Product Description

FLOWMETER WT-XE4000 PA

Datalink Description

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Manufacturer:

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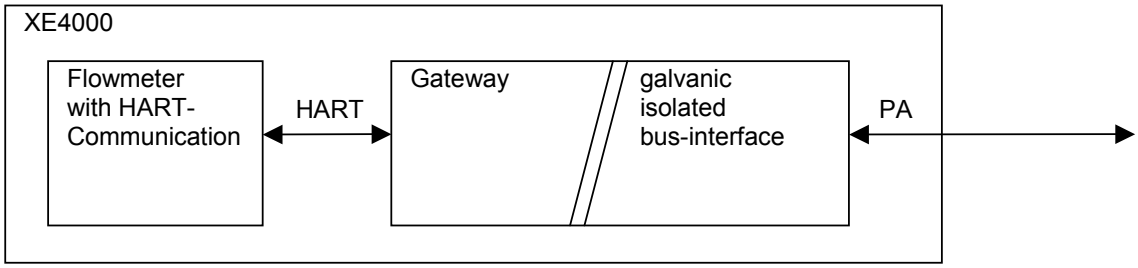
CONTENTS

1. Hardware

The WT-XE4000 PA BUS interface is realized as gateway, which translates internal HART communication to PA-communication. Because of internal high speed HART baudrate and created special HART-commands for often used parameters the internal HART communication does not have anyeffects on the speed and quality of the external PA BUS speed and general behaviour.



The gateway requires both power supplies being active, the flowmeter supply and the PA BUS supply.
The local display of the XE4000 presents some parameters of the gateway (PA-address, ..) and allows to change someot these by using the local keyboard. Pre condition for this again is that both power supplies are active.

2. Configuration

2.1 Ident Number

Each Profibus instrument is assigned an manufacturer identification number (ID) by Profibus International (PI). The ID of the XE4000 is: 0xB208. This ID is base for the naming of the manufacturer specific GSD file which is called WT0AC1.gsd. This file includes the access to all the manufacturer functionblocks being implemented, one AI block and two TOT blocks.

Profile GSD files can be obtained via the Internet:
www.profibus.com -----> Libraries -----> PA Profiles.

2.2 Config String

Configuring a PA slave starts with transfering a configuration string from the master. This string defines the data used during cyclic data exchange. Please refer to the GSD file which includes the possible configuration strings.

Excerpt of the GSD file WT0AC1.gsd:

```
Module 1 = "EMPTY_MODULE"          0x00
Module 2 = "AI"                    0x94
Module 3 = "TOTAL"                 0x41,0x84,0x85
Module 4 = "SETTOT_TOTAL"          0xC1,0x80,0x84,0x85
Module 5 = "SETTOT_MODETOT_TOTAL"  0xC1,0x81,0x84,0x85

Slot(1)  = "AI1"              2 1,2
Slot(2)  = "Totalizer 1"      3 1,3,4,5
Slot(3)  = "Totalizer 2"      3 1,3,4,5
```

If the PA 3.0 device is used with the ident number 129 and the PA 2.0 GSD for the PA 2.0 device (0x06668), the config strings of this GSD WT0AC1.gsd are valid. This configuration does not allow to use the PA 2.0 DTM nor the PA 3.0 DTM for acyclic device access.

Module

Each module consists of a configuration string. This string in an ecoded form defines how many bytes could cyclically be transferred from Master to Slave and vice versa.
Example: 0x94 means 5 bytes transferred from Slave to Master, 0 bytes from Master to Slave.

The data transferred depends on the profile fixed within the function block. The above mentioned modules include:

1. "EMPTY_MODULE"
   This module does not transfer any data.

2. "AI"
   Cyclical transfer of AI block OUT parameter from Slave to Master.
   These are 5 bytes: 4 Bytes (Value, type:Float) + 1 Byte (Status)

3. "TOTAL"
   Cyclical transfer of TOTAL parameter (totalizer block) from Slave to Master.
   These are 5 bytes: 4 Bytes (Value, type:Float) + 1 Byte (Status)

4. "SETTOT_TOTAL"
   Cyclical transfer of the parameter TOTAL (totalizer block) from Slave to Master (5 bytes) and transfer of the parameter SET_TOT of the totalizer block (1 byte) from Master to Slave.

5. "SETTOT_MODETOT_TOTAL"
   Cyclical transfer of the parameter TOTAL (totalizer block) from Slave to Master (5 bytes) and transfer of SET_TOT and MODE_TOT parameters (totalizer block, 2 bytes in sum) from Master to slave.
   .

2.2.1 Slots

The XE4000 with the ID 0xB208 includes 3 Slots: AI, Totalizer 1 and Totalizer 2.
The Slot-Definition defines which modules are to be used with the respective slots.
These are as follows:
AI: module 1 or 2
Totalizer: module 1, 3, 4 or 5.

2.2.2 Examples

The configuration string **0x94,0x41,0x84,0x85,0x41,0x84,0x85** cyclically transfers OUT value coming from the AI block and both TOTAL values coming from the Totalizer blocks from Slave to Master. Altogether this amounts to 15 data bytes :

	Slot 1 = AI	**Slot 2 = Totalizer 1**	**Slot 3 = Totalizer 2**	
Config-String	**0x94**	**0x41, 0x84, 0x85**	**0x41, 0x84, 0x85**	
Module chosen	Module 2: AI (Out)	Module 3 TOTAL	Module 3 TOTAL	
Data Slave→Master	5	5	5	Sum: 15 Bytes
Data Master→Slave	0	0	0	Sum: 0 Bytes

The configuration string **0x94, 0xC1, 0x81, 0x84, 0x85, 0x00** cyclically transfers the value for OUT of the AI block and the value for TOTAL of Totalizer 1 from Slave to Master. Altogether this amounts to 10 data bytes. The TOTAL value of the second Totalizer block will not be transferred (empty module).
SET_TOT and MODE-TOT will be cyclically transferred from Master to Slave. In sum this amounts to 2 bytes.

	Slot 1 = AI	**Slot 2 = Totalizer 1**	**Slot 3 = Totalizer 2**	
Config-String	**0x94**	**0xC1, 0x81, 0x84,0x85**	**0x00**	
Module chosen	Module 2: AI (Out)	Module 3 SETTOT_MODETOT_TOTAL	Module 1 Empty	
Data Slave→Master	5	5	0	Sum: 10 Bytes
Data Master→Slave	0	2	0	Sum: 2 Bytes

3. Overview blocks

The XE4000 converter contains the following blocks:

	0xB208		
Physical Block	Slot 0		
Analog Input Block	Slot 1		
Totalizer Block 1	Slot 2		
Totalizer Block 2	Slot 3		
Transducer Block	Slot 4		

The physical block, the AI block and the Totalizer blocks correspond to the PROFIBUS PA profile 3.0.

Up to index 53, the transducer block contains the part of the specified “Flow Transducer Block”. The parameters correspond to the electromagnetic profile. On from index the manufacturer-specific parameters are added to the transducer block.

Note: The PA-address can be setted by PA BUS.

3.1 Block-Table-Legend

The following tables contain the following explained attributes:

Rel.Index – Absolute Slot Index:
Relative Index of parameters within the Block and absolute Slot-Index. In accordance with the PA profile all blocks start on absolute slot index 16.
The BLOCK_OBJECT e.g is located in each block on relative index 0
which means absolute slot index 16.

Data-Type: Data type of parameter. Some parameters consist of structures which are defined using the form DS-xx. Please see Chapter 3.6 for details concerning these structures.

Size: Size of parameter in bytes.

Storage Type:
- Cst = Constant Parameter. Parameter is not subject to any changes.
- S = Static Parameter will be stored permanently (non-volatile). When saving a static parameter the static revision counter ST_REV of each respective block (index 1 in each block) will be incremented by 1.
- N = Non-volatile Parameters will be saved permanently (non-volatile). When writing non-volatile parameters ST_REV remains unchanged.
- D = Dynamic Parameters will be lost during powering down.

Access
- r = Parameter can be read.
- w = Parameter can be written.

Parameter usage
- C = Contained: Parameter for internal use only, cannot be accessed cyclically.
- I = Input: Input parameter for cyclic communication.
- O = Output: Output parameter for cyclic communication.

Data transport
- a = Parameter can only be accessed acyclically.
- cyc = Parameter can be accessed cyclically and acyclically.

Default Value: Basic settings of parameters.
The parameter FACTORY_RESET (index 19 in the physical block)
The selection “restart with defaults” resets resource block, AI blocks, totalizer block and some transducer block parameters to default settings.

Note: FACTORY_RESET will reset some manufacturer specific parameters of the tranducer block to a stored setting.

3.2 Slot 0 - Physical Block

This block contains general information of the fieldbus instrument, e.g. manufacturer name, instrument type, version no. etc.

