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Supplementary instructions: PROFINET®

DULCOMETER®
Multi-parameter Controller diaLog DACb

A2666

Please carefully read these operating instructions before use. · Do not discard.
The operator shall be liable for any damage caused by installation or operating errors.
The latest version of the operating instructions are available on our homepage.

General non-discriminatory approach

In order to make it easier to read, this document uses the male form in grammatical structures but with an implied neutral sense. It is aimed equally at both men and women. We kindly ask female readers for their understanding in this simplification of the text.

Supplementary information

Please read the supplementary information in its entirety.

Information

This provides important information relating to the correct operation of the unit or is intended to make your work easier.

Warning information

Warning information include detailed descriptions of the hazardous situation.

The following symbols are used to highlight instructions, links, lists, results and other elements in this document:

Tab. 1: More symbols

Symbol	Description
1. ▶	Action, step by step.
⇨	Outcome of an action.
⚕	Links to elements or sections of these instructions or other applicable documents.
■	List without set order.
[Button]	Display element (e.g. indicators).
	Operating element (e.g. button, switch).
'Display /GUI'	Screen elements (e.g. buttons, assignment of function keys).
CODE	Presentation of software elements and/or texts.

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1 Supplementary Instructions for PROFINET®

1.1 Prerequisites

Personnel must be familiar with the contents of the "Assembly and Operating Instructions for DULCOMETER® Multi-parameter Controller diaLog DACa".

The controller must have a PROFINET® module.

Validity of the supplementary instructions

These supplementary instructions are only valid when used in conjunction with the operating instructions for the Multi-parameter Controller diaLog DACb.

1.2 Terminal diagram for the DAC communication unit
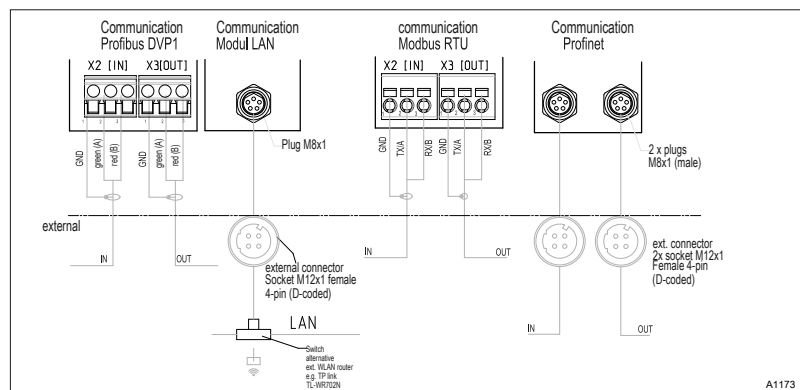
Fig. 1: Terminal diagram for the DAC communication unit (module B, optional)

1. ▸ Connect the PROFINET® to the DAC communication unit, Fig. 1.

2. ▸ Slot 1 is the left-hand *[IN]* connector.

3. ▸ Slot 2 is the right-hand *[OUT]* connector.

1.3 Adjusting the Controller

1.3.1 General

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

> ⓘ *Adjustment process cancelled*
> *The adjustment process is cancelled in the event of a pause longer than 60 seconds.*

1.3.2 Configuring PROFINET®

Remote configuration needs to be enabled to be able to configure and control the controller via the PROFINET®. The PROFINET® is always enabled but it does not accept external commands if remote configuration has not been enabled.

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All external inputs also work while the PROFINET® is enabled. The external inputs lead to the expected reactions, as in the case of a controller without PROFINET® functionality (see controller operating instructions). The controller sends corresponding information via the PROFINET® to the master (PLC Programmable Logic Controller, PC etc.).

Even if the remote configuration is set to inactive, the master is able to read-access the controller data defined in the GSDML file.

If the remote configuration is inactive or switched to inactive, then the settings for the operating mode selected prior to "inactive" status are reloaded in the controller.

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

1. ▶ To access the *'Menu'*: press the *[Menu]* key

2. ▶ Use the arrow keys to select the menu item *'Setup'* and confirm with *[OK]*

   ⇨ The *'Device setup'* menu appears.

3. ▶ Use the arrow keys to select the menu item *'Bus configuration'* and confirm with *[OK]*

   ⇨ The *'Configuration'* menu appears.

