

SMART Digital XL DDA and DDE

From 60 to 200 l/h

Service instructions



Installation and operating instructions
DDA
<http://net.grundfos.com/qr/i/98767821>



Installation and operating instructions
DDE
<http://net.grundfos.com/qr/i/98767824>

Original service instructions

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1. Purpose and target group of this document

This document is intended for trained and certified service persons, and describes advanced repair and testing procedures for the SMART Digital XL dosing pump types DDA and DDE from 60 to 200 l/h.



The procedures described in this document require expert knowledge and must only be carried out by certified service persons authorised and qualified by Grundfos.

To identify your product see the type key and nameplate description in the installation and operating instructions:

Installation and operating instructions DDA

- <http://net.grundfos.com/qr/i/98767821>

Installation and operating instructions DDE

- <http://net.grundfos.com/qr/i/98767824>

2. Symbols used in this document

2.1 Hazard statements



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious personal injury.

The text accompanying the hazard symbol WARNING is structured in the following way:



SIGNAL WORD

Description of hazard

Consequence of ignoring the warning.

- Action to avoid the hazard.

2.2 Notes



If these instructions are not observed, it may result in malfunction or damage to the equipment.



Tips and advice that make the work easier.

2.2.1 Safety instructions

Important safety information as well as instructions on standard service procedures for users can be found in the installation and operating instructions of the product.

Installation and operating instructions DDA

- <http://net.grundfos.com/qr/i/98767821>

Installation and operating instructions DDE

- <http://net.grundfos.com/qr/i/98767824>

WARNING

Electric shock



Death or serious personal injury

- Before starting any work on the product, pull out the mains plug, or switch off the power supply and make sure it cannot be accidentally switched on.
- Keep liquids away from the power supply and electrical components.

WARNING

Chemical hazard

Death or serious personal injury



- Before starting work on the pump, the system must be pressureless.

- Observe the material safety data sheet of the dosing medium.

- Wear protective clothing (gloves and goggles) when working on the dosing head, connections or lines.

2.3 Diaphragm leakage

If the diaphragm leaks or is broken, dosing liquid escapes from the drain opening in the dosing head.

In case of diaphragm leakage, the safety diaphragm protects the pump housing against the ingress of dosing liquid.

When dosing crystallising liquids, the drain opening can be blocked by crystallisation. If the pump is not taken out of operation immediately, pressure can build up between the diaphragm and the safety diaphragm. In consequence, dosing liquid can penetrate the safety diaphragm and enter the pump housing.

Most dosing liquids don't cause any danger when entering the pump housing. A few liquids can cause a chemical reaction with inner parts of the pump. In the worst case, this chemical reaction can produce explosive gases in the pump housing.

WARNING

Danger of explosion, if dosing liquid has entered the pump housing!

Death or serious personal injury

Operation with damaged diaphragms can lead to dosing liquid entering the pump housing.



- In case of diaphragm leakage, immediately separate the pump from the power supply!
- Make sure the pump cannot be put back into operation by accident!
- Dismantle the dosing head without connecting the pump to the power supply and make sure no dosing liquid has entered the pump housing. If the safety diaphragm is damaged, the pump cannot be repaired and must be replaced.

3. Special tools

3.1 PC Tool for E-Products

The PC Tool for E-Products consists of hardware for pump connection and software for your computer. It is required for special service tasks, like firmware update and I/O board calibration after replacement.

For analog output calibration, an additional multimeter is required.

See section 6. *Firmware update, analog I/O calibration, store/restore settings*

3.2 Profi tester

The Profi tester is a special tool to check the inputs and outputs of Grundfos dosing pumps.

Product number: 99600937

3.3 Hydraulic test unit

The hydraulic test unit is used to check the hydraulic performance of Grundfos dosing pumps.

Product number: 99600938

4. Replacing the I/O board

Before replacing the I/O board you can use the Profi tester to check if it is damaged. See section 3.2 *Profi tester*.