3.2.1 Physical Block Parameter, sorted in accordance with index

Rel.Idx /Slot Idx	Variable Name	Data Type	Size	Store	Access	Parameter usage / Data transport	Default Value	Description
0 / 16	BLOCK_OBJECT	DS-32	20	Cst	r	C/a	-	This object applies to every block and are placed before the first parameter. It contains the characteristics of the block e.g. block type and profile number.
1 / 17	ST_REV	Unsigned16	2	N	r	C/a	0	Revision counter for static variables. If astaic variable changes its value this counter is increased by one.
2 / 18	TAG_DESC	OctetString	32	S	r,w	C/a	' '	Every block can be assigned a textual TAG description. The TAG_DESC must be unambiguous and unique in the fieldbus system.
3 / 19	STRATEGY	Unsigned16	2	S	r,w	C/a	0	Grouping of Function Blocks. The STRATEGY field can be used to group blocks.
4 / 20	ALERT_KEY	Unsigned8	1	S	r,w	C/a	0	This parameter contains the identification number of the plant unit. It helps to identify the location (plant unit) of an event.
5 / 21	TARGET_MODE	Unsigned8	1	S	r,w	C/a	Auto	The TARGET_MODE parameter contains the operating mode of a block. 0x08: Auto 0x10: Man 0x80: Out Of Service
6 / 22	MODE_BLK	DS-37	3	D	r	C/a	Actual : Permitted: Auto Normal : Auto	This parameter contains the current mode and the permitted and normal mode of the block.
7 / 23	ALARM_SUM	DS-42	8	D	r	C/a	0,0,0,0	This parameter contains the current states of the block alarms.
8 / 24	SOFTWARE_REVISION	VisibleString	16	Cst	r	C/a	D200S022U02 A.10	Revision-number of the software of the field device. This is the Gateway software.
9 / 25	HARDWARE_REVISION	VisibleString	16	Cst	r	C/a	REVISION 0	Revision-number of the hardware of the field device.
10 / 26	DEVICE_MAN_ID	Unsigned16	2	Cst	r	C/a	147 (=ABB)	Identification code for the manufacturer company of the field device.
11 / 27	DEVICE_ID	VisibleString	16	Cst	r	C/a	XE4000 PA3.0	Manufacturer specific identification of the device.
12 / 28	DEVICE_SER_NUM	VisibleString	16	Cst	r	C/a	-	Serial number of the field device. Note: the number is equal to the instrument number (see tranducer block rel. index 101)
13 /29	DIAGNOSIS	Octetstring	4	D	r	C/a	-	Detailed information of the device, bitwize coded. Details in chapter 4.1
14 / 30	DIAGNOSIS_EXTENSION	Octetstring	6	D	r	C/a	-	Additional manufacturer-specific information of the device, bitwize coded. More than one message possible at once, see chapter 4.2
15 / 31	DIAGNOSIS_MASK	Octetstring	4	Cst	r	C/a	0x30,0x00,0x00, 0x80	Mask for the supported DIAGNOSIS information-bits 0 = not supported 1 = supported
16 / 32	DIAGNOSIS_MASK_EXTENSION	Octetstring	6	Cst	r	C/a	0xFF,0xFF,0xD7, 0x00,0x00,0x00	Mask for the supported DIAGNOSIS_EXTENSION information-bits 0 = not supported 1 = supported
17 / 33	DEVICE_CERTIFICATION	VisibleString	32	Cst	r	C/a	-	Certifications of the field device, e.g. EX certification.
18 / 34	WRITE_LOCKING	Unsigned16	2	N	r,w	C/a	2457	Software write protection

Rel.Idx /Slot Idx	Variable Name	Data Type	Size	Store	Access	Parameter usage / Data transport	Default Value	Description
								=0: no acyclic write allowed, except to WRITE_LOCKING =2457: all writeable parameters of a device are writeable.
19 / 35	FACTORY_RESET	Unsigned16	2	S	r,w	C/a	-	Reset = 1 reset parameters to default =2506: warm start =2712: reset bus address only
20 / 36	DESCRIPTOR	OctetString	32	S	r,w	C/a	-	User-definable text (a string) to describe the device within the application.
21 / 37	DEVICE_MESSAGE	OctetString	32	S	r,w	C/a	-	User-definable MESSAGE (a string) to describe the device within the application or in the plant.
22 / 38	DEVICE_INSTAL_DATE	OctetString	16	S	r,w	C/a	-	Date of installation of the device.
23 / 39	-	Unsigned8	1	N	r,w	C/a	1	LOCAL_OP_ENA, optional parameter, not implemented
24 / 40	IDENT_NUMBER_SELECTOR	Unsigned8	1	S	r,w	C/a	-	Ident numbers: 1 = manufacturer specific: 0x0691
25 / 41	-	Unsigned8	1	D	r	C/a	-	HW_WRITE_PROTECTTION, optional parameter, not implemented
26 to 32 (42 to 48)	Reserved by PNO							

3.2.2 Physical Block Parameter, sorted according to names

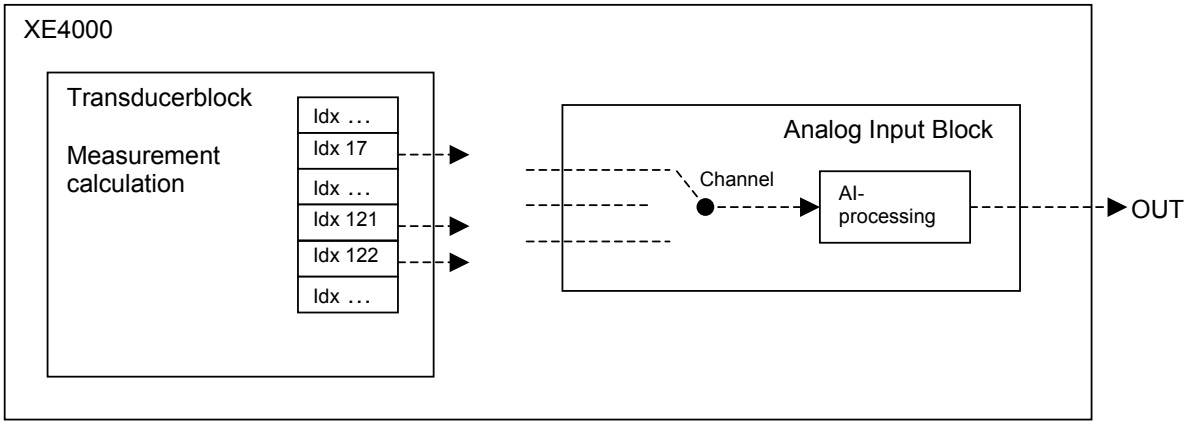
Parameter Name	Rel.Index / Slot Index
ALARM_SUM	7 / 23
ALERT_KEY	4 / 20
BLOCK_OBJECT	0 / 16
DESCRIPTOR	20 / 36
DEVICE_CERTIFICATION	17 / 33
DEVICE_ID	11 / 17
DEVICE_INSTAL_DATE	22 / 38
DEVICE_MAN_ID	10 / 26
DEVICE_MESSAGE	21 / 37
DEVICE_SER_NUM	12 / 28
DIAGNOSIS	13 /29
DIAGNOSIS_EXTENSION	14 / 30
DIAGNOSIS_MASK	15 / 31
DIAGNOSIS_MASK_EXTENSION	16 / 32
FACTORY_RESET	19 / 35
HARDWARE_REVISION	9 / 25
IDENT_NUMBER_SELECTOR	24 / 40
LOCAL_OP_ENA	23 / 39
MODE_BLK	6 / 22
SOFTWARE_REVISION	8 / 24
ST_REV	1 / 17
STRATEGY	3 / 19
TAG_DESC	2 / 18
TARGET_MODE	5 / 21
WRITE_LOCKING	18 / 34

3.3 Slot 1- Analog Input Block

Measurement calculation is a part of the transducer block. The transducer block internally provides the measured values. The cyclic output of the measurement values takes place using the analog input block (AI block). The XE4000 disposes of one AI block.

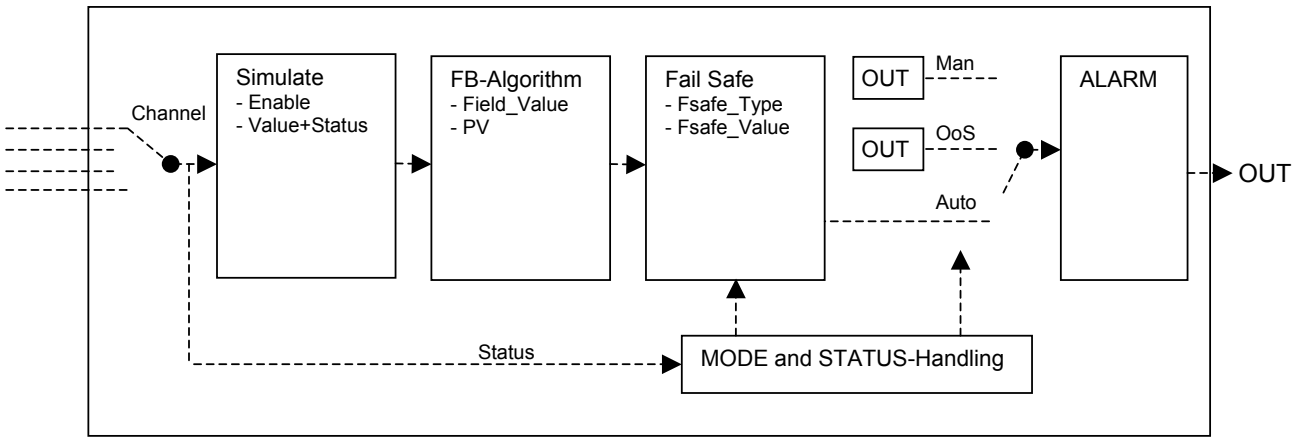
Please make use of the Channel Parameter to choose the parameter to be presented by the AI block (index 14 in AI). The XE4000 channels are (decimal, see chapter 3.5.1):

Channel 256+17 = 273: VOLUME_FLOW
Channel 256+121 = 377: Transducer-block internal totalizer >F (forward flow)
Channel 256+122 = 378: Transducer-block internal totalizer <R (reverse flow)



The AI block handles certain tasks such as change of scaling, alarm detection, simulation etc. The following section provides an overview of these tasks.

3.3.1 Analog Input Block Diagram



Channel: Please choose the value to be transferred from the transducer block using the channel parameter (index 14). See also 3.5.1

Simulate: The simulate parameter is a structure (see 3.6.7) enabling a simulation process (Sub parameter “Simulate enable”). The Sub parameter “Simulate value” defines those values which will then be processed instead of the channel value.

FB-Algorithm: The PV_SCALE structure is used scaling the entry value (generally the channel value) to percent. This percent value is called FIELD_VALUE and is available only internal. It cannot be accessed via communication:

FIELD_VAL = 100 * (Channel-Value – PV_SCALE.EU0%) /
(PV_SCALE.EU100% - PV_SCALE.EU0%)

This percentage value is scaled to the PV value using the OUT_SCALE structure:

PV = (FIELD_VAL / 100) * (OUT_SCALE.EU100% - OUT_SCALE.EU0%)
+ OUT_SCALE.EU0%

The parameter PV_FTIME (Index 18) allows the entry of a damping time in seconds. The filtered measurement value is called OUT.

OUT = Filter (PV)

Fail-Safe: FSAFE_TYPE (Index) defines the behaviour in case of a failure. If FSAFE_TYPE=0 in case of failure a FSAVE_VALUE will be transferred. If FSAVE_TYPE=1 the last usable value will be transferred. If FSAVE_TYPE = 2 then the incorrect values are tranfered.

Mode: With mode= Auto the so far determined value will be transferred

With mode= MAN the OUT parameter will be transferred. The OUT parameter can be written acyclically in Man mode.

With mode= OUT of Service the OUT parameter will be transferred.

