# **Modbus for Smart Digital Dosing**

SoftCIM Modbus RTU SoftCIM Modbus TCP CIM 200 Modbus RTU CIM 500 Ethernet for Modbus TCP

Functional profile and user manual



# Modbus for Smart Digital Dosing

English (GB)	
Functional profile and user manual	4
Appendix A	6

# English (GB) Functional profile and user manual

# Original functional profile and user manual Table of contents

<b>1.</b> 1.1 1.2	General information
<b>2.</b> 2.1 2.2 2.3	Introduction
3.	System description6
<b>4.</b> 4.1 4.2 4.3 4.4 4.5	Specifications         7           CIM         7           CIM 200 Modbus RTU         7           CIM 500 Modbus TCP         7           SoftCIM Modbus RTU (DDA model C only)         8           SoftCIM Modbus TCP (DDA model C only)         8
<b>5</b> . 5.1 5.2 5.3 5.4 5.5	Modbus RTU, CIM 200 setup9Setting the Modbus transmission speed.9Setting the parity.9Modbus address selection.10Termination resistor.10Status LEDs.00
<ol> <li>6.1</li> <li>6.2</li> <li>6.3</li> <li>6.4</li> <li>6.5</li> <li>6.6</li> </ol>	Modbus TCP, CIM 500 setup11Connecting the Ethernet cable.11Setting the industrial Ethernet protocol.11Setting the IP addresses12Establishing a connection to the webserver.12Status LEDs.12Data activity and link LEDs.12
7.	Modbus function code overview
<ol> <li>8.</li> <li>8.1</li> <li>8.2</li> <li>8.3</li> <li>8.4</li> <li>8.5</li> <li>8.6</li> <li>8.7</li> <li>8.8</li> </ol>	Modbus register addresses14Register block overview14CIM configuration register block14CIM status register block15Control registers16Dosing settings19Other settings19Overview of DDA settings and controls20
8.9 8.10 8.11	Status registers       21         Measurement data modules       24         Alarms and warning       26         Device identification (DeviceIdentification)       27
8.9 8.10 8.11 <b>9.</b> 9.1	Status registers       21         Measurement data modules       24         Alarms and warning       26         Device identification (DeviceIdentification)       27         Modbus commissioning, step-by-step guides       28         SoftCIM Modbus RTU commissioning, step-by-step       28         SoftCIM Modbus RTU commissioning, step-by-step       28
8.9 8.10 8.11 <b>9.</b> 9.1 9.2	Status registers.       21         Measurement data modules       24         Alarms and warning       26         Device identification (DeviceIdentification)       27         Modbus commissioning, step-by-step guides       28         SoftCIM Modbus RTU commissioning, step-by-step guide       28         SoftCIM Modbus TCP commissioning, step-by-step guide       28         SoftCIM Modbus TCP commissioning, step-by-step guide       29
8.9 8.10 8.11 <b>9.</b> 9.1 9.2 9.3 9.4	Status registers.       21         Measurement data modules       24         Alarms and warning       26         Device identification (DeviceIdentification)       27         Modbus commissioning, step-by-step guides       28         SoftCIM Modbus RTU commissioning, step-by-step guide       28         SoftCIM Modbus TCP commissioning, step-by-step guide       29         CIM 200 Modbus RTU commissioning, step-by-step guide       29         CIM 500 Modbus TCP commissioning, step-by-step guide       30

## 1. General information



Read this document before you install the product. Installation and operation must comply with local regulations and accepted codes of good practice.

#### 1.1 Hazard statements

The symbols and hazard statements below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.



## DANGER

#### Indicates a hazardous situation which, if not avoided, will

result in death or serious personal injury.

#### WARNING

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



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

The hazard statements are structured in the following way:

## SIGNAL WORD

Description of the hazard
Consequence of ignoring the warning
Action to avoid the hazard.

#### 1.2 Notes

The symbols and notes below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.



Observe these instructions for explosion-proof products.



A blue or grey circle with a white graphical symbol indicates that an action must be taken.



A red or grey circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.



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. Introduction

# 2.1 About this functional profile

In this document, the Smart Digital Dosing pump, type DDA, is referred to as DDA pump.