1. Read section 2.2.1 *Safety instructions*.
2. Make the system pressureless.
3. Before starting any work on the product, pull out the mains plug, or switch off the power supply and make sure it cannot be accidentally switched on.

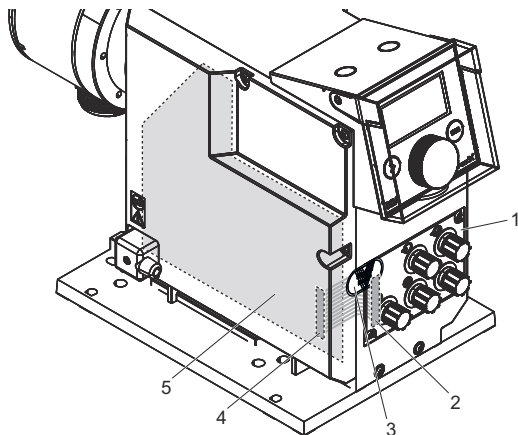


Fig. 1 Replacing the I/O board - overview

Pos.	Description
1	I/O board
2	Plug connector position at backside of I/O board
3	Seal sticker
4	Position of I/O board cable connection at main circuit board
5	Main circuit board

4. Remove the signal connections from I/O board (1).
5. Remove seal sticker (3).

The grey area (2) indicates the position of the plug connector at the backside of the I/O board. The grey area (4) indicates where the cable is fixed at the main circuit board (5).



The cable from the I/O board to the main circuit board is short. The cable is fixed permanently at the main circuit board.

Do not pull off the I/O board with force, otherwise the main circuit board or the cable can be damaged. The main circuit board and the cable cannot be repaired.

6. Remove the screws at the corners of I/O board (1).
 - Wrench size: TORX PLUS 15 IP

7. Carefully pull off the right side of the I/O board until you can reach the plug connector (2) on the backside.

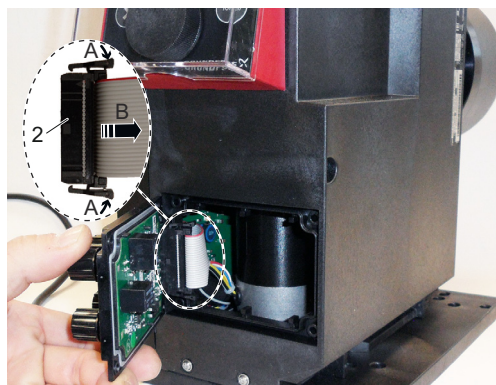


Fig. 2 I/O board plug connector

8. To disconnect plug connector (2) proceed as follows:
 - Press both latches (A) to unlock the plug.
 - Carefully pull off the plug in the direction of the arrow (B).
9. Remove the I/O board.
10. Connect the new I/O board and install it in reverse order.
11. Tighten the screws using a torque wrench.
 - Torque [Nm]: 1.7 (\pm 0.2)
12. Apply new seal sticker (3). Make sure the seal sticker covers the side cover and the top left screw of the I/O board.

Perform I/O board calibration

If an I/O board with analog connections was replaced, these connections must be calibrated.

The number of analog connections depends on the pump type and control variant.

Type	Control variant	Analog input	Analog output
DDA	AR	YES	YES
	FCM	YES	YES
DDE	AR	YES	-
	B	-	-

Perform calibration according to section 6. *Firmware update, analog I/O calibration, store/restore settings*.

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5. Replacing the control cube

1. Read section 2.2.1 *Safety instructions*.
2. Make the system pressureless.
3. Before starting any work on the product, pull out the mains plug, or switch off the power supply and make sure it cannot be accidentally switched on.