Alarm: There are four different alarm thresholds (Indices 21,23,25,27)
- High-High-Limit
- High-Limit
- Low-Limit
- Low-Low-Limit

Should OUT be less than Low-Limit or Low-Low-Limit or be higher than High-Limit or High-High-Limit, the alarm signal (indices 30-33) will be set to the corresponding status.
- High-High-Alarm
- High-Alarm
- Low-Alarm
- Low-Low-Alarm

Using ALARM_HYS (Index 19) you can set a hysteresis value for the alarm thresholds.

3.3.2 Analog Input Block Parameter, sorted in accordance with index

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Parameter usage / Data transport	Default Value	Description
0 / 16	BLOCK_OBJECT	DS-32	20	Cst	r	C/a	-	This object applies to every block and are placed before the first parameter. It contains the characteristics of the block e.g. block type and profile number.
1 / 17	ST_REV	Unsigned16	2	N	r	C/a	0	A block has static block parameters, that are not changed by the process. Values are assigned to this parameter during the configuration or optimisation. The value of ST_REV must increase by 1 after every change of a static block parameter. This provides a check of the parameter revision.
2 / 18	TAG_DESC	OctetString	32	S	r,w	C/a	' '	Every block can be assigned a textual TAG description. The TAG_DESC must be unambiguous and unique in the fieldbus system.
3 / 19	STRATEGY	Unsigned16	2	S	r,w	C/a	0	Grouping of Function Block. The STRATEGY field can be used to group blocks.
4 / 20	ALERT_KEY	Unsigned8	1	S	r,w	C/a	0	This parameter contains the identification number of the plant unit. It helps to identify the location (plant unit) of an event.
5 / 21	TARGET_MODE	Unsigned8	1	S	r,w	C/a	Auto	The desired operating mode of the block. 0x08: Auto 0x10: Man 0x80: Out Of Service
6 / 22	MODE_BLK	DS-37	3	D	r	C/a	Blockspecific Actual : Permitted: Oos,Man,Auto Normal : Auto	This parameter contains the current mode and the permitted and normal mode of the block. Oos=out of service
7 / 23	ALARM_SUM	DS-42	8	D	r	C/a	0,0,0,0	This parameter contains the current states of the block alarms.
8 / 24	BATCH	DS-67	10	S	R,w	C/a	0,0,0,0	See detailed descriptions in the Pa profile
9 / 25	-							
10 / 26	OUT	DS-33	5	D	r, w (1)	O/cyc	measured of the variable, state	The function block parameter OUT contains the current measurement value in a vendor specific or configuration adjusted engineering unit and the belonging state in AUTO MODE. (1)The function block parameter OUT contains the value and status set by an operator in MAN MODE.
11 / 27	PV_SCALE	Array of Float (EU at 100%, EU at 0%)	8	S	r,w	C/a	100, 0	Input scaling of thew block Conversion of the Process Variable into percent using the high and low scale values. The engineering unit of PV_SCALE high and low scale values are direct related to the PV_UNIT of the configured Transducer Block (configured via Channel parameter). The PV_SCALE high and low scale values follow the changes of the PV_UNIT of the related Transducer Block automatically, i.e. a change of the Transducer Block PV_Unit causes no bump at OUT from AI.

12 / 28	OUT_SCALE	DS-36	11	S	r,w	C/a	100, 0, 1349, 2 (1349 = m3/h)	Output scaling of the block Scale of the Process Variable The function block parameter OUT_SCALE contains the values of the lower limit and upper limit effective range, the code number of the engineering unit of Process Variable and the number of digits on the right hand side of the decimal point.
13 / 29	LIN_TYPE	Unsigned8	1	S	r,w	C/a	0	Type of linearisation: 0= no linearization
14 / 30	CHANNEL	Unsigned16	2	S	r,w	C/a	273 (=256+17)	Reference to the active Transducer Block and the relative index of the transducer block parameter which will be processed in the AI block (2) Note: the channel only can be changed in mode Man or Out of Service. By writing to the channel parameter automatically the scaling and unit of the channel is written into PV_SCALE and OUT_SCALE.
16 / 32	PV_FTIME	Float	4	S	r,w	C/a	0	Filter time of the Process Variable The function block parameter PV_FTIME contains the time constant for the rise time of the FB output up to a value of 63,21 % resulted from a jump on the input (PT1 filter). The engineering unit of the parameter is second.
17 / 33	FSAFE_TYPE	Unsigned8	1	S	r,w	C/a	1	Determines the behaviour values are incorrect: =0: FSAVE_VALUE is valid instead of OUT, Status is Uncertain_Substitute Value =1: last value of OUT remains valid, Status is Uncertain_LastUsableValue =2: the incorrect value is tranferred as OUT, Status ist Bad
18 / 34	FSAFE_VALUE	Float	4	S	r,w	C/a	- (0.0)	This value is tranferred as OUT if the channel provides incorrect values and FSAVE_TYPE is 0.
19 / 35	ALARM_HYS	Float	4	S	r,w	C/a	0.5% of range	Hysteresis for all the alarm limits and warning limits
21 / 37	HI_HI_LIM	Float	4	S	r,w	C/a	max value	Value for upper limit of alarms in physical units like OUT
23 / 39	HI_LIM	Float	4	S	r,w	C/a	max value	Value for upper limit of warnings in physical units like OUT
25 / 41	LO_LIM	Float	4	S	r,w	C/a	min value	Value for lower limit of warnings in physical units like OUT
27 / 43	LO_LO_LIM	Float	4	S	r,w	C/a	min value	Value for the lower limit of alarms in physical units like OUT
30 / 46	HI_HI_ALM	DS-39	16	D	r	C/a	0	State of the upper limit of alarms
31 / 47	HI_ALM	DS-39	16	D	r	C/a	0	State of the upper limit of warnings
32 / 48	LO_ALM	DS-39	16	D	r	C/a	0	State of the lower limit of warnings
33 / 49	LO_LO_ALM	DS-39	16	D	r	C/a	0	State of the lower limit of alarms
34 / 50	SIMULATE	DS-50	6	S	r,w	C/a	disable	For commissioning and test purposes the input value from the Transducer Block in the Analog Input Function Block AI-FB can be simulated. That means that the Transducer and AI-FB will be disconnected.
35 / 51	OUT_UNIT_TEXT	OctetString	16	S	r,w	C/a	-	If a specific unit of OUT parameter is not in the code list (see General Requirement) the user has the possibility to write the specific text in this parameter. The unit code is then equal “textual unit definition”.
36 to 44 (52 to 60)	reserved by PNO							

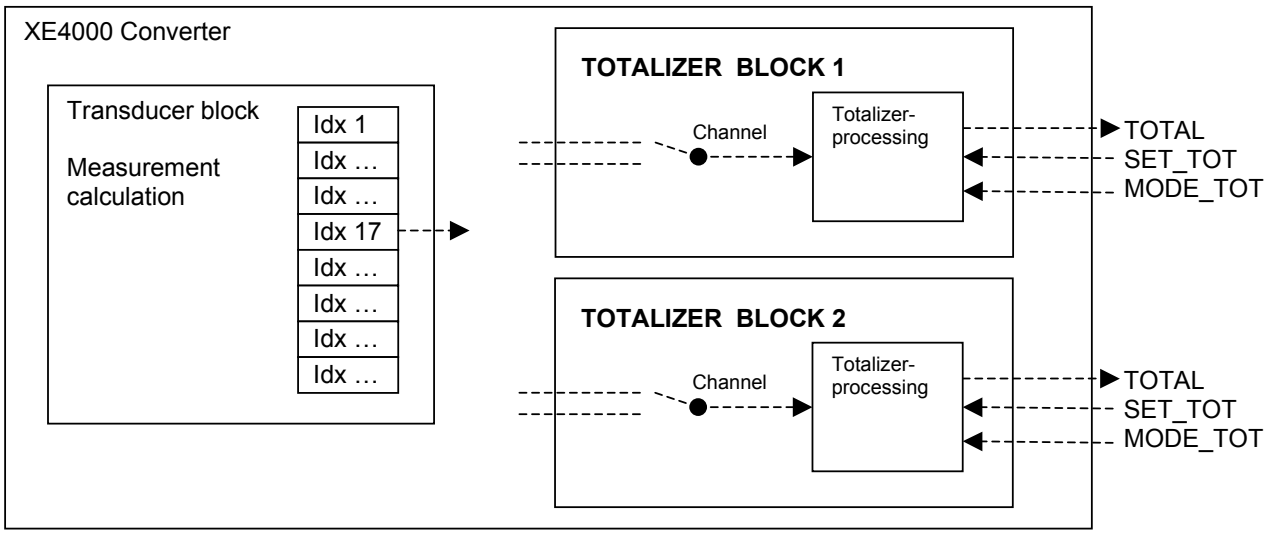
3.3.3 Analog Input Block Parameter, sorted according to names

Parameter Name	Rel.Index / Slot Index
ALARM_HYS	19 / 35
ALARM_SUM	7 / 23
ALERT_KEY	4 / 20
BATCH	8 / 24
BLOCK_OBJECT	0 / 16
CHANNEL	14 / 30
FSAFE_TYPE	17 / 33
FSAFE_VALUE	18 / 34
HI_ALM	31 / 47
HI_HI_ALM	30 / 46
HI_HI_LIM	21 / 37
HI_LIM	23 / 39
LIN_TYPE	13 / 29
LO_ALM	32 / 48
LO_LIM	25 / 41
LO_LO_ALM	33 / 49
LO_LO_LIM	27 / 43
MODE_BLK	6 / 22
OUT	10 / 26
OUT_SCALE	12 / 28
OUT_UNIT_TEXT	35 / 51
PV_FTIME	16 / 32
PV_SCALE	11 / 27
SIMULATE	34 / 50
ST_REV	1 / 17
STRATEGY	3 / 19
TAG_DESC	2 / 18
TARGET_MODE	5 / 21

3.4 Slot 2 and 3 - Totalizer Block

Within the totalizer block, the flow measurement value will be totalized (integrated) to determine the volume flow (counter reading). The totalizer block receives the measurement data from the transducer block. Possible selections for the channel only are (decimal reading):

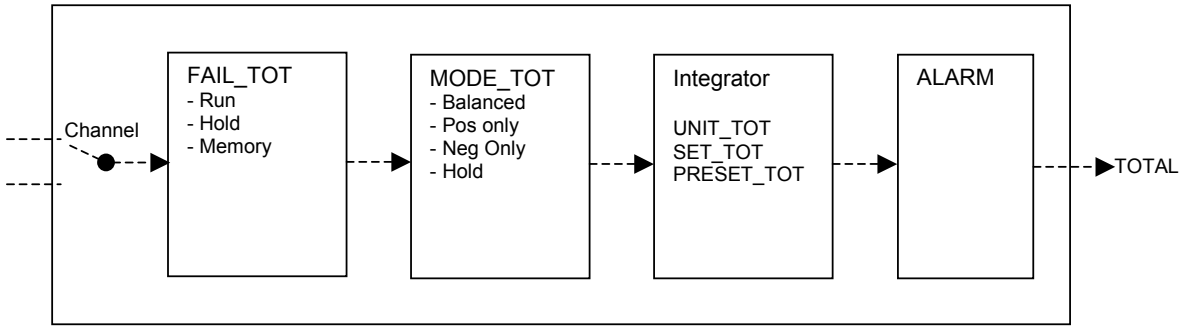
256+17 = 273: VOLUME_FLOW



The totalizer block parameters
- TOTAL
- SET_TOT
- MODE_TOT

can be changed via cyclic communication. This is done using the Config-String, see chapter 2.2.

