



TRICOR®

Coriolis Mass Flow Meter – TCD 9x00 Profibus





Manual-Version

TCD_PROFI_S_EN_200326_E002

This document is supplied as standard in electronic media with the device. Latest version can be downloaded at www.tricorflow.com.

NOTE:

This manual applies to the Coriolis Flow Meter with the brand TRICOR.

Index

1.	LEGAL INFORMATION	5
1.1.	Warning notice system	5
1.2.	Qualified Personnel	5
1.3.	Proper use of TRICOR products	6
1.4.	Disclaimer of Liability.....	6
2.	INTRODUCTION	7
2.1.	Purpose of this documentation	7
2.2.	Document history	7
3.	COMMUNICATION	8
3.1.	Features	8
3.2.	Installation in hazardous area	8
3.3.	Profibus.....	8
3.4.	Changing Profibus termination at the transmitter cassette.....	10
3.5.	Connecting the Profibus (CH1)	11
3.6.	Installation check.....	12
3.7.	Cyclic services	12
3.8.	Acyclic communication	13
3.8.1.	Slot 0, Physical Block.....	13
3.8.2.	Slot 1: Analog Input block – Mass flow.....	18
3.8.3.	Slot 1: Transducer Block	19
3.8.4.	Slot 2: Analog Input block – Density	29
3.8.5.	Slot 3: Analog Input block – Medium temperature	30
3.8.6.	Slot 4: Totalizer block 1.....	30
3.8.7.	Slot 5: Totalizer block 2.....	33
3.8.8.	Slot 6: Analog Input block – Volume flow.....	36
3.8.9.	Slot 7: Analog Input block – Fractional flow A block	36
3.8.10.	Slot 8: Analog Input block – Fractional flow B block	37
3.8.11.	Slot 9: Analog Input block – Fractional flow % A block.....	38
3.8.12.	Slot 10: Analog Input block – Fractional flow % B block.....	38
3.8.13.	Slot 11: Analog Input block – Standard volume flow	39
3.8.14.	Slot 12: Analog Input block – Frame temperature	40
3.8.15.	Slot 12: Analog Input block – Frame temperature	40
3.8.16.	Slot 13: Totalizer block 3.....	41
3.8.17.	Slot 14: Control commands (Manufacturer Specific)	44
3.8.18.	Dosing block, Slot 15.....	45



3.9.	Access Control	46
3.10.	Alarm, error, an system messages.....	47
3.10.1.	Introduction	47
3.10.2.	Diagnosis Response	47
4.	CABLE SPECIFICATIONS.....	49
5.	LISTINGS	50
5.1.	List of Figures.....	50
5.2.	List of Tables	50



1. Legal information

1.1. Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger. All names identified by ® are registered trademarks. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

DANGER!

indicates that death or severe personal injury will result if proper precautions are not taken.

WARNING!

indicates that death or severe personal injury may result if proper precautions are not taken

CAUTION!

indicates that minor personal injury can result if proper precautions are not taken

NOTE:

indicates that property damage can result if proper precautions are not taken

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

1.2. Qualified Personnel

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.



1.3. Proper use of TRICOR products

Note the following:

WARNING!

TRICOR products may only be used for the applications described in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by TRICOR. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

1.4. Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.



2. Introduction

2.1. Purpose of this documentation

This manual contains all information needed to integrate the process instruments into a communications network. The manual is aimed at control system designers, system integrators, instrument engineers.

In order to operate safely and for more detailed information you need the product specific manual. Available for download from Flow documentation (www.tricorflow.com).

This manual applies to the TRICOR TCD 9x00 transmitter Profibus DP/PA version only. The TCD 9x00 transmitter is intended to be used for TCMQ and TCMQ series.

In order to operate a Coriolis flow meter, you also need Operating Instructions. See Flow documentation (www.tricorflow.com).

2.2. Document history

The following table shows major changes in the documentation compared to the previous edition.

Edition	Note
03/2020	First edition



3. Communication

3.1. Features

The device provides the following features:

- PROFIBUS DP communication up to 12 Mbit/s
- Automatic baud rate adaption
- PROFIBUS PA communication
- Automatic baud rate adaption
- Cyclic communication
- Support of PROFIBUS PA Profile for Process Control Devices V4.0 and V3
- Automatic GSD adaption
- Support of up to 15 modules (process values and control values), in cyclic communication
- PROFIBUS clock synchronization by master

3.2. Installation in hazardous area

The PROFIBUS DP module is not allowed for use in hazardous areas.

The PROFIBUS PA module is allowed for use in hazardous areas.

3.3. Profibus

The transmitter has a modular design with discrete, replaceable electronic modules and connection boards to maintain separation between functions and facilitate field service. All modules are fully traceable and their provenance is included in the transmitter setup.

The bus termination can be activated via a switch internal in the transmitter. The bus termination switch is set to off by default. If the internal switch is not used for termination an external separate bus terminator must be installed. The internal switch is located on the transmitter PCBA module.

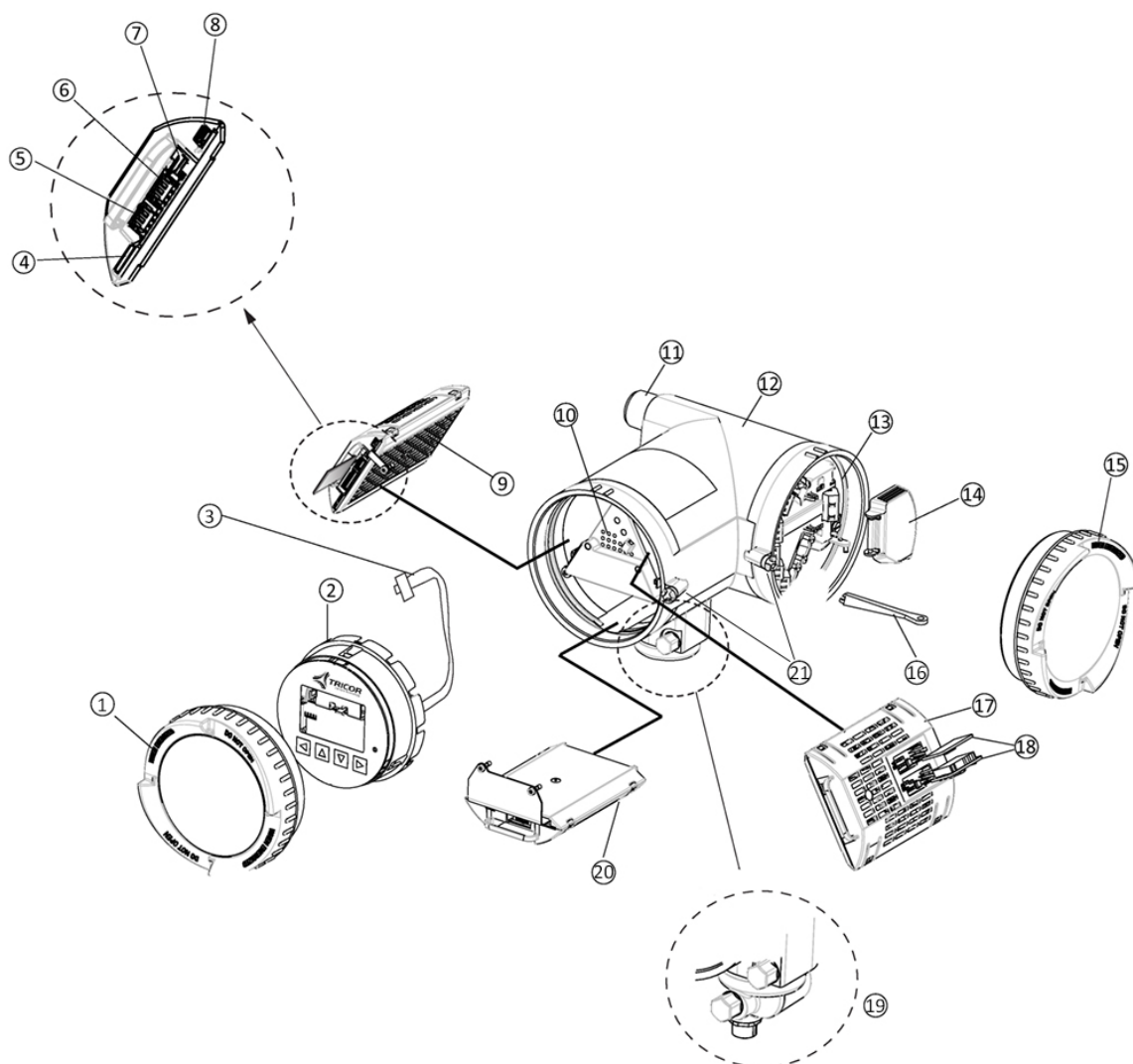


Fig. 1: Transmitter exploded view

- | | |
|-------------------------------------|--|
| ① Housing cover with viewing window | ⑫ Transmitter housing |
| ② Display (HMI) | ⑬ Terminal space |
| ③ HMI data cable | ⑭ Power supply terminal protection cover |
| ④ SD card | ⑮ Housing cover |
| ⑤ DIP switch (for custody transfer) | ⑯ Wiring tool |
| ⑥ DIP switch (for HART and Modbus) | ⑰ I/O cassette (optional) |
| ⑦ HMI port | ⑱ I/O configuration keys (optional) |
| ⑧ USB service port | ⑲ M12 socket
(version dependent for TCD 9200) |
| ⑨ Transmitter cassette | ⑳ Sensor module |
| ⑩ Power supply module | ㉑ Cover lock |
| ⑪ Cable entry | |



3.4. Changing Profibus termination at the transmitter cassette

To change the termination of the Profibus, it is required to remove the transmitter module out of the transmitter. This can be done following below instructions.