This functional profile can be used for Modbus communication with the DDA pump using one of the following interfaces:

- Build-in SoftCIM Modbus RTU, using the RS485 (A,Y,B) M12 terminals: the configuration of the protocol parameters takes place via the Grundfos GO or the pump HMI Settings menu.
- Build-in SoftCIM Modbus TCP, using the Ethernet M12 port: the configuration of the protocol parameters takes place via the Grundfos GO or the pump HMI Settings menu,
- Build-in GENIbus interface, using the RS485 (A,Y,B) M12 terminals to connect to a CIM 200 Modbus RTU device mounted in a CIU 900: the configuration of the protocol parameters takes place via hardware switches on the CIM 200.
- Build-in GENIbus interface, using the RS485 (A,Y,B) M12 terminals to connect to a CIM 500 Ethernet module mounted in a CIU 900 unit: the configuration of the protocol parameters takes place via the WEB server in the CIM 500.

The built-in SoftCIM Modbus TCP Ethernet port can be used simultaneously with any CIM that connects via a CIU to the RS485 interface of the DDA pump.

Grundfos cannot be held responsible for any problems caused directly or indirectly by using information in this functional profile.

#### 2.2 Assumptions

This functional profile assumes that the reader is familiar with the commissioning and programming of the Modbus RTU devices. The reader should also have some basic knowledge of the Modbus RTU protocol and technical specifications.

It is further assumed that an existing Modbus RTU network with a Modbus RTU master is present.

#### 2.3 Definitions and abbreviations

ARP	Address Resolution Protocol:	
	It translates IP addresses to MAC addresses.	
Auto-MDIX	Interface ensuring that both crossover cable types and non-crossover cable types can be used	
CAT5	Ethernet cable with four twisted pairs of wires	
CAT5e	Enhanced CAT5 cable with better performance	
CAT6	High performance Ethernet cable compatible with CAT5 and CAT5e	
CIM	Communication Interface Module	
CRC	Cyclic Redundancy Check: a data error detection method	
DDA	Digital Dosing Advanced	
DHCP	Dynamic Host Configuration Protocol: used for configuring network devices so that they can communicate on an IP network	
DNS	Domain Name System: used for resolving host names to IP addresses	
GENIbus	Proprietary Grundfos fieldbus standard	
GENIpro	Proprietary Grundfos fieldbus protocol	
Grundfos GO	A Grundfos application designed to control Grundfos products via infrared or radio communication available for iOS and Android devices	
НМІ	Human Machine Interface: display and buttons on the DDA pump	
HTTP	Hyper Text Transfer Protocol: the protocol commonly used to navigate the world wide web	
IANA	Internet Assigned Numbers Authority	
IP	Internet Protocol	
LED	Light-emitting diode	
MAC	Media Access Control: unique network address for a piece of hardware	
Modbus	Serial communications protocol commonly used in industry and building automation systems	

Modbus RTU	Fieldbus used worldwide with the RTU version used for wired networks	
Modbus TCP	Fieldbus used worldwide with the TCP version adapted for use as an application protocol on TCP/IP using either the CIM 260 3G/4G cellular or the CIM 500 Ethernet as basis	
Ping	Packet Internet Groper: a software utility that tests connectivity between two TCP/IP hosts	
PLC	Programmable Logic Controller	
SELV	Separated or Safety Extra-Low Voltage	
SELV-E	Separated or Safety Extra-Low Voltage with earth connection	
SoftCIM	Software Communication Interface Module: integrated communication protocol that can be enabled and configured by the Grundfos GO app	
	The DDA pump has a Modbus RTU SoftCIM using the RS485 interface and a Modbus TCP SoftCIM using the Ethernet RJ45 port.	
ТСР	Transmission Control Protocol: for Internet communication and Industrial Ethernet communication	
TCP/IP	Transmission Control Protocol/Internet Protocol: for Internet communication	
Transmission speed	Bits transferred per second, bits/s	
URL	Uniform Resource Locator: the IP address used for connecting to a server	
UTC	Coordinated Universal Time: the primary time standard by which the world regulates clocks and time	

### 3. System description

The pictures below provide an overview of the different ways the DDA pumps can connect to the Modbus RTU (RS485) or the Modbus TCP (Ethernet).

The small DDA pump has the Modbus RTU and the Modbus TCP as a build-in feature (SoftCIM) that are configured from the HMI or the Grundfos GO.

The DDA XL pump must use the CIM 200 and the CIM 500 for the Modbus RTU and the Modbus TCP communication, respectively. These communication modules are installed in the Grundfos CIU via a 10-pin connector. In this setup, the CIM is powered from a power supply in the CIU 900 that uses an external power source, 24-340V AC/DC.



Small DDA pump model C connected directly to a Modbus RTU network via the built-in Modbus RTU protocol

Connect the bus wires to the RS485 A,Y,B terminals via the M12 connector and set the protocol parameters via the HMI or the Grundfos GO.



