Interface Description
PROFIBUS PA 3.0
D184B093U30

Electromagnetic Flowmeter FSM4000

Valid for software levels from C.10
Model FSM4000-S4

Electromagnetic Flowmeter
FSM4000-S4

Interface description PROFIBUS PA 3.0

D184B093U30

04.2008

Manufacturer:

ABB Automation Products GmbH
Dransfelder Straße 2
D-37079 Göttingen
Germany
Tel.: +49 800 1114411
Fax: +49 800 1114422
CCC-support.deapr@de.abb.com

CONTENTS

1. Hardware

The PA interface has following datas:

U = 9 – 32 V
I = 10 mA (normal operation)
I_{max} = 13 mA (max fault current)

2. Configuration

2.1 Ident Number

Each Profibus instrument is assigned an explicit identification no. by Profibus International (PI). The respective number for the instrument is: 0x078C. Consequently, the respective instrument file is called: ABB_078C.GSD. Using this ident no. you are in a position to benefit from the complete entire functionality of your instrument: One AI block and two totalizer blocks.

PI decided to define standard profiles with individual ident no. The FSM4000 supports profiles 0x9740 (one AI and one totalizer block) and 0x9700 (one AI block only). The advantage of these profiles is the interchangeability of devices from different manufacturers if these are supporting the standard ident numbers.
A disadvantage is the restricted functionality. This is caused by the fact that not all special features of an instrument can be covered by a standard profile.

The Physical Block includes the so-called IDENT_NUMBER_SELECTOR (index 24). Using this selector you can choose one of the following valid ident no.:

0:	0x9740	Profile specific	AI + TOT	PA139740.GSD
1:	0x078C	manufacturer specific ABB FSM4000	AI + 2*TOT	ABB_078C.GSD
128:	0x9700	Profile specific	AI	PA139700.GSD

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

2.2 Config String

During configuring a PA slave receives a configuration string. This string defines the data used for cyclical data exchange. Please refer to GSD file for possible configuration strings.

Excerpt from the GSD file ABB_078C:

```
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
```

2.2.1 Module

Each module disposes of a configuration string. This string in an transliterated form defines how many bytes could cyclically be transferred from Master to Slave and vice versa. Example: 0x94 means 5 bytes from Slave to Master, 0 bytes from Master to Slave. The data transferred depends on the specification of 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.
   .

2.2.2 Slots

The FSM4000 with the ident no. 078C disposes of 3 Slots with function blocks: 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.

2.2.3 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 Master Slave	0	0	0	Sum: 0 Bytes
Data Slave Master	5	5	5	Sum: 15 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. On the whole, 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 Master Slave	0	2	0	Sum: 2 Bytes
Data Slave Master	5	5	0	Sum: 10 Bytes

NOTE:

This examples are valid only for ident no. 0x078C. Both profiles, 0x9740 and 0x9700 contain a different slot no. and thus different configuration strings.
“Empty Modules” (0x00) at the end of the config string can be leave out. “Empty Modules” at the beginning of the config string are required, for example: 0x00, 0x41, 0x84,0x85 is the config string for Totalizer 1, slot 1 with AI is empty (0x00).

2.2.4 Extended Identifier Format

PA Profile specifies two config strings for the AI block: The “short” config string 0x94 and a long config string (Extended Identifier Format):

0x42, 0x84, 0x08, 0x05

Both are accepted by the FSM4000 flowmeter.

2.3 Address setting

There are three ways to set the PA-address:

- Hardware-switch
- PA-bus
- Menu “Slave address” in submenu “Data link” (refer 5.2.1)

The hardware switch has highest priority. An address set by switch is fixed and can not be changed, neither by bus nor by menu. If switch-address-setting is disabled (switch no. 8 off), then it’s possible to set the address via bus or via the menu “Slave address”.

2.3.1 Hardware switch for address setting

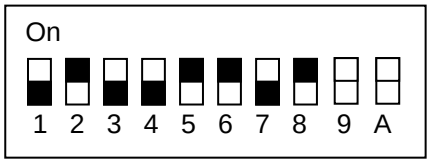
The switch for address setting is placed on a printed circuit board (see picture):

The switch can be seen and set by open converter housing. Take care to security instructions in flowmeter manual before opening the housing. The switch setting is shown on the display in the submenu “data link”, menu “Dip Switch”. It can also be read by PA communication, Transducerblock relative index 153.

Switch 8 defines whether the address needs to be adjusted per bus or hardware:
On: The address will be adjusted per hardware via switches 1-7. It can by no means be adjusted by bus.
Off: The address will be adjusted via bus, switches 1-7 are meaningless.

Switches 1-7: Hardware address settings, binary coded. Valid addresses 0-125.
Switch 9 and “A” have no meaning for address setting.

Example: Address 50 adjusted per switch: 50dez = 32hex = 110010 binary switches 2, 5, 6 and 8



Switch Settings will only becoming active during starting up, not while the system is operating! A new starting up can be done by power cycling the device or with a software reset (Factory_Reset in Physical Block).

The default factory setting is: 0000000000.

The deafult factory setting for the switch 8 is OFF, which means software addressing active.

If switch address setting is deactivated (last starting up with swich 8 on, then starting up with switch 8 off), then PA-address is set back to default address 126 and NO_ADDRESS_CHANGE is set back to FALSE. This is according to PA-specifications.

2.3.2 Menu "PA Address"

There is a menü „PA Address" in the submenu „Data link". This menü shows the actual address. A new address can be set in the range 0 to 126.

```
PA Adress
126
```

Address setting is not possible during running cyclic communication or if switch 8 is "on" (In this case the address is set and fixed by switch).

2.3.3 Set Address by bus

According to PA specifications it is only possible to set an address in the range 0 to 125. It is not allowed to set the address back to default 126 with the Set_Slave_Address-Command.

Address setting is not possible during running cyclic communication, if switch 8 is "on" (In this case the address is set and fixed by switch) or if NO_ADDRESS_CHANGE is TRUE.

2.3.4 Reset Address back to default 126

There are some ways to go back to default address 126:

Write value "Reset bus address" (= 2712 dec = 0A98 hex) into parameter „Factory Reset" (Physical Block rel. Index 19). This is an acyclic write command over PA bus.

It is possible to set address 126 in the menu "PA Address".

Start up the device with switch 8 on, then start up with switch 8 off. Because of deactivating the switch addressing the address goes back to 126.

2.3.5 NO_ADDRESS_CHANGE

Setting the PA address over the PA bus is done with a "Set_Slave_Address"-Command. In this command is a boolean variable "NO_ADDRESS_CHANGE". If this boolean variable is set to TRUE, no further address change is possible with a "Set_Slave_Address"-Command.

If NO_ADDRESS_CHANGE is TRUE, then the only possibility to change the PA address is to write "Reset bus address" into "Factory Reset". This sets the address back to default 126 and clears NO_ADDRESS_CHANGE. After that it is possible to set any address by a "Set_Slave_Address"-Command.

Even if NO_ADDRESS_CHANGE is TRUE, it is possible to set a new address with the menu "PA address". During this NO_ADDRESS_CHANGE is cleared.

3. Overview blocks

Dependent from the ident number, the FSM40000 converter contains the following blocks:

	0x078C FSM4000 PA3.0	0x9740 PA Profil 1*AI, 1*Totalizer	0x9700 PA Profil 1*AI
Physical Block	Slot 0	Slot 0	Slot 0
Analog Input Block	Slot 1	Slot 1	Slot 1
Totalizer Block 1	Slot 2	Slot 2	-
Totalizer Block 2	Slot 3	-	-
Transducer Block	Slot 4	Slot 4	Slot 4
Diagnosis Block (= Transducer Block 2)	Slot 5	Slot 5	Slot 5

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. From index 54 on, the manufacturer-specific parameters are added in the transducer block.

The Diagnosis Block is a second Transducer Block, which contains manufacturer-specific diagnosis parameters.

3.1 Block-Table-Legend

The following tables contain a. o. the below attributes:

Rel. Index / Abs. 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. Refer to chapter 3.7 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 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 cyclical communication.
- O = Output: Output parameter for cyclical 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), selection “restart with defaults”, resets resource block, AI blocks, totalizer block and some transducer block parameters to default settings.

3.2 Slo 0 - Physical Block

This block contains general information of the fieldbus instrument, e.g. manufacturer, 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	D699G004U02 C.10	Revision-number of the software of the field device.
9 / 25	HARDWARE_REVISION	VisibleString	16	Cst	r	C/a	REVISION C	Revision-number of the hardware of the field device.
10 / 26	DEVICE_MAN_ID	Unsigned16	2	Cst	r	C/a	26 (=ABB)	Identification code for the manufacturer company of the field device.
11 / 17	DEVICE_ID	VisibleString	16	Cst	r	C/a	FSM4000 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 (refer to tranducer block rel. index 110)
13 /29	DIAGNOSIS	Octetstring	4	D	r	C/a	-	Detailed information of the device, bitwize coded. Details in chapter 4.2.3.
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 4.2.4.
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	0xEF,0x3F,0x00, 0xFF,0xC7,0x03	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.

Rel.Idx /Slot Idx	Variable Name	Data Type	Size	Store	Access	Parameter usage / Data transport	Default Value	Description
18 / 34	WRITE_LOCKING	Unsigned16	2	N	r,w	C/a	2457	Software write protection =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	-	The FSM4000 supports the following Ident numbers: 0 = profile specific: 0x9740 1 = manufacturer specific: 0x078C 128 = manufacturer specific: equal to profile 0x9700
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

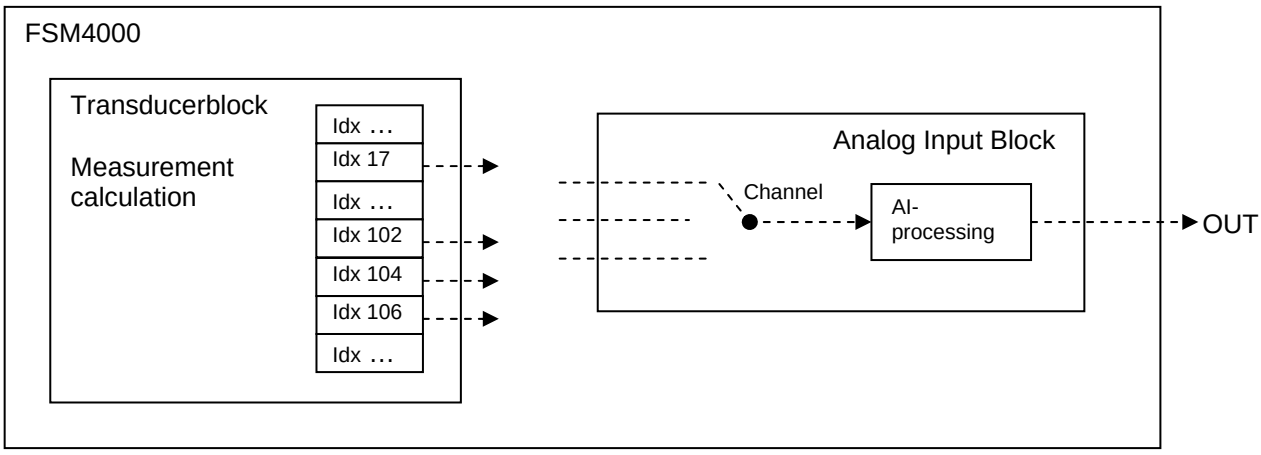
3.3 Slot 1- Analog Input Block

Measurement calculation is effected in the transducer block. The transducer block internally provides the measured values. The cyclical output of the measurement values takes place using the analog input block (AI block). The flowmeter disposes of one AI block.

Please make use of Channel Parameter to choose the parameter to be transferred by the AI block (index 14 in AI). The FSM4000 channels are (decimal, see chapter 3.5.1):

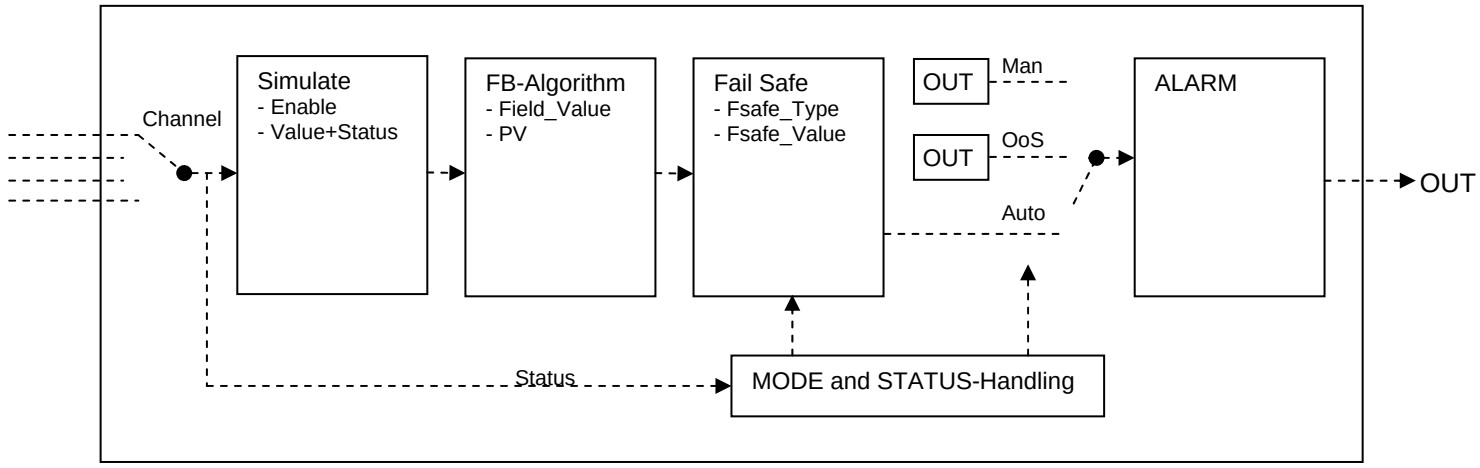
Channel 256+17 = 273: VOLUME_FLOW
Channel 256+102 = 358: Transducer-block internal totalizer >F
Channel 256+104 = 360: Transducer-block internal totalizer <R
Channel 256+106 = 362: Transducer-block internal totalizer diff.

Information: PA specification calls index 17 in the transducer block “VOLUME_FLOW”. The FSM4000 flow value, which is placed in index 17, can be a volume or mass flow, depending on the selected flow unit.



The AI block fulfil certain tasks such as change of scaling, alarm detection, simulation etc. The following section is set out to give you an overview of these tasks.