1. Isolate the device from power.
2. Unscrew the locking screw of the display and remove the display lid using a wrench bar if necessary.
3. Carefully remove display and cable plug.



NOTE:

Use a screwdriver to release the display as shown in photo below. The display is held in place with three clips.

4. Remove the screw holding the transmitter cassette. Pull out the transmitter cassette.



5. Changing termination at the transmitter cassette, by changing the position of the dip switches as below.
6. All off: no termination
7. All on: termination activated





8. Reinstall the transmitter cassette.
9. Reinstall the display and display cable, incl. the O-ring. Mount the O-ring by pulling it over the display lid.



Return the device to operation

1. Restore power to the device.
2. Check that the device starts up as expected. If possible watch the display during startup and observe the device versions for consistency.

3.5. Connecting the Profibus (CH1)

WARNING!

Warnings provide very important information for the correct usage of the equipment. Not observing the warnings may lead to danger for the equipment and to danger for health and life of the user.

1. Remove cap and ferrule from cable gland and slide onto cable.
2. Push cable through open gland and cable path.
3. Restore ferrule and tighten cap to lightly hold cable in place.
4. Signal cable screen is folded back over outer sheath and grounded beneath cable clamp.
5. Connect wires to terminals using wiring tool, field mount transmitter
6. Tighten cable gland.

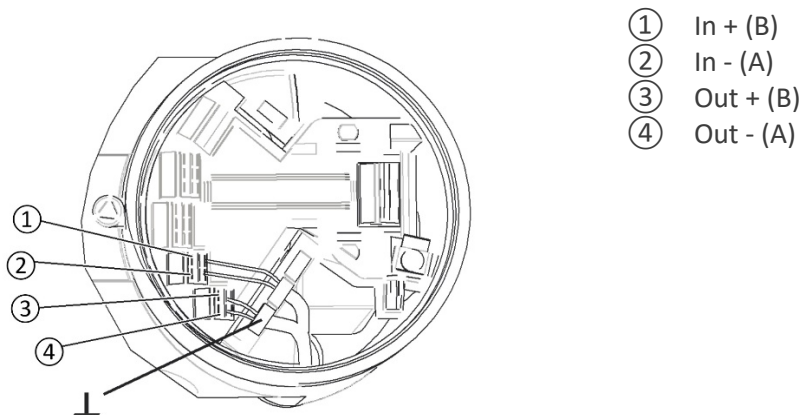


Fig. 2: Profibus DP/PA



3.6. Installation check

- Make sure the installation guidelines provided by the "Wiring & Installation Application Guide" on Profibus Installation guide (<http://www.profibus.com/download/installation-guide/>) are followed.
- Make sure the wiring requirements for the device are met.
- Make sure all connectors are properly tightened.

3.7. Cyclic services

Below is an overview of which cyclic services and parameter update time the device provides. Input (Master view) is defined as values from the flowmeter to the master. Output (Master view) is defined as values from the master to the flowmeter. Update time is the interval the flowmeter updates the parameters.

	Parameter name	Update time
Input (Master view)	Mass flow	10 msec
	Density	10 msec
	Medium temperature	30 msec
	Totalizer 1 (single and double precision)	10 msec
	Totalizer 2 (single and double precision)	30 msec
	Fractional flow A	10 msec
	Fractional flow B	30 msec
	Fractional flow % A	30 msec
	Fractional flow % B	30 msec
	Standard volume flow	10 msec
	Frame temperature	30 msec
	Totalizer 3 (single and double precision)	30 msec
	Control status: • Zero point adjustment active • Outputs forced • Process values frozen	10 msec
	Dosing: • Zero point adjustment active • Dosing status • Dosing output (analogue/discrete)	30 msec
Output (Master view)	Dosing control: • Start • Stop • Pause • Resume • Clean	
	Start zero point adjustment	
	Force / unforce outputs	
	Control totalizer 1	
	Control totalizer 2	
	Control totalizer 3	

Tab. 1: Cyclic services



3.8. Acyclic communication

Acyclic Addressing

Each parameter in a PROFIBUS slave is mapped to an address specified by slot and index. The slot number refers to an array of data. The index tells you where in the array the data you want starts.

Slot	Index Range	Block
0	16...68	Physical block
1	16...37	Analog input block - Mass flow
	68...138	Transducer block
2	16...37	Analog input block - Density
3	16...37	Analog input block - Medium Temperature
4	16...32	Totalizer block 1
5	16...32	Totalizer block 2
6	16...37	Analog input block - Volume Flow
7	16...37	Fraction Flow A block (Manufacturer Specific)
8	16...37	Fraction Flow B block (Manufacturer Specific)
9	16...37	Fraction Flow % A block (Manufacturer Specific)
10	16...37	Fraction Flow % B block (Manufacturer Specific)
11	16...37	Analog input block - Standard volume flow
12	16...37	Analog input block - Frame temperature
13	16...32	Totalizer block 3
14	16...19	Binary commands (Manufacturer Specific)
15	16...33	Dosing block (Manufacturer Specific)
30 ... 255 Used for direct access of MODBUS registers.		

Tab. 2: Acyclic data

3.8.1. Slot 0, Physical Block

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode 8: Automatic 128: Out of service
22	TARGET_MODE	Unsigned8	Read Write	Desired device mode that is taken over by the CURRENT- MODE parameter: Coding: 8: Automatic 128: Out of service, sets all function blocks into out of service
23	OrderID	Visible-String(20)	Read only	Order ID no.
24	Software_Revision	Visible-String(20)	Read only	String representation of the product firmware version



Index	Parameter name	Data type [size]	Access	Annotation
25	Hardware_Revision	Visible-String(20)	Read only	String representation of the product hardware version
26	VendorID	Unsigned16	Read only	Unsigned16 identifier of the product manufacturer
27	DEVICE_ID	Visible-String(20)	Read only	Product name
28	IM_Serial_Number	Visible-String(20)	Read only	Serial number
29	DIAGNOSIS	Octet-String(20)	Read only	Device global alarm information Byte 0: Bits 0...7 reserved Byte 1: Bits 0...2 reserved Bit 3 warm start (restart) Bit 4 cold start (application reset) Bit 5 maintenance required Bits 6...7 reserved Byte 2: Bit 0 maintenance alarm Bit 1 maintenance demanded Bit 2 function check Bit 3 invalid process conditions Bit 4 update event Bits 5...7 reserved Byte 3: Bits 0...6 reserved Bit 7 more information is available
31	IM_Tag_Location	Visible String(22)	Read Write	Device location
32	IM_Revision_Counter	Unsigned16	Read only	The device has parameters with attribute S (static) that are not changed by the process. This parameter will be incremented at least by one if at least one static parameter has been modified. This provides a check of the parameter revision. In case of an overflow this parameter is set to 1 i.e. 0 is not used
33	IM_Profile_ID	Unsigned16	Read only	Fixed to 0x9700
34	IM_Profile_Specific_Type	Unsigned16	Read only	—



Index	Parameter name	Data type [size]	Access	Annotation
35	RESET	Unsigned16	Read Write	Valid Codes: 1: Application Reset: Is the command for resetting a device to Profile default values. The setting of the bus address is not affected. 2506: Restart is the command for a restart of the device. All non-volatile parameters re-main unchanged; all dynamic parameters are reset to their defaults. 2712: Communication Reset The bus address is set to its default address; other parameterization remains unchanged. The bus address is changed immediately regardless if the device is in cyclic data transfer state. The reset is not suspended up to a subsequent power cycle / warm start. The No_Add_Chg_Flag corresponding to the Set_Slave_Add service is cleared. 2713: Application and Communication Reset Combined Application Reset and Communication Reset
36	IM_DESCRIPTOR	Visible-String(54)	Read Write	54 character long description field
37	LANGUAGE	Visible-String(2)	Read	Language setting of the local user interface. The coding is according Alpha-2 of ISO639. Available codes: “en” Englisch “fr” French “de” German “es” Spanish “it” Italian “zh” Chinese
39	STARTUP_PAR-AM VALIDITY	Unsigned8	Read only	Provides information if the cyclic master has sent startup parameters that has been declared as valid to be taken to adjust the device parameterization.
40	IDENT_NUMBER SELECTOR	Unsigned8	Read only	Specifies which ident number is used 0: PA profile 4 specific ident number 0 : PA profile 4 specific ident number 1 : Device specific ident number (81CB/81CC) 127: Automatic adaption (default) 129: PA profile 3 specific (9700, 1 AI) 130: PA profile 3 specific (9701, 2 AI) 131: PA profile 3 specific (9702, 3 AI) 132: PA profile 3 specific (9742, 3 AI, 1 TOT)
41	BUS_ADDRESS	Unsigned8	Read Write	PROFIBUS slave address that is currently set. Used by the parameterization tool to create a complete snapshot of the device parameterization.



