow) are output via digital output 41 / 42. 0x02: Reverse flow – Only pulses (in the) reverse flow (direction) (flow in opposite direction to arrow) are output via digital output 41 / 42.
DIG_OUT_41_42_PULSE_VALUE	20	83	99	Simple	Unsigned8	S	1	r,w	Selection of process variable that is issued via the pulse output. 0x00: None 0x01: Mass flow in the selected mass flow unit 0x02: Standard volume flow in the selected volume unit 0x08: Net mass flow in the selected mass unit 0x09: Net volume flow in the selected volume unit 0x0A: Volume flow at a reference temperature.
DIG_OUT_41_42_PULSE_PER_UNIT	20	84	100	Simple	Float	S	4	r,w	Sets the pulses per mass unit or volume unit (see) and the pulse width for the pulse output.
DIG_OUT_41_42_PULSE_WIDTH	20	85	101	Simple	Float	S	4	r,w	The potential pulse width depends on the configured pulse value and is calculated dynamically.
DIG_OUT_41_42_PULSE_PER_UNIT_MAX	20	86	102	Simple	Float	N	4	r	Maximum possible pulses per mass or volume unit for pulse output 41 / 42.
DIG_OUT_41_42_PULSE_PER_UNIT_MIN	20	87	103	Simple	Float	N	4	r	Minimum possible pulses per mass or volume unit for pulse output 41 / 42.
DIG_OUT_41_42_PULSE_WIDTH_MAX	20	88	104	Simple	Float	N	4	r	Maximum possible pulse width for pulse width 41 / 42.
DIG_OUT_41_42_PULSE_WIDTH_MIN	20	89	105	Simple	Float	N	4	r	Minimum possible pulse width for pulse width 41 / 42.

… 3 Block overview

… Transducer Block 3 – Special Function – Slot 20

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
DIG_OUT_41_42_FREQ_ VALUE	20	90	106	Simple	Unsigned8	S	1	r,w	Selection of process variable that is issued via the frequency output. 0x00: None 0x01: Net mass flow in percent 0x02: Standard volume flow in percent 0x03: Density in percent 0x04: Temperature in percent 0x05: Density at a reference temperature in percent 0x06: Concentration in the selected unit 0x07: Concentration in the selected unit in percent 0x08: Net mass flow in percent 0x09: Net volume flow in percent 0x0A: Volume flow at a reference temperature in percent
DIG_OUT_41_42_FREQ_ UPPER_VALUE	20	91	107	Simple	Float	S	4	r,w	Sets the frequency for the upper range value. The entered value corresponds to 100 % flow.
DIG_OUT_41_42_LOGIC_ ACTION	20	92	108	Simple	Unsigned8	S	1	r,w	Selection of binary output function. 0x00: No function 0x01: Forward/reverse flow signal – The binary output signals the flow direction. 0x02: Alarm signal – The binary output indicates an active alarm. 0x03: Two measuring ranges – The binary output is activated when measuring range 2 (QmMax 2 / QvMax 2) is selected. This selection is only available if the parameter 'Two measuring ranges' has been configured to Qm or Qv. 0x04: End contact fill – the binary output is activated when the set fill quantity is reached (only if the FillMass function is activated). 0x05: Concentration matrix selection – the binary output signals the selected concentration matrix (only with the DensiMass function activated and if the variable matrix has been selected).
DIG_OUT_41_42_LOGIC_ ACTIVE_MODE	20	93	109	Simple	Unsigned8	S	1	r,w	Select switching properties for the binary output. 0x00: Opener 0x01: Closer
DIG_OUT_41_42_ALARM_ GENERAL	20	94	110	Simple	Unsigned8	S	1	r,w	Collective alarm via binary output 41 / 42 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_41_42_ALARM_ QM_MAX	20	95	111	Simple	Unsigned8	S	1	r,w	Maximum alarm mass flow via binary output 41 / 42. 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
DIG_OUT_41_42_ALARM_QM_MIN	20	96	112	Simple	Unsigned8	S	1	r,w	Minimum alarm mass flow via binary output 41 / 42. 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_41_42_ALARM_DENSITY_MIN	20	97	113	Simple	Unsigned8	S	1	r,w	Minimum alarm density via binary output 41 / 42. 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_41_42_ALARM_SIGNAL_MIN	20	98	114	Simple	Unsigned8	S	1	r,w	Minimum alarm voltage sensor via binary output 41 / 42. 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_41_42_ALARM_DRIVER_MAX	20	99	115	Simple	Unsigned8	S	1	r,w	Maximum alarm current sensor via binary output 41 / 42. 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_41_42_FREQ_OUTPUT_VALUE	20	100	116	Simple	Float	D	4	r	Starting value for frequency DO 41 / 42
DIG_OUT_41_42_STATE_OUTPUT_VALUE	20	101	117	Simple	Unsigned8	D	1	r	Starting value for state DO 41 / 42 (binary)
DIG_OUT_51_52_MODE	20	102	118	Simple	Unsigned8	S	1	r,w	

Description

Selection of the operating mode for the digital output 51 / 52.

The operating modes ‘Follow DO1’, ‘90°’ and ‘180°’ are only available if digital output 41 / 42 has been configured as a pulse output.

0x00: Off – Digital output deactivated.

0x01: Binary – digital output functions as binary output (for function, see parameter “DIG_OUT_51_52_LOGIC_ ACTION”).

0x02: Frequency – digital output functions as frequency output (for process value see the parameter “DIG_OUT_41_42_FREQ_ VALUE”). In frequency mode, a frequency proportional to the flow rate is given as output. The maximum frequency can be configured in accordance with the upper range value.

0x04: Sequence DO1 – digital output 51 / 52 follows digital output 41 / 42. Digital output 51 / 52 then also works as a pulse output, the settings for digital output 41 / 42 are adopted. The output of pulses at digital output 51 / 52 is dependent on the setting of the register “DIG_OUT_41_42_LOGIC_ ACTION” for digital output 41 / 42:

- When “0x00 – Forward and reverse flow” is selected, digital output 51 / 52 follows digital output 41 / 42.
- When “0x01 – Forward flow” is selected, pulses are output for the forward flow at digital output 41 / 42, and at digital output 51 / 52, pulses are output for the reverse flow.
- When “0x02 – Reverse flow” is selected, pulses are output for the reverse flow at digital output 41 / 42; and at digital output 51 / 52, pulses are output for the forward flow.

0x05: 90° phase rotation – 90° phase rotation of output of the same pulses as for digital output 41 / 42.

0x06: 180° phase rotation – 180° phase rotation of output of the same pulses as for digital output 41 / 42.

0x07: Sequence DO 41 / 42 (frequency): digital output 51 / 52 follows digital output 41 / 42. Digital output 51 / 52 then also works as a frequency output, the settings of digital output 41 / 42 are adopted.

0x08: 180° phase rotation (frequency): 180° phase rotation of output of the same frequency as for digital output 41 / 42.

Note

If digital output 41 / 42 has been configured as pulse or frequency output, digital output 51 / 52 can be configured separately as binary or frequency output. However, digital output 51 / 52 cannot be configured as a second independent pulse output.

… 3 Block overview

… Transducer Block 3 – Special Function – Slot 20

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
DIG_OUT_51_52_OUT_ FLOW_DIRECTION	20	103	119	Simple	Unsigned8	S	1	r,w	Selection of flow direction in which the pulse / frequency output issues the selected process value. The parameter is only available if the digital output has been configured as a pulse or frequency output. 0x00: Forward and reverse flow – Pulses for both flow directions are output via digital output 51 / 52. 0x01: Forward flow (direction) – Only pulses in the forward flow (direction) (flow in direction of arrow) are output via digital output 51 / 52. 0x02: Reverse flow – Only pulses (in the) reverse flow (direction) (flow in opposite direction to arrow) are output via digital output 41 / 42.
DIG_OUT_51_52_LOGIC_ ACTION	20	104	120	Simple	Unsigned8	S	1	r,w	Selection of binary output function. See description DIG_OUT_41_42_LOGIC_ ACTION on page 50.
DIG_OUT_51_52_LOGIC_ ACTIVE_MODE	20	105	121	Simple	Unsigned8	S	1	r,w	Select switching properties for the binary output. 0x00: Opener 0x01: Closer
DIG_OUT_51_52_ALARM_ GENERAL	20	106	122	Simple	Unsigned8	S	1	r,w	Collective alarm via binary output 51 / 52 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_51_52_ALARM_ QM_MAX	20	107	123	Simple	Unsigned8	S	1	r,w	Maximum alarm mass flow via binary output 51 / 52. 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_51_52_ALARM_ QM_MIN	20	108	124	Simple	Unsigned8	S	1	r,w	Minimum alarm mass flow via binary output 51 / 52. 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_51_52_ALARM_ DENSITY_MIN	20	109	125	Simple	Unsigned8	S	1	r,w	Minimum alarm density via binary output 51 / 52. 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_51_52_ALARM_ SIGNAL_MIN	20	110	126	Simple	Unsigned8	S	1	r,w	Minimum alarm voltage sensor via binary output 51 / 52. 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_51_52_ALARM_ DRIVER_MAX	20	111	127	Simple	Unsigned8	S	1	r,w	Maximum alarm current sensor via binary output 51 / 52. 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_51_52_FREQ_ OUTPUT_VALUE	20	112	128	Simple	Float	D	4	r	Starting value for frequency DO 51 / 52
DIG_OUT_51_52_STATE_ OUTPUT_VALUE	20	113	129	Simple	Unsigned8	D	1	r	Starting value for state DO 51 / 52 (binary)

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
DIG_OUT_V3_V4_MODE	20	114	130	Simple	Unsigned8	S	1	r,w	Selection of the operating mode for digital output V3 / V4. 0x00: Off – Digital output deactivated. 0x01: Binary – Digital output works as a binary output The digital outputs V1 / V2 and V3 / V4 are only available if the corresponding plug-in cards are present!
DIG_OUT_V3_V4_LOGIC_ ACTION	20	115	131	Simple	Unsigned8	S	1	r,w	Selection of binary output function. See description DIG_OUT_41_42_LOGIC_ ACTION on page 50.
DIG_OUT_V3_V4_LOGIC_ ACTIVE_MODE	20	116	132	Simple	Unsigned8	S	1	r,w	Select switching properties for the binary output. 0x00: Opener 0x01: Closer
DIG_OUT_V3_V4_ALARM_G ENERAL	20	117	133	Simple	Unsigned8	S	1	r,w	Collective alarm via binary output V3 / V4 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_V3_V4_ALARM_Q M_MAX	20	118	134	Simple	Unsigned8	S	1	r,w	Maximum alarm mass flow via binary output V3 / V4 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_V3_V4_ALARM_Q M_MIN	20	119	135	Simple	Unsigned8	S	1	r,w	Minimum alarm mass flow via binary output V3 / V4 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_V3_V4_ALARM_D ENSITY_MIN	20	120	136	Simple	Unsigned8	S	1	r,w	Minimum alarm density via binary output V3 / V4 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_V3_V4_ALARM_ SIGNAL_MIN	20	121	137	Simple	Unsigned8	S	1	r,w	Minimum alarm voltage sensor via binary output V3 / V4 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_V3_V4_ALARM_D RIVER_MAX	20	122	138	Simple	Unsigned8	S	1	r,w	Maximum alarm current sensor via binary output V3 / V4 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_V3_V4_STATE_ OUTPUT_VALUE	20	123	139	Simple	Unsigned8	D	1	r	Starting value for state DO V3 / V4 (binary)

