

Supplementary operating instructions

Peristaltic metering pump DULCO flex Control, DFXa

Modules, options, accessories



Table of contents

1

1	Supplementary operating instructions for CANopen	. 4
	1.1 About this pump	. 4
	1.2 Control elements	. 5
	1.3 Electrical installation	. 5
	1.4 Emergency mode	. 7
	1.5 Troubleshooting	. 7
	1.6 Accessories	. 8
	1.7 Appendix	. 8
	1.7.1 Object list for metering pump DULCO flex Control DFXa, DFXa	. 8
	1.7.2 Communication profile area 0x1000-0x1FFF	. 8
	1.7.3 Manufacturer-specific profile area 0x2000-0x5FFF	. 9
	1.7.4 Device profile area 0x6000-0x9FFF	13
	1.7.5 Alarm action area for measurement devices	40
	(404)	18
	1.7.6 EMERGENCY	18
	1.7.7 Explanations of objects	20
	1.7.8 Changing the CANopen node address (Node ID)	21
	1.7.9 I ransfer rate (baud rate)	22
	1.7.10 Calibration, explanations	22
	1.7.11 Firmware update	22
	1.7.12 Data storage	22
•	1.7.13 Directives / standards compiled with	23
2	Supplementary operating instructions for Modbus RIU	24
	2.1 About this Modbus pump	24
	2.2 Control elements.	25
	2.3 Electrical Installation	25
	2.4 Setting options for the pump control elements	27
	2.5 Woodbus RTU Implementation	28
	2.5.1 Modbus RTU [®] message structure	29
	2.6 Device monitoring	30
	2.7 Emergency mode	31
	2.8 Faults	31
		31
	2.10 Modbus RTU for Prominent pumps register	32
		32
	2.10.2 "Modbus" register	33
	2.10.3 "Production data pump module-specific" register	34
	2.10.4 "Production data Modbus module-specific" reg- ister	34
	2.10.5 "Current operating parameters" register	36
	2.10.6 "Target operating parameter" register	39
	2.10.7 "Advanced configuration" register	41
	2.10.8 "Accessories 1" register	43
	2.10.9 "Accessories 3" register	43
	2.10.10 "Debug data" register	44
3	Supplementary operating instructions for PROFIBUS [®]	46
	3.1 Requirements	46
	3.2 Adjusting the pump	46
		10

Table of contents

3.2.1 General	46
3.2.2 Switch PROFIBUS® to active / inactive	46
3.2.3 Setting the slave address	47
3.3 Special features in active PROFIBUS® operation	48
3.3.1 General	48
3.3.2 Displays	48
3.3.3 LEDs on the PROFIBUS® module	49
3.3.4 Using the metering monitor	49
3.4 Installation	49
3.5 Operation	51
3.5.1 General	51
3.5.2 GSD file	51
3.5.3 DULCO flex Control DFXa, DFXa data objects	51
Supplementary Operating Instructions for PROFINET [®]	61
4.1 Requirements	61
4.2 Adjusting the pump	61
4.2.1 General	61
4.2.2 Activating / deactivating PROFINET [®]	61
4.2.3 Configuring PROFINET [®]	62
4.3 Special features in active PROFINET [®] mode	63
4.3.1 General	63
4.3.2 Displays	63
4.3.3 LEDs on the PROFINET [®] module	64
4.3.4 Using the metering monitor	64
4.4 Installation	65
4.5 Operation	65
4.5.1 General	65
4.5.2 GSDML file	65
4.5.3 DULCO flex Control DFXa, DFXa data objects	66
4.5.4 Diagnostic messages and types of data access	74
A h h ULC error and numer hehaviour	75
4.5.5 PLC error and pump behaviour	15

4

1.1	About this pump	4
1.2	Control elements	. 5
1.3	Electrical installation	5
1.4	Emergency mode	. 7
1.5	Troubleshooting	7
1.6	Accessories	8
1.7	Appendix	. 8
1.7.1	Object list for metering pump DULCO flex Control DFXa, DFXa	8
1.7.2	Communication profile area 0x1000-0x1FFF	8
1.7.3	Manufacturer-specific profile area 0x2000-0x5FFF	9
1.7.4	Device profile area 0x6000-0x9FFF	13
1.7.5	Alarm action area for measurement devices	
	(404)	18
1.7.6	EMERGENCY	18
1.7.7	Explanations of objects	20
1.7.8	Changing the CANopen node address (Node ID)	21
1.7.9	Transfer rate (baud rate)	22
1.7.1	0 Calibration, explanations	22
1.7.1	1 Firmware update	22
1.7.1	2 Data storage	22
1.7.1	3 Directives / standards complied with	23

1.1 About this pump

Metering pumps DULCO flex Control DFXa with CAN connector differ from standard pumps in that they can be connected to a CANopen bus system. A CAN pump DULCO flex Control DFXa can be connected to a CANopen bus or used as a standalone unit.

Example:

Measurement value-dependent metering of sodium-calcium hypochlorite into a swimming pool water circuit, in 'CANopen' operating mode, the pump being controlled by a controller.

A "CANopen" version of DULCO flex Control DFXa (Identity code feature "Control type" = C or D) is designed for incorporation in a CANopen system.

1.2 Control elements



Fig. 1: DFXa control elements

- 1 CAN bus status LEDs
- 2 "CAN bus" socket
- 3 Device LEDs

1.3 Electrical installation



CAUTION!

Pump may be damaged.

IP65 degree of protection cannot be guaranteed if the CAN cable is not correctly screwed in.

 Manually screw in the CAN cable threaded connectors until they reach the stop.



CAUTION!

Pump may be damaged.

The panel plug on the housing may break off.

 Never connect a T-coupler directly to the housing.

Connect the CAN cable with the CANopen bus connector as shown below (for more details - refer to the documentation for your CANopen installation).

Insert the mains plug into the power socket - the metering pump may possibly start to pump.



Fig. 2: CAN connector for metering pumps (example shows 2 GMXa with Dulcomarin II as control)

- 5 T-coupler, M 12, 5-pin CAN
- 6 Terminating resistor M 12 coupling
- 7 Terminating resistor M 12 plug
- 8 CAN connecting cable CAN connecting cable
- 9 CAN connecting cable
- 13 CAN pump gamma/ X e.g. for acid
- 14 CAN pump gamma/ X e.g. for alkali

Connector for CANopen bus



Fig. 3: Pump pin assignment (male)



Fig. 4: CAN cable assignment (female)

A five-pin plug is used as the "connector for CANopen bus".

- 1 Shielding
- 2 CAN V+ (supply voltage not connected)
- 3 CAN GND (reference potential)
- 4 CAN H (bus line dominant high)
- 5 CAN L (bus line dominant low)

1.4 Emergency mode

You can guard against the possibility of the CANopen bus control failing as follows:

- **1.** Program an auxiliary frequency into the pump that fits best with your process in emergency mode.
- 2. As soon as emergency mode is required, run the pump using the "external control" terminal on the auxiliary frequency see "Peristaltic metering pump DULCO flex Control, DFXa" - "Installation, electrical".



1.5 Troubleshooting

The CANopen status LED indicates the status of the CAN connection.

Operating and fault statuses are displayed by the 3 other LEDs see "Operating instructions for peristaltic metering pump DULCO flex control DFXa".

Tab.	1: Flash	codes of	f CANopen	status	LED,	top
------	----------	----------	-----------	--------	------	-----

Colour	Flash code	Cause	Remedy
Green	Lit	Bus status OPERATIONAL	- (Pump normal mode)
Green	Flashing *	Bus status PRE-OPERATIONAL	Wait briefly or start pump via bus
Green	Single flashing **	Bus status STARTUP	Wait briefly or set pump for active bus operation - see "Set-up" chapter
Green	Off	Error (BUSOFF, Error,)	Test CAN bus
Green	Flickering	Bus status INIT	Wait briefly





Ignore the flash codes for approx. 2 minutes after connecting the metering pump.

$\left(\right)$	$\mathbf{)}$
_	

For "Error messages about CANopen telegram", see end of the appendix.

1.6 Accessories

Accessories	Part no.
T-coupler M12 5-pin CAN	1022155
Terminating resistor M 12 coupling	1022154
Terminating resistor M 12 plug	1022592
Connecting cable - CAN, M 12, 5-pin, 1 m	1022139
Connecting cable - CAN, M 12, 5-pin, 2 m	1022140
Connecting cable - CAN, M 12, 5-pin, 5 m	1022141
Connecting cable - CAN, sold by the metre	1022160
CAN coupling, M 12, 5-pin Screw connector	1022157
CAN plug M 12, 5-pin Screw connector	1022156

1.7 Appendix

1.7.1 Object list for metering pump DULCO flex Control DFXa, DFXa

1.7.2 Communication profile area 0x1000-0x1FFF

Tab. 2: Transmit-PDOs MAPPING parameter

Index	S	Name	Туре	Description	Mapping
1A00h	0	TPDO1			
	1	DP_state	U16	Status of metering pump (base)	0x2A10 00 10
	2	DP_output_man (actual)	U16	Pump frequency (actual) in %	0x2A01 00 10
	3	DP_stroke_len	U8	Stroke length	0x2A040 00 8
1A01h	0	TPDO2			
	1	DP_level	U8	Liquid level of dosing tank	0x2A050 00 8

Tab. 3: Receive-PDOs MAPPING parameter

Index	S	Name	Туре	Description	Mapping
1600h	0	RPDO1			
	1	DP_output_cont	U16	Pump frequency (target) in %	0x2A00 00 10
1601h	0	RPDO2			

Index	S	Name	Туре	Description	Mapping
	1	DP_batch_time_stamp	U16	Batch time stamp	0x2A02 00 10
	2	DP_batch_value	U16	Factor (target)	0x2A03 00 10

1.7.3 Manufacturer-specific profile area 0x2000-0x5FFF

Index	S	Name	Туре	Description	Objects	Attr
2A00h	0	DP_output_cont (target)	U16	Frequency in % (0=100.0%)	RPDO1	wr
2A01h	0	DP_output_actual	U16	Frequency in % (0=100.0%)	TPDO1	ro
2A02h	0	DP_batch_time_stam p	U16	Time stamp last received com- mand	RPDO2	wo
2A03h	0	DP_batch_value	U16	Batch factor	RPDO2	wo
2A05h	0	DP_level	U8	Liquid level of dosing tank	TPDO2	rO
2A10h	0	DP_state	U16	0=out of ctrl, 1=mem, 2=cal, 3=pos/neg 4=prime, 5=warning, 6=errors, 7=stops, 8-11=mode, 12=aux;13=flow;1 4=pause,15=hand/ bus	TPDO1	ro
2A11h	0	DP_Control	U8	1= batch-mem, 2=setp. pos/neg, 3=calibrated, 4=flowctrl active, 6=reset	SDO	rw
2A12h	0	DP_Mode	U8	0=stop,1=manual, 2=batch,	SDO	wo
2A21h	0	DP_metering volume	Float	Volume / revolu- tion	SDO	wr
2A22h	0	DP_measuring_unit	U8	0=litre, 1=gallon	SDO	wr
2A30h	0	DP_volume	U32	in ml since last reset	SDO	ro
2A31h	0	DP_revol_cnt	U16	revolutions since last reset	SDO	ro
2A33h	0	DP_rem_revol	U16	Remaining revolu- tions no. (in batch mode)	SDO	ro
2A35h	0	PCO_HighestSubIn dex	U8			ro
	1	FlowControl	U8	Bit	SDO	wo
	2	BatchMem	U8	Bit	SDO	wo
	3	ClearCount	U8	Bit	SDO	wo

Index	S	Name	Туре	Description	Objects	Attr
3FBBh	0	PCO_HighestSubIn dex	U8			
	1		U32	Identity code		RO
	2		U32			RO
	3		U32			RO
	4		U32			RO
	5		U32			RO
	6		U32			RO
	7		U32			RO
	8		U32			RO
3FBCh	0	PCO_HighestSubIn dex	U8			
	1		String	Product designa- tion (ASCII)		RO
	2		String			RO
	3		String			RO
	4		String			RO
	5		String			RO
	6		String			RO
	7		String			RO
	8		String			RO
3FBDh	0	PCO_HighestSubIn dex	U8			
	1		String	Hardware version (ASCII)		RO
	2		String			RO
	3		String			RO
0x2A34	1	DP_quantity_left	Float	Remaining dosing	SDO	RO
0x2A40	1	DP_nom- inal_thoughput	Float	Target capacity	SDO	WR
0x2A41	1	DP_cur- rent_thoughput	Float	Actual capacity	SDO	RO
0x2A42	1	DP_max- imal_thoughput	Float	Max. capacity	SDO	RO
0x2A50	1	DP_nominal_concen- tration	Float	Target final con- centration	SDO	WR
0x2A51	1	DP_cur- rent_thoughput	Float	Actual final con- centration	SDO	RO
0x2A60	1	DP_state_extended	U32	Extended status register	SDO	RO