Small DDA pump model C connected directly to a Modbus TCP network via the built-in Modbus TCP protocol

Connect the bus wires to the M12 Ethernet port and set the protocol parameters via the HMI or the Grundfos GO.



DDA XL pump connected to a Modbus RTU network via the CIM 200.

Connect the dosing pump to the CIU using the RS485 A,Y,B terminals. For a DDA XL, this is always GENIbus. This module must be mounted in a CIU 900 with its own 24-240V AC/DC supply.



DDA XL pump connected to a Modbus TCP network via the CIM 500 communication module

Connect the dosing pump to the CIU using the RS485 A,Y,B terminals. For a DDA XL, this is always GENIbus. This module must be mounted in a CIU 900 with its own 24-240V AC/DC supply.

# 4. Specifications

#### 4.1 CIM

Conorol data	Description	Commente
General data	Description	Comments
Ambient humidity	30 % to 95 %	Relative, non-condensing
Operating temperature	-20 °C to +45 °C	
Storage temperature	-25 °C to +70 °C	
Fieldbus visual diagnostics	LED1	Four possible states:
		Off, flashing green, permanently red, flashing red
GENIbus visual diagnostics	LED2	Four possible states:
		Off, permanently green, flashing red, permanently red

#### **Related information**

5.5 Status LEDs

#### 4.2 CIM 200 Modbus RTU

The table below provides an overview of the specifications for the Grundfos CIM 200. For further details, refer to the specific sections of this functional profile.

Modbus RTU specifications	Description	Comments	
Modbus connector	Screw-type terminal	It has 3 pins.	
Modbus connection type	RS-485, 2-wire + common	The conductors are the following: D0, D1 and Common.	
Maximum cable length	1200 m	It equals to 4000 ft.	
Slave address	1-247	It is set via the the pump HMI. In DDA model C, it can also be set via the GO app. See instructions for DDA.	
Line termination	On or Off	It is set via the DIP switches SW1 and SW2.	
Recommended cable cross-section	0.20 - 0.25 mm <sup>2</sup>	AWG24 or AWG23	
Supported transmission speeds	1200 <sup>1)</sup> , 2400 <sup>1)</sup> , 4800 <sup>1)</sup> , 9600, 19200, 38400 bits/s	It is set via the DIP switches SW4 and SW5.	
Start bit	1	It is a fixed value.	
Data bits	8	It is a fixed value.	
Stop bits	1 or 2	It is set via the DIP switch SW3.	
Parity bit	Even parity, odd parity <sup>1)</sup> or no parity	It is set via the DIP switch SW3.	
Modbus visual diagnostics	LED1	It has four possible states: off, flashing green, flashing red, permanently red.	
Maximum number of Modbus devices	32	Using repeaters, this number can be increased.	
		The legal address range is 1-247.	
Maximum Modbus telegram size	256 bytes	It is the total length with the node address and the CRC included.	
Watchdog timeout	10 s	This is only active if the DDA bus/cloud control is enabled, see separate description in the Modbus commissioning chapter.	

1) It can only be set via software.

#### **Related information**

5. Modbus RTU, CIM 200 setup

5.1 Setting the Modbus transmission speed

5.2 Setting the parity

5.4 Termination resistor

5.5 Status LEDs

#### 4.3 CIM 500 Modbus TCP

The table below provides an overview of the specifications for the Grundfos CIM 500 for the Modbus TCP. For further details, refer to the specific sections of this functional profile.

Modbus TCP specifications	Description	Comments	
Application layer	DHCP, HTTP, Ping, FTP, Modbus TCP Rotary switch in position 1		
Transport layer	TCP		
Network layer	Internet protocol V4 (IPv4), Ping		
Link layer	ARP, media access control (Ethernet)		
	Register reading by master: max 125 registers		
Telegram size	Register writing from master: max 123 registers		
	Telegram size: max 255 byte		

Modbus TCP specifications Description		Comments	
Ethernet cable	Screened/unscreened, twisted-pair cables, CAT5, CAT5e or CAT6	Auto cable-crossover detecting (Auto-MDIX) supported	
Maximum cable length	100 metres	328 feet	
Transmission speed	10 Mbits/s, 100 Mbits/s	Auto-detected	
Industrial Ethernet protocols	PROFINET IO, Modbus TCP, EtherNet/IP	Selected with rotary switch	
Watchdog timeout	10 s	This is only active if the DDA bus/cloud control is enabled, see separate description in the Modbus commissioning chapter.	