… 3 Block overview

… Transducer Block 3 – Special Function – Slot 20

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
DIG_IN_V3_V4_FUNCTION	20	124	140	Simple	Unsigned8	S	1	r,w	Select a function for the digital input. 0x00: Off – No function 0x01: Totalizer reset (all) – Totalizer reset for all totalizers (forward, reverse and difference totalizer) 0x04: Totalizer stop (all) – External totalizer stop for all totalizers (forward, reverse and difference totalizer) 0x02: Ext. Zero point balancing. - Start external zero point balancing. 0x03: Ext. Shutdown - Sets flow measurement to 0. 0x05: Filler on / off – Start / stop fill operation (only when FillMass function is activated). 0x06: Two measuring ranges Qm – change over Qm Max / Qm Max 2. 0x09: Two measuring ranges Qv – change over Qv Max / Qv Max 2 0x08 Selection of matrices 1 / 2 – Switchover for concentration matrix (only when DensiMass function is activated).
DIG_IN_V3_V4_ ACTIVE_MODE	20	125	141	Simple	Unsigned8	S	1	r,w	Select switching properties for the binary input. 0x00: Opener 0x01: Closer
DIG_IN_V3_V4_ DELAY_TIME	20	126	142	Simple	Unsigned8	S	1	r,w	Selection of delay time for suppressing EMC faults on the digital input. **Note** If the digital input has been configured with the function 'Filler on / off,' the pulse for starting the filling process must fit at least for the set delay time!
DIG_IN_V3_V4_ STATE_INPUT_READING	20	127	143	Simple	Unsigned8	D	1	r	Input value for state DI V3 / V4 (binary)
CURR_OUT_31_32_ OUTPUT_VALUE	20	128	144	Simple	Unsigned8	S	1	r,w	Selection of process variable issued at the corresponding current output. 0x00: Mass flow 0x02: Volume flow 0x04: Temperature 0x06: Density 0x08: Net mass flow 0x0A: Net volume flow 0x0C: Volume flow at reference temperature 0x0E: Density at reference temperature 0x11: Concentration in the selected unit 0x12: Concentration in %

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
CURR_OUT_31_32_LOOP_CURRENT_MODE	20	129	145	Simple	Unsigned8	S	1	r,w	Selection of the operating mode for current output 31/32/Uco. 0x00: Multidrop Fixed: The current output 31 / 32/Uco supports the HART multi-drop mode, the current output is fixed to 3.6 mA and no longer follows the selected process variable. The process variables can be transferred via the HART protocol. 0x01: Normal Signaling: The current output 31 / 32/Uco transfers the selected process variables. In addition, the process variables can be transferred via the HART protocol. 0xF2 Power Mode: The current output 31 / 32/Uco is set permanently to 22.6 mA and no longer follows the selected process variable. HART communication is deactivated. The current output 31/32/Uco works as a power supply unit for the operation of the digital output 41 / 42 as an active output.
DIG_OUT_41_42_PULSE_ACTIVE_MODE	20	130	146	Simple	Unsigned8	S	1	r,w	Selection of switching properties for the pulse output. 0x00: Opener 0x01: Closer
DIG_OUT_41_42_PULSE_FREQ_AT_QMAX	20	131	147	Simple	Float	S	4	r,w	Setting and output of the pulse frequency in pulses/s at 100% flow (mass or volume flow) for the current device configuration. **Note** The value can be changed within the defined limits. The parameter “DIG_OUT_41_42_FREQ_ NUM_PULSE” is also adjusted.
DIG_OUT_41_42_P_FREQ_AT_QMAX_MAX	20	132	148	Simple	Float	D	4	r	Output of limits for the parameter DIG_OUT_41_42_PULSE_FREQ_AT_QMAX.
DIG_OUT_41_42_P_FREQ_AT_QMAX_MIN	20	133	149	Simple	Float	D	4	r	The parameter can be set within these limits. The limits are calculated dynamically.

… 3 Block overview

… Transducer Block 3 – Special Function – Slot 20

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
DIG_OUT_41_42_ALARM_MAX_DENSITY	20	134	150	Simple	Unsigned8	S	1	r,w	Maximum alarm density via binary output 41 / 42 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_41_42_ALARM_MIN_DENSITY	20	135	151	Simple	Unsigned8	S	1	r,w	Minimum alarm density via binary output 41 / 42. 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_41_42_FREQ_NUM_PULSE	20	136	152	Simple	Float	S	4	r,w	Setting and output of pulses per flow unit. The value (in 1/unit) is calculated dynamically from the parameter “DIG_OUT_41_42_FREQ_ UPPER_VALUE”, the mass or volume flow and Q_{max}. **Note** • The value can be changed within the defined limits. The parameter “DIG_OUT_41_42_FREQ_ UPPER_VALUE” is also adjusted automatically when doing this. • The parameter is only available for the following process variables: Mass Flow [%], Volume Flow [%], Net Mass Flow [%], Net Vol. Flow [%], Vol. Flow @ Tref [%]
DIG_OUT_41_42_FREQ_NUM_PULSE_MAX	20	137	153	Simple	Float	D	4	r	Output of limits for the parameter DIG_OUT_41_42_FREQ_ NUM_PULSE.
DIG_OUT_41_42_FREQ_NUM_PULSE_MIN	20	138	154	Simple	Float	D	4	r	The parameter can be set within these limits. The limits are calculated dynamically.
DIG_OUT_41_42_FREQ_NOP_UNIT_CODE	20	139	155	Simple	Unsigned8	D	1	r	Output of the unit for the parameter “DIG_OUT_41_42_FREQ_ NUM_PULSE”. Refer to . The unit is dependent on the selected flow unit and the selected process variable for the frequency output. **Example:** Process variable “DIG_OUT_41_42_FREQ_ VALUE” = Volume Flow [%] Unit “Unit” = “1/Ml (1 pulse per megaliter)” The output at the frequency output is then 1 pulse per megaliter.
DIG_OUT_51_52_ALARM_MAX_DENSITY	20	140	156	Simple	Unsigned8	S	1	r,w	Maximum alarm density via binary output 51 / 52 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_51_52_ALARM_MIN_DENSITY	20	141	157	Simple	Unsigned8	S	1	r,w	Minimum alarm density via binary output 51 / 52 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
DIG_OUT_51_52_FREQ_ VALUE	20	142	158	Simple	Float	S	1	r,w	Selection of the process value issued via the frequency output. Refer to .
DIG_OUT_51_52_FREQ_ NUM_PULSE	20	143	159	Simple	Float	S	4	r,w	Setting and output of pulses per flow unit. The value (in 1/unit) is calculated dynamically from the parameter “DIG_OUT_51_52_FREQ_ UPPER_VALUE”, the mass or volume flow and Q_{max}. **Note** • The value can be changed within the defined limits. The parameter “DIG_OUT_51_52_FREQ_ UPPER_VALUE” is also adjusted automatically when doing this. • The parameter is only available for the following process variables: Mass Flow [%], Volume Flow [%], Net Mass Flow [%], Net Vol. Flow [%], Vol. Flow @ Tref [%]
DIG_OUT_51_52_FREQ_ NUM_PULSE_MAX	20	144	160	Simple	Float	D	4	r	Output of limits for the parameter DIG_OUT_51_52_FREQ_ NUM_PULSE.
DIG_OUT_51_52_FREQ_ NUM_PULSE_MIN	20	145	161	Simple	Float	D	4	r	The parameter can be set within these limits. The limits are calculated dynamically.
DIG_OUT_51_52_FREQ_ NOP_UNIT_CODE	20	146	162	Simple	Unsigned8	D	1	r	Output of the unit for the parameter “DIG_OUT_51_52_FREQ_ NUM_PULSE”. Refer to . The unit is dependent on the selected flow unit and the selected process variable for the frequency output. **Example:** Process variable “DIG_OUT_51_52_FREQ_ VALUE” = Volume Flow [%] Unit “Unit” = “1/Ml (1 pulse per megaliter)” The output at the frequency output is then 1 pulse per megaliter.
DIG_OUT_V3_V4_ALARM_M AX_DENSITY	20	147	163	Simple	Unsigned8	S	1	r,w	Maximum alarm density via binary output V3 / V4 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_V3_V4_ALARM_MI N_DENSITY	20	148	164	Simple	Unsigned8	S	1	r,w	Minimum alarm density via binary output V3 / V4 0x00: Alarm behavior OK 0x00: Alarm behavior FAIL
DIG_OUT_51_52_FREQ_ UPPER_VALUE	20	149	165	Simple	Float	S	4	r,w	Sets the frequency for the upper range value. The entered value corresponds to 100 % flow.
DEVICE_RESTART_ COUNTDOWN	20	150	166	Simple	Float	S	4	r,w	Restart the device after the entered time has elapsed.
–	20	128 to 150	144 to 166	–	–	–	–	–	Reserved for future use.

… 3 Block overview

Transducer Block 4 – Display – Slot 21

The 'Display' Transducer Block is a manufacturer-specific Transducer Block.
It contains the parameters related to the configuration of the transmitter display.

Transducer Block 4 – Display parameters

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
BLOCK_OBJECT	21	0	16	Record	DS-32	Cst	20	r	–
ST_REV	21	1	17	Simple	Unsigned16	N	2	r	–
TAG_DESC	21	2	18	Simple	OctetString	S	32	r,w	–
STRATEGY	21	3	19	Simple	Unsigned16	S	2	r,w	–
ALERT_KEY	21	4	20	Simple	Unsigned8	S	1	r,w	–
TARGET_MODE	21	5	21	Simple	Unsigned8	S	1	r,w	–
MODE_BLK	21	6	22	Record	DS-37	D	3	r	–
ALARM_SUM	21	7	23	Record	DS-42	D	8	r	–
LANGUAGE	21	8	24	Simple	Unsigned8	S	1	r,w	Selection of menu language. Available languages: 0x00: English 0x01: Deutsch 0x02: Français 0x03: Español 0x0E: Português 0x04: Italiano 0x0B: Chinese
CONTRAST	21	9	25	Simple	Unsigned8	S	1	r,w	Contrast setting for the LCD display.
PAGE_1_DISPLAY_MODE	21	10	26	Simple	Unsigned8	S	1	r,w	Configure each operator page.
PAGE_2_DISPLAY_MODE	21	15	31	Simple	Unsigned8	S	1	r,w	The following versions can be selected:
PAGE_3_DISPLAY_MODE	21	20	36	Simple	Unsigned8	S	1	r,w	0x00: Off,
PAGE_4_DISPLAY_MODE	21	25	41	Simple	Unsigned8	S	1	r,w	0x01: Graphic view, 0x02: 1x4, 0x03: 1x6A, 0x04: 1x6A bar, 0x07: 1x9, 0x08: 1x9 bar, 0x09: 2x9, 0x0A: 2x9 bar, 0x0B: 3x9. Selecting 'Off' deactivates the corresponding operator page.
PAGE_1_LINE_1	21	11	27	Simple	Unsigned8	S	1	r,w	Selection of process variable displayed in the respective row.
PAGE_1_LINE_2	21	12	28	Simple	Unsigned8	S	1	r,w	Refer to .
PAGE_1_LINE_3	21	13	29	Simple	Unsigned8	S	1	r,w	
PAGE_1_BARGRAPH	21	14	30	Simple	Unsigned8	S	1	r,w	