3.3.1 Analog Input Block Diagram



Channel: Please choose the reading 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 3.7.7) 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 will help setting the entry value (generally the channel value) to percent gauging. This percent value is called FIELD_VALUE and will be 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 reaction 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 non-cyclically 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 one of these thresholds be under or overshot, the alarm signal (indices 30-33) will be triggered off.

- High-High-Alarm
- High-Alarm
- Low-Alarm
- Low-Low-Alarm

Using ALARM_HYS (Index 19) you can set a hysteresis 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 (2)	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							

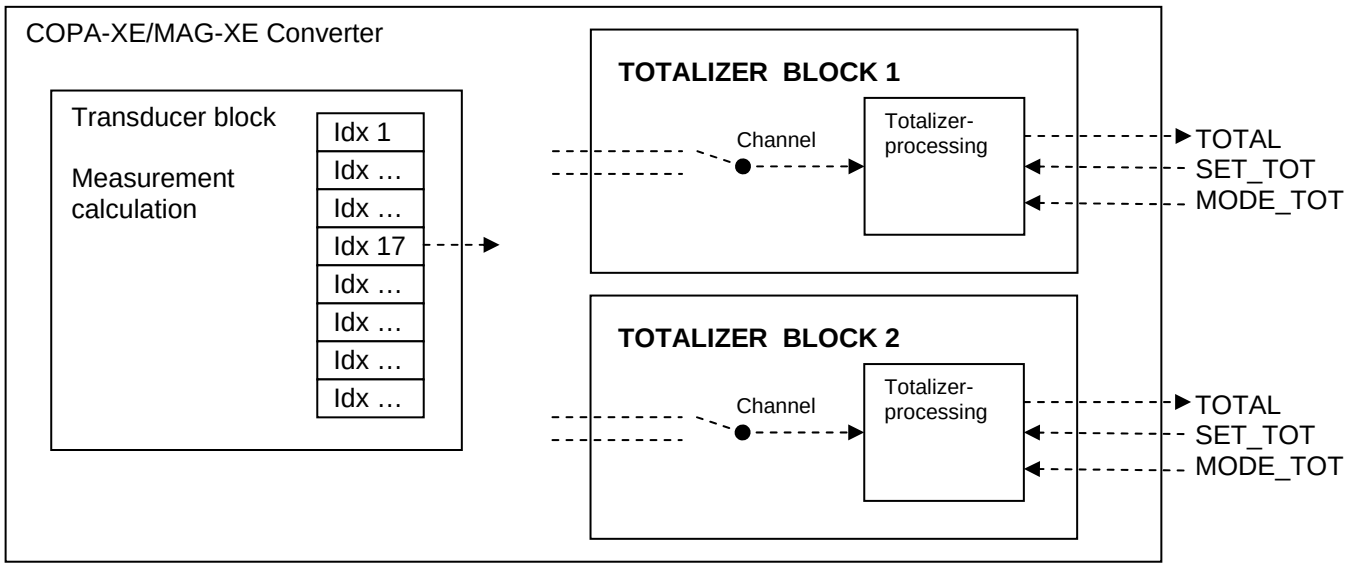
3.3.3 Analog Input Block Parameter, sorted according to names

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 values will be accumulated (integrated) to determine the volume flow (counter reading). The totalizer block will retrieve the measurement data from the transducer block. Possible selctions for the channel are (decimal reading) only:

256+17 = 273: VOLUME_FLOW



The totalizer block parameters
- TOTAL
- SET_TOT
- MODE_TOT

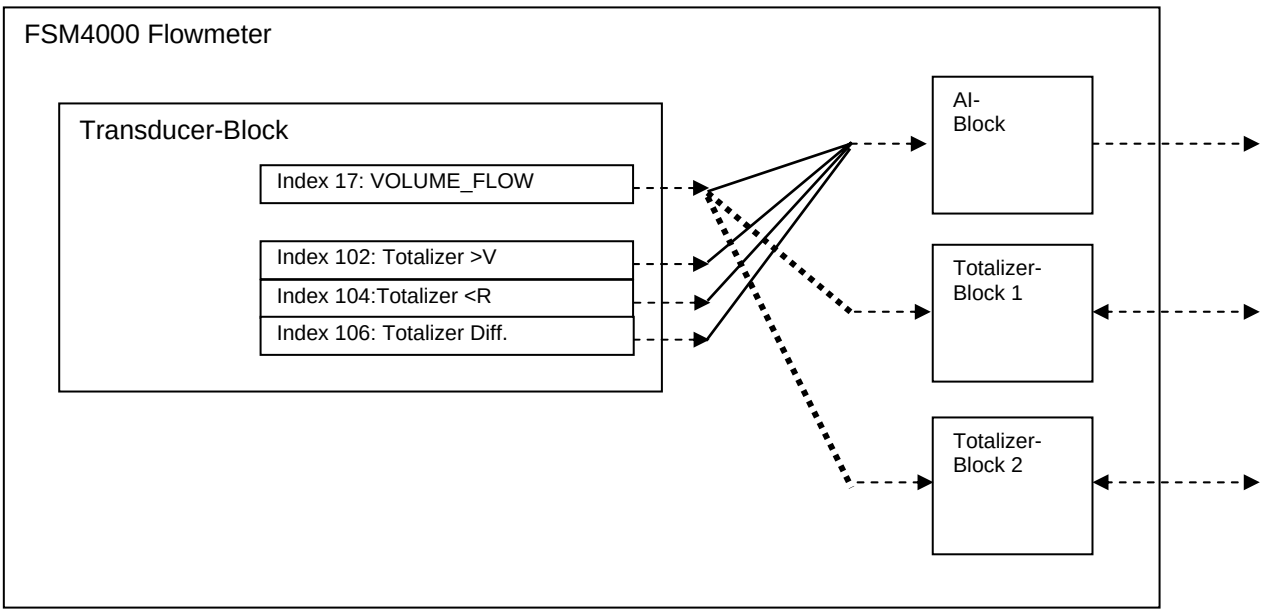
Can be changed via cyclical communication. This is done using the Config-String, see chalpter 2.2.

3.4.1 Totalizer block and flowmeter own totalizer

The FSM4000 is available as standard device with current output and HART communication. This version has no PA-Totalizer blocks. It has its own totalizers for forward flow, reverse flow and differential flow. These “flowmeter own totalizers” are also implemented in the PA version. They can be seen in the submenu “Totalizer” on the local display of the flowmeter. These “flowmeter own totalizers” can be selected as channel for the AI block. So its possible to read them with cyclic communication by reading the AI block.

The only correct cannel for the PA Totalizer blocks is the VOLUME_FLOW value (index 17). It would be senseless to select the „flowmeter own totalizers“ as channel for the Totalizer blocks, because this would be a double adding up.

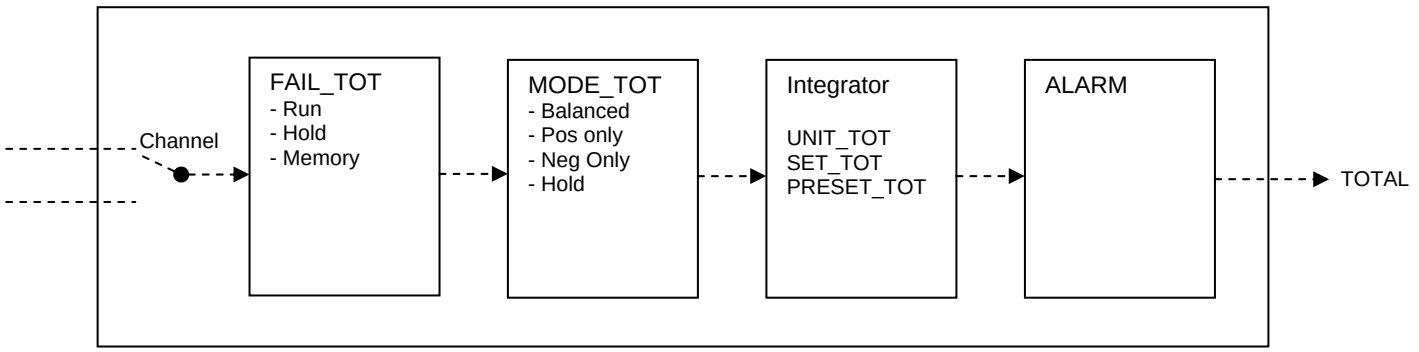
The “PA Totalizer blocks” and “flowmeter own totalizers” are independend. Because of differend settings (units, reset, …) they may show different values.



The Totalizer block unit is according to the VOLUME_FLOW unit, because PA Totalizer blocks are adding up the “VOLUME_FLOW” value. Example: flow unit: m3/h Totalizer block unit: m3.

The Totalizer block unit UNIT_TOT (index 11) is automatically set accorting to the VOLUME_FLOW unit.

3.4.2 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 accumulate the last usable value (Memory).

MODE_TOT (Index 14) determines whether both flow directions ought to be accumulated or merely the positive or negative flow values. Hold will stop the totalizer.

Integrator: The flow values will be continually accumulated 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 will not be verified and the UNIT_TOT will not be included in the calculations.

SET_TOT (Index 13) allows resetting or presetting of TOTAL value:
0: Totalize means that the totalizer is working and accumulating 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 condition will be preserved. Only when SET_TOT is reset to 0 , the totalizer will restart counting normally.

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

There are alarm readings for each threshold (Index 22-25), which will be triggered off should the respective be exceeded or undershot.
- High-High-Alarm
- High-Alarm
- Low-Alarm
- Low-Low-Alarm

Using ALARM_HYS (Index 17) you can implement a hysteresis for the alarm thresholds mentioned.

3.4.3 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 (1)	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.
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: 0: BALANCED; true arithmetic integration of the incoming rate values.

Rel.Idx /Slot Idx	Variable Name	Data Type	Size	Store	Access	Parameter usage / Data transport	Default Value	Description
								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	A preset value for TOTAL. Refer also to SET_TOT paramter.
17 / 33	ALARM_HYS	Float	4	S	r,w	C/a	0.0	Hysteresis for all the alarm limits and warning limits.
18 / 34	HI_HI_LIM	Float	4	S	r,w	C/a	Max value	Value for upper limit of alarms.
19 / 35	HI_LIM	Float	4	S	r,w	C/a	Max value	Value for upper limit of warnings.
20 / 36	LO_LIM	Float	4	S	r,w	C/a	Min value	Value for lower limit of warnings.
21 / 37	LO_LO_LIM	Float	4	S	r,w	C/a	Min value	Value for the lower limit of alarms.
22 / 38	HI_HI_ALM	DS-39	16	D	r	C/a	0	State of the upper limit of alarms.
23 / 39	HI_ALM	DS-39	16	D	r	C/a	0	State of the upper limit of warnings.
24 / 40	LO_ALM	DS-39	16	D	r	C/a	0	State of the lower limit of warnings.
25 / 41	LO_LO_ALM	DS-39	16	D	r	C/a	0	State of the lower limit of alarms.
26 to 35 (42 to 51)	reserved by PNO							

3.4.4 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 cyclical 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. Values can also be read noncyclically out of the transducer block with the respective indices.

3.5.1 Channels and Units

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

Channel 256+17 = 273:	VOLUME_FLOW
	Unit: see TB-Parameter VOLUME_FLOW_UNITS (Index 18).
	Although the name is “VOLUME_FLOW” (coming from PA specifications), this parameter contains the FSM4000 flow value, which may be a volume or mass flow, depending from the selected unit.
Channel 256+102 = 358:	Transducer-block Totalizer >F
Channel 256+104 = 360:	Transducer-block Totalizer <R
Channel 256+106 = 362:	Transducer-block Totalizer Diff
	Unit: see TB-Parameter “Unit Totalizer” (Index 59)
	These are not the PA totalizer block values! The FSM4000 has his own, internal totalizers, which are mapped to index 102, 104 and 106 of the Transducer block, refer to 3.4.1.

The channel parameter is of the type Unsigned16. The upper byte indicates the index of the transducer block, the lower byte indicates the relative index of the parameter within the transducer block. The measurment values are in the first transducer block, which has index 1. So the high byte will always be 1, which is equivalent to +256 onto the relative index.

3.5.2 Transducer Block Parameter, sorted in accordance with index

Up to index 52 the transducer block consists of the part "flow transducer block". The parameters correspond to the elecromagnetic flow profile.

From index 53 on, manufacturer-specific parameters are attached to the transducer block. The order of this parameters correspondends to the order of parameters on the local display.

Some parameters have two default values in the table below. The first one is the default value of the FSM4000. The PA specifications require some special default values after a "Factory Reset" (Physical block index 19). These default values are the second in the table.

Some parameters are double placed in the Transducer block, for example index 9 (LOW_FLOW_CUTOFF of the PA profile) and index 84 ("Low flow cut off" in the manufacturer specific part). Both are equal. It is not important which one will be read or written.