#### **Related information**

6.2 Setting the industrial Ethernet protocol

### 4.4 SoftCIM Modbus RTU (DDA model C only)

The table below provides an overview of the specifications for the Grundfos SoftCIM Modbus RTU. For further details, refer to the specific sections of this functional profile.

Modbus RTU specifications	Description	Comments
Modbus RTU connector	M12 connector	3 pins
Modbus RTU connection type	RS-485, 2-wire + common	Conductors: A, Y, B
Maximum cable length	1200 m	4000 ft
Slave address	1-247	Set via the Grundfos GO app or the pump HMI
Line termination	With M12 termination plug	Accessory
Recommended cable cross-section	0.20 - 0.25 mm <sup>2</sup>	AWG24 or AWG23
Supported transmission speeds	9600, 19200, 38400 bits/s	Set via the Grundfos GO app or the pump HMI, default = 9600 bits/s
Start bit	1	Fixed value
Data bits	8	Fixed value
Stop bits	1 or 2	Set via the Grundfos GO app or the pump HMI
Parity bit	Even parity, odd parity or no parity	Set via the Grundfos GO app or the pump HMI
Modbus RTU visual status	No communication Communication active Fault in communication	Status via the HMI or the Grundfos GO app
Maximum number of Modbus RTU devices	32	Using repeaters, this number can be increased. The legal address range is 1-247.
Maximum Modbus RTU telegram size	256 byte	Total length, node address and CRC included
Watchdog timeout	10 s	This is only active if the DDA bus/cloud control is enabled, see separate description in the Modbus commissioning chapter.

#### 4.5 SoftCIM Modbus TCP (DDA model C only)

The table below provides an overview of the specifications for the Grundfos SoftCIM Modbus TCP. For further details, refer to the specific sections of this functional profile.

Modbus TCP specification	Description	Comments
Number of IO socket connections	2	
Application Layer	Modbus TCP	
Transport Layer	ТСР	
Network Layer	Internet protocol V4 (IPv4), Ping	
	Ethernet 100BASE-TX (IEEE 802.3u)	
Link Lawa	ARP (Address Resolution Protocol)	
LINK Layer	Auto crossover detection (auto MDI-X)	
	10 Mbits/s, 100 Mbits/s (auto-detected)	
	Register reading by master: max 125 registers	
Telegram size	Register writing from master: max 123 registers	
	Telegram size: max 255 byte	
	No communication	
Medbue TCR viewel statue	Communication successful	This status can be reading the numerical will be the CO and
Moubus TCF visual status	Fault in communication	This status can be read via the pump Fivil of the GO app.
	Configuration error	
Watchdog timeout	10 s	This is only active if the DDA bus/cloud control is enabled, see separate description in the Modbus commissioning chapter.
	DHCP Enable/Disable	
	Setting IP address	Set via HMI or GO app, default = product dependent
Configuration	Setting subnet mask	Set via HMI or GO app, default = product dependent
	Setting gateway	Set via HMI or GO app, default = product dependent
	Setting TCP port number	Set via HMI or GO app, default = 502

Modbus TCP specification	Description	Comments
Connector	M12	
Recommended cable	Screened twisted pair CAT5 or better	
Distance	Max. 100 m	

FM041697

#### 5. Modbus RTU, CIM 200 setup



#### CIM 200 Modbus module

Pos.	Designation	Description
1	D1	Modbus terminal D1 (positive data signal)
2	D0	Modbus terminal D0 (negative data signal)
3	Common/GND	Modbus terminal Common and GND
4	SW1/SW2	On and off switches for termination resistor
5	SW3/SW4/SW5	Switches for selection of Modbus parity and transmission speed
6	LED1	Red and green status LED for Modbus communication
7	LED2	Red and green status LED for internal communication between CIM 200 and the DDA pump
8	SW6	Not used for DDA
9	SW7	Not used for DDA

Use a screened, twisted-pair cable. Connect the cable screen to protective earth at both ends.

#### **Recommended connection**

Modbus terminal	Colour code	Data signal
D1-TXD1	Yellow	Positive
D0-TXD0	Brown	Negative
Common/GND	Grey	Common and GND

#### 5.1 Setting the Modbus transmission speed

Set the transmission speed correctly before the CIM 200 Modbus module is ready to communicate with the Modbus network. Use DIP switches SW4 and SW5 to set the transmission speed, see the figure below.



#### **DIP switch settings**

The available transmission speeds are the following: 1200, 2400, 4800, 9600, 19200 and 38400 bits/s.

The first three transmission speeds are only available via software settings, whereas the last three are available via DIP switches.