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
PAGE_2_LINE_1	21	16	32	Simple	Unsigned8	S	1	r,w	Selection of process variable displayed in the respective row.
PAGE_2_LINE_2	21	17	33	Simple	Unsigned8	S	1	r,w	Refer to .
PAGE_2_LINE_3	21	18	34	Simple	Unsigned8	S	1	r,w	
PAGE_2_BARGRAPH	21	19	35	Simple	Unsigned8	S	1	r,w	
PAGE_3_LINE_1	21	21	37	Simple	Unsigned8	S	1	r,w	
PAGE_3_LINE_2	21	22	38	Simple	Unsigned8	S	1	r,w	
PAGE_3_LINE_3	21	23	39	Simple	Unsigned8	S	1	r,w	
PAGE_3_BARGRAPH	21	24	40	Simple	Unsigned8	S	1	r,w	
PAGE_4_LINE_1	21	26	42	Simple	Unsigned8	S	1	r,w	
PAGE_4_LINE_2	21	27	43	Simple	Unsigned8	S	1	r,w	
PAGE_4_LINE_3	21	28	44	Simple	Unsigned8	S	1	r,w	
PAGE_4_BARGRAPH	21	29	45	Simple	Unsigned8	S	1	r,w	
AUTOSCROLL	21	30	46	Simple	Unsigned8	S	1	r,w	If Multiplex operation is enabled, you can also activate the 'Autoscroll' function on the information level of the operator menu. In this function, operator pages are automatically displayed in succession on the process screen, changing every 10 seconds. Manual scrolling through pre-configured operator pages as described above is no longer necessary. When Auto scroll mode is enabled, the icon ↻ is displayed in the lower left corner of the screen. Default setting: disabled.
DECIMAL_PLACES_ MASSFLOW	21	31	47	Simple	Unsigned8	S	1	r,w	Selection of number of decimal places (maximum 12) used to display the corresponding process variables.
DECIMAL_PLACES_MASS	21	32	48	Simple	Unsigned8	S	1	r,w	
DECIMAL_PLACES_ VOLUMEFLOW	21	33	49	Simple	Unsigned8	S	1	r,w	
DECIMAL_PLACES_ VOLUME	21	34	50	Simple	Unsigned8	S	1	r,w	
DECIMAL_PLACES_ TEMPERATURE	21	35	51	Simple	Unsigned8	S	1	r,w	
DECIMAL_PLACES_ DENSITY	21	36	52	Simple	Unsigned8	S	1	r,w	
DECIMAL_PLACES_ CONCENTRATION	21	37	53	Simple	Unsigned8	S	1	r,w	
DATE_FORMAT	21	38	54	Simple	Unsigned8	S	1	r,w	Set the display format for the date and time. 0x00: DD_MM_YYYY 0x01: MM_DD_YYYY 0x02: YYYY_MM_DD

… 3 Block overview

… Transducer Block 4 – Display – Slot 21

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
EXTERN_VARIABLE_1	21	39	55	Simple	DS-101	S	5	r,w	Value of the external variable 1, can be read via AO1, slot 12
CUSTOM_NAME_ VARIABLE_1	21	40	56	Simple	Visible String	S	8	r,w	Input of the name (unit) of the external variable (maximum 8 characters). The transmitter can show two external process variables in the display. The process variables can be transferred from the fieldbus master to the transmitter via the HART, Modbus or PROFIBUS DP protocol. You can configure the indicator through the ‘Indicator’ menu.
EXTERN_VARIABLE_2	21	41	57	Simple	DS-101	S	5	r,w	Value of the external variable 2, can be read via AO2, slot 13
CUSTOM_NAME_ VARIABLE_2	21	42	58	Simple	Visible String	S	8	r,w	Input of the name (unit) of the external variable (maximum 8 characters).
DISPLAY_TAG_SELECTOR	21	43	59	Simple	Unsigned8	S	1	r,w	Selection of the displayed data in the ‘measuring point tagging’ field of the process display. 0x00: Off 0x01: Measuring point tagging 0x02: Bus address 0x03: HART address
DISPLAY_ROTATION	21	44	60	Simple	Unsigned8	S	1	r,w	Rotation of the display content by 180°. The function of the operating buttons is adapted accordingly. 0x00: Rotation 0° 0x01: Rotation 180°
–	21	45 to 47	61 to 63	–	–	–	–	–	Reserved for future use.

Transducer Block 5 – Diagnostics – Slot 22

The FCx4xx transmitter has functions for process diagnostics.The functions are incorporated in the Transducer Block – Diagnostics.

Transducer Block 5 – Diagnostics – parameters

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
BLOCK_OBJECT	22	0	16	Record	DS-32	Cst	20	r	–
ST_REV	22	1	17	Simple	Unsigned16	N	2	r	–
TAG_DESC	22	2	18	Simple	OctetString	S	32	r,w	–
STRATEGY	22	3	19	Simple	Unsigned16	S	2	r,w	–
ALERT_KEY	22	4	20	Simple	Unsigned8	S	1	r,w	–
TARGET_MODE	22	5	21	Simple	Unsigned8	S	1	r,w	–
MODE_BLK	22	6	22	Record	DS-37	D	3	r	–
ALARM_SUM	22	7	23	Record	DS-42	D	8	r	–
DRIVER_OUTPUT	22	8	24	Record	DS-101	D	5	r	Process variable – Current driver currents in mA.
SENSOR_SINGAL_A	22	9	25	Record	DS-101	D	5	r	Process variable – Current amplitude (sensor voltage) for sensor A in mV.
SENSOR_SIGNAL_B	22	10	26	Record	DS-101	D	5	r	Process variable – Current amplitude (sensor voltage) for sensor B in mV.
TUBE_FREQUENCY	22	11	27	Record	DS-101	D	5	r	Process variable – Current meter tube frequency in Hz.
PIPE_TEMPERATURE	22	12	28	Simple	Float	D	4	r	Process variable – Current meter tube temperature in °C.
HOUSE_TEMPERATURE	22	13	29	Simple	Float	D	4	r	Process variable – Current sensor housing temperature in °C.
QM_MASSFLOW_MIN_ ALARM	22	14	30	Simple	Float	S	4	r,w	Sets the minimum / maximum limit value for mass measurement. If the process value ‘Qm [unit]’ exceeds or falls below the limit value, an alarm is triggered.
QM_MASSFLOW_MAX_ ALARM	22	15	31	Simple	Float	S	4	r,w	
QV_VOLUMEFLOW_MIN_ ALARM	22	16	32	Simple	Float	S	4	r,w	Sets the minimum / maximum limit value for volume measurement. If the process value ‘Qv [unit]’ exceeds or falls below the limit value, an alarm is triggered.
QV_VOLUMEFLOW_MAX_ ALARM	22	17	33	Simple	Float	S	4	r,w	
DENSITY_MIN_ALARM	22	18	34	Simple	Float	S	4	r,w	Sets the minimum / maximum limit value for density measurement. If the process value ‘Density [unit]’ exceeds or falls below the limit value, an alarm is triggered.
DENSITY_MAX_ALARM	22	19	35	Simple	Float	S	4	r,w	
TEMPERATURE_MIN_ ALARM	22	20	36	Simple	Float	S	4	r,w	Sets the minimum / maximum limit value for sensor temperature. If the process value ‘Temperature [unit]’ exceeds or falls below the limit value, an alarm is triggered.
TEMPERATURE_MAX_ ALARM	22	21	37	Simple	Float	S	4	r,w	

… 3 Block overview

… Transducer Block 5 – Diagnostics – Slot 22

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
CONCENTRATION_RATIO_MIN_ALARM	22	22	38	Simple	Float	S	4	r,w	Sets the minimum / maximum limit value for concentration measurement. If the process value 'Conc. Unit [%]' or 'Conc. Unit [%]' exceeds or falls below the limit value, an alarm is triggered.
CONCENTRATION_RATIO_MAX_ALARM	22	23	39	Simple	Float	S	4	r,w	
CONCENTRATION_UNIT_MIN_ALARM	22	24	40	Simple	Float	S	4	r,w	Sets the minimum / maximum limit value for concentration measurement. If the process value 'Conc. Unit [unit]' exceeds or falls below the limit value, an alarm is triggered.
CONCENTRATION_UNIT_MAX_ALARM	22	25	41	Simple	Float	S	4	r,w	
DRIVER_OUTPUT_MAX_ALARM	22	26	42	Simple	Float	S	4	r,w	Sets the maximum limit value for driver current. If the driver current exceeds the limit value for the time set under the parameter 'Driver current time', an alarm is triggered.
DRIVER_OUTPUT_ALARM_TIME	22	27	43	Simple	Float	S	4	r,w	Sets the delay time for the alarm 'Sensor current too high.'
SENSOR_SIGNAL_MIN_ALARM	22	28	44	Simple	Float	S	4	r,w	Sets the maximum limit value for the sensor amplitude. If the sensor amplitude exceeds the limit value for the time set under the parameter 'Sensor Amp. Time,' an alarm is triggered.
SENSOR_SIGNAL_ALARM_TIME	22	29	45	Simple	Float	S	4	r,w	Sets the delay time for the alarm 'Sensor amplitude outside of spec.'
DENSITY_LOW_CHECK	22	30	46	Simple	Float	S	4	r,w	Sets the alarm limit for the density alarm. If the density falls below the set value, the process variables Qm and Qv are set to '0' and alarm 'Density set to 1g/cm³' is issued.
MAINTENANCE_TIMER_UPCOUNT	22	31	47	Simple	Unsigned32	D	4	r	Forward totalizer maintenance interval.
PRESET_MAINTENANCE_CYCLE	22	32	48	Simple	Unsigned32	S	4	r,w	Sets the service interval. After the service interval has expired, the corresponding error message 'Service interval has been reached' is set. The setting '0' deactivates the maintenance interval
MAINTENANCE_REMAIN_TIME	22	33	49	Simple	Unsigned32	D	4	r	Remaining service interval time until setting of error message 'Service interval has been reached.'
START_NEW_MAINTENANCE_CYCLE	22	34	50	Simple	Unsigned8	S	1	r,w	Resetting of the maintenance interval. The service interval is reset to the value set in PRESET_MAINTENANCE_ CYCLE.