Index	Parameter name	Data type [size]	Access	Annotation
43	BAUD RATE	Unsigned8	Read only	Shows the current used baud rate. 0: 9.6 kbit/s 1: 19.2 kbit/s 2: 93.75 kbit/s 3: 187.5 kbit/s 4: 500 kbit/s 5: 1.5 Mbit/s 6: 3 Mbit/s 7: 6 Mbit/s 8: 12 Mbit/s 9: 31.25 kbit/s (MBP) Note: The PA variant returns always code 9. The DP variant does not support code 9 (31.25 kbit/s)
44	WRITE_PROTECTION	Unsigned16	Read only	Information about active parameter protection. Bit 2: Password write protection enabled Bit 15: Custody transfer mode enabled
45	ALARM_DELAY	Unsigned16	Read Write	A coming event is suppressed until the suppression time has elapsed. This prevents alarm flooding.
46	UP-DATE_EVENT_ACK	Unsigned8	Read Write	Command to reset the update event flag in quality codes and the DIAGNOSIS parameter in case that manual acknowledge mode is enabled (UPDATE_EVENT_MODE)
47	UP-DATE EVENT MODE	Unsigned8	Read Write	Holds the configuration for the behavior of the update event flag in all status bytes 0: auto-acknowledge after 20 seconds. 1: manual acknowledge by means of parameter UP-DATE_EVENT_ACK
48	BUS_ADDRESS	Octet-String(6)	Read only	Detailed information of the device, bitwise coded. Allows setting of diagnostic flags specified by the NAMUR recommendation NE107 comprising common device diagnostics. The device type specific diagnostics are allocated to the respective transducer block (module/submodule) that characterizes the device type mainly.
49	LINK_NE107_COMMON	DS-69	Read Write	Indicates / controls the reaction of the device on device specific diagnostic events.
50	View_1		Read only	Parameter to read the following block parameters at once: • BLOCK_OBJECT • OrderID • SOFTWARE_REVISION • HARDWARE_REVISION • VendorID • DeviceID • IM_Serial_Number • IM_Profile_ID • IM_Profile_Specific_Type



Index	Parameter name	Data type [size]	Access	Annotation
51	View_2		Read Write	Parameter to read the following block parameters at once: • CURRENT_MODE • DIAGNOSIS • IM_Revision_Counter • STARTUP_PARAM_VALIDITY • BUS_ADDRESS • IDENT_NUMBER • BAUD_RATE • WRITE_PROTECTION • NE107_COMMON
52	View_3		Read Write	Parameter to read and write the following block parameters at once: • IM_Tag_Function • IM_Tag_Location • IM_Descriptor • LANGUAGE • IM_Date • IDENT_NUMBER_SELECTOR
53	View_4		Read Write	Parameter to read and write the following block parameters at once: • TARGET_MODE • ALARM_DELAY • UPDATE_EVENT_MODE • LINK_NE107_COMMON
62	PARAMS_1_REGISTER		Read Write	32 bytes to define 16 MODBUS registers that are accessible all with one read and/or write request to PARAMS_1_DATA
63	PARAMS_1_DATA		Read Write	64 byte data field for parameters specified by PARAMS_1_REGISTER
64	PARAMS_2_REGISTER		Read Write	64 bytes to define 32 MODBUS registers that are accessible all with one read and/or write request to PARAMS_2_DATA
65	PARAMS_2_DATA		Read Write	128 byte data field for parameters specified by PARAMS_2_REGISTER This parameter is intentionally the double size of PARAMS_1_DATA. Some PROFIBUS components might still have a frame length limit that does not allow the access of larger data units. For these components PARAMS_1_DATA can be used.
68	LIST_IDENT_NUM_SUP	Unsigned16	Read only	Provides information which ident numbers are supported by the device. This includes the profile GSD files.
69	CURRENT_ACCESS_LEVEL	Unsigned8	Read only	Current access level of the acyclic connection. The access level is handled for each acyclic connection. 2: Read only 3: User 4: Expert



Index	Parameter name	Data type [size]	Access	Annotation
70	DEFAULT_ACCESS_LEVEL	Unsigned8	Read Write	Initial access level for an acyclic connection. See also access control 2: Read only 3: User
71	LOGIN_USER	Unsigned16	Read Write	Input of the end user PIN to change the current ACCESS_LEVEL of the acyclic connection. Reading this parameter indicates if user privilege is granted (1) or not (0).
72	LOGIN_EXPERT	Unsigned16	Read Write	Input of the service user PIN to change the current ACCESS_LEVEL of the acyclic connection Reading this parameter indicates if user privilege is granted (1) or not (0).

Tab. 3: Slot 0, Physical Block

3.8.2. Slot 1: Analog Input block – Mass flow

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	8: Automatic 128: Out of service
22	PROCESS_VALUE	DS-101	Read only	Process value with quality code
23	PROCESS_VALUE_UNITS	Unsigned16	Read only	Read-only copy of the transducer block unit setting
24	DAMPING	Float32	Read Write	Low-pass filter of the input value. Value in seconds. Valid range: 0...100 s
25	SIMULATE	DS-50	Read Write	Possibility to simulate the PROCESS_VALUE parameter (including the quality code). This could be used to verify the PLC program behavior.
26	INPUT_SELECTOR	Unsigned16	Read Write	Constant transducer reference information
27	VIEW_1		Read only	Read-only parameter to read • BLOCK_OBJECT • CURRENT_MODE • PROCESS_VALUE • PROCESS_VALUE_UNITS • DAMPING • SIMULATE
Manufacturer Specific				
37	PROCESS_VALUE_UNITS TEXT	Visible-Strng(8)	Read only	

Tab. 4: Slot 1: Analog Input block – Mass flow



3.8.3. Slot 1: Transducer Block

Index	Parameter name	Data type [size]	Access	Annotation
68	BLOCK_OBJECT	DS-32	Read only	Constant block information
69	CURRENT_MODE	Unsigned8	Read only	Fixed to automatic (8)
74	VOLUME_FLOW	101	Read only	Volume flow
75	VOLUME_FLOW UNITS	Unsigned16	Read	Volume flow units The coding is according the PROFIBUS PA Profile specification 1347: m ³ /s 1348: m ³ /min 1349: m ³ /h 1350: m ³ /d 1351: l/s 1352: l/min 1353: l/h 1354: l/d 1355: Ml/d 1356: ft ³ /s 1357: ft ³ /min 1358: ft ³ /h 1359: ft ³ /d 1362: gal/s 1363: gal/min 1364: gal/h 1365: gal/d 1366: Mgal/d 1367: i.gal/s 1368: i.gal/min 1369: i.gal/h 1370: i.gal/d 1371: BBL/s 1372: BBL/min 1373: BBL/h 1374: BBL/d 1448: µgal/s 1449: mgal/s 1450: kgal/s 1451: Mgal/s 1452: µgal/min 1453: mgal/min 1454: kgal/min 1455: Mgal/min 1456: µgal/h 1457: mgal/h 1458: kgal/h 1459: Mgal/h



Index	Parameter name	Data type [size]	Access	Annotation
				1460: $\mu\text{gal/d}$ 1461: mgal/d 1462: kgal/d 1463: $\mu\text{i.gal/s}$ 1464: mi.gal/s 1465: ki.gal/s 1466: Mi.gal/s 1467: $\mu\text{i.gal/min}$ 1468: mi.gal/min 1469: ki.gal/min 1470: Mi.gal/min 1471: $\mu\text{i.gal/h}$ 1472: mi.gal/h 1473: ki.gal/h 1474: Mi.gal/h 1475: $\mu\text{i.gal/d}$ 1476: mi.gal/d 1477: ki.gal/d 1478: Mi.gal/d 1479: $\mu\text{BBL/s}$ 1480: mBBL/s 1481: kBBL/s 1482: MBBL/s 1483: $\mu\text{BBL/min}$ 1484: mBBL/min 1485: kBBL/min 1486: MBBL/min 1487: $\mu\text{BBL/h D1942}$ 1488: mBBL/h 1489: kBBL/h 1490: MBBL/h 1491: $\mu\text{BBL/d}$ 1492: mBBL/d 1493: kBBL/d 1494: MBBL/d 1495: $\mu\text{m}^3/\text{s}$ 1496: mm^3/s 1497: km^3/s 1498: Mm^3/s 1499: $\mu\text{m}^3/\text{min}$ 1500: mm^3/min 1501: km^3/min 1502: Mm^3/min 1503: $\mu\text{m}^3/\text{h}$ 1504: mm^3/h 1505: km^3/h 1506: Mm^3/h 1507: $\mu\text{m}^3/\text{d}$ 1508: mm^3/d 1509: km^3/d