Transmission speed [bits/s]	SW4	SW5
9600	OFF	ON
19200	OFF	OFF
38400	ON	OFF
Software-defined	ON	ON

The default transmission speed is 19200 bits per second, as per the Modbus RTU standard.

#### Software-defined

When the SW4 and SW5 are set to Software-defined, writing a value to the holding register at address 00004 sets a new transmission speed.

Use the following values for software-defined transmission speeds:

Software-defined transmission speed	Value to set in register 00004
1200 bits/s	0
2400 bits/s	1
4800 bits/s	2
9600 bits/s	3
19200 bits/s	4
38400 bits/s	5

This value is set to 1200 bits/s as default.

The communication interface does not support transmission speeds above 38400 bits/s.

The software-defined transmission speed value is stored in the communication interface and remains after a power-off.

#### 5.2 Setting the parity



When software-defined transmission speed is enabled
(SW4 and SW5 are ON), software-defined parity and stop bits are also enabled.

You can set the parity either manually by using SW3 or via software-defined settings.

#### Manual setting of parity

- The default byte format (11 bits) is the following:
- 1 start bit
- 8 data bits (least significant bit sent first)
- 1 parity bit (even parity)
- 1 stop bit.

The default setting of the CIM 200 Modbus module is even parity (1 stop bit). It is possible to change the parity using the DIP switch SW3. You can change the parity no parity (2 stop bits). See the figure below.



Parity

TM041710

FM041709

#### **DIP** switch settings

Parity	SW3
Even parity, 1 stop bit	OFF
No parity, 2 stop bits	ON

#### Software-defined parity and stop bits

When the SW4 and SW5 are set to Software-defined, the value in the holding registers at addresses 00009 and 00010 overrides the setting of the SW3. See figures *Modbus transmission speed* and *Parity*.

Software-defined parity	Value to set in register 00009
No parity [default]	0
Even parity	1
Odd parity	2

Software-defined stop bit	Value to set in register 00010
1 stop bit [default]	1
2 stop bits	2

The software-defined parity and stop bit values are stored in the communication interface and remain after a power-off.



Before you can set the parity and stop bits via softwaredefined settings, you must set the SW4 and SW5 to ON.

#### **Related information**

5.1 Setting the Modbus transmission speed

#### 5.3 Modbus address selection

A Modbus slave on a Modbus network must have a unique address from 1-247. Address 0 is reserved for broadcasting and is not a valid slave address.

The Modbus address is selected via the menu system in the pump display.



The hexadecimal turn switches that are used for address selection on other Grundfos products are not used when connecting to a DDA pump.

#### 5.4 Termination resistor

The termination resistor is fitted on the CIM 200 Modbus module and has a value of 150  $\Omega.$ 

The CIM 200 has a DIP switch with two switches, SW1 and SW2, for cutting the termination resistor in and out. The figure below shows the DIP switches in cut-out state.



Cutting the termination resistor in and out

#### DIP switch settings

Status	SW1	SW2
Cut in	ON	ON
	OFF	OFF
Cut out	ON	OFF
	OFF	ON

Default setting: the termination resistor is cut out.

#### Cable length

We recommend the following maximum lengths:

	Maximum cable length		
Bits/s	Terminated cable	Unterminated cable	
	[m/ft]	[m/ft]	
1200-9600	1200/4000	1200/4000	
19200	1200/4000	500/1700	
38400	1200/4000	250/800	



To ensure a stable and reliable communication, it is important that only the termination resistor of the first and last units in the Modbus network are cut in.



All switch settings are effective immediately after setting the values, no power-off is necessary.

#### 5.5 Status LEDs

The CIM 200 Modbus module has two LEDs:

- red and green status LED1 for Modbus communication
- red and green status LED2 for internal communication between the CIM 200 and the Grundfos product.

See figure CIM 200 Modbus module.

#### LED1

Status	Description
Off	No Modbus communication
Flashing green	Modbus communication active
Flashing red	Fault in the Modbus communication
Permanent red	Fault in the CIM 200 Modbus configuration

#### LED2

Status	Description
Off	CIM 200 switched off
Flashing red	No internal communication between the CIM 200 and the Grundfos product
Permanent red	CIM 200 not supporting the Grundfos product connected
Permanent green	Internal communication between the CIM 200 and the Grundfos product OK



TM04170<sup>-</sup>

During startup, there may be a delay of up to 5 seconds before the LED2 status is updated.

### 6. Modbus TCP, CIM 500 setup



CAUTION Electric shock

Minor or moderate personal injury

Connect the CIM 500 only to SELV or SELV-E circuits.