3.4.1 Totalizer Block Diagram



Channel: Measured value from transducer block to be processed can be chosen via channel parameter (index 12). See also 3.5.1

FAIL_TOT (Index 15) determines behaviour of channel values with “BAD” status. In this case you can either keep the totalizer running (Run) and ignore the bad values, stop the totalizer or totalize the last usable value (Memory).

MODE_TOT (Index 14) determines whether both flow directions are totalized or merely the positive or negative flow values. Hold will stop the totalizer.

Integrator: The flow values are continually totalized to the TOTAL values (index 10) to calculate the totalizer reading.

UNIT_TOT (Index 11) indicates the unit. The value should correspond to the channel unit. This is not verified and the UNIT_TOT is not included in the calculations.

SET_TOT (Index 13) allows resetting or presetting of TOTAL value:
0: Totalize means that the totalizer is working and totalizing normally
1: Reset resets totalizer to 0.
2: Preset resets totalizer to PRESET_TOT (Index 16).
As long as SET_TOT is set to 1 or 2, the reset or preset state remains unchanged. Only when SET_TOT is reset to 0 , the totalizer restarts normal operating.

Alarm: There are four alarm thresholds (Index 18-21)
- High-High-Limit
- High-Limit
- Low-Limit
- Low-Low-Limit

and four corresponding alarm states for each threshold (Index 22-25), which will be set if the limits are reached.
- High-High-Alarm
- High-Alarm
- Low-Alarm
- Low-Low-Alarm

Using ALARM_HYS (Index 17) a hysteresis value can be set for the alarm thresholds mentioned.

3.4.2 Totalizer Block Parameter, sorted in accordance with index

Rel.Idx /Slot Idx	Variable Name	Data Type	Size	Store	Access	Parameter usage / Data transport	Default Value	Description
0 / 16	BLOCK_OBJECT	DS-32	20	C	r	C/a	-	This object applies to every block and are placed before the first parameter. It contains the characteristics of the block e.g. block type and profile number.
1 / 17	ST_REV	Unsigned16	2	N	r	C/a	0	A block has static block parameters, that are not changed by the process. Values are assigned to this parameter during the configuration or optimisation. The value of ST_REV must increase by 1 after every change of a static block parameter. This provides a check of the parameter revision.
2 / 18	TAG_DESC	OctetString	32	S	r,w	C/a	' '	Every block can be assigned a textual TAG description. The TAG_DESC must be unambiguous and unique in the fieldbus system.
3 / 19	STRATEGY	Unsigned16	2	S	r,w	C/a	0	Grouping of Function Block. The STRATEGY field can be used to group blocks.
4 / 20	ALERT_KEY	Unsigned8	1	S	r,w	C/a	0	This parameter contains the identification number of the plant unit. It helps to identify the location (plant unit) of an event.
5 / 21	TARGET_MODE	Unsigned8	1	S	r,w	C/a	Auto	The desired operation mode of the block 0x08: Auto 0x10: Man 0x80: Out Of Service
6 / 22	MODE_BLK	DS-37	3	D	r	C/a	Actual : Permitted: Oos,Man,Auto Normal : Auto	This parameter contains the current mode and the permitted and normal mode of the block.
7 / 23	ALARM_SUM	DS-42	8	D	r	C/a	0,0,0,0	This parameter contains the current states of the block alarms.
8 / 24	BATCH	DS-67	10	S	R,w	C/a	0,0,0,0	See detailed descriptions in the PA profile
9 / 25	-							
10 / 26	TOTAL	DS-33	5	N	r	O/cyc	0	The function block parameter TOTAL contains the integrated quantity of the value refernced by the CHANNEL and the associated status.
11 / 27	UNIT_TOT	Unsigned16	2	S	r,w	C/a	1038 = Liter	Unit of TOTAL
12 / 28	CHANNEL	Unsigned16	2	S	r,w	C/a	273 (=256+17)	Reference to the active transducer block, which provides the measurement value to the function block. (1) Note: The channel can only be changed in mode MAN or OUT of Service. While writing to the channel parameter automatically the physical unit of the value the channel is related to is entered into UNIT_TOT. This is the the unit for mass flow (kg/h→ kg) or volume flow (m^3/h→ m^3) .
13 / 29	SET_TOT	Unsigned8	1	N	r,w	I/cyc	0	Reset of the internal value of the FB algorithm to 0 or set this value to PRESET_TOT. The function block parameter SET_TOT affects the current totalized value (TOTAL) immediately. This function is level sensitive. The following selections of this function block parameter are possible: 0: TOTALIZE; „normal“ operation of the totalizer 1: RESET; resets the TOTAL value to 0 2: PRESET; resets the TOTAL value to the value of PRESET_TOT
14 / 30	MODE_TOT	Unsigned8	1	N	r,w	I/cyc	0	This function block parameter governs the behaviour of the totalization. The following selections are possible:

Rel.Idx /Slot Idx	Variable Name	Data Type	Size	Store	Access	Parameter usage / Data transport	Default Value	Description
								0: BALANCED; true arithmetic integration of the incoming rate values. 1: POS_ONLY; totalization of positive incoming rate values only. 2: NEG_ONLY; totalization of negative incoming rate values only. 3: HOLD; totalization stopped.
15 / 31	FAIL_TOT	Unsigned8	1	S	r,w	C/a	0	Fail-safe mode of the totalizer function block. This parameter governs the behaviour of the function block during the occurrence of input values with bad status. The following selections are possible: 0: RUN ; totalisation is continued using the input values despite the bad status. The status is ignored. 1: HOLD; totalisation is stopped during occurrence of bad status of incoming values. 2: MEMORY; totalisation is continued based on the last incoming value with good status before the first occurrence of bad status.
16 / 32	PRESET_TOT	Float	4	S	r,w	C/a	0.0	
17 / 33	ALARM_HYS	Float	4	S	r,w	C/a	0.0	Hysteresis Within the scope of the PROFIBUS-PA specification for transmitters there are functions for the monitoring of limit violation (off-limit conditions) of adjustable limits. Maybe the value of one process variable is just the same as the value of a limit and the variable fluctuates around the limit it will occur a lot of limit violations. That triggers a lot of messages; so it must be possible to trigger messages only after crossing an adjustable hysteresis. The sensitivity of triggering of the alarm messages is adjustable. The value of the hysteresis is fixed in ALARM_HYS and is the same for the parameters HI_HI_LIM, HI_LIM, LO_LIM and LO_LO_LIM. The hysteresis is expressed as value below high limit and above low limit in the engineering unit of xx_LIM.
18 / 34	HI_HI_LIM	Float	4	S	r,w	C/a	Max value	Value for upper limit of alarms Upper limit value for alarms with engineering unit of the OUT parameter. If the measured variable is equal or higher than the upper limit value the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
19 / 35	HI_LIM	Float	4	S	r,w	C/a	Max value	Value for upper limit of warnings Upper limit value for warnings with engineering unit of the OUT parameter. If the measured variable is equal or higher than the upper limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one .
20 / 36	LO_LIM	Float	4	S	r,w	C/a	Min value	Value for lower limit of warnings Lower limit value for warnings with engineering unit of the OUT parameter. If the measured variable is equal to or lower than the lower limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
21 / 37	LO_LO_LIM	Float	4	S	r,w	C/a	Min value	Value for the lower limit of alarms Lower limit value for alarms with engineering unit of the OUT parameter. If the measured variable is equal to or lower than the lower limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
22 / 38	HI_HI_ALM	DS-39	16	D	r	C/a	0	State of the upper limit of alarms This parameter contains the state of the upper limit of an alarm and the relating time

Rel.Idx /Slot Idx	Variable Name	Data Type	Size	Store	Access	Parameter usage / Data transport	Default Value	Description
								stamp. The time stamp expresses the time the measured variable has been equal or higher than the upper limit of the alarm. Devices without clock use the beginning of the PROFIBUS-PA time (1st January 1984) as time stamp.
23 / 39	HI_ALM	DS-39	16	D	r	C/a	0	State of the upper limit of warnings This parameter contains the state of the upper limit of a warning and the relating time stamp. The time stamp expresses the time the measured variable has been equal or higher than the upper limit of the warning. Devices without clock use the beginning of the PROFIBUS-PA time (1st January 1984) as time stamp.
24 / 40	LO_ALM	DS-39	16	D	r	C/a	0	State of the lower limit of warnings This parameter contains the state of the lower limit of a warning and the relating time stamp. The time stamp expresses the time at which the measured variable has been equal to or higher than the lower limit of the warning. Devices without clock use the beginning of the PROFIBUS-PA time (1st January 1984) as time stamp.
25 / 41	LO_LO_ALM	DS-39	16	D	r	C/a	0	State of the lower limit of alarms This parameter contains the state of the lower limit of an alarm and the relating time stamp. The time stamp expresses the time at which the measured variable has been equal to or higher than the lower limit of the alarm. Devices without clock use the beginning of the PROFIBUS-PA time (1st January 1984) as time stamp.
26 to 35 (42 to 51)	reserved by PNO							

3.4.3 Totalizer Block Parameter, sorted according to names

Parameter Name	Rel.Index / Slot Index
ALARM_HYS	17 / 33
ALARM_SUM	7 /23
ALERT_KEY	4 / 20
BATCH	8 / 24
BLOCK_OBJECT	0 / 16
CHANNEL	12 / 28
FAIL_TOT	15 / 31
HI_ALM	23 / 39
HI_HI_ALM	22 / 38
HI_HI_LIM	18 / 34
HI_LIM	19 / 35
LO_ALM	24 / 40
LO_LIM	20 / 36
LO_LO_ALM	25 / 41
LO_LO_LIM	21 / 37
MODE_BLK	6 / 22
MODE_TOT	14 / 30
PRESET_TOT	16 / 32
SET_TOT	13 / 29
ST_REV	1 / 17
STRATEGY	3 / 19
TAG_DESC	2 / 18
TARGET_MODE	5 / 21
TOTAL	10 / 26
UNIT_TOT	11 / 27

3.5 Transducer Block

The transducer block contains all instrument specific parameters and functions necessary for flow measurement and calculation. The measured and calculated values are being provided as Channel-values.
The cyclic reading of measured values is only possible for the OUT of the AI block and the TOTAL of the totalizer blocks, not for the Transducer block channel values. The channel parameter of the AI or totalizer block selects the channel desired. However the values can also be read acyclically from the transducer block using the respective indices.