Index	S	Name	Туре	Description	Objects	Attr
				Bit 0 = Manual stop		
				Bit 1 = Optional module stop		
				Bit 2 = Bluetooth stop		
				Bit 3 = Init stop after "Mains power On"		
				Bit 4 = Concentra- tion mode active		
				Bit 5 = Diaphragm rupture sensor connected		
				Bit 6 = Bleeding active		
				Bit 7 = Cavitation detected		
				Bit 8 = Back pres- sure too low		
				Bit 9 - Air in dosing head		
3FBEh	0	PCO_HighestSubIn dex	U8			
	1		String	Software version (ASCII)		RO
	2		String			RO
	3		String			RO

Tab. 4: 0x5100 – 0x5500

Index	S	Name	Туре	Description Max	Objects	Attr
5100h	1	Switch-on counter	U32	Switch-on counter	SDO	RO
5101h	1	Error flags	U32	Pump error flags	SDO	RO
5102h	1	Warning flags	U32	Pump warn- ings	SDO	RO
5105h	1	Total revolu- tions counter	U32	Total revolu- tions counter	SDO	RO
5106h	1	Metering quantity counter	Float	Metering quantity counter	SDO	RO
5108h	1	Remaining metering quantity	Float	Remaining metering quantity	SDO	RO
510Bh	1	Setpoint fre- quency	U16	Setpoint fre- quency	SDO	RW

Index	S	Name	Туре	Description Max	Objects	Attr
510Ch	1	Actual fre- quency	U16	Actual fre- quency	SDO	RO
510Dh	1	Metering volume per release	Float	Metering volume per release	SDO	RW
510Eh	1	Actual capacity	Float	Current capacity	SDO	RO
510Fh	1	Metering time for batch	U16	Metering time for batch in sec	SDO	RW
5110h	1	Maximum capacity	Float	Maximum capacity	SDO	RO
5112h	1	Target capacity	Float	Target capacity	SDO	RW
5114h	1	Auxiliary capacity	Float	Auxiliary capacity	SDO	RW
5117h	1	Target oper- ating mode	U32	Target oper- ating mode (0-stop,1- manual,)	SDO	RW
5118h	1	Actual oper- ating mode	U32	Current oper- ating mode	SDO	RO
5119h	1	Target sub- operating mode	U32	Target sub- operating mode (0-020mA,1- 420mA,4 linear curve,)	SDO	RW
511Ah	1	Actual sub- operating mode	U32	Current sub- operating mode	SDO	RO
511Bh	1	Operating mode (auto- matic On/Off)	U32	Operating mode (auto- matic On(1)/ Off(0))	SDO	RW
511Ch	1	Concentra- tion-con- trolled opera- tion on/off	U32	Concentra- tion-con- trolled opera- tion on(1)/ off(0)	SDO	RW
511Eh	1	Priming dura- tion	U16	Priming dura- tion in sec	SDO	RW
511Fh	1	Batch factor	U32	Batch factor (1-99999)	SDO	RW
5148h	1	Total oper- ating time	U32	Total oper- ating time in sec	SDO	RO

Index	S	Name	Туре	Description Max	Objects	Attr
5152h	1	Metering volume per revolution	Float	Metering volume per revolution in ml	SDO	RO
5153h	1	Deletable revolution counter	U32	Deletable revolution counter	SDO	RW
5154h	1	Deletable quantity counter	Float	Deletable quantity counter	SDO	RW

Tab. 5: Strings

Index	S	Name	Туре	Description	Objects	Attr
5042h	1	Identifica- tion_LED	U16	0- Off	SDO	rw
				>0 Set identi- fication time (LED yellow +red flash for duration)		
				1 is equiva- lent to approx. 10 ms		
5FEE	0	CANopen- StackRevi- sion	UINT32	ProMinent CANopen- Stack-Revi- sion		RO

1.7.4 Device profile area 0x6000-0x9FFF

Index	Sub	Name	Туре	Description	Categ.*	Attr
6000h	00h	HighestSubInde x	U32	Failure codes	MANDA	RO
	01h	Hardware failure codes 1	U32		MANDA	RO
	02h	Hardware failure codes 2	U32		MANDA	RO
	03h	Software failure codes 1	U32	Bit#0: Software- Fault	MANDA	RO
				Bit#1: SoftwareR- eset		
				Bit#2: Parameter problem		
				Bit#3: Memory resource problem		

Index	Sub	Name	Type	Description	Cateq.*	Attr
			.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Bit#4: Application failure		
				Bit#5: Failure in control software		
				Bit#6: Failure of operation system software		
				Bit#7: Failure in communication soft- ware		
				Bit#8 to 31 Reserved		
	04h	Software failure codes 2	U32		MANDA	RO
	05h	Mechanics failure codes 1	U32		MANDA	RO
	06h	Mechanics failure codes 2	U32		MANDA	RO
	07h	Electrics failure codes 1	U32		MANDA	RO
	08h	Electrics failure codes 2	U32		MANDA	RO
	0Dh	Operation failure codes 1	U32		MANDA	RO
	0Eh	Operation failure codes 2	U32		MANDA	RO
	0Fh	Operation failure codes 3	U32		MANDA	RO
	10h	Auxiliary device failure codes 1	U32		MANDA	RO
	11h	Auxiliary device failure codes 2	U32		MANDA	RO
	12h	Auxiliary device failure codes 3	U32		MANDA	RO

Index	Sub	Name	Туре	Description	Categ.*	Attr
6001h	00h	HighestSubInde x	U32	Warning codes	MANDA	RO
	01h	Hardware warning codes 1	U32		MANDA	RO
	02h	Hardware warning codes 2	U32		MANDA	RO
	03h	Software warning codes 1	U32	Bit#0: Software- Warning	MANDA	RO
				Bit#1: SoftwareR- eset		

Index	Sub	Name	Туре	Description	Categ.*	Attr
				Bit#2: Parameter problem		
				Bit#3: Memory resource problem		
				Bit#4: Application failure		
				Bit#5: Warning in control software		
				Bit#6: Warning of operation system software		
				Bit#7: Warning in communication software		
				Bit#8 to 31 Reserved		
	04h	Software warning codes 2	U32		MANDA	RO
	05h	Mechanics warning codes 1	U32		MANDA	RO
	06h	Mechanics warning codes 2	U32		MANDA	RO
	07h	Electrics warning codes 1	U32		MANDA	RO
	08h	Electrics warning codes 2	U32		MANDA	RO
	0Dh	Operation warning codes 1	U32		MANDA	RO
	0Eh	Operation warning codes 2	U32		MANDA	RO
	0Fh	Operation warning codes 3	U32		MANDA	RO
	10h	Auxiliary device warning codes 1	U32		MANDA	RO
	11h	Auxiliary device warning codes 2	U32		MANDA	RO
	12h	Auxiliary device warning codes 3	U32		MANDA	RO

Tab. 6: *	
MANDA	Mandatory
OPTION	Optional
CONDIT	Conditional mandatory

Index	Sub	Name	Туре	Description	Categ.*	Attr
6002h	00h	HighestSubIndex	U32	Alarm codes	MANDA	RO
	01h	Hardware alarm codes 1	U32		MANDA	RO
	02h	Hardware alarm codes 2	U32		MANDA	RO
	03h	Software alarm codes 1	U32	Bit#0: Software- Fault	MANDA	RO
				Bit#1: SoftwareR- eset		
				Bit#2: Parameter problem		
				Bit#3: Memory resource problem		
				Bit#4: Application failure		
				Bit#5: Failure in control software		
				Bit#6: Failure of operation system software		
				Bit#7: Failure in communication soft- ware		
				Bit#8 to 31 Reserved		
	04h	Software alarm codes 2	U32		MANDA	RO
	05h	Mechanics alarm codes 1	U32		MANDA	RO
	06h	Mechanics alarm codes 2	U32		MANDA	RO
	07h07	Electrics alarm codes 1	U32		MANDA	RO
	08h	Electrics alarm codes 2	U32		MANDA	RO
	0Dh	Operation alarm codes 1	U32		MANDA	RO
	0Eh	Operation alarm codes 2	U32		MANDA	RO
	0Fh	Operation alarm codes 3	U32		MANDA	RO
	10h	Auxiliary device alarm codes 1	U32		MANDA	RO
	11h	Auxiliary device alarm codes 2	U32		MANDA	RO
	12h	Auxiliary device alarm codes 3	U32		MANDA	RO

Index	Sub	Name	Туре	Description	Categ.*	Attr
6003h	00h	HighestSubIndex	U32	Specific physical units	MANDA	RO
	01h	Physical unit pres- sure	U32	Default: bar 0x004E0000,	MANDA	RW
				gal (AE)		
6005h	00h	HighestSubIndex		GenericPump con- trol	MANDA	
	01h	Generic pump com- mands	U8	Bit#0: Pump opera- tion: off=0 / on=1	MANDA	RW
				Bit#1: ResetFault: No reset=0 / Reset of fault=1		
				Bit#2: RemoteAc- cessReq: No remote=0; Remote access=1		
				Bit#3 to 7 Reserved		
6007h	00h	HighestSubIndex		Identification	MANDA	RO
	01h	ManufacturerID	String		MANDA	RO
	02h	DeviceType	String		MANDA	RO
	03h	ProfileRevision	String		MANDA	RO

Index	Sub	Name	Туре	Description	Categ.*	Attr
6026h	00h	HighestSubIndex		Error notification control	MANDA	СО
	02h	Name	String	0xA	MANDA	RW
	03h	Class	String	0sB	MANDA	RW
	07h	NotificationCode	U16	0	OPTION	RW
6027h	00h	HighestSubIndex		Error notification status	MANDA	
	01h	Status	U8	0	MANDA	RO

Tab. 7: *	
MANDA	Mandatory
OPTION	Optional
CONDIT	Conditional mandatory

1.7.5 Alarm action area for measurement devices (40	04)
---	-----

Index	Sub	Name	Туре	Description	Categ.	Attr
6519h	1	Al2_action =0 inac- tive	U8	Level min warning		RW
6529h	1	Al3_action	U8	Batch error		RW
6539h	1	Al4_action	U8	Cal warning		RW
6549h	1	AI5_action	U8	Sys error		RW
6559h	1	Al6_action	U8	Not bus		RW
6569h	1	AI7_action	U8	add2		RW
6579h	1	Al8_action	U8	add3		RW

1.7.6 EMERGENCY

Tab. 8: Emergency object data:

Byte	0	1	2	3	4	5	6	7
Content*	Emergency code*	error	Error reg- ister*	Manufactu	rer-specific e	error field*		

Tab. 9: *

Content (1 byte):	80h+Node ID
Emergency error code (2 bytes):	0x1000 (0x10xx = Generic error)
	0x0000 (0x00xx = No error)
Error register (1001h-content) (1 byte):	0x81 (Bit #0=Generic error,Bit #7= Manufacturer- specific)
Manufacturer-specific error field (5 bytes):	Byte #3: Component no. (channel)
	Byte #4: Error type
	Byte #5: Error class
	Byte #6: free
	Byte #7: free

Emergency ErrorCode (2 bytes):

0xFF01 (0xFFxx = Device-specific)

Tab. 10: Manufacturer-specific error field (5 bytes):

Byte #3:	Component no. (channel)
Byte #4:	Error type
Byte #5:	Error class
Byte #6:	free
Byte #7:	free

Tab. 11: Component no. (channel):

0	-
1	DFXa

Tab. 12: Error type (1-99):

- see error table

Tab. 13: Error class:

Bit0	Emergency active
Bit1	Error (1) / warning (0)
Bit2	Action: 1 active (horn on) – 0 inactive (horn off)

Tab. 14: Error table

Error	EMCY						
	Emergency ErrorCode	Error reg- ister	Manufacturer-spe- cific error field				
			Component no.	Error type	Error class	-	-
Level warning	0xFF01	0x81	0x01	0x01	0x01	0x00	0x00
Metering monitor warning	0xFF01	0x81	0x01	0x03	0x01	0x00	0x00
Hose warning	0xFF01	0x81	0x01	0x04	0x01	0x00	0x00
Overload warning	0xFF01	0x81	0x01	0x06	0x01	0x00	0x00
Temperature warning	0x4201	0x09	0x01	0x07	0x01	0x00	0x00
Level error	0xFF01	0x81	0x01	0x21	0x02	0x00	0x00
Storage tank overflow	0xFF01	0x81	0x01	0x22	0x02	0x00	0x00
Control signal < 4mA	0xFF01	0x81	0x01	0x23	0x02	0x00	0x00
Control signal > 20mA	0xFF01	0x81	0x01	0x24	0x02	0x00	0x00
Incorrect metering revolu- tions	0xFF01	0x81	0x01	0x25	0x02	0x00	0x00
Hose rupture	0xFF01	0x81	0x01	0x26	0x02	0x00	0x00
System error	0xFF01	0x81	0x01	0x2A	0x02	0x00	0x00
Module communication	0x8101	0x11	0x01	0x2C	0x02	0x00	0x00
Module missing	0x8101	0x11	0x01	0x2D	0x02	0x00	0x00

Tab. 15: Emergency ErrorCodes from stack

	Emergency ErrorCode	
#define ERRCODE_COMM_ERROR	0x8100	Communication error
#define ERRCODE_CAN_OVERRUN	0x8110	CAN overrun
#define ERRCODE_CAN_PASSIVE	0x8120	CAN in error passive
#define ERRCODE_HB_ERROR	0x8130	HB or life guard
#define ERRCODE_CAN_RECOVER_BOFF	0x8140	CAN recovered from bus-off
#define ERRCODE_BAD_PDOPARA	0x8210	PDO not processed due the length
#define ERRCODE_BAD_PDOLEN	0x8220	PDO length exceeded

1.7.7 Explanations of objects

DeviceState [Index 0x2A10, Subindex 0x00]

The 'DeviceState' object contains current operating statuses and the pump's pending errors. 'DeviceState' is read-only.