#### 6.1 Connecting the Ethernet cable

Use RJ45 plugs and Ethernet cable. Connect the cable shield to protective earth at both ends.



It is important to connect the cable shield to earth through an earth clamp or in the connector.

The CIM 500 is designed for flexible network installation: the builtin 2-port switch makes it possible to daisy chain from product to product without additional Ethernet switches. The last product in the chain is only connected to one of the Ethernet ports. Each Ethernet port has its own MAC address.



Example of industrial Ethernet network



TM081364

#### Example of Ethernet connection

Pos.	Description	Designation
1	Industrial Ethernet RJ45 connector 1	ETH1
2	Industrial Ethernet RJ45 connector 2	ETH2
3	Connector 1, 10/100 Mbits/s speed	DATA1
4	Link LED for connector 1	LINK1
5	Connector 2, 10/100 Mbits/s speed	DATA2
6	Link LED for connector 2	LINK2
7	Green and red status LED for Ethernet communication	LED1
8	Green and red status LED for internal communication between module and pump	LED2
9	Rotary switch for protocol selection	SW1

#### 6.2 Setting the industrial Ethernet protocol

The CIM 500 Ethernet module has a rotary switch for selecting the industrial Ethernet protocol.



Selecting the industrial Ethernet protocol

Pos.	Description
0	PROFINET IO (default)
1	Modbus TCP
2	BACnet IP, not supporting DDA pumps
3	Ethernet/IP
4E	Reserved, LED1 permanently red to indicate an invalid switch position



When the module is powered on, every change of the rotary switch setting causes the module to restart and prepare for the selected protocol.

TM079843

#### 6.3 Setting the IP addresses

The CIM 500 Ethernet module is by default set to a fixed IP address. It is possible to change the IP address settings from the built-in webserver.

Default IP settings used by the webserver	IP address:192.168.1.100 Subnet mask: 255.255.255.0 Gateway: 192.168.1.1
IP settings for Modbus TCP	This must be set via the webserver and it must be different from the webserver address

#### 6.4 Establishing a connection to the webserver

You can configure the CIM 500 using the built-in webserver. To establish a connection from a PC to the CIM 500, the following steps are required:

- 1. Connect the PC and the CIM 500 using an Ethernet cable.
- 2. Configure the PC Ethernet port to the same subnetwork as the CIM 500, for example, 192.168.1.101, and the subnet mask to 255.255.255.0.
- 3. Open a standard internet browser and type 192.168.1.100 in the URL field.
- 4. The browser shows one or more security warnings, depending on which browser is used. Ignore these and proceed until you see the CIM 500 home page main menu.
- 5. Log in to the webserver using the following:

User name (default)	admin	
Password (default)	Grundfos	

The user name and password may have been changed from their default values and if you cannot remember them, the CIM 500 must be reset to factory settings.

If the password has not been changed, you are prompted to change it to a new and stronger password.



CIM 500 connected to a PC via Ethernet cable



You can use both the ETH1 and ETH2 to establish a connection to the webserver.



You can access the webserver while the selected industrial Ethernet protocol is active.

#### 6.5 Status LEDs

The CIM 500 Ethernet module has two status LEDs:.

- red and green status LED1 for Ethernet communication
- red and green status LED2 for internal communication between the CIM 500 and the Grundfos product.

See section Connecting the Ethernet cable.

#### LED1

Status	Description	
Off	No Modbus TCP communication or switched off	
Flashing green	Modbus TCP communication active	
Permanent red	CIM 500 module configuration fault	
Permanent red and green	Error in the firmware download	
Electring red and groop	Resetting to factory default	
Flashing red and green	After 20 seconds, the CIM 500 restarts.	
_ED2		

Status	Description
Off	CIM 500 switched off
Flashing red	No internal communication between the CIM 500 and the Grundfos product
Permanent red	CIM 500 not supporting the Grundfos product connected
Permanent green	Internal communication between the CIM 500 and the Grundfos product OK
Downson and used and one on	Managen fault

Permanent red and green Memory fault



During startup, there is a delay of up to 5 seconds before the LED1 and LED2 status is updated.

#### **Related information**

6.1 Connecting the Ethernet cable 10.4 CIM 500

#### 6.6 Data activity and link LEDs

The module has two connectivity LEDs related to each RJ45 connector.

#### DATA1 and DATA2

These yellow LEDs indicate the speed of the data connection.

Status	Description
Off	The RJ45 connection speed is 10 Mbits/s or there is no link.
On	The RJ45 connection speed is 100 Mbits/s.