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
SIMULATION_SWITCH	22	35	51	Simple	Unsigned8	D	1	r,w	Manual stimulation of measured values / outputs. 0x00: Off 0x01: Qm mass flow [unit] 0x02: Qm mass flow [%] 0x03: Qv volume flow [unit] 0x04: Qv volume flow [%] 0x05: Density [unit] 0x06: Density [%] 0x07: Temperature [unit] 0x08: Temperature [%] 0x09: Current output 31 / 32/Uco 0x0C: Digital output 41 / 42 0x0D: Digital output 51 / 52 0x0E: Digital output V3/V4 0x0F: Digital input V3/V4
SIM_CURR_OUT_31_32_ UCO	22	36	52	Simple	Float	D	4	r,w	Manual simulation of measured values. The output values correspond to the simulated flowrate entered. The 'Configuration' information is displayed in the lower line of the display. Only one measured value / output can be selected for simulation. After power-up / restart of the device, the simulation is switched off.
SIM_DIG_OUT_41_42_ STATE	22	37	53	Simple	Unsigned8	D	1	r,w	
SIM_DIG_OUT_41_42_ FREQ_PULSE	22	38	54	Simple	Float	D	4	r,w	
SIM_DIG_OUT_51_52_ STATE	22	39	55	Simple	Unsigned8	D	1	r,w	
SIM_DIG_OUT_51_52_ PULSE	22	40	56	Simple	Float	D	4	r,w	
SIM_DIG_OUT_V3_V4_ STATE	22	41	57	Simple	Unsigned8	D	1	r,w	
SIM_DIG_IN_V3_V4_STATE	22	42	58	Simple	Unsigned8	D	1	r,w	
SIM_QM_MASSFLOW_ UNIT	22	43	59	Simple	Float	D	4	r,w	
SIM_QM_MASSFLOW_ RATIO	22	44	60	Simple	Float	D	4	r,w	
SIM_QM_MASSFLOW_ RANGE_MIN	22	45	61	Simple	Float	N	4	r	
SIM_QM_MASSFLOW_ RANGE_MAX	22	46	62	Simple	Float	N	4	r	
SIM_QV_VOLUMEFLOW_ UNIT	22	47	63	Simple	Float	D	4	r,w	
SIM_QV_VOLUMEFLOW_ RATIO	22	48	64	Simple	Float	D	4	r,w	
SIM_QV_VOLUMEFLOW_ RANGE_MIN	22	49	65	Simple	Float	N	4	r	
SIM_QV_VOLUMEFLOW_ RANGE_MAX	22	50	66	Simple	Float	N	4	r	

… 3 Block overview

… Transducer Block 5 – Diagnostics – Slot 22

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
SIM_DENSITY_UNIT	22	51	67	Simple	Float	D	4	r,w	Manual simulation of measured values.
SIM_DENSITY_RATIO	22	52	68	Simple	Float	D	4	r,w	(continued)
SIM_TEMPERATURE_UNIT	22	53	69	Simple	Float	D	4	r,w	
SIM_TEMPERATURE_RATIO	22	54	70	Simple	Float	D	4	r,w	
EROSION_CONTROL_TYPE	22	55	71	Simple	Unsigned8	S	1	r,w	Selection of the operating mode for the erosion monitor. 0x00: Manual – Manual input of limit values for the erosion monitor. 0x01: Automatic – The transmitter calculates the limit values for the erosion monitor automatically. Factory setting: manual.
EROSION_DRIVER_ CURRENT_MAX	22	56	72	Simple	Float	S	4	r,w	Sets the maximum limit value for driver current. If the driver current exceeds the limit value for the time set under the parameter “Current time”, the alarm “Density too low. Empty pipe or gas in pipe” is triggered. This parameter is only available if the value “Manual” has been selected for the parameter EROSION_CONTROL_TYPE.
EROSION_DRIVER_ CURRENT_TIME	22	57	73	Simple	Float	S	4	r,w	Sets the delay time for the alarm “Density too low. Empty pipe or gas in pipe”. This parameter is only available if the value “Manual” has been selected for the parameter EROSION_CONTROL_TYPE.
EROSION_STATUS_ ADJUST	22	58	74	Simple	Unsigned8	D	1	r	Output of the status for automatic adjustment of the erosion monitor. 0x00: Outstanding: The limit value is not set, the erosion monitoring is not active. 0x01: Requested: Automatic adjustment of the erosion monitor is activated but has not yet been performed. 0x02: Self adjust active: Automatic adjustment of the erosion monitor is active. 0x03: Complete: Automatic adjustment of the erosion monitor is complete; erosion monitoring is active This parameter is only available if the value “Auto” has been selected for the parameter EROSION_CONTROL_TYPE.
EROSION_SELF_ADJUST_ TIME	22	59	75	Simple	Float	S	4	r,w	Sets the runtime for automatic adjustment of the erosion monitor. The setting depends on the application and should cover several days or, if necessary, weeks.
DO_PV_EROSION_START_A DJUST	22	60	76	Record	DS-102	S	2	r	Object for the discrete input block (slot 10). Refer to .

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
EROSION_NEW_VALUE_ LEFT_TIME	22	61	77	Simple	Unsigned32	D	1	r	Time remaining for the current automatic calibration of the erosion monitor.
EROSION_METER_ EROSION_LEVEL	22	62	78	Simple	Float	N	4	r	Output of the current automatic calibration of the erosion monitor.
EROSION_ADJUSTED_ LIMIT	22	63	79	Simple	Float	N	4	r	Output of the erosion monitor's automatically calculated limit value. The limit value is calculated from the erosion value from the automatic adjustment process and a tolerance value.
EROSION_ACTUAL_VALUE	22	64	80	Simple	Float	S	4	r,w	Output of the current erosion value for comparison with the learned limit.
DIAG_REF_TIME_SETUP	22	65	81	Simple	Unsigned32	D	4	r	Output of the reference diagnosis: time
DIAG_REF_DAY_SETUP	22	66	82	Simple	Unsigned8	D	1	r	Output of the reference diagnosis: day
DIAG_REF_MONTH_SETUP	22	67	83	Simple	Unsigned8	D	1	r	Output of the reference diagnosis: month
DIAG_REF_YEAR_SETUP	22	68	84	Simple	Unsigned8	D	1	r	Output of the reference diagnosis: year
SETUP_REF_TIME_SETUP	22	69	85	Simple	Unsigned32	D	4	r,w	Sets the reference diagnosis: time
SETUP_REF_DAY_SETUP	22	70	86	Simple	Unsigned8	D	1	r,w	Sets the reference diagnosis: day
SETUP_REF_MONTH_ SETUP	22	71	87	Simple	Unsigned8	D	1	r,w	Sets the reference diagnosis: month
SETUP_REF_YEAR_SETUP	22	72	88	Simple	Unsigned8	D	1	r,w	Sets the reference diagnosis: year
DIAG_DIAGNOSIS_ SIMULATION	22	73	89	Simple	Unsigned8	D	6	r	Display of manually simulated alarms / error messages.
DIAG_SIMULATION_ STATUS	22	74	90	Simple	Unsigned8	D	1	r	Display of manually simulated alarms / error messages.
EROSION_START_ADJUST	22	75	91	Simple	Unsigned8	D	1	r,w	Manual start of the calibration of the erosion monitor.
CURR_OUT_31_32_ READBACK_CURRENT	22	76	92	Simple	Unsigned16	D	2	r	Output of the read back value of current output 31 / 32 in µA.
CURR_OUT_31_32_ READBACK_SWITCH	22	77	93	Simple	Unsigned8	S	1	r, w	Activate the monitoring function for current output 31 / 32. If the measured value deviates from the set point by more than ±2 %, the current output on the alarm current of 3.3 mA is set and the 'CO 31/32 readbackcurrent deviates' error message is generated. 0x00: Off 0x01: On
CURR_OUT_31_32_RB_ RESET_10MIN	22	78	94	Simple	Unsigned8	S	1	r, w	Automatic reset of the 'CO 31/32 readbackcurrent deviates' error message. 0x00: The error is permanently saved and must be reset manually. After the reset, the current output 31 / 32 is retested. 0x01: The error is automatically reset after 10 minutes. After the reset, the current output 31 / 32 is retested.

… 3 Block overview

… Transducer Block 5 – Diagnostics – Slot 22

Parameter Name	Slot no.	Rel. Idx	Slot Idx	Obj. Type	Data Type	Store	Bytes	Access	Description
CURR_OUT_31_32_RB_ RESET_OPENLOOP	22	79	95	Simple	Unsigned8	S	1	r, w	Behavior in the case of an open current output 31 / 32 (interruption of the current loop). 0X00: If the current loop is interrupted, the error “CO 31/32 readbackcurrent deviates” is generated. The reset of the error then depends on the setting of the ‘CURR_OUT_31_32_RB_ RESET_10MIN’ parameter. 0X01: If the current loop is closed again, the error will be automatically reset.
CURR_OUT_31_32_RB_ RESET_ALARM	22	80	96	Simple	Unsigned8	D	1	r, w	Manual reset of the ‘CO 31/32 readbackcurrent deviates’ error message. The error message is reset by writing any value to this address.
TRANSMITTER_ TEMPERATURE	22	81	97	Simple	Float	D	4	r	Issue of the current frontend board temperature in °C.
DRAG_INDIC_MASS_ FLOW_MIN	22	82	98	Simple	Float	D	4	r	Output of the minimum / maximum mass flow measured value since the last reset of the drag indicators.
DRAG_INDIC_MASS_ FLOW_MAX	22	83	99	Simple	Float	D	4	r	
DRAG_INDIC_DENSITY_ MIN	22	84	100	Simple	Float	D	4	r	Output of the minimum / maximum density measured value since the last reset of the drag indicators.
DRAG_INDIC_DENSITY_ MAX	22	85	101	Simple	Float	D	4	r	
DRAG_INDIC_DRIVER_ CURRENT_MAX	22	86	102	Simple	Float	D	4	r	Output of the maximum transmitter driver current since the last reset of the drag indicators.
DRAG_INDIC_SENSOR_ AMP_SA_MIN	22	87	103	Simple	Float	D	4	r	Output of the minimum transmitter sensor amplitude since the last reset of the drag indicators.
DRAG_INDIC_SENSOR_ AMP_SB_MIN	22	88	104	Simple	Float	D	4	r	
DRAG_INDIC_MEDIUM_ TEMP_MIN	22	89	105	Simple	Float	D	4	r	Output of the minimum / maximum measuring medium temperature since the last reset of the drag indicators.
DRAG_INDIC_MEDIUM_ TEMP_MAX	22	90	106	Simple	Float	D	4	r	
DRAG_INDIC_SENSOR_ TEMP_MIN	22	91	107	Simple	Float	D	4	r	Output of the minimum / maximum sensor housing temperature since the last reset of the drag indicators.
DRAG_INDIC_SENSOR_ TEMP_MAX	22	92	108	Simple	Float	D	4	r	
DRAG_INDIC_TX_TEMP_ MIN	22	93	109	Simple	Float	D	4	r	Output of the minimum / maximum frontend board temperature since the last reset of the drag indicators.
DRAG_INDIC_TX_TEMP_ MAX	22	94	110	Simple	Float	D	4	r	
DRAG_INDIC_RESET	22	95	111	Simple	Unsigned8	D	1	r, w	Reset all drag indicators. The drag indicator is reset by writing any value to this address.

Data structures

In the following, the used internal data structures are listed.

For a detailed description of the PROFIBUS data structures, refer to the PROFIBUS PA Profile 3.01.

Type: Block
Size: 14 Bytes
Name: Diag_Detail_History
Number of elements: 5
Structure: See the following table

Element No.	Element name	Data type	Store	Size	Access	Description
1	alarmCounter	Unsigned16	N	2	r	Number of occurred alarms
2	alarmTimeCounterMsec	Unsigned32	N	4	r	Information about how long the alarm was active in total.
3	alarmTimeCounterDay	Unsigned16	N	2	r	
4	timeStampLastAlarmMsec	Unsigned32	N	4	r	Information about the last occurrence of the alarm.
5	timeStampLastAlarmDay	Unsigned16	N	2	r	

… 3 Block overview

Available process variables

The process variables available in the software are listed in the table.
Process variables can be assigned to the display (HMI), the current outputs (CO), the frequency outputs (DO [f]), and the pulse outputs (DO [pulse]).
The “Code / Code [hex] PROFIBUS DP” column indicates the value to which the corresponding parameter must be set, e.g. using the communications interface.