Tab. To. DeviceState bitvalues	
Bit positions	Meaning
15 (MSB)	Manual / bus operation
14	Pause
13	Metering monitor active
12	Auxiliary
11	Operating mode: 1. Continuous
10	Operating mode: 2. Batch operation
9	Operating mode: 3. External contact
8	Operating mode: 4. Analogue input
7	Stop
6	Internal error
5	Warning (e.g. container filling level)
4	Priming active
3	Decrease value (only in ProMinent systems)
2	Calibration invalid
1	Tank metering
0 (LSB)	No remote operation possible

DeviceControl [Index 0x2A11, Subindex 0x00] The 'DeviceControl' object is used to specify the operating mode more precisely.

Tab. Tr. DeviceControl Ditvalues					
Bit positions	Meaning				
7 (MSB)	Must be "0"				
6	Reset				
5	Must be "0"				
4	Activate metering monitor				
3	Calibration ended / performed				
2	Must be "0" (setpoint)				
1	Batch memory active				
0 (LSB)	Must be "0"				

Tab. 17: DeviceControl BitValues

If bit 6 (RESET) is set to '1', the pump is stopped (DeviceMode = 0x00), pending errors are deleted and the batch memory is set to 0.

DeviceMode [Index 0x2A12, Subindex 0x00]

The 'DeviceMode' object is used to configure the pump's CANopen operating mode.

Tab. 18: DeviceMode BitValues

Bit positions	Meaning
7 (MSB)	Must be "0"
6	Must be "0"
5	Must be "0"
4	Must be "0"
3	Must be "0"
2	Must be "0"
1	Continuous operation [0], batch operation [1]
0 (LSB)	Stop [0] / Start [1]

Tab. 19

		Value of 'Devi- ceMode'
a)	Stop	0x00
b)	Continuous operation	0x01
c)	Batch operation	0x02

1.7.8 Changing the CANopen node address (Node ID)

The CANopen node address can be changed as follows:

Change via the object list using default SDO traffic.

The object list index 3F40h, subindex 1 can be used to read the node address currently configured or to configure a new node address.

The permitted range for the node address is 1..127. The default node address is 119.

The data type of this entry is UNSIGNED SHORT.

1. To change the node address, the new address is written to index 3F40h, subindex 1.

Tab	20:	CAN	message f	for	writing	the	new	node	address	55:	
-----	-----	-----	-----------	-----	---------	-----	-----	------	---------	-----	--

ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
600h + node ID	8	CMD = 2Bh	40h	3Fh	01h	37h	00h	х	Х
			Index 3F40h		Sindex 1	Node ID 0037h			

2. Writing the "save" signature to index 1010h, subindex 05 causes the new node address to be saved in the non-volatile memory.

Tab. 21: CAN message for saving the new node address 250kBit/s:

ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
600h + node ID	8	CMD = 23h	10h	10Fh	05h	73h	61h	76h	65h
			Index 1010h		Sindex 5		"save"		

3. When the device is next started, the changed baud rate becomes effective. The device can also be restarted via the NMT command "ResetNode".

1.7.9 Transfer rate (baud rate)

When supplied, the device is set to a baud rate of 125 kBit/s. This is the ProMinent default baud rate.

1.7.10 Calibration, explanations

The pump is pre-calibrated. The metering volume can be recalibrated if required.

1.7.11 Firmware update

The firmware cannot be updated via the CAN bus.

1.7.12 Data storage

Configuration data (e.g. the calculated calibration data) is saved in a power fail-safe memory.

1.7.13 Directives / standards complied with

CAN standards and specifications complied with Iso 11898-1 and details of the physical layer in compliance with ISO 11898-2 (high speed CAN up to 1 Mbit/sec) and ISO 11898-3 (low speed CAN up to 125 kBit/sec).

The device complies with the CAN-Open specification CIA-DS401 that forms the basis of the European standard EN50325-4.

It also complies with the controller device profile CiA-404.

2 Supplementary operating instructions for Modbus RTU

2.1 About this Modbus pump	24
2.2 Control elements	25
2.3 Electrical installation	25
2.4 Setting options for the pump control elements	27
2.5 "Modbus RTU" implementation	28
2.5.1 "Modbus RTU" message structure	29
2.6 Device monitoring	30
2.7 Emergency mode	31
2.8 Faults	31
2.9 Accessories	31
2.10 Modbus RTU for Prominent pumps register	32
2.10.1 "Device identification" register	32
2.10.2 "Modbus" register	33
2.10.3 "Production data pump module-specific" register	34
2.10.4 "Production data Modbus module-specific" reg-	
ister	34
2.10.5 "Current operating parameters" register	36
2.10.6 "Target operating parameter" register	39
2.10.7 "Advanced configuration" register	41
2.10.8 "Accessories 1" register	43
2.10.9 "Accessories 3" register	43
2.10.10 "Debug data" register	44

2.1 About this Modbus pump

Metering pumps DULCO flex Control DFXa with a "Modbus RTU" connection differ from standard pumps by way of the option to connect to a "Modbus RTU" bus system. A "Modbus RTU" pump DULCO flex Control DFXa can either be connected to a "Modbus RTU" bus or be used as a stand-alone unit.

Example:

Measured value-dependent metering of sodium-calcium hypochlorite into a swimming pool water circuit, where the pump is controlled by a PLC in *'Modbus RTU'* operating mode.

A "Modbus RTU" version of the DULCO flex Control DFXa (identity code feature "Control option" = M) is intended for integration into a "Modbus RTU" system.

This document contains general information for the implementation of the metering pump DULCO flex Control DFXa, DFXa into the serial communication protocol of the Modbus RTU.

2.2 Control elements



Fig. 5: DFXa control elements

- 1 "Modbus RTU" status LEDs
- 2 "Modbus RTU" socket
- 3 Device LEDs

Tab. 22: "Modbus RTU" status LEDs

Colour	Cause
red	The Modbus does not function correctly.
(flashing)	
yellow	The Modbus is currently sending or receiving.
green	The Modbus PCB is supplied with voltage.

Refer to the "Operating instructions for the solenoid metering pump DULCO flex Control DFXa, DFXa" for the meaning of the device LEDs

2.3 Electrical installation



CAUTION!

Pump may be damaged.

The panel plug on the housing may break off.

 Never connect a T-coupler directly to the housing.

Only connect a cable directly to the housing.



CAUTION!

Pump may be damaged.

IP65 degree of protection cannot be guaranteed if the CAN cable is not correctly screwed in.

 Manually screw in the CAN cable threaded connectors until they reach the stop.

The following requirements apply for the connecting cables / Modbus interface:

- Half-duplex, 2-wire technology, "twisted pair" cable
- Max. cable length 1200 m
- RS-485 (TIA-485-A)
- Differential voltage level ± 5 V
- Active termination (terminating resistor)



If the Modbus pump is connected to the end of the Modbus, the Modbus PCB's integrated terminating resistor can be switched on via the metering pump's menu - there is then no need for a separate terminating resistor screwed to the end.



Fig. 6: Socket assignment on the pump



Fig. 7: Plug assignment on the CAN cable

Tab. 23: Connection assignment for Modbus RTU

Pin	Lead colour	PLC terminal
1	-	-
2	-	-
3	blue	GND
4	black	A
5	grey	В

Connect the CAN cable to the pump's "Modbus RTU" module as shown below. For further information, see the documentation for your Modbus installation.



Fig. 8: Modbus connector for metering pumps (example showing 2 pumps GMXa and a PLC)

- 5 T-coupler, M 12, 5-pin CAN
- 6 Terminating resistor M 12 coupling
- 7 Terminating resistor M 12 plug
- 8 CAN connecting cable CAN connecting cable
- 9 CAN connecting cable
- 13 CAN pump GMXa e.g. for acid
- 14 CAN pump GMXa e.g. for alkali

Insert the metering pump's mains plug into the power socket
 the metering pump may start to pump.

2.4 Setting options for the pump control elements

Tab. 24: Operating menu for L	DFXa, ModbusRTU
-------------------------------	-----------------

1st level	2nd level	3rd level	4th level
Information			
Settings			
	Inputs/outputs		
	Bleeding		
	ModbusRTU	Bus address 20	1 247

1st level	2nd level	3rd level	4th level
		Baud rate	9600 19200 38400
		Data length	7 bits 8 bits
		Stop bits	1 2
		Parity	none uneven even
		Termination	disabled enabled ignored
		Modbus timeout	0 10,000 ms
	Priming time		
Timer			
Field bus	Inactive Active Passive		

2.5 "Modbus RTU" implementation

This chapter contains general information for implementing the metering pump DULCO flex Control DFXa, DFXa into the serial communication protocol of the Modbus RTU.

The metering pump DULCO flex Control DFXa, DFXa acts as a slave (device 1).

Communication is possible between the metering pump DULCO flex Control DFXa, DFXa (device 1) and external masters (device 0), such as a PLC.

The Modbus protocol is a communication protocol that enables devices to use data via a joint connection if the devices communicate with each other via the "Modbus RTU" Modbus Application Protocol Specification V1.1b3.

The "Modbus RTU" specification describes the "data link layer" and the physical layer.

The notification structure of the function codes uses "Modbus RTU" standards.

IEEE 32-bit floating point numbers and integers are used.



The Modbus interface is implemented based on the following standards:

www.modbus.org/docs/Modbus_over_serial_line_V1_02.pdf

Additional information about Modbus can be found at <u>www.modbus.org</u> or the websites of your country's Modbus organisation - if available.

2.5.1 "Modbus RTU" message structure

Parameter	Value
Standard	RS-485
Number of data bits per character	11 bits:
	1 start bit
	8 data bits
	1 parity bit - "even"
	1 stop bit
Data rate (baud)	Pre-set: 19200
	(9600, 19200, 38400)
Error check	CRC-16 (cyclic redundancy check); polynomial = 0x0A001 (101000000000001

Tab. 25: A telegram comprises:

Component	Length
Slave address	1 bytes
Function code	1 bytes
Data	n bytes
CRC check sum	2 bytes

2.5.1.1 Slave address

The slave address can be set from 1 to 247. Pre-set: 20

2.5.1.2 Function codes

Tab. 26: 16 bit values				
Function code	Command	Maximum register number in one transaction		
0x03 (3)	'Read Holding Register'	125		
0x06 (6)	'Write Single Register'	1		
0x10 (16)	'Write Multiple Register'	123		
0x17 (23)	'Read / Write Multiple Register'	Read: 125 / Write: 121		

Not all registers support all commands. *'Read Holding Register'* can only be called up with function code 3.



Maximum message size

Excessive message sizes may disrupt the communication.

The maximum message size for the 'Read Holding Register' function is 200 bytes at 19,200 baud (100 bytes at 9600 baud or 400 bytes at 38,400 baud).

2.5.1.3 Data

The length and content of a data field depends on whether we are dealing with a request or a response telegram:

Tab. 27: Request telegram

Length	Content
2 bytes	Register
2 bytes	Number of registers to be trans- ferred

Tab. 28: Response telegram

Length	Content
1 bytes	Number of bytes to be transferred
n bytes	Content of registers requested

2.5.1.4 CRC check sum

The check sum can be calculated with the following tool: <u>https://www.lammertbies.nl/comm/info/crc-calculation.html</u>.

2.6 Device monitoring

The monitoring time for device monitoring can be changed in the menu.

Device monitoring is only performed if the Modbus is in an active operating status. To do this, the Modbus master needs to cyclically send queries to the slaves. If this does not happen - in the specified time - the pump stops.