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	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	ALARM_SUM is not supported.
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	1.0 (Factory Reset: 0.0)	This parameter is equal to index 84.
10 / 26	MEASUREMENT_MODE	unsigned8	1	S	r,w	1 (Factory Reset: 0)	Mode of measurement: 0: unidirectional 1: bidirectional This parameter is similar to parameter "Flowdirection" (Index 56), but there the coding is different: 0: Forward/Reverse, 1: Forward
11 / 27	FLOW_DIRECTION	unsigned8	1	S	r,w	0	Assigns an arbitrary positive or negative sign to the measured PV value. 0 = positive

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
							1 = negative This parameter is equal to parameter “Flow indication” (Index 57).
12 / 28	ZERO_POINT	float	4	S	r,w	Sensor-specific	This parameter is equal to index 125, “system zero adj.”
13 /29	ZERO_POINT_ADJUST	unsigned8	1	N	r,w	0	Starts and indicates adjust of the ZERO_POINT: 0 = chancel 1 = execute This parameter is equal to index 126.
14 / 30	ZERO_POINT_UNIT	unsigned16	2	S	r,w	1342 (Factory Reset: 1062)	FSM4000-„System zero adjust“ unit is %, but PA-Profile also requires “mm/s”. Because of that both units are possible here. The translation factor is: 100% = 10 m/s 1% = 100 mm/s. 1062 = mm/s 1342 = %

<table>
<tr><td>15 / 31</td><td>NOMINAL_SIZE</td><td>float</td><td>4</td><td>S</td><td>r,w</td><td>-</td><td>Meter size of the primary in mm or inch.
This parameter is nearly equal to index 75. Here the meter size is a float number, index 75 is an enumerated parameter.
PA profile requires writing of the parameter. But it is only possible to write the value, which is already in this parameter (“Dummy”–write, no real write).
<table><tr><th>Enumerted-Wert bei Idx 75</th><th>mm</th><th>inch</th><th></th></tr><tr><td>43</td><td>1 mm</td><td>0,04 in</td><td>(1/25 in)</td></tr><tr><td>44</td><td>1,5 mm</td><td>0,0588 in</td><td>(1/17 in)</td></tr><tr><td>45</td><td>2 mm</td><td>0,0833 in</td><td>(1/12 in)</td></tr><tr><td>0</td><td>3 mm</td><td>0,1 in</td><td>(1/10 in)</td></tr><tr><td>1</td><td>4 mm</td><td>0,15625 in</td><td>(5/32 in)</td></tr><tr><td>2</td><td>6 mm</td><td>0,25 in</td><td>(1/4 in)</td></tr><tr><td>3</td><td>8 mm</td><td>0,3125 in</td><td>(5/16 in)</td></tr><tr><td>4</td><td>10 mm</td><td>0,375 in</td><td>(3/8 in)</td></tr><tr><td>5</td><td>15 mm</td><td>0,5 in</td><td>(1/2 in)</td></tr><tr><td>6</td><td>20 mm</td><td>0,75 in</td><td>(3/4 in)</td></tr><tr><td>7</td><td>25 mm</td><td>1 in</td><td></td></tr><tr><td>8</td><td>32 mm</td><td>1,25 in</td><td>(1-1/4 in)</td></tr><tr><td>9</td><td>40 mm</td><td>1,5 in</td><td>(1-1/2 in)</td></tr><tr><td>10</td><td>50 mm</td><td>2 in</td><td></td></tr><tr><td>11</td><td>65 mm</td><td>2,5 in</td><td>(2-1/2 in)</td></tr><tr><td>12</td><td>80 mm</td><td>3 in</td><td></td></tr><tr><td>13</td><td>100 mm</td><td>4 in</td><td></td></tr><tr><td>14</td><td>125 mm</td><td>5 in</td><td></td></tr><tr><td>15</td><td>150 mm</td><td>6 in</td><td></td></tr><tr><td>16</td><td>200 mm</td><td>8 in</td><td></td></tr><tr><td>17</td><td>250 mm</td><td>10 in</td><td></td></tr><tr><td>18</td><td>300 mm</td><td>12 in</td><td></td></tr><tr><td>19</td><td>350 mm</td><td>14 in</td><td></td></tr><tr><td>20</td><td>400 mm</td><td>16 in</td><td></td></tr><tr><td>21</td><td>450 mm</td><td>18 in</td><td></td></tr><tr><td>22</td><td>500 mm</td><td>20 in</td><td></td></tr><tr><td>23</td><td>600 mm</td><td>24 in</td><td></td></tr><tr><td>24</td><td>700 mm</td><td>28 in</td><td></td></tr><tr><td>25</td><td>750 mm</td><td>30 in</td><td></td></tr><tr><td>26</td><td>800 mm</td><td>32 in</td><td></td></tr><tr><td>27</td><td>900 mm</td><td>36 in</td><td></td></tr><tr><td>28</td><td>1000 mm</td><td>40 in</td><td></td></tr></table></td></tr>
<tr><td>16 / 32</td><td>NOMINAL_SIZE_UNITS</td><td>unsigned16</td><td>2</td><td>S</td><td>r,w</td><td>1013</td><td>Unit for NOMINAL_SIZE:
1013 : mm
1019 : inch</td></tr>
<tr><td>17 / 33</td><td>VOLUME_FLOW</td><td>DS-33</td><td>5</td><td>D</td><td>r</td><td>-</td><td>This is the measured flow value.</td></tr>
<tr><td>18 / 34</td><td>VOLUME_FLOW_UNITS</td><td>unsigned16</td><td>2</td><td>S</td><td>r,w</td><td>1349</td><td>Unit for VOLUME_FLOW, VOLUME_FLOW_LO_LIMIT und VOLUME_FLOW_HI_LIMIT.
This parameter is equal to Index 58, “Range unit”. Available units see there.</td></tr>
</table>

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 81, “Cal-factor”. PA profile requires writing. It is only possible to write the vaue, which is already in this parameter.
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
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	70	Excitation of the sensor. This parameter is nearly equal to index 145, Frequency primary. There the parameter is an enumerated number, here it is a float number: 70
42 / 58	SAMPLING_FREQ_UNITS	Unsigned16	2	S	r,w	1077	Unit of excitation is always Hz = 1077.
43 to 52 (59 to 68)	Reserved						

Parameters up to 52 are according to PA3.0 profile for electromagnetic flowmeters. Here (index 53) starts the manufacturer specific part of the transducer block.

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
53 / 69	Prog. protect code	Unsigned 16	2	S	r,w	0	Lower Limit: 0 Upper Limit: 9999 Unit : -
54 / 70	Language	Unsigned 8	1	S	r,w	0	0 : German 1 : English 2 : French 3 : Finnish 4 : Spain 5 : Italian 6 : Dutch 7 : Danish 8 : Swedish 9 : Turkish
55 / 71	Operating mode	Unsigned 8	1	S	r,w	0	0 : Standard 1 : Piston Pump 2 : Fast
56 / 72	Flow direction	Unsigned 8	1	S	r,w	0	0 : Forward/Reverse 1 : Forward
57 / 73	Flow indication	Unsigned 8	1	S	r,w	0	0 : Normal 1 : Invers
58 / 74	Unit Qmax	Unsigned 16	2	S	r,w	l/s (Factory Reset: m3/h)	1351: l/s 1352: l/min 1353: l/h 1347: m3/s 1348: m3/min 1349: m3/h 1350: m3/d 1362: usgps 1363: usgpm 1364: usgph 1366: usmgd 1367: igps 1368: igpm 1369: igph 1370: igpd 1371: bbl/s 1372: bbl/m 1373: bbl/h 1374: bbl/d 1356: ft3/s 1357: ft3/m

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
							1358: ft3/h 1359: ft3/d 1318: g/s 1319: g/min 1320: g/h 1322: kg/s 1323: kg/min 1324: kg/h 1325: kg/d 1327: t/min 1328: t/h 1329: t/d 1330: lb/s 1331: lb/min 1332: lb/h 1333: lb/d 1563: ml/m
59 / 75	Unit totalizer	Unsigned 16	2	S	r,w	l	1040: ml 1038: l 1034: m3 1048: ugl 1049: igl 1051: bbl 1089: g 1088: kg 1092: t 1094: lb
60 / 76	Density	Float	4	S	r,w	1	Lower Limit: 0,1 Upper Limit: 5 Unit : g/cm3
61 / 77	Data 50Hz Channel	Float	4	S	r		Einheit : us
62 / 78	Data 50Hz Zero	Float	4	S	r		Einheit : %
63 / 79	Data 50Hz Span >V	Float	4	S	r		Einheit : %
64 / 80	Data 50Hz Span <R	Float	4	S	r		Einheit : %
65 / 81	Data 60Hz Channel	Float	4	S	r		Einheit : us
66 / 82	Data 60Hz Zero	Float	4	S	r		Einheit : %
67 / 83	Data 60Hz Span >V	Float	4	S	r		Einheit : %
68 / 84	Data 60Hz Span <R	Float	4	S	r		Einheit : %
69 / 85	Data 70Hz Channel	Float	4	S	r		Einheit : us
70 / 86	Data 70Hz Zero	Float	4	S	r		Einheit : %
71 / 87	Data 70Hz Span >V	Float	4	S	r		Einheit : %
72 / 88	Data 70Hz Span <R	Float	4	S	r		Einheit : %
73 / 89	Type of primary	Unsigned 8	1	S	r	0	0 : SE2_,SE4_ 1 : DS2_

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
							2 : DS4_ 3 : 10DS3111 (A-C) 4 : 10DS3111 (E-) 5 : 10DI1422 6 : 10DI1425 7 : 10DS3111 D 8 : non
74 / 90	Line frequency	Unsigned 8	1	S	r		0 : 50 Hz 1 : 60 Hz
75 / 91	Meter size	Unsigned 8	1	S	r	12	43 : 1 mm 1/25 in 44 : 1,5 mm 1/17 in 45 : 2 mm 1/12 in 0 : 3 mm 1/10 in 1 : 4 mm 5/32 in 2 : 6 mm 1/4 in 3 : 8 mm 5/16 in 4 : 10 mm 3/8 in 5 : 15 mm 1/2 in 6 : 20 mm 3/4 in 7 : 25 mm 1 in 8 : 32 mm 1-1/4 in 9 : 40 mm 1-1/2 in 10 : 50 mm 2 in 11 : 65 mm 2-1/2 in 12 : 80 mm 3 in 13 : 100 mm 4 in 14 : 125 mm 5 in 15 : 150 mm 6 in 16 : 200 mm 8 in 17 : 250 mm 10 in 18 : 300 mm 12 in 19 : 350 mm 14 in 20 : 400 mm 16 in 21 : 450 mm 18 in 22 : 500 mm 20 in 23 : 600 mm 24 in 24 : 700 mm 28 in 25 : 750 mm 30 in 26 : 800 mm 32 in 27 : 900 mm 36 in 28 : 1000 mm 40 in
76 / 92	Primary Span Adjust	Float	4	S	r	100	Unit : %
77 / 93	Primary Zero Adjust	Float	4	S	r	0	Unit : %
78 / 94	Primary Phase Adjust	Float	4	S	r	90	Unit : -
79 / 95	Reference voltage	Float	4	S	r	70	Unit : mV

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
80 / 96	Order number	String	16		r		
81 / 97	Cal-factor 10 m/s	Float	4	S	r	50	Unit : Unit Qmax
82 / 98	Qmax	Float	4	S	r,w	50	Lower Limit: depends from some other parameters Upper Limit: depends from some other parameters Unit : Unit Qmax
83 / 99	Damping [1]	Float	4	S	r,w	5	Lower Limit: depends from Operating mode Upper Limit: depends from Operating mode Unit : sek
84 / 100	Low flow cut off	Float	4	S	r,w	1	Lower Limit: 0 Upper Limit: 10 Unit : %
85 / 101	Detector empty pipe	Unsigned 8	1	S	r,w	0	0 : Off 1 : On
86 / 102	DEP Mode	Unsigned 8	1	S	r,w	0	0 : Standard 1 : New adjust
87 / 103	Adjust empty pipe	Float	4	S	r,w	1000	Lower Limit: 100 Upper Limit: 10000000 Unit : -
88 / 104	Start automatic Adjust empty pipe						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 about 45 seconds.
89 / 105	Adjust full pipe	Float	4	S	r,w	500	Lower Limit: 100 Upper Limit: 10000000 Unit : -
90 / 106	Start automatic Adjust full pipe						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 about 45 seconds.
91 / 107	Threshold	Float	4	S	r,w	10000	Lower Limit: 100 Upper Limit: 10000000 Unit : -
92 / 108	Alarm empty pipe	Unsigned 8	1	S	r,w	0	0 : Off 1 : On

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
93 / 109	Display mode	Unsigned 8	1	S	r,w	0	0 : 1 big, 1 small 1 : 4 small
94 / 110	Display 1st line	Unsigned 8	1	S	r,w	0	0 : Q [Percentt] 1 : Q [unit] 3 : Q [m/s] 4 : Q Bargraph 5 : Totalizer 6 : Totalizer >V 7 : Totalizer <R 8 : Totalizer Diff. 9 : Hart Tag 10 : Detector empty pipe 11 : blank 12 : Signal (1) 13 : Reference (1) 14 : Min-/Max-Signal (1) 15 : Min-/Max-Ref. (1) 16 : Min-/Max-SigFilt (1) 17 : Min-/Max-RefFilt (1) 18 : Phase (1) 19 : DEP Puls E1 (1) 20 : DEP Puls E2 (1) 21 : DC-Reset (1) 22 : DAC Amp. (1) 23: Pulse out (2) 24: Fprt1 (2) 25: Fprt2 (2) 26: Fprt3 (2) 27: Fprt4 (2) 28: Hist Max Error (2) 29: Hist Min Error (2) 30: Act Max Error (2) 31: Act Min Error (2) 32: Akt Max Warning (2) 33: Akt Min Warning (2) 34: Connect Warning (2) 35: Connect Error (2) 100: PA Adr+State 101: TB VolFlowValue 102: TB VolFlow Stat 103: TB Total >V Val. 104: TB Total >V Stat 105: TB Total <R Val. 106: TB Total <R Stat 107: TB TotDiff Val. 108: TB TotDiff Stat 109: FB AI Out 110: FB AI Status 111: FB TOT1 Total 112: FB TOT1 Status 113: FB TOT2 Total 114: FB TOT2 Status Note (1): This can only be written, if service code is set. Note (2): Writing of this values is only possible if diagnosis is active.
95 / 111	Display 2st line	Unsigned 8	1	S	r,w	5	
96 / 112	Display 3st line	Unsigned 8	1	S	r,w	11	
97 / 113	Display 4th line	Unsigned 8	1	S	r,w	11	
98 / 114	Contrast	Unsigned 8	1	S	r,w	137	Lower Limit: 0 Upper Limit: 255 Unit : -
99 / 115	Min. Alarm	Float	4	S	r,w	0	Lower Limit: 0 Upper Limit: Max. Alarm Unit : %
100 / 116	Max. Alarm	Float	4	S	r,w	105	Lower Limit: Min. Alarm Upper Limit: 105

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
							Unit : %
101 / 117	Overflow >F	Unsigned 16	2	S	r		
102 / 118	Totalizer >F	DS-33	5	S	r,w		Lower Limit: 0 Upper Limit: 10000000 Unit : rel.Index 59: Unit Totalizer
103 / 119	Overflow <R	Unsigned 16	2	S	r		
104 / 120	Totalizer <R	DS-33	5	S	r,w		Lower Limit: 0 Upper Limit: 10000000 Unit : rel.Index 59: Unit Totalizer
105 / 121	Overflow Diff.	Signed 16	2	S	r		
106 / 122	Totalizer Diff.	DS-33	5	S	r,w		Lower Limit: 0 Upper Limit: 10000000 Unit : rel.Index 59: Unit Totalizer
107 / 123	Totalizer reset	Unsigned8	1	D	r,w		Write: 1= Reset all Totalizer and overflow values Resetting is triggerd by writing „1“, not by the level „1“.
108 / 124	-						
109 / 125	Contact output	Unsigned 8	1	S	r,w	0	0 : No Function 1 : F/R-Signal /_ 13: F/R-Signal __ 4 : General-Alarm /_ 5 : General-Alarm__ 6 : Max/Min Alarm/_ 7 : Max/Min Alarm__ 8 : Min Alarm /_ 9 : Min Alarm __ 10: Max Alarm /_ 11: Max Alarm __ 2 : Empty pipe /_ (1) 3 : Empty pipe __ (1) 14: 5 kHz Output (2) 14: Extended Diagnosis-Alarm /_ 15: Extended Diagnosis-Alarm __ 16: 5 kHz Output (2) Note (1): This can only be written, if Detector empty pipe (rel.Index 85) is on. Note (2): This can only be written, if service code is set.
110 / 126	Instrument No.	Unsigned 16	2	S	r	700	
111 / 127	Manufacture Code	Visible String	8	S	r	"00000000"	
112 / 128	-						
113 / 129	Primary TAG	Visible String	32	S	r,w	"----------	
114 / 130	Converter TAG	Visible String	32	S	r,w	"----------	