Index	Parameter name	Data type [size]	Access	Annotation
				1510: Mm ³ /d 1511: cm ³ /s 1512: cm ³ /min 1513: cm ³ /h 1514: cm ³ /d 1518: kl/min 1519: kl/h 1520: kl/d 1563: ml/min 1577: ml/s 1578: ml/h 1579: ml/d 1580: af/s 1581: af/min 1582: af/h 1583: af/d 1584: fl oz (US)/s 1585: fl oz (US)/min 1586: fl oz (US)/h 1587: fl oz (US)/d 1633: hl/s 1634: hl/min 1635: hl/h 1636: hl/d 1637: BBL/s 1638: BBL/min 1639: BBL/h 1640: BBL/d 1642: BBL/s 1643: BBL/min 1644: BBL/h 1645: BBL/d 1995: customized unit (32768: bush/s 32769: bush/min 32770: bush/h 32771: bush/d 32772: yd ³ /s 32773: yd ³ /min 32774: yd ³ /h 32775: yd ³ /d 32776: in ³ /s 32777: in ³ /min 32778: in ³ /h 32779: in ³ /d 32780: Mft ³ /d
76	VOLUME_FLOW_LO_LIMIT	Float32	Read	Volume flow low limit



Index	Parameter name	Data type [size]	Access	Annotation
77	VOLUME_FLOW_HI_LIMIT	Float32	Read	Volume flow high limit
78	MASS_FLOW	101	Read	Mass flow
79	MASS_FLOW_UNITS	Unsigned16	Read Write	Mass flow units: The coding is according the PROFIBUS PA Profile specification: 1318: g/s 1319: g/min 1320: g/h 1321: g/d 1322: kg/s 1323: kg/min 1324: kg/h 1325: kg/d 1326: t/s 1327: t/min 1328: t/h 1329: t/d 1330: lb/s 1331: lb/min 1332: lb/h 1333: lb/d 1334: STon/s 1335: STon/min 1336: STon/h 1337: STon/d 1338: T/s 1339: T/min 1340: T/h 1341: T/d 1606: oz/s 1607: oz/min 1608: oz/h 1609: oz/d 1995: customized unit
80	MASS_FLOW_LO_LIMIT	Float32	Read only	Mass flow low limit
81	MASS_FLOW_HI_LIMIT	Float32	Read only	Mass flow high limit
82	DENSITY	101	Read only	Process value
83	DENSITY_UNITS	Unsigned16	Read Write	Density unit The coding is according the PROFIBUS PA Profile specification: 1097: kg/m ³ 1098: Mg/m ³ 1099: kg/dm ³ 1100: g/cm ³ 1101: g/m ³



Index	Parameter name	Data type [size]	Access	Annotation
				1102: t/m ³ 1103: kg/l 1104: g/ml 1105: g/l 1106: lb/in ³ 1107: lb/ft ³ 1108: lb/gal 1109: STon/yd ³ 1430: lb/i.gal 1558: mg/l 1559: µg/l 1564: mg/dm ³ 1566: mg/m ³ 1995: customized unit
84	DENSITY_LO_LIMIT	Float32	Read only	Fixed to 0.0
85	DENSITY_HI_LIMIT	Float32	Read only	Fixed to 5000
86	TEMPERATURE	101	Read only	Media temperature
87	TEMPERATURE UNITS	Unsigned16	Read Write	Temperature unit that is used by temperature values Coding: 1000: K 1001: °C 1002: °F 1003: °R
88	TEMPERATURE_LO_LIMIT	Float32	Read only	Media temperature flow low limit
89	TEMPERATURE_HI_LIMIT	Float32	Read only	Media temperature high limit
98	LOW_FLOW_CUT_OFF	Float32	Read Write	Mass flow low-flow cut-off filter
99	FLOW_DIRECTION	Unsigned8	Read Write	Assigns an arbitrary positive or negative sign to the measured PV value. Coding: 0: positive 1: negative
100	NE107_CORIOLIS	Octet-String(3)	Read only	
101	LINK_NE107_CORIOLIS	DS-69	Read Write	
112	VIEW		Read only	Parameter to read the following block parameters at once: • BLOCK_OBJECT • CURRENT_MODE • MASS_FLOW • MASS_FLOW_UNITS • MASS_FLOW_LO_LIMIT • MASS_FLOW_HI_LIMIT



Index	Parameter name	Data type [size]	Access	Annotation
				- DENSITY - DENSITY_UNITS - DENSITY_LO_LIMIT - DENSITY_HI_LIMIT - TEMPERATURE - TEMPERATURE_UNITS - TEMPERATURE_LO_LIMIT - TEMPERATURE_HI_LIMIT - LOW_FLOW_CUTOFF - FLOW_DIRECTION - NE_107_CORIOLIS - LINK_NE107_CORIOLIS
113	VIEW_2		Read Write	Parameter to read and write the following block parameters at once: - MASS_FLOW_UNITS - DENSITY_UNITS - TEMPERATURE_UNITS - LOW_FLOW_CUTOFF - FLOW_DIRECTION - LINK_NE107_CORIOLIS
123	FRAME_TEMPERATURE	101	Read only	Process value in TEMPERATURE_UNITS
124	STANDARD_VOLUME_FLOW	101	Read only	Process value in STANDARD_VOLUME_FLOW_UNITS
125	STANDARD_VOLUME_FLOW_UNITS	Unsigned16	Read Write	Standard volume flow unit The coding is according the PROFIBUS PA Profile specification
126	FRACTION_FLOW_A	101	Read only	1588: Nm ³ /s 1360: Sft ³ /min 1361: Sft ³ /h 1589: Nm ³ /min 1590: Nm ³ /h 1591: Nm ³ /d 1592: NI/s 1593: NI/min 1594: NI/h 1595: NI/d 1596: Sm ³ /s 1597: Sm ³ /min 1598: Sm ³ /h 1599: Sm ³ /d 1600: SI/s 1601: SI/min 1602: SI/h 1603: SI/d 1604: Sft ³ /s 1605: Sft ³ /d 1995: customized unit



Index	Parameter name	Data type [size]	Access	Annotation
127	FRACTION_FLOW_B	101	Read only	
128	FRACTION_FLOW_UNITS	Unsigned16	Read Write	Selected unit for fractional mass flow value that affects values accessed via the PROFIBUS fieldbus interface. The coding is according the PROFIBUS PA Profile specification: 1318: g/s 1319: g/min 1320: g/h 1321: g/d 1322: kg/s 1323: kg/min 1324: kg/h 1325: kg/d 1326: t/s 1327: t/min 1328: t/h 1329: t/d 1330: lb/s 1331: lb/min 1332: lb/h 1333: lb/d 1334: STon/s 1335: STon/min 1336: STon/h 1337: STon/d 1338: T/s 1339: T/min 1340: T/h 1341: T/d 1606: oz/s 1607: oz/min 1608: oz/h 1609: oz/d 1995: customized unit Selected unit for fractional volume flow value that affects values accessed via the PROFIBUS fieldbus interface. The coding is according the PROFIBUS PA Profile specification: 1347: m³/s 1348: m³/min 1349: m³/h 1350: m³/d 1351: l/s 1352: l/min 1353: l/h



Index	Parameter name	Data type [size]	Access	Annotation
				1354: l/d 1356: ft ³ /s 1357: ft ³ /min 1358: ft ³ /h 1359: ft ³ /d 1362: gal/s 1363: gal/min 1364: gal/h 1365: gal/d 1366: Mgal/d 1367: i.gal/s 1368: i.gal/min 1369: i.gal/h 1370: i.gal/d 1371: BBL/s 1372: BBL/min 1373: BBL/h 1374: BBL/d 1448: µgal/s 1449: mgal/s 1450: kgal/s 1451: Mgal/s 1452: µgal/min 1453: mgal/min 1454: kgal/min 1455: Mgal/min 1456: µgal/h 1457: mgal/h 1458: kgal/h 1459: Mgal/h 1460: µgal/d 1461: mgal/d 1462: kgal/d 1463: µi.gal/s 1464: mi.gal/s 1465: ki.gal/s 1466: Mi.gal/s 1467: µi.gal/min 1468: mi.gal/min 1469: ki.gal/min 1470: Mi.gal/min 1471: µi.gal/h 1472: mi.gal/h 1473: ki.gal/h 1474: Mi.gal/h 1475: µi.gal/d 1476: mi.gal/d 1477: ki.gal/d 1478: Mi.gal/d 1479: µBBL/s