Process:

If queries from the master remain unanswered beyond a certain time, the pump is stopped. An error message is generated and transferred to the pump. As soon as queries are resent, the pump automatically starts up - providing the parameters responsible for the operation of the pump permit this.

2.7 Emergency mode

You can guard against a potential failure of the Modbus control in the following way:

- **1.** Set an auxiliary frequency on the pump that fits best your process in emergency mode.
- 2. If emergency mode is required, run the pump using the "external control" terminal on the auxiliary frequency see "Peristaltic metering pump DULCO flex Control, DFXa" "Installation, electrical".

2.8 Faults

The "Modbus RTU" status LEDs on the Modbus module display the status of the Modbus connection / Modbus module:

Tab.	29:	"Modbus	RTU"	' status	LEDs
I aD.	29.	woubus	$\pi i 0$	Siaius	LEDS

Colour	Cause
red	The Modbus does not function correctly.
(flashing)	
yellow	The Modbus is currently sending or receiving.
green	The Modbus PCB is supplied with voltage.

The 3 LEDs on top of the pump indicate the operating and fault statuses of the pump itself - see "Peristaltic metering pump DULCO flex Control, DFXa".

2.9 Accessories



You can use our CAN accessories, below, for a DULCO flex Control DFXa Modbus installation.

Supplementary operating instructions for Modbus RTU

Accessories	Part no.
T-coupler M12 5-pin CAN	1022155
Terminating resistor M 12 coupling	1022154
Terminating resistor M 12 plug	1022592
Connecting cable - CAN, M 12, 5-pin, 1 m	1022139
Connecting cable - CAN, M 12, 5-pin, 2 m	1022140
Connecting cable - CAN, M 12, 5-pin, 5 m	1022141
Connecting cable - CAN, sold by the metre	1022160
CAN coupling, M 12, 5-pin Screw connector	1022157
CAN plug M 12, 5-pin Screw connector	1022156

2.10 Modbus RTU for Prominent pumps register

Tab. 30: Tip - Number of registers	
Data type	Number of registers
BOOLEAN	1
Enum	1
FLOAT32	2
INT16	1
UINT8	1
UINT16	1
UINT32	2
STRING[2]	1
STRING[4]	2
STRING[8]	4
STRING[10]	5
STRING[32]	16

2.10.1 "Device identification" register

Register	Parameter	Туре	Description
1	Product code	UINT32	Option for explicitly identifying the product
3	Modbus register set version	UINT16	Format: XX.XX
			Provides information as to which version of the Modbus register set is used to access the indi- vidual parameters. This information must be stored in the Modbus module

Supplementary operating instructions for Modbus RTU

Register	Parameter	Туре	Description
4	Serial number	STRING[10]	ASCII coding 10 characters
9	Identity code	STRING[32]	ASCII coding 32 characters
25	HMI data version	UINT32	Format: XX.XX.XX.XX (depending on project)
27	Firmware version control	UINT32	Format: XX.XX.XX.XX (depending on project)
29	Bootloader version control	UINT32	Format: XX.XX.XX.XX (depending on project)
31	Firmware version power	UINT32	Format: XX.XX.XX.XX (depending on project)
33	Bootloader version power	UINT32	Format: XX.XX.XX.XX (depending on project)

2.10.2 "Modbus" register

Register	Designation	Туре	Display / purpose
50	Modbus module active	UINT8	0 - NOT ACTIVE 1 - ACTIVE 2 - PASSIVE
51	Baud rate	UINT8	0 - 9600 bits/sec 1 - 19200 Bits/sec 2 - 38400 Bits/sec
52	Bus address (Modbus)	UINT8	1 247
53	Parity (parity bit)	UINT8	0 - NONE 1 - ODD 2 - EVEN
54	Stop bits (number of stop bits)	UINT8	0 - 1 STOP BIT
55	Data length (number of data bits)	UINT8	1 - 8 BIT
56	Termination (bus termination)	UINT8	0 - DISABLE 1 - ENABLE 2 - IGNORED
57	Software version of the Modbus module	UINT32	Format: XX.XX.XX.XX
59	Hardware version of the Modbus module	UINT32	Format: XX.XX.XX.XX
61	Modbus timeout (cyclic timeout time)	UINT16	0 10,000 ms
63	Modbus endianness pattern	UINT32	Pattern "0xAABBCCDD" is stored in the pump and can be read out using this register enabling the endianness of the Modbus access to be determined from the master

2.10.3 "Production data pump module-specific" register

These register inputs are all only for function code "0x03" (Read only).

Register	Designation	Туре	Display / purpose
200	Version structure definition "Produc- tion data" for control module	UINT16	Format: XXXX, consecutive version number
201	10-digit serial number for control module	STRING[10]	ASCII coding 10 characters
206	Identification tester/test equipment for control module	STRING[4]	ASCII coding 4 characters
208	ICT testing date for control module	STRING[10]	ASCII coding 10 characters Date format: DD.MM.YYYY
213	ICT testing time for control module	STRING[8]	ASCII coding 8 characters Time format: HH:MM:SS
217	Production order of service provider for control module	STRING[10]	ASCII coding 10 characters
222	Material number of printed circuit board for control module	STRING[8]	ASCII coding 8 characters
226	Revision number of module for con- trol module	STRING[2]	ASCII coding 2 characters Hardware version of module
227	Version structure definition "Produc- tion data" for power module	UINT16	Format: XXXX, consecutive version number
228	10-digit serial number for power module	STRING[10]	ASCII coding 10 characters
233	Identification tester/test equipment for power module	STRING[4]	ASCII coding 4 characters
235	ICT testing date for power module	STRING[10]	ASCII coding 10 characters Date format: DD.MM.YYYY
240	ICT testing time for power module	STRING[8]	ASCII coding 8 characters Time format: HH:MM:SS
244	Production order of service provider for power module	STRING[10]	ASCII coding 10 characters
249	Material number of printed circuit board for power module	STRING[8]	ASCII coding 8 characters
253	Revision number of module for power module	STRING[2]	ASCII coding 2 characters Hardware version of module

2.10.4 "Production data Modbus module-specific" register

Supplementary operating instructions for Modbus RTU

Register	Designation	Type	Display / purpose
500	Version structure definition "Production data" for Modbus	UINT16	Format: XXXX, consecutive version number
	module		
501	10-digit serial number for Modbus module	STRING[10]	ASCII coding 10 characters
506	Identification tester/test equip- ment for Modbus module	STRING[4]	ASCII coding 4 characters
508	ICT testing date for Modbus module	STRING[10]	ASCII coding 10 characters Date format: DD.MM.YYYY
513	ICT testing time for Modbus module	STRING[8]	ASCII coding 8 characters Format time: HH:MM:SS
517	Production order of service provider for Modbus module	STRING[10]	ASCII coding 10 characters
522	Material number of printed cir- cuit board for Modbus module	STRING[8]	ASCII coding 8 characters
526	Revision number of module for Modbus module	STRING[2]	ASCII coding 2 characters Hardware version of module

2.10.5 "Current operating parameters" register
Register	Designation	Туре	Display / purpose
1000	Status register	UINT32	Bit 0 - reserved
			Bit 1 - reserved
			Bits 2 - 4 - operating mode
			(0 = halt; 1 = manual; 2 = batch; 3 = contact; 4 = analog)
			Bit 5 - Error (Error present)
			Bit 6 - Warnings (Warnings present)
			Bit 7 - Manual stop (Pump was manually stopped)
			Bit 8 - Stop (Pump is stopped)
			Bit 9 - Priming (Pump is in priming mode)
			Bit 10 - Auxiliary (Pump is in auxiliary operation)
			Bit 11 - Pause (Pump has switched to pause)
			Bit 12 - Field bus (Field bus mode enabled)
			Bit 13 - Flow (Metering monitor enabled and accessories connected)
			Bit 14 - Batch memory (Batch memory is activated)
			Bit 15 - Calibration (Pump is calibrated)
			Bit 16 - Relay 1 (Relay 1 present)
			Bit 17 - Relay 2 (Relay 2 present)
			Bit 18 - Analogue Out (Analogue output present)
			Bit 19 - Diaphragm rupture (Diaphragm rupture option is installed)
			Bit 20 - Concentration (Concentration calculation is activated)
			Bit 21 - reserved
			Bit 22 - Cavitation (Cavitation was detected)
			Bit 23 - Airlock (Air was detected in the dosing head)
			Bit 24 - Overpressure (Back pressure too high)
			Bit 25 - Negative pressure (Back pressure too low)
			Bit 26 - Bleeding (Pump currently bleeding)
			Bits 27 - 32 - reserved
1002	Error flags (1st register)	UINT32	Bit 0 - CONFIGURATION DATA ERROR (SYSTEM)
			Bit 1 - POWER INPUT TOO LOW ERROR
			Bit 2 - POWER INPUT TOO HIGH ERROR
			Bit 3 - LEVEL ERROR
			Bit 4 - DIAPHRAGM RUPTURE ERROR
			Bit 5 - METERING MONITOR ERROR
			Bit 6 - POSITION DETERMINATION ERROR
			Bit 7 - TEMPERATURE TOO HIGH ERROR
			Bit 8 - INITIALISATION ERROR (SYSTEM)
			Bit 9 - DRIVE ERROR

Register	Designation	Туре	Display / purpose
-			Bit 10 - INVALID METERING PARAMETER ERROR
			Bit 11 - OVERPRESSURE ERROR
			Bit 12 - OVERCURRENT ERROR
			Bit 13 - UNDERVOLTAGE ERROR
			Bit 14 - AIR IN THE HEAD ERROR
			Bit 15 - BLEEDING UNSUCCESSFUL ERROR
			Bit 16 - OVERFLOW BATCH MEMORY ERROR
			Bit 17 - INPUT CURRENT SMALLER THAN LIMIT VALUE ERROR
			Bit 18 - INPUT CURRENT LARGER THAN LIMIT VALUE ERROR
			Bit 19 - NEGATIVE PRESSURE ERROR
			Bit 20 - NO "PUMP<->MODULE" CONNECTION ERROR (not relevant for Modbus)
			Bit 21 - NO "PUMP<-> MASTER" CONNECTION ERROR (not relevant for Modbus)
			Bit 22 - INTERNAL CAN-BUS ERROR (Only for GXLa, Sigma, peristaltic pump,)
			Bit 23 - FAN ERROR
			Bits 24 - 31 - RESERVED
1004	Error flags (2nd register)	UINT32	Bits 0 - 31 - RESERVED
1006	Warning flags	UINT32	Bit 0 - LEVEL WARNING
			Bit 1 - DIAPHRAGM RUPTURE WARNING
			Bit 2 - METERING MONITOR WARNING
			Bit 3 - METERING VOLUME WARNING
			Bit 4 - INVALID METERING PARAMETER WARNING
			Bit 5 - FAN WARNING
			Bit 6 - WRONG MAGNET WARNING
			Bit 7 - AIR IN DOSING HEAD WARNING
			Bit 8 - OVERPRESSURE WARNING
			Bit 9 - CAPACITY TOO LOW WARNING
			Bit 10 - NEGATIVE PRESSURE WARNING
			Bit 11 - CAVITATION WARNING
			Bit 12 - POWER UNIT WARNING
			Bit 13 - MODULE WARNING
			Bits 14 - 31 - RESERVED
1018	Actual capacity	FLOAT32	Dependent on - dosing head fitted - device context (e.g. set suction stroke)
1020	Maximum possible capacity	FLOAT32	Determined by - dosing head fitting - device context (e.g. set suction stroke)

Register	Designation	Туре	Display / purpose
1022	Actual operating mode	Enum	0 - EXTERNAL STOP
			1 - MANUAL
			2 - CONTACT
			3 - BATCH
			4 - ANALOGUE
1023	Actual sub-operating mode	Enum	0 = NO SUB-OPERATING MODE
			1 - PRIMING
			2 - AUXILIARY OPERATION
			3 - BATCH TIME CONTROL
			5 - BATCH ANALOGUE-CONTROLLED VOLUME
			QUENCY
			7 - BLEEDING
			8 - CALIBRATION
1024	Actual concentration	FLOAT32	0.01 100000 ppm
1026	Switch-on counter	UINT32	Number of previous "Power-ups"
			0 2 ³² -1
1028	Total operating time	UINT32	0 (2 ³² -1)/3600 h
1030	Total revolutions counter	UINT32	0 2 ³² -1 strokes
1032	Deletable revolution counter	UINT32	"Write access" means "Clear counter"
			0 2 ³² -1 strokes
1034	Total metering quantity counter	FLOAT32	0.0 (max. FLOAT32) I
1036	Deletable metering quantity	FLOAT32	Write access means "Clear counter"
	counter		0.0 … (max. FLOAT32) I
1040	Remaining metering quantity	FLOAT32	0.0 l
1042	Metering quantity of last	FLOAT32	Dependent on
	SILOKE		- dosing head fitted
			- metering type
			•
1046	"Liquid level" monitoring	UINT16	0 100 %

2.10.6 "Target operating parameter" register

These register inputs are all for function code "0x03", "0x06", 0x10 and 0x17 (Read / Write).