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
115 / 131	Memory Test	Unsigned8	1	D	r,w	0	0: No Memory Test 1: Memory Test int Fram run 2: Memory Test int Fram ok 3: Memory Test int Fram error 4: Memory Test ext Fram run 5: Memory Test ext Fram ok 6: Memory Test ext Fram error 7: Memory Test Flash run 8: Memory Test Flash ok 9: Memory Test Flash error There are tree types of memory: Internal Fram, External Fram and Flash. Starting the test is triggered by writing 1, 4 or 7. As long as the test is running the same number is read (example 7 = Flash test is running). If the test is finished another number shows the result (example 8 = Flash ok, 9 = Flash has error). A new test can't be started as long as another test is running.
116 / 132	Test Contact output						0 : No Test 1 : Test aktiv, contact output off 2 : Test aktiv, contact output on
117 / 133	Simulation Mode	Unsigned8	1	D	r,w	0	0 : Off 1 : On
118 / 134	Simlation Value	Float	4	D	r,w	0	
119 / 135	Actual error register	OctetString	4	D	r		This error register shows the actually set errors. If an error disappears (for example Error 3: Flow to big. If flow becomes smaller the error disappears) also the error bit in this register diappears. See ??? for meaning of bits.
120 / 136	Actual warning register	OctetString	4	D	r		Same as for actual error register See ??? for meaning of bits.
121 / 137	History of error register	OctetString	4	S	r,w		Actual errors are also shown in this register. If the error disappears the error bit will stay here. Because of that this register shows the "history" of errors. It shows any error, which was set in the past. Writing 0,0,0,0 resets the rigister.
122 / 138	History of warning register	OctetString	4	S	r,w		Same as for history of error register
123 / 139	Mains interrupt	Unsigned 16	2	S	r		
124 / 140	DSP Reset	Unsigned 16	2	S	r		
125 / 141	System zero	Float	4	S	r,w	0	Lower Limit:-10 Upper Limit: 10 Unit : %
126 / 142	Start automatic adjust system zero						Read: 0 = no adjust running 1 = adjust is running Write: 1 = start adjust

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
							Starting the ajust is triggered by writing „1“, not from the static value „1“. The ajust needs about 1 minute.
127 / 143	Version	Visible String	16	Cst	r	"D699G004U01 B.10"	
128 / 144	Driver	Unsigned 8	1	S	r	0	0 : Controller 1 : Control System
129 / 145	-						
130 / 146	Delta Amp.	Float	4	S	r	0,015	Lower Limit: 0 Upper Limit: 1 Unit : -
131 / 147	DAC Amp.	Unsigned 16	2	S	r	130	Lower Limit: 130 Upper Limit: 1023 Unit : -
132 / 148	Min DAC Amp.	Unsigned 16	2	S	r	130	Lower Limit: 130 Upper Limit: 1023 Unit : -
133 / 149	Max DAC Amp.	Unsigned 16	2	S	r	700	Lower Limit: 130 Upper Limit: 1023 Unit : -
134 / 150	Dummy	Unsigned 8	1	S	r	0	The B-software parameter “eigenerregt” was removed from C-software. Now this index contains a dummy parameter.
135 / 151	Noise Reduction	Unsigned 8	1	S	r	0	0 : Off 1 : On
136 / 152	Moving Average wide	Unsigned 16	2	S	r	16	Lower Limit: 16 Upper Limit: 400 Unit : -
137 / 153	Hold time	Unsigned 16	2	S	r	16	Lower Limit: 16 Upper Limit: 400 Unit : -
138 / 154	Band width	Float	4	S	r	10	Lower Limit: 0,1 Upper Limit: 100 Unit : %
139 / 155	Threshold On	Unsigned 16	2	S	r	25000	Lower Limit: Threshold Off Upper Limit: 32767 Unit : -
140 / 156	Threshold Off	Unsigned 16	2	S	r	15000	Lower Limit: 500 Upper Limit: Threshold On Unit : -
141 / 157	Dummy	Unsigned 8	1	S	r	0	The B-software parameter “Sig.correction” was removed from C-software. Now this index contains a dummy parameter.
142 / 158	Dummy	Float	4	S	r	500	The B-software parameter “MDS zero” was removed from C-software. Now this index contains a dummy parameter.
143 / 159	Dummy	Float	4	S	r	1500	The B-software parameter “MDR” was removed from C-software. Now this index contains a dummy parameter.
144 / 160	Dummy	Unsigned 16	2	D	r		The B-software parameter “MDS sum” was removed from C-software. Now this index contains a

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
							dummy parameter.
145 / 161	Frequncy Primary	Unsigned 8	1	S	r	0	0 : Primary 70Hz 1 : Primary 50Hz 2 : Primary 60Hz
146 / 162	-						
147 / 163	Calib.Date	Visible String	16	N	r	"21/08/02"	
148 / 164	Testrig	Unsigned 16	2	S	r	0	Lower Limit: 0 Upper Limit: 9999 Unit : -
149 / 165	Tester	Visible String	12	N	r	"----------"	
150 / 166	Cal-factor	Float	4	S	r	0	Lower Limit: -10 Upper Limit: 10 Unit : %
151 / 167	Gain	Unsigned 8	1	S	r	1	0 : Low 1 : High
152 / 168	TB_Diagnosis_Mask_Extension	Octetstring	6	S	r,w	EF,0F,00,02,00,03	Refer to 4.2.4. Some bits can't be cleared, refer to 4.2.4.
153 / 169	DIP-Switch	Unsigned 16	2	S	r		Refer to 2.3.1.
154 / 170	Status Register	OctetString	4	D	r		Refer to 4.1.3.
155 / 171	Error Warning Simulation On	Unsigned 8	1	D	r,w	0	0 : Off 1 : On
156 / 172	Error Simulation Value	OctetString	4	D	r,w	0,0,0,0	Refer to 4.
157 / 173	Warning Simulation Value	OctetString	4	D	r,w	0,0,0,1	Refer to 4.
158 / 174	New Float-Parameter C10	Array	48	N	r		Array with all new float parameters of software revision C10
	Zero 2	Float	4	N	r		Unit: %
	Span 2 >V	Float	4	N	r		Unit: %
	Span 2 >V	Float	4	N	r		Unit: %
	Zero 4	Float	4	N	r		Unit: %
	Span 4 >V	Float	4	N	r		Unit: %
	Span 4 >V	Float	4	N	r		Unit: %
	Zero 8	Float	4	N	r		Unit: %
	Span 8 >V	Float	4	N	r		Unit: %
	Span 8 >V	Float	4	N	r		Unit: %
	Zero Pre/FIR2	Float	4	N	r		Unit: %
	Zero Pre	Float	4	N	r		Unit: %
	Meter Faktor	Float	4	N	r		Unit: no
159 / 175	New Unsigned8 Parameter C10	Array	6	N	r		Array with all new unsigned8 parameters of software revision C10
	DC-Countervalue	Unsigned 8	2	N	r	50	Lower Limit: 1 Upper Limit: 70 Unit : no
	Prefilter	Unsigned 8	1	N	r	0	0 : Off 1 : On

Rel.Idx / Slot Idx	Variable Name		Data Type	Size	Store	Access	Default Value	Description
		Filterbandwith	Unsigned 8	1	N	r	5	0: 0.15 Hz 1: 0.3 Hz 2: 0.6 Hz 3: 1.1 Hz 4: 2.2 Hz 5: 4.3 Hz 6: 8.7 Hz 7: 17.3 Hz 8: 34 Hz 9: 68 Hz
		FIR_E/A	Unsigned 8	1	N	r	0	0 : Off 1 : On
		Preamplifier	Unsigned 8	1	N	r	1	0 : Off 1 : On
		Qmin	Unsigned 8	1	S	r	0	0: Qmin = 0.05 QDN 1: Qmin = 0.02 QDN

3.5.3 Transducer Block Parameter, sorted according to names

Parameter Name	Rel.Index / Slot Index
Actual error register	119 / 135
Actual warning register	120 / 136
Adjust empty pipe	87 / 103
Adjust full pipe	89 / 105
Alarm empty pipe	92 / 108
ALARM_SUM	7 / 23
ALERT_KEY	4 / 20
Band width	138 / 154
BLOCK_OBJECT	0 / 16
Cal-factor	150 / 166
Cal-factor 10 m/s	81 / 97
Calib.Date	147 / 163
CALIBR_FACTOR	8 / 24
Contact output	109 / 125
Contrast	98 / 114
Converter TAG	114 / 130
DAC Amp.	131 / 147
Damping [1t]	83 / 99
Data 70Hz Channel	69 / 85
Data 70Hz Span <R	72 / 88
Data 70Hz Span >V	71 / 87
Data 70Hz Zero	70 / 86
Delta Amp.	130 / 146
Density	60 / 76
DEP Mode	86 / 102
Detector empty pipe	85 / 101
DIP-Schalter	153 / 169
Display 1st line	94 / 110
Display 2st line	95 / 111
Display 3st line	96 / 112
Display 4th line	97 / 113
Display mode	93 / 109
Driver	128 / 144
DSP Reset	124 / 140
Eigenerregt	134 / 150
Error Simulation Value	156 / 172
Error Warning Simulation On	155 / 171
Flow direction	56 / 72
Flow indication	57 / 73
FLOW_DIRECTION	21 / 27
Frequncy Primary	145 / 161
History of error register	121 / 137
History of warning register	122 / 138
Hold time	137 / 153
Instrument No.	110 / 126
Language	54 / 70
Line frequency	74 / 90
Low flow cut off	84 / 100
LOW_FLOW_CUTOFF	19 / 25
Mains interrupt	123 / 139
Manufacture Code	111 / 127
Max DAC Amp.	133 / 149
Max. Alarm	100 / 116
MDR	143 / 159
MDS Sum	144 / 160
MDS Zero	142 / 158
MEASUREMENT_MODE	20 / 26
Memory Test	115 / 131
Messumformer-Status	154 / 170
Meter size	75 / 91
Min DAC Amp.	132 / 148
Min. Alarm	99 / 115
MODE_BLK	6 / 22
Moving Average wide	136 / 152
Noise Reduction	135 / 151
NOMINAL_SIZE	15 / 31
NOMINAL_SIZE_UNITS	16 / 32
Operating mode	55 / 71
Order number	80 / 96
Overflow <R	103 / 119
Overflow >F	101 / 117
Overflow Diff.	105 / 121
Primary Phase Adjust	78 / 94
Primary Span Adjust	76 / 92
Primary TAG	113 / 129
Primary Zero Adjust	77 / 93
Prog. protect code	53 / 69
Qmax	82 / 98
Reference voltage	79 / 95
SAMPLING_FREQ	41 / 57
SAMPLING_FREQ_UNITS	42 / 58
Sig. correction	141 / 157
Simlation Value	118 / 134
Simulation Mode	117 / 133
ST_REV	1 / 17
Start automatic Adjust empty pipe	88 / 104
Start automatic Adjust full pipe	90 / 106
Start automatic adjust system zero	126 / 142
STRATEGY	3 / 19
System zero	125 / 141
TAG_DESC	2 / 18
TARGET_MODE	5 / 21
TB_Diagnosis_Mask_Extension	152 / 168
Test Contact output	116 / 132
Tester	149 / 165
Testrig	148 / 164
Threshold	91 / 107
Threshold Off	140 / 156
Threshold On	139 / 155
Totalizer <R	104 / 120
Totalizer >F	102 / 118
Totalizer Diff.	106 / 122
Totalizer reset	107 / 123
Type of primary	73 / 89
Unit Qmax	58 / 74
Unit totalizer	59 / 75
Version	127 / 143
Verstärkung	151 / 167
VOLUME_FLOW	17 / 33
VOLUME_FLOW_HI_LIMIT	20 / 36
VOLUME_FLOW_LO_LIMIT	19 / 35
VOLUME_FLOW_UNITS	18 / 34
Warning Simulation Value	157 / 173
ZERO_POINT	12 / 28
ZERO_POINT_ADJUST	13 /29
ZERO_POINT_UNIT	14 / 30

3.6 Slot 5 – Diagnosis Block

The FSM4000 flowmeter has extended diagnosis functions. These functions are available in an own Fieldbus Diagnosis Block. This interface description only describes the mapping of this parameters to the fieldbus, but not the exact meaning and function of these parameters. For this refer to the diagnosis manual.

3.6.1 Diagnosis Measurement Values

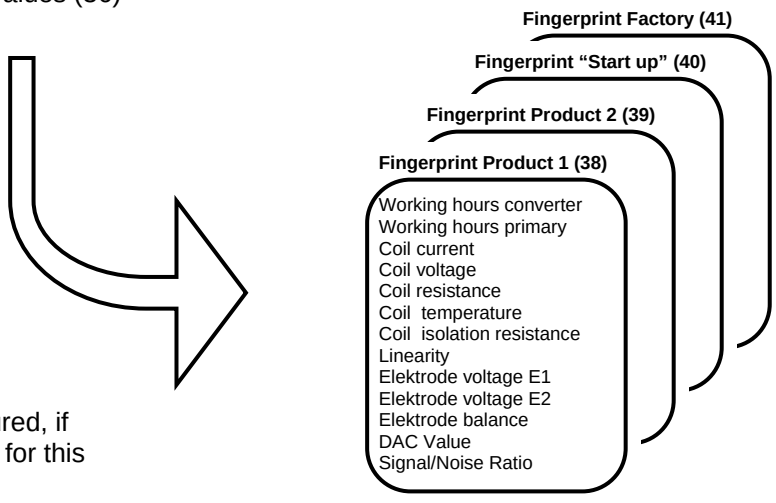
The converter measures periodicallly or on demand (refer to index 9 and 10 of Diagnosis Block) the following parameters. For every parameter are the actual value and the nine values before stored in the converter.

Number behind parameter: Index in Diagnose Block

Working Hours Converter (11)	Actual Value	Last Value [1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
Working Hours Primary (12)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
Coil Current (14)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
Coil Voltage (16)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
Coil Resistance (18) (*)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
Coil Temperature (20) (*)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
Coil Isolation Resistance (22) (*)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
Linearity (24) (*)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
Elektrode Voltage E1 (26)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
Elektrode Voltage E2 (28)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
Elektrode Balance (30)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
DAC Value (32)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]
Signal/Noise Ratio (34)	Actual Value	Last Value [-1]	Value [-2]	Value [-3]	Value [-4]	Value [-5]	Value [-6]	Value [-7]	Value [-8]	Value [-9]

Actual Values (36)

The actual values can be copied (with index 37) into a fingerprint. Customers can only write fingerprints 1, 2 and “start up”. The fingerprint “factory” can only be written by the manufacturer.