Index	Parameter name	Data type [size]	Access	Annotation
				1480: mBBL/s 1481: kBBL/s 1482: MBBL/s 1483: μ BBL/min 1484: mBBL/min 1485: kBBL/min 1486: MBBL/min 1487: μ BBL/h D1942 1488: mBBL/h 1489: kBBL/h 1490: MBBL/h 1491: μ BBL/d 1492: mBBL/d 1493: kBBL/d 1494: MBBL/d 1495: $\mu\text{m}^3/\text{s}$ 1496: mm^3/s 1497: km^3/s 1498: Mm^3/s 1499: $\mu\text{m}^3/\text{min}$ 1500: mm^3/min 1501: km^3/min 1502: Mm^3/min 1503: $\mu\text{m}^3/\text{h}$ 1504: mm^3/h 1505: km^3/h 1506: Mm^3/h 1507: $\mu\text{m}^3/\text{d}$ 1508: mm^3/d 1509: km^3/d 1510: Mm^3/d 1511: cm^3/s 1512: cm^3/min 1513: cm^3/h 1514: cm^3/d 1518: kl/min 1519: kl/h 1520: kl/d 1563: ml/min 1577: ml/s 1578: ml/h 1579: ml/d 1580: af/s 1581: af/min 1582: af/h 1583: af/d 1584: fl oz (US)/s 1585: fl oz (US)/min 1586: fl oz (US)/h 1587: fl oz (US)/d



Index	Parameter name	Data type [size]	Access	Annotation
				1633: hl/s 1634: hl/min 1635: hl/h 1636: hl/d 1637: BBL/s 1638: BBL/min 1639: BBL/h 1640: BBL/d 1642: BBL/s 1643: BBL/min 1644: BBL/h 1645: BBL/d 1995: customized unit (see PID_CUSTOM_STRING_VOLUME_FLOW and PID_CUSTOM_FACTOR_VOLUME_FLOW) 32768: bush/s 32769: bush/min 32770: bush/h 32771: bush/d 32772: yd ³ /s 32773: yd ³ /min 32774: yd ³ /h 32775: yd ³ /d 32776: in ³ /s 32777: in ³ /min 32778: in ³ /h 32779: in ³ /d 32780: Mft ³ /d
129	FRACTION FLOW PCT A	101	Read only	Percentage fraction process value
130	FRACTION FLOW PCT B	101	Read only	Percentage fraction process value
131	FRACTION FLOW PCT UNITS	Unsignd16	Read Write	Unit code that affects FRACTION_FLOW_PCT_A and FRACTION_FLOW_PCT_B. Coding: 1342: % 1428: proof
132	LOW_VOLUME FLOW CUT-OFF	Float32	Read Write	Low-flow cut-off filter setting for volume flow
133	CUSTOM_UNIT_ FACTO MASS FLOW	Float32	Read Write	Define a mass flow factor for the custom units mass flow
134	CUSTOM_UNIT_ LABEL MASS FLOW	Visible String(8)	Read Write	Define a name for the custom units mass flow
135	CUSTOM_UNIT_ FACTOR VOL-UME FLOW	Float32	Read Write	Define a mass flow factor for the custom units volume flow



Index	Parameter name	Data type [size]	Access	Annotation
136	CUSTOM_UNIT_LABEL VOLUME FLOW	Visible String(8)	Read Write	Define a name for the custom units volume flow
137	CUSTOM_UNIT_FACTOR DENSITY	Float32	Read Write	Define a mass flow factor for the custom units Density flow
138	CUSTOM_UNIT_LABEL DENSITY	Visible String(8)	Read Write	Define a name for the custom units Density flow
139	CUSTOM_UNIT_FACTOR STANDARD VOLUME FLOW	Float32	Read Write	Define a mass flow factor for the custom units standard volume flow
140	CUSTOM_UNIT_LABEL STANDARD VOLUME FLOW	Visible String(8)	Read Write	Define a name for the custom units standard volume flow

Tab. 5: Slot 1: Transducer Block

3.8.4. Slot 2: Analog Input block – Density

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode of the Physical Block 8: Automatic 128: Out of service
22	PROCESS_VALUE	DS-101	Read only	Process value with quality code
23	PROCESS_VALUE UNITS	Unsigned16	Read only	Read-only copy of the transducer block unit setting
24	DAMPING	Float32	Read Write	Low-pass filter of the input value. Value in seconds. Valid range: 0...100 s
25	SIMULATE	DS-50	Read Write	Possibility to simulate the PROCESS_VAUE parameter (including the quality code). This could be used to verify the PLC program behavior.
26	VIEW_1		Read only	Read-only parameter to read • CURRENT MODE • DENSITY FLOW • DENSITY UNITS • DAMPING • SIMULATE

Manufacturer Specific

36	PROCESS_VALUE UNITS TEXT	Visible String(8)	Read only	
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Tab. 6: Slot 2: Analog Input block – Density



3.8.5. Slot 3: Analog Input block – Medium temperature

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode of the Physical Block 8: Automatic 128: Out of service
22	PROCESS_VALUE	DS-101	Read only	Process value with quality code
23	PROCESS_VALUE UNITS	Unsigned16	Read only	Read-only copy of the transducer block unit setting
24	DAMPING	Float32	Read Write	Low-pass filter of the input value. Value in seconds. Valid range: 0...100 s
25	SIMULATE	DS-50	Read Write	Possibility to simulate the PROCESS_VAUE parameter (including the quality code). This could be used to verify the PLC program behavior.
26	VIEW_1		Read only	Read-only parameter to read • CURRENT_MODE • MEDIUM TEMPERATURE • MEDIUM TEMPERATURE UNITS • DAMPING • SIMULATE

Manufacturer Specific

36	PROCESS_VALUE UNITS TEXT	Visible String(8)	Read only	
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Tab. 7: Slot 3: Analog Input block – Medium temperature

3.8.6. Slot 4: Totalizer block 1

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Set to “Out of service” if the TARGET_MODE parameter of the Physical Block is set to “Out of service”. Available modes: 8: Automatic 128: Out of Service
22	TOTAL	101	Read only	32-bit floating point process value with quality code. The value follows TOTAL_UNITS. TOTAL and TOTAL_DOUBLE are always “on pair” i.e. both showing the same totalized value but with a different precision.



Index	Parameter name	Data type [size]	Access	Annotation
23	TOTAL_UNITS	Unsigned16	Read Write	Influences the TOTAL, TOTAL_DOUBLE and PRESET_TOT value. The INPUT_SELECTOR defines the available physical unit codes that are allowed e.g. INPUT_SELECTOR is set to mass flow, the TOTAL_UNITS only accepts mass units. Available Mass units: 1088: kg 1089: g 1090: mg 1091: Mg 1092: t 1093: oz 1094: lb 1095: STon 1096: T 1567: ct 1568: lb (tr) 1569: oz (tr) 1995: customized unit Available Volume units: 1034: m³ 1035: dm³ 1036: cm³ 1037: mm³ 1038: l 1039: cl 1040: ml 1041: hl 1042: in³ 1043: ft³ 1044: yd³ 1045: mile³ 1048: gal 1046: pint 1047: quart 1049: i.gal 1050: bush 1051: BBL 1052: BBL (liq) 1517: kl 1570: fl oz (US) 1572: af 1641: BBL (fed) 1995: customized unit Available Standard volume units: 1053: Sft³



Index	Parameter name	Data type [size]	Access	Annotation
				1573: Nm ³ 1574: NI 1575: Sm ³ 1576: SI 1995: customized unit
24	SET_TOT	Unsigned8	Read Write	1: RESET; assign value „0“ to Totalizer 2: PRESET; assign value of PRESET_TOT to Totalizer 3: HOLD; totalization stopped 4: TOTALIZE; „normal“ operation of the Totalizer
25	MODE_TOT	Unsigned8	Read Write	0: FORWARD AND BACKWARD; totalization of positive and negative incoming flowrate 1: FORWARD; totalization of positive incoming rate values only. 2: BACKWARD; totalization of negative incoming rate values only.
26	FAIL_TOT	Unsigned8	Read Write	0: RUN; totalization is continued using the input values despite the BAD status. The status is ignored. 1: HOLD; totalization is stopped during occurrence of BAD status of incoming values. 2: MEMORY; totalization is continued based on the last incoming value with GOOD status before the first occurrence of BAD status.
27	PRESET_TOT	Float32	Read Write	This 32-bit floating point value is used as a preset for the internal value of the FB algorithm. The value gets effective if using the SET function. This value follows TOTAL_UNITS.
28	INPUT_SELECTOR	Unsigned8	Read Write	1: Volume flow 2: Standard volume flow 3...127: reserved 128: Fraction Flow A 129: Fraction Flow B
29	SIMULATE	DS-50	Read Write	Simulation
30	TOTAL_DOUBLE	106	Read only	64-bit floating point process value with quality code. The value follows TOTAL_UNITS. TOTAL and TOTAL_DOUBLE are always “on pair” i.e. both showing the same totalized value but with a different precision.
31	VIEW_1		Read only	Read-only parameter to read the following block parameters at once • CURRENT_MODE • TOTAL_DOUBLE • TOTAL_UNITS • SET_TOT • MODE_TOT • FAIL_TOT • PRESET_TOT • INPUT_SELECTOR



