Datalink Description

D184B093U22

Field^{IT}

Vortex Flowmeter FV4000

(TRIO-WIRL V)

Swirl Flowmeter FS4000

(TRIO-WIRL S)

PROFIBUS PA

Industrial^{IT} enabled™

Valid on from Software Edition A.10

ABB

Product Designation
FV4000 / FS4000

Operating Instruction

Part No.. D184B093U22

Issue date: 01.03
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1. Configuration

1.1 Ident Number

Each Profibus instrument is assigned an explicit identification no. by Profibus International (PI). The respective number for the TRIO-WIRL instrument is: 0x05DC. Consequently, the respective instrument file is called: ABB_05DC.GSD. Using this ident no. you are in a position to benefit from the complete entire functionality of your instrument: Two AI blocks and one totalizer block.

PI decided to define standard profiles with individual ident no. The TRIO-WIRL 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	1*AI + TOT	PA139740.GSD
1:	0x05DC	manufacturer specific ABB TRIO-WIRL	2*AI+TOT	ABB_05DC.GSD
128:	0x9700	Profile specific	1*AI	PA139700.GSD

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

1.2 Config String

When 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_05DC:

```
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)  = "AI2"       2 1,2
Slot(3)  = "Totalizer" 3 1,3,4,5
```

1.2.1 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 profile fixed within the function block. The above mentioned modules include:

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

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

3. "TOTAL"
   Cyclical transfer of TOTAL parameters (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.
   .

1.2.2 Slots

The TRIO-WIRL with the ident no. 05DC disposes of 3 Slots: AI1, Totalizer and AI2. The Slot-Definition defines which modules are to be used with the respective slots.
These are as follows:
AI: module 1 or 3
Totalizer: module 1, 3, 4 or 5.

1.2.3 Examples

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

	Slot 1 = AI1	**Slot 2 = Totalizer**	**Slot 3 = AI2**	
Config-String	**0x94**	**0x41, 0x84, 0x85**	**0x94**	
Module chosen	Module 2: AI (Out)	Module 3 TOTAL	Module 3 AI (Out)	
Data Slave→Master	5	5	5	Sum: 15 Bytes
Data Master→Slave	0	0	0	Sum: 0 Bytes

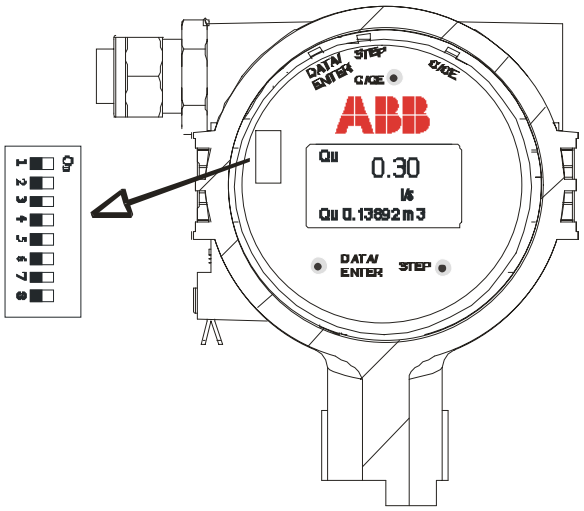
The configuration string **0x94, 0xC1, 0x81, 0x84, 0x00** cyclically transfers the value for OUT of the first AI block and the value for TOTAL from Slave to Master. Altogether this amounts to 10 data bytes.
The OUT value of the second AI block will not be transferred (empty module).
SET_TOT and MODE-TOT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

	Slot 1 = AI1	Slot 2 = Totalizer	Slot 3 = AI2	
Config-String	**0x94**	**0xC1, 0x81, 0x84,0x85**	**0x00**	
Module chosen	Module 2: AI (Out)	Module 3 SETTOT_MODETOT_TOTAL	Module 1 Empty	
Data Slave→Master	5	5	0	Sum: 10 Bytes
Data Master→Slave	0	2	0	Sum: 2 Bytes

NOTE:
This examples are valid only for ident no. 0x05DC. Both profiles, 0x9740 and 0x9700 contain a different slot no. and thus different configuration strings.

1.3 Address settings

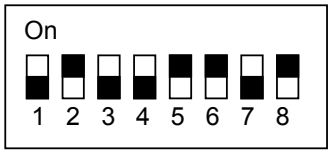
You will find an eightfold switch on the digital board (below the display). This switch is unvisible from outside. The switch settings are changeable while housing cap is opened.



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.

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



Switch Settings will only becoming active during powering up, not while the system is operating!

The switch settings can be retrieved via keyboard and display (sub-menu function test, menu DIP switch). The current switch settings as well as the consequential address settings will be displayed in this respective menu.

The default factory setting is: 01111110, which means address 126.

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

2. Overview blocks

Dependent from the ident no., the TRIO-WIRL converter contains the following blocks:

	0x05DC	0x9740	0x9700
Physical Block	Slot 0	Slot 0	Slot 0
Analog Input Block 1	Slot 1	Slot 1	Slot 1
Totalizer Block	Slot 2	Slot 2	-
Analog Input Block 2	Slot 3	-	-
Transducer Block	Slot 4	Slot 4	Slot 4

The physical block, the AI blocks and the totalizer block 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 vortex profile. In addition, indeces 29-32 contain 2 temperature-oriented parameters as the TRIO-WIRL optionally disposes of a temperature sensor. From index 54 on, the manufacturer-specific parameters are added in the transducer block.

2.1 Block-Table-Legend

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

Rel.Index – Slot Index:
Relative Index of parameters within the Block and Slot-Index. In accordance with the PA profile all blocks start on slot index 16.
The BLOCK_OBJECT e.g is located in each block on relative index 0
which means 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 2.6 for details concerning these structures.

Size: Size of parameter in bytes.

Storage Type:
- Cst = Constant Parameter. Parameter is not subject to any changes.
- S = Static Parameter will be stored permanently (non-volatile). When saving a static parameter the static revision counter ST_REV 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.
Note: FACTORY_RESET will reset the manufacturer specific TB parameters (on from index 54) to a stored setting(status at delivery, if not changed at a later time).

2.2 Slo 0 - Physical Block

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

2.2.1 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	D200F003U01 A.10	Revision-number of the software of the field device.
9 / 25	HARDWARE_REVISION	VisibleString	16	Cst	r	C/a	REVISION 0	Revision-number of the hardware of the field device.
10 / 26	DEVICE_MAN_ID	Unsigned16	2	Cst	r	C/a	26 (=ABB)	Identification code) for the manufacturer company of the field device.
11 / 17	DEVICE_ID	VisibleString	16	Cst	r	C/a	TRIO-WIRL PA3.0	Manufacturer specific identification of the device.
12 / 28	DEVICE_SER_NUM	VisibleString	16	Cst	r	C/a	-	Serial number of the field device. Note: the number is equal to the instrument number (see tranducer block rel. index 101)
13 /29	DIAGNOSIS	Octetstring	4	D	r	C/a	-	Detailed information of the device, bitwize coded. Details in chapter 3.1
14 / 30	DIAGNOSIS_EXTENSION	Octetstring	6	D	r	C/a	-	Additional manufacturer-specific information of the device, bitwize coded. More than one message possible at once, see chapter 3.2
15 / 31	DIAGNOSIS_MASK	Octetstring	4	Cst	r	C/a	-	Mask for the supported DIAGNOSIS information-bits 0 = not supported 1 = supported
16 / 32	DIAGNOSIS_MASK_EXTENSION	Octetstring	6	Cst	r	C/a	-	Mask for the supported DIAGNOSIS_EXTENSION information-bits 0 = not supported 1 = supported

Rel.Idx /Slot Idx	Variable Name	Data Type	Size	Store	Access	Parameter usage / Data transport	Default Value	Description
17 / 33	DEVICE_CERTIFICATION	VisibleString	32	Cst	r	C/a	-	Certifications of the field device, e.g. EX certification.
18 / 34	WRITE_LOCKING	Unsigned16	2	N	r,w	C/a	-	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	-	Each PROFIBUS device has an Ident_Number provided by the PI. There are profile specific Ident_Numbers. A device may have profile specific ones and the manufacturer specific one. The TRIO-WIRL supports the following: O - profile specific Ident_Number (mandatory): 0x9740 1 – manufacturer specific Ident_Number (optional): 0x05DC 2 - manufacturer specific Ident_Number of V2.0 (optional): no 3 – Ident_Number of Multi-Variable Device (optinal): no 4 to 127 – reserved for profile use (not allowed) 128 to 255 – manufacturer specific (optional), 128: 0x9700 If a device is switched to the profile Ident_Number, the device shall interact with the profile features of the GSD file. The Ident_Number_Selector parameter isn't effected by the Factory_Reset.
25 / 41	------	Unsigned8	1	D	r	C/a	-	HW_WRITE_PROTECTTION Optional parameter, not implemented
26 to 32 (42 to 48)	Reserved by PNO							