(*) Some values are only measured, if an error or warning checking for this value is switched on, refer to diagnosis manual.

3.6.2 Limits for Diagnosis Measurement Values

For every diagnosis measurement value it is possible to set a lower and upper limit and to set the reporting behaviour, if the value exceeds the limits: No report, a warning or error message. A warning will set the corresponding bit in the warning register, an error sets a bit in the error register. These bits are reset, if the measurment value goes back inside the limits.

Index	
36	Actual Value Working Hours Converter
	Actual Value Working Hours Primary
	Actual Value Coil Current
	Actual Value Coil Voltage
	Actual Value Coil Resistance
	Actual Value Coil Temperature
	Actual Value Coil Isolation Resistance
	Actual Value Linearity
	Actual Value Elektrode Voltage E1
	Actual Value Elektrode Voltage E2
	Actual Value Elektrode Balance
	Actual Value DAC Value
	Actual Value Signal/Noise Ratio

Monitoring Limits

Index		
15	Lower Limit	
	Upper Limit	
	Report	
	Back to defaults	
17	Lower Limit	
	Upper Limit	
	Report	
	Back to defaults	
19	Lower Limit	
	Upper Limit	
	Report	
	Back to defaults	
21	Lower Limit	
	Upper Limit	
	Report	
	Back to defaults	
23	Lower Limit	
	Upper Limit	
	Report	
	Back to defaults	
25	Lower Limit	
	Upper Limit	
	Report	
	Back to defaults	
27	Lower Limit	
	Upper Limit	
	Report	
	Back to defaults	
29	Lower Limit	
	Upper Limit	
	Report	
	Back to defaults	
31	Lower Limit	
	Upper Limit	
	Report	
	Back to defaults	
33	Lower Limit	
	Upper Limit	
	Report	
	Back to defaults	
35	Lower Limit	
	Upper Limit	
	Report	
	Back to defaults	
42	Report Ground Short Circuit Coil	
43	Report Electrodes not connected	

Error register (Index 45)
Warning register (Index 46)
History Register (Index 47)

Octet / Bit	
0/0	Min Coil Current
0/1	Max Coil Current
0/2	Min Coil Voltage
0/3	Max Coil Voltage
0/4	Min Coil Resistance
0/5	Max Coil Resistance
0/6	Min Coil Temperature
0/7	Max Coil Temperature
1/0	Min Coil Isolation Resistance
1/1	Max Coil Isolation Resistance
1/ 2	Min Linearity
1/3	Max Linearity
1/ 4	Min Elektrode Voltage E1
1/5	Max Elektrode Voltage E1
1/6	Min Elektrode Voltage E2
1/7	Max Elektrode Voltage E2
2/0	Min Elektrode Balance
2/1	Max Elektrode Balance
2/2	Min DAC Value
2/3	Max DAC Value
2/4	Min Signal/Noise Ratio
2/5	Max Signal/Noise Ratio
2/6	-
2/7	-
3/0	Ground Short Circuit Coil
3/1	-
3/2	-
3/3	Electrodes not connected
3/ 4	-
3/5	-
3/6	-
3/7	-

3.6.3 Diagnosis Block Error Message Chains

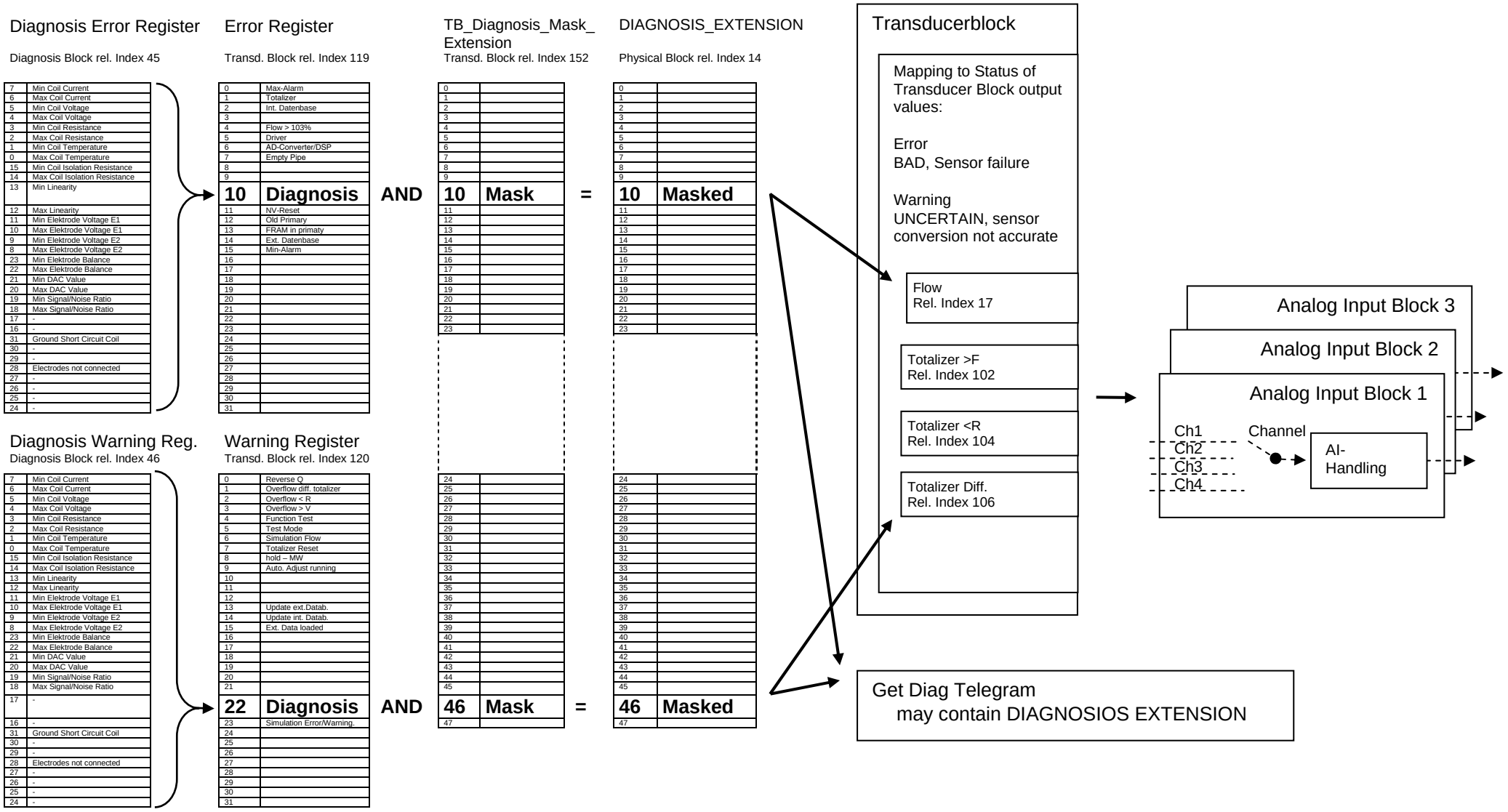
The diagram on the following page shows the way of diagnosis messages from the Diagnosis block to the Fieldbus:

If at least one bit in the Diagnosis Error Register (Diagnosis Block rel. Index 45) is set, this will set the Diagnosis-Bit 10 in the Error Register (Transducer Block rel. Index 119).
The Transducer Block has a Mask TB_Diagnosis_Mask_Extension (rel. Index 152). This mask enables or disables copying of error bits to DIAGNOSIS_EXTENSION (Physical Block rel. Index 14), refer to chapter 4.2.4.
If the Diagnosis Error Bit is set in DIAGNOSIS_EXTENSION, this will be reported as „BAD, Sensor failure“ in the status of the Transducer Block Output Values, refer to 4.3.1.
The Transducer Block Output Values are read by the AI Blocks. The AI Block output values can be read with cyclic communication.

A similar chain exists for warnig messages. A warning will be reported as “UNCERTAIN, sensor conversion not accurate” in the status of the Transducer Block Output Values.

Factory settings are:
All Diagnosis Block monitoring reports (refer to 3.6.2) are switched off.
In TB_Diagnosis_Mask_Extension all errors are enabled and only warnings 1, 15 and 16 (refer to 4.2.4) are enabled.

With these factory settings no diagnosis message will be reported to the fieldbus. To get diagnosis messages it is sufficient to enable a message reporting inside the Diagnosis Block.


Diagnosis Error Register
Diagnosis Block rel. Index 45
Error Register
Transd. Block rel. Index 119
TB_Diagnosis_Mask_ Extension
Transd. Block rel. Index 152
DIAGNOSIS_EXTENSION
Physical Block rel. Index 14
7 Min Coil Current
6 Max Coil Current
5 Min Coil Voltage
4 Max Coil Voltage
3 Min Coil Resistance
2 Max Coil Resistance
1 Min Coil Temperature
0 Max Coil Temperature
15 Min Coil Isolation Resistance
14 Max Coil Isolation Resistance
13 Min Linearity
12 Max Linearity
11 Min Elektrode Voltage E1
10 Max Elektrode Voltage E1
9 Min Elektrode Voltage E2
8 Max Elektrode Voltage E2
23 Min Elektrode Balance
22 Max Elektrode Balance
21 Min DAC Value
20 Max DAC Value
19 Min Signal/Noise Ratio
18 Max Signal/Noise Ratio
17 -
16 -
31 Ground Short Circuit Coil
30 -
29 -
28 Electrodes not connected
27 -
26 -
25 -
24 -
0 Max-Alarm
1 Totalizer
2 Int. Datenbase
3
4 Flow > 103%
5 Driver
6 AD-Converter/DSP
7 Empty Pipe
8
9
10 Diagnosis
11 NV-Reset
12 Old Primary
13 FRAM in primaty
14 Ext. Datenbase
15 Min-Alarm
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
AND
10 Mask
=
10 Masked
Diagnosis Warning Reg.
Diagnosis Block rel. Index 46
Warning Register
Transd. Block rel. Index 120
0 Reverse Q
1 Overflow diff. totalizer
2 Overflow < R
3 Overflow > V
4 Function Test
5 Test Mode
6 Simulation Flow
7 Totalizer Reset
8 hold – MW
9 Auto. Adjust running
10
11
12
13 Update ext.Datab.
14 Update int. Datab.
15 Ext. Data loaded
16
17
18
19
20
21
22 Diagnosis
23 Simulation Error/Warning.
24
25
26
27
28
29
30
31
AND
46 Mask
=
46 Masked
Transducerblock
Mapping to Status of Transducer Block output values:
Error
BAD, Sensor failure
Warning
UNCERTAIN, sensor conversion not accurate
Flow
Rel. Index 17
Totalizer >F
Rel. Index 102
Totalizer <R
Rel. Index 104
Totalizer Diff.
Rel. Index 106
Analog Input Block 3
Analog Input Block 2
Analog Input Block 1
Ch1
Ch2
Ch3
Ch4
Channel
AI-
Handling
Get Diag Telegram
may contain DIAGNOSIOS EXTENSION

3.6.4 Diagnosis Block Parameter, sorted in accordance with index

3.6.4.1 Diagnosis Block Part 1: Standard Parameters

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	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	ALARM_SUM is not supported.

3.6.4.2 Diagnosis Block Part 2: manufacturer spezific parameters

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
8 / 24	-						
9 / 25	Diagnosis Cycle Time	Unsigned 8	1	S	r,w	0	0 : Manual Diagnosis Start 1 : 10 Seconds 2 : 60 Seconds 3 : 10 Minutes 4 : 60 Minutes 5 : 6 Hours 6 : 12 Hours 7 : 24 Hours 8 : 7 Days
10 / 26	Start manual Diagnosis	Unsigned 8	1	S	r,w	0	0: Do nothing 1: Start
11 / 27	Working Hours Converter	DS-Value-History	40	N	r		Unit: Hours
12 / 28	Working Hours Primary	DS-Value-History	40	N	r		Unit: Hours
13 / 29	Set all Limits to Default	Unsigned 8	1	S	r,w	0	0 : Do nothing 1 : All to Default
14 / 30	Coil Current	DS-Value-History	40	N	r		Unit: mA
15 / 31	Limits Coil Current	DS-Limits	10	S	r,w	2 to 1000mA, no report	Input Range for min: 0 to 500mA Input Range for max: 0 to 1000mA
16 / 32	Coil Voltage	DS-Value-History	40	N	r		Unit: V
17 / 33	Limits Coil Voltage	DS-Limits	10	S	r,w	1 to 100V, no report	Input Range for min and max: 0 to 150V
18 / 34	Coil Resistance	DS-Value-History	40	N	r		Unit: Ohm
19 / 35	Limits Coil Resistance	DS-Limits	10	S	r,w	2 to 500 Ohm, no report	Input Range for min and max: 0 to 1500 Ohm
20 / 36	Coil Temperature	DS-Value-History	40	N	r		Unit: C
21 / 37	Limits Coil Temperature	DS-Limits	10	S	r,w	-50 to 150C, no report	Input Range for min and max: -100 to +200C
22 / 38	Coil Isolation Resistance	DS-Value-History	40	N	r		Unit: Mohm
23 / 39	Limits Coil Isolation Resistance	DS-Limits	10	S	r,w	0,5 to 50 MOhm, no report	Input Range for min and max: 0 to 500Mohm
24 / 40	Linearity	DS-Value-History	40	N	r		Unit: %
25 / 41	Limits Linearity	DS-Limits	10	S	r,w	1 to 200%, no report	Input Range for min and max: 0 to 300%
26 / 42	Elektrode Voltage E1	DS-Value-History	40	N	r		Unit: uV
27 / 43	Limits Elektrode Voltage E1	DS-Limits	10	S	r,w	0 to 3000uV no report	Input Range for min and max: 0 to 30000uV
28 / 44	Elektrode Voltage E2	DS-Value-History	40	N	r		Unit: uV
29 / 45	Limits Elektrode Voltage E2	DS-Limits	10	S	r,w	0 to 3000uV, no report	Input Range for min and max: 0 to 30000uV
30 / 46	Elektrode Balance	DS-Value-History	40	N	r		Unit: %