4. ▶ In the *'Configuration'* menu, you can:

   ■ *'Remote configuration'*
     – Switch remote configuration on or off.
   ■ DHCP
     – Switch DHCP on or off.
   ■ *'IP address'*
     – You can set the IP address here at which the controller can be accessed.
   ■ *'Subnet'*
     – You can set the address of the subnet here.
   ■ *'Gateway'*
     – You can set the address of the gateway here.
   ■ *'DNS'*
     – You can set the address of the DNS here.
   ■ *'Station name'*
     – You can set the station name as an actual word e.g. "daca" or "daisy", using lower case letters only.

Origin of the designations

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

1.4 Special Features in Active PROFINET® Mode

1.4.1 General

> ℹ️ **Setting or programming**
>
> *In PROFINET® mode, the controller cannot be manually set or programmed. Switch off remote configuration to set or program the controller.*

■ The settings from the last operating mode without PROFINET® are carried over when switching to PROFINET® mode. By contrast, the settings made via the PROFINET® are not saved. They only apply as long as the controller is linked to the PROFINET®.

■ The controller stops if it is set to PROFINET® mode. The controller can be controlled again by pressing the 🔲 *[Stop/Start]* key. The start command is given via the PROFINET®.

1.4.2 Display

When PROFINET® mode is running there are further identifiers in the operating indicator.

> ℹ️ **Common identifiers**
>
> *The common identifiers are described in the controller operating instructions.*

1.4.3 LEDs on the PROFINET® DP 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 messages.
Green flashing, 1 Hz	DCP flash
Red	Serious exception error
Red, single flash	Configuration error
Red, double flash	IP address error

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Signal	Cause
Red, triple flash	Station name error
Red, quadruple flash	Internal error

1.5 Installation

Bus installation

> ⚠️ **CAUTION!**
> **Degree of protection IP 67**
> – IP 67 degree of protection only applies if the appropriate assembly accessories (cable passages etc.) have been correctly installed (see controller assembly and operating instructions).

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 67 with a screwed M12x1 plug, 4-pin, D-coded to IEC 61076-2-101. Complies with IEEE 802.3.

Mains extension:

■ Copper-based twisted pair cable (TP) maximum 100 metres.
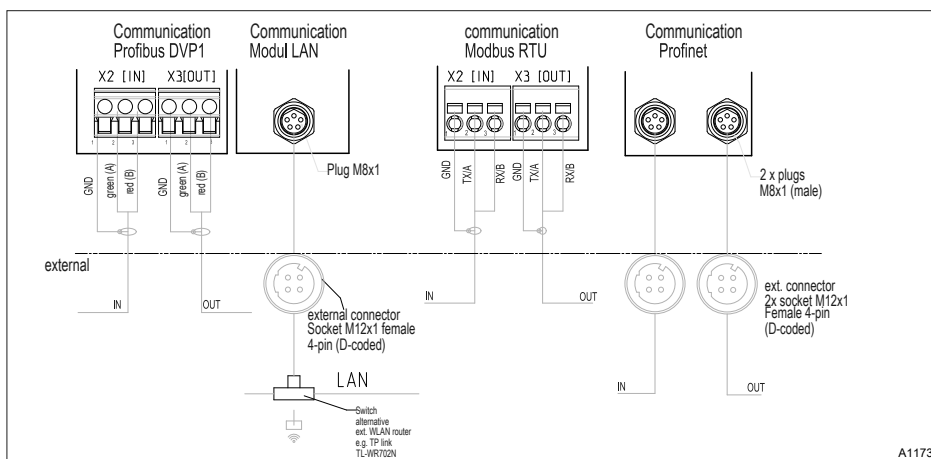
Fig. 2: Terminal diagram of the communication modules

1.6 Operation

1.6.1 General

When the PROFINET® module is connected, the controller in the PROFINET® represents a subscriber with slave functionality.

1.6.2 GSDML file

Use the GSDML file to configure the master. The GSDML file describes all the features of the controller in PROFINET® mode (keywords, diagnosis, 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-V2.32-Prominent-DACa-PRT2P-20150721.xml .