2.2.2 Physical Block Parameter, sorted according to names

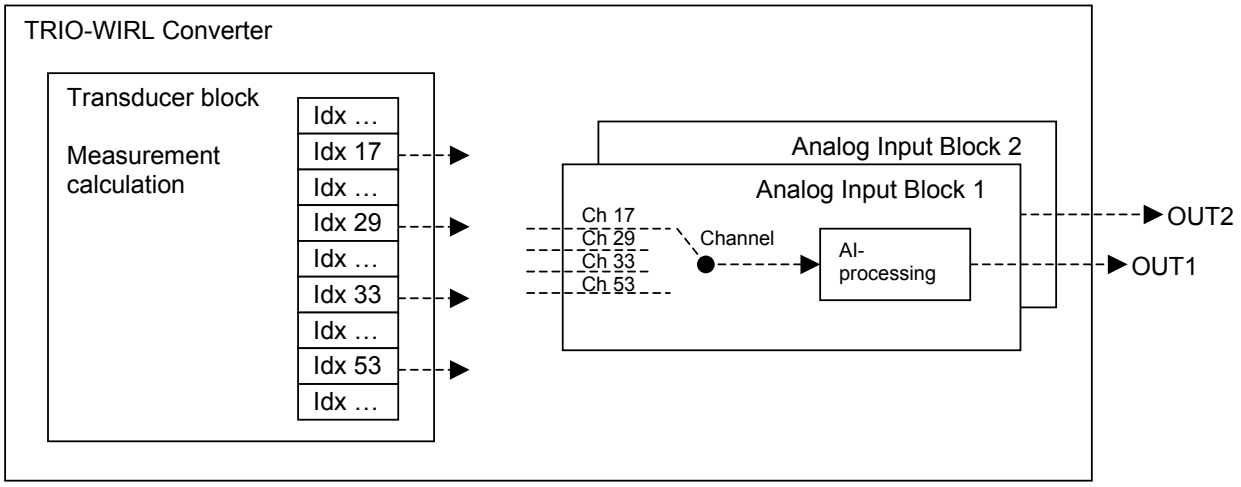
Parameter Name	Rel.Index / Slot Index
ALARM_SUM	7 / 23
ALERT_KEY	4 / 20
BLOCK_OBJECT	0 / 16
DESCRIPTOR	20 / 36
DEVICE_CERTIFICATION	17 / 33
DEVICE_ID	11 / 17
DEVICE_INSTAL_DATE	22 / 38
DEVICE_MAN_ID	10 / 26
DEVICE_MESSAGE	21 / 37
DEVICE_SER_NUM	12 / 28
DIAGNOSIS	13 /29
DIAGNOSIS_EXTENSION	14 / 30
DIAGNOSIS_MASK	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

2.3 Slot 1 and 3 - Analogue 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 analogue input blocks (AI blocks). The TRIO-WIRL disposes of two AI blocks.

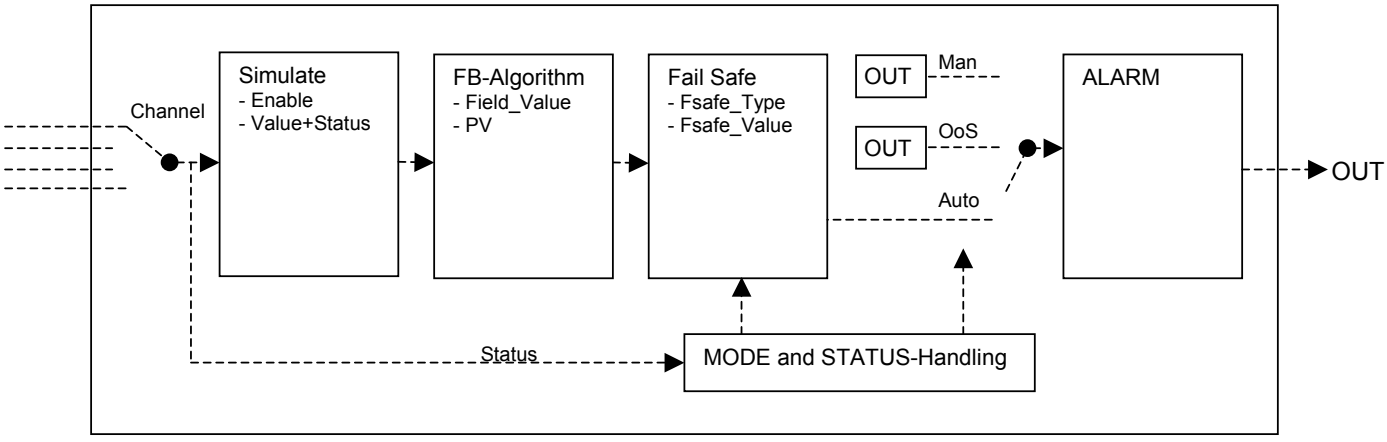
Please make use of Channel Parameter to choose the parameter to be transferred by AI blocks (index 14 in AI).
The TRIO-WIRL channels (decimal, see chapter 2.5.1):

Channel 256+17 = 273: Operating Flow Qv
Channel 256+29 = 285: Temperature
Channel 256+33 = 289: Frequency
Channel 256+53 = 309: Q Operating mode (Flow indicated in chosen operating mode)
Channel 256+149 = 405:Transducer block internal counter



AI blocks 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.

2.3.1 Analogue Input Block Diagram



Channel: Please choose the reading to be transferred from the transducer block using the channel parameter (index 14). See also 2.5.1

Simulate: The simulate parameter is a structure (see 2.6.7) enabling a simulation process (Sub parameter “Simulate enable”). The Sub parameter “Simulate enable” 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.

2.3.2 Analogue 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	AI1: 100, 0, 1349, 2 (1349 = m3/h) AI2: 100, 0, 1077, 2 (1077 = Hz)	Output scaling of the block Scale of the Process Variable The function block parameter OUT_SCALE contains the values of the lower limit and upper limit effective range, the code number of the engineering unit of Process Variable and the number of digits on the right hand side of the decimal point.
13 / 29	LIN_TYPE	Unsigned8	1	S	r,w	C/a	0	Type of linearisation: 0= no linearization
14 / 30	CHANNEL	Unsigned16	2	S	r,w	C/a	AI1: 273 (=256+17) AI2: 289 (=256+33)	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 autoatically the unit of the channel is written into OUT_SCALE.UNIT
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							

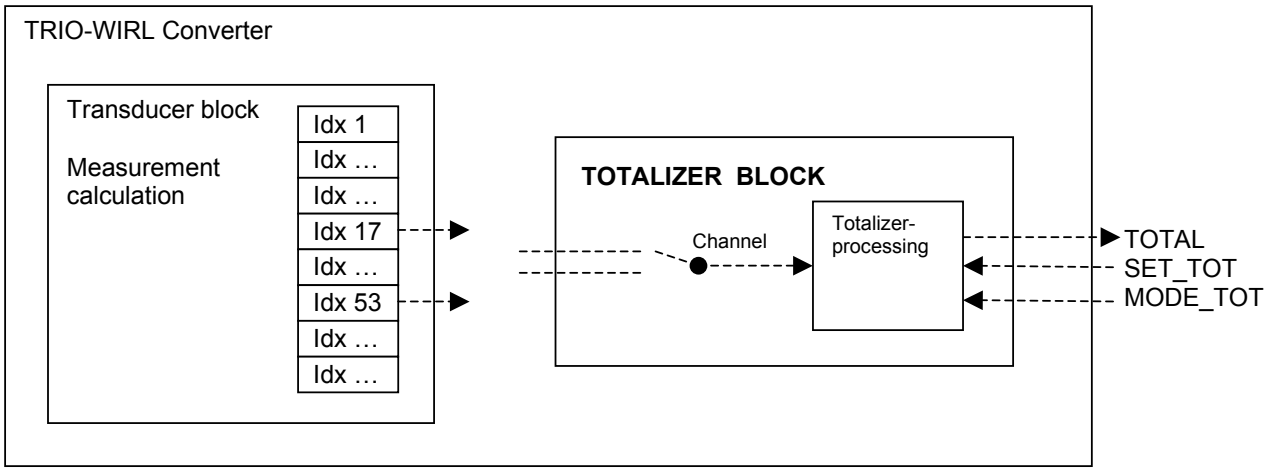
2.3.3 Analogue Input Block Parameter, sorted according to names