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
31 / 47	Limits Elektrode Balance	DS-Limits	10	S	r,w	100 to 300% no report	Input Range for min and max: 0 to 300%
32 / 48	DAC Value	DS-Value-History	40	N	r		Unit: Digits
33 / 49	Limits DAC Value	DS-Limits	10	S	r,w	16 to 1024 Digits no report	Input Range for min and max: 0 to 1024 Digits
34 / 50	Signal/Noise Ratio (SNR)	DS-Value-History	40	N	r		Unit: %
35 / 51	Limits Signal/Noise Ratio (SNR)	DS-Limits	10	S	r,w	0,01 to 100% no report	Input Range for min and max: 0 to 100%
36 / 52	Actual Diagnosis Values	DS-Fingerprint	52	N	r		Refer to 3.6.1 and 3.6.6.2.
37 / 53	Copy actual Values to	Unsigned 8	1	S	r,w	0	0: Do nothing 1: Fingerprint Product 1 2: Fingerprint Product 2 3: Fingerprint Setting-up working
38 / 54	Fingerprint Product 1	DS-Fingerprint	52	N	r		Refer to 3.6.1 and 3.6.6.2.
39 / 55	Fingerprint Product 2	DS-Fingerprint	52	N	r		Refer to 3.6.1 and 3.6.6.2.
40 / 56	Fingerprint Setting-up working	DS-Fingerprint	52	N	r		Refer to 3.6.1 and 3.6.6.2.
41 / 57	Fingerprint Factory	DS-Fingerprint	52	N	r		Refer to 3.6.1 and 3.6.6.2.
42 / 58	Report Ground Short Circuit Coil	Unsigned 8	1	S	r,w		0: Off 1: Warning 2: Error
43 / 59	Report Electrodes not connected	Unsigned 8	1	S	r,w		0: Off 1: Warning 2: Error
44 / 60	Clear Diagnosis History Register	Unsigned 8	1	S	r,w	0	0: Do nothing 1: Clear
45 / 61	Diagnosis Error Register	Bit String	4	D	r		Bit content refer to chapter 3.6.7
46 / 62	Diagnosis Warning Register	Bit String	4	D	r		Bit content refer to chapter 3.6.7
47 / 63	Diagnosis History Register	Bit String	4	N	r		Bit content refer to chapter 3.6.7
48 / 64	Cable Length	Float	4	S	r,w		Input Range: 0 to 200m
49 / 65	Temperature Offset	Float	4	S	r,w		Input Range: -100 to +200C
50 / 66	Temperature Definition	Float	4	S	r,w		Input Range: -100 to +200C
51 / 67	Reference Resistance at 20C	Float	4	S	r		
52 / 68	Elektrode Signals	DS-Elektrode-Signals	32	D	r		Refer to 3.6.6.4.

3.6.5 Diagnosis Block Parameter, sorted according to names

Parameter Name	Rel.Index / Slot Index
Actual Diagnosis Values	36 / 52
ALERT_KEY	4 / 20
BLOCK_ALM	8 / 24
BLOCK_ERR	6 / 22
Cable Length	48 / 64
Clear Diagnosis History Register	44 / 60
Coil Current	14 / 30
Coil Isolation Resistance	22 / 38
Coil Resistance	18 / 34
Coil Temperature	20 / 36
Coil Voltage	16 / 32
Copy actual Values to	37 / 53
DAC Value	32 / 48
Diagnosis Cycle Time	9 / 25
Diagnosis Error Register	45 / 61
Diagnosis History Register	47 / 63
Diagnosis Warning Register	46 / 62
Elektrode Balance	30 / 46
Elektrode Signals	52 / 68
Elektrode Voltage E1	26 / 42
Elektrode Voltage E2	28 / 44
Fingerprint Factory	41 / 57
Fingerprint Product 1	38 / 54
Fingerprint Product 2	39 / 55
Fingerprint Setting-up working	40 / 56
Limits Coil Current	15 / 31
Limits Coil Isolation Resistance	23 / 39
Limits Coil Resistance	19 / 35
Limits Coil Temperature	21 / 37
Limits Coil Voltage	17 / 33
Limits DAC Value	33 / 49
Limits Elektrode Balance	31 / 47
Limits Elektrode Voltage E1	27 / 43
Limits Elektrode Voltage E2	29 / 45
Limits Linearity	25 / 41
Limits Signal/Noise Ratio (SNR)	35 / 51
Linearity	24 / 40
MODE_BLK	5 / 21
Reference Resistance at 20C	51 / 67
Report Electrodes not connected	43 / 59
Report Ground Short Circuit Coil	42 / 58
Set all Limits to Default	13 / 29
Signal/Noise Ratio (SNR)	34 / 50
ST_REV	1 / 17
Start manual Diagnosis	10 / 26
STRATEGY	3 / 19
TAG_DESC	2 / 18
Temperature Definition	50 / 66
Temperature Offset	49 / 65
UPDATE_EVT	7 / 23
Working Hours Converter	11 / 27
Working Hours Primary	12 / 28

3.6.6 Data structures of Diagnosis Block

3.6.6.1 DS-Value-History

Element Nr.	Element Name	Data Type	Size	Storage	Access	Description
1	Last, Actual Value	Float	4	N	r	
2	Preview Value [-1]	Float	4	N	r	
3	Value [-2]	Float	4	N	r	
4	Value [-3]	Float	4	N	r	
5	Value [-4]	Float	4	N	r	
6	Value [-5]	Float	4	N	r	
7	Value [-6]	Float	4	N	r	
8	Value [-7]	Float	4	N	r	
9	Value [-8]	Float	4	N	r	
10	Value [-9]	Float	4	N	r	

3.6.6.2 DS-Fingerprint

Element Nr.	Element Name	Data Type	Size	Storage	Access	Description
1	Working Hours Converter	Float	4	N	r	Unit: Hours
2	Working Hours Primary	Float	4	N	r	Unit: Hours
3	Coil Current	Float	4	N	r	Unit: mA
4	Coil Voltage	Float	4	N	r	Unit: V
5	Coil Resistance	Float	4	N	r	Unit: Ohm
6	Coil Temperature	Float	4	N	r	Unit: C
7	Coil Isolation Resistance	Float	4	N	r	Unit: MOhm
8	Linearity	Float	4	N	r	Unit: %
9	Elektrode Voltage E1	Float	4	N	r	Unit: uV
10	Elektrode Voltage E2	Float	4	N	r	Unit: uV
11	Elektrode Balance	Float	4	N	r	Unit: %
12	DAC Value	Float	4	N	r	Unit: Digits
13	Signal/Noise Ratio	Float	4	N	r	Unit: %

3.6.6.3 DS-Limits

Element Nr.	Element Name	Data Type	Size	Storage	Access	Description
1	Lower Limit	Float	4	S	r,w	
2	Upper Limit	Float	4	S	r,w	
3	Meldung	Unsigned 8	1	S	r,w	0: Off 1: Warning 2: Error
4	Set Limits back to default	Unsigned 8	1	S	r,w	0: Do nothing 1: Back to default

3.6.6.4 DS-Elektrode Signals

Element Nr.	Element Name	Data Type	Size	Storage	Access	Description
1	Elektrode Voltage E1	Float	4	D	r	Unit: uV
2	Elektrode Voltage E2	Float	4	D	r	Unit: uV
3	Phase Elektrode Voltage E1	Float	4	D	r	Unit: Degree
4	Phase Elektrode Voltage E2	Float	4	D	r	Unit: Degree
5	Elektrode Zeropoint E1	Float	4	D	r	Unit: uV
6	Elektrode Zeropoint E2	Float	4	D	r	Unit: uV
7	Phase Elektrode Zeropoint E1	Float	4	D	r	Unit: Degree
8	Phase Elektrode Zeropoint E2	Float	4	D	r	Unit: Degree

3.6.7 Diagnosis Registers

The registers
Diagnosis Error Register (Index 45)
Diagnosis Warning Register (Index 46)
Diagnosis History Register (Index 47)
are each 4 Byte Octet Strings. The bits have following meanings:

Octet 1	Bit 0 (LSB)	Bitstring 7	Min Coil Current
	Bit 1	Bitstring 6	Max Coil Current
	Bit 2	Bitstring 5	Min Coil Voltage
	Bit 3	Bitstring 4	Max Coil Voltage
	Bit 4	Bitstring 3	Min Coil Resistance
	Bit 5	Bitstring 2	Max Coil Resistance
	Bit 6	Bitstring 1	Min Coil Temperature
	Bit 7 (MSB)	Bitstring 0	Max Coil Temperature
Octet 2	Bit 0 (LSB)	Bitstring 15	Min Coil Isolation Resistance
	Bit 1	Bitstring 14	Max Coil Isolation Resistance
	Bit 2	Bitstring 13	Min Linearity
	Bit 3	Bitstring 12	Max Linearity
	Bit 4	Bitstring 11	Min Elektrode Voltage E1
	Bit 5	Bitstring 10	Max Elektrode Voltage E1
	Bit 6	Bitstring 9	Min Elektrode Voltage E2
	Bit 7 (MSB)	Bitstring 8	Max Elektrode Voltage E2
Octet 3	Bit 0 (LSB)	Bitstring 23	Min Elektrode Balance
	Bit 1	Bitstring 22	Max Elektrode Balance
	Bit 2	Bitstring 21	Min DAC Value
	Bit 3	Bitstring 20	Max DAC Value
	Bit 4	Bitstring 19	Min Signal/Noise Ratio
	Bit 5	Bitstring 18	Max Signal/Noise Ratio
	Bit 6	Bitstring 17	-
	Bit 7 (MSB)	Bitstring 16	-
Octet 4	Bit 0 (LSB)	Bitstring 31	Ground Short Circuit Coil
	Bit 1	Bitstring 30	-
	Bit 2	Bitstring 29	-
	Bit 3	Bitstring 28	Electrodes not connected
	Bit 4	Bitstring 27	-
	Bit 5	Bitstring 26	-
	Bit 6	Bitstring 25	-
	Bit 7 (MSB)	Bitstring 24	-

3.7 Data structures

3.7.1 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

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

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

3.7.3 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

3.7.4 DS-37 – Mode Structure

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

3.7.5 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

3.7.6 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

3.7.7 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

3.7.8 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. Error and warning handling

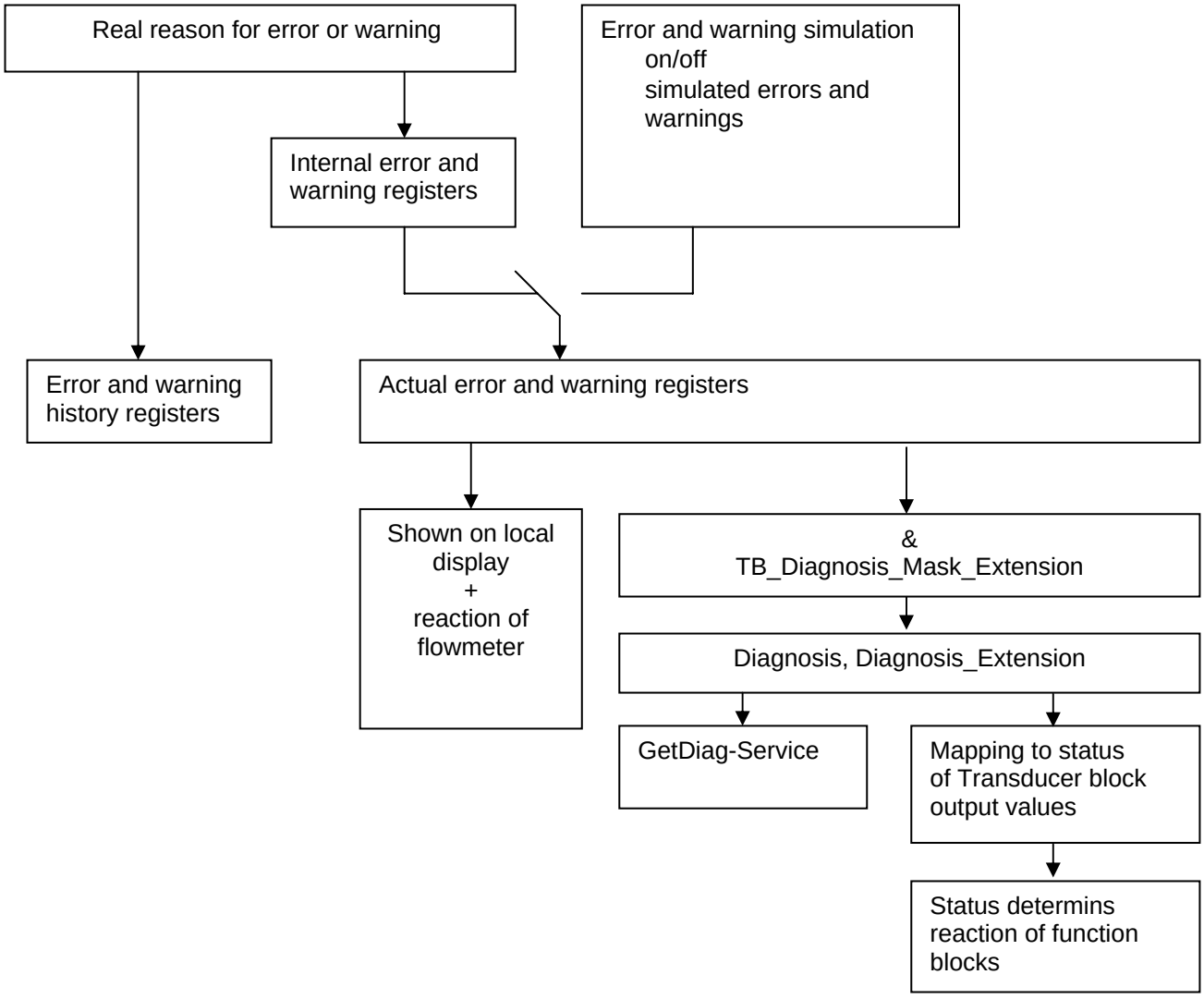
The flowmeter has two error registers: One for the actual errors (Tansducer block rel. Index 119), another one for the history (Tansducer Block rel. Index 121 which also shows errors set in the past. The same is for warnings: One register shows actual warnings (rel. Index 120), another one shows the warning history (rel. Index 122). The history registers can be cleared.

History registers are only for information. The actual register are important for the reaction of the device:

Actual errors and warnings are shown at the local display of the flowmeter.

Actual errors and warnings are mapped, masked with „ TB_Diagnosis_Mask_Extension “, to parameter „Diagnosis_ Extension“ in the Physical block (refer **4.2.4**). This parameter is reported with the PA-GetDiag-Service to the PA-master (refer **4.2.2**).
Actual errors and warnings are mapped to the status bytes of Transducer block output variables (refer 3.5.1). This status is send to the function blocks and determins the reaction of the function blocks and the function block output values and status (refer 4.3).