3.5.1 Channels and Units

The transducer block (TB) provides four measured values in so called channels. Each function block (FB) disposes of one channel parameter (Index 14 in AI block, index 12 in totalizer block). This channel parameter determines which channel will be transferred from TB to FB. The following values are decimal:

Channel 256+17 = 273:	VOLUME_FLOW Unit: see TB-Parameter VOLUME_FLOW_UNITS (Index 18)
Channel 256+121 = 377: Channel 256+122= 378:	Transducer-block Totalizer >F (forward flow) Transducer-block Totalizer <R (reverse flow) Unit: see TB-Parameter “Unit Totalizer” (Index 68) **This is NOT the Totalizer block value!** The XE4000 has separate totalizers (see submenu Totalizer on flowmeter-display), which are mapped to the Transducer block and which can be accessed via selecting channel-values.

The value type of the channel parameter is Unsigned16. The upper byte indicates the transducer block index (in general it is possible that an instrument disposes of several transducer blocks), the lower byte indicates the relative index of the parameter within the transducer block.

The XE4000 merely disposes of one transducer block which is assigned to index 1. Consequently, the high byte always is set to 1 which corresponds to relative index +256.

3.5.2 Transducer Block Parameter, sorted in accordance with index

Up to index 53 the transducer block consists of the part "flow transducer block". The parameters correspond to the elecromagnetic profile. On from index 54, manufacturer-specific parameters are attached to the transducer block.

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description
0 / 16	BLOCK_OBJECT	DS-32	20	Cst	r	-		This structure contains general information about the block like block type, profil version, etc.
1 / 17	ST_REV	Unsigned16	2	N	r	0		Revision counter for static variables. If a variable changes, the revison counter is incremented each time by one.
2 / 18	TAG_DESC	OctetString	32	S	r,w	' '		A textual description of the block. This has to be unique within a fieldbus
3 / 19	STRATEGY	Unsigned16	2	S	r,w	0		This parameter can be used to build groups of blocks . Each block of a group gets the same reference number.
4 / 20	ALERT_KEY	Unsigned8	1	S	r,w	0		This parameter is used as identification number for a part of a plant.
5 / 21	TARGET_MODE	Unsigned8	1	S	r,w	Auto		The desired operating mode of the block: 0x08: Auto 0x10: Man 0x80: Out Of Service
6 / 22	MODE_BLK	DS-37	3	D	r	Actual : Permitted: Auto Normal : Auto		This parameter includes the actual, permitted and normal operating modes of the block.
7 / 23	ALARM_SUM	DS-42	8	D	r	0,0,0,0		This parameter includes a summary of the block alarms
8 / 24	CALIBR_FACTOR	float	4	S	r,w			Not used. No flowmeter-parameter is mapped to this block parameter.
9 / 25	LOW_FLOW_CUTOFF	float	4	S	r,w	0	132/133 Slot 5	This parameter is the XE4000 low flow cutoff. It's equal to index 62.
10 / 26	MEASUREMENT_MODE	unsigned8	1	S	r,w	0	128/129 Slot 24	Mode of measurement: 0: unidirektional 1: bidirektional This parameter is equal to parameter "Flowdirection" (Index 90).
11 / 27	FLOW_DIRECTION	unsigned8	1	S	r,w	0	128/129 Slot 25	Assigns an arbitrary positive or negative sign to the measured PV value. 0 = positive 1 = negative This parameter is equal to parameter "Flow indication" (Index 91).
12 / 28	ZERO_POINT	float	4	S	r,w	Sensor-specific	132/133 Slot 8	This parameter is equal to index 66, "system zero adj."
13 /29	ZERO_POINT_ADJUST	unsigned8	1	N	r,w	0	147	Starts and indicates adjust of the ZERO_POINT: 0 = chancel 1 = execute This parameter is equal to index 113.
14 / 30	ZERO_POINT_UNIT	unsigned16	2	S	r,w	1077		Unit of the ZERO_POINT is always Hz.

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description
15 / 31	NOMINAL_SIZE	float	4	S	r,w	-	128/129 Slot 1	Meter size of the primary in mm or inch. This parameter is nearly equal to index 55. Here the meter size is a float number, index 55 is an enumerated parameter. 3 mm / 0.1 in / (1/10 in) 4 mm / 0.15625 in / (5/32 in) 5 mm / 0.1875 in / (3/16 in) 6 mm / 0.25 in / (1/4 in) 8 mm / 0.3125 in / (5/16 in) 10 mm / 0.375 in / (3/8 in) 15 mm / 0.5 in / (1/2 in) 20 mm / 0.75 in / (/3/4 in) 25 mm / 1 in 32 mm / 1.25 in / (1-1/4 in) 40 mm / 1.5 in / (1-1/2 in) 50 mm / 2 in 65 mm / 2.5 in / (2-1/2 in) 80 mm / 3 in 100 mm / 4 in 125 mm / 5 in 150 mm / 6 in 200 mm / 8 in 250 mm / 10 in 300 mm / 12 in 350 mm / 14 in 400 mm / 16 in 450 mm / 18 in 500 mm / 20 in 600 mm / 24 in 700 mm / 28 in 750 mm / 30 in 800 mm / 32 in 900 mm / 36 in 1000 mm / 40 in
16 / 32	NOMINAL_SIZE_UNITS	unsigned16	2	S	r,w	1013		Unit for NOMINAL_SIZE: 1013 : mm 1019 : inch
17 / 33	VOLUME_FLOW	DS-33	5	D	r	-		Measuring value, measured volume flow value. Primary Variable (PV) of this device.
18 / 34	VOLUME_FLOW_UNITS	unsigned16	2	S	r,w	1349		Unit for VOLUME_FLOW, VOLUME_FLOW_LO_LIMIT und VOLUME_FLOW_HI_LIMIT. This parameter is equal to Index 67, “Range unit”. Available units see there.
19 / 35	VOLUME_FLOW_LO_LIMIT	float	4	S	r,w	0.0		Lower Range value of the sensor. This parameter is always 0.
20 / 36	VOLUME_FLOW_HI_LIMIT	float	4	S	r,w	-		Upper range value of the sensor. This parameter is equal to index 58, “Cal-factor”.
21 / 37	-	DS-33	5	D	r	-		MASS_FLOW is not part of the electromagnetic flow profile
22 / 38	-	unsigned16	2	S	r,w	1322		MASS_FLOW_UNITS is not part of the electromagnetic flow profile
23 / 39	-	float	4	S	r,w	-		MASS_FLOW_LO_LIMIT is not part of the electromagnetic flow profile
24 / 40		float	4	S	r,w	-		MASS_FLOW_HI_LIMIT is not part of the electromagnetic flow profile

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description
25 / 41	-	DS-33	5	D	r	-		DENSITY is not part of the electromagnetic flow profile
26 / 42	-	unsigned16	2	S	r,w	1103		DENSITY_UNITS is not part of the electromagnetic flow profile
27 / 43	-	float	4	S	r,w	-		DENSITY_LO_LIMIT is not part of the electromagnetic flow profile
28 / 44	-	float	4	S	r,w	-		DENSITY_HI_LIMIT is not part of the electromagnetic flow profile
29 / 45	-	DS-33	5	D	r	-		TEMPERATURE is not part of the electromagnetic flow profile
30 / 46	-	unsigned16	2	S	r,w	-		TEMPERATURE_UNITS is not part of the electromagnetic flow profile
31 / 47	-	float	4	S	r,w	-		TEMPERATURE_LO_LIMIT is not part of the electromagnetic flow profile
32 / 48	-	Float	4	S	r,w	-		TEMPERATURE_HI_LIMIT is not part of the electromagnetic flow profile
33 / 49	-	DS-33	5	D	r	-		VORTEX_FREQ is not part of the electromagnetic flow profile
34 /50	-	Unsigned16	2	S	r,w	-		VORTEX_FREQ_UNITS is not part of the electromagnetic flow profile
35 / 51	-	Float	4	S	r,w			VORTEX_FREQ_LO_LIMIT is not part of the electromagnetic flow profile
36 / 52	-	Float	4	S	r,w	-		VORTEX_FREQ_HI_LIMIT is not part of the electromagnetic flow profile
37 / 53	-	DS-33	5	D	r	-		SOUND_VELOCITY is not part of the electromagnetic flow profile
38 / 54	-	Unsigned16	2	S	r,w	-		SOUND_VELOCITY_UNITS is not part of the electromagnetic flow profile
39 / 55	-	float	4	S	r,w	-		SOUND_VELOCITY_LO_LIMIT is not part of the electromagnetic flow profile
40 / 56	-	float	4	S	r,w	-		SOUND_VELOCITY_HI_LIMIT is not part of the electromagnetic flow profile
41 / 57	SAMPLING_FREQ	DS-33	5	D	r	-		Excitation of the sensor. This parameter is nearly equal to index 97. There the parameter is an enumerated, wich allows to difference between AC/DC and DC excitation. Here the parameter is a float number. 6.25 Hz AC/DC → 6.25 7.5 Hz AC/DC → 7.5 12.5 Hz AC/DC → 12.5 15 Hz AC/DC → 15 25 Hz AC/DC → 25 30 Hz AC/DC → 30 6.25 Hz DC → 6.25 7.5 Hz DC → 7.5 12.5 Hz DC → 12.5 15 Hz DC → 15 25 Hz DC → 25 30 Hz DC → 30 negativ → 0 positiv → 0
42 / 58	SAMPLING_FREQ_UNITS	Unsigned16	2	S	r,w	1077		Unit of excitation is always Hz.
43 to 52 (59 to 68)	Reserved							
53 / 69	-							
54 / 70	Language	Unsigned8	1	S	r,w		128/129 Slot 0	0 German 1 English 2 French 4 Spanish