#### LINK1 and LINK2

M056436

These green LEDs show whether the Ethernet cable is properly connected to the RJ45 connector in question.

Status	Description
Off	There is no link connection on the RJ45 connector.
On	There is link connection on the RJ45 connector without data traffic.
Flashing	There is link connection on the RJ45 connector with data traffic.

#### **Related information**

6.1 Connecting the Ethernet cable

## 7. Modbus function code overview

The supported function codes are shown in the table below.

Туре	Code	Hex	Name
16-bit data (registers)	03	0x03	Read holding registers
	04	0x04	Read input registers
	06	0x06	Write single register
	16	0x10	Write multiple registers
Diagnostics	08	08	Diagnostics



Reading or writing coils is not supported.

The same data are available in both holding registers and input registers, meaning that either function (0x03 or 0x04) can be used for reading data.



The Modbus data model states that registers numbered X are addressed in telegrams as X - 1, for example, register 00115 SetOutputRelays is addressed as 00114 in a Modbus telegram.

# 8.1 Register block overview

The Modbus RTU registers are grouped in the following register blocks:

Start address	Register block	Permissions	Description
00001	CIM configuration	R/W	Configuration of the CIM
00021	CIM status	R	Status registers for the CIM
00101	Pump control	R/W	Registers for control of the DDA pump
00201	Pump status	R	Registers for reading mode status from the DDA pump
00301	Pump data	R	Registers for reading measured data values from the DDA pump
00701	Alarm simulation	R/W	Registers for simulating alarms and warnings in the DDA pump

#### 8.2 CIM configuration register block

Registers in this block can be read by function codes 0x03 and/or 0x04. They can be written as holding registers with function codes 0x06 and 0x10.

Address	Register name Description		Modbus RTU	Modbus TCP
00001	SlaveMinimumReplyDelay	It shows the minimum reply delay from the slave in ms. Value range: 0-10000, meaning up to 10 seconds reply delay. This delay is typically used in conjunction with a radio modem. The delay value is stored in the device and remains after a power-off. The delay set here is added to the internal delay in the device. The default value is 0. Note that this is not supported by the built-in SoftCIM Modbus RTU and Modbus TCP.		-
00002	RESERVED			
00003	SoftwareDefinedModbusAddr	This is only applicable to SoftCIM Modbus RTU in DDA-C.		
00004	SoftwareDefinedBitRate	It is the Modbus software-defined transmission speed enumeration. The software-defined transmission speed value is stored in the device and remains after a power-off. 0: 1200 bits/s 1: 2400 bits/s 2: 4800 bits/s 3: 9600 bits/s 4: 19200 bits/s 5: 38400 bits/s. Note that for the CIM 200, this value is used only when the transmission speed is set to software-defined on DIP switches SW4 and SW5. Otherwise, the slave ignores it. Note that the SoftCIM Modbus RTU only supports bit rate 9600 bits/s and above.	•	-
00005	AutoAckControlBits	It is used for selecting the behaviour of control bit acknowledgements from the CIM. 0: Disabled Control bits are not automatically lowered when accepted by the device. The user must lower the triggered control bit manually before the control bit can be triggered again. 1: Enabled Control bits are automatically lowered when accepted by the device. The user does not have to lower it manually.	•	•
00006	RESERVED			
00007	RESERVED			
00008	RESERVED			
00009	SoftwareDefinedParity	It is a parity setting for using software-defined settings. 0: No parity [default] 1: Even parity 2: Odd parity. Note for CIM 200 that this value is used only when the transmission speed is set to "Software-defined" on DIP switches SW4 and SW5. Otherwise, the slave will ignore it.	•	-
00010		<ul> <li>Stop bit setting to be used when using "software-defined" settings.</li> <li>0: No stop bit</li> <li>1: 1 stop bit [default]</li> <li>2: 2 stop bits</li> <li>Note that for CIM 200, this value is used only when the transmission speed is set to software-defined on DIP switches SW4 and SW5. Otherwise, the slave ignores it.</li> </ul>	•	-
00011	RESERVED			

#### 8.3 CIM status register block

Registers in this block can be read by function codes 0x03 and/or 0x04. They are read-only. This block can be used for various kinds of fault finding.