For test purpose it is possible to simulate actual errors and warnings. For this the error- and warning-simulation must be switched on to use simulated errors and warnings instead of the real, actual errors and warnings. Simulation is possible local at the device (display and keyboard) or via PA bus (Transducer block rel. Index 155-157).



4.1.1 Error register

The actual error register is in the Transducer block at rel. index 119.
The error history register (errors set in the past) is at rel. index 121.

Octet 1	Bit 0	Error 0	Empty pipe
	Bit 1	Error 1	AD-Converter / DSP
	Bit 2	Error 2	Driver
	Bit 3	Error 3	Flow > 105%
	Bit 4	-	- (Error 4, Zero return, only in standard device, not in PA device)
	Bit 5	Error 5	Int. database
	Bit 6	Error 6	Totalizer
	Bit 7	Error A	Max-Alarm
Octet 2	Bit 0	Error B	Min-Alarm
	Bit 1	Error C	Ext. datenbase
	Bit 2	Error F	FRAM in primary
	Bit 3	Error D	Old primary
	Bit 4	Error E	NV-Reset
	Bit 5	Error G	Diagnosis
	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	-	

Example: 01 00 00 00 = Error 0, Empty pipe
00 08 00 00 = Error D, Old primary

4.1.2 Warning register

The actual warning register is in the Transducer block at rel. index 120.
The warnings history (warnings set in the past) is at rel. Index 122.

Octet 1	Bit 0	Warning 2	Totalizer reset
	Bit 1	Warning 1	Simulation
	Bit 2	Warning 3	Test Mode
	Bit 3	Warning 4	Funktion test
	Bit 4	Warning 9a	Overflow >F
	Bit 5	Warning 9b	Overflow < R
	Bit 6	Warning 9c	Overflow Diff.
	Bit 7	Warning 10	Reverse Q
Octet 22	Bit 0	Warning 7	Ext. data loaded
	Bit 1	Warning 8a	Update int. Database
	Bit 2	Warning 8b	Update ext. Datenbase
	Bit 3	-	- (Warning 11, Polling Address > 0, only in standard device, not in PA device)
	Bit 4	-	- (Warning 12a, Simulation Iout, only in standard device, not in PA device)
	Bit 5	-	- (Warning 12b, Simulation pulse, only in standard device, not in PA device)
	Bit 6	Warning 13	Automatic adjust running
	Bit 7	Warning 14	hold – MV
Octet 3	Bit 0	Warning 15	Error and warning simulation
	Bit 1	Warning 16	Diagnosis
	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	-	

Example: 01 00 00 00 = Warning 2 = Totalizer reset
80 00 00 00 = Warning 10 = Reverse Q

4.1.3 Status register

A status register is in the Transducer-Block at rel. index 154. It shows the status of some function test and adjust functions.

Octet 1	Bit 0	- (Funktion test Current output 1, only in standard device, not in PA device)
	Bit 1	- (Funktion test Current output 2, only in standard device, not in PA device)
	Bit 2	Funktion test Contact output
	Bit 3	- (Funktion test Pulse output, only in standard device, not in PA device)
	Bit 4	- (Adjust current output 1, only in standard device, not in PA device)
	Bit 5	- (Adjust current output 2, only in standard device, not in PA device)
	Bit 6	- (Funktion test Contact input, only in standard device, not in PA device)
	Bit 7	-
Octet 2	Bit 0	Funktion test on
	Bit 1	Simulation on
	Bit 2	Automatic adjust running
	Bit 3	Error at automatic adjust
	Bit 4	Average calculation is running
	Bit 5	Result of function test
	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	-

Example: 00 01 00 00 = Funktion test is on

4.2 Get Diag

Information concerning the converter condition can be retrieved using the parameters DIAGNOSIS and DIAGNOSIS_EXTENSION. These parameters are at relative indices 13 and 14 within the Physical Block and can be read both acyclically or during cyclic communication via DDLM_SLAVE_DIAG.

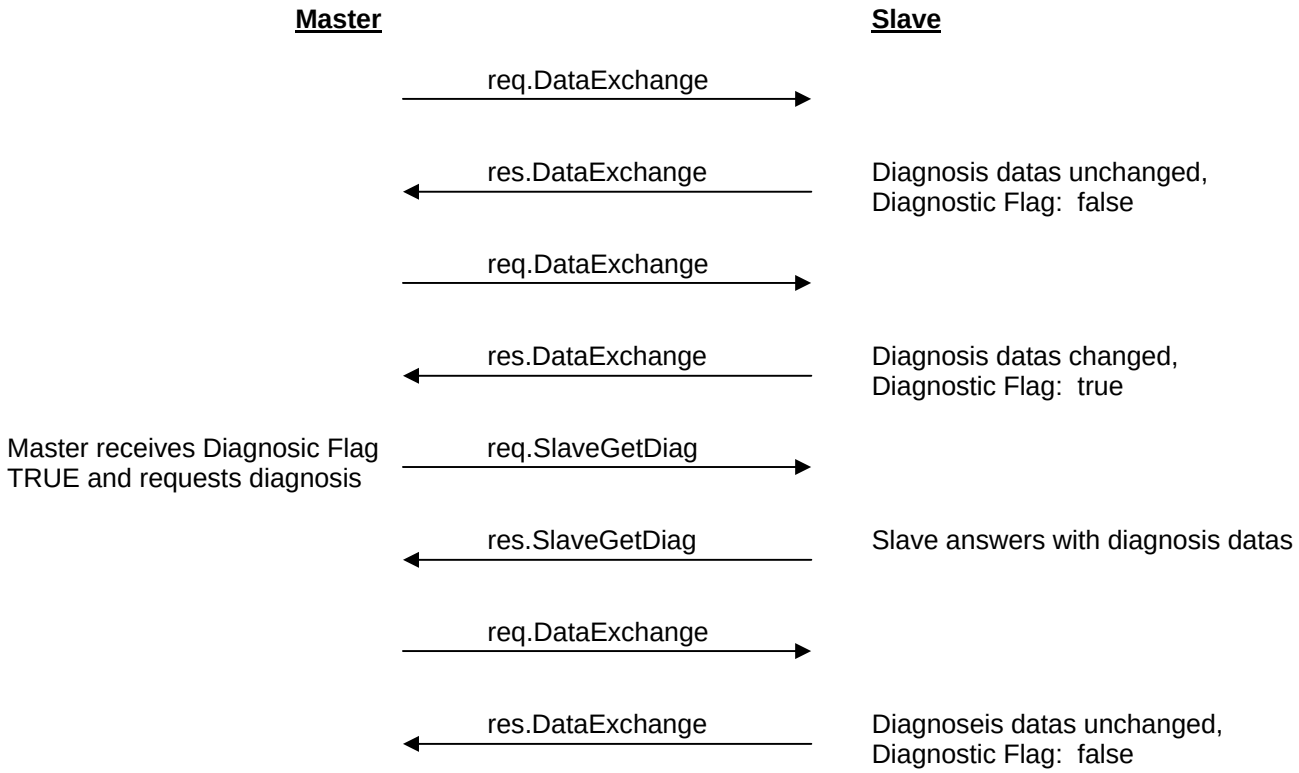
The contents of DIAGNOSIS is specified by the PA3.0 profile. The contents DIAGNOSIS_EXTENSION is manufacturer specific. Because of that DDLM_SLAVE_DIAG delivers for the general PA-profiles 9740 and 9700 only DIAGNOSIS. For the manufacturer specific profile 078C both parameters DIAGNOSIS and DIAGNOSIS_ EXTENSION are delivered by DDLM_SLAVE_DIAG

4.2.1 Principle

During running cyclic communication the master sends continually „Request Data Exchange“ to the slave. The slave answers with „Response Data Exchange“. In the answer of the slave is a bit called “Diagnostic Flag”, which says if new diagnostic informations are available in the slave.

The slave sets this bit one times, if his diagnostic datas are changed. One times means, that this bit is set in only one “Response Data Exchange“-frame. Changed data means, that one or more new diagnostic bits are set or reset.

After receiving a “Response Data Exchange“ with set Diagnostic Flag (=TRUE) the master requests one time the diagnosis datas from the slave with „Request Get Diag“ (DDLM_SLAVE_DIAG). The slave will answer with “Response Get Diag”.



4.2.2 Get Diag Frame

Byte Nr.	DPV1 Name	Bit Nr.	Wert	"long" Frame 9740 or 9700	"long" Frame 078C	„short" Frame 078C
Byte 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
Byte 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
Byte 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
Byte 4	Master Address			0x00	0x00	0x00
Byte 5 – 6	Ident Number			0x97,0x40 or 0x97,0x00	0x07,0x8C	0x07,0x8C
Byte 7	Header	Bit 7-6	fixed to 0	0x08	0x0E	
		Bit 5 – 0	Block length			
Byte 8	Status_Type	Bit 7	Status	0xFE	0xFE	
		Bit 6 – 0	Not used			
Byte 9	Slot Nr. of PB			0x00	0x00	
Byte 10	Specifier	Bit 2-7	reserved	0x01	0x01	
		Bit 0+1	1 = Status appears 2 = Status disappears			
Byte 11–14			DIAGNOSIS (Example from next page)	0x20 0x00 0x00 0x00	0x00 0x00 0x00 0x80	
Byte 15–20			DIAGNOSIS_ EXTENSION (Example from next page)		0x80 0x00 0x00 0x00 0x00 0x00	

The FSM4000 sends a “short” frame (only bytes 1 to 6), if no diagnostic bit is set.
If diagnostic bits are set the device sends a 14 byte answer (9740 or 9700) or a 20 byte answer (078C).

This is an example for 078C with some errors/warning-bits set:

0x08,0x0c,0x00,0x00,0x07,0x8c,	0x0e,0xfe,0x00,0x01,	0x00,0x00,0x00,0x80,	0x80,0x00,0x00,0x00,0x00,0x00
Byte 1-6	Bytes 7-10	Bytes 11-14 Diagnosis	Bytes 15-20 Diagnosis_Extension

Bit 7 in Octet 1 of Diagnosis Extension (=Byte 15) shows “Max Alarm“.
Bi 7 in Octet 4 of Diagnosis (Byte 14), shows that the Diagnosis Extension is available.
Bit 3 in Byte 1 shows that diagnosis datas are available.

The following example is the “short” frame, which comes if no diagnostic bit is set.

0x00,0x0c,0x00,0x00,0x07,0x8c
Byte 1-6

Bit 3 in Byte 1 is 0, because no diagnosis datas are available.

4.2.3 DIAGNOSIS

DIAGNOSIS is at relative index 13 of the Physical block. The meaning of the bits in DIAGNOSIS is specified or they are reserved in the PA3.0 profile. The FSM4000 flowmeter maps some of his own error messages to some DIAGNOSIS bits:

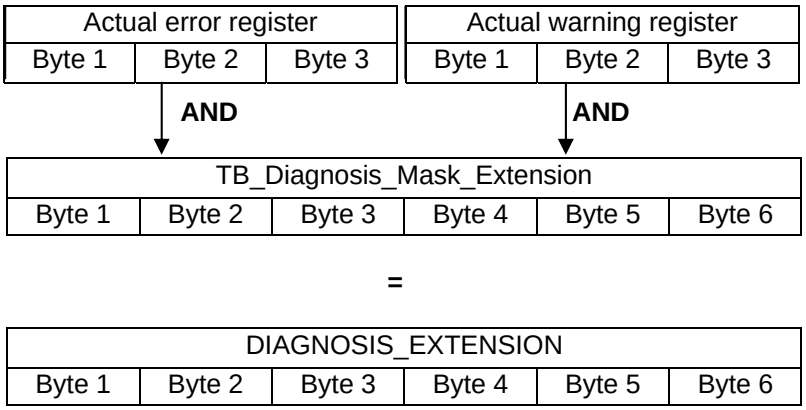
	Bit in Octet	Unit_Diag _Bit (GSD)	
Octet 1	Bit 0	24	-
	Bit 1	25	-
	Bit 2	26	-
	Bit 3	27	-
	Bit 4	28	Memory error: Error 5: Int. Database Error 6: Totalizer Error C: Ext.Database
	Bit 5	29	Failure in measurement: Error 1: AD-Converter/DSP Error 2: Driver
	Bit 6	30	-
	Bit 7	31	-
Octet 2	Bit 0	32	-
	Bit 1	33	-
	Bit 2	34	-
	Bit 3	35	-
	Bit 4	36	-
	Bit 5	37	-
	Bit 6	38	-
	Bit 7	39	-
Octet 3	Bit 0	40	-
	Bit 1	41	-
	Bit 2	42	-
	Bit 3	43	-
	Bit 4	44	-
	Bit 5	45	-
	Bit 6	46	-
	Bit 7	47	-
Octet 4	Bit 0	48	-
	Bit 1	49	-
	Bit 2	50	-
	Bit 3	51	-
	Bit 4	52	-
	Bit 5	53	-
	Bit 6	54	-
	Bit 7	55	More diagnosis information is available This Bit is set at profil 078C, because DIAGNOSIS_EXTENSION follows. For profil 9740 or 9700 this bit is 0, because DIAGNOSIS_EXTENSION doesn't follow.

4.2.4 DIAGNOSIS_EXTENSION

DIAGNOSIS_EXTENSION (relative index 14 in Physical Block) contains manufacturer specific diagnosis informations. DIAGNOSIS_MASK_EXTENSION (relative index 16 in Physical Block) describes, which bits in DIAGNOSIS_EXTENSION are supported (0= not supported, 1 = supported). This mask is according to PA specifications a constant value and read only.

The FSM4000 flowmeter has an error- and warning register (Transducer block relative indicees 119 and 120). Bytes 1 to 3 of the error register are mapped to bytes 1 to 3 of DIAGNOSIS_EXTENSION, bytes 1 to 3 of the warning register are mapped to bytes 4 to 6 of DIAGNOSIS_EXTENSION.

To have the possibility to decide which of the error and warning bits are used, there is another mask in the Transducer block: TB_Diagnosis_Mask_Extension (rel. Index 152).This mask determins, which bits from the error- and warning register are copied to DIAGNOSIS_ EXTENSION (0 = not copied, 1 = copied). This mask can be read or wiritten over PA bus or via display and keyboard (refer to 5.2.5).



The table below shows the default values of TB_Diagnosis_Mask_Extension. Some of the bits can't be cleared. These bits are not maskable.