1.6.3 Description of the DACa data objects

Tab. 2: Output data

Slot	Index	Name	Module name		Data type	Byte count	Total:
		Output data					
		Channel 1	*'Channel 1'*				
1	2			Measured value	FLOAT	4	
1	3			Controller control variable	INT16	2	
1	4			Temperature	INT16	2	0.1 °C
1	5			Setpoint	FLOAT	4	
1	6			Channel status	UINT16	2	↰ *Chapter 1.7.1 'Status of the channel' on page 14*
1	7			Warnings	UINT16	2	↰ *Chapter 1.7.3 'Warning of the channel' on page 17*
		Channel 2	*'Channel 2'*				
2	2			Measured value	FLOAT	4	
2	3			Controller control variable	INT16	2	
2	4			Temperature	INT16	2	0.1 °C
2	5			Setpoint	FLOAT	4	
2	6			Channel status	UINT16	2	↰ *Chapter 1.7.1 'Status of the channel' on page 14*
2	7			Warnings	UINT16	2	↰ *Chapter 1.7.3 'Warning of the channel' on page 17*
		Channel 3	*'Channel 3'*				
3	2			Measured value	FLOAT	4	
3	3			Controller control variable	INT16	2	

Slot	Index	Name	Module name		Data type	Byte count	Total:
3	4			Temperature	INT16	2	0.1 °C
3	5			Setpoint	FLOAT	4	
3	6			Channel status	UINT16	2	♨ *Chapter 1.7.1 'Status of the channel' on page 14*
3	7			Warnings	UINT16	2	♨ *Chapter 1.7.3 'Warning of the channel' on page 17*
		Channel 4 (differential channel)	*'Channel 4'*				
4	1			Measured value	FLOAT	4	
4	2			Channel status	UINT16	2	♨ *Chapter 1.7.1 'Status of the channel' on page 14*
4	3			Warnings	UINT16	2	♨ *Chapter 1.7.3 'Warning of the channel' on page 17*
		Digital out-puts	*'digital output'*				
5	1			Relay	UINT16	2	♨ *Chapter 1.7.4 'Potential-free relay' on page 18*
5	2			MosFET 1	UINT16	2	Frequency
5	3			MosFET 2	UINT16	2	Frequency
5	4			MosFET 3	UINT16	2	Frequency
5	5			MosFET 4	UINT16	2	Frequency
		Error	*'errors'*				

Slot	Index	Name	Module name		Data type	Byte count	Total:
6	1			Error channel 1	UINT32	4	↻ *Chapter 1.7.2 'Error of the channel' on page 16*
6	2			Error channel 2	UINT32	4	↻ *Chapter 1.7.2 'Error of the channel' on page 16*
6	3			Error channel 3	UINT32	4	↻ *Chapter 1.7.2 'Error of the channel' on page 16*
6	4			Error channel 4	UINT16	2	↻ *Chapter 1.7.2 'Error of the channel' on page 16*

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Tab. 3: Input data

Slot	Index	Name	Module name		Data type	Byte count	Total:
		Input data					
		Stop / Pause (belongs to the *'Channel1/ Channel2'* module)					
1	1		*'Channel 1'*	Stop / Pause channel 1	UINT8	1	Bit 7 = Stop Bit 1 = Pause/ HOLD Bit 0 = Pause
2	1		*'Channel 2'*	Stop / Pause channel 2	UINT8	1	Bit 7 = Stop Bit 1 = Pause/ HOLD Bit 0 = Pause
3	1		*'Channel 3'*	Stop / Pause channel 3	UINT8	1	Bit 7 = Stop Bit 1 = Pause/ HOLD Bit 0 = Pause
		Controller channel 1	*'controller channel 1'*				
7	1			Configuration	UINT16	2	⮆ *Chapter 1.7.5 'Settings of the channel configuration' on page 19* (Parameter via bus, mode, limit value direction, control time)
7	2			Limit value 1 value	FLOAT	4	
7	3			Limit value 2 value	FLOAT	4	
7	4			Setpoint 1	FLOAT	4	
7	5			Xp	FLOAT	4	
		Controller channel 2	*'controller channel 2'*				

