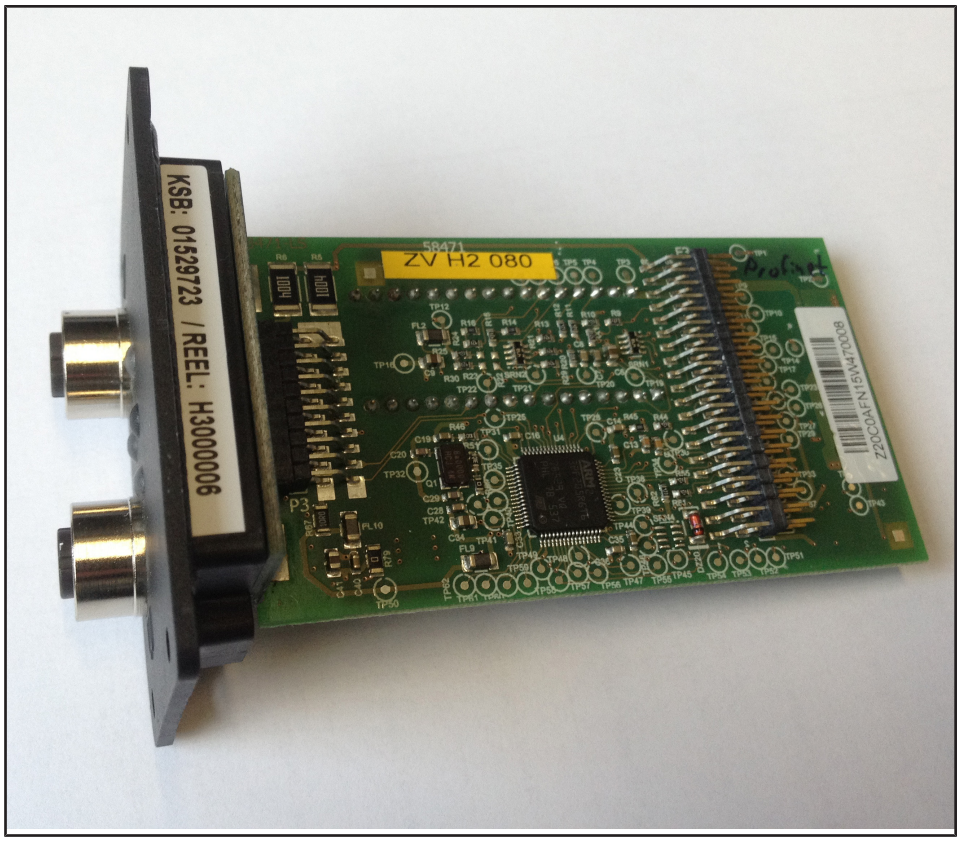
Field Bus Module

PROFINET Module

PumpDrive 2

Supplementary Operating Manual



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Supplementary Operating Manual PROFINET Module

Original operating manual

Subject to technical modification without prior notice.

Contents

1 Supplementary Operating Manual

1.1 General

This supplementary operating manual accompanies the installation/operating manual. All information contained in the installation/operating manual must be observed.

Table 1: Relevant operating manuals

Type series	Reference number of the operating/installation manual
PumpDrive 2	4074.81

1.2 Function

The PROFINET field bus module is used to connect the frequency inverter to a PROFINET network. A PROFINET module is required for monitoring and open-loop or closed-loop control purposes for each frequency inverter in a single-pump configuration or multiple pump configuration.

Interface

The PROFINET module has an interface with PROFINET IO protocol in accordance with the Profile for Intelligent Pumps specification, Version 1.0 (2422). Configuration is done via frequency inverter parameters.

Conformance Class	CC-B
Communication protocol	PROFINET IO
Interface	Ethernet
Bus baud rate	≤ 100 Mbaud
Device type	Slave

For information on PROFINET and downloads for PROFINET IO and the Profile for Intelligent Pumps, please go to www.Profibus.com.

The connection to the frequency inverter is made via 4-pole M12 Ethernet connection lines with D-coded connectors.

GSDML file

The characteristic properties of the frequency inverter such as the number of input signals and output signals, diagnostic messages, etc. are described in an electronic general station description (GSD) file that is available for PROFINET in an XML language format as a GSDML file.

The GSDML file can be read into a PROFINET configuration tool and is used to configure the PROFINET module. The GSDML file can be downloaded from the KSB web site.

Certificates

The PumpDrive2 PROFINET module is certified under certificate number Z11254 as a PROFINET IO device in accordance with PNIO Version V2.2 by Profibus Nutzerorganisation e.V.

1.3 Field bus module connections

The field bus modules are plug-in modules.

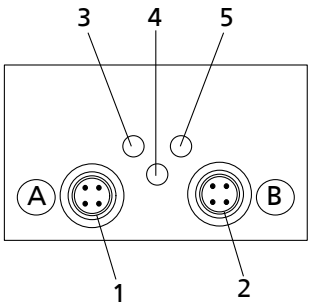

Fig. 1: Field bus module

Table 2: Field bus module

Item	Component	Description
1	M12 socket A	D-coded
2	M12 socket B	D-coded
3	Green LED signal lamp	Ethernet connection A active
4	Amber LED signal lamp	Slow flashing: Heartbeat detected Fast flashing: Initialisation or fault
5	Green LED signal lamp	Ethernet connection B active

- Can be retrofitted

1.4 Installing the field bus module

The field bus module can be fitted in an available slot of the frequency inverter.

Blind cover

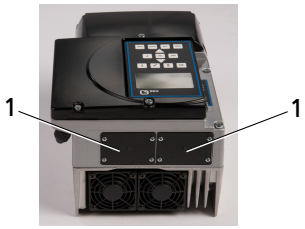

Fig. 2: Blind cover

1	Blind cover

1. Unscrew the cross recessed head screws in the blind cover.
2. Remove the blind cover.

Field bus module

1. Carefully insert the field bus module into the open slot. The plug-in module is guided on rails until it engages in the contact.

Fig. 3: Inserting the field bus module

Fig. 4: Securing the field bus module

2. Secure the field bus module using the 4 cross recessed head screws. IP55 enclosure protection is not provided until the screws have been tightened.

	CAUTION
	Incorrect assembly Impairment of protection provided by the enclosure (protection may be compromised)! ▷ Cover unused M12 connections with a cap (included in the scope of supply).