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description
55 / 71	Meter size	Unsigned8	1	S	r,w		128/129 Slot 1	0 3 mm 1/10 in 1 4 mm 5/32 in 2 5 mm 3/16 in 3 6 mm 1/4 in 4, 8 mm 5/16 in 5 10 mm 3/8 in 6 15 mm 1/2 in 7 20 mm 3/4 in 8 25 mm 1 in 9 32 mm 1-1/4 in 10 40 mm 1-1/2 in 11 50 mm 2 in 12 65 mm 2-1/2 in 13 80 mm 3 in 14 100 mm 4 in 15 125 mm 5 in 16 150 mm 6 in 17 200 mm 8 in 18 250 mm 10 in 19 300 mm 12 in 20 350 mm 14 in 21 400 mm 16 in 22 450 mm 18 in 23 500 mm 20 in 24 600 mm 24 in 25 700 mm 28 in 26 750 mm 30 in 27 800 mm 32 in 28 900 mm 36 in 29 1000 mm 40 in
56 / 72	Short model no.	Visible String	16	S	r,w		231/230 Slot 1	
57 / 73	Order no.	Visible String	16	S	r,w		231/230 Slot 4	
58 / 74	Cal-fact	Float	4	S	r,w		132/133 Slot 0	Writing: If „Range DN“ (index 95) is fixed, it is only allowed to write the same value, which already is stored in this parameter. If „Range DN“ (index 95) is programable, any value from 0.001 to 9999999 can be written.
59 / 75	Range	Float	4	S	r,w		132/133 Slot 1	Lower Limit: 0.02 or 0.05 * QmaxDN (look at index 94: Range<.05RangeDN) Upper Limit: QmaxDN Unit :look at index 67, „Range unit“
60 / 76	Pulse factor	Float	4	S	r,w		132/133 Slot 3	Lower Limit: 0.001 Upper Limit: 1000 Unit : 1 / Totalizer unit (look at index 68)

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description
61 / 77	Pulse width	Float	4	S	r,w		132/133 Slot 4	Lower Limit: 0.1 Upper Limit: 2000 Unit : msek
62 / 78	Low flow cut-off	Float	4	S	r,w		132/133 Slot 5	Lower Limit: 0.0 Upper Limit: 10.0 Unit : %
63 / 79	Damping	Float	4	S	r,w		132/133 Slot 6	Lower Limit: 0.2 Upper Limit: 100 Unit : sek
64 / 80	Filter	Unsigned8	1	S	r,w		128/129 Slot 2	0 off 1 on
65 / 81	Density	Float	4	S	r,w		132/133 Slot 7	Lower Limit: 0.01 Upper Limit: 5.0 Unit : g/cm3
66 / 82	System zero adj.	Float	4	S	r,w		132/133 Slot 8	

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description	
67 / 83	Range unit	Unsigned16	1	S	r,w		128/129 Slot 3	1351 1352 1353 1347 1348 1349 1350 1367 1368 1369 1370 1366 1363 1364 1371 1372 1373 1374 1322 1323 1324 1325 1327 1328 1329 1318 1319 1320 1330 1331 1332 1356 1357 1358 1359	l/s l/min l/h m3/s m3/min m3/h m3/d igps igpm igph igpd mgd gpm gph bbl/s bbl/min bbl/h bbl/d kg/s kg/min kg/h kg/d t/min t/h t/d g/s g/min g/h lbs/s lbs/min lbs/h ft3/s ft3/m ft3/h ft3/d
68 / 84	Totalizer unit	Unsigned16	1	S	r,w		128/129 Slot 4	1038 1034 1049 1048 1051 1088 1092 1089 1094 1043	l m3 igal gal bbl kg t g lbs ft3

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description
69 / 85	Error log	OctetString	3	N	r,w		48	Error Log #0, Bit 0 — Error 8: — Negative Reference #0, Bit 1 — Error 9: — Excitation #0, Bit 2 — Error A: — MAX-Alarm #0, Bit 3 — Error B: — MIN-Alarm #0, Bit 4 — Error C: — Primary #0, Bit 5 — Error D: — - #0, Bit 6 — Error E: — Totalizer >F #0, Bit 7 — Error F: — Totalizer <R #1, Bit 0 — Error 0: — Empty pipe #1, Bit 1 — Error 1: — A/D-Converter #1, Bit 2 — Error 2: — Uref to small #1, Bit 3 — Error 3: — Flow > 130% #1, Bit 4 — Error 4: — Zero return #1, Bit 5 — Error 5: — EEPROM #1, Bit 6 — Error 6: — Totalizer #1, Bit 7 — Error 7: — Positive Reference #2, Bit 0 — Status 0: — Automatic adjust running #2, Bit 1 — Status 1: — Automatic adjust #2, Bit 2 — Status 2: — Average measurement #2, Bit 3 — Status 3: — - #2, Bit 4 — Status 4: — Prot.cust.trans. #2, Bit 5 — Status 5: — - #2, Bit 6 — Status 6: — Simulation on #2, Bit 7 — Status 7: — Funktiontest or testmode on To reset Error log write 0,0,0.
70 / 86	Max alarm	Unsigned16	2	S	r,w		130/131 Slot 0	Lower Limit: 0 Upper Limit: 130 Unit : %
71 / 87	Min alarm	Unsigned16	2	S	r,w		130/131 Slot 1	Lower Limit: 0 Upper Limit: 130 Unit : %
72 / 88	-							
73 / 89	-							
74 / 90	Detector e.pipe	Unsigned8	1	S	r,w		128/129 Slot 13	0 — off 1 — on
75 / 91	Alarm empty pipe	Unsigned8	1	S	r,w		128/129 Slot 14	0 — off 1 — on
76 / 92	Threshold	Float	4	S	r,w		132/133 Slot 10	
77 / 93	Totalizer >F	Float	4	S	r		132/133 Slot 11	Lower Limit: 0 Upper Limit: 9999999 Unit : Totalizer unit, index 68

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description
78 / 94	Overflow >F	Unsigned16	2	S	r		130/131 Slot 3	Lower Limit: 0 Upper Limit: 65535 Unit : keine
79 / 95	Totalizer >F reset	Unsigned8	1	D	w		140 142	Writing: 1= reset totalizer and overflow 2 = reset only overflow Writing triggers the reset, it is not a static reset signal by the value.
80 / 96	Totalizer <R	Float	4	S	r		132/133 Slot 12	Lower Limit: 0 Upper Limit: 9999999 Unit : Totalizer unit, index 68
81 / 97	Overflow <R	Unsigned16	2	S	r		130/131 Slot 4	Lower Limit: 0 Upper Limit: 65535 Unit : keine
82 / 98	Totalizer <R reset	Unsigned8	1	D	w		141 143	Writing: 1= reset totalizer and overflow 2 = reset only overflow Writing triggers the reset, it is not a static reset signal by the value.
83 / 99	totalizer funct.	Unsigned8	1	S	r,w	128-18		0 Standard 1 differ. Total
84 / 100	Mains interrupt	Unsigned16	2	S	r,w		130/131 Slot 5	Read: Get actual value. Write: Writing value different 0 resets the mains interrupts.
85 / 101	Display 1st line	Unsigned8	1	S	r,w		128/129 Slot 19	7 Q [Bargraph] 2 Q [mA] 1 Q [unit] 0 Q [%] 9 Detector e.P. 11 Signal p/n 12 Reference p/n 13 Signal, Ref. 8 Blanks 6 CommunikationTag 5 Totalizer <R 4 Totalizer >F 3 Totalizer 10 Mains Freqency 15 Channel, Mode, Status 16 Value, Unit 17 Address, State
86 / 102	Display 2st line	Unsigned8	1	S	r,w		128/129 Slot 20	
87 / 103	Display 1st line multipl.	Unsigned8	1	S	r,w		128/129 Slot 21	7 Q [Bargraph] 2 Q [mA]

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description	
88 / 104	Display 2st line multipl.	Unsigned8	1	S	r,w		128/129 Slot 22	1 0 9 11 12 13 8 6 5 4 3 10 14 15 16 17	Q [unit] Q [%] Detector e.P. Signal p/n Reference p/n Signal, Ref. Blanks CommunikationTag Totalizer <R Totalizer >F Totalizer Mains Freqency Off Channel, Mode, Status Value, Unit Address, State
89 / 105	Operating mode	Unsigned8	1	S	r,w		128/129 Slot 23	0 2	Standard Fast
90 / 106	Flowdirection	Unsigned8	1	S	r,w		128/129 Slot 24	0 1	Forward Forward/Reverse
91 / 107	Flow indication	Unsigned8	1	S	r,w		128/129 Slot 25	0 1	standard opposite
92 / 108	Version	Visible String	16	N	r	D699B180U01 X.30	231/230 Slot 7	Software-version of the WT-XE4000 device	
93 / 109	QmaxDN velocity	Unsigned8	1	S	r,w (1)		128/129 Slot 27	0 1	10 m/s 33.33 ft/s
94 / 110	Range<.05RangeDN	Unsigned8	1	S	r,w (1)		128/129 Slot 28	0 1	Off on
95 / 111	Range DN	Unsigned8	1	S	r,w (1)		128/129 Slot 29	0 1	fixed programable
96 / 112	Debit Excitation	Unsigned8	1	S	r,w (1)		128/129 Slot 30	0 1	6.25 Hz AC/DC 7.5 Hz AC/DC