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

2.4 Slot 4 - 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):

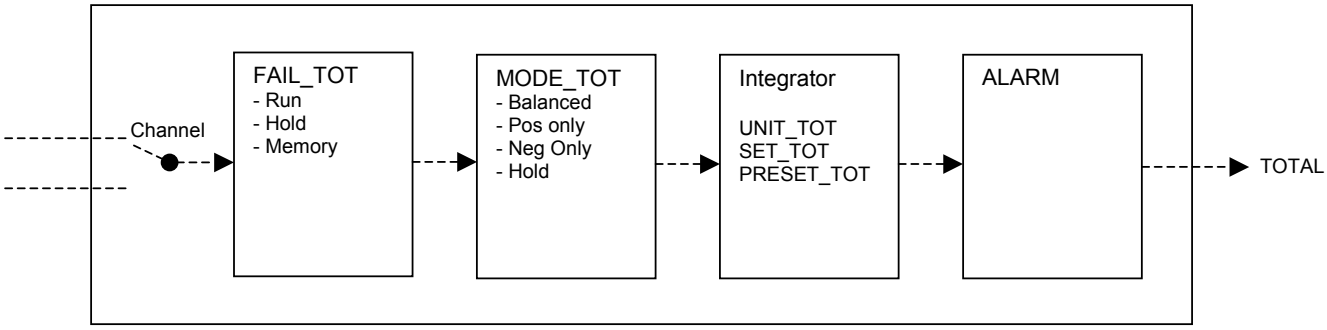
256+17 = 273: operating flow Qv
or 256+53 = 309: flow in operating mode (Qv, Qn or Qm)



The totalizer block parameters
- SET_TOT
- TOTAL
- SET_TOT

Can be changed via cyclical communication. This is done using the Congig-String, see chalpter 1.2.

2.4.1 Totalizer Block Diagram



Channel: Measured value from transducer block to be processed can be chosen via channel parameter (index 12). See also 2.5.1

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. NOTE: A vortex instrument solely measures one flow direction and consequently only reads positive values.

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.

2.4.2 Totalizer Block Parameter, sorted in accordance with index

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

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

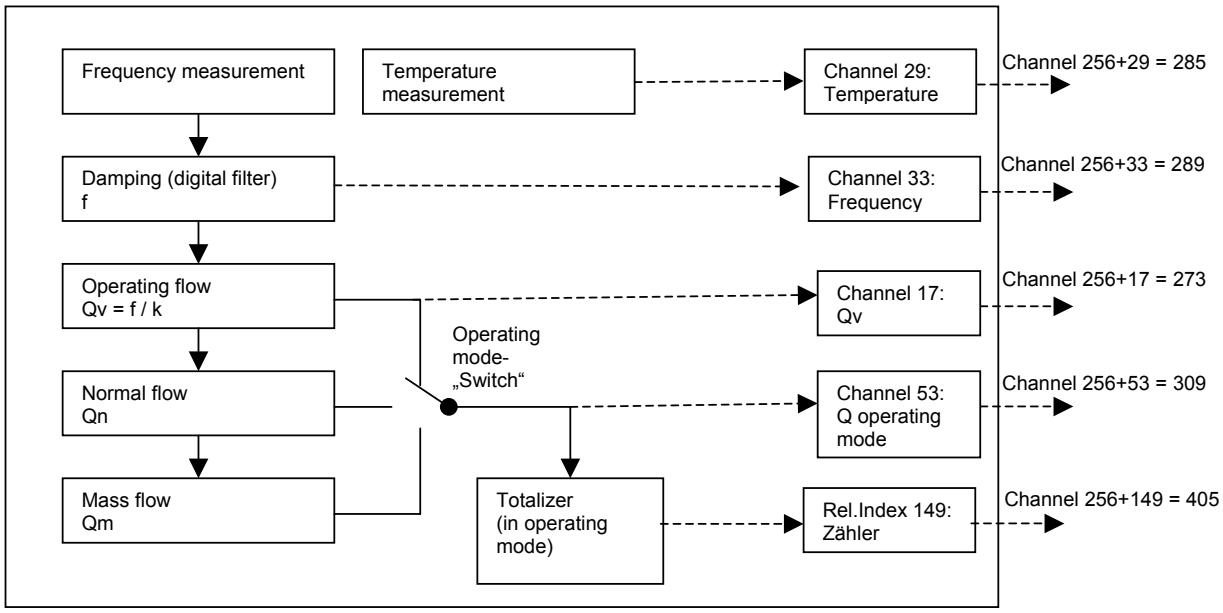
Rel.Idx /Slot Idx	Variable Name	Data Type	Size	Store	Access	Parameter usage / Data transport	Default Value	Description
22 / 38	HI_HI_ALM	DS-39	16	D	r	C/a	0	State of the upper limit of alarms This parameter contains the state of the upper limit of an alarm and the relating time stamp. The time stamp expresses the time the measured variable has been equal or higher than the upper limit of the alarm. Devices without clock use the beginning of the PROFIBUS-PA time (1st January 1984) as time stamp. *
23 / 39	HI_ALM	DS-39	16	D	r	C/a	0	State of the upper limit of warnings This parameter contains the state of the upper limit of a warning and the relating time stamp. The time stamp expresses the time the measured variable has been equal or higher than the upper limit of the warning. Devices without clock use the beginning of the PROFIBUS-PA time (1st January 1984) as time stamp. *
24 / 40	LO_ALM	DS-39	16	D	r	C/a	0	State of the lower limit of warnings This parameter contains the state of the lower limit of a warning and the relating time stamp. The time stamp expresses the time at which the measured variable has been equal to or higher than the lower limit of the warning. Devices without clock use the beginning of the PROFIBUS-PA time (1st January 1984) as time stamp. *
25 / 41	LO_LO_ALM	DS-39	16	D	r	C/a	0	State of the lower limit of alarms This parameter contains the state of the lower limit of an alarm and the relating time stamp. The time stamp expresses the time at which the measured variable has been equal to or higher than the lower limit of the alarm. Devices without clock use the beginning of the PROFIBUS-PA time (1st January 1984) as time stamp. *
26 to 35 (42 to 51)	reserved by PNO							

2.4.3 Totalizer Block Parameter, sorted according to names

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

2.5 Transducer Block

The transducer block contains all instrument specific parameters and functions necessary for flow measurement and calculation. The following diagram is set out to demonstrate the calculation process:



The converter (Vortex / Swirl flow meter) provides a frequency as measured variable.
The calibration factors (k factor) helps taking the operating flow Qv from the damped frequency. Via further calculations, dependent on the operating mode chosen, a normal (Qn) or mass flow (Qm) will be calculated. Dependent on the respective operating mode one of the following flow values Qv, Qn or Qm will be directed to the converter internal totalizer. In addition, the temperature will be measured.

As you can see in the diagram the values measured or calculated are being provided as Channel 17, 29, 33 or 53 transducer block output value and can be taken from either the AI blocks or the totalizer block.
The cyclical reading of measured values is only possible for the OUT of the AI blocks and the totalizer blocks. The channel parameter of the AI or totalizer block selects the value desired. Values can also be read noncyclically out of the transducer block with the respective indices 17, 29, 33 or 53.

2.5.1 Channels and Units

The transducer block (TB) within the TRIO-WIRL 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: Qv = operating flow

Unit: see TB-Parameter “Unit Qv” (Index 18 or 75)

Channel 256+29 = 285: Temperature

Unit: see TB-Parameter “Unit temp” (Index 30 or 69)

Channel 256+33 = 289: Frequency

Unit: Hz

Channel 256+53 = 309: Q Operating mode = flow in operating mode chosen

Unit: Dependent on operating mode (see TB index 63) a volume flow unit (see TB parameter “unit Qv” index 75) or mass flow unit (see TB parameter “unit Qm” index 76)

Channel 256+149 =405 Transducer Block internal counter

Unit: dependent on operating mode (index 63) a volume flow unit (“unit Zv” Index 82) or mass unit (“unit Zm” index 83).

Hinweis: Der TRIO-WIRL includes two independent counters, a Transducer Block internal countzer, which is identical to the counter of the TRIO-WIRL HART version. Additional there is the PA Totalizer Block existing.

The channel parameter is of the type Unsigned 16. The upper byte indicates the transducer block index (in general it is possible for an instrument to dispose of several transducer blocks), the lower byte indicates the relative index of the parameter within the transducer block.