1.5 Connecting the field bus module

For connecting the field bus module, observe PROFINET installation guideline 8071 from the Profibus user organisation (PNO) (download from "http://www.profibus.com/download/installation-guide/"). Pay particular attention to the following:

- Before the bus connection is established among the nodes, potential equalisation must have been implemented and checked.
- For high-frequency shielding, use shielded cables and assemble according to EMC requirements.
- A minimum distance of 0.3 metres is recommended between such cables and other electric conductors.
- Do not use the bus cable to make any further connections in addition to the field bus module (for example, 230 V alert and 24 V start).
- A cable specified for the field bus module must be used as the connecting cable.

	CAUTION
	Incorrect installation Damage to the field bus module! ▷ Never supply power to the field bus module via the M12 connections.

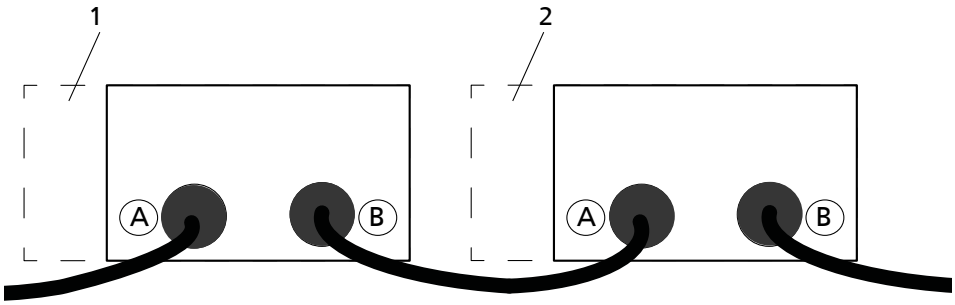

Fig. 5: Connecting the field bus module

Table 3: Connecting the field bus module

Item	Device	M12 module
1	Frequency inverter 1	M12 socket A: Coming M12 socket B: Going
2	Frequency inverter 2	M12 socket A: Coming M12 socket B: Going

1.5.1 Connecting the field bus module in bus topology

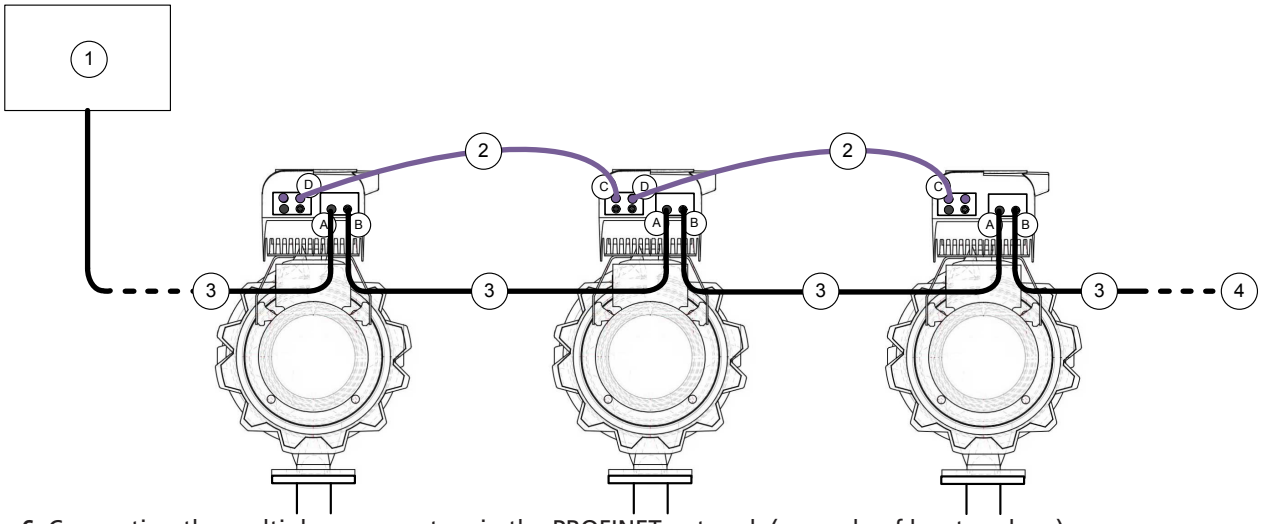

Fig. 6: Connecting the multiple pump system in the PROFINET network (example of bus topology)

1	PROFINET controller
2	M12 cable for multiple pump configuration
3	M12 cable for PROFINET
4	Additional participants in the network

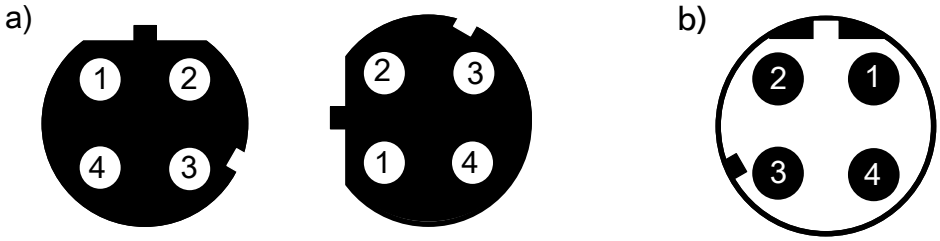

Fig. 7: Pin assignment: a) Module contact arrangement b) Connector contact arrangement

Table 4: Pin assignment

Pin	Conductor colour code of Ethernet cable (category 5, IEC 11801)	Assignment of M12 connector/M12 socket (D-coding)
1	Yellow	TD+/RD+
2	White	RD+/TD+
3	Orange	TD-/RD-
4	Blue	RD-/TD-
Thread	Shielding	Shielding