Process variable		Modbus address	Code	Code [hex] PROFIBUS DP	Description	HMI	CO	DO [f]	DO [pulse]
Mass Flow [unit]	Qm	247	1	0x00	Mass flow in the selected mass flow unit	X	—	—	X
Mass Flow [%]	Qm	267	2	0x01	Mass flow in percent	X	X	X	—
Volume Flow [unit]	Qv	253	3	0x02	Volume flow in the selected volume unit	X	—	—	X
Volume Flow [%]	Qv	273	4	0x03	Volume flow in percent	X	X	X	—
Temperature [unit]	Tm	251	5	0x04	Temperature in the selected volume unit	X	—	—	—
Temperature [%]	Tm	271	6	0x05	Temperature in percent	X	X	X	—
Density [unit]	p	249	7	0x06	Density in the selected density unit	X	—	—	—
Density [%]	p	269	8	0x07	Density in percent	X	X	X	—
Net Mass Flow[unit]*	nQm	973	9	0x08	Net mass flow in the selected volume unit	X	—	—	X
Net Mass Flow [%]*	nQm	977	10	0x09	Net mass flow in percent	X	X	X	—
Net Vol. Flow [unit]*	nQv	979	11	0x0A	Net volume flow in the selected volume unit	X	—	—	X
Net Volume Flow [%]*	nQv	983	12	0x0B	Net volume flow in percent	X	X	X	—
Vol.Flow@Tref [unit]*	Q@T	967	13	0x0C	Volume flow at a reference temperature.	X	—	—	X
Vol.Flow@Tref [%]*	Q@T	971	14	0x0D		X	X	X	—
Density@Tref [unit]*	p@T	963	15	0x0E	Density at a reference temperature.	X	—	—	—
Density @ Tref [%]*	p@T	965	16	0x0F		X	X	X	—
Concentr.unit [%]*	β u	987	17	0x10	Concentration in the selected unit in percent	X	X	X	—
Concentr.unit [unit]*	β u	985	18	0x11	Concentration in the selected unit	X	—	—	—
Concentr.% [%]*	β %	989	19	0x12	Concentration in the selected unit	X	X	X	—

* Process variable is only available if the DensiMass function is activated.

X Parameter available

— Parameter not available

Process variable		Modbus address	Code	Code [hex] PROFIBUS DP	Description	HMI	CO	DO [f]	DO [pulse]
Totalizer Qm Fwd	∑m+	851 (double) 259 (float)	20	0x13	Mass flow counter reading in the forward flow direction	X	—	—	—
Totalizer Qm Rev	∑m-	855 (double) 261 (float)	21	0x14	Mass flow counter reading in the reverse flow direction	X	—	—	—
Totalizer Qm Diff	∑m	859 (double) 255 (float)	22	0x15	Mass flow counter reading for forward flow / reverse flow difference	X	—	—	—
Totalizer Qv Fwd	∑v+	863 (double) 263 (float)	23	0x16	Volume flow counter reading in forward flow direction	X	—	—	—
Totalizer Qv Rev	∑v-	867 (double) 265 (float)	24	0x17	Volume flow counter reading in reverse flow direction	X	—	—	—
Totalizer Qv Diff	∑v	871 (double) 257 (float)	25	0x18	Volume flow counter reading for forward flow / reverse flow difference	X	—	—	—
Total. Net Qm Fwd*	∑M+	887 (double) 995 (float)	26	0x19	Net mass flow counter reading in forward flow direction	X	—	—	—
Total. Net Qm Rev*	∑M-	891 (double) 997 (float)	27	0x1A	Net mass flow counter reading in reverse flow direction.	X	—	—	—
Total. Net Qm Diff*	∑M	895 (double) 975 (float)	28	0x1B	Net mass flow counter reading for forward flow / reverse flow difference.	X	—	—	—
Total. Net Qv Fwd*	∑V+	899 (double) 999 (float)	29	0x1C	Net volume flow counter reading in forward flow direction.	X	—	—	—
Total. Net Qv Rev*	∑V-	903 (double) 1001 (float)	30	0x1D	Net volume flow counter reading in reverse flow direction.	X	—	—	—
Total. Net Qv Diff*	∑M	907 (double) 981 (float)	31	0x1E	Net volume flow counter reading for forward flow / reverse flow difference.	X	—	—	—
Total.Qv@Tref Fwd*	∑T+	875 (double) 991 (float)	32	0x1F	Volume flow counter reading in forward flow direction at a reference temperature.	X	—	—	—
Total.Qv@Tref Rev*	∑T-	879 (double) 993 (float)	33	0x20	Volume flow counter reading in reverse flow direction at a reference temperature.	X	—	—	—
Total.Qv@Tref Diff*	∑T	883 (double) 969 (float)	34	0x21	Volume flow counter reading for forward flow / reverse flow difference at a reference temperature.	X	—	—	—
Totalizer Qm Sum	∑m+-S	911 (double) 441 (float)	41	0x28	Absolute value from mass flow counter reading in the forward flow and reverse flow direction. The counter cannot be stopped or reset.	X	—	—	—
Totalizer Qv Sum	∑v+-S	915 (double) 443 (float)	42	0x29	Absolute value from volume flow counter reading in the forward flow and reverse flow direction. The counter cannot be stopped or reset.	X	—	—	—
Total. Net Qm Sum	∑M+-S	919 (double) 445 (float)	43	0x2A	Absolute value from net mass flow counter reading in forward flow and reverse flow direction. The counter cannot be stopped or reset.	X	—	—	—

* Process variable is only available if the DensiMass function is activated.

** Process variable is only available if the FillMass function is activated.

X Parameter available

— Parameter not available

… 3 Block overview

… Available process variables

Process variable		Modbus address	Code	Code [hex] PROFIBUS DP	Description	HMI	CO	DO [f]	DO [pulse]
Total. Net Qv Sum	∑V+-S	923 (double) 447 (float)	44	0x2B	Absolute value from net volume flow counter reading in forward flow and reverse flow direction. The counter cannot be stopped or reset.	X	—	—	—
Total. Qv @ Tref Sum	∑T+-S	927 (double) 449 (float)	45	0x2C	Absolute value from volume flow counter reading in forward flow and reverse flow direction at a reference temperature. The counter cannot be stopped or reset.	X	—	—	—
Current Batch Total.**	CBT	847 (double)	35	0x22	Current fill quantity.	X	—	—	—
Batch Counts**	CBC	465	36	0x23	Number of fill operations.	X	—	—	—
Tube Frequency	PF	275	37	0x24	Meter tube frequency in Hz.	X	—	—	—
Driver Output	DOC	291	38	0x25	Driver current in mA.	X	—	—	—
Sensor Signal Sa	SSA	283	39	0x26	Sensor amplitude of sensor A in mV	X	—	—	—
Sensor Signal Sb	SSB	285	40	0x27	Sensor amplitude of sensor B in mV	X	—	—	—
Specific Gravity	SG	431	46	0x2D	Specific weight for liquids.	X	—	—	—
°API Gravity	API	433	47	0x2E	Crude oil density in API degrees	X	—	—	—
Variable 1	Va1	619 (float)	48	—	External fieldbus variable 1	X	—	—	—
Variable 2	Va2	621 (float)	49	—	External fieldbus variable 2	X	—	—	—
Electr. (FEB) Temp	Ttx	281 (float)	50	—	Temperature of the frontend board.	X	—	—	—
Sensor Housing Temp	Tsx	3500 (float)	51	—	Temperature in the sensor housing.	X	—	—	—

* Process variable is only available if the DensiMass function is activated.

** Process variable is only available if the FillMass function is activated.

X Parameter available

— Parameter not available

Available units

For certain parameters it is possible to choose among the following units.
The 'code' column indicates which value the corresponding parameter must be set to, for example using the PROFIBUS DP interface.

Table 1: Units for the volume flow

Selection	Code [hex]	Description
m^3/s	543	Cubic meters per second
m^3/min	544	Cubic meters per minute
m^3/h	545	Cubic meters per hour
m^3/d	546	Cubic meters per day
ft^3/s	54C	Cubic feet per second
ft^3/min	54D	Cubic feet per minute
ft^3/h	54E	Cubic feet per hour
ft^3/d	54F	Cubic feet per day
ml/s	629	Milliliters per second
ml/min	61B	Milliliters per minute
l/s	547	Liters per second
l/min	548	Liters per minute
l/h	549	Liters per hour
l/d	54A	Liters per day
hl/h	663	Hectoliters per hour
Ml/d	54B	Megaliters per day
ugal/s	552	US gallons per second
ugal/min	553	US gallons per minute
ugal/h	554	US gallons per hour
ugal/d	555	US gallons per day
Mugal/d	556	Mega US gallons per day
igal/s	557	Imperial gallons per second
igal/min	558	Imperial gallons per minute
igal/h	559	Imperial gallons per hour
igal/d	55A	Imperial gallons per day
bbl/s	55B	Oil barrels per second
bbl/min	55C	Oil barrels per minute
bbl/h	55D	Oil barrels per hour
bbl/d	55E	Oil barrels per day
bls/s	665	Brew barrels per second
bls/min	666	Brew barrels per minute
bls/h	667	Brew barrels per hour
bls/d	668	Brew barrels per day
xx/yy	5F2	User-defined unit

Table 2: Units for the mass flow

Selection	Code [hex]	Description
g/s	526	Grams per second
g/min	527	Grams per minute
g/h	528	Grams per hour
g/d	529	Grams per day
kg/s	52A	Kilograms per second
kg/min	52B	Kilograms per minute
kg/h	52C	Kilograms per hour
kg/d	52D	Kilograms per day
lb/s	532	Pounds (avdp) per second
lb/min	533	Pounds (avdp) per minute
lb/h	534	Pounds (avdp) per hour
lb/d	535	Pounds (avdp) per day
t/min	52F	Metric tons per minute
t/h	530	Metric tons per hour
t/d	531	Metric tons per day
xx/yy	5F1	User-definable unit

Table 3: Density units

Selection	Code [hex]	Description
g/cm^3	44C	Grams per cubic centimeter
kg/m^3	449	Grams per cubic meter
g/ml	450	Grams per milliliter
g/l	451	Grams per liter
kg/l	44F	Kilograms per liter
lb/ft^3	453	Pounds (avdp) per cubic foot
lb/ugal	454	Pounds (avdp) per gallon
SG	5F7	Specific gravity
xx/yy	5F3	User-definable unit

Table 4: Temperature units

Selection	Code [hex]	Description
K	3E8	Kelvin
°C	3E9	Celsius
°F	3EA	Fahrenheit
xx/yy	5F4	User-definable unit

... 3 Block overview

... Available units

Table 5: Concentration units

Selection	Code [hex]	Description
%	53E	Concentration in %
Brix	5F8	Brix concentration
Variable Matrix	5F9	The concentration is calculated with the variables matrix
Baume	5FA	Baume concentration
API	5FB	Crude oil density in API degrees

Table 6: Units for the mass totalizer

Selection	Code [hex]	Description
kg	440	Kilograms
g	441	Grams
t	444	Tons (metric)
Pound	446	Pounds (advp)
xx/yy	5F5	User-definable unit

Table 7: Units for the volume totalizer

Selection	Code [hex]	Description
m^3	40A	Cubic meters
ft^3	413	Cubic feet
ml	410	Milliliters
l	40E	Liters
hl	411	Hectoliters
ugal	418	US gallons
igal	419	Imperial gallons
bbl	41B	Barrels (petroleum, USA)
bls	41C	Barrels (beer, USA)
xx/yy	5F6	User-definable unit

Table 8: Pressure units

Selection	Code [hex]	Description
Pa	64A	Pascals
kPa	650	Kilopascals
Bar	471	Bar
mBar	472	Millibar
psi	475	Pounds per square inch

Table 9: Pulses per flow unit

Selection	Code [hex]	Description
1/kg	0x02	Per kilogram
1/g	0x03	Per gram
$1/m^3$	0x04	Per cubic meter
1/t	0x05	Per metric tonne
$1/ft^3$	0x07	Per cubic foot
1/lb	0x08	Per pound
1/ml	0x0B	Per milliliter
1/l	0x0D	Per liter
1/hl	0x0E	Per hectoliter
1/Ml	0x10	Per megaliter
1/ugal	0x14	Per gallon (US)
1/igal	0x15	Per gallon (Imperial)
1/bbl	0x16	Per barrel (petroleum, US)
1/Mugal	0x1B	Per megagallon (US)
1/bls	0xE7	Barrels (beer, USA)
1/xx	0xEE	Per user-defined volume unit
1/yy	0xEF	Per user-defined mass flow unit

4 Diagnosis / error messages

The FCx4xx transmitter has several error registers and parameters for configuring the alarm handling. All registers and parameters are included in the Physical Block. For test purposes, you can simulate all existing device errors and the corresponding reactions. It is also possible to mask specific alarms or alarm groups.