The TRIO-WIRL merely disposes of one transducer block which is assigned index 1. Consequently, the high byte will always be stated as 1 which is equivalent to +256 onto the relative index.

2.5.2 Transducer Block Parameter, sorted in accordance with index

Up to index 53 the transducer block consists of the part "flow transducer block". The parameters correspond to the vortex profile. As the TRIO-WIRL optionally disposes of a temperature measurement, parameters 29-32 additionally dispose of temperature-relating parameters. From index 54 on, manufacturer-specific parameters are attached to the transducer block.

Rel.Idx / Slot Idx	Variable Name	Data Type	Size	Store	Access	Default Value	Description
0 / 16	BLOCK_OBJECT	DS-32	20	C	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 valid and normal operating modes of the block.
7 / 23	ALARM_SUM	DS-42	8	D	r	0,0,0,0	This parameter includes a summary of the block alarms
8 / 24	CALIBR_FACTOR	float	4	S	r,w	Sensor-specific	k-Factor (Calibration Factor) of Vortex. The converter can be operated using a mean k-factor or a 5-point-calibration. There are k-factors for gases or fluids. See index 104 to 129. - Using the current k-factor a mean k-factor will be calculated and indicated on the display. This calculated, mean k-factor is shown here. - When writing, "Liquid km" (=index 118) or "Gas km" (index 129) is used, depending on the respective settings.
9 / 25	LOW_FLOW_CUTOFF	float	4	S	r,w	0	No function !
10 / 26	-	unsigned8	1	S	r,w	0	MEASUREMENT_MODE Not included in Vortex-Transducer-Block-Profile
11 / 27	-	unsigned8	1	S	r,w	0	FLOW_DIRECTION Not included in Vortex-Transducer-Block-Profile
12 / 28	-	float	4	S	r,w	Sensor-specific	ZERO_POINT Not included in Vortex-Transducer-Block-Profile
13 / 29	-	unsigned8	1	N	r,w	0	ZERO_POINT_ADJUST Not included in Vortex-Transducer-Block-Profile
14 / 30	-	unsigned16	2	S	r,w	10xx	ZERO_POINT_UNIT Not included in Vortex-Transducer-Block-Profile

<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>The TRIO-WIRL converter can be operated in connection with Vortex and Swirl primaries, see index 59. Depending on the respective primary, please take data from one of the below tables. The meter size will be transferred as float no. Unit can be either mm or inch, see index 16: NOMINAL_SIZE_UNITS. A primary “DIN 50mm 2in” can thus , depending on the unit chosen, be read/written as 50.0 mm or 2.0 inch.
Vortex Primary:
Vortex primaries are available both in DIN and ANSI design. For clarification reasons ANSI instruments are marked with “0.01”:

Meter Size : mm inch
DIN 15mm 0.5in: 15.0 0.5
DIN 25mm 1in: 25.0 1.0
DIN 40mm 1.5in: 40.0 1.5
DIN 50mm 2in: 50.0 2.0
DIN 80mm 3in: 80.0 3.0
DIN 100mm 4in: 100.0 4.0
DIN 150mm 6in: 150.0 6.0
DIN 200mm 8in: 200.0 8.0
DIN 250mm 10in: 250.0 10.0
DIN 300mm 12in: 300.0 12.0
ANSI 15mm 0.5in: 15.01 0.51
ANSI 25mm 1in: 25.01 1.01
ANSI 40mm 1.5in: 40.01 1.51
ANSI 50mm 2in: 50.01 2.01
ANSI 80mm 3in: 80.01 3.01
ANSI 100mm 4in: 100.01 4.01
ANSI 150mm 6in: 150.01 6.01
ANSI 200mm 8in: 200.01 8.01
ANSI 250mm 10in: 250.01 10.01
ANSI 300mm 12in: 300.01 12.01

Swirl meter:
Meter size : mm inch
15 mm 1/2 in: 15.0 0.5
20 mm 3/4 in: 20.0 0.75
25 mm 1 in: 25.0 1.0
32 mm 1-1/4 in: 32.0 1.25
40 mm 1-1/2 in: 40.0 1.5
50 mm 2 in: 50.0 2.0
80 mm 3 in: 80.0 3.0
100 mm 4 in: 100.0 4.0
150 mm 6 in: 150.0 6.0
200 mm 8 in: 200.0 8.0
300 mm 12 in: 300.0 12.0
400 mm 16 in: 400.0 16.0</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:</td></tr>
</table>

							1013 : mm 1019 : inch
17 / 33	VOLUME_FLOW	DS-33	5	D	r	-	Measured operating flow Qv.
18 / 34	VOLUME_FLOW_UNITS	unsigned16	2	S	r,w	1349	Unit of VOLUME_FLOW, VOLUME_FLOW_LO_LIMIT and VOLUME_FLOW_HI_LIMIT. This parameter is identical with index 75, unit Qv. Unit table see index 75.
19 / 35	VOLUME_FLOW_LO_LIMIT	float	4	S	r,w	-	Lower end of sensor flow range. This parameter is identical with Index77, QmaxDN
20 / 36	VOLUME_FLOW_HI_LIMIT	float	4	S	r,w	-	Upper end of sensor flow range. This Parameter is identical with Index79, Qmin.
21 / 37	-	DS-33	5	D	r	-	MASS_FLOW not included in Vortex-Transducer-Block Profile
22 / 38	-	unsigned16	2	S	r,w	1322	MASS_FLOW_UNITS not included in Vortex-Transducer-Block Profile
23 / 39	-	float	4	S	r,w	-	MASS_FLOW_LO_LIMIT not included in Vortex-Transducer-Block Profile
24 / 40		float	4	S	r,w	-	MASS_FLOW_HI_LIMIT not included in Vortex-Transducer-Block Profile
25 / 41	-	DS-33	5	D	r	-	DENSITY not included in Vortex-Transducer-Block Profile
26 / 42	-	unsigned16	2	S	r,w	1103	DENSITY_UNITS not included in Vortex-Transducer-Block Profile
27 / 43	-	float	4	S	r,w	-	DENSITY_LO_LIMIT not included in Vortex-Transducer-Block Profile
28 / 44	-	float	4	S	r,w	-	DENSITY_HI_LIMIT not included in Vortex-Transducer-Block Profile
29 / 45	TEMPERATURE	DS-33	5	D	r	-	The TRIO-WIRL optionally is available with a temperature sensor. This parameter is the temperature value
30 / 46	TEMPERATURE_UNITS	unsigned16	2	S	r,w	1000	Unit of temperature: K : 1000 C : 1001 F : 1002 This parameter is identical with Index 69, unit temp.
31 / 47	TEMPERATURE_LO_LIMIT	float	4	S	r,w	213,15	Lower end of temperature sensor metering range This value amounts to –60 C or the respective value expressed in different temperature units.
32 / 48	TEMPERATURE_HI_LIMIT	Float	4	S	r,w	783,15	Upper end of temperature sensor metering range This value amounts to +510 C or the respective value expressed in different temperature units.
33 / 49	VORTEX_FREQ	DS-33	5	D	r	-	Metered frequency of vortex and swirl primaries.
34 / 50	VORTEX_FREQ_UNITS	Unsigned16	2	S	r,w	1077	Frequency always has to be set to Hz. Hz : 1077
35 / 51	VORTEX_FREQ_LO_LIMIT	Float	4	S	r,w	0	Lower end of frequency metering range
36 / 52	VORTEX_FREQ_HI_LIMIT	Float	4	S	r,w	3000	Upper end of frequency metering range
37 / 53	-	DS-33	5	D	r	-	SOUND_VELOCITY not included in Vortex-Transducer-Block Profile
38 / 54	-	Unsigned16	2	S	r,w	1061	SOUND_VELOCITY_UNITS not included in Vortex-Transducer-Block Profile
39 / 55	-	float	4	S	r,w	-	SOUND_VELOCITY_LO_LIMIT not included in Vortex-Transducer-Block Profile
40 / 56	-	float	4	S	r,w	-	SOUND_VELOCITY_HI_LIMIT not included in Vortex-Transducer-Block Profile
41 / 57	-	DS-33	5	D	r	-	SAMPLING_FREQ not included in Vortex-Transducer-Block Profile
42 / 58	-	Unsigned16	2	S	r,w	1077	SAMPLING_FREQ_UNITS not included in Vortex-Transducer-Block Profile
43 to 52 (59 to 68)	Reserved						
53 / 69	Q in Operating Mode	DS-33	5	D	r		Flow indicated in operating mode chosen, meaning Qv, On or Qm.
54 / 70	Unit Qoperating mode	Unsigned 16	2	S	r,w		Unit in accordance with Index 53 Depending on operating mode chosen this is a volume flow unit (identical with Index 75, unit Qv)