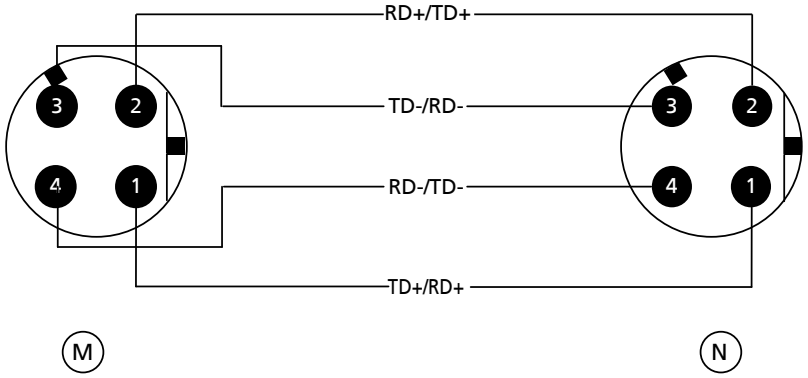

Fig. 8: User-configured cable for bus topology

Ⓜ	M12 connector	Ⓝ	M12 connector

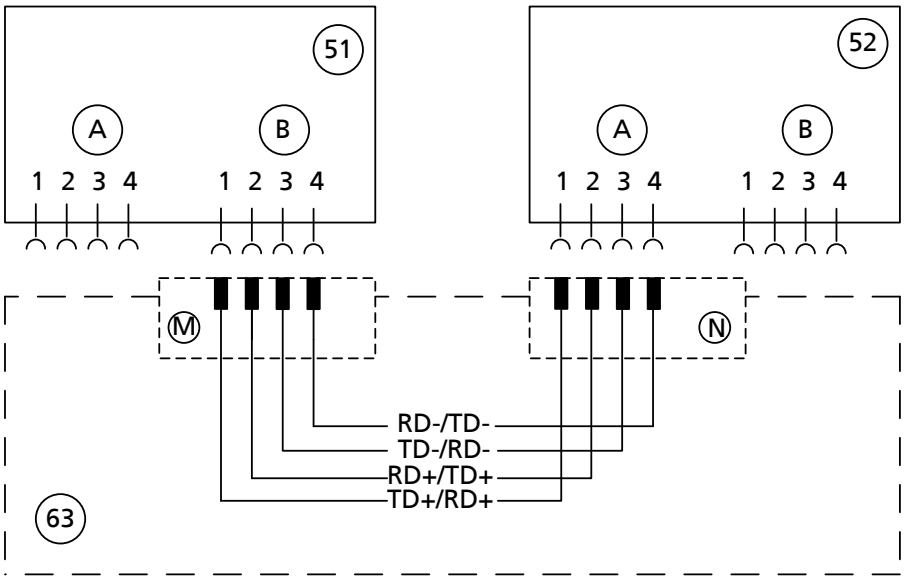

Fig. 9: Wiring diagram

NOTE

The frequency inverter is reset when a field bus module is replaced or retrofitted. Menu 3-12 for setting the parameters of the field bus module is then enabled in the control panel.

1.5.2 Connecting the field bus module in star topology

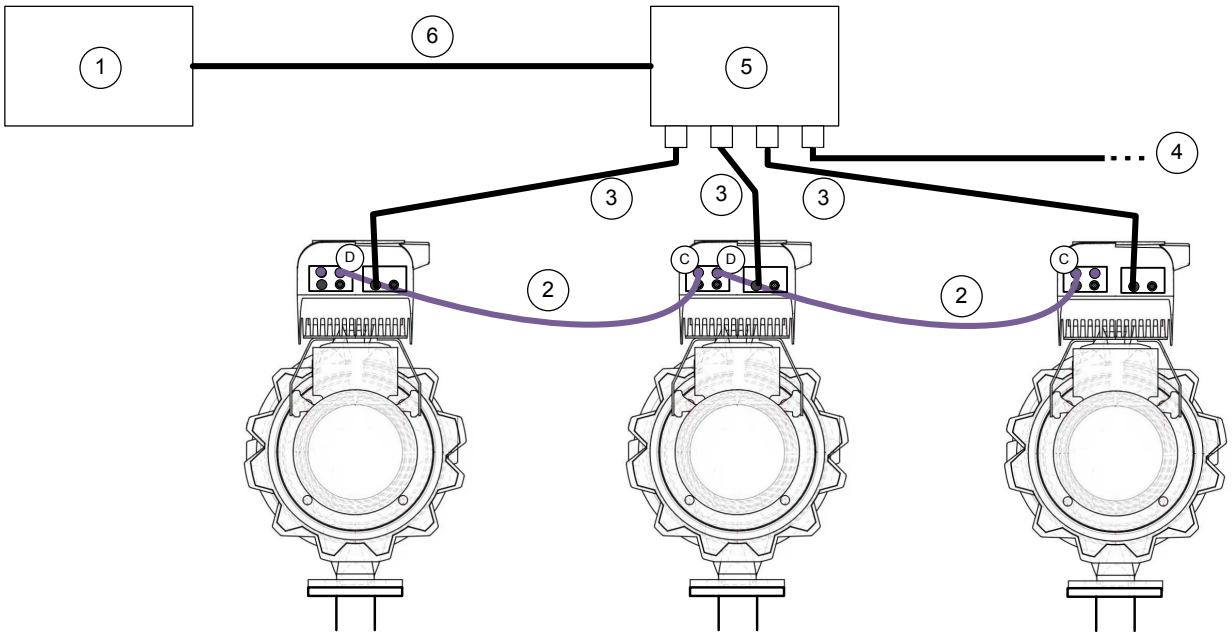

Fig. 10: Connecting the multiple pump system in the PROFINET network (example of star topology)

1	PROFINET controller
2	M12 cable for multiple pump configuration
3	M12 cable for PROFINET
4	Additional participants in the network
5	PROFINET switch
6	PROFINET network connection

When using the star topology to connect the field bus modules, the field bus functionality of the remaining frequency inverters also remains intact when one frequency inverter suffers a power failure. When connecting the field bus modules in a bus topology, this is not the case as the switch integrated in the field bus module will only work on a powered frequency inverter and integrate the subsequent field bus modules in the network.

1.6 Setting the parameters of the field bus module

Field bus control must be activated in the frequency inverter when using the field bus module.

The PROFINET device properties and parameters of the control point are displayed and set on the frequency inverter's control panel.

Table 5: PROFINET module parameters

Parameter	Description	Possible settings	Factory setting
3-6-2	Control Point *Activating the field bus as control point. Digital inputs and analog inputs have the highest priority. The actual value source must be configured separately.*	▪ Local ▪ Field Bus	Local
3-6-2	Actual Value Source *Selecting the source for the actual value: Activating the field bus as the actual value source. Analog inputs or PumpMeter have the highest priority.*	▪ Local ▪ Field Bus	Local
3-12-4-1	PROFINET Device Name *User-defined device name for identification in the network (a maximum length of 49 characters is recommended). The control panel just allows read-only access to this parameter. The device name is changed in the PROFINET controller.*	User-defined	-
3-12-4-2	PROFINET IP Address *Display of the IP address defined in the network. The IP address is changed in the PROFINET controller.*	User-defined	0.0.0.0
3-12-4-3	Cycle Time, Setpoint/Control Value *Time delay, in seconds, before the message (warning or alert) is triggered. In a redundant system, only a warning is output as the auxiliary master can assume the function. Only if the setpoint/control value also fails at the auxiliary master is the alert output, which then triggers the specified response to setpoint/ control value failure.*	0,0 - 10,0	5,0
3-12-4-4	Cycle Time, Actual Value *Time delay, in seconds, before the message (warning or alert) is triggered. In a redundant system, only a warning is output as the auxiliary master can assume the function. Only if the actual value also fails at the auxiliary master is the alert output, which then triggers the specified response to actual value failure.*	0,0 - 10,0	1,0

NOTE

If the field bus is only used for monitoring purposes, the Control Point parameter *(3-6-2)* is set to Local.