Slot	Index	Name	Module name		Data type	Byte count	Total:
8	1			Configuration	UINT16	2	✋ *Chapter 1.7.5 'Settings of the channel configuration' on page 19* (Parameter via bus, mode, limit value direction, control time)
8	2			Limit value 1 value	FLOAT	4	
8	3			Limit value 2 value	FLOAT	4	
8	4			Setpoint 1	FLOAT	4	
8	5			Xp	FLOAT	4	
		Controller channel 3	*'controller channel 3'*				
9	1			Configuration	UINT16	2	✋ *Chapter 1.7.5 'Settings of the channel configuration' on page 19* (Parameter via bus, mode, limit value direction, control time)
9	2			Limit value 1 value	FLOAT	4	
9	3			Limit value 2 value	FLOAT	4	
9	4			Setpoint 1	FLOAT	4	
9	5			Xp	FLOAT	4	
		Error confirmation	*'error confirmation'*				
10	1			Error channel 1	UINT32	4	`0xFFFFFFFF` * => all pending errors have been confirmed ✋ *Chapter 1.7.2 'Error of the channel' on page 16*

Slot	Index	Name	Module name		Data type	Byte count	Total:
10	2			Error channel 2	UINT32	4	`0xFFFFFFFF` * => all pending errors have been confirmed ↳ *Chapter 1.7.2 'Error of the channel' on page 16*
10	3			Error channel 3	UINT32	4	`0xFFFFFFFF` * => all pending errors have been confirmed ↳ *Chapter 1.7.2 'Error of the channel' on page 16*
10	4			Error channel 4	UINT16	2	`0xFFFF` * => all pending errors have been confirmed ↳ *Chapter 1.7.2 'Error of the channel' on page 16*

* These errors can also be deleted/acknowledged individually.

Slot	Index	Name	Module name		Data type	Byte count	Total:
		Controller parameter channel 1	*'controller parameter ch1'*				
11	1			Additive basic load	INT16	2	
11	2			Control variable limit	UINT16	2	
11	3			Delay after stop	UINT16	2	
11	4			Delay after restart	UINT16	2	
11	5			Setpoint 2	FLOAT	4	only with neutral zone control
		Controller parameter channel 2	*'controller parameter ch2'*				

Slot	Index	Name	Module name		Data type	Byte count	Total:
12	1			Additive basic load	INT16	2	
12	2			Control variable limit	UINT16	2	
12	3			Delay after stop	UINT16	2	
12	4			Delay after restart	UINT16	2	
12	5			Setpoint 2	FLOAT	4	only with neutral zone control
		Controller parameter channel 3	*'controller parameter ch3'*				
13	1			Additive basic load	INT16	2	
13	2			Control variable limit	UINT16	2	
13	3			Delay after stop	UINT16	2	
13	4			Delay after restart	UINT16	2	
13	5			Setpoint 2	FLOAT	4	only with neutral zone control

1.7 Bit field definitions

1.7.1 Status of the channel

Bit	Description
15	1 = channel uses bus control parameters; 0 = channel uses internal parameters
14	
13	1 = error exists; 0 = no error
12	1 = warning exists; 0 = no warning
11	1 = SD card full; 0 = SD card not full
10	1 = SD card free < 20%; 0 = SD card free ≧ 20%
9	1 = SD card exists; 0 = no SD card
8	1 = local control rate 2 active; 0 = local control rate 1 active
7	
6	
5	
4	

Bit	Description
3	
2	
1	1 = local stop active; 0 = no local stop active
0	1 = channel active; 0 = channel inactive (or cannot be connected)

1.7.2 Error of the channel

Bit	Description
31	Error 99: There is a system error; *[A system error exists]*
30	
29	
28	
27	
26	
25	
24	
23	
22	
21	
20	Error 88: The connection to the extension module is faulty; *[The connection to the expansion module is faulty]*
19	Error 34: Incorrect correction variable; *[Incorrect correction variable]*
18	Error 19: The liquid level in storage tank 3 is too low; *[The level in tank 3 is too low]*
17	Error 18: The liquid level in storage tank 2 is too low; *[The level in tank 2 is too low]*
16	Error 17: The liquid level in storage tank 1 is too low; *[The level in tank 1 is too low]*
15	Error 16: The mA input is overloaded; *[The mA input is overloaded]*
14	Error 15: The mA input supply is overloaded; *[The mA input supply is overloaded]*
13	Error 14: The status of the controller is pause / hold *[PAUSE / HOLD]*; *[The controller is in the state PAUSE / HOLD]*
12	Error 13: The status of the controller is pause *[PAUSE]*; *[The controller is in the state PAUSE]*
11	Error 12: There is a sample water fault e.g. no flow; *[Error sample water exists, e. g. no flow]*
10	Error 11: After elapse of the delay period, a limit value error still exists; *[After elapsing of the delay time a limit error still exists]*
9	Error 10: The mA input current is less than 4 mA; *[The mA input current is less than 4 mA]*
8	Error 9: The mA input current is greater than 20 mA; *[The mA input current is greater than 20 mA]*
7	Error 8: The check time was infringed; *[The checkout time was infringed]*
6	Error 7: Check the mechanical condition (glass breakage) of the sensor; *[Check the mechanical status of the sensor Glass break is possible]*
5	Error 6: No sensor available; *[No sensor is available]*
4	Error 5: Calibration error exists; *[A calibration error exists]*
3	Error 4: The temperature is too high; *[The temperature is too high]*
2	Error 3: The temperature is too low; *[The temperature is too low]*
1	Error 2: The mV input voltage is too high; *[The mV input voltage is too high]*
0	Error 1: The mV input voltage is too low; *[The mV input voltage is too low]*