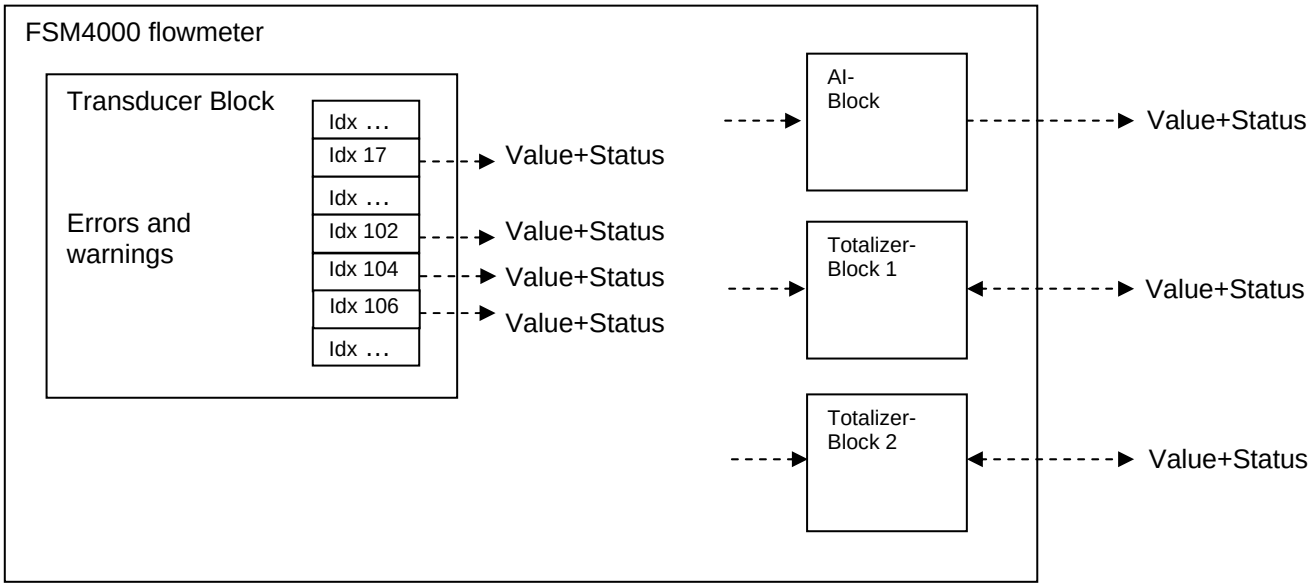
Warning: The GetDiag-frame for profiles 9740 and 9700 doesn't has the DIAGNOSIS_EXTENSION parameter, only DIAGNOSIS. Because DIAGNOSIS doesn't contain the information about an "Error- and warning simulation" it is not possible ro recognize if real or simulated diagnostic datas are used. To get this information DIAGNOSIS_ EXTENSION can be acyclic read.

	Bit in Octet	Unit_Diag_Bit (GSD)			Default-Value 1 in TB_Diagnosis_ Mask_ Extenssion	Not maskable Bits
Octet 1	Bit 0	56	Error 0	Empty pipe	1	
	Bit 1	57	Error 1	AD-Converter / DSP	1	x
	Bit 2	58	Error 2	Driver	1	x
	Bit 3	59	Error 3	FlowDurchfluß > 105%	1	
	Bit 4	60	-			
	Bit 5	61	Error 5	Int. Datenbase	1	x
	Bit 6	62	Error 6	Totalizer	1	x
	Bit 7	63	Error A	Max-Alarm	1	
Octet 2	Bit 0	64	Error B	Min-Alarm	1	
	Bit 1	65	Error C	Ext. Datenbase	1	x
	Bit 2	66	Error F	FRAM in primary	1	
	Bit 3	67	Error D	Old Primary	1	
	Bit 4	68	Error E	NV-Reset	1	
	Bit 5	69	Error G	Diagnosis	1	
	Bit 6	70	-			
	Bit 7	71	-			
Octet 3	Bit 0	72	-			

	Bit 1	73	-			
	Bit 2	74	-			
	Bit 3	75	-			
	Bit 4	76	-			
	Bit 5	77	-			
	Bit 6	78	-			
	Bit 7	79	-			
Octet 4	Bit 0	80	Warning 2	Totalizer reset		
	Bit 1	81	Warning 1	Simulation	1	x
	Bit 2	82	Warning 3	Test Mode		
	Bit 3	83	Warning 4	Function test		
	Bit 4	84	Warning 9a	Overflow >F		
	Bit 5	85	Warning 9b	Overflow < R		
	Bit 6	86	Warning 9c	Oferflow Diff.		
	Bit 7	87	Warning 10	Reverse flow		
Octet 5	Bit 0	88	Warning 7	External data loaded		
	Bit 1	89	Warning 8a	Update internal Datenbase		
	Bit 2	90	Warning 8b	Update external Datenbase		
	Bit 3	91	-			
	Bit 4	92	-			
	Bit 5	93	-			
	Bit 6	94	Warning 13	Automatic adjust running		
	Bit 7	95	Warning 14	hold – MV		
Octet 6	Bit 0	96	Warning 15	Error and warning simulation	1	x
	Bit 1	97	Warning 16	Diagnosis	1	
	Bit 2	98	-			
	Bit 3	99	-			
	Bit 4	100	-			
	Bit 5	101	-			
	Bit 6	102	-			
	Bit 7	103	-			

4.3 Mapping from error and warnings to the Transducerblock status

The Transducerblock delievers the measurement values to the function blocks. The measurement value consists of a data structure DS-33: Value and status. This status goes to the function blocks, which will react according to their settings and PA specifications. The function blocks calculate their values and status, which can be read by cyclic communication.



4.3.1 Mapping-Table

The following table shows the mapping of FSM4000 errors and warnings to the status of the Transducer Block output variables:

	FSM4000-Fehler/Warnung	Mapping to status of VOLUME_FLOW (Index 17)	Mapping to status of Totalizer (Index 102, 104 und 106)
Error 0	Empty pipe	UNCERTAIN, non-specific	UNCERTAIN, non-specific
Error 1	AD-Converter / DSP	BAD, sensor failure	BAD, sensor failure
Error 2	Driver	BAD, sensor failure	BAD, sensor failure
Error 3	Flow > 105%	UNCERTAIN, engineering unit range violation	UNCERTAIN, engineering unit range violation
Error 5	Internal Datenbase	BAD, device failure	BAD, device failure
Error 6	Totalizer	-	BAD, device failure
Error A	Max-Alarm	-	-
Error B	Min-Alarm	-	-
Error C	External Datenbase	BAD, device failure	BAD, device failure
Error D	Old Primary	-	
Error E	NV-Reset	BAD, sensor failure	BAD, sensor failure
Error F	FRAM in primary	-	-
Error G	Diagnosis	BAD, sensor failure	BAD, sensor failure
		-	
Warning 1	Simulation	UNCERTAIN, simulated value	UNCERTAIN, simulated value
Warning 2	Totalizer rset	-	-
Warning 3	Test Mode	-	-
Warning 4	Function test	-	-
Warning 7	External Data loaded	-	-
Warning 8a	Update internal Database	-	-
Warning 8b	Update external Datenbase	-	-
Warning 9a	Overflow >F	-	-
Warning 9b	Overflow <R	-	-
Warning 9c	Overflow Diff.	-	-
Warning 10	Reverse flow	-	-
Warning 13	Automatic adjust running	UNCERTAIN, sensor calibration	UNCERTAIN, sensor calibration
Warning 14	Old primary	-	-
Warning 15	Simulation Error- and Warning	-	-
Warning 16	Diagnosis	UNCERTAIN, sensor conversion not accurate	UNCERTAIN, sensor conversion not accurate

4.4 Status-Byte

The measurement value is usually transferred cyclically as data structure 33 (see chapter 3.7.2). This structure consists out 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 für 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 für UNCERTAIN
- 0: non-specific
- 1: last usable value
- 2: substitute-set
- 3: initial value
- 4: sensor conversion not accurate
- 5: engineering unit range violation (unit not in the valid set)
- 6: sub-normal
- 7: configuration error
- 8: simulated value
- 9: sensor calibration

Substatus für 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 für 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. Menus on flowmeter

5.1 Values on display

The flowmeter has a 4-line LCD-display. In the submenu „Display“ can be choosen for every line, which value should be shown (refer also to Transducer block rel.Index 94 to 97). The following PA related parameter can be selected:

PA Adr+State
TB VolFlow Value
TB VolFlow Status
TB Total >V Value
TB Total >V Status
TB Total <R Value
TB Total <R Status
TB TotDiff Value
TB TotDiff Status
FB AI Out
FB AI Status
FB TOT1 Total
FB TOT1 Status
FB TOT2 Total
FB TOT2 Status

5.1.1 Adr+State

The PA-address and the state of cyclic communication (STOP, CLEAR oder OPERATE) will be shown, for example:

```
PA Adr  6 STOP
```

5.1.2 TB VolFlow Value

The value of VOLUME_FLOW (Transducer Block Index 17) is shown:

```
TB VolF  123.45
```

5.1.3 TB VolFlow Status

The status of VOLUME_FLOW (Transducer Block Index 17) is shown:

```
TB VolF  GOOD
```

5.1.4 TB Total >F Value

The value of Totalizer >F (Transducer Block Index 102) is shown:

```
TB T>V  0.00000
```

5.1.5 TB Total >F Status

The status of Totalizer >F (Transducer Block Index 102) is shown:

```
TB T>V  GOOD
```

5.1.6 FB AI Out

The OUT variable of the AI block is shown. The number of digits behind the dot "." is determined by the parameter DECIMAL_POINT of the OUT_SCALE-structure of the AI block. The shown unit comes from UNIT_INDEX of the OUT_SCALE-Structure.

```
AI  123.45 m3/h
```

5.1.7 FB TOT1 Total

The TOTAL value of the Totalizer block 1 is shown. The unit is determined by UNIT_TOTAL.

```
T1  1.2345 m3
```

5.1.8 FB AI status and FB TOT status

The actual mode of the block (Auto, Man, Out of Service) and the status of the output variable is shown.

```
AI  AUTO GOOD
```

The substatus is shown as a number, for example BAD4 means: status is bad, substatus is 4 = sensor failure.
The substatus coding is shown in 4.4.

5.2 Submenu Data link

5.2.1 PA Address

The actual PA address is shown and can be set here. Address setting is possible in the range 0 to 126. See also 2.3.

```
PA Address
126
```

It is not possible to change the address during running cyclic communication.

If switch 8 is closed and therefor the address comes from the switches 0 to 7 this is shown on the display. Then no address change is possible.

```
PA Address
10
Address is set
by switch
```

5.2.2 IdentNr Selector

The actual Ident number is shown here and can be changed. Changing is not possible during running cyclic communication.

```
IdentNr Selector
FSM4000 078C
AI+2*TOT
```

Possible Ident numbers are:

FSM4000 078C	AI+2*TOT
Profile 9740	AI+TOT
Profile 9700	AI

5.2.3 AI Channel

The actual channel of the AI block is shown here and can be changed. If the channel is changed the PV_SCALE and OUT_SCALE structures are set fitting to the channel.

```
AI Channel
TB Volume Flow
```

Possible channels are:

- TB Volume Flow
- TB Total >F
- TB Total <R
- TB Diff Total

5.2.4 TOT Channel.

Similar to AI channel. The only possible selection is:
TB Volume Flow

It seem to be senseless because no real selection is possible, but it helps to set an wrong channel parameter back to the only correct value „TB Volume Flow“. If the channel is set the Totalizer unit is set fitting to the channel unit, example: channel in m3/h Totalizer unit is m3.

```
TOT1 Channel
TB Volume Flow
```

5.2.5 TB_Diagnosis_Mask_Extension

This menu shows the TB_Diagnosis_Mask_Extension (see Transducerblock relative Index 152 and chapter 4.2.4) and allows to change it.

```
TB DiagExtMask
```

It is possible to set or reset most of the bits in this mask (exception refer to 4.2.4: non maskable bits). The actual bit is shown in the first line of the display:

```
Byte 0 Bit 0 OFF
FF0F00000001
Fehler 0
Leeres Rohr
```

Line two shows the complete mask as hex number. Line 3 and 4 show the meaning of the bit. Handling of the menu: keys STEP or DATA to select the bit, ENTER to switch the bit on or off, CE (or 20 seconds no key) to leave the menu.

5.2.6 Revision Communication Software

The version of the communication part of the software is shown here.

```
Software Rev.
Communication:
2
```

5.3 Submenu status

The FSM4000 PA software has the following additional menus for error and warning simulation in the submeune status.

5.3.1 Simulation

This menu is only visible if the service code is put in. It allows to switch on or off the error and warning simulation.

```
Simualtion
Aus
```

5 minutes after the last keyboard activity according to the simulation the simulation is switched off.

5.3.2 Error simulation

This menu is only visible if the simulation is switched on. It contains the error simulation register.

```
Error Simulation
```

Every bit in the error simulation register can switched on or off. The first line shows the bit. Line two shows the complete error simulation register value as hex number. The lines three and four show the meaning of the bits.

```
Byte 0 Bit 0 OFF
00000000
Error 0
Empty pipe
```

Handling of the menu: Keys STEP or DATA to select the bit, ENTER to switch the bit on or off, CE (or 20 seconds no key) to leave the menu. Pressing a key resets the timer for disabling the simulation back to 5 minutes.

5.3.3 Warning simulation

Similar to Error simulation.
Information: Byte 2 bit 0 „Error and warning simulation“ can not be reset.

6. Startup

6.1 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 (rel. index 82 TB)
Unit: VOLUME_FLOW_UNITS (rel. index 18 TB)

Channel 256+102 = 358 = Transducer block internal totalizer >F
Channel 256+104 = 360 = Transducer block internal totalizer <R
Channel 256+106 = 362 = Transducer block internal diff. totalizer
Scale: 0 to 10.000.000
Unit: Totalizer unit (rel. index 59 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.

6.2 Totalizer block

The unit of the totalizer block is the volume (or mass)-unit of VOLUME_FLOW_UNITS (rel. index 18, equal to index 58 „Range unit“). It is not the „Totalizer unit“ index 59 (unit of transducer block internal totalizer).
Example:

VOLUME_FLOW_UNITS = „Range units“ = m3/h	Totalizer block has m3
„Totalizer unit“ = L	Transducer block internal totalizer has Liter

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 58).

ABB has Sales & Customer Support expertise in over 100 countries worldwide.

www.abb.com

Printed in the Fed. Rep. of Germany

(04.2008)

D184B093U30 Rev.2

ABB Ltd.
Oldends Lane, Stonehouse
Gloucestershire, GL 10 3TA
UK
Phone: +44(0)1453 826661
Fax: +44(0)1453 829671

ABB Inc.
125 E. County Line Road
Warminster, PA 18974
USA
Phone: +1 215 674 6000
Fax: +1 215 674 7183

ABB Automation Products GmbH
Dransfelder Str. 2
37079 Göttingen
GERMANY
Phone: +49 551 905-534
Fax: +49 551 905-555

CCC-support.deapr@de.abb.com