NOTE

If the cycle times of parameters *3-12-1-3* and *3-12-1-4* are set to 0 seconds, the monitoring function for each of these parameters is disabled.

1.7 Frequency inverter operation with PROFINET module

The function and the commissioning procedure described below for the frequency inverter are based on the Profile for Intelligent Pumps Version 1.0 November 2007 (2422) (PIP) device profile and communication profile, edition for centrifugal pumps (“Rotodynamic Pumps”), issued by the Profibus user organisation (PNO).

The frequency inverter is defined as a slave of the Drive device type and can be addressed by a class 1 or class 2 PROFINET master.

The PROFINET implementation supports the cyclic exchange of I/O data as part of the MS0 communication relationship and the acyclic Read/Write services (PI function blocks RDREC and WRREC) as part of the MS1 or MS2 communication relationship.

1.7.1 Addressing the parameters defined in the PIP for access via MS1/MS2

Table 6: Description of column titles

Column title	Description
Functional element ID	ID of the functional elements defined in the PIP for centrifugal pumps (rotodynamic pumps)
Functional element	Name of the functional element defined in the PIP for centrifugal pumps (rotodynamic pumps)
Slot, Index	Address information of the functional elements and their parameters for access via MS1 communication protocol
Parameter name	Parameter name defined in the PIP
Rel. index	Address index of the parameter within the functional element
Access	Supported access to the parameter
Data type	Data type of the parameter
Size	Parameter size in bytes
Description	Parameter description to PIP
KSB menu number, Value range, Value (example)	Mapping to functions by indicating the corresponding menu number (if available) and the valid value range for the parameters

The operating values are indicated in the unit shown under Values. It corresponds with the four-digit number code to DIN IEC 61158 under VALUE_UNIT.

Parameter addressing deviates from the PIP; see the following table.

NOTE

When a device is accessed using the acyclic communication relationship, the maximum number of usable functional elements is limited to 30. The subslot address for every functional element is “1”.

Table 7: Addressing of the parameters defined in the PIP for PROFINET connection

Functional element ID	Functional element	Slot	Index	Parameter name	Rel. index	Access	Data type	Size [byte]	Description	KSB menu number	Value range	Value (example)	Parameter index
2	PhysicalBlock	1	17	DEVICE_ TYPE	1	r	VisibleString	20	Device name	-	▪ PumpDrive ▪ PumpDrive Eco	PumpDrive	0
			19	DIAGNOSIS	3	r	OctetString	4	See table PB/ DIAGNOSIS module	-	▪ 0: No diagnosis event ▪ 1: Diagnosis event available	00 00 00 00	1

Functional element ID	Functional element	Slot	Index	Parameter name	Rel. index	Access	Data type	Size [byte]	Description	KSB menu number	Value range	Value (example)	Parameter index
2	PhysicalBlock	1	20	DIAGNOSIS_MASK	4	r	OctetString	4	Supported diagnostic bits in DIAGNOSIS parameter	-	▪ 00 20 00 FF	00 20 00 FF	2
			21	DIAGNOSIS_EXT_HARDWARE	5	r	OctetString	2	Diagnosis event in the corresponding component	-	▪ 0: No diagnosis event ▪ 1: Diagnosis event available	00 00	3
			22	DIAGNOSIS_EXT_SOFTWARE	6	r	OctetString	2		-		00 00	4
			23	DIAGNOSIS_EXT_MECHANICS	7	r	OctetString	3		-		00 00 00	5
			24	DIAGNOSIS_EXT_ELECTRICS	8	r	OctetString	3		-		00 00 00	6
			25	DIAGNOSIS_EXT_PROC_LIQUID	9	r	OctetString	2		-		00 00	7
			26	DIAGNOSIS_EXT_PROC_VACUUM	10	r	OctetString	2		-		00 00	8
			27	DIAGNOSIS_EXT_OPERATION	11	r	OctetString	5		-		00 00 00 00 00	9
			28	DIAGNOSIS_EXT_AUX_DEVICE	12	r	OctetString	5		-		00 00 00 00 00	10
1	GenericPump	3	17	PUMP_TYPE_ID	1	r	Unsigned8	1	Pump type (ID)	-	▪ 3 as per PIP specification	3	11
			18	PUMP_TYPE_VERS	2	r	Unsigned8	1		-	▪ 1 as per PIP specification	1	12
			19	ON_OFF	3	rw	Boolean	1	System start/stop	1-3-1	▪ FALSE: Off (stop) ▪ TRUE: On (start)	FALSE	13
			20	FAULT	4	r	Boolean	1	Status information: Active alerts	-	▪ FALSE: No alert ▪ TRUE: Active pump or system alert	FALSE	14

Functional element ID	Functional element	Slot	Index	Parameter name	Rel. index	Access	Data type	Size [byte]	Description	KSB menu number	Value range	Value (example)	Parameter index
1	GenericPump	3	21	RESET_FAULT	5	rw	Boolean	1	Reset messages	-	▪ FALSE: No reset activated ▪ TRUE: Reset activated	FALSE	15
			22	REMOTE_ACCESS_ REQUEST	6	rw	Boolean	1	Remote control point access request	3-6-2	▪ FALSE: No remote request (local) ▪ TRUE: Remote request (field bus)	TRUE	16
			23	ACCESS_MODE	7	rw	Unsigned8	1	Access to control point and actual value (remote or local)	3-6-2, 3-6-3	▪ Control point, local / Actual value source, local ▪ 2: Control point, field bus / Actual value source, local ▪ 129: Control point, local / Actual value source, field bus ▪ 130: Control point, field bus / Actual value source, field bus	130	17
3	PumpActuation	4	17	SETPOINT	1	r	Float32	4	Control value (open-loop control) / Setpoint (closed-loop control)	1-3-2, 1-3-3	0-100 % of the value range defined for the process variable	0	18
			19	SETPOINT_UNIT	3	r	Unsigned16	2		-	%	1342	19
			23	FEEDBACK	7	r	Float32	4	Actual value (closed-loop control)	1-2-1, 1-2-3-1	0-100 % of the value range defined for the process variable	0	20
			25	FEEDBACK_UNIT	9	r	Unsigned16	2		-	%	1342	21
			28	OPERATION_MODE	12	rw	Unsigned8	1	Operating mode	1-3-8	▪ 128: Off ▪ 129: Manual mode ▪ 130: Automatic mode	130	22