Register	Designation	Туре	Display / purpose
1200	Start/stop pump	UINT8	Bit 0 - Start/Stop via bus
			(0=PUMP STOPS; 1=PUMP ACTIVE OR IN STANDBY)
			Bit 1 - Start/Stop via Modbus-TimeOut
			(0=no TimeOut; 1=TimeOut)
1211	Target capacity	FLOAT32	Dependent on
			- dosing head fitted
			- device context (e.g. set suction stroke)
1215	Metering volume per batch	FLOAT32	Specification for batch mode value range:
	mode inggered		min. value is derived from the dosing head,
			the max. value is also from the metering time set
1217	Metering time for batch	UINT16	Min/max values are also controlled by specifying the "Metering time for batch"
			1 10 000 sec
1221	Metering volume per contact	FLOAT32	Specification for contact mode
	mode triggered	1 20/1102	0.00 001 99.99 I / Contact
1223	Auxiliary capacity	FLOAT32	Dependent on
			- dosing head fitted
			- device context (e.g. set suction stroke)
1225	Activate concentration mode	BOOLEAN	0 - INACTIVE
			1 - ACTIVE
1226	"Desired final concentration"	FLOAT32	0.01 100 000 ppm
4000		F a	
1229	rarget operating mode	Enum	U-EXTERNAL STOP
			2 - CONTACT
			3 - BATCH
			4 - ANALOGUE
1233	Priming duration	UINT16	1 60 sec
1234	Clear counter	Enum	0 - CLEAR STROKE COUNTER
			1 - CLEAR QUANTITY COUNTER
			2 - CLEAR CONTACT MEMORY
			3 - CLEAR ALL COUNTERS
1235	Trigger a batch/contact cycle	UINT16	When a Modbus message with this register number and user data pattern "0x5555" is received, depending on the operating mode set, a batch or contact cycle is triggered
1236	Delete error requiring acknowledgement	UINT16	When a Modbus message with this register number and user data pattern "0x5555" is received, all errors requiring acknowledgement are reset

2.10.7 "Advanced configuration" register

These register inputs are all for function code "0x03", "0x06", 0x10 and 0x17 (Read / Write).

Register	Designation	Туре	Display / purpose
1400	Pump start behaviour	Enum	Configuration as to how the pump should behave after a power-up:
			0 - ALWAYS OFF
			1 - ALWAYS ON
			2 - STATUS IMMEDIATELY BEFORE LAST SWITCH-OFF
1407	Analogue input "operating	Enum	Setting of analogue operating mode:
	mode"		0 - 020mA
			1 - 420 mA
			2 - 200mA
			3 - 204mA
			4 - LINEAR CURVE
			5 - LOWER SIDE BAND
			6 - UPPER SIDE BAND
1408	"Current 1st user-defined point" analogue input	FLOAT32	For the analogue operating modes - LINEAR CURVE - LOWER SIDE BAND - UPPER SIDE BAND this parameter determines the current value for the first support point of the "Current <-> stroke rate/capacity" assignment lines
			0.0 20.0 mA
1411	"Capacity 1st user-defined point" analogue input	FLOAT32	For the analogue operating modes - LINEAR CURVE - LOWER SIDE BAND - UPPER SIDE BAND this parameter determines the metering rate for the first support point of the "Current <-> capacity" assignment lines. Setting in Auto On oper- ating mode only
			0 … [max. capacity] l/h
1413	"Current 2nd user-defined point" analogue input	FLOAT32	For the analogue operating modes - LINEAR CURVE - LOWER SIDE BAND - UPPER SIDE BAND this parameter determines the current value for the second support point of the "Current <-> stroke rate/capacity" assignment lines 0.0 20.0 mA
1416	"Capacity 2nd user-defined	FI ΩΔΤ32	For the analogue operating modes - LINEAR
1410	point" analogue input		CURVE- LOWER SIDE BAND - UPPER SIDE BAND this parameter determines the metering rate for the second support point of the "Current <-> capacity" assignment lines. Setting in Auto On operating mode only 0 [max. capacity] I/h
1418	"Fault message current too	BOO-	0 - DO NOT REPORT FAULT
	high" analogue input	LEAN	1 - REPORT FAULT
1419	"Fault message current too	BOO-	0 - DO NOT REPORT FAULT
	low" analogue input	LEAN	1 - REPORT FAULT

Supplementary operating instructions for Modbus RTU

Decister	Designation	Time	Dianlay (numero
Register	Designation	туре	Display / purpose
1420	"Lower user-defined error limit current" analogue input	FLOAT32	For the analogue operating modes - LINEAR CURVE - LOWER SIDE BAND - UPPER SIDE BAND this parameter determines the configurable lower error threshold for the input current. Setting only effective if "Fault message current too low" parameter was set to "active" 0.1 20.5 mA
1422	"Upper user-defined error limit current" analogue input	FLOAT32	For the analogue operating modes - LINEAR CURVE - LOWER SIDE BAND - UPPER SIDE BAND this parameter determines the configurable upper error threshold for the input current. Setting only effective if "Fault message current too high" parameter was set to "active" 0.1 20.5 mA
1424	"Input level" pause input	BOO- LEAN	Without inversion, the PAUSE status is activated via a LOW level at the pause input
			0 - DO NOT INVERT INPUT LEVEL
			1 - INVERT INPUT LEVEL
1425	"Delete error requiring acknowledgement" pause input	BOO- LEAN	Depending on the configuration, all errors requiring acknowledgement can be reset at the start of an active PAUSE signal
			0 - DO NOT RESET ERROR REQUIRING ACKNOWLEDGEMENT
			MENT
1426	"Input level" auxiliary input	BOO- LEAN	Without inversion, the auxiliary operating mode is activated via a LOW level at the auxiliary input
			0 - DO NOT INVERT INPUT LEVEL
			1 - INVERT INPUT LEVEL
1427	"Memory function batch" contact input	BOO- LEAN	If the batch memory is activated and a new batch process is triggered while batch metering is in pro- gress, the remaining volume to be metered will be increased by that of the new batch. If the batch memory is not activated, the remaining volume is deleted and the new batch is started
			0 - BATCH MEMORY NOT ACTIVATED
			1 - BATCH MEMORY ACTIVATED
1428	"Memory function contact" contact input	BOO- LEAN	If the contact memory is activated and a new contact process is triggered while contact metering is in pro- gress, the remaining volume to be metered will be increased by that of the new contact process. If the contact memory is not activated, the remaining volume is deleted and the new batch is started
			0 - CONTACT MEMORY NOT ACTIVATED
			1 - CONTACT MEMORY ACTIVATED

Register	Designation	Туре	Display / purpose
1429	"Adaptive contact control" contact input	Enum	With adaptive contact control (exclusively in contact mode), the stroke rate or capacity is set according to the time interval of the incoming contact impulses. If the time interval changes, the values mentioned change adaptively. 0 - INACTIVE
1438	"Mass density feed chemical"	FLOAT32	Material characteristic of the feed chemical
			0.5 … 2.0 kg/l
1440	"Flow main medium" concen- tration mode	FLOAT32	Characterised quantity of the main medium in which metering is to be performed
			0.1 9999.9 m³/h
1442	"Volumetric flow for max. analogue value" concentra-	FLOAT32	Characterised quantity of the main medium in which metering is to be performed
	tion mode		0.1 9999.9 m³/h
1444	"Volume main medium" con- centration mode	FLOAT32	Characterised quantity of the main medium in which metering is to be performed 0.1 9999.9 I
1446	"Volume per contact detected" concentration	FLOAT32	Characterised quantity of the main medium in which metering is to be performed
	mode		0.1 999.99 I / contact

2.10.8 "Accessories 1" register

These register inputs are all for function code "0x03", "0x06", 0x10 and 0x17 (Read / Write).

Register	Designation	Туре	Display / purpose
2000	Hose rupture sensor	BOO- LEAN	Configuration as to how the pump should react to a "hose rupture" event: 0 - WARNING 1 - ERROR

2.10.9 "Accessories 3" register

These register inputs are all for function code "0x03", "0x06", 0x10 and 0x17 (Read / Write).

Supplementary operating instructions for Modbus RTU

-		_	
Register	Designation	Туре	Display / purpose
2200 "Inp moi	"Input level warning" level monitoring	BOO- LEAN	Parameter is used with 2-stage level monitoring. Without inversion, warning detection is performed via HIGH level at level warning input
			0 - DO NOT INVERT INPUT LEVEL
			1 - INVERT INPUT LEVEL
2201	"Input level fault" level moni- toring	BOO- LEAN	Parameter is used with 2-stage level monitoring. Without inversion, error detection is performed via a HIGH level at the level error input
			0 - DO NOT INVERT INPUT LEVEL
			1 - INVERT INPUT LEVEL
2202	"Switchover" level monitoring	BOO- LEAN	This setting can be used to switch between 2-stage and continuous level monitoring
			0 - ACTIVATE 2-STAGE LEVEL MONITORING
			1 - ACTIVATE CONTINUOUS LEVEL MONITORING
2203	"Warning threshold cont.	UINT8	With continuous level monitoring:
	mode" level monitoring		Specification of a threshold value (in [%] of the max- imum level); if this threshold value is not reached, a warning is generated by the level monitoring
			0 100%
2204 "Error threshold cont. mode" UINT8	UINT8	With continuous level monitoring:	
	level monitoring		Specification of a threshold value (in [%] of the max- imum liquid level); if this threshold value is not reached, an error is generated by the level moni- toring
			0 100%
2205	"Unit liquid level" level moni- toring	BOO- LEAN	This setting enables the continuous level measure- ment unit to be selected
			0 - LEVEL DATA IN % (RELATIVE TO THE MAX- IMUM)
			1 - LEVEL IN LITRES (ABSOLUTE FIGURE)
2206	"Total volume storage tank" level monitoring	UINT16	Specifies the capacity of the storage tank containing the feed chemical
			1 65535 l

2.10.10 "Debug data" register

These register inputs are all only for function code "0x03" (Read only).

Supplementary operating instructions for Modbus RTU

Register	Designation	Туре	Display / purpose
3002	Hose type	UINT8	Information about the hose fitted
			0 - TPV, 5 bar (Pump type 0530, SP)
			1 - TPV, 7 bar (Pump type 0730, SP)
			2 - PUR, 5 bar (Pump type 0530, VP)
3003	Current rotor position	UINT8	Under certain conditions (including stroke rate < 3600 strokes / h), a progress bar appears on the display, which shows the position of the rotor.
3014	Fan speed	UINT16	Revolutions / second
3017	Power supply of Modbus unit	UINT16	Power supply of Modbus unit
3018	CAN link connection error	UINT16	0 - CAN connection OK
			1 - CAN node not found
			2 - Vendor ID is incorrect
			3 - Product code is incorrect
			4 - Modbus register version is incorrect"

3.1 Requirements	46
3.2 Adjusting the pump	46
3.2.1 General	46
3.2.2 Switch PROFIBUS® to active / inactive	46
3.2.3 Setting the slave address	47
3.3 Special features in active PROFIBUS® operation	48
3.3.1 General	48
3.3.2 Displays	48
3.3.3 LEDs on the PROFIBUS [®] module	49
3.3.4 Using the metering monitor	49
3.4 Installation	49
3.5 Operation	51
3.5.1 General	51
3.5.2 GSD file	51
3.5.3 DULCO flex Control DFXa, DFXa data objects	51

3.1 Requirements

Personnel must be familiar with the contents of the "Peristaltic metering pump DULCO flex Control, DFXa"!

The pump must have the identity code feature "Control type": "R" PROFIBUS[®]DP interface M 12". The *'Fieldbus'* menu item is then available in the operating menu. (When *'Fieldbus \rightarrow Active'* is set, *'Settings \rightarrow PROFIBUS'* also appears in the operating menu.)

3.2 Adjusting the pump

3.2.1 General

The pump with PROFIBUS[®] functionality is adjusted in the same way as the standard pump, with the addition of the bus functionality.



The adjustment process is cancelled in the event of a pause lasting longer than 60 s.

Using the connected PROFIBUS[®] module, the PROFIBUS[®] pump represents a device with slave functionality in conformity with DP-V1. This means that the payload is transferred both cyclically and acyclically.

3.2.2 Switch PROFIBUS® to active / inactive

In order for the pump to be activated using the PROFIBUS[®], *'Fieldbus'* must be set to *'Active'* in the operating menu.

- 1. Press the [] [Menu] key to access the 'Menu'.
 - ⇒ The cursor immediately goes to *'Information'*.