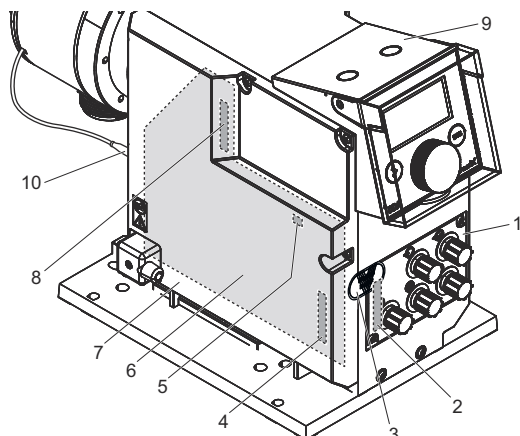


Fig. 3 Replacing the control cube - overview

Pos.	Description
1	I/O board
2	Plug connector position at backside of I/O board
3	Seal sticker
4	Position of I/O board cable connection at main circuit board
5	Hall sensor plug connector position at main circuit board
6	Main circuit board
7	Side cover (mains cable and main circuit board are fixed at this cover)
8	Control cube plug connector position at main circuit board
9	Control cube
10	FlowControl or DLD signal connection (DDA only)

4. Remove the I/O board (1) according to section 4. *Replacing the I/O board*.
5. Unplug FlowControl or DLD signal connection (10).
6. Carefully remove both protective caps on control cube (9) using a thin flathead screwdriver.
7. Remove the screws from control cube (9).
– Wrench size: TORX PLUS 15 IP
8. For best access to main circuit board (6) turn control cube (9) to the right.

The main circuit board (6) and the mains connection are fixed at the side cover (7). There are several cables connecting the main circuit board with other product components.

The cables from the main circuit board to other product components are short.

Do not pull off the side cover with force, otherwise the main circuit board or cables can be damaged. The main circuit board and cables (except control cube cable) cannot be repaired.

9. Remove the screws from side cover (7).
– Wrench size: TORX PLUS 15 IP
– Leave the mains cable fixed at the side cover.

10. Carefully open the side cover (7) at the front side of the pump, until you can reach the hall sensor plug connector (5) on the main circuit board.



Fig. 4 Hall sensor plug connector

11. Carefully pull off the plug in the direction of the arrow. You can use a pair of needle-nosed pliers (A), if necessary. The plug is not locked.
12. Carefully pull off side cover (7) until you can reach the control cube plug connector (8) on the main circuit board.

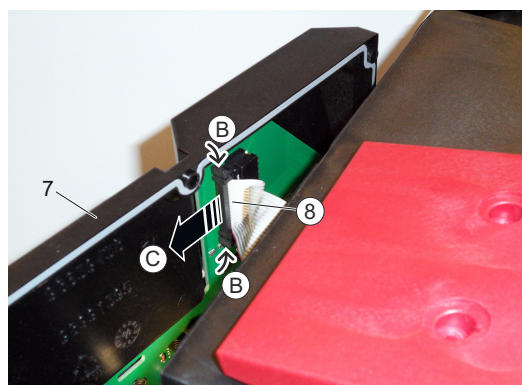


Fig. 5 Control cube plug connector

13. To disconnect plug connector (8) proceed as follows:
 - Press both latches (B) to unlock the plug.
 - Carefully pull off the plug in the direction of the arrow (C).
14. Remove the control cube and gasket.
15. Carefully pre-bend the cable of the new control cube as shown in detail (D).



Fig. 6 Control cube cable placement

16. Put the new control cube gasket in place.
17. Pass the cable through the control cube installation hole as shown in detail (E).
18. Plug in the control cube cable at the main circuit board.
19. Plug in the hall sensor cable at the main circuit board.

20. Install the side cover again.
 - Make sure that the cables do not have any sharp bends and are not pinched.
 - Make sure the I/O board cable is placed correctly for subsequent I/O board installation.
21. Tighten the screws using a torque wrench.
 - Torque [Nm]: 1.7 (\pm 0.2)
22. Turn the control cube into the original position.
23. Mount the screws at the control cube.
24. Tighten the screws using a torque wrench.
 - Torque [Nm]: 1.7 (\pm 0.2)
25. Apply the protective caps.
26. Plug in the I/O board cable.
27. Install the I/O board again.
28. Tighten the screws using a torque wrench.
 - Torque [Nm]: 1.7 (\pm 0.2)
29. Plug in the FlowControl or DLD signal connection (10) again.
30. Perform electrical testing as described in 5.1 *Dielectric voltage withstand test*.
31. Apply new seal sticker (3). Make sure the seal sticker covers the side cover and the top left screw of the I/O board.
32. Perform hydraulic calibration. See installation and operating instructions.