Functional element ID	Functional element	Slot	Index	Parameter name	Rel. index	Access	Data type	Size [byte]	Description	KSB menu number	Value range	Value (example)	Parameter index
3	PumpActuation	4	29	CB_OPERATION_MODE	13	r	Unsigned8	1	Status: Operating mode	1-3-8	See: Operating mode	130	23
			31	CONTROL_MODE	15	rw	Unsigned8	1	Type of control	3-6-1	▪ 128: OFF (open-loop control) ▪ 129: Discharge pressure ▪ 130: Suction pressure ▪ 131: Differential pressure ▪ 132: Differential pressure (sensorless) ▪ 133: Flow rate ▪ 134: Flow rate (sensorless) ▪ 135: Temperature (cooling) ▪ 136: Temperature (heating) ▪ 137: Suction-side level ▪ 138: Discharge-side level	128	24
			32	CB_CONTROL_MODE	16	r	Unsigned8	1	Status: Type of control	3-6-1	See: Type of control	128	25
4	MultiPump	5	18	PUMP_ROLE	2	r	Unsigned8	1	Role in multiple pump system	3-7-1	▪ 0: Slave (auxiliary control device) ▪ 1: Master (active master control device) ▪ 2: Slave and auxiliary master (redundant master control device)	1	26
			19	OPERATION_MODE	3	r	Unsigned8	1	Single-pump/ Multiple-pump operating mode	-	▪ 0: Stand-alone mode (SPO) ▪ 3: Mixed redundancy and addition operation mode (MPO)	0	27
			20	NUMBER_OF_PUMPS	4	r	Unsigned8	1	Number of pumps installed	-	1 - 6	1	28

Functional element ID	Functional element	Slot	Index	Parameter name	Rel. index	Access	Data type	Size [byte]	Description	KSB menu number	Value range	Value (example)	Parameter index
4	MultiPump	5	21	PUMP_COLLECTIVE_IDS	5	r	Unsigned8	1		-	0	0	29
			22	MAX_NUM_PUMP_OPERATION	6	rw	Unsigned8	1	Maximum number of pumps running	3-7-2	1 - 6	1	30
			24	EXCHANGE_EVENT	8	rw	Boolean	1	Immediate pump changeover	1-3-5	▪ FALSE: No pump changeover requested ▪ TRUE: Pump changeover requested	FALSE	31
			25	EXCHANGE_MODE	9	rw	Unsigned8	1	Automatic pump changeover	3-7-4-1	▪ 1: Deactivated ▪ 2: Pump changeover after defined runtime or at specific time of day after defined runtime	1	32
			26	EXCHANGE_TIME	10	Rw	TimeOfDay	6	Pump changeover time	3-7-4-3	Time of day in ms starting at 0:00:00	49500000 ms	33
			27	EXCHANGE_TIMEDIFFERENCE	11	rw	TimeDifference4	4	Pump runtime	3-7-4-2	Specification of time interval in ms	14400000 ms	34
5	PIDControl	6	28	KP	12	rw	Float32	4	Proportional constant	3-6-4-2	0,01..100,00	1	35
			29	TI	13	rw	TimeDifference4	4	Integral time (integral constant)	3-6-4-3	0,1..9999,9 ms	200 ms	36
			30	TD	14	rw	TimeDifference4	4	Rate time (differential constant)	3-6-4-4	0,00..100,00 ms	0 ms	37
6	StandBy	7	17	VALUE	1	r	Boolean	1	Status: Operational availability	-	▪ FALSE: Not on standby ▪ TRUE: On standby	TRUE	38
7	PumpActivation	8	17	VALUE	1	r	Boolean	1	Status: Automatic mode	1-3-8	▪ FALSE: Not in automatic mode ▪ TRUE: In automatic mode	TRUE	39

Functional element ID	Functional element	Slot	Index	Parameter name	Rel. index	Access	Data type	Size [byte]	Description	KSB menu number	Value range	Value (example)	Parameter index
8	PumpOperation	9	17	VALUE	1	r	Boolean	1	Status: Operation		▪ FALSE: Pump not in operation ▪ TRUE: Pump operating	FALSE	40
10	PumpSpeedMax	10	17	VALUE	1	r	Boolean	1	Operation at maximum speed	-	▪ FALSE: Pump does not run at maximum motor speed ▪ TRUE: Pump runs at maximum motor speed 3-2-2-2	FALSE	41
11	PumpSpeedMin	11	17	VALUE	1	r	Boolean	1	Operation at minimum speed	-	▪ FALSE: Pump does not run at minimum motor speed ▪ TRUE: Pump runs at minimum motor speed 3-2-2-1	FALSE	42
15	PumpKick	12	17	VALUE	1	rw	Boolean	1	Immediate functional check run	1-3-6	▪ FALSE: No functional check run requested ▪ TRUE: Carry out functional check run immediately	FALSE	43
19	InletPressure	13	17	VALUE	1	r	Float32	4	Suction pressure	1-2-3-2	-	0	44
			18	VALUE_UNIT	2	r	Unsigned16	2		-	bar	1137	45
20	OutletPressure	14	17	VALUE	1	r	Float32	4	Discharge pressure	1-2-3-3	-	0	46
			18	VALUE_UNIT	2	r	Unsigned16	2		-	bar	1137	47
22	DiffPressure	15	17	VALUE	1	r	Float32	4	Differential pressure	1-2-3-4	-	-1	48
			18	VALUE_UNIT	2	r	Unsigned16	2		-	bar	1137	49
24	Head	16	17	VALUE	1	r	Float32	4	Head	1-2-3-9	-	0	50
			18	VALUE_UNIT	2	r	Unsigned16	2		-	m	1010	51
25	VolumeFlow	17	17	VALUE	1	r	Float32	4	Flow rate	1-2-3-5	-	0	52
			18	VALUE_UNIT	2	r	Unsigned16	2		-	m^3/h	1349	53
29	FlowVelocity	18	17	VALUE	1	r	Float32	4	Flow velocity of fluid handled	1-2-3-8	-	0	54