The following physical block parameters describe the alarm treatment of the FCx4xx:

Rel. Index	Parameter Name	Object Type	Data type	Store	Bytes	Access
13	DIAGNOSIS	Simple	OctetString	D	4	r
14	DIAGNOSIS_EXTENSION	Simple	OctetString	D	6	r
15	DIAGNOSIS_MASK	Simple	OctetString	Cst	4	r
16	DIAGNOSIS_MASK_EXTENSION	Simple	OctetString	Cst	6	r
33	DIAG_ALARM_HISTORY	Simple	Unsigned8	D	6	r
34	DIAG_CLEAR_ALARM_HISTORY	Simple	Unsigned8	D	1	r,w
35	DIAG_ALARM_SIMULATION	Simple	Unsigned8	D	1	r,w
36	DIAG_MASK_MAINTENANCE	Simple	Unsigned8	S	1	r,w
37	DIAG_MASK_CHECK_FUNCTION	Simple	Unsigned8	S	1	r,w
38	DIAG_CLEAR_ALARM_HISTORY	Simple	Unsigned8	S	1	r,w
39	DIAG_MASK_INDIVIDUAL_ALARM	Simple	Unsigned8	S	6	r,w
40	DIAG_CONDITION_IDX	Simple	Unsigned8	D	1	r,w
41	DIAG_IDX_DETAILS_CLASS	Simple	Unsigned8	D	1	r
42	DIAG_IDX_DETAILS_GROUP	Simple	Unsigned8	D	1	r
43	DIAG_IDX_DETAILS_PRIORITY	Simple	Unsigned8	D	1	r
44	DIAG_IDX_DETAILS_HISTORY	Record	Diag_Detail_History	D	14	r
45	DIAG_CONDITION_ALARM_VALID	Simple	Unsigned8	D	1	r

The meaning of all bits in the DIAGNOSIS is already defined in the PA3.02 profile and the bits are reserved accordingly. It depends on the used status (Extended or Condensed). The eighth bit in the fourth byte indicates whether manufacturer-specific alarm information is present. These are provided in the DIAGNOSIS_EXTENSION parameter.

DIAGNOSIS_MASK and DIAGNOSIS_MASK_EXTENSION describe which bits are used in DIAGNOSIS and DIAGNOSIS_EXTENSION (0 = not used, 1 = used). In accordance with the PA specification, this mask is a constant and read-only.

DIAG_ALARM_HISTORY contains all history information of the manufacturer-specific alarms. The bit size and arrangement exactly correspond to the DIAGNOSIS_EXTENSION parameter (0 = alarm has never been active, 1 = alarm has been active).
With the DIAG_CONDITION_IDX parameter, you can call additional history information for an alarm. Every manufacturer-specific alarm has a unique alarm ID (see the FCx4xx alarm overview). This alarm ID is written in the DIAG_CONDITION_IDX parameter, thus allowing you to retrieve additional information like the number of occurrences, alarm duration and last occurrence of the alarm by means of DIAG_DETAILS.

All history information can be deleted with the DIAG_CLEAR_ALARM_HISTORY parameter.

... 4 Diagnosis / error messages

... Available units

The DIAG_ALARM_SIMULATION parameter is used to specify, which manufacturer-specific alarm is to be simulated. The system will react on this simulated alarm in the same way as on a real alarm, with the difference that simulated alarms are not logged in the alarm history.

In order to enable the user to decide which alarm bits are used or not, dedicated parameters for masking single alarms or alarm groups were created in the physical block (rel. indices 36 to 39).

Note
The profiles 0x9741 and 0x9742 do not transmit the DIAGNOSIS_EXTENSION in the GetDiag telegram. As a result, the master cannot read from the GetDiag telegram whether a simulation is running in the transmitter or not. This information can be obtained for example by acyclic reading of the DIAGNOSIS_EXTENSION from the physical block.
DIAG_CONDITION_ALARM_VALID is only readable and indicates whether a time stamp was set in the device.

Alarm overview of the FCx4xx

The following tables list the device-specific alarms of the FCx4xx.
Every alarm is assigned to an alarm group (in accordance with Namur) and to a priority.
The simulation value (SV) specifies which value must be written into the DIAG_ALARM_SIMULATION parameter in order to simulate an alarm.

Alarm Mapping	Description	NAMUR Group	NAMUR class	Prio	WS
FLOW_MASS_REACHED	Mass flowrate exceeds limits.	OPERATING_CONDITION_PROCESS	OFF_SPECIFICATION	46	1
FLOW_VOLUME_REACHED	Volume flowrate exceeds limits.	OPERATING_CONDITION_PROCESS	OFF_SPECIFICATION	44	2
SIMUALTION_ALARM	Simulation is on. Simulating process/output value.	CONFIG_STATUS	CHECK_FUNCTION	72	3
FLOWRATE_TO_ZERO	Flowrate to zero	CONFIG_STATUS	CHECK_FUNCTION	78	4
ALARM_MAINTENANCE_CYCLE_TIME_EXEED	Maintenance interval is reached	OPERATING_CONDITION_PROCESS	MAINTENANCE	26	5
TOTALIZER_STOP_ALARM	All totalizer stopp.	CONFIG_STATUS	CHECK_FUNCTION	76	6
TOTALIZER_RESET_ALARM	Totalizer reset. Reset of one or more Totalizer	CONFIG_STATUS	CHECK_FUNCTION	74	7
DISPLAY_TOTALIZER_ROLLOVER	Display value is <1600h at Qmax.	CONFIG_STATUS	MAINTENANCE	28	8
DEVICE_NOT_CALIBRATED_ALARM	Device not calibrated.	CONFIG_STATUS	MAINTENANCE	24	9
NV_CHIPS_DEFECT_FEB	Sensor memory defective.	HW_STATUS_ELECTRONICS	MAINTENANCE	38	10
NV_DATA_DEFECT	NV data defect. Data storage irreparable.	HW_STATUS_ELECTRONICS	FAILURE	84	11
FE_BOARD_NOT_DETECTED	No Frontend Board detected	HW_STATUS_ELECTRONICS	FAILURE	98	12
FE_BOARD_COMM_ERROR	FEB communication error. EMC disturbance.	HW_STATUS_ELECTRONICS	FAILURE	88	13
INCOMPATIBLE_FE_BOARD	Incompatible Frontend Board.	HW_STATUS_ELECTRONICS	FAILURE	82	14
NV_CHIP_DEFECT_MB	NV chips defect on Motherboard.	HW_STATUS_ELECTRONICS	MAINTENANCE	37	15
DO1_PULSENUMMAXALARM	Pulse output is cut off.	OPERATING_CONDITION_PROCESS	OFF_SPECIFICATION	47	16
CO1_SATURATED_ALARM	Curr.Out 31/32 is saturated.	OPERATING_CONDITION_PROCESS	OFF_SPECIFICATION	52	17
CO2_3_SATURATED_ALARM	Curr.Out V1/V2, V3/V4 saturated	OPERATING_CONDITION_PROCESS	OFF_SPECIFICATION	51	18
CO1_COM_ERROR	Curr.Out 31/32 com error.	HW_STATUS_ELECTRONICS	FAILURE	86	19
OPTION_MODULE_1 _COM_ ERROR	Option Card 1 com error.	HW_STATUS_ELECTRONICS	OFF_SPECIFICATION	49	20
OPTION_MODULE_2 _COM_ ERROR	Option Card 2 com error.	HW_STATUS_ELECTRONICS	OFF_SPECIFICATION	48	21
CO1_SAFETY_ALARM	Safety Alarm Curr.Out 31/32	HW_STATUS_ELECTRONICS	FAILURE	94	22
CO1_NOT_CALIBRATED_ALARM	Curr.Out 31/32 not calibrated.	CONFIG_STATUS	MAINTENANCE	32	23
CO2_NOT_CALIBRATED_ALARM	Curr.Out V1/V2 not calibrated.	CONFIG_STATUS	MAINTENANCE	31	24
CO3_NOT_CALIBRATED_ALARM	Curr.Out V3/V4 not calibrated.	CONFIG_STATUS	MAINTENANCE	30	25
VOLTAGE_MONITORING_ALARM_MB	MB voltages outside range.	HW_STATUS_ELECTRONICS	OFF_SPECIFICATION	53	26
ALARM_SIMULATION	An alarm is simulated.	CONFIG_STATUS	CHECK_FUNCTION	70	n/a

… 4 Diagnosis / error messages

… Alarm overview of the FCx4xx

Alarm Mapping	Description	NAMUR Group	NAMUR class	Prio	WS
FIELDBUS_BOARD_IN_RESET	Communicat. card not responding	HW_STATUS_ELECTRONICS	MAINTENANCE	20	40
CO1_READBACK_ALARM	CO 31/32 readbackcurrent deviates	CONFIG_STATUS	OFF_SPECIFICATION	65	41
SENSOR_AMPLITUDE_BELOW_CUSTOM_LIMIT	Sensor amplitude out of ranges	HW_STATUS_SENSOR	OFF_SPECIFICATION	54	42
DSP_FAILURE	DSP Failure on Frontend Board.	HW_STATUS_ELECTRONICS	FAILURE	96	27
DENSITY_FAILURE	Density failure	HW_STATUS_SENSOR	FAILURE	80	28
TEMPERATURE_SENSOR_EXCEEDS_LIMITS	Sensor temperature out max range	HW_STATUS_SENSOR	OFF_SPECIFICATION	57	29
TEMPERATURE_SENSOR_MEASURING_FAILED	Sensor temperature measure error	HW_STATUS_ELECTRONICS	FAILURE	90	30
SENSOR_AMPLITUDE_OUT_OF_RANGE	Sensor amplitudeout of range.	HW_STATUS_SENSOR	FAILURE	93	31
SENSOR_DRIVER_CURRENT_FAILURE	Sensor driver current to high.	HW_STATUS_SENSOR	OFF_SPECIFICATION	60	32
ALARM_DENSITY_TOO_LOW	Density too low.Empty pipe, gas	OPERATING_CONDITION_PROCESS	OFF_SPECIFICATION	59	33
FLOW_DENSITY_REACHED	Density exceeds min/max limits.	OPERATING_CONDITION_PROCESS	OFF_SPECIFICATION	43	34
FLOW_TEMP_REACHED	Medium temperat exceeds limits.	OPERATING_CONDITION_PROCESS	OFF_SPECIFICATION	42	35
DENSITY_TO_ONE	Density to 1g/cm³	CONFIG_STATUS	OFF_SPECIFICATION	58	36
CONCENTRATION_SCALED_MAX_MIN	Concentration inunit exceeds	OPERATING_CONDITION_PROCESS	OFF_SPECIFICATION	41	37
CONCENTRATION_UNSCALED_MAX_MIN	Concentration in percent exceeds	OPERATING_CONDITION_PROCESS	OFF_SPECIFICATION	40	38
VOLTAGE_MONITORING_ALARM_FEB	FEB voltages outside range.	HW_STATUS_ELECTRONICS	OFF_SPECIFICATION	54	39

Get Diag

The DIAGNOSIS and DIAGNOSIS_EXTENSION parameters can be used to poll the transmitter status.
These parameters are located on the relative indices 13 and 14 in the Physical Block where they can be read acyclically. Cyclic reading via the DDLM_SLAVE_DIAG service is also possible.