5.1 Dielectric voltage withstand test

WARNING



Electric shock

- Death or serious personal injury
- The described procedures must only be performed by a qualified electrician.

Test voltage: 1400 VAC or 2000 VDC

1. The test voltage must be applied between A and B which are defined as:
 - A: the short-circuited supply voltage connections
 - B: all accessible conductive parts (potential earth at mains cable, I/O board pins)
2. Raise the test voltage to the specified value within 5 seconds and maintain it for minimum 2 seconds.

6. Firmware update, analog I/O calibration, store/restore settings

6.1 Required equipment

The update & calibration process requires hardware to connect the pump to a PC and software to perform the process.

6.1.1 Hardware for firmware update and analog I/O calibration

PC Tool Link

The package (part no. **96705378**) contains the PC Tool Link, various cables and a driver CD.



Fig. 7 PC Tool Link



Fig. 8 RS485 cable with screw terminal connector from PC Tool Link package

Cable with female 5-pin M12 connector

To connect to the pump's GENIbus or analog output, a cable with a female 5-pin M12 connector is required:

- Part no. **96632921** (2m)
- or part no. **96632922** (5m)



Fig. 9 Cable with female 5-pin M12 connector



For analog output calibration, the analog output and the GENIbus must be connected at the same time, so two cables are required in this case.

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6.1.2 Additional hardware for analog output calibration

To measure the actual current on the analog output, a multimeter and a separate cable are required:

- The multimeter must have a DC current measuring range of 0-200 mA or 0-400 mA.
- The multimeter must have an accuracy of current measurement < 0.5 % Full Scale.
- The cable to connect the multimeter to the current output is the same as the GENIbus cable. See fig. 9.

6.1.3 Establishing the GENIbus connection (for firmware update, I/O calibration, store/restore settings)

1. Connect the female 5-pin M12 connector cable (see fig. 9.) to the GENIbus connector of the pump.
Connector symbol on pump:



2. Connect the open ends of the 5-pin M12 connector cable to the RS485 cable with screw terminal connector according to this table:

5-pin M12 connector cable	RS485 cable with screw terminal connector
White	Black
Blue	Blue
Yellow – Green	Yellow

6.1.4 Establishing the Analog output connection (for I/O calibration)

1. Connect the female 5-pin M12 connector cable (see fig. 9.) to the analog output connector of the pump.
Connector symbol on pump:



2. Connect the open ends of the 5-pin M12 connector cable to the multimeter's measuring leads according to this table:

5-pin M12 connector cable	Measuring lead of multimeter
Black	DC mA input (+)
Yellow - Green	GND (-)

6.1.5 Software

To perform the update, the installation of "PC Tool E-Products" (part. no. **96562934**) is required.

You can find the "PC Tool E-Products" page in GTI (Grundfos Technical Information), where you can download the software and find more information:

- <http://insite.grundfos.com/notes/techmar/modifica.nsf/6e56a3648c96eb09c1256c13003b9509/860a2698d0d005f2c125788b00479ba7>

The "PC Tool E-Products" page can also be found this way:

- Grundfos Insite->Toolbox->GTI->Service Support Tools->Grundfos PC Tools\PC Tool E-Product

COM port and user configuration

1. Start PC-Tool E-Products.
2. A message is displayed, indicating that no COM port is selected.
 - Click "OK" to select the correct COM port.
3. Click "Communication" in the next window and select the suitable port:

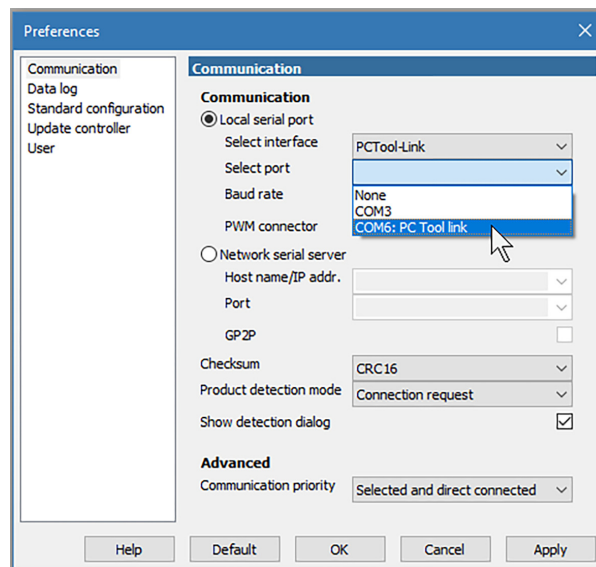


Fig. 10 COM port configuration

4. Switch user account for elevated permissions:
 - Click "File" -> "Preferences..."
 - Click "User" in the left window
 - Make sure user "Firmware updater" is selected. If not, select user "Firmware updater" and enter password "Program@456":

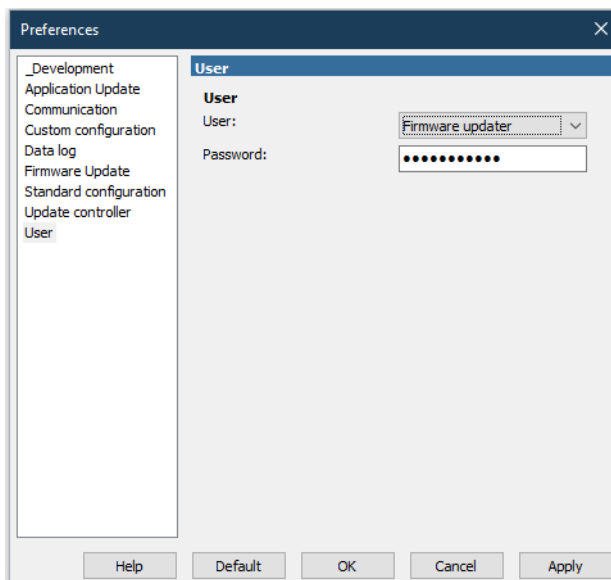


Fig. 11 User configuration

5. Click "OK" and restart "PC-Tool E-Products".

6.2 Updating the firmware



This kind of update does not affect the pump settings.

1. Make sure you have installed and configured the hardware and software according to section 6.1 *Required equipment*.
2. Start "PC-Tool E-Products" and click the "Firmware update" button.
3. Click "Select file for PIC32 flash" and select the *.aes file in the text box:

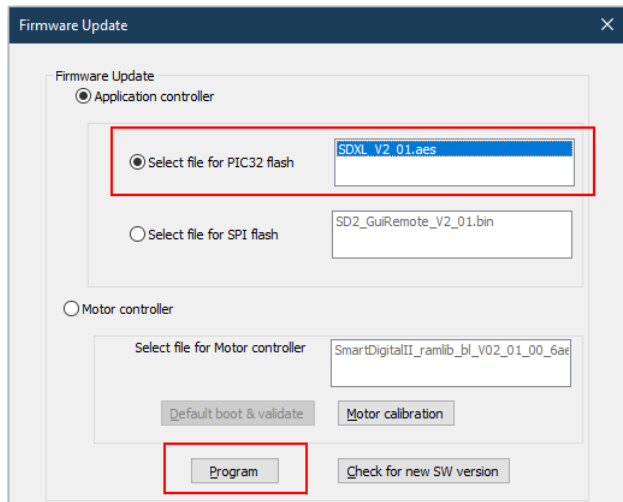


Fig. 12 Updating the firmware

4. Power-off the pump.
5. Click "Program".
6. Power-on the pump. The update process starts.
7. After the update the pump restarts automatically.