Index	Parameter name	Data type [size]	Access	Annotation
32	VIEW_2		Read Write	Parameter to read and write the following block parameters at once • SET_TOT • MODE_TOT • FAIL_TOT • PRESET_TOT • INPUT_SELECTOR

Manufacturer Specific

41	TOTAL_UNITS TEXT	Visible String(8)	Read only	Textual unit representation of the current TOTAL_UNITS parameter settings.
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Tab. 8: Slot 4: Totalizer block 1

3.8.7. Slot 5: Totalizer block 2

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information used to identify the block type
17	CURRENT_MODE	Unsigned8	Read only	Set to "Out of service" if the TARGET_MODE parameter of the Physical Block is set to "Out of service". Available modes: 8: Automatic 128: Out of service
22	TOTAL	101	Read only	32-bit floating point process value with quality code. The value follows TOTAL_UNITS. TOTAL and TOTAL_DOUBLE are always "on pair" i.e. both showing the same totalized value but with a different precision.
23	TOTAL_UNITS	Unsigned16	Read Write	Influences the TOTAL, TOTAL_DOUBLE and PRESET_TOT value. The INPUT_SELECTOR defines the available physical unit codes that are allowed e.g. INPUT_SELECTOR is set to mass flow, the TOTAL_UNITS only accepts mass units. Available Mass units: 1088: kg 1089: g 1090: mg 1091: Mg 1092: t 1093: oz 1094: lb 1095: STon



Index	Parameter name	Data type [size]	Access	Annotation
				1096: T 1567: ct 1568: lb (tr) 1569: oz (tr) 1995: customized unit Available Volume units: 1034: m ³ 1035: dm ³ 1036: cm ³ 1037: mm ³ 1038: l 1039: cl 1040: ml 1041: hl 1042: in ³ 1043: ft ³ 1044: yd ³ 1045: mile ³ 1048: gal 1046: pint 1047: quart 1049: i.gal 1050: bush 1051: BBL 1052: BBL (liq) 1517: kl 1570: fl oz (US) 1572: af 1641: BBL (fed) 1995: customized unit Available Standard volume units: 1053: Sft ³ 1573: Nm ³ 1574: NI 1575: Sm ³ 1576: SI 1995: customized unit
24	SET_TOT	Unsigned8	Read Write	1: RESET; assign value „0“ to Totalizer 2: PRESET; assign value of PRESET_TOT to Totalizer 3: HOLD; totalization stopped 4: TOTALIZE; „normal“ operation of the Totalizer
25	MODE_TOT	Unsigned8	Read Write	0: FORWARD AND BACKWARD; totalization of positive and negative incoming flowrate 1: FORWARD; totalization of positive incoming rate values only. 2: BACKWARD; totalization of negative incoming rate values only.



Index	Parameter name	Data type [size]	Access	Annotation
26	FAIL_TOT	Unsigned8	Read Write	0: RUN; totalization is continued using the input values despite the BAD status. The status is ignored. 1: HOLD; totalization is stopped during occurrence of BAD status of incoming values. 2: MEMORY; totalization is continued based on the last incoming value with GOOD status before the first occurrence of BAD status.
27	PRESET_TOT	Float32	Read Write	This 32-bit floating point value is used as a preset for the internal value of the FB algorithm. The value gets effective if using the SET function. This value follows TOTAL_UNITS.
28	INPUT_SELECTOR	Unsigned8	Read Write	1: Volume flow 2: Standard volume flow 3...127: reserved 128: Fraction Flow A 129: Fraction Flow B
29	SIMULATE	DS-50	Read Write	Simulation
30	TOTAL_DOUBLE	106	Read only	64-bit floating point process value with quality code. The value follows TOTAL_UNITS. TOTAL and TOTAL_DOUBLE are always “on pair” i.e. both showing the same totalized value but with a different precision.
31	VIEW_1		Read only	Read-only parameter to read the following block parameters at once • CURRENT_MODE • TOTAL_DOUBLE • TOTAL_UNITS • SET_TOT • MODE_TOT • FAIL_TOT • PRESET_TOT • INPUT_SELECTOR
32	VIEW_2		Read Write	Parameter to read and write the following block parameters at once • SET_TOT • MODE_TOT • FAIL_TOT • PRESET_TOT • INPUT_SELECTOR

Manufacturer Specific

41	TOTAL_UNITS TEXT	Visible String(8)	Read only	Textual unit representation of the current TOTAL_UNITS parameter settings.
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Tab. 9: Slot 5: Totalizer block 2



3.8.8. Slot 6: Analog Input block – Volume flow

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode of the Physical Block 8: Automatic 128: Out of service
22	PROCESS_VALUE	DS-101	Read only	Process value with quality code
23	PROCESS_VALUE UNITS	Unsigned16	Read only	Read-only copy of the transducer block unit setting
24	DAMPING	Float32	Read Write	Low-pass filter of the input value. Value in seconds. Valid range: 0...100 s
25	SIMULATE	DS-50	Read Write	Possibility to simulate the PROCESS_VALUE parameter (including the quality code). This could be used to verify the PLC program behavior.
27	VIEW_1		Read only	Read-only parameter to read • CURRENT_MODE • VOLUME FLOW • VOLUME FLOW UNITS • DAMPING • SIMULATE

Manufacturer Specific

37	PROCESS_VALUE UNITS TEXT	Visible-Strng(8)	Read only	
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Tab. 10: Slot 6: Analog Input block – Volume flow

3.8.9. Slot 7: Analog Input block – Fractional flow A block

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode of the Physical Block 8: Automatic 128: Out of service
22	PROCESS_VALUE	DS-101	Read only	Process value with quality code
23	PROCESS_VALUE UNITS	Unsigned16	Read only	Read-only copy of the transducer block unit setting
24	DAMPING	Float32	Read Write	Low-pass filter of the input value. Value in seconds. Valid range: 0...100 s



Index	Parameter name	Data type [size]	Access	Annotation
25	SIMULATE	DS-50	Read Write	Possibility to simulate the PROCESS_VALUE parameter (including the quality code). This could be used to verify the PLC program behavior.
27	VIEW_1		Read only	Read-only parameter to read • CURRENT_MODE • FRACTIONAL FLOW A • FRACTIONAL FLOW A UNITS • DAMPING • SIMULATE

Manufacturer Specific

37	PROCESS_VALUE UNITS TEXT	Visible- Strng(8)	Read only	
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Tab. 11: Slot 7: Analog Input block – Fractional flow A block

3.8.10. Slot 8: Analog Input block – Fractional flow B block

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode of the Physical Block 8: Automatic 128: Out of service
22	PROCESS_VALUE	DS-101	Read only	Process value with quality code
23	PROCESS_VALUE UNITS	Unsigned16	Read only	Read-only copy of the transducer block unit setting
24	DAMPING	Float32	Read Write	Low-pass filter of the input value. Value in seconds. Valid range: 0...100 s
25	SIMULATE	DS-50	Read Write	Possibility to simulate the PROCESS_VALUE parameter (including the quality code). This could be used to verify the PLC program behavior.
27	VIEW_1		Read only	Read-only parameter to read • CURRENT_MODE • FRACTIONAL FLOW B • FRACTIONAL FLOW UNITS • DAMPING • SIMULATE

Manufacturer Specific

37	PROCESS_VALUE UNITS TEXT	Visible- Strng(8)	Read only	
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Tab. 12: Slot 8: Analog Input block – Fractional flow B block



3.8.11. Slot 9: Analog Input block – Fractional flow % A block

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode of the Physical Block 8: Automatic 128: Out of service
22	PROCESS_VALUE	DS-101	Read only	Process value with quality code
23	PROCESS_VALUE UNITS	Unsigned16	Read only	Read-only copy of the transducer block unit setting
24	DAMPING	Float32	Read Write	Low-pass filter of the input value. Value in seconds. Valid range: 0...100 s
25	SIMULATE	DS-50	Read Write	Possibility to simulate the PROCESS_VALUE parameter (including the quality code). This could be used to verify the PLC program behavior.
27	VIEW_1		Read only	Read-only parameter to read • CURRENT_MODE • FRACTIONAL FLOW % A • FRACTIONAL FLOW % A UNITS • DAMPING • SIMULATE

Manufacturer Specific

37	PROCESS_VALUE UNITS TEXT	Visible-Strng(8)	Read only	
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Tab. 13: Slot 9: Analog Input block – Fractional flow % A block