							or mass flow unit (identical with Index 76, unit Qm)
55 / 71	Version	Visible String	16	N	r	D200F003U01 A.10	Software Part no. and Version
56 / 72	Progr.level	Unsigned 8	1	D	r,w	0	0 : Disabled 1 : Standard 2 : Specialist 3 : Service
57 / 73	Service code	Unsigned 16	2	D	r,w		Limits: none Unit : none
58 / 74	Language	Unsigned 8	1	S	r,w	0	0 : German 1 : English
59 / 75	Primary	Unsigned 8	1	S	r,w	1	0 : DDM ST/SR 1 : Vortex VT/VR
60 / 76	Meter Size Swirl	Unsigned 8	1	S	r,w	0	0 : 15 mm 1/2 in 1 : 20 mm 3/4 in 2 : 25 mm 1 in 3 : 32 mm 1-1/4 in 4 : 40 mm 1-1/2 in 5 : 50 mm 2 in 6 : 80 mm 3 in 7 : 100 mm 4 in 8 : 150 mm 6 in 9 : 200 mm 8 in 10: 300 mm 12 in 11: 400 mm 16 in
61 / 77	Meter Size Vortex	Unsigned 8	1	S	r,w	0	0 : DIN 15mm 0.5in 1 : DIN 25mm 1in 2 : DIN 40mm 1.5in 3 : DIN 50mm 2in 4 : DIN 80mm 3in 5 : DIN 100mm 4in 6 : DIN 150mm 6in 7 : DIN 200mm 8in 8 : DIN 250mm 10in 9 : DIN 300mm 12in 10: ANSI 15mm 0.5in 11 : ANSI 25mm 1in 12 : ANSI 40mm 1.5in 13 : ANSI 50mm 2in 14 : ANSI 80mm 3in 15 : ANSI 100mm 4in 16 : ANSI 150mm 6in 17 : ANSI 200mm 8in 18 : ANSI 250mm 10in 19 : ANSI 300mm 12in

62 / 78	Diameter.-Correct.	Unsigned 8	1	S	r,w	1	0 : Schedule40 1 : Schedule80
63 / 79	Operating Mode	Unsigned 8	1	S	r,w	0	0 : Fluid Qv (1) 1 : Fluid Qm (D) (1) 2 : Fluid Qm (D,T) (2) 3 : Fluid Qm (V,T) (2) 4 : Gas Qv (3) 5 : Gas Norm Qn (pT) (4) 6 : Gas Stnd Qs (pT) (4) 7 : Gas Norm Qn (KmpF) (3) 8 : Gas MassQm (pT) (4) 9 : Gas MassQm (D) (3) 10: S-Vapour Qm (4) 11: S-Vapour Qv (4) NOTE: (1) Can only be chosen, should „Enable K-Set“ (Index 104) be set to 1 or 2 (2) Can only be chosen, should „Enable K-Set“ (Index 104) be set to 1 or 2 and „PT-100-Sensor“ (Index 103) be set to 1 (3) Can only be chosen, should „Enable K-Set“ (Index 104) be set to 0 or 2 (4) Can only be chosen, should „Enable K-Set“ (Index 104) be set to 0 or 2 and „PT-100-Sensor“ (Index 103) be set to 1
64 / 80	Unit Density	Unsigned 16	2	S	r,w	1103	1104: g/ml 1100: g/cm3 1105: g/l 1103: kg/l 1097: kg/m3 1107: lb/ft3 1108: lb/ugl
65 / 81	Reference Density	Float	4	S	r,w	1.0	Lower limit: 0.00001 kg/l Upper limit :10 kg/l or the respective values expressed in different units Unit : see Index 64, Unit Density
66 / 82	Norm Density	Float	4	S	r,w	0.001293	Lower limit: 0.0 kg/l Upper limit :0.1 kg/l Or the respective values expressed in different units Units : see Index 64, Unit Density
67 / 83	Norm Factor	Float	4	S	r,w	1.0	Lower limit: 0.00001 Upper limit : 30.0 Unitt : none
68 / 84	Norm Condition	Unsigned 8	1	S	r,w	0	0 : 1.0133bara 0C 1 : 1.0133bara 20C 2 : 14.7psi-abs 60F 3 : 14.7psi-abs 70F

69 / 85	Unit Temp.	Unsigned 16	2	S	r,w	1001	1001: C 1002: F 1000: K
70 / 86	Reference Temp.	Float	4	S	r,w	20.0	Lower limit: -200 C Upper limit : 450 C Or the respective values expressed in different units unit : see Index 69, Unit Temp.
71 / 87	Unit Pressure	Unsigned 16	2	S	r,w	1137	1137: bara 1142: PSIA 1132: MPA 1138: mbar
72 / 88	Pressure Pbtr abs	Float	4	S	r,w	1.0133	Lower limit: 0 bar Upper limit : 100 bar Or the respective values expressed in different units Unit : see Index 71, Unit Pressure
73 / 89	Vol.Extension	Float	4	S	r,w	1.0	Lower limit: 0 Upper limit : 10.0 Unit : none
74 / 90	D.Bal.Coeffi. (Density Balance Coefficient)	Float	4	S	r,w	1.0	Lower limit: 0 Upper limit : 10.0 Unit : none
75 / 91	Unit Qv	Unsigned 16	2	S	r,w	1349	1351: l/s 1352: l/m 1353: l/h 1347: m3/s 1348: m3/m 1349: m3/h 1350: m3/d 1356: ft3/s 1357: ft3/m 1358: ft3/h 1359: ft3/d 1362: usgps 1363: usgpm 1364: usgph 1365: usmgd 1367: igps 1368: igpm 1369: igph 1370: igpd 1371: bbl/s 1372: bbl/m 1373: bbl/h 1374: bbl/d

76 / 92	Unit Qm	Unsigned 16	2	S	r,w	1324	1318: g/s 1319: g/m 1320: g/h 1322: kg/s 1323: kg/m 1324: kg/h 1325: kg/d 1327: t/m 1328: t/h 1329: t/d 1330: lb/s 1331: lb/m 1332: lb/h 1333: lb/d
77 / 93	QmaxDN Operation	Float	4	N	r	1.67	Unit: see Index 75, UnitQv
78 / 94	Qmax	Float	4	S	r,w	1.67	Limits: depending on different other parameters Unit: see Index 75, UnitQv, or Index 76, UnitQm, Depending on operating mode chosen (Index 63)
79 / 95	Qmin Operation	Float	4	S	r,w	0.139	Lower limit: 0 Upper limit : depending on different other parameters Unit: see Index 54, UnitQv
80 / 96	Totalizer	Float	4	N	r	0.0	Unit: see Index 82, UnitZv, or Index 83, UnitZm, Depending on operating mode chosen (Index 63)
81 / 97	Overflow (Totalizer)	Unsigned 16	2	N	r	0	Unit: none
82 / 98	Unit Totalizer (Volume units)	Unsigned 16	2	S	r,w	1034	1038: l 1034: m3 1043: ft3 1048: ugl 1049: igl 1051: bbl
83 / 99	Unit Totalizer (Masse units)	Unsigned 16	2	S	r,w	1088	1089: g 1088: kg 1092: t 1094: lb
84 / 100	Clear Totalizer		1	D	w	0	Writing a value other than 0 the totalizer will be reset.
85 / 101	Damping	Float	4	S	r,w	3.0	Lower limit: 0.2 Upper limit : 100 Unit : Seconds
86 / 102	Hardware Config.	Unsigned 8	1	S	r,w	0	0 : Off 1 : Puls_Bin 2 : Q_Alarm 3 : T_Alarm (1) 4 : S_Alarm NOTE:

							Can only be chosen, if parameter PT100Sensor (Index 103) is set to 1
87 / 103	Minalarm flow	Float	4	S	r,w	0.0	Lower limit: 0 Upper limit : 100 Unit : %
88 / 104	Maxalarm flow	Float	4	S	r,w	100.0	Lower limit: 0 Upper limit : 100 Unit : %
89 / 105	Minalarm Temp.	Float	4	S	r,w	-60.0	Lower limit: -60.0 C Upper limit : 510.0 C Or the respective values expressed in different units Unit : see Index 69, UnitTemp
90 / 106	Maxalarm Temp.	Float	4	S	r,w	510.0	Lower limit: -60.0 C Upper limit : 510.0 C Or the respective values expressed in different units Unit : see Index 69, UnitTemp.
91 / 107	Pulse factor	Float	4	S	r,w	20.0	Lower limit: : dependent from different factors, mikn. 0.001 Upper limt : dependent from different factors, m ax. 1000 Unit : reciprocal of the totalizer unit See index82, unit Zv or index 83 unit Zm dependent from choosen operating mode (index 63)
92 / 108	Pulse width	Float	4	S	r,w	5	Lower limit: 1 msek Upper limit : 256 msek or less. (limitation to max. 50% Cycle duration pulse output) Unit : msek
93 / 109	Display mode	Unsigned 8	1	S	r,w	0	0 : 1 ample, 1 small 1 : 4 small
94 / 110	Display line 1	Unsigned 8	1	S	r,w	0	0 : Q Operating mode 1 : Qv Operation 2 : Per cent 3 : Totalizer 4 : Temperature (1) 5 : Frequency 6 : AI1 Out 7 : AI1 Status 8 : AI2 Out 9 : AI2 Status 10: Totalizer Total 11: Total. Status 12: Adr+State Note: (1) can only be chosen, if parameter PT100Sensor (Index 103) is set to 1
95 / 111	Display line 2	Unsigned 8	1	S	r,w	3	
96 / 112	Display line 3	Unsigned 8	1	S	r,w	2	
97 / 113	Display line 4	Unsigned 8	1	S	r,w	5	
98 / 114	Display Contrast	Unsigned 8	1	S	r	148	Range 136 (min. Contrast) – 159 (max.Contrast)
99 / 115	Error Register	Unsigned 16	2	N	r,w	0	Read Error Register: Bit 0: Vapour calculation Bit 1: Front end Bit 2: - Bit 3: Flow > 115% Qmax Bit 4: -

							Bit 5: Main Database Bit 6: Totalizer defect Bit 7: Temperature Bit 8: - Bit 9: Qv > 115% QmaxDN Bit 10: - Bit 11: Backup Datenbase Bit 12: - Bit 13: - Bit 14: - Bit 15: - Write Error Register: Writing a value other than 0 the error register will be reset.
100 / 116	Netzausfall	Unsigned 16	2	N	r,w	0	Read AC power failure totalizer: Indication of current AC power failure tcounter value. Write AC power failure totalizer: Writing a value other than 0 the AC power failure totalizer will be reset.
101 / 117	Instrument No.	Unsigned 16	2	N	r,w (1)	0	Lower limit: 0 Upper limit : 65535 unit : none
102 / 118	Order-Number	Visible String	16	S	r,w		
103 / 119	PT100 Sensor	Unsigned 8	1	S	r,w (1)	0	0 : Off 1 : On
104 / 120	Enable K-Set	Unsigned 8	1	S	r,w (1)	2	0 : Gas 1 : Liquid 2 : Liquid & Gas
105 / 121	k-Linearisation	Unsigned 8	1	S	r,w (1)	0	0 : average 1 : 5 Points
106 / 122	Shedule-ShiftFct	Float	4	S	r,w (1)	0.0	Lower limit: -10.0 Upper limit : 10.0 unit : none
107 / 123	Calib.Schedule	Float	4	S	r,w (1)	1.0	0 : Schedule40 1 : Schedule80
108 / 124	Liquid f1	Float	4	S	r,w (1)	2500.0	Lower limit: 1 Upper limit : Liquid f2 Unit : Hz
109 / 125	Liquid f2	Float	4	S	r,w (1)	2500.0	Lower limit: Liquid f1 Upper limit : Liquid f3 Unit : Hz
110 / 126	Liquid f3	Float	4	S	r,w (1)	2500.0	Lower limit: Liquid f2 Upper limit : Liquid f4 Unit : Hz
111 / 127	Liquid f4	Float	4	S	r,w (1)	2500.0	Lower limit: Liquid f3 Upper limit : Liquid f5 Unit : Hz

112 / 128	Liquid f5	Float	4	S	r,w (1)	2500.0	Lower limit: Liquid f4 Upper limit :2500 Unit : Hz
113 / 129	Liquid k1	Float	4	S	r,w (1)	60.0	Lower limit: 1.0 Upper limit : 200000.0 Unit : 1/m3
114 / 130	Liquid k2	Float	4	S	r,w (1)	60.0	Lower limit: 1.0 Upper limit : 200000.0 Unit : 1/m3
115 / 131	Liquid k3	Float	4	S	r,w (1)	60.0	Lower limit: 1.0 Upper limit : 200000.0 Unit : 1/m3
116 / 132	Liquid k4	Float	4	S	r,w (1)	60.0	Lower limit: 1.0 Upper limit : 200000.0 Unit : 1/m3
117 / 133	Liquid k5	Float	4	S	r,w (1)	60.0	Lower limit: 1.0 Upper limit : 200000.0 Unit : 1/m3
118 / 134	Liquid km	Float	4	S	r,w (1)	60.0	Lower limit: 1.0 Upper limit : 200000.0 Unit : 1/m3
119 / 135	Gas f1	Float	4	S	r,w (1)	2500.0	Lower limit: 1 Upper limit : Gas f2 Unit : Hz
120 / 136	Gas f2	Float	4	S	r,w (1)	2500.0	Lower limit: Gas f1 Upper limit : Gas f3 Unit : Hz
121 / 137	Gas f3	Float	4	S	r,w (1)	2500.0	Lower limit: Gas f2 Upper limit : Gas f4 Unit : Hz
122 /138	Gas f4	Float	4	S	r,w (1)	2500.0	Lower limit: Gas f3 Upper limit : Gas f5 Unit : Hz
123 / 139	Gas f5	Float	4	S	r,w (1)	2500.0	Lower limit: Gas f4 Upper limit : 2500 Unit : Hz
124 / 140	Gas k1	Float	4	S	r,w (1)	150.0	Lower limit: 1.0 Upper limit : 200000.0 Unit : 1/m3
125 / 141	Gas k2	Float	4	S	r,w (1)	150.0	Lower limit: 1.0 Upper limit : 200000.0 Unit : 1/m3
126 / 142	Gas k3	Float	4	S	r,w (1)	150.0	Lower limit: 1.0 Upper limit : 200000.0 Unit : 1/m3
127 / 143	Gas k4	Float	4	S	r,w (1)	150.0	Lower limit: 1.0 Upper limit : 200000.0

							Unit : 1/m3
128 / 144	Gas k5	Float	4	S	r,w (1)	150.0	Lower limit: 1.0 Upper limit : 200000.0 Unit : 1/m3
129 / 145	Gas km	Float	4	S	r,w (1)	150.0	Lower limit: 1.0 Upper limit : 200000.0 Unit : 1/m3
130 / 146	DSP BootPage	Unsigned 8	1	S	r,w (1)	1	0 : Page 0 1 : Page Standard 2 : Page Spectrum
131 / 147	Freq.Min	Unsigned 8	1	S	r,w (1)	6	0 : 954Hz 1 : 477Hz 2 : 238Hz 3 : 119Hz 4 : 60Hz 5 : 30Hz 6 : 15Hz 7 : 8Hz 8 : 4Hz 9 : 2Hz 10: 1Hz
132 / 148	Freq.Max	Unsigned 8	1	S	r,w (1)	1	0 : 2500Hz 1 : 954Hz 2 : 477Hz 3 : 238Hz 4 : 119Hz 5 : 60Hz 6 : 30Hz 7 : 15Hz 8 : 8Hz 9 : 4Hz 10 : 2Hz
133 / 149	Gain Max	Unsigned 16	2	S	r,w (1)	0x06EA	Lower limit: 0x400 Upper limit : 0x07FF Unit : none
134 / 150	BP-Aver Damp	Unsigned 8	1	S	r,w (1)	1	0 : 1.0 Sec 1 : 2.0 Sec 2 : 5.0 Sec
135 / 151	FreqSpecBalance	Unsigned 8	1	S	r,w (1)	0	0 : Off 1 : 1 2 : 2 3 : 3
136 / 152	Input Minimum	Float	4	S	r,w (1)	0.03	Lower limit: 0 Upper limit : 0.99 Unit : none
137 / 153	Gain VibTrigger	Unsigned 16	2	S	r,w (1)	0x062C	Lower limit: 0x400 Upper limit : 0x07FF