Functional element ID	Functional element	Slot	Index	Parameter name	Rel. index	Access	Data type	Size [byte]	Description	KSB menu number	Value range	Value (example)	Parameter index
29	FlowVelocity	18	18	VALUE_UNIT	2	r	Unsigned16	2		-	m/s	1061	55
30	Level	19	17	VALUE	1	r	Float32	4	Level	1-2-3-6	-	0	56
			18	VALUE_UNIT	2	r	Unsigned16	2		-	m	1010	57
31	Speed	20	17	VALUE	1	r	Float32	4	Speed	1-2-1-1	-	0	58
			18	VALUE_UNIT	2	r	Unsigned16	2		-	rpm	1085	59
32	Frequency	21	17	VALUE	1	r	Float32	4	Output frequency	1-2-1-7	-	0	60
			18	VALUE_UNIT	2	r	Unsigned16	2		-	Hz	1077	61
33	Torque	22	17	VALUE	1	r	Float32	4	Motor torque	1-2-1-11	-	0	62
			18	VALUE_UNIT	2	r	Unsigned16	2		-	Nm	1136	63
34	PumpLiquidTemp	23	17	VALUE	1	r	Float32	4	Temperature	1-2-3-7	-	-200	64
			18	VALUE_UNIT	2	r	Unsigned16	2		-	°C	1001	65
40	OperationTime	24	17	VALUE	1	r	Float32	4	Pump operating hours	1-4-2-3	-	555	66
			18	VALUE_UNIT	2	r	Unsigned16	2		-	h	1059	67
41	PowerElectronicTe mp	25	17	VALUE	1	r	Float32	4	Heat sink temperature	1-2-1-9	-	33,9	68
			18	VALUE_UNIT	2	r	Unsigned16	2		-	°C	1001	69
48	Power	26	17	VALUE	1	r	Float32	4	Motor input power	1-2-1-2	-	0	70
			18	VALUE_UNIT	2	r	Unsigned16	2		-	kW	1190	71
50	MotorCurrent	27	17	VALUE	1	r	Float32	4	Motor current	1-2-1-5	-	0	72
			18	VALUE_UNIT	2	r	Unsigned16	2		-	A	1209	73
53	MotorVoltage	28	17	VALUE	1	r	Float32	4	Motor voltage	1-2-1-6	-	0	74
			18	VALUE_UNIT	2	r	Unsigned16	2		-	V	1240	75
54	DCLinkVoltage	29	17	VALUE	1	r	Float32	4	DC link voltage	1-2-1-8	-	542	76
			18	VALUE_UNIT	2	r	Unsigned16	2		-	V	1240	77
56	TotalPoweredTime	30	17	VALUE	1	r	Float32	4	Frequency inverter operating hours	1-4-2-1	-	1965	78
			18	VALUE_UNIT	2	r	Unsigned16	2		-	h	1059	79

1.7.2 Definition of the RotoDynamicPump module available in the cyclic data exchange

The RotoDynamicPump module serves to enter setpoints and control values for the pump set in a compact form. It also provides key information on the current operating status.

A variety of data types is used within the address range of the module. Binary information and requests in the module are bit-coded; the other data points are transmitted as integer values.

Table 8: RotoDynamicPump module, input

Offset Byte.Bit	Data type	Parameter name	Functional element	Description	Unit
0.7	BOOL	AT_MIN_SPEED	PumpSpeedMin.VALUE	1: Pump running at minimum speed	-
0.6	BOOL	STANDBY	StandBy.VALUE	1: Pump ready for start-up	-
0.5	BOOL	AT_MAX_SPEED	PumpSpeedMax.VALUE	1: Pump running at maximum speed	-
0.4	BOOL	PUMP_ACTIVE	PumpActivation.VALUE	1: Automatic mode activated (AUTO is displayed)	-
0.3	BOOL	WARNING	-	Not supported	-
0.2	BOOL	FAULT	-	1: Active pump alert or system alert	-
0.1	BOOL	ON_OFF	GenericPump.ON_OFF	1: The pump is switched on	-
0.0	BOOL	ACCESS_MODE	GenericPump.ACCESS_MODE	Bus control is enabled	-
1.7	BOOL	DIRECTION	-	Not supported	-
1.6	BOOL	ROTATION	-	Not supported	-
1.5	BOOL	AT_MAX_POWER	-	Not supported	-
1.4	BOOL	SETPOINT_INFLUENCE	-	Not supported	-
2	INT	PROCESS_FEEDBACK	PumpActuation.FEEDBACK	Actual value of the active process variable (see CB_CONTROL_MODE)	0,01 %
4	BYTE	CB_CONTROL_MODE	PumpActuation.CB_CONTROL_MODE	128: Off Control system OFF, fixed speed operation	-
				129: Discharge pressure	-
				130: Suction pressure	-
				131: Differential pressure	-
				132: Differential pressure (sensorless)	-
				133: Flow rate	-
				134: Flow rate (sensorless)	-
				135: Temperature (cooling)	-
				136: Temperature (heating)	-
				137: Suction-side level	-
				138: Discharge-side level	-
5	BYTE	CB_OPERATION_MODE	PumpActuation.CB_OPERATION_MODE	128: OFF (display: OFF)	-
				129: Manual mode (display: MAN)	
				130: Automatic mode (display: AUTO)	