6.3 Updating the GUI data



This kind of update does not affect the pump settings.

1. Make sure you have installed and configured the hardware and software according to section 6.1 *Required equipment*.
2. Start "PC-Tool E-Products" and click the "Firmware update" button.
3. Click "Select file for SPI flash" and select the *.bin file in the text box:

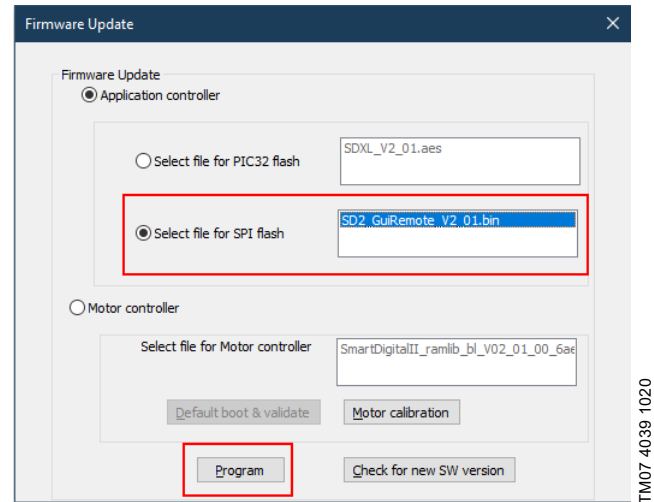


Fig. 13 Updating the GUI data

4. Power-off the pump.
5. Click "Program".
6. Power-on the pump. The update process starts.
7. After the update the pump restarts automatically.

6.4 Updating the motor controller



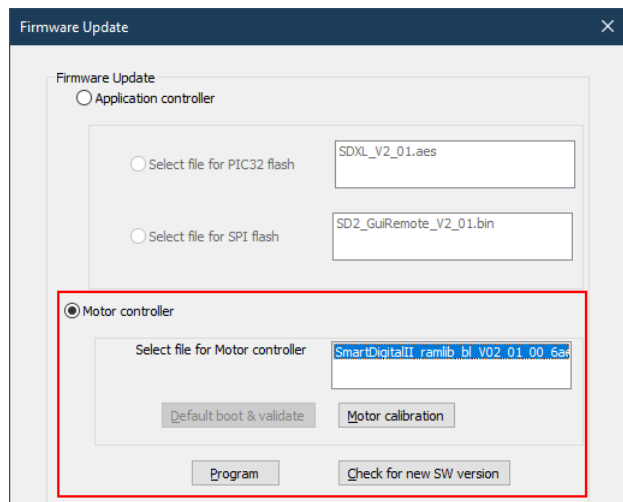
This kind of update does not affect the pump settings.

The motor controller update is a three-step process:

- Update of motor controller firmware
- Default boot and validation
- Motor calibration

6.4.1 Updating the motor controller firmware

1. Make sure you have installed and configured the hardware and software according to section 6.1 *Required equipment*.
2. Power-on the pump.
3. Start "PC-Tool E-Products" and click the "Firmware update" button.
4. Click "Motor controller" and select the *.xbin file in the text box:



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Fig. 14 Updating the motor controller firmware

5. Click "Program". The update process starts.

6.4.2 Default boot and validation

After the update of the motor controller firmware, click "Default boot, Validate" (fig. 14) to load default parameters and to check if the update process was successful.

In case of any error, repeat the motor controller firmware update.