							Unit : none
138 / 154	Vib Qv Factor	Float	4	S	r,w (1)	0.9	Lower limit: 0 Upper limit : 0.99 Unit : none
139 / 155	Input Select	Unsigned 8	1	S	r,w (1)	0	0 : Qv 1 : Qv Comp
140 / 156	Low DisFrequen.	Float	4	S	r,w (1)	5000	Lower limit: 0 Upper limit : 5000 Unit : none
141 / 157	High DisFrequen.	Float	4	S	r,w (1)	5000	Lower limit: 0 Upper limit : 5000 Unit : none
142 / 158	Low DisGain	Unsigned 16	2	S	r,w (1)	0x07FF	Lower limit: 0x0400 Upper limit :0x07FF Unit : none
143 / 159	High DisGain	Unsigned 16	2	S	r,w (1)	0x07FF	Lower limit: 0x0400 Upper limit : 0x07FF Unit : none
144 / 160	Temp.Correct.	Float	4	S	r,w (1)	0.0	Lower limit: -10.0 Upper limit :10.0 Unit : Celsius
145 / 161	Temp.Interval	Unsigned 16	2	S	r,w (1)	32767	Lower limit: 0 Upper limit : 32767 Unit : none
146 /162	Service Display	Unsigned 8	1	D	r,w (1)	0	0 : BP Range 1 : BP State 2 : Input Values 3 : Vib In Values 4 : Input Quality 5 : Gain Values 6 : Freq Values
147 / 163	Statusregister	Unsigned 16	2	N	r,w (1)	0	Bit 0: limited pulse value Bit 1: limited pulse width Bit 2: limited totalizer unit Bit 3: Low flow Bit 4: Self test pulse output Bit 5: Self test switch output Bit 6: self test flow Bit 7: - Bit 8: Max Alarm Temperature (T) Bit 9: Min Alarm Temperature (T) Bit 10: Alarm Bit 11: Max Alarm flow (Q) Bit 12: Min Alarm flow (Q) Bit 13: error register alarm Bit 14: - Bit 15: -

148 / 164	Service Frame	Octet String	22	D	r	-	Raw data from DSP(digital signal processoer) which is working on frequnecy and temperature measurement
149 / 165	Counter	DS-33	5	D	r		This countewr is identical to Index 80. Index 80 ist the float value only. This however is a data structure 33: Value and Status. This index can be entered as channel in the AI blocks (see 2.5.1), in order to be able to cyclically tranfer this structure. Unit: see Index 82, unit Zv or index 83, unit Zm, dependent form the choosen operating mode (Index 63)

Note:

(1) When writing this parameter, please enter within the parameter service code (index 57) the correct value for activating the service field.

2.5.3 Transducer Block Parameter, sorted according to names

Parameter Name	Rel.Index / Slot Index
ALARM_SUM	7 / 23
ALERT_KEY	4 / 20
Counter	149 / 165
Display Contrast	98 / 114
Display line 1	94 / 110
Display line 2	95 / 111
Display line 3	96 / 112
Display line 4	97 / 113
Display mode	93 / 109
Operating mode	63 / 79
Reference density	65 / 81
Reference temperature	70 / 86
BLOCK_OBJECT	0 / 16
BP-Aver Damp	134 / 150
Calib.Schedule	107 / 123
CALIBR_FACTOR	8 / 24
D.Bal.Coeffi.	74 / 90
Damping	85 / 101
DENSITY	25 / 41
DENSITY_HI_LIMIT	28 / 44
DENSITY_LO_LIMIT	27 / 43
DENSITY_UNITS	26 / 42
Pressure Pbtr abs	72 / 88
DSP BootPage	130 / 146
Diameter Corr.	62 / 78
Unit Density	64 / 80
Unit Pressure	71 / 87
Unit Qoperatingmode	54 / 70
Unit Qm	76 / 92
Unit Qvol	75 / 91
Unit Temp.	69 / 85
Unit Totalizer	82 / 98
Unit Totalizer	83 / 99
Enable K-Set	104 / 120
Error Register	99 / 115
FLOW_DIRECTION	11 / 27
Freq.Max	132 / 148
Freq.Min	131 / 147
FreqSpecBalance	135 / 151
Gain Max	133 / 149
Gain VibTrigger	137 / 153
Gas f1	119 / 135
Gas f2	120 / 136
Gas f3	121 / 137
Gas f4	122 /138
Gas f5	123 / 139
Gas k1	124 / 140
Gas k2	125 / 141
Gas k3	126 / 142
Gas k4	127 / 143
Gas k5	128 / 144
Gas km	129 / 145
Hardware Config.	86 / 102
High DisFrequen.	141 / 157
High DisGain	143 / 159
Impulsbreite	92 / 108
Impulsfaktor	91 / 107
Input Minimum	136 / 152
Input Select	139 / 155
Instrument No.	101 / 117
k-Linearisation	105 / 121
Liquid f1	108 / 124
Liquid f2	109 / 125
Liquid f3	110 / 126
Liquid f4	111 / 127
Liquid f5	112 / 128

Parameter Name	Rel.Index / Slot Index
Liquid k1	113 / 129
Liquid k2	114 / 130
Liquid k3	115 / 131
Liquid k4	116 / 132
Liquid k5	117 / 133
Liquid km	118 / 134
Low DisFrequen.	140 / 156
Low DisGain	142 / 158
LOW_FLOW_CUTOFF	9 / 25
MASS_FLOW	21 / 37
MASS_FLOW_HI_LIMIT	24 / 40
MASS_FLOW_LO_LIMIT	23 / 39
MASS_FLOW_UNITS	22 / 38
Maxalarm flow	88 / 104
Maxalarm Temp.	90 / 106
MEASUREMENT_MODE	10 / 26
Primary	59 / 75
Minalarm flow	87 / 103
Minalarm Temp.	89 / 105
MODE_BLK	6 / 22
Meter size DDM	60 / 76
Meter size Vortex	61 / 77
AC power failure	100 / 116
NOMINAL_SIZE	15 / 31
NOMINAL_SIZE_UNITS	16 / 32
Norm density	66 / 82
Norm factor	67 / 83
Norm Condition	68 / 84
Order-Number	102 / 118
Progr.level	56 / 72
PT100 Sensor	103 / 119
Q in operating mode	53 / 69
Qmax	78 / 94
QmaxDN operation	77 / 93
Qmin operation	79 / 95
Reserved	(59 to 68)
SAMPLING_FREQ	41 / 57
SAMPLING_FREQ_UNITS	42 / 58
Service Display	146 /162
Service code	57 / 73
Shedule-ShiftFct	106 / 122
SOUND_VELOCITY	37 / 53
SOUND_VELOCITY_HI_LIMIT	40 / 56
SOUND_VELOCITY_LO_LIMIT	39 / 55
SOUND_VELOCITY_UNITS	38 / 54
Language	58 / 74
ST_REV	1 / 17
Status register	147 / 163
STRATEGY	3 / 19
TAG_DESC	2 / 18
TARGET_MODE	5 / 21
Temp.Correct.	144 / 160
Temp.Interval	145 / 161
TEMPERATURE	29 / 45
TEMPERATURE_HI_LIMIT	32 / 48
TEMPERATURE_LO_LIMIT	31 / 47
TEMPERATURE_UNITS	30 / 46
Overflow (totalizer)	81 / 97
Version	55 / 71
Vib Qv Factor	138 / 154
Vol.Extension	73 / 89
VOLUME_FLOW	17 / 33
VOLUME_FLOW_HI_LIM	20 / 36
VOLUME_FLOW_LO_LI	19 / 35
VOLUME_FLOW_UNITS	18 / 34
VORTEX_FREQ	33 / 49
VORTEX_FREQ_HI_LIMIT	36 / 52
VORTEX_FREQ_LO_LIMIT	35 / 51

Parameter Name	Rel.Index / Slot Index
VORTEX_FREQ_UNITS	34 /50
Totalizer	80 / 96
Reset Totalizer	84 / 100
ZERO_POINT	12 / 28
ZERO_POINT_ADJUST	13 / 29
ZERO_POINT_UNIT	14 / 30

2.6 Datenstrukturen

2.6.1 DS-32 – Block Structure

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

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

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

2.6.3 DS-36 – Scaling Structure

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

2.6.4 DS-37 – Mode Structure

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

2.6.5 DS-39 – Alarm Float Structure

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

2.6.6 DS-42 – Alarm Summary Structure

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

2.6.7 DS-50 – Simulate – Floating Point Structure

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

2.6.8 DS-67 – Batch Structure

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

3. Diagnosis

The cyclic data tranfer service Data-Exchange（DP response Data Exchange) includes the Bit Diagnostic Flag, which is set, if the Bytes of DIAGNOSIS or DIAGNOSIS_EXTENSION are changed. The master then starts the service SLAVE_DIAG (DP request Slave Diag) and the converter answers with the the following SLAVE_DIAG – Telegram (DP response Slave Diag).
The Parameter DIAGNOSIS and DIAGNOSIS_EXTENSION iclude the status of the converter. These parameters are represented by the relative indices 13 and 14 in the Physical Block and can be read using the service SLAVE_DIAG.
The service SLAVE_DIAG in minimum transfers according to the PA profile the parameters DIAGNOSIS in Byte 11 to 14 of the answer. For the FXE4000 the service has been extended and additionally transfers Byte 15 to 20 for the parameter DIAGNOSIS_EXTENSION.