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description	
97 / 113	Excitation	Unsigned8	1	S	r,w (1)		128/129 Slot 31	2 3 4 5 6 7 8 9 10 11 12 13	12.5 Hz AC/DC 15 Hz AC/DC 25 Hz AC/DC 30 Hz AC/DC 6.25 Hz DC 7.5 Hz DC 12.5 Hz DC 15 Hz DC 25 Hz DC 30 Hz DC negativ positiv
98 / 114	Analog range	Unsigned8	1	S	r,w (1)		128/129 Slot 32	7 6 5 4 3 2 1 0	V = 8 auto. V = 4 auto. V = 2 auto. V = 1 auto. V = 8 man. V = 4 man. V = 2 man. V = 1 man.
99 / 115	Preamplifier	Unsigned8	1	S	r,w (1)		128/129 Slot 33	0 1	Yes no
100 / 116	Service-Kode	Unsigned16	2	S	r,w		130/131 Slot 6	Lower Limit: 0 Upper Limit: 9999 Unit : -	
101 / 117	Instrument no.	Unsigned16	2	S	r,w		130/131 Slot 7	Lower Limit: 0 Upper Limit: 65535 Unit : -	
102 / 118	Calibration mode	Unsigned16	2	S	r,w (1)		130/131 Slot 8	Lower Limit: 0 Upper Limit: 65535 Unit : keine	
103 / 119	Span adjust >F	Float	4	S	r,w (1)		132/133 Slot 13	Lower Limit: 250.0 Upper Limit: 300.0 Unit : %	
104 / 120	Span adjust <R	Float	4	S	r,w (1)		132/133 Slot 14	Lower Limit: -300.0 Upper Limit: -250.0 Unit : %	
105 / 121	Zero adjust	Float	4	S	r,w (1)		132/133 Slot 15	Lower Limit: -5.0 Upper Limit: 5.0 Unit : %	
106 / 122	Calibration	Float	4	S	r,w (1)		132/133 Slot 18	Lower Limit: -10.0 Upper Limit: 10.0 Unit : %	

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description
107 / 123	Span Cs 6.25 Hz	Float	4	S	r,w (1)		132/133 Slot 19	Lower Limit: 15.0 Upper Limit: 200.0 Or (dependfs from flow direction) Lower Limit: -200.0 Upper Limit: -15.0 Unit : %
108 / 124	Zero Cz 6.25 Hz	Float	4	S	r,w (1)		132/133 Slot 20	Lower Limit: -5.0 Upper Limit: 5.0 Unit : %
109 / 125	Span Cs 12.5 Hz	Float	4	S	r,w (1)		132/133 Slot 21	Lower Limit: 15.0 Upper Limit: 200.0 Or (dependfs from flow direction) Lower Limit: -200.0 Upper Limit: -15.0 Unit : %
110 / 126	Zero Cz 12.5 Hz	Float	4	S	r,w (1)		132/133 Slot 22	Lower Limit: -5.0 Upper Limit: 5.0 Unit : %
111 / 127	Span Cs 25 Hz	Float	4	S	r,w (1)		132/133 Slot 23	Lower Limit: 15.0 Upper Limit: 200.0 Or (dependfs from flow direction) Lower Limit: -200.0 Upper Limit: -15.0 Unit : %
112 / 128	Zero Cz 25 Hz	Float	4	S	r,w (1)		132/133 Slot 24	Lower Limit: -5.0 Upper Limit: 5.0 Unit : %
113/129	Adjust “System zero adj.”	Unsigned8	1	S	r,w		147	Read: 0 = no adjust running 1 = adjust is running Write: 1 = start adjust Starting the ajust is triggered by writing „1“, not from the static value „1“. The ajust needs 10 to 40 seconds, depending from the excitation frequency.
114/130	Load Primary Data	Unsigned8	1	S	w		148	Write: 1 = Load primary data
115/131	Store Primary Data	Unsigned8	1	S	w		149	Write: 1 = Store primary data
116/132	Initialise external EEPROM	Unsigned16	1	S	w		152	Write: 4000 = Init external EEPROM

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	HART-Cmd read/write	Description
117/133	Adjust primary zero point	Unsigned8	1	S	r,w		155	Read: 0 = no adjust running 1 = adjust is running Write: 1 = start adjust Starting the ajust is triggered by writing „1“, not from the static value „1“. The ajust needs 10 to 40 seconds, depending from the excitation frequency.
118/134	Adjust primary span	Unsigned8	1	S	r,w		156	Read: 0 = no adjust running 1 = adjust is running Write: 1 = start adjust Starting the ajust is triggered by writing „1“, not from the static value „1“. The ajust needs 10 to 40 seconds, depending from the excitation frequency.
119/135	Adjust detector empty pipe	Unsigned8	1	S	r,w		200 Slot 4 190 Slot 3	Lower Limit: 0 Upper Limit: 255 Unit : -
120/136	Version Gateway-Software	Visible String	16	N	r	D200S022U02 A.10		
121/137	Totalizer >F	DS-33	5	D	r			Totalizer >F and status as data structure DS-33, suitable as channel for AI-block
122/138	Totalizer <R	DS-33	5	D	r			Totalizer <R and status as data structure DS-33, suitable as channel for AI-block Info: the reverse totaliser is shown with positive sign (positive number).
123/139	DIP-Switch	Unsigned8	1	N	r,w (1)			Actual switch position
124/140	Start „Zero adjust“	Unsigned8	1	S	r,w		180 Slot 5	Read: 0 = no adjust running 1 = adjust is running Write: 1 = start adjust Starting the ajust is triggered by writing „1“, not from the static value „1“. The ajust needs 10 to 40 seconds, depending from the excitation frequency.
125/141	Start „Span adjust >F“	Unsigned8	1	S	r,w		180 Slot 3	
126/142	Start „Span adjust <R“	Unsigned8	1	S	r,w		180 Slot 4	
127/143	Calibration date	Visible String	6	S	r,w		231/230 Slot 0	
128/144	Message	Visible String	32	S	r,w		12/17	
129/145	Frequency detector empty	Float	4	D	R		200 Slot 21	
130/146	Load device data from external EEPROM	Unsigned8	1	S	w	HartCmd 150		Write: 1 = Load data
131/147	Store device data to external EEPROM	Unsigned8	1	S	w	HartCmd 151		Write: 1 = Store data

3.5.3 Transducer Block Parameter, sorted according to names

Parameter Name	Rel.Index / Slot Index
Adjust “System zero adj.”	113/129
Adjust detector empty pipe	119/135
Adjust primary span	118/134
Adjust primary zero point	117/133
Alarm empty pipe	75 / 91
ALARM_SUM	7 / 23
ALERT_KEY	4 / 20
Analog range	98 / 114
BLOCK_OBJECT	0 / 16
Cal-fact	58 / 74
CALIBR_FACTOR	8 / 24
Calibration	106 / 122
Calibration date	127/143
Calibration mode	102 / 118
Damping	63 / 79
Debit Excitation	96 / 112
Density	65 / 81
Detector e.pipe	74 / 90
DIP-Switch	123/139
Display 1st line	85 / 101
Display 1st line multipl.	87 / 103
Display 2st line	86 / 102
Display 2st line multipl.	88 / 104
Error log	69 / 85
Excitation	97 / 113
Filter	64 / 80
Flow indication	91 / 107
FLOW_DIRECTION	11 / 27
Flowdirection	90 / 106
Frequency detector empty	129/145
Initialise external EEPROM	116/132
Instrument no.	101 / 117
Language	54 / 70
Load device data from external EEPROM	130/146
Load Primary Data	114/130
Low flow cut-off	62 / 78
LOW_FLOW_CUTOFF	9 / 25
Mains interrupt	84 / 100
Max alarm	70 / 86
MEASUREMENT_MODE	10 / 26
Message	128/144
Meter size	55 / 71
Min alarm	71 / 87
MODE_BLK	6 / 22
NOMINAL_SIZE	15 / 31
NOMINAL_SIZE_UNITS	16 / 32
Operating mode	89 / 105
Order no.	57 / 73
Overflow <R	81 / 97
Overflow >F	78 / 94
Preamplifier	99 / 115
Pulse factor	60 / 76
Pulse width	61 / 77
QmaxDN velocity	93 / 109
Range	59 / 75
Range DN	95 / 111
Range unit	67 / 83
Range<.05RangeDN	94 / 110
Reserved	(59 to 68)
SAMPLING_FREQ	41 / 57
SAMPLING_FREQ_UNITS	42 / 58
Service-Kode	100 / 116
Short model no.	56 / 72
Span adjust <R	104 / 120
Span adjust >F	103 / 119
Span Cs 12.5 Hz	109 / 125
Span Cs 25 Hz	111 / 127
Span Cs 6.25 Hz	107 / 123
ST_REV	1 / 17
Start „Span adjust <R“	126/142
Start „Span adjust >F“	125/141
Start „Zero adjust“	124/140
Store device data to external EEPROM	131/147
Store Primary Data	115/131
STRATEGY	3 / 19
System zero adj.	66 / 82
TAG_DESC	2 / 18
TARGET_MODE	5 / 21
Threshold	76 / 92
Totalizer <R	80 / 96
Totalizer <R	122/138
Totalizer <R reset	82 / 98
Totalizer >F	77 / 93
Totalizer >F	121/137
Totalizer >F reset	79 / 95
totalizer funct.	83 / 99
Totalizer unit	68 / 84
Version	92 / 108
Version Gateway-Software	120/136
VOLUME_FLOW	17 / 33
VOLUME_FLOW_HI_LIMIT	20 / 36
VOLUME_FLOW_LO_LIMIT	19 / 35
VOLUME_FLOW_UNITS	18 / 34
Zero adjust	105 / 121
Zero Cz 12.5 Hz	110 / 126
Zero Cz 25 Hz	112 / 128
Zero Cz 6.25 Hz	108 / 124
ZERO_POINT	12 / 28
ZERO_POINT_ADJUST	13 /29
ZERO_POINT_UNIT	14 / 30

3.6 Data Structures

3.6.1 DS-32 – Block Structure

E	Element Name	Data Type	Size
1	Reserved	Unsigned8	1
2	Block Object	Unsigned8	1
3	Parent Class	Unsigned8	1
4	Class	Unsigned8	1
5	DD Reference	Unsigned32	4
6	DD Revision	Unsigned16	2
7	Profile	OctetString	2
8	Profile Revision	Unsigned16	2
9	Execution Time	Unsigned8	1
10	Number of Parameters	Unsigned16	2
11	Address of VIEW_1	Unsigned16	2
12	Number of Views	Unsigned8	1

3.6.2 DS-33 – Value & Status – Floating Point Structure

E	Element Name	Data Type	Size
1	Value	Float	4
2	Status	Unsigned8	1

3.6.3 DS-36 – Scaling Structure

E	Element Name	Data Type	Size
1	EU at 100%	Float	4
2	EU at 0%	Float	4
3	Units Index	Unsigned16	2
4	Decimal Point	Integer8	1