The DDLM_SLAVE_DIAG service provides for the general PA profiles 9741 and 9742 only the DIAGNOSIS, as this parameter is defined in the PA profile, but the DIAGNOSIS_EXTENSION is manufacturer-specific.
With the FCx4xx-specific profile 0x3434, the service DDLM_SLAVE_DIAG has been expanded and also transmits the parameter DIAGNOSIS_EXTENSION in byte 15 to 20.

Procedure:

During cyclic communication, the master regularly requests data from the slave via 'Request Data Exchange.' The slave responds with 'Response Data Exchange.' The slave's response contains a bit (diagnostic flag) which states whether new diagnostics information is available in the slave.

If something changes in Diagnosis or Diagnosis Extension in the slave (one or more bits set/deleted), then the slave sets the 'Diagnostic Flag' to 'true' once in 'Response Data Exchange.' Following this, the master requests diagnostics data from the slave using 'Request Get Diag.'
This responds with 'Response Get Diag.' Therefore, the 'Get Diag' service only takes place when the diagnostics data in the slave changes.

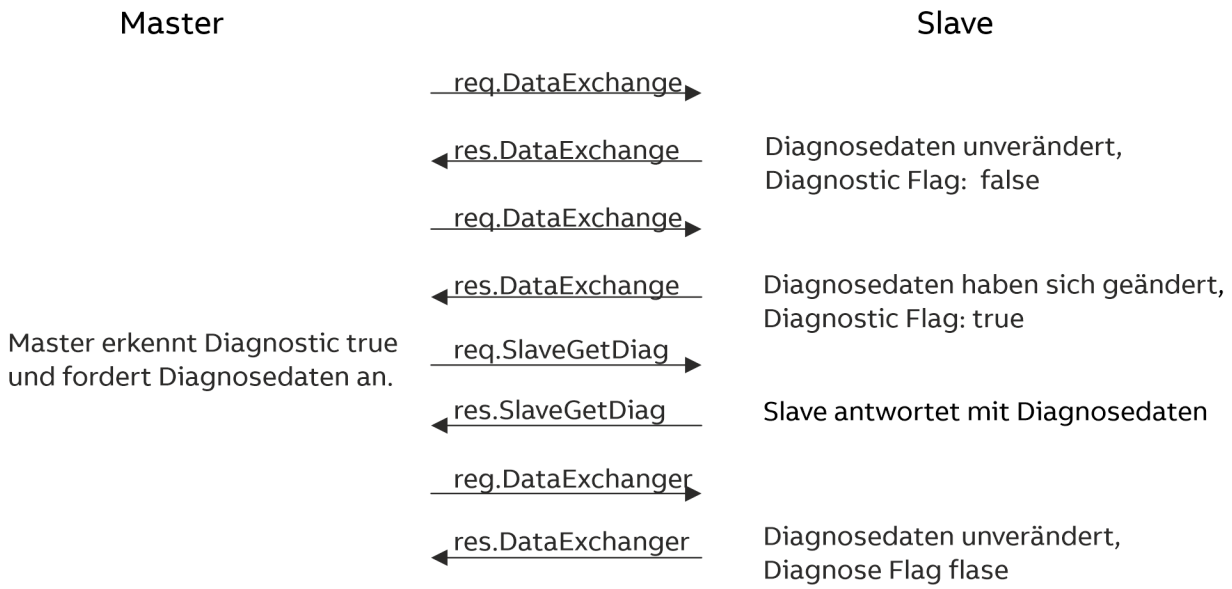

Figure 11: Sequence of the diagnostic query

… 4 Diagnosis / error messages

… Get Diag

Get Diag Telegram

Byte No.	DPV1 name	Bit No.	Value	'long' Telegram 9741 or 9742	'long' Telegram 0x3434	'Short' Telegram 0x3434
1	Station Status 1	Bit 7	Diag Master Lock	0	0	0
		Bit 6	Diag Frame Fault	0	0	0
		Bit 5	Diag Invalid Slave Response	0	0	0
		Bit 4	Diag not supported	0	0	0
		Bit 3	Diag Ext Diag	1	1	0
		Bit 2	Diag Config Fault	0	0	0
		Bit 1	Diag Station Not Ready	0	0	0
		Bit 0	Diag Station Non Existent	0	0	0
2	Station Status 2	Bit 7	Diag deactivated	0	0	0
		Bit 6	reserved	0	0	0
		Bit 5	Diag Sync Mode	0	0	0
		Bit 4	Diag Freeze Mode	0	0	0
		Bit 3	Diag Watchdog on	x	x	x
		Bit 2	set to 1 by DP slave	1	1	1
		Bit 1	Diag static Diagnostics	0	0	0
		Bit 0	Diag parameterization request	0	0	0
3	Station Status 3	Bit 7	Ext. Diag Overflow	0	0	0
		Bit 6	reserved	0	0	0
		Bit 5	reserved	0	0	0
		Bit 4	reserved	0	0	0
		Bit 3	reserved	0	0	0
		Bit 2	reserved	0	0	0
		Bit 1	reserved	0	0	0
		Bit 0	reserved	0	0	0
4	Master Address			0x00	0x00	0x00
5-6	Ident Number			0x9740/ 0x9700	0x3434	0x3434
7	Header	Bit 7-6	fixed to 0	0x08	0x0E	
		Bit 5-0	Block length			
8	Status_Type	Bit 7	Status	0xFE	0xFE	
		Bit 6-0	Not used			
9	Slot Nr. of PB			0x00	0x00	

Byte No.	DPV1 name	Bit No.	Value	'long' Telegram 9741 or 9742	'long' Telegram 0x3434	'Short' Telegram 0x3434
10	Specifier	Bit 2-7	reserved			
		Bit 0+1	1 = Status appears			
			2 = Status disappears			
11-14			DIAGNOSIS	0x20	0x00	
				0x00	0x00	
				0x00	0x00	
				0x00	0x80	
15-20			DIAGNOSIS_EXTENSION		0x80	
					0x00	
					0x00	
					0x00	
					0x00	
					0x00	

If no errors or warnings are present, the transmitter responds with a 'short' telegram (only bytes 1-6). Otherwise, the transmitter responds with a 'long' telegram (14 bytes for 0x9740 and 0x9700, 20 bytes for 0x3434).

The example shows a telegram for 0x3430 with errors / warnings:

Bytes 1-6: 0x08, 0x0C, 0x00, 0x00, 0x07, 0x8C
Bytes 7-10: 0x0E, 0xFE, 0x00, 0x01
Bytes 11-14: 0x00, 0x00, 0x00, 0x80 (Diagnosis)
Bytes 15-20: 0x80, 0x00, 0x00, 0x00, 0x00, 0x00 (DiagnosisExtension)

Bit 7 in octet 1 of the Diagnosis Extension (=byte 15) indicates an alarm.
Bit 7 in octet 4 of the Diagnosis (byte 14), indicates that the Diagnosis Extension exists.
Bit 3 in byte 1 indicates that diagnostics data exist.

This example shows the 'short' diagram that comes when the last error / warning disappears.

Bytes 1-6: 0x00, 0x0C, 0x00, 0x00, 0x07, 0x8C

Bit 3 in byte 1 is 0, as no further diagnostics data are available.

... 4 Diagnosis / error messages

... Get Diag

The following table provides an overview of the manufacturer-specific alarms and their maskability. When masking is active, the corresponding bits are not set in the DIAGNOSIS_EXTENSION and have no effect on the status information of the cyclic output values of the AI and TOT Blocks.
The setup of the DIAG_EXT_HISTORY parameter is identical to the DIAGNOSIS_EXTENSION.

Octet	Bit	Alarm Mapping	ID	Mask with	Rel. Idx. PB
0	0	FLOW_MASS_REACHED	0	DIAG_MASK_OFF_SPECIFICATION	38
	1	FLOW_VOLUME_REACHED	1	DIAG_MASK_OFF_SPECIFICATION	38
	2	SIMUALTION_ALARM	2	DIAG_MASK_CHECK_FUNCTION	37
	3	FLOWRATE_TO_ZERO	3	DIAG_MASK_CHECK_FUNCTION	37
	4	ALARM_MAINTENANCE_CYCLE_TIME_EXEED	4	DIAG_MASK_MAINTENANCE	36
	5	TOTALIZER_STOP_ALARM	5	DIAG_MASK_CHECK_FUNCTION	37
	6	TOTALIZER_RESET_ALARM	6	DIAG_MASK_CHECK_FUNCTION	37
	7	DISPLAY_TOTALIZER_ROLLOVER	7	DIAG_MASK_MAINTENANCE	36
1	0	DEVICE_NOT_CALIBRATED_ALARM	8	DIAG_MASK_MAINTENANCE	36
	1	NV_CHIPS_DEFECT_FEB	9	DIAG_MASK_MAINTENANCE	36
	2	NV_DATA_DEFECT	10	Not maskable	X
	3	FE_BOARD_NOT_DETECTED	11	Not maskable	X
	4	FE_BOARD_COMM_ERROR	12	Not maskable	X
	5	INCOMPATIBLE_FE_BOARD	13	Not maskable	X
	6	NV_CHIP_DEFECT_MB	14	DIAG_MASK_MAINTENANCE	36
	7	DO1_PULSENUMMAXALARM	15	DIAG_MASK_OFF_SPECIFICATION	38
2	0	CO1_SATURATED_ALARM	16	DIAG_MASK_OFF_SPECIFICATION	38
	1	CO2_3_SATURATED_ALARM	17	DIAG_MASK_OFF_SPECIFICATION	38
	2	CO1_COM_ERROR	18	Not maskable	X
	3	OPTION_MODULE_1_COM_ ERROR	19	DIAG_MASK_OFF_SPECIFICATION	38
	4	OPTION_MODULE_2_COM_ ERROR	20	DIAG_MASK_OFF_SPECIFICATION	38
	5	CO1_SAFETY_ALARM	21	Not maskable	X
	6	CO1_NOT_CALIBRATED_ALARM	22	DIAG_MASK_MAINTENANCE	36
	7	CO2_NOT_CALIBRATED_ALARM	23	DIAG_MASK_MAINTENANCE	36