Table 9: RotoDynamicPump module, output

Offset Byte.Bit	Data type	Parameter name	Functional element	Description	Unit
0.7	BOOL	PUMP_KICK_REQ	PumpKick.VALUE	0 => 1 Starts a functional check run	-
0.4	BOOL	REMOTE_OPERATION	-	Not supported	-
0.3	BOOL	DIRECTION_REQ	-	Not supported	-
0.2	BOOL	RESET_FAULT	GenericPump.RESET_FAULT	0 => 1 Acknowledges warnings and alerts and clears the fault	-
0.1	BOOL	ON_OFF_REQ	GenericPump.ON_OFF	1: Pump ON	-
0.0	BOOL	REMOTE_ACCESS_REQUEST	GenericPump.REMOTE_ACCESS_REQUEST	-	-
1	BYTE	CONTROL_MODE	PumpActuation.CONTROL_MODE	128: OFF (control system OFF, fixed speed operation)	-
				129: Discharge pressure	-
				130: Suction pressure	-
				131: Differential pressure	-
				132: Differential pressure (sensorless)	-
				133: Flow rate	-
				134: Flow rate (sensorless)	-
				135: Temperature (cooling)	-
				136: Temperature (heating)	-
				137: Suction-side level	-
				138: Discharge-side level	-
2	BYTE	OPEPRATION_MODE	PumpActuation.OPERATION_MODE	Request of operating mode: 128: Off	-
				129: Manual mode	-
				130: Automatic mode	-
3	INT	SETPOINT	PumpActuation.SETPOINT	Setpoint of the corresponding type of control (CB_CONTROL_MODE). The value range corresponds to that of the process value (actual value).	0.01 %

1.7.3 Definition of the feedback module available in the cyclic data exchange

The feedback module is required for transmitting an actual value for the closed-loop control of PumpDrive 2 via field bus. In this case process control is effected by PumpDrive 2.

Table 10: Feedback module, output

Module designation	Data type	Description	Menu	Unit	Functional element
Feedback/ VALUE	INT	Actual value (closed-loop control)	1-2-3-1	0,01 %	Feedback.VALUE

1.7.4 Definition of the modules for reading out process values available in the cyclic data exchange

Each process value is represented by the corresponding module. All process values are of the REAL data type.

Table 11: Process value modules, input

Offset byte	Module name	Data type	Description	Menu	Unit	PIP functional element
0	DiffPressure/ VALUE	REAL	Process value, differential pressure	1-2-3-4	bar	DiffPressure.VALUE
4	FlowVelocity/ VALUE	REAL	Flow velocity	1-2-3-8	m/s	FlowVelocity.VALUE
8	Head/VALUE	REAL	Head	1-2-3-9	m/s	Head.VALUE
12	InletPressure/ VALUE	REAL	Suction pressure	1-2-3-2	bar	InletPressure.VALUE
16	Level/VALUE	REAL	Fill level	1-2-3-6	m/s	Level.VALUE
20	OutletPressur e/VALUE	REAL	Discharge pressure	1-2-3-3	bar	OutletPressure.VALUE
24	PumpLiquidT emp/VALUE	REAL	Temperature	1-2-3-7	°C	PumpLiquidTemp.VALUE
28	VolumeFlow/ VALUE	REAL	Flow rate	1-2-3-5	m^3/h	VolumeFlow.VALUE

Table 12: Drive and motor modules, input

Offset byte	Module name	Data type	Description	Menu	Unit	PIP functional element
0	Frequency/ VALUE	REAL	Output frequency	1-2-1-7	Hz	Frequency.VALUE
4	PowerElectro nicTemp/ VALUE	REAL	Heat sink temperature	1-2-1-9	°C	PowerElectronicTemp.VA LUE
8	MotorCurrent /VALUE	REAL	Motor current	1-2-1-5	A	MotorCurrent.VALUE
12	MotorVoltag e/VALUE	REAL	Motor voltage	1-2-1-6	V	MotorVoltage.VALUE
16	Power/VALUE	REAL	Motor input power	1-2-1-2	kW	Power.VALUE
20	Speed/VALUE	REAL	Speed	1-2-1-1	rpm	Speed.VALUE

1.7.5 Content of the Diagnosis/Input diagnostic module available in the cyclic data exchange

All diagnostic information is contained in the DIAGNOSIS module and is grouped into different address ranges depending on the category in question. Access is gained via the offset value defined for this category.

Table 13: PhysicalBlock.DIAGNOSIS

Offset Byte. Bit	Data type	Error code	Parameter name	Comment	PumpDrive 2 message
0.0-0.7	BOOL	0x9000-0x9007	-	Reserved by PI, fixed at 0	-
1.0-1.2	BOOL	0x9008-0x900A	-	Reserved by PI, fixed at 0	-
1.3	BOOL	0x900B	DIA_WARMSTART	Reserved by PI, not a PIP component, fixed at 0	-
1.4	BOOL	0x900C	DIA_COLDSTART	Reserved by PI, not a PIP component, fixed at 0	-
1.5	BOOL	0x900D	DIA_MAINTENANCE	1: Active maintenance interval of the pump.	I100
1.6	BOOL	0x900E	-	Reserved by PI, fixed at 0	-
1.7-2.3	BOOL	0x900F-0x9013	IDENT_NUMBER_VIO LATION	Not supported	-
2.4-2.7	BOOL	0x9014-0x9017	-	Reserved by PI, fixed at 0	-

Offset Byte. Bit	Data type	Error code	Parameter name	Comment	PumpDrive 2 message
3.0	BOOL	0x9018	DIA_HARDWARE	Hardware diagnosis event	-
3.1	BOOL	0x9019	DIA_SOFTWARE	Software diagnosis event	-
3.2	BOOL	0x901A	DIA_MECHANICS	Mechanical equipment diagnosis event	-
3.3	BOOL	0x901B	DIA_ELETRICS	Electronic equipment diagnosis event	-
3.4	BOOL	0x901C	DIA_PROCESS	Process diagnosis event	-
3.5	BOOL	0x901D	DIA_OPERATION	Operation diagnosis event	-
3.6	BOOL	0x901E	DIA_AUX_DEVICE	Auxiliary equipment diagnosis event	-
3.7	BOOL	0x901F	EXTENSION_AVAILABLE	1: Further error details are available in the extended diagnosis.	-

Table 14: PhysicalBlock.DIAGNOSIS_EXT_HARDWARE

Offset Byte. Bit	Data type	Error code	Parameter name	Comment	PumpDrive 2 message
12.0	BOOL	0x9101	HardwareFault	1: Hardware error	A6
12.1	BOOL	0x9102	PowerSupply	1: Power supply error	A21
12.2	BOOL	0x9103	DCLinkSupply	1: Undervoltage, 24 V DC supply	A22
12.3-13.3	BOOL	0x9104-0x910C	-	Not supported	-
13.4-13.6	BOOL	0x9000, 0x910D-0x917F	-	Reserved by PI, fixed at 0	-
13.7	BOOL	0x9180-0x9182	HW_test_failed (manufacturer-specific)	HMI hardware test not passed	A98
				IO hardware test not passed	A99
				24 V overload	W79