3.6.4 DS-37 – Mode Structure

E	Element Name	Data Type	Size
1	Actual	Unsigned8	1
2	Permitted	Unsigned8	1
3	Normal	Unsigned8	1

3.6.5 DS-39 – Alarm Float Structure

E	Element Name	Data Type	Size
1	Unacknowledged	Unsigned8	1
2	Alarm State	Unsigned8	1
3	Time Stamp	Time Value	8
4	Subcode	Unsigned16	2
5	Value	Float	4

3.6.6 DS-42 – Alarm Summary Structure

E	Element Name	Data Type	Size
1	Current	Octet String	2
2	Unacknowledged	Octet String	2
3	Unreported	Octet String	2
4	Disabled	Octet String	2

3.6.7 DS-50 – Simulate – Floating Point Structure

E	Element Name	Data Type	Size
1	Simulate Status	Unsigned8	1
2	Simulate Value	Float	4
3	Simulate Enabled	Unsigned8	1

3.6.8 DS-67 – Batch Structure

E	Element Name	Data Type	Size
1	BATCH_ID	Unsigned32	4
2	RUP	Unsigned16	2
3	OPERATION	Unsigned16	2
4	PHASE	Unsigned16	2

4. Diagnosis

The cyclic data transfer service Data-Exchange（DP response Data Exchange) includes the Bit Diagnostic Flag, which is set, if the Bytes of DIAGNOSIS or DIAGNOSIS_EXTENSION are changed. The master then starts the service SLAVE_DIAG (DP request Slave Diag) and the converter answers with the following SLAVE_DIAG – Telegram (DP response Slave Diag).
The Parameter DIAGNOSIS and DIAGNOSIS_EXTENSION include the status of the converter. These parameters are represented by the relative indices 13 and 14 in the Physical Block and can be read using the service SLAVE_DIAG.
The service SLAVE_DIAG in minimum transfers according to the PA profile the parameters DIAGNOSIS in Byte 11 to 14 of the answer. For the XE4000 the service has been extended and additionally transfers Byte 15 to 20 for the parameter DIAGNOSIS_EXTENSION.

Content of SLAVE_DIAG – Telegram:

6 Byte	4 Byte	4 Byte	6 Byte
Byte 1 - 6	Byte 7 - 10	Byte 11 - 14	Byte 15 - 20
DP part	PA-Header	DIAGNOSIS	DIAGNOSIS-EXTENSION

If in the 4 bytes of DIAGNOSIS or the 6 bytes of DIAGNOSIS EXTENSION no bit is set, the converter answers with a short telegram, which only consists of the 6 bytes of the DP part only. If in the 4 bytes of DIAGNOSIS or the 6 bytes of DIAGNOSIS EXTENSION in minimum one bit is set the converter answers with a long telegram (20 Byte) as shown above.

4.1 DIAGNOSIS

Octet 1	Bit 0	Hardware failure of the electronic
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	Memory error
	Bit 5	Failure in measurement
	Bit 6	-
	Bit 7	-
Octet 2	Bit 0	-
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	-
	Bit 5	-
	Bit 6	-
	Bit 7	-
Octet 3	Bit 0	-
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	-
	Bit 5	-
	Bit 6	-
	Bit 7	-
Octet 4	Bit 0	-
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	-
	Bit 5	-
	Bit 6	-
	Bit 7	More diagnosis information is available (is set if in minimum one bit in Diagnosis_Extension is set)

Mapping to XE4000 error codes see 1.13

4.2 DIAGNOSIS_EXTENSION

Octet 1	Bit 0	Fehlerregister 8: Negative Reference
	Bit 1	Fehlerregister 9: Excitation
	Bit 2	Fehlerregister A: MAX-Alarm
	Bit 3	Fehlerregister B: MIN-Alarm
	Bit 4	Fehlerregister C: Primary
	Bit 5	Fehlerregister D: -
	Bit 6	Fehlerregister E: Totalizer >F
	Bit 7	Fehlerregister F: Totalizer <R
Octet 2	Bit 0	Fehlerregister 0: Detektor leeres Rohr
	Bit 1	Fehlerregister 1: A/D-Converter
	Bit 2	Fehlerregister 2: Uref to small
	Bit 3	Fehlerregister 3: Fkow > 130%
	Bit 4	Fehlerregister 4: Zero return
	Bit 5	Fehlerregister 5: EEPROM
	Bit 6	Fehlerregister 6: Totalizer
	Bit 7	Fehlerregister 7: Positive Reference
Octet 3	Bit 0	Statusregister 0: Automatic adjust running
	Bit 1	Statusregister 1: Automatic adjust
	Bit 2	Statusregister 2: Average measurement
	Bit 3	Statusregister 3: -
	Bit 4	Statusregister 4: Prot.cust.trans.
	Bit 5	Statusregister 5: -
	Bit 6	Statusregister 6: Simulation on
	Bit 7	Statusregister 7: Funktion test or Test mode on
Octet 4	Bit 0	-
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	-
	Bit 5	-
	Bit 6	-
	Bit 7	-
Octet 5	Bit 0	-
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	-
	Bit 5	-
	Bit 6	-
	Bit 7	-
Octet 6	Bit 0	-
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	-
	Bit 5	-
	Bit 6	-
	Bit 7	-

Note: Error and status register of XE4000 are situated within the transducer block relative index 69.

4.3 Mapping XE-Error/Status

	Error/Status	Mapping to DIAGNOSIS-Bits	Mapping to Status VOLUME_FLOW	Mapping to Status Totalizer
Error 0	Detector empty pipe		UNCERTAIN, non-specific	UNCERTAIN, non-specific
Error 1	A/D-Converter	Failure in measurement	BAD, sensor failure	BAD, sensor failure
Error 2	Uref to small	Failure in measurement	BAD, sensor failure	BAD, sensor failure
Error 3	Flow > 130%		UNCERTAIN, engineering unit range violation	UNCERTAIN, engineering unit range violation
Error 4	Zero return			
Error 5	EEPROM	Memory error	BAD, device failure	BAD, device failure
Error 6	Zähler	Memory error		BAD, device failure
Error 7	Positive Reference	Failure in measurement	BAD, sensor failure	BAD, sensor failure
Error 8	Negative Reference	Failure in measurement	BAD, sensor failure	BAD, sensor failure
Error 9	Excitation	Failure in measurement	BAD, sensor failure	BAD, sensor failure
Error A	MAX-Alarm			
Error B	MIN-Alarm			
Error C	Primary	Memory error	BAD, device failure	BAD, device failure
Error D	-			
Error E	Totalizer >F	Memory error		BAD, device failure (nur bei Zähler Vorlauf)
Error F	Totalizer <R	Memory error		BAD, device failure (nur bei Zähler Rücklauf)
Status 0	Automatic adjust running		UNCERTAIN, sensor calibration	UNCERTAIN, sensor calibration
Status 1	Automatic adjust			
Status 2	Average measurement		UNCERTAIN, sensor calibration	UNCERTAIN, sensor calibration
Status 3	-			
Status 4	Protection custody transfer active			
Status 5	-			
Status 6	Simulation on		UNCERTAIN, simulated value	UNCERTAIN, simulated value
Status 7	Funktionstest or Test mode on			

4.4 Status-Byte

The measurement value is usually transferred cyclically as data structure 33 (see chapter 3.6.2).
This structure consists of a value as floating point and a status byte. The status byte includes three areas:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Quality		Quality Substatus				Limits	

Quality
- 0: bad
- 1: uncertain
- 2: good (Not Cascade)
- 3: good (Cascade)

Substatus for BAD
- 0: non-specific
- 1: configuration error
- 2: not connected
- 3: device failure
- 4: sensor failure
- 5: no communication (last usable value)
- 6: no communication (no usable value)
- 7: out of service

Substatus for UNCERTAIN
- 0: non-specific
- 1: last usable value
- 2: substitute-set
- 3: initial value
- 4: sensor conversion not accurate
- 5: engineering unit violation (unit not in the valid set)
- 6: sub-normal
- 7: configuration error
- 8: simulated value
- 9: sensor calibration

Substatus for GOOD (Non-Cascade)
- 0: ok
- 1: Update Event
- 2: active advisory alarm (priority < 8)
- 3: active critical alarm (priority > 8)
- 4: unacknowledged update event
- 5: unacknowledged advisory alarm
- 6: unacknowledged critical alarm
- 7: -
- 8: initiate fail safe
- 9: maintenance required

Substatus for GOOD (Cascade)
- 0: ok
- 1: initialisation acknowlegded
- 2: initialisation request
- 3: not invited
- 4: reserved
- 5: do not select
- 6: local override

Limits:
- 0: ok
- 1: low limited
- 2: high limited
- 3: constant

5. Start-up

5.1 AI-block

If the channel of the AI-block is written, PV_SVALE and OUT_SCALE of the AI will be set to corresponding values:

Channel 273 = VOLUME_FLOW
Scale: -Range to +Range (index 59 TB)
Unit: VOLUME_FLOW_UNITS (index 18 TB)

Channel 377 = Transducer block internal totalizer >F (forward flow)
Channel 378 = Transducer block internal totalizer <R (reverse flow)
Scale: 0 to 10.000.000
Unit: Totalizer unit, index 68 TB

If the channel is 273 and the range is written by PA-bus or if the range is changed indirectly (writing meter size, unit, …), then the AI-scaling will also be adjusted as described above.

5.2 Totalizer block

The unit of the totalizer block is the volume (or mass)-unit of VOLUME_FLOW_UNITS (index 18, equal to index 67 „Range unit“). It is not the „Totalizer unit“ index 68 (unit of transducer block internal totalizer).
Example:
VOLUME_FLOW_UNITS = „Range units“ = m3/h → Totalizer block counts in m3
„Totalizer unit“ = L → Transducer block internal totalizer counts liter

The Totalizer the channel value periodically:

Total.Value = Total.Value + Channel.Value

The time base of the channel unit (/s, /m, /h, /d) is considered. Therefore the totalizer block can be used with all possible channel units (see Transducer Block Index 67).

Total.Value is a float value. Float values (4 Byte) have a resolution of 7½ decimal points. This limits the maximum counter range. E.g.: 20000000 + 1 will remain as 20000000, as the resolution of the floating point is not sufficient. This means that reaching up to high counter values the counter will not be incremented.