- **2.** To switch from *'Information'* to *'Fieldbus'*, turn the *[Clickwheel]* and press it.
- **3.** To switch from *'Fieldbus'* to *'Inactive / Active'*, turn the *[Clickwheel]* and press it.
- **4.** To switch from *'Inactive'* to *'Active'*, turn the *[Clickwheel]* and press it.
 - \Rightarrow The pump saves the '*Active*' setting.

The 'Settings → PROFIBUS'menu also appears.

The pump is in "Stop" mode. To activate it, press the [Stop/Start] key. Use the BUS to give the Start command.

All external inputs, such as level monitoring, metering monitoring and external control (pause, contact input, analogue input), will function even while the PROFIBUS[®] is *'Active'*. They produce the reactions you would expect if the pump had no PROFIBUS[®] functionality - see pump operating instructions. The pump transmits corresponding information via the PROFIBUS[®] to the master (PLC, PC etc.).

The DULCO flex Control DFXa, DFXa is factory-set to 'Automatic' metering.

Even if the fieldbus is set to inactive, the master has read-only access to the pump data defined in its GSD file.

If the PROFIBUS[®] is set to *'Inactive'*, the settings for the previously selected operating mode are reloaded.

If the pump is switched to another operating mode, it stops and can only be restarted using the a [Stop/Start] key.

3.2.3 Setting the slave address

3.2.3.1 Using the 'Bus address'

If a master in the PROFIBUS[®] segment assigns the slave addresses, manual setting of the slave address does not apply.

The address is pre-set to "120" for the DULCO flex Control DFXa, DFXa.

- **1.** To access the *'Menu'*: press the [] *[Menu]* key
 - ⇒ The cursor immediately goes to 'Information'.
- **2.** To switch from *'Settings'* to *'Fieldbus'*, turn the *[Clickwheel]* and press it.
 - ⇒ The cursor immediately goes to 'Operating mode'.
- 3. To switch from *'Operating mode'* to *'PROFIBUS'* turn the *[Clickwheel]* and press it.
 - ⇒ The *'Bus address'* menu appears.

The PROFIBUS[®] address must always be entered as 3 digits (addresses from "002" to "125"):

- **1.** 1. option: Turn the *[Clickwheel]* until the desired value is reached and then press the *[Clickwheel]*.
- 2. ▶ 2. option: Press the ▶ [Priming] key to change to digit-bydigit setting. Set the number using the [Clickwheel] and save using the ▶ [Priming] key. The cursor moves to the next number, and so on .
- 3.3 Special features in active PROFIBUS® operation
- 3.3.1 General

The pump cannot be manually set or programmed in PROFIBUS® operation! To do this, set the PRO-FIBUS® to 'Inactive' .

- Using the [Clickwheel] it is possible to switch between the continuous displays at any time, as in the other operating modes. This does not affect the operation of the pump.
- When PROFIBUS[®] operation is selected, the settings from the last operating mode without PROFIBUS[®] are applied. However, settings made using the PROFIBUS[®] are not saved! They only apply as long as the pump is linked to the PROFIBUS[®]. Only the 'stroke counter' (total number of strokes) and the 'quantity counter' (total number of litres) continue to be counted and saved.
- If the pump is set to PROFIBUS[®] operation, it stops. It can be activated again by pressing the [Stop/Start] key. Use the BUS to give the Start command.

3.3.2 Displays

There are additional identifiers in the operating display when PRO-FIBUS[®] operation is running.



The commonly used identifiers can be found in the "Control elements" chapter in the "Peristaltic metering pump DULCO flex Control, DFXa".

Stop PROFIBUS[®]: The pump has been stopped using PRO-FIBUS[®]. The master has sent the pump a corresponding telegram.

Stop manual: The pump has been stopped using the [Start/Stop] key. The master has sent the pump a corresponding telegram.

Connection error: If the pump loses its connection to the PRO-FIBUS[®] (as soon as the BUS cable is removed or the bus master becomes inoperative, for example), the [G] error symbol and the symbol appear. • Error module: If the pump loses its connection to the BUS module (as soon as the BUS module is removed or if communication between the BUS module and pump is interrupted for other reasons, for example), the error symbol [4] and the • symbol appear.

3.3.3 LEDs on the PROFIBUS® module

LED 1 (left) - module operating status

Signal	Cause
Off	The module has no supply voltage or connection.
Green	The module and the master are exchanging information.
Green flashing	The module has been initialised.
Red flashing	Error in pump parametrisation
Red flashing, double	Error in PROFIBUS configuration

LED 2 (right) - module status

Signal	Cause
Off	The module has not been initialised.
Green	The module has been initialised.
Green flashing	The module has been initialised and there are diagnostic messages.
Red	Serious exception error

3.3.4 Using the metering monitor

The "Metering monitor" socket must be assigned to use the metering monitor in PROFIBUS[®] operation. The pump then transmits *'available'* for the "Flow" status bit. The metering monitor can be switched on and off using the PROFIBUS[®] using the *'Metering monitor'* and *'FlowControl'* parameters.

If the metering monitor is set to '*Active*', DFXa reports a problem as a warning or error.

3.4 Installation	
Bus installation	All devices that are members of the bus system must be connected in a line. Up to 32 stations are possible (master, slaves, repeaters).
	At both the beginning and end of the cable, the bus must be termi- nated with a terminating resistor.
Plugs and cables	Use a screened, twisted-pair cable in conformity with EN 50170 (cable type A) for the PROFIBUS [®] cable.

Using shielding which is earthed at one end prevents low-frequency ground loops. Shielding earthed at one end is not effective in countering HF magnetic pick-up. Shielding earthed at both ends as well as twisted conductors are effective in countering magnetic HF pick-up but are not effective against electrical HF pick-up.

We would recommend establishing a bilateral, low-inductance (i.e. large area and low-impedance) connection with the protective earth with PROFIBUS[®].

The overall length of the bus cabling without repeaters varies according to the desired data transmission rate:

Data transmission rate	Maximum length of bus cabling
kBit/s	m
12000	100
6000	100
3000	100
1500	200
500	400
187.5	1000
93.75	1200
19.2	1200
9.6	1200

Tab. 31: Data transmission rate and length of the bus cabling

The PROFIBUS[®] module has two M12 industrial sockets for connecting with the PROFIBUS[®] cable. The pin configuration complies with the PROFIBUS[®] standard - see below - which means that commercially available bus plugs may be used. Please note that cable connections made with these plugs generally only meet the requirements for protection against contact and moisture according to IP 20!

But:

Note for achieving IP 65 degree of protection

Installation in accordance with IP 65 protection against contact and moisture is possible, since the M12 industrial socket of the PRO-FIBUS[®] module allows it. But the PROFIBUS[®] cable must then be provided with IP 65 class M12 industrial connectors.



Terminal resistance



P_DE_0079_SW

If the pump is the last bus device connected to the PROFIBUS[®] cable, it must be connected completely as a termination using the PROFIBUS[®]terminating resistance, pluggable (order no. 1036622) see EN 50170. The PROFIBUS[®] terminating resistance has IP 65 protection against contact and moisture.

3.5 Operation

3.5.1 General

Using the connected PROFIBUS[®] module, the PROFIBUS[®] pump represents a device with slave functionality in conformity with DP-V1. This means that the payload is transferred both cyclically and acyclically.

3.5.2 GSD file

The GSD file must be used to configure the master. It describes all features of the pump in PROFIBUS[®] operation (keywords, diagnosis, modules, slots). The GSD file can be downloaded from the PROFIBUS[®] website and from the ProMinent website. The file name is clearly indicated: DFXA1137.GSD.

3.5.3 DULCO flex Control DFXa, DFXa data objects

Tab. 32: Status and control

Module/ slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Description		
							Bit	Name	Function
1	1	State	Status	40.83	u32	R	0	Motor	Motor state 0 = Motor idle, 1 = Motor run- ning)
							1	-	-

Module/ slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Descripti	Description			
							Bit	Name	Function		
							2 4	Mode	00 – halt 01 – manual 02 – batch 03 – contact 04 – analogue		
							5	Error	There are errors - see "Errors"		
							6	Warn- ings	There are warn- ings - see "Warn- ings"		
							7	Manual stop	Pump has been stopped manually		
							8	Stop	Pump has stopped		
							9	Priming	Pump is in pri- ming operation (higher-level function)		
							10	Auxil- iary	Pump is in auxil- iary operation (higher-level function)		
							11	Pause	Pump has been switched to <i>'Pause'</i> status (higher-level function)		
							12	Module	Fieldbus active		
							13	Tube Service	Tube Service being performed		
							14	Batch Mem.	Batch memory is activated		
							15	Cali- brated	Pump is cali- brated		
							16	-	-		
							17	-	-		
							18	-	-		
							19	Tube rupture sensor	Tube rupture sensor is installed		
							20	Con- centra- tion	Concentration calculation is acti- vated		
							21	-	-		
							22	-	-		

Module/ slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Description		
							Bit	Name	Function
							23	-	-
							24	-	-
							25	-	-
							26	-	-
							27	-	-
							28	-	-
							29	-	-
							30	-	-
							31	-	-
2	1	Start / Stop	Control	80.81	30.81 u8 u8	S	Corresponds to <i>[Start/Stop]</i> key; if Start / Stop = 0, then the pump is stopped		
	2	Reset					If the res to 0, the cleared (and - as errors are	et value is internal pr e.g. with t far as pos e deleted	s switched from 1 ump memory is patch metering) sible - pending

* R = read, W = write

Tab. 33: Mode,	Flow rate,	Max.	flow rate,	Batch,	Contact,	Concentration,	Metering	monitor
----------------	------------	------	------------	--------	----------	----------------	----------	---------

Module/ slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Description		
3	1	Mode	Mode	C0,80,8	u8	R, W	Value	Name	Description
				0			0.16	Stop	Pump is ready but not metering.
							1	Manual	Pump is metering continuously with the set volume
							2	Batch	When triggered, the pump is metering the volume set in the batch code
							3	Contact	Pump is metering volume in the predefined time
						R, W	4	Analog	Pump is metering in accordance with the analogue signal and ana- logue mode set on the pump.

Module/ slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Description	on				
										17	Manual (con- centr.)	Manual in con- centration mode
								18	Batch (con- centr.)	Batch in concen- tration mode		
									19	Contact (con- centr.)	Contact in con- centration mode	
							20	Analog (con- centr.)	Analogue in con- centration mode			
4	4 1 I 1	Nominal flow rate	Flow rate	C0,83,8 3	f32	S	Capacity	setpoint i	n litres / hour			
2		Actual flow rate			f32	R	Actual capacity value					
5	1	Max. flow rate	Max. flow rate	40.83	f32	R	Maximum capacity in litres / hour					
6	1	Batch volume	Batch	Batch	C0,83,8 8	f32	S	Batch me	etering vol	ume		
	2	Batch time			u16		Time in v metered	which the l	patch is to be			
	3	Batch start			u8		If the value changes from 1 to 0, batch metering is activated in batch mode. (Batches may also be acti- vated via the contact input.)					
	4	Batch memory			u8		If "Batch Memory" is activated and a new batch is activated during a batch metering already in progress, the remaining metering volume is increased by that of the new batch. If the "Batch Memory" is not activated, the remaining volume is deleted and the new batch started.					
	5	Remaini ng volume			f32	R	The remain batch r	aining volu node	ime to be metered			
7	1	Contact volume	Con- tact	80.84	f32	S	Volume r	netered p	er contact			
	2	Contact memory			u8		- see "Ba	tch Memo	ory"			
8	1	Con- centra- tion rate	Con- centra- tion	C0,83,8 3	f32	S	Concentr in <i>'Conce</i>	ation setti entration'	ng setpoint (only operating mode)			
	2	Actual concen- tration			f32	R	Actual va (only in ' mode)	llue of cor Concentra	centration setting ation' operating			

* R = read, W = write

Module /slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Descripti	on		
9	1	Error	Error /	40.85	u32	R	Bit	Name	Function	
			Warning				0	Minimum	Metering medium level is too low	
					1 Batch	Batch	Too many metering strokes: > 100,000			
							2	Analog < 4mA	Analogue cur- rent is less than 4 mA	
							3	Analog > 23mA	Analogue cur- rent is greater than 23 mA	
								4	Tem- perature fault	Temperature too high
							5	Hose rupture	Metering hose damaged	
							6	-		
							7	-		
							8	-		
							9	-		
							10	-		
							11	-		
							12	-		
							13	Bus error	Bus error reported by the module	
							14	System error	System compo- nents faulty - see display	
							15	Module error	Error in module handling	
							16	-		
							17	-		
							18	-		
							19	-		
							20	-		
							21	-		
							22	-		