3.8.12. Slot 10: Analog Input block – Fractional flow % B block

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode of the Physical Block 8: Automatic 128: Out of service
22	PROCESS_VALUE	DS-101	Read only	Process value with quality code
23	PROCESS_VALUE UNITS	Unsigned16	Read only	Read-only copy of the transducer block unit setting
24	DAMPING	Float32	Read Write	Low-pass filter of the input value. Value in seconds. Valid range: 0...100 s
25	SIMULATE	DS-50	Read Write	Possibility to simulate the PROCESS_VALUE parameter (including the quality code). This could



Index	Parameter name	Data type [size]	Access	Annotation
				be used to verify the PLC program behavior.
27	VIEW_1		Read only	Read-only parameter to read • CURRENT_MODE • FRACTIONAL FLOW % B • FRACTIONAL FLOW % B UNITS • DAMPING • SIMULATE
Manufacturer Specific				
37	PROCESS_VALUE UNITS TEXT	Visible-Strng(8)	Read only	

Tab. 14: Slot 10: Analog Input block - Fractional flow % B block

3.8.13. Slot 11: Analog Input block – Standard volume flow

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode of the Physical Block 8: Automatic 128: Out of service
22	PROCESS_VALUE	DS-101	Read only	Process value with quality code
23	PROCESS_VALUE UNITS	Unsigned16	Read only	Read-only copy of the transducer block unit setting
24	DAMPING	Float32	Read Write	Low-pass filter of the input value. Value in seconds. Valid range: 0...100 s
25	SIMULATE	DS-50	Read Write	Possibility to simulate the PROCESS_VALUE parameter (including the quality code). This could be used to verify the PLC program behavior.
27	VIEW_1		Read only	Read-only parameter to read • CURRENT_MODE • STANDARD VOLUME FLOW • STANDARD VOLUME FLOW UNITS • DAMPING • SIMULATE
Manufacturer Specific				
37	PROCESS_VALUE UNITS TEXT	Visible-Strng(8)	Read only	

Tab. 15: Slot 11: Analog Input block – Standard volume flow



3.8.14. Slot 12: Analog Input block – Frame temperature

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode of the Physical Block 8: Automatic 128: Out of service
22	PROCESS_VALUE	DS-101	Read only	Process value with quality code
23	PROCESS_VALUE UNITS	Unsigned16	Read only	Read-only copy of the transducer block unit setting
24	DAMPING	Float32	Read Write	Low-pass filter of the input value. Value in seconds. Valid range: 0...100 s
25	SIMULATE	DS-50	Read Write	Possibility to simulate the PROCESS_VALUE parameter (including the quality code). This could be used to verify the PLC program behavior.
27	VIEW_1		Read only	Read-only parameter to read • CURRENT_MODE • FRAME TEMPERATURE • FRAME TEMPERATURE UNITS • DAMPING • SIMULATE

Manufacturer Specific

37	PROCESS_VALUE UNITS TEXT	Visible-Strng(8)	Read only	
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Tab. 16: Slot 12: Analog Input block – Frame temperature

3.8.15. Slot 12: Analog Input block – Frame temperature

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode of the Physical Block 8: Automatic 128: Out of service
22	PROCESS_VALUE	DS-101	Read only	Process value with quality code
23	PROCESS_VALUE UNITS	Unsigned16	Read only	Read-only copy of the transducer block unit setting
24	DAMPING	Float32	Read Write	Low-pass filter of the input value. Value in seconds. Valid range: 0...100 s



Index	Parameter name	Data type [size]	Access	Annotation
25	SIMULATE	DS-50	Read Write	Possibility to simulate the PROCESS_VALUE parameter (including the quality code). This could be used to verify the PLC program behavior.
27	VIEW_1		Read only	Read-only parameter to read • CURRENT_MODE • FRAME TEMPERATURE • FRAME TEMPERATURE UNITS • DAMPING • SIMULATE

Manufacturer Specific

37	PROCESS_VALUE UNITS TEXT	Visible- String(8)	Read only	
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Tab. 17: Slot 12: Analog Input block – Frame temperature

3.8.16. Slot 13: Totalizer block 3

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Set to “Out of service” if the TARGET_MODE parameter of the Physical Block is set to “Out of service”. Available modes: 8: Automatic 128: Out of service
22	PROCESS_VALUE	101	Read only	32-bit floating point process value with quality code. The value follows TOTAL_UNITS. TOTAL and TOTAL_DOUBLE are always “on pair” i.e. both showing the same totalized value but with a different precision.
23	TOTAL_UNITS	Unsigned16	Read Write	Influences the TOTAL, TOTAL_DOUBLE and PRESET_TOT value. The INPUT_SELECTOR defines the available physical unit codes that are allowed e.g. INPUT_SELECTOR is set to mass flow, the TOTAL_UNITS only accepts mass units. Available Mass units: 1088: kg 1089: g 1090: mg 1091: Mg 1092: t 1093: oz 1094: lb



Index	Parameter name	Data type [size]	Access	Annotation
				1095: STon 1096: T 1567: ct 1568: lb (tr) 1569: oz (tr) 1995: customized unit Available Volume units: 1034: m ³ 1035: dm ³ 1036: cm ³ 1037: mm ³ 1038: l 1039: cl 1040: ml 1041: hl 1042: in ³ 1043: ft ³ 1044: yd ³ 1045: mile ³ 1048: gal 1046: pint 1047: quart 1049: i.gal 1050: bush 1051: BBL 1052: BBL (liq) 1517: kl 1570: fl oz (US) 1572: af 1641: BBL (fed) 1995: customized unit Available Standard volume units: 1053: Sft ³ 1573: Nm ³ 1574: NI 1575: Sm ³ 1576: SI 1995: customized unit
24	SET_TOT	Unsigned8	Read Write	1: RESET; assign value „0“ to Totalizer 2: PRESET; assign value of PRESET_TOT to Totalizer 3: HOLD; totalization stopped 4: TOTALIZE; „normal“ operation of the Totalizer



Index	Parameter name	Data type [size]	Access	Annotation
25	MODE_TOT	Unsigned8	Read Write	0: FORWARD AND BACKWARD; totalization of positive and negative incoming flowrate 1: FORWARD; totalization of positive incoming rate values only. 2: BACKWARD; totalization of negative incoming rate values only.
26	FAIL_TOT	Unsigned8	Read Write	0: RUN; totalization is continued using the input values despite the BAD status. The status is ignored. 1: HOLD; totalization is stopped during occurrence of BAD status of incoming values. 2: MEMORY; totalization is continued based on the last incoming value with GOOD status before the first occurrence of BAD status.
27	PRESET_TOT	Float32	Read Write	This 32-bit floating point value is used as a preset for the internal value of the FB algorithm. The value gets effective if using the SET function. This value follows TOTAL_UNITS.
28	INPUT_SELECTOR	Unsigned8	Read Write	0: Mass flow 1: Volume flow 2: Standard volume flow 3...127: reserved 128: Fraction Flow A 129: Fraction Flow B 130...255: reserved
29	SIMULATE	DS-50	Read Write	
30	TOTAL_DOUBLE	106	Read only	64-bit floating point process value with quality code. The value follows TOTAL_UNITS. TOTAL and TOTAL_DOUBLE are always “on pair” i.e. both showing the same totalized value but with a different precision.
31	VIEW_1		Read only	Read-only parameter to read the following block parameters at once • CURRENT_MODE • TOTAL_DOUBLE • TOTAL_UNITS • SET_TOT • MODE_TOT • FAIL_TOT • PRESET_TOT • INPUT_SELECTOR
32	VIEW_2		Read Write	Parameter to read and write the following block parameters at once • SET_TOT • MODE_TOT • FAIL_TOT • PRESET_TOT • INPUT_SELECTOR



Index	Parameter name	Data type [size]	Access	Annotation
Manufacturer Specific				
41	TOTAL_UNITS TEXT	Visible- Stirng(8)	Read only	Textual unit representation of the current TOTAL_UNITS parameter settings.