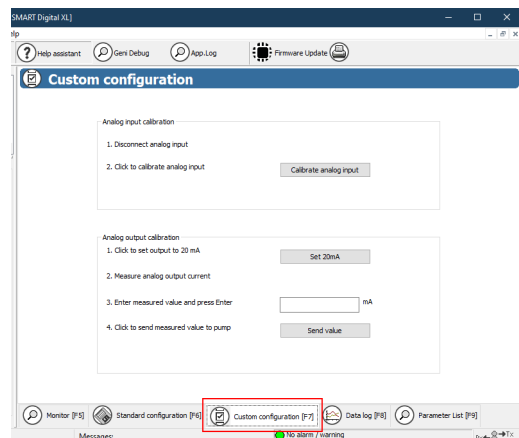
6.4.3 Motor calibration

Perform a motor calibration, if the motor does not run properly after the motor controller firmware update:

1. Start "PC-Tool E-Products" and click the "Firmware update" button.
2. Click "Motor calibration" (fig. 14). The motor runs at full speed for some seconds.
3. After the motor calibration the motor stops and the pump returns to normal operation.

6.5 Calibrating the analog input

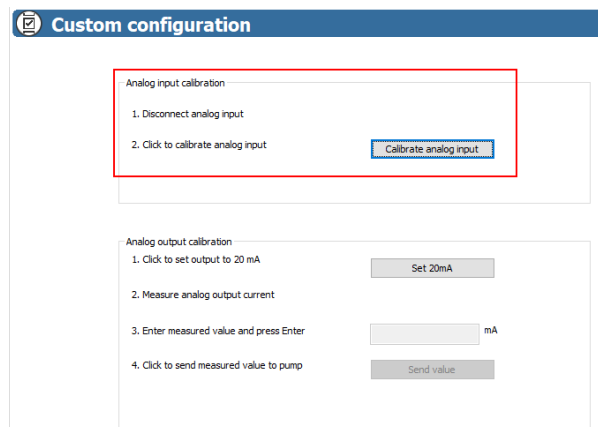
1. Make sure you have installed and configured the hardware and software according to section 6.1 *Required equipment*.
2. Start "PC-Tool E-Products" and click the "Custom configuration [F7]" button:



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Fig. 15 Opening the "Custom configuration" menu

3. Make sure all cables are disconnected from the analog input of the pump.
4. Click "Calibrate analog input". The calibration of the analog input starts.



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Fig. 16 Calibrating the analog input

5. After the calibration the pump restarts automatically.

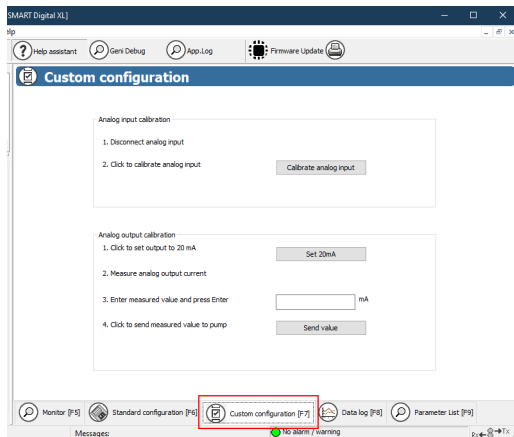
6.6 Calibrating the analog output

Calibration of the analog output is a two-step process:

- Set the analog output to a reference value of 20 mA and measure the actual current, using a multimeter (expected range: 18-22 mA)
- Write the measured value back into the pump, so the pump can adjust its output accordingly.

6.6.1 Performing the calibration

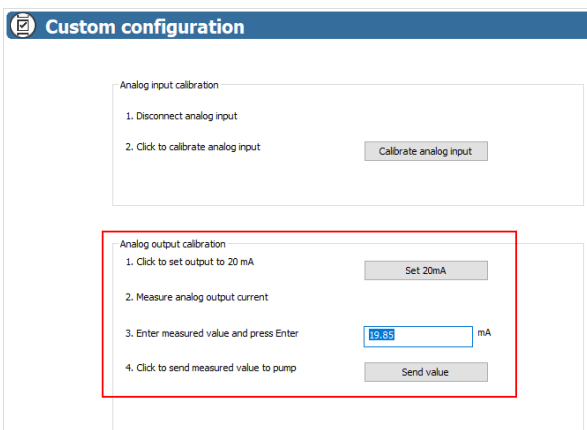
1. Make sure you have installed and configured the hardware and software according to section 6.1 *Required equipment*.
2. Start "PC-Tool E-Products" and click the "Custom configuration [F7]" button:



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Fig. 17 Opening the "Custom configuration" menu

3. Connect a multimeter to the analog output. Observe section 6.1.4 *Establishing the Analog output connection (for I/O calibration)*.
4. Click "Set 20 mA".
5. Read the measured current from the multimeter and enter the value into the input field.
 - Example: 19.85 mA.