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1.7.3 Warning of the channel

Bit	Description
15	
14	
13	
12	
11	
10	
9	
8	
7	
6	Warning 73: The fan has a fault; *[The fan has an error]*
5	Warning 72 The time must be checked; *[The time must be checked]*
4	Warning 71 The battery needs to be replaced; *[The battery must be replace]*
3	Warning 4 The measuring channel is not yet calibrated; *[The measuring channel is not yet calibrated]*
2	Warning 3 The wash timer has timed out. Maintenance is required; *[The wash timer has timed out. Maintenance is necessary]*
1	Warning 2 The limit value was exceeded; *[The limit was exceeded]*
0	Warning 1 The limit value was not reached; *[The limit was undershot]*

1.7.4 Potential-free relay

If relay output is active, then according bit is used.

Bit	Description
15	
14	
13	
12	
11	
10	
9	
8	
7	
6	
5	
4	
3	
2	Configuring alarm relay (XR3)
1	Relay 2 (XR2)
0	Relay 1 (XR1)

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1.7.5 Settings of the channel configuration

Bit	Description		
15	1 = Channel uses remote control parameters; 0 = Channel uses internal parameters; [1 = Channel uses remote control parameters; 0 = Channel uses internal parameters]		
14	1 = Channel uses internal set 2; 0 = Channel uses internal set 1; [1 = Use internal parameter set 2; 0 = Use internal parameter set 1]		
13			
12			
11			
10			
9			
8	1 = Limit value 2 configuration on; 0 = limit value 2 configuration off [1 = limit 2 configuration on; 0 = limit 2 configuration off]		
7	1 = Limit value 1 configuration on; 0 = limit value 1 configuration off [1 = limit 1 configuration on; 0 = limit1 configuration off]		
6	0 = Control off;	1 = manual	2 = P (1 way, increase)
5	[0 = Control off]	[1 = manual]	[2 = P (1 way, increase)]
4	3 = P (1 way, decrease);	4 = P (2 way, standard)	5 = P (2 way, dead zone)
3	[3 = P (1 way, decrease)]	[4 = P (2 way, standard)]	[5 = P (2 way, deadzone)]
	6 = PID (1 way, increase)	7 = PID (1 way, decrease);	8 = PID (2 way, standard)
	[6 = PID (1 way, increase)]	[7 = PID (1 way, decrease)]	[8 = PID (2way, standard)]
	9 = PID (2 way, dead zone)		
	[9 = PID (2 way, deadzone)]		
2			
1	1 = Limit value 2 configuration high; 0 = limit value 2 configuration low; [1 = limit 2 configuration high; 0 = limit 2 configuration off]		
0	1 = Limit value 1 configuration high; 0 = limit value 1 configuration low; [1 = limit 1 configuration high; 0 = limit 1 configuration off]		

- Bit 14 is only valid if bit 15 = 0
- Bit 3, 4, 5, 6 are only valid if bit 15 = 1
- Bit 3, 4, 5, 6, 14, 15 only exists on channels 1 and 2

1.8 Diagnostic messages

The diagnostic messages are shown in plain text in the PLC Programmable Logic Controller.

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

1.9 PLC Programmable Logic Controller error message and controller behaviour

PLC Programmable Logic Controller error message	Controller behaviour
IOPS = bad	stopped
Disconnected connection	stopped
Mains power On	stopped