Content of SLAVE_DIAG – Telegram:

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

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

3.1 DIAGNOSIS

Octet 1	Bit 0	Hardware failure of the electronic: Cause: Error preamplifier, see error register
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	Memory error: Cause: Error Main-D-Base, see error register
	Bit 5	Failure in measurement: Cause: error preamplifier, see error register
	Bit 6	-
	Bit 7	-
Octet 2	Bit 0	-
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	-
	Bit 5	-
	Bit 6	-
	Bit 7	-
Octet 3	Bit 0	-
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	-
	Bit 5	-
	Bit 6	-
	Bit 7	-
Octet 4	Bit 0	-
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	-
	Bit 5	-
	Bit 6	-
	Bit 7	More diagnosis information is available (is set if in minimum one bit in Diagnosis_Extension is set)

3.2 DIAGNOSIS_EXTENSION

Octet 1	Bit 0	Error register 8: -
	Bit 1	Error register 9: Flow > 115% of QmaxDN
	Bit 2	Error register A: -
	Bit 3	Error register B: Backup-Database faulty
	Bit 4	Error register C: -
	Bit 5	Error register D: -
	Bit 6	Error register E: -
	Bit 7	Error register F: -
Octet 2	Bit 0	Error register 0: Error as to vapour calculation
	Bit 1	Error register 1: Error preamplifier
	Bit 2	Error register 2: -
	Bit 3	Error register 3: Flow > 115% of Qmax
	Bit 4	Error register 4: -
	Bit 5	Error register 5: Main-Database faulty
	Bit 6	Error register 6: Totalizer defect
	Bit 7	Error register 7: Error temperature measurement
Octet 3	Bit 0	Status register 8: Max-Temperature-Alarm (T-Alarm)
	Bit 1	Status register 9: Min-Temperature-Alarm (T-Alarm)
	Bit 2	Status register A: -
	Bit 3	Status register B: Max-flow-Alarm (Q-Alarm)
	Bit 4	Status register C: Min-flow-Alarm (Q-Alarm)
	Bit 5	Status register D: -
	Bit 6	Status register E: -
	Bit 7	Status register F: -
Octet 4	Bit 0	Status register 0: -
	Bit 1	Status register 1: -
	Bit 2	Status register 2: -
	Bit 3	Status register 3: -
	Bit 4	Status register 4: Function test Pulse output
	Bit 5	Status register 5: Function test contact output
	Bit 6	Status register 6: Function test Simulation of flow
	Bit 7	Status register 7: -
Octet 5	Bit 0	-
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	-
	Bit 5	-
	Bit 6	-
	Bit 7	-
Octet 6	Bit 0	-
	Bit 1	-
	Bit 2	-
	Bit 3	-
	Bit 4	-
	Bit 5	-
	Bit 6	-
	Bit 7	-

Note: Error and status register of TRIO-WIRL are situated within the transducer block relative indices 99 and 147 respectively.

3.3 Status-Byte

The measurement value is usually transferred cyclically as data structure 33 (see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**).
This structure consists out of a value as floating point ana a status byte. The status byte includes three areas:

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

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

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

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

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

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

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

4. Start-up

4.1 Default Values

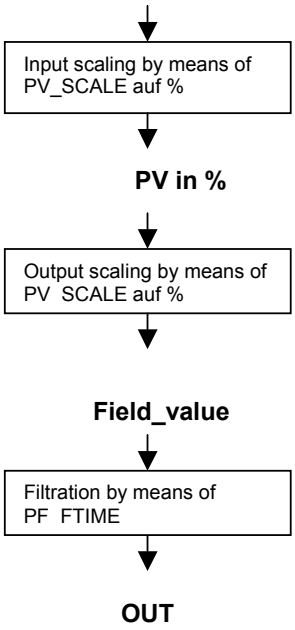
The default values are partially determined by the PA3.0 profile, partially selectable by the manufacturer. Manufacturer selections provide for AI and totalizer block to be set to auto-mode. Default channel settings are:

AI-Block 1:	17+256 = 273	Qv (=operating flow)
Totalizer-Block:	17 + 256 = 273	Qv(=operating flow)
AI-Block 2:	33 + 256 = 289	Frequency

As soon as the cyclical communication is activated (starting with the dafault values) the above values will be read cyclically; no other parameters have to be adjusted acyclically.

4.2 Reference as to AI block

The following diagram shows the normal calculation sequence as well as the default values:



			AI1:	**AI2:**
	Channel	Default Value	273 = Qv	289 = Frequency
	„Einheit Qv“	Default Value	1349 = m3/h	1077 = Hz
	EU of 100%	Default Value	100	100
	EU of 0%	Default Value	0	0
	EU of 100%	Default Value	100	100
	EU of 0%	Default Value	0	0
	Unit-Index	Default Value	1349 = m3/h	1077 = Hz
	Decimal point	Default Value	2 post decimal positions	2

As both, the in and output scaling dispose of identical default values, the channel value will be transferred unaltered within the AI block. The scaling values do not represent limits. Values exceeding EU100% or undershooting EU0% will likewise be transferred.

The OUT_SCALE unit does not influence the calculation.

4.3 References as to the Totalizer Block

TheTotalizer accumulates the channel value periodically:

Total.Value = Total.Value + Channel.Value

The time base of the channel unit (/s, /m, /h, /d) is considered. Therefore the totalizer block can be used with all possible channel units (see Transducer Block Index 75 or 76).

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

4.4 Representations in the Device Display

The TRIO-WIRL disposes of a four line display (LCD). In the submenu „Display“ the respresentations in these lines can be selected(see Transducer Block rel. index 94 up to 97). Following selections are given:

6 : AI1 Out
7 : AI1 Status
8 : AI2 Out
9 : AI2 Status
10: Totalizer Total
11: Total. Status
12: Adr+State

4.4.1 AI1 Out and AI2 Out

Displaying the OUT value of the respective AI block (AI1 or AI2). The post decimal points rae related to the decimal point of the OUT_SCALE structure. The displayed unit is UNIT_INDEX from OUT_SCALE structure:

```
AI1  123.45 m3/h
```

4.4.2 Totalizer Total

Display of the TOTAL value of the totalizer blcok. The displayed unit ist UNIT_TOTAL:

```
TOT  1.2345 m3
```

4.4.3 AI1, AI2, TOT Status

Display of the actual mode of the respective block and the status of the output variables (Out.Status or Total.Status).

```
AI1  AUTO GOOD
```

To the right of the status if existing the substatus is displayed as number.
E.g.: BAD 4 means status ist BAD, substatus 4 = sensor failure (substatus coding seehe chapter 3.3).

4.4.4 Adr+State

Display of the BUS address and the status of the cyclic communication (STOP, CLEAR oder OPERATE)

```
PA Adr  6 STOP
```

4.5 Submenu Profibus

4.5.1 Revision Communication Software

Displays the version of the communication software.

```
Software Rev.
Communication:
0
```

4.5.2 IdentNr Selector

Displays the actual active ident number selector and allows the changing. A changing is not possible during running of the cyclic communication, but in the device status Stop.

```
IdentNr Selector
Triowirl 05DC
2*AI+TOT
```

Selections:
- TRIO-WIRL 05DC: 2*AI+TOT
- Standard ID 9740: AI+TOT
- Standard ID 9700: AI

4.5.3 AI1 Channel and AI2 Channel

Displays the actual choosen channel of the respective AI block and allows ajustment. While changing the channel in addition the unit of the channel is copied into the AI block to OUT_SCALE.UNIT_ INDEX.

```
AI1 Channel
Qv
```

Selection:
- Qv
- Qoperating mode
- Temperature
- Frequency
- TB counter

4.5.4 TOT Channel.

This is handled similar to the AI channel. Selection possibilities are:
- Qv
- Qopeating mode

While changing the channel in addition the unit for mass flow or volume flow of the channel is copied into the Totalizer to UNIT_TOT (e.g. $m^3/h \rightarrow m^3$).

We reserve the right to technical amendments

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