Module /slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Descriptio	Description		
							23	-		
							24	-		
							25	-		
							26	-		
							27	-		
							28	-		
							29	-		
							30	-		
							31	-		
	2	Warn- ings			u16		Bit	Name	Function	
							0	Minimum	Metering liquid is low	
							1	Calibra- tion	-	
							2	-		
							3	-		
							4	-		
							5	-		
							6	-		
							7	-		
							8	-		
							9	-		
							10	-		
							11	-		
							12	-		
							13	-		
							14	-		
							15	-		

* R = read, W = write

<i>1 ub. 00.</i> 0		juanity ai		ai uulu				
Module/ slot	Index	Name	Module name	Diag. number	Identifi- cation (hex)	Туре	Data flow *	Description
10	1	Reset stroke counter	Strokes /quan- tity	20	C0,81, C5	u8	S	If the value changes from 1 to 0, the <i>'Stroke counter'</i> (total number of strokes) is reset
	2	Reset quantity counter		21		u8		If the value changes from 1 to 0, the <i>'Quantity counter'</i> (total number of litres) is reset
	3	Stroke counter		22		u32	R	Counts the number of strokes - since the last reset (<i>'Stroke counter'</i>)
	4	Quan- tity counter		23		f32		Counts the metering volume in litres - since the last reset (<i>'Quantity</i> <i>counter'</i>)
	5	Litres per stroke		24		f32		Litres per stroke
	6	Live- span hose		25		u32		Hose service life
only acylic: 11	1	Identity code		25		s32		Pump identity code
	2	Serial number		26		s16		Pump serial number
	3	Name		27		s32		Pump name, freely deter- minable
	4	Installa- tion location		28		s32		Installation site, freely determinable

Tab	25.	Ctrakes	/~	unntit	1 and	indi	idual	data
I aD.		SHOKES	α	uamm	v ano	IIIOI	nouar	Uala

* R = read, W = write

Diagnostic telegrams

In conformity with PROFIBUS[®] standard, the device makes the *[Get_Sl_Diag]* service available. The diagnostics data comprise standard diagnostics information (6 bytes according to PRO-FIBUS[®] standard) and any possible diagnostics data specific to the device. A maximum of 63 bytes can be added for the device-specific diagnostics data. Of these, the first 4 bytes in the PROFIBUS[®] standard are specified:



Length of the status DU including the header byte: 04..63 'Device-related diagnostics' specification: 00 constant

0 0

1-	0	1	1	0	0	0	0
						1	

Encode the status_type byte as follows:

Status type: 48 (manufacturer-specific) 'Status' specification: 1 constant

Encode the slot_number byte as follows:

Slot number: 0 (because only slot 0 is being used)

 Encode the specifier byte as follows:

Status specification: 00 constant Reserved

59 bytes subsequently remain freely available (user_data):

user_data

Errors are indicated using the user_data fields.

The user_data fields are each combined in blocks of 3 bytes and are interpreted as follows:

- 1 Services
- 2 Error type
- 3 Type of data access (read/write)

Up to 19 errors can thereby be indicated.

Order number	Name	Explanation
1	Status	- see "DULCO flex Control DFXa data objects" table
11	Start/Stop	Complies with Start/Stop switch;
		If Start/Stop = 0, then the pump is stopped
12	Reset	Clear internal pump memory and pending errors by changing "1" to "0"
21	Target operating mode	- see "DULCO flex Control DFXa data objects" table
22	Actual operating mode	- see "DULCO flex Control DFXa data objects" table
31	Target capacity	Setpoint capacity in [l/h]
32	Actual capacity	Actual capacity value in [l/h]
41	Max. metering capacity	Maximum capacity in [l/h]
51	Volume per contact "batch mode"	Volume to be delivered with con- tact in batch mode

Tab. 36: User_Data

Order number	Name	Evolution
52	Metering time batch mode	Time in which the batch volume is to be delivered
53	Batch start	Start batch metering by changing "1" to "0"
54	Batch memory	If "1", the volume to be delivered is added up for each additional batch contact; if "0", the remaining volume is cleared and a new batch process is started
55	Remaining volume batch mode	Remaining volume to be metered in batch mode
61	Volume per contact "contact mode"	Volume to be delivered with con- tact in contact mode
62	Contact memory	If "1", the volume to be delivered is added up for each additional batch contact; if "0", the remaining volume is cleared and a new con- tact process is started (same as "batch memory")
71	Setpoint final concentration	Desired final concentration in con- centration mode
72	Actual value of final concentration	Current final concentration in con- centration mode
81	Error	- see "DULCO flex Control DFXa data objects" table
82	Warnings	- see "DULCO flex Control DFXa data objects" table
91	Reset stroke counter	Reset stroke counter by changing "1" to "0"
92	Reset metering quantity counter	Reset metering quantity counter by changing "1" to "0"
93	Deletable stroke counter	Number of strokes since the last reset
94	Deletable metering quantity counter	Totalled metering volumes since the last reset
95	Litres per stroke	Litres per stroke
96	Hose service life	- see "DULCO flex Control DFXa data objects" table
101	Identity code	Pump identity code
102	Serial number	Pump serial number
103	Pump name	Pump name, freely determinable
104	Installation site	Installation site, freely determi- nable

Tab. 37: Services 2

Value	Meaning	
0x30	OK	-
0x31	Transfer OK	Date outside of permitted limits
0x32	Transfer OK	Date protected
0x33	Transfer OK	Date rejected because device is in manual and not in remote opera- tion
0x34	Transfer OK	Date rejected because option is not installed
0x35	Transfer OK	Service not defined
0x36	Transfer OK	Value cannot be read or changed in current device context
0x37	Transfer OK	No further updating
0x55	Transfer OK	Fuse / UART error
0x56	Error in timeout	-

Tab. 38: Data access types

Value	Meaning
0xD3	Write access
0xE5	Read access

4.1 Requirements	61
4.2 Adjusting the pump	61
4.2.1 General	61
4.2.2 Activating / deactivating PROFINET [®]	61
4.2.3 Configuring PROFINET [®]	62
4.3 Special features in active PROFINET [®] mode	63
4.3.1 General	63
4.3.2 Displays	63
4.3.3 LEDs on the PROFINET [®] module	64
4.3.4 Using the metering monitor	64
4.4 Installation	65
4.5 Operation	65
4.5.1 General	65
4.5.2 GSDML file	65
4.5.3 DULCO flex Control DFXa, DFXa data objects	66
4.5.4 Diagnostic messages and types of data access	74
4.5.5 PLC error and pump behaviour	75

4.1 Requirements

Personnel must be familiar with the contents of the "Peristaltic metering pump DULCO flex Control, DFXa"!

The pump must have the identity code feature "Control type": "E" -"PROFINET 10". The *'Fieldbus'* menu item is then available in the operating menu. (When *'Fieldbus* \rightarrow *Active'* is set, *'Settings* \rightarrow *PROFINET'* also appears in the operating menu.)

4.2 Adjusting the pump

4.2.1 General

The pump with PROFINET[®] functionality is adjusted in the same way as the standard pump, with the addition of the bus functionality.



The adjustment process is cancelled in the event of a pause lasting longer than 60 s.

4.2.2 Activating / deactivating PROFINET®

In order for the pump to be activated using the PROFINET[®], *'Fieldbus'* must be set to *'Active'* in the operating menu.

- 1. Press the [] [Menu] key to access the 'Menu'.
 - \Rightarrow The cursor immediately goes to *'Information'*.
- **2.** To switch from *'Information'* to *'Fieldbus'*, turn the *[Clickwheel]* and press it.
- **3.** To switch from *'Fieldbus'* to *'Inactive / Active'*, turn the *[Clickwheel]* and press it.

- **4.** To switch from *'Inactive'* to *'Active'*, turn the *[Clickwheel]* and press it.
 - \Rightarrow The pump saves the 'Active' setting.

The 'Settings \rightarrow PROFINET' menu also appears.

The pump is in "Stop" mode. To activate it, press the [Stop/Start] key. Use the BUS to give the Start command.

While the PROFINET[®] is '*Active*', all external inputs such as level monitoring, metering monitoring and external control (pause, contact input, analogue input) will function. In the appropriate operating mode, they produce the reactions you would expect if the pump had no PROFINET[®] functionality - see pump operating instructions. The pump sends corresponding information via the PROFINET[®] to the master (PLC, PC etc.).

The DULCO flex Control DFXa, DFXa is factory-set to 'Automatic' metering.

Even if the fieldbus is set to inactive, the master has read-only access to the pump data defined in its GSDML file.

If the PROFINET[®] is set to *'Inactive'*, the settings for the operating mode previously selected are reloaded.

If the pump is switched to another operating mode, it stops and can only be restarted using the a [Stop/Start] key.

4.2.3 Configuring PROFINET®

The pump can always be configured via the PROFINET[®] – regardless of whether PROFINET is activated or not.

Fieldbus mode must be enabled to be able to control the pump via the PROFINET[®].

Normally, the pump is configured using the PLC and not using the pump's *'PROFINET'* menu. To do this, use the PLC to enter a name for the pump.

The settings for the IP address, subnet, ... are undertaken by the PLC. The pump's menu can be used to check the values:

Checking configuration on pump

Requirement:

The PROFINET[®] is activated - see [⊗] *Chapter 4.2 'Adjusting the pump' on page 61.*

- 1. To access the 'Menu': press the [Menu] key
- 2. Use the *[arrow keys]* to select the *'Settings'* menu item and confirm with the *[OK]* key
 - ⇒ The 'Operating mode' menu appears.
- 3. Use the *[arrow keys]* to select the *'PROFINET'* menu item and confirm with the *[OK]* key

- **4.** In the *'PROFINET'* menu, you can undertake the following for the pump:
 - IP address ...'
 - ... (set).
 - Subnet address ...'
 - ... (set).
 - *'Gateway address ...'* ... (set).
 - 'DNS address ...'
 - ... (set).
 - dhcp ...
 - ... (activate or deactivate).
 - "Pump name ...'
 - ... (read off / change).



Origin of the designations

The different names and/or addresses represent user-specific information and are the responsibility of the system operator.

4.3 Special features in active PROFINET[®] mode

4.3.1 General



In PROFINET[®] mode, the pump cannot be manually set or programmed! To do this, set the PRO-FINET[®] to 'Inactive'.

- Using the [Clickwheel] it is possible to switch between the continuous displays at any time, as in the other operating modes. This does not affect the operation of the pump.
- When PROFINET[®] operation is selected, the settings from the last operating mode without PROFINET[®] are applied. By contrast, the settings made via PROFINET[®] are not saved! They only apply as long as the pump is linked to the PROFINET[®]. Only the 'stroke counter' (total number of strokes) and the 'quantity counter' (total number of litres) continue to be counted and saved.
- The pump stops if it is set to PROFINET[®] mode. It can be activated again by pressing the [] [Stop/Start] key. Use the BUS to give the Start command.

4.3.2 Displays

When $\mathsf{PROFINET}^{\circledast}$ mode is running there are further identifiers in the operating indicator.



The commonly used identifiers can be found in the "Control elements" chapter in the "Peristaltic metering pump DULCO flex Control, DFXa". Stop PROFINET[®]: The pump has been stopped using PRO-FINET[®]. The master has sent the pump a corresponding telegram.

Stop manual: The pump has been stopped using the [Start/Stop] key. The master has sent the pump a corresponding telegram.

 \leftarrow Connection error: If the pump loses its connection to the PRO-FINET[®] (as soon as the BUS cable is removed, the bus master is switched to "Stop" status or the bus master becomes inoperative, for example), then the [4] error symbol and the \leftarrow symbol appear.

• Error module: If the pump loses its connection to the BUS module (as soon as the BUS module is removed or if communication between the BUS module and pump is interrupted for other reasons, for example), the error symbol [4] and the • symbol appear.

4.3.3 LEDs on the PROFINET[®] module

LED 1 (left) - module operating status

Signal	Cause
Off	The module has no supply voltage or connection.
Green	The module and the master are exchanging information.
Green flashing	The module has been initialised.

LED 2 (right) - module status

Signal	Cause
Off	The module has not been initialised.
Green	The module has been initialised / normal mode
Green flashing, single flash	The module has been initialised and there are diagnostic mes- sages.
Green flashing, 1 Hz	DCP flash
Red	Serious exception error
Red, single flash	Configuration error
Red, double flash	IP address error
Red, triple flash	Station name error
Red, quadruple flash	Internal error

4.3.4 Using the metering monitor

The "Metering monitor" socket must be used to use the metering monitor in PROFINET[®] mode. The pump then transmits *'available'* for the "Flow" status bit. The metering monitor can be switched on and off using the PROFINET[®] by means of the *'Metering monitor'* and/or *'FlowControl'* parameters.

If the metering monitor is set to '*Active*', it issues either a warning or an error with DULCO flex Control DFXa.

4.4 Installation

Bus installation



CAUTION! Degree of protection IP 65

 IP 65 degree of protection only applies if the appropriate assembly accessories (cable openings etc.) have been fitted correctly.