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Fig. 18 Calibrating the analog output

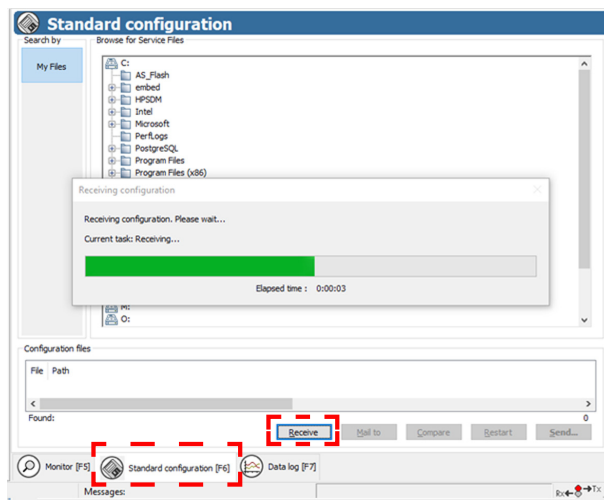
6. Click "Send value" to send the multimeter value to the pump.
 - The pump adjusts the current output accordingly and restarts.

6.7 Storing and restoring the pump settings

1. Make sure you have installed and configured the hardware and software according to section 6.1 *Required equipment*.
2. Start "PC-Tool E-Products" and click "Standard configuration [F6]".

Storing settings

3. Click "Receive" to receive the current settings.



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Fig. 19 Storing settings

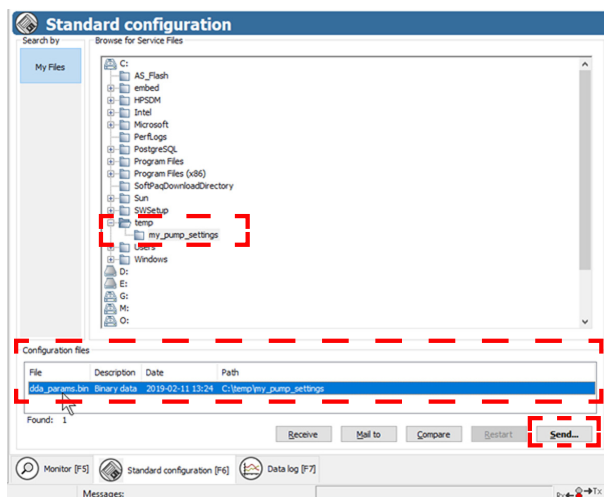
After some seconds, a window with the binary data pops up.



The displayed binary data looks like glyphs and symbols, not like readable text.

4. Click "File > Save as..." to store the received settings.
5. Select a folder and enter a meaningful file name to store the settings. The file name extension ".bin" is appended automatically.

Restoring settings



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Fig. 20 Restoring settings

6. Browse the folder where the settings are stored. Then select the .bin file.
7. Click "Send..." to transfer the settings to the pump.
 - A message pops up asking if you want to send the configuration data and stop the pump during transfer.
 - Tick the check box and confirm the message with "Yes" to stop the pump during the transfer.

The settings are transferred to the pump.

The settings are effective after the transfer has finished.

7. Service kits and spare parts

For the full range of service kits and spare parts, see the service kit catalogue:

- http://net.grundfos.com/qr/i/96488862_23

or the Grundfos Product Center:

- <https://product-selection.grundfos.com>

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