Table 15: PhysicalBlock.DIAGNOSIS_EXT_SOFTWARE

Offset Byte. Bit	Data type	Error code	Parameter name	Comment	PumpDrive 2 message
24.0-24.7	BOOL	0x9201-0x9208	Software fault	Not supported	-
25.0-25.6	BOOL	0x9200, 0x920A-0x927F	-	Reserved by PI, fixed at 0	-
25.7	BOOL	0x9280-0x9285	SW_test_failed (manufacturer-specific)	Firmware update required	A12
				No matching motor data available	A18
				No motor data available	A19
				Firmware update for field bus required	W78
				Firmware update for HMI required	W79
				General settings loaded	W99

Table 16: PhysicalBlock.DIAGNOSIS_EXT_MECHANICS

Offset Byte. Bit	Data type	Error code	Parameter name	Comment	PumpDrive 2 message
14.0-15.5	BOOL	0x9301-0x930E	-	Not supported	-
15.6	BOOL	0x930F	BrakingResistor	1: Problem with braking resistor	-
15.7	BOOL	0x9310	-	Not supported	-
16.0-16.6	BOOL	0x9300, 0x9311-0x937F	-	Reserved by PI, fixed at 0	-
16.7	BOOL	0x9380-0x93FF	-	Manufacturer-specific, no messages	-

Table 17: PhysicalBlock.DIAGNOSIS_EXT_ELECTRICS

Offset Byte. Bit	Data type	Error code	Parameter name	Comment	PumpDrive 2 message
9.0	BOOL	0x9401	ElectricalFault	Not supported	-
9.1	BOOL	0x9402	InstallationFault	Not supported	-
9.2	BOOL	0x9403	SupplyVoltage	Phase failure, mains side	A23
9.3	BOOL	0x9404	SupplyVoltHigh	Overvoltage	A2, W51
9.4	BOOL	0x9405	SupplyVoltLow	Undervoltage	A3, W52
9.5	BOOL	0x9406	SupplyCurrent	Not supported	-
9.6	BOOL	0x9407	SupplyCurrHigh	Current high	W61
9.7	BOOL	0x9408	SupplyCurrLow	Current low	W62
10.0	BOOL	0x9409	SupplyFrequency	-	Not supported
10.1	BOOL	0x940A	SupplyFreqHigh	Mains frequency too high	W71
10.2	BOOL	0x940B	SupplyFreqLow	Mains frequency too low	W72
10.3	BOOL	0x940C	PhaseFailure	Phase failure, motor side	A4
10.4	BOOL	0x940D	VoltageInDevice	Not supported	-
10.5	BOOL	0x940E	CurrentInDevice	Overcurrent	A9
10.6	BOOL	0x940F	ShortToEarth	Not supported	-
10.7	BOOL	0x9410	ShortCircuit	Short circuit	A5
11.0	BOOL	0x9411	WindingTemp	Not supported	-
11.1	BOOL	0x9412	InsulationResist	Not supported	-
11.2	BOOL	0x9413	FieldCircuit	Not supported	-
11.3	BOOL	0x9414	-	ArmatureCircuit	Not supported
11.4-11.6	BOOL	0x9400, 0x9415-0x947F	-	Reserved by PI, fixed at 0	-
11.7	BOOL	0x9480-0x9485	EXT_ELEC_FAILURE (manufacturer-specific)	Drive disabled	I101
				Dynamic overload protection	A11, W50
				AMA fault	A20
				Power high	W73
				Power low	W74
				Limited stop ramp	W75

Table 18: PhysicalBlock.DIAGNOSIS_EXT_FLUID

Offset Byte. Bit	Data type	Error code	Parameter name	Comment	PumpDrive 2 message
22.0-22.2	BOOL	0x9501-0x9503	-	Not supported	-
22.3	BOOL	0x9504	Dry	Dry running	A13
22.4	BOOL	0x9505	Blockage	Hydraulic blockage	A15, W56
22.5-23.2	BOOL	0x9507-0x950B	-	Not supported	-
23.3-23.6	BOOL	0x9500, 0x950C-0x957F	-	Reserved by PI, fixed at 0	-
23.7	BOOL	0x9580-0x9581	FluidShortage	Dry running (external)	A14
				Lack of fluid	A17

Table 19: PhysicalBlock.DIAGNOSIS_EXT_OPERATION

Offset Byte. Bit	Data type	Error code	Parameter name	Comment	PumpDrive 2 message
17.0-20.0	BOOL	0x9701-0x9719	-	Not supported	-
20.1	BOOL	0x971A	OverLoad	Overload	W58
20.2	BOOL	0x971B	PartialLoad	Low flow	W57
20.3-21.0	BOOL	0x971C-0x9721	-	Not supported	-
21.1	BOOL	0x9722	DriveOverheat	Heat sink temperature high	A7, W59
21.2	BOOL	0x9723	MotorOverheat	Thermal motor protection	A1
21.3	BOOL	0x9724	ContrOverheat	PCB temperature high	A8, W60
21.4	BOOL	0x9725	-	Not supported	-
21.5-21.6	BOOL	0x9700, 0x9726-0x977F	-	Reserved by PI, fixed at 0	-
21.7	BOOL	0x9780-0x978F	ExtOperationFailure	No master control	A16
				External message	A30, W30
				Resonance range	W53
				Actual value failure	W55
				Speed monitoring	W63
				Setpoint monitoring	W64
				Actual value monitoring	W65
				Flow rate monitoring	W66
				Suction pressure monitoring	W67
				Discharge pressure monitoring	W68
				Differential pressure monitoring	W69
				Temperature monitoring	W70
				Low flow velocity	W80
				Pipe flushing mode active	I102
				Pipe filling mode active	I103
				Overflow	W83

Table 20: PhysicalBlock.DIAGNOSIS_EXT_AUX_DEVICE

Offset Byte. Bit	Data type	Error code	Parameter name	Comment	PumpDrive 2 message
4.0	BOOL	0x9A01	AuxDeviceFault	Not supported	-
4.1	BOOL	0x9A02	SensorElement	Broken wire	W54
4.2-8.2	BOOL	0x9A03-0x9A23	-	Not supported	-
8.3	BOOL	0x9A24	-	Not defined	-
8.4-8.6	BOOL	0x9A00, 0x9A25-0x9A7F	-	Reserved by PI, fixed at 0	-
8.7	BOOL	0x9A80, 0x9A81	FieldbusFailure	PumpMeter communication	W77
				Field bus communication	W81

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