Octet	Bit	Alarm Mapping	ID	Mask with	Rel. Idx. PB
3	0	CO3_NOT_CALIBRATED_ALARM	24	DIAG_MASK_MAINTENANCE	36
	1	VOLTAGE_MONITORING_ALARM_MB	25	Not maskable	X
	2	ALARM_SIMULATION	26	DIAG_MASK_CHECK_FUNCTION	37
	3	FIELDBUS_BOARD_IN_RESET	27	DIAG_MASK_MAINTENANCE	36
	4	CO1_READBACK_ALARM	28	DIAG_MASK_OFF_SPECIFICATION	38
	5	DSP_FAILURE	29	Not maskable	X
	6	DENSITY_FAILURE	30	Not maskable	X
	7	TEMPERATURE_SENSOR_EXCEEDS_LIMITS	31	DIAG_MASK_OFF_SPECIFICATION	38
4	0	TEMPERATURE_SENSOR_MEASURING_FAILED	32	Not maskable	X
	1	SENSOR_AMPLITUDE_OUT_OF_RANGE	33	Not maskable	X
	2	SENSOR_DRIVER_CURRENT_FAILURE	34	DIAG_MASK_OFF_SPECIFICATION	38
	3	ALARM_DENSITY_TOO_LOW	35	DIAG_MASK_OFF_SPECIFICATION	38
	4	FLOW_DENSITY_REACHED	36	DIAG_MASK_OFF_SPECIFICATION	38
	5	FLOW_TEMP_REACHED	37	DIAG_MASK_OFF_SPECIFICATION	38
	6	DENSITY_TO_ONE	38	DIAG_MASK_OFF_SPECIFICATION	38
	7	CONCENTRATION_SCALED_MAX_MIN	39	DIAG_MASK_OFF_SPECIFICATION	38
5	0	CONCENTRATION_UNSCALED_MAX_MIN	41	DIAG_MASK_OFF_SPECIFICATION	X
	1	SENSOR_AMPLITUDE_BELOW_CUSTOM_LIMIT	42	Reserved DIAG_MASK_OFF_SPECIFICATION	38
	2			Reserved	
	3			Reserved	
	4			Reserved	
	5			Reserved	
	6			Reserved	
	7			Reserved	

DIAG_MASK_INDIVIDUAL_ALARM object

The alarm configuration can be individually masked with the DIAG_MASK_INDIVIDUAL_ALARM object (see).
1 bit is available for configuration for every alarm. In total, the object is correspondingly 6 bytes long.
The sequence of the alarms in the DIAG_MASK_INDIVIDUAL_ALARM object corresponds to the sequence of DIAGNOSIS_EXTENSION.

Example of masking of ‘FLOWRATE_TO_ZERO’ and ‘NV_CHIP_DEFECT_MB’
FLOWRATE_TO_ZERO: Byte 1, Bit 3
NV_CHIP_DEFECT_MB: Byte 2, Bit 6

Byte1	Byte2	Byte3	Byte4	Byte5	Byte6
0x08	0x40	0x00	0x00	0x00	0x00

Note
Alarms with the ‘Failure’ NAMUR class cannot be masked.

... 4 Diagnosis / error messages

Transducer Block Status

The transducer blocks of the FCx4xx provide the measured values for the function blocks.
They consist of a data structure with value and status. The status reaches the function blocks (AI or totalizer blocks) which react according to their settings and PA specifications and calculate their value and status and cyclically communicate them outside.
The status calculation depends on whether the Condensed Status has been activated or not.

The following FCx4xx alarms are shown on the status of all slots of the AI blocks:

Alarm Mapping	Description	Classic Status	Condensed Status
FLOW_MASS_REACHED	Mass flowrate exceeds limits.	Good-advisory alarm, high limit (0x89)	Good-high limited (0x82)
FLOW_VOLUME_REACHED	Volume flowrate exceeds limits.	Good-advisory alarm, high limit (0x89)	Good-high limited (0x82)
SIMUALTION_ALARM	Simulation is on. Simulating process/output value.	Check (0x3C)	Uncertain-simulated value (0x60)
FLOWRATE_TO_ZERO	Flowrate to zero	Check (0x3C)	Uncertain-simulated value (0x60)
ALARM_MAINTENANCE_CYCLE_TIME_EXEED	Maintenance interval is reached	Maintenance (0xA4)	Maintenance (0xA4)
TOTALIZER_STOP_ALARM	All totalizer stopp.	Check (0x3C)	Uncertain (0x40)
TOTALIZER_RESET_ALARM	Totalizer reset. Reset of one or more Totalizer	Check (0x3C)	Uncertain (0x40)
DISPLAY_TOTALIZER_ROLLOVER	Display value is <1600h at Qmax.	Maintenance (0xA4)	Maintenance (0xA4)
DEVICE_NOT_CALIBRATED_ALARM	Device not calibrated.	Maintenance (0xA4)	Maintenance (0xA4)
NV_CHIPS_DEFECT_FEB	Sensor memory defective.	Maintenance (0xA4)	Maintenance (0xA4)
NV_DATA_DEFECT	NV data defect. Data storage irreparable.	Failure (0x24)	Bad-device failure (0x12)
FE_BOARD_NOT_DETECTED	No Frontend Board detected	Failure (0x24)	Bad-device failure (0x12)
FE_BOARD_COMM_ERROR	FEB communication error. EMC disturbance.	Failure (0x24)	Bad-device failure (0x12)
INCOMPATIBLE_FE_BOARD	Incompatible Frontend Board.	Failure (0x24)	Bad-device failure (0x12)
NV_CHIP_DEFECT_MB	NV chips defect on Motherboard.	Maintenance (0xA4)	Maintenance (0xA4)
DO1_PULSENUMMAXALARM	Pulse output is cut off.	Out of Specification (0x78)	Uncertain (0x40)
CO1_SATURATED_ALARM	Curr.Out 31/32 is saturated.	Out of Specification (0x78)	Uncertain (0x40)
CO2_3_SATURATED_ALARM	Curr.Out V1/V2, V3/V4 saturated	Out of Specification (0x78)	Uncertain (0x40)
CO1_COM_ERROR	Curr.Out 31/32 com error.	Failure (0x24)	Bad-device failure (0x12)
OPTION_MODULE_1_COM_ERROR	Option Card 1 com error.	Out of Specification (0x78)	Uncertain (0x40)
OPTION_MODULE_2_COM_ERROR	Option Card 2 com error.	Out of Specification (0x78)	Uncertain (0x40)
CO1_SAFETY_ALARM	Safety Alarm Curr.Out 31/32	Failure (0x24)	Bad-device failure (0x12)
CO1_NOT_CALIBRATED_ALARM	Curr.Out 31/32 not calibrated.	Maintenance (0xA4)	Maintenance (0xA4)
CO2_NOT_CALIBRATED_ALARM	Curr.Out V1/V2 not calibrated.	Maintenance (0xA4)	Maintenance (0xA4)
CO3_NOT_CALIBRATED_ALARM	Curr.Out V3/V4 not calibrated.	Maintenance (0xA4)	Maintenance (0xA4)
VOLTAGE_MONITORING_ALARM_MB	MB voltages outside range.	Out of Specification (0x78)	Uncertain (0x40)
ALARM_SIMULATION	An alarm is simulated.	Check (0x3C)	Uncertain (0x40)
FIELDBUS_BOARD_IN_RESET	Communicat. card not responding	Maintenance (0xA4)	Maintenance (0xA4)
CO1_READBACK_ALARM	CO 31/32 readbackcurrent deviates	Out of Specification (0x78)	Uncertain (0x40)
DSP_FAILURE	DSP Failure on Frontend Board.	Failure (0x24)	Bad-device failure (0x12)
DENSITY_FAILURE	Density failure	Failure (0x24)	Bad-device failure (0x12)

Alarm Mapping	Description	Classic Status	Condensed Status
TEMPERATURE_SENSOR_EXCEEDS_LIMITS	Sensor temperature out max range	Out of Specification (0x78)	Uncertain (0x40)
TEMPERATURE_SENSOR_MEASURING_FAILED	Sensor temperature measure error	Failure (0x24)	Bad-device failure (0x12)
SENSOR_AMPLITUDE_OUT_OF_RANGE	Sensor amplitudeout of range.	Failure (0x24)	Bad-device failure (0x12)
SENSOR_DRIVER_CURRENT_FAILURE	Sensor driver current to high.	Out of Specification (0x78)	Uncertain (0x40)
ALARM_DENSITY_TOO_LOW	Density too low.Empty pipe, gas	Out of Specification (0x78)	Uncertain (0x40)
FLOW_DENSITY_REACHED	Density exceeds min/max limits.	Out of Specification (0x78)	Uncertain (0x40)
FLOW_TEMP_REACHED	Medium temperat exceeds limits.	Out of Specification (0x78)	Uncertain (0x40)
DENSITY_TO_ONE	Density to 1g/cm³	Out of Specification (0x78)	Uncertain (0x40)
CONCENTRATION_SCALED_MAX_MIN	Concentration inunit exceeds	Out of Specification (0x78)	Uncertain (0x40)
CONCENTRATION_UNSCALED_MAX_MIN	Concentration in percent exceeds	Out of Specification (0x78)	Uncertain (0x40)
VOLTAGE_MONITORING_ALARM_FEB	FEB voltages outside range.	Out of Specification (0x78)	Uncertain (0x40)
SENSOR_AMPLITUDE_BELOW_CUSTOM_LIMIT	Sensor amplitude out of ranges	Out of Specification (0x78)	Uncertain (0x40)

Valid for:

TB1 Rel. Idx: 17,21,25,29,80,83,86,89,93,94,120
TB3 Rel. Idx: 14-33, 63;
TB5 Rel. Idx: 8,9,10,11,78

5 Indicators on the transmitter

Under the main menu item ‘Communication’ you can find, among others, the ‘...Profibus’ menu item.

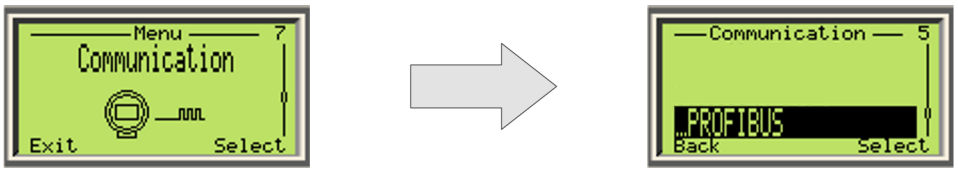

Figure 12: Menu ‘Communication / ...Profibus’

Here you can find some important PROFIBUS parameters.
All parameters except the slave address can only be read via the transmitter menu.
The slave address can only be changed under certain conditions via the HMI menu (see **Address setting** on page 8).
The configuration of only the readable parameters occurs via the bus or automatically.

The following section is a detailed description of all the setting options provided under the ‘...Profibus’ menu.

... / Communication / ...Profibus	
Address	Set the PROFIBUS DP device address (1 to 126).
Ident Nr. Selector	Display the PROFIBUS DP identification number For selection of the ID number see **ID number** on page 4.
Comm State	Display the PROFIBUS communication status. • Offline: No PROFIBUS communication. • Stop: Bus active, device not active. • Clear: Device is being initialized. • Operate: Cyclic communication is active.
Baud Rate	Display the transmission speed (baud rate) for the PROFIBUS communication. The baud rate is automatically detected and does not need to be configured manually.
PB Manufacturer ID	Display the PROFIBUS DP manufacturer ID

6 Revision history

Revision	**Date**	**Changes**
0.1	30.01.2018	First edition
0.2	04.03.2020	Update

Notes

Notes

Notes

—

ABB Measurement & Analytics

For your local ABB contact, visit:
www.abb.com/contacts

For more product information, visit:
www.abb.com/flow

3KXF411017R4001

COM/FCB400/FCH400/FCD400/PB-EN Rev. C 02.2024