Tab. 18: Slot 13: Totalizer block 3

3.8.17. Slot 14: Control commands (Manufacturer Specific)

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Follows the target mode of the Physical Block 8: Automatic 128: Out of service
18	COMMAND	Unsigned8 (2)	Read Write	Command invocation Byte 0: Command Bit 0: Start zero point adjustment Bit 1: Freeze process values Bit 2: Force outputs Byte 1: Command Validity Mask Bit coded information to indicate which bit or bits are valid to be processed by the device. Bit 0: process "Start zero point adjustment" com- mand Bit 1: process "Freeze process values" command Bit 2: process "Force outputs command" The command bit is only processed if the corresponding mask bit is set. Otherwise the com- mand information is ignored. The concurrent access could happen if an acyclic master sets up a write request while the cyclic mas- ter is connected and provides also command data. The acyclic write request is processed but could be overwritten by the cyclic master if the validity bit in scope is set.
19	COMMAND_STA- TUS	Unsigned8	Read only	Command Status Bit 0: Zero point adjustment processing Bit 1: Process values are frozen Bit 2: Outputs are forced

Tab. 19: Slot 14: Control commands (Manufacturer Specific)



3.8.18. Dosing block, Slot 15

Index	Parameter name	Data type [size]	Access	Annotation
16	BLOCK_OBJECT	DS-32	Read only	Constant block information
17	CURRENT_MODE	Unsigned8	Read only	Fixed to automatic (8)
18	BATCH_STATE	Unsigned8	Read only	0: batch stopped 1: batch running 2: batch paused 3: cleaning (all valves are set to "open valve")
19	BATCH_COM-MAND	Unsigned8	Read Write	Used to control a dosing cycle: 1: start batch 2: stop batch 3: pause batch 4: resume batch 5: start cleaning Reading this parameter returns 0
20	MODE	Unsigned8	Read Write	Batching Mode 0: off, batching disabled 1: 1-stage batching 2: 2-stage batching 3: analog batching
21	INPUT_SELECTOR	Unsigned8	Read Write	Batch input selection: 0: Mass Flow 1: Volume Flow 4: Standard Volume Flow 5: Fraction Flow Media A 6: Fraction Flow Media B
22	AMOUNT_DONE	DS-101	Read only	Current amount that is totaled since the start of the batch cycle. Includes a quality code
23	AMOUNT_REMAINING	DS-101	Read only	Amount that is missing to complete the current batch
24	RECIPE_ID	Unsigned8	Read Write	Active recipe that specifies the used parameter set. Valid range 1...5
25	RECIPE_NAME	Visible String(16)	Read Write	The recipe's name
26	RECIPE_TARGET AMOUNT	Float32	Read Write	The recipe's target amount. Follows the unit setting by RECIPE_TARGET_AMOUNT
27	RECIPE AMOUNT UNIT	Unsigned16	Read Write	Unit code that influences the AMOUNT_DONE, AMOUNT_REMAINING and RECIPE_TARGET_AMOUNT values
28	—	—	—	—
29	RECIPE_FIXED_COMPENSTATION	Float32	Read Write	Define the fixed pre-stop value. The value is subtracted from 'Amount' to compensate for application delays in closing the valves.
Analog dosing				
30	ANALOG_OUTPUT	DS-101	Read only	Calculated set point for analog valve



Index	Parameter name	Data type [size]	Access	Annotation
31	RECIPE_CURRENT CLOSED	Float32	Read Write	Current level that is used in analog batching mode when the analog valve shall be closed.
31	RECIPE_CURRENT CLOSED	Float32	Read Write	Define current level to partly close the analog valve
31	RECIPE_CURRENT CLOSED	Float32	Read Write	Define current level to fully open the analog valve.
Digital dosing				
34	DIGITAL_OUTPUT 1	DS-102	Read only	Calculated set point for the digital valve 1
35	DIGITAL_OUTPUT 2	DS-102	Read only	Calculated set point for the digital valve 2

Tab. 20: Dosing block, Slot 15

3.9. Access Control

Each acyclic PROFIBUS connection has an access level that can be changed by providing PIN information via the parameters USER_PIN and / or EXPERT_PIN

- Each parameter has a protection level assigned that specifies the required access level to modify the parameter via an acyclic PROFIBUS connection.
- If the access level of the acyclic PROFIBUS connection is smaller than the protection level of the parameter that is desired to be modified, then the attempt to modify the parameter is rejected by the device.

The following access levels are provided:

Access level	Description
READ ONLY	Having this access level, the acyclic PROFIBUS master is not able to modify the device configuration (setup parameters). The PROFIBUS master is only able to execute commands, e.g. start dosing and reset totalizers.
USER	Having this access level, the PROFIBUS master is able to modify a subset of the device configuration. The PROFIBUS master has to provide the correct end user password to the parameter USER_PIN to reach this access level. The initiator is a "normal" user in the plant not having access to critical parts of the configuration.
EXPERT	Having this access level, the PROFIBUS master is able to modify the configuration of the device. The PROFIBUS master has to provide the correct service user password to the parameter EXPERT_PIN to reach this access level. The initiator is either a service user at the plant (not TRICOR service personnel) or TRICOR service personnel.



3.10. Alarm, error, an system messages

3.10.1. Introduction

The PROFIBUS slave has the capability of sending diagnostic data. The diagnostic data is hierarchically organized.

- Device status
- General faults and conditions
- Alarm status (1 to 10)

3.10.2. Diagnosis Response

A PROFIBUS master is able to request diagnosis information from the slave using the diagnosis service. The following table shows the content of the diagnosis response sent from the device upon a request from the master.

Byte	Element Name	Description
10...13	Device status	Device status Restart Application reset Maintenance required Maintenance alarm Maintenance demanded Function check Out of specification Parameter update Extension available
NE107 diagnostic		
14...19	General faults and faults conditions	Sensor element exciter faulty Error in evaluation electronics Error in internal energy supply Error in sensor element Error in actuator element Faulty installation e.g. dead space Parameter setting error Signal path broken or short cut Overloading Wrong polarity of aux power Maximum line length exceeded Corrosion/abrasion by medium Fouling on sensor element Auxil medium missing or insufficient Wear reserve used up (operation) Wear reserve used up (wear) Error in peripherals Electromag interference too high Temperature of medium too high Ambient temperature too high Vibration/Impact load too high Auxiliary power range off-spec Auxiliary medium missing



Byte	Element Name	Description
		Excessive temperature shock Deviation from measurement Humidity in electronics area Medium in electronics area Mechanical damage Communication error Foreign material in electro area
Detailed alarm status		
23...26	ALARM_STATUS_1	
27...30	ALARM_STATUS_2	
31...34	ALARM_STATUS_3	
35...38	ALARM_STATUS_4	
39...42	ALARM_STATUS_5	
43...46	ALARM_STATUS_6	
47...50	ALARM_STATUS_7	
51...54	ALARM_STATUS_8	
55...58	ALARM_STATUS_9	
59...62	ALARM_STATUS_10	

Tab. 21: Diagnosis Response



4. Cable specifications

Recommended cable types

The PROFIBUS standard defines two variations of the bus cable: Cable type A and cable type B. It is recommended to use cable Type A in all new installations.

Both types have cable shielding that guarantees adequate protection from electromagnetic interference and thus the most reliable data transfer.

	Type A
Cable structure	twisted pair, individual shield
Wire size	0.8 mm ² (AWG 18)
Loop resistance (DC)	44 Ω/km
Impedance at 31.25 kHz	100 Ω ± 20%
Attenuation at 39 kHz	3 dB/km
Capacitive asymmetry	2 nF/km
Envelope delay distortion (7.9 to 39 kHz)	1.7 μs/km
Shield coverage	90 %
Max. cable length (inc. spurs >1 m)	1900 m (6233 ft)

Tab. 22: Cable type A specifications

Overall cable length

The overall cable length is made up of the length of the main cable and the length of all spurs (>1 m [3.28 ft]).

The maximum network expansion depends on the type of ignition protection and the cable specifications.

NOTE

If repeaters are used the maximum allowed cable length is doubled. Max. three repeaters are permitted between user and master.

PROFIBUS transmission rate (kBit/s)	Cable length
9.6	1,200 m [4,000 ft.]
19.2	1,200 m [4,000 ft.]
45.45	1,200 m [4,000 ft.]
93.75	1,200 m [4,000 ft.]
187.5	1,000 m [3,300 ft.]
500	400 m [1,300 ft.]
1500	200 m [650 ft.]
3000	100 m [330 ft.]
6000	100 m [330 ft.]
12000	100 m [330 ft.]



5. Listings

5.1. List of Figures

Fig. 1: Transmitter exploded view	9
Fig. 2: Profibus DP/PA.....	11

5.2. List of Tables

Tab. 1: Cyclic services	12
Tab. 2: Acyclic data	13
Tab. 3: Slot 0, Physical Block.....	18
Tab. 4: Slot 1: Analog Input block – Mass flow.....	18
Tab. 5: Slot 1: Transducer Block	29
Tab. 6: Slot 2: Analog Input block – Density.....	29
Tab. 7: Slot 3: Analog Input block – Medium temperature.....	30
Tab. 8: Slot 4: Totalizer block 1.....	33
Tab. 9: Slot 5: Totalizer block 2.....	35
Tab. 10: Slot 6: Analog Input block – Volume flow.....	36
Tab. 11: Slot 7: Analog Input block – Fractional flow A block	37
Tab. 12: Slot 8: Analog Input block – Fractional flow B block	37
Tab. 13: Slot 9: Analog Input block – Fractional flow % A block.....	38
Tab. 14: Slot 10: Analog Input block - Fractional flow % B block	39
Tab. 15: Slot 11: Analog Input block – Standard volume flow	39
Tab. 16: Slot 12: Analog Input block – Frame temperature	40
Tab. 17: Slot 12: Analog Input block – Frame temperature	41
Tab. 18: Slot 13: Totalizer block 3.....	44
Tab. 19: Slot 14: Control commands (Manufacturer Specific)	44
Tab. 20: Dosing block, Slot 15.....	46
Tab. 21: Diagnosis Response	48
Tab. 22: Cable type A specifications	49

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