The connection to the existing LAN infrastructure is provided by a suitable LAN cable, e.g. twisted pair cable (CAT5 or higher) to comply with IP 65 with a screwed M12x1 plug, 4-pin, D-coded to IEC 61076-2-101. Complies with IEEE 802.3.

Tab. 39: Connectors

Module label	Meaning
OUT	Port 1
IN	Port 2

Mains extension:

Copper-based twisted pair cable (TP) maximum 100 metres.

4.5 Operation

4.5.1 General

Using the connected PROFINET[®] module, the pump in the PRO-FINET[®] represents a device with slave functionality. User data is then transmitted cyclically.

4.5.2 GSDML file

Use the GSDML file to configure the master. The GSDML file describes all the features of the pump in PROFINET[®] mode (keywords, diagnostics, modules, sub-modules). The GSDML file can be downloaded from the PROFINET[®] website and from the ProMinent website. The file name is clearly indicated:

GSDML-V2.35-Prominent-DFXa-20191118.xml.

4.5.3 DULCO flex Control DFXa, DFXa data objects

Tab. 40: Status and control

Module/ slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Descripti	on	
							Bit	Name	Function
1	1	State	Status	40.83	u32	R	0	Motor	Motor state 0 = Motor idle, 1 = Motor run- ning)
							1	-	-
							2 4	Mode	00 – halt 01 – manual 02 – batch 03 – contact 04 – analogue
							5	Error	There are errors - see "Errors"
							6	Warn- ings	There are warn- ings - see "Warn- ings"
							7	Manual stop	Pump has been stopped manually
							8	Stop	Pump has stopped
							9	Priming	Pump is in pri- ming operation (higher-level function)
							10	Auxil- iary	Pump is in auxil- iary operation (higher-level function)
							11	Pause	Pump has been switched to <i>'Pause'</i> status (higher-level function)
							12	Module	Fieldbus active
							13	Tube Service	Tube Service being performed
							14	Batch Mem.	Batch memory is activated
							15	Cali- brated	Pump is cali- brated
							16	-	-
							17	-	-
							18	-	-

Module/ slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Descripti	Description		
							Bit	Name	Function	
							19	Tube rupture sensor	Tube rupture sensor is installed	
					20	Con- centra- tion	Concentration calculation is acti- vated			
					21	-	-			
						22	-	-		
					23	-	-			
				24	-	-				
			25	-	-					
							26	-	-	
							27	-	-	
							28	-	-	
							29	-	-	
							30	-	-	
							31	-	-	
2	1	Start / Stop Control 80.81 u8 Reset u8 u8		u8	S	Correspo Start / St stopped	rresponds to <i>[Start/Stop]</i> key; if irt / Stop = 0, then the pump is pped			
	2				u8		If the reset value is switched from 1 to 0, the internal pump memory is cleared (e.g. with batch metering) and - as far as possible - pending errors are deleted			

* R = read, W = write

Tab.	41: Mode.	Flow rate.	Max. flow rate.	Batch. Contact.	Concentration.	Meterina monitor
ruo.	11. moao,	<i>i ion iuto</i> ,	max. non rate,	Duton, Contaol,	00110011110111,	motoring mornitor

Module/ slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Descripti	on	
3	1	Mode	Mode	Mode C0,80,8 u8 R,		R, W	Value	Name	Description
	0	U			0.16	Stop	Pump is ready but not metering.		
							1	Manual	Pump is metering continuously with the set volume
					2	Batch	When triggered, the pump is metering the volume set in the batch code		

Module/ slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Descripti	on		
							3	Contact	Pump is metering volume in the predefined time	
					R, W	4	Analog	Pump is metering in accordance with the analogue signal and ana- logue mode set on the pump.		
						17	Manual (con- centr.)	Manual in con- centration mode		
							18	Batch (con- centr.)	Batch in concen- tration mode	
							19	Contact (con- centr.)	Contact in con- centration mode	
							20	Analog (con- centr.)	Analogue in con- centration mode	
4	1	Nominal flow rate	Flow rate	C0,83,8 3	f32	S	Capacity	setpoint i	n litres / hour	
	2	Actual flow rate			f32	R	Actual ca	pacity val	ue	
5	1	Max. flow rate	Max. flow rate	40.83	f32	R	Maximun	n capacity	in litres / hour	
6	1	Batch volume	Batch	C0,83,8 8	f32	S	Batch me	etering vol	ume	
	2	Batch time			u16		Time in v metered	which the t	patch is to be	
	3	Batch start			u8		If the value changes from 1 to 0, batch metering is activated in batch mode. (Batches may also be acti- vated via the contact input.)			
	4	Batch memory			u8		If "Batch new batc metering remaining increased the "Batc the rema the new l	Memory" h is activa already ir g metering d by that c h Memory ining volu patch start	is activated and a ted during a batch progress, the y volume is of the new batch. If " is not activated, me is deleted and ted.	
	5	Remaini ng volume			f32	R	The remain batch i	aining volu mode	ime to be metered	
7	1	Contact volume	Con- tact	80.84	f32	S	Volume r	metered p	er contact	

Module/ slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Description
	2	Contact memory			u8		- see "Batch Memory"
8	1	Con- centra- tion rate	Con- centra- tion	C0,83,8 3	f32	S	Concentration setting setpoint (only in <i>'Concentration'</i> operating mode)
	2	Actual concen- tration			f32	R	Actual value of concentration setting (only in <i>'Concentration'</i> operating mode)

* R = read, W = write

Tab. 42: Error / Warning

Module /slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Descripti	on	
9	1	Error	Error /	40.85	u32	R	Bit	Name	Function
	warning				0	Minimum	Metering medium level is too low		
				1	Batch	Too many metering strokes: > 100,000			
							2	Analog < 4mA	Analogue cur- rent is less than 4 mA
							3	Analog > 23mA	Analogue cur- rent is greater than 23 mA
							4	Tem- perature fault	Temperature too high
						5	Hose rupture	Metering hose damaged	
							6	-	
							7	-	
							8	-	
							9	-	
							10	-	
							11	-	
							12	-	
							13	Bus error	Bus error reported by the module
					14	System error	System compo- nents faulty - see display		

Module /slot	Index	Name	Module name	Identifi- cation (hex)	Туре	Data flow *	Descriptio	on	
							15	Module error	Error in module handling
							16	-	
							17	-	
							18	-	
							19	-	
							20	-	
							21	-	
							22	-	
							23	-	
							24	-	
							25	-	
							26	-	
							27	-	
							28	-	
							29	-	
							30	-	
							31	-	
	2	Warn-			u16		Bit	Name	Function
		ings					0	Minimum	Metering liquid is low
							1	Calibra- tion	-
							2	-	
							3	-	
							4	-	
							5	-	
							6	-	
							7	-	
							8	-	
							9	-	
							10	-	
							11	-	
							12	-	
							13	-	
							14	-	
							15	-	

* R = read, W = write

Madula/	Index	Nomo	Madula	Dieg	Idontifi	Tumo	Data	Description
slot	Index	Name	name	number	cation (hex)	туре	flow *	Description
10	1	Reset stroke counter	Strokes /quan- tity	20	C0,81, C5	u8	S	If the value changes from 1 to 0, the <i>'Stroke counter'</i> (total number of strokes) is reset
	2	Reset 21 quantity counter		u8		If the value changes from 1 to 0, the <i>'Quantity counter'</i> (total number of litres) is reset		
	3	Stroke counter		22		u32	R	Counts the number of strokes - since the last reset (<i>'Stroke counter'</i>)
	4 Quan- tity counter	23			f32		Counts the metering volume in litres - since the last reset (<i>'Quantity</i> <i>counter'</i>)	
	5	Litres per stroke		24		f32		Litres per stroke
	6	Live- span hose		25		u32		Hose service life

Tab. 43: Strokes / quantity and individual data

* R = read, W = write

Diagnostic telegrams

0 0

In conformity with PROFIBUS[®] standard, the device makes the *[Get_Sl_Diag]* service available. The diagnostics data comprise standard diagnostics information (6 bytes according to PRO-FIBUS[®] standard) and any possible diagnostics data specific to the device. A maximum of 63 bytes can be added for the device-specific diagnostics data. Of these, the first 4 bytes in the PROFIBUS[®] standard are specified:



Length of the status DU including the header byte: 04..63 'Device-related diagnostics' specification: 00 constant



Encode the status_type byte as follows:

Status type: 48 (manufacturer-specific) 'Status' specification: 1 constant



Encode the slot_number byte as follows:

Slot number: 0 (because only slot 0 is being used)

	Ι.				()	0)	
\square		-							
									 -
									 -

Encode the specifier byte as follows:

Status specification: 00 constant Reserved

59 bytes subsequently remain freely available (user_data):

user_data

Errors are indicated using the user_data fields.

The user_data fields are each combined in blocks of 3 bytes and are interpreted as follows:

- 1 Services
- 2 Error type
- 3 Type of data access (read/write)

Up to 19 errors can thereby be indicated.

Tab. 44: User_Data

Order number	Name	Explanation
1	Status	- see "DULCO flex Control DFXa data objects" table
11	Start/Stop	Complies with Start/Stop switch;
		If Start/Stop = 0, then the pump is stopped
12	Reset	Clear internal pump memory and pending errors by changing "1" to "0"
21	Target operating mode	- see "DULCO flex Control DFXa data objects" table
22	Actual operating mode	- see "DULCO flex Control DFXa data objects" table
31	Target capacity	Setpoint capacity in [l/h]
32	Actual capacity	Actual capacity value in [l/h]
41	Max. metering capacity	Maximum capacity in [l/h]
51	Volume per contact "batch mode"	Volume to be delivered with con- tact in batch mode
52	Metering time batch mode	Time in which the batch volume is to be delivered
53	Batch start	Start batch metering by changing "1" to "0"
54	Batch memory	If "1", the volume to be delivered is added up for each additional batch contact; if "0", the remaining volume is cleared and a new batch process is started
55	Remaining volume batch mode	Remaining volume to be metered in batch mode
Order number	Name	Explanation
--------------	-------------------------------------	--
61	Volume per contact "contact mode"	Volume to be delivered with con- tact in contact mode
62	Contact memory	If "1", the volume to be delivered is added up for each additional batch contact; if "0", the remaining volume is cleared and a new con- tact process is started (same as "batch memory")
71	Setpoint final concentration	Desired final concentration in con- centration mode
72	Actual value of final concentration	Current final concentration in con- centration mode
81	Error	- see "DULCO flex Control DFXa data objects" table
82	Warnings	- see "DULCO flex Control DFXa data objects" table
91	Reset stroke counter	Reset stroke counter by changing "1" to "0"
92	Reset metering quantity counter	Reset metering quantity counter by changing "1" to "0"
93	Deletable stroke counter	Number of strokes since the last reset
94	Deletable metering quantity counter	Totalled metering volumes since the last reset
95	Litres per stroke	Litres per stroke
96	Hose service life	- see "DULCO flex Control DFXa data objects" table
101	Identity code	Pump identity code
102	Serial number	Pump serial number
103	Pump name	Pump name, freely determinable
104	Installation site	Installation site, freely determi- nable

Tab. 45: Services 2		
Value	Meaning	
0x30	OK	-
0x31	Transfer OK	Date outside of permitted limits
0x32	Transfer OK	Date protected
0x33	Transfer OK	Date rejected because device is in manual and not in remote operation
0x34	Transfer OK	Date rejected because option is not installed
0x35	Transfer OK	Service not defined
0x36	Transfer OK	Value cannot be read or changed in current device context

Supplementary Operating Instructions for PROFINET®

Value	Meaning	
0x37	Transfer OK	No further updating
0x55	Transfer OK	Fuse / UART error
0x56	Error in timeout	-

Tab. 46: Data access types

Value	Meaning
0xD3	Write access
0xE5	Read access

4.5.4 Diagnostic messages and types of data access

The diagnostic messages are shown in plain text in the PLC.

Error type	Diagnostic messages
12755	Limit error when writing
12773	Limit error when reading
13011	Protected value
13029	Protected value
13267	Device not in remote mode
13285	Device not in remote mode
13523	Option not installed
13541	Option not installed
13779	Service not defined
13797	Service not defined
14035	Value cannot be changed
14053	Value cannot be changed

Tab. 47: Data access types

Value	Meaning
0xD3	Write access
0xE5	Read access

4.5.5 PLC error and pump behaviour

PLC error	Pump behaviour
IOPS = bad	stopped
Disconnected connection	stopped
Mains power On	stopped



ProMinent GmbH Im Schuhmachergewann 5-11 69123 Heidelberg Germany Telephone: +49 6221 842-0 Fax: +49 6221 842-419 Email: info@prominent.com Internet: www.prominent.com

981282, 1, en_GB