Address	Register name	Description
00021	GENIbusCRCErrorCnt	It holds a CRC error counter for the GENIbus connection to the DDA pump. <sup>2)</sup>
00022	GENIbusDataErrorCnt	It holds a data error counter for the GENIbus connection to the DDA pump. <sup>2)</sup>
00023	VersionNumber	It is a Grundfos-specific CIM/SoftCIM version number. This is an unsigned integer value.
00024	ActualModbusAddress	It holds the current Modbus slave address of the device. Valid value range: 1-247.
00025 00026	GENIbusTXcountHI GENIbusTXcountLO	It holds a transmit counter for the total number of telegrams sent to the DDA pump on the GENIbus connection. <sup>2)</sup>
00027 00028	GENIbusRXcountHI GENIbusRXcountLO	Holds a receive counter for the total number of telegrams received from the DDA pump on the GENIbus connection. <sup>2)</sup>
00029	RESERVED	
00030	UnitFamily	It is a Grundfos product family.
00031	UnitType	It is a Grundfos product type.
00032	UnitVersion	It is a Grundfos product version.

2) This is not supported by the SoftCIM Modbus RTU in DDA-C.

#### 8.4 Control registers

Modbus registers are used for the control of the DDA pump.

Mode/state settings				
Address	Bit	Name	Event trigger	
	0	RemoteAccessReq	State	
	1	Deaerating (100 %)	Value change	
	2	AnalogMode	Value change	
00101	3	TimerMode	Value change	
	4	SlowMode	Value change	
	5	Velocity	Value change	
	6-7	-	-	
	Enable	disable function		
Address	Bit	Name	Event trigger	
	0	AutoDeaeratingEnable	Value change	
	1	FlowControlEnable	Value change	
00102	2	ModbusWatchdogEnable	Value change	
00102	3	AutoFlowAdaptEnable	Value change	
	4	PulseMemoryEnable	Value change	
	5-7	-	-	
	Action	commands		
Address	Bit	Name	Event trigger	
	0	ResetFault	Rising edge	
	1	Pulse	Rising edge	
00103	2	ResetVolumeCounter	Rising edge	
	3	SetRTC	Rising edge	
	4-7	-	-	
	ReqSta	rtStop [enumeration]		
	Triggered by value change			
Address	Value	Name		
	0	ReqStart		
00104	1	ReqStop		
	2-255	-		
	Operati	ngMode [enumeration]		
	Triggere	ered by value change		
Address	Value	Name		
	0	Manual		
	1	Pulse		
00105	2	Analog		
00103	3	Timer		
	4	Batch		
	5-255	-		

#### 8.4.1 Explanation of event trigger

#### State

Control bits with a state event trigger behave like a state that is forced upon the DDA pump. The CIM/SoftCIM attempts to make the pump operate according to the requested state in the control registers 00101-00103. Due to certain state/mode restrictions, this might not always be possible. See section Explanation of control bits in control registers. The actual state of the pump can be read from the corresponding bit in the status registers 00201-00206.

#### Value change

Control bits/bytes with a value-change event trigger behave like a command that is executed when the bit/byte changes its value. The CIM/SoftCIM attempts to make the DDA pump operate according to the requested value in the control registers 00101-00103. The change is reflected in the corresponding bit/byte in the status registers 00201-00206. Bits/bytes that are controlled by a value-change event trigger can be controlled from both the Modbus and the pump HMI or the GO app. The last value change, no matter from which source, becomes active if not prevented by other conditions. See section Explanation of control bits in control registers.

#### **Rising edge**

Control bits with a rising-edge event trigger behave like a command that is executed when a bit transition from "0" to "1" occurs. Each of them has a corresponding acknowledge bit in the status register 00203 that is set when the command is executed and cleared when the control bit is written back to "0".

#### 8.4.2 Explanation of control bits in control registers

#### RemoteAccessReq

It is the control bit used for activating control from the Modbus.

0:	The pump can only be controlled via the pump HMI or the GO app and from its external signal inputs. With this setting, all control bits in control registers and writing to any output module have no influence.
	The CIM module can control the pump according to the settings in

 the control registers and the writing to the other writable registers.
 The pump can also be controlled via the pump HMI or the GO app and from its external signal inputs.

#### **De-aerating**

It is the control bit used for starting and stopping the de-aeration of the pump

0:	It stops the de-aeration of the pump.
1.	It starts the de-aeration of the pump.
1.	It is the same as pressing 100% .

If the pump is stopped via the pump HMI or the GO app (symbol  $\blacksquare$ ), it is not possible to start and stop the de-aeration of the pump from the Modbus.

If the de-aeration of the pump is started from the Modbus, it can be stopped by pressing 100% or ▶/■ on the pump.

#### AnalogMode

It is the control bit used for selecting the type of the analog input signal.

0:	0-20 mA
1:	4-20 mA

The toggling of this bit has no effect unless the pump is in operating mode Analog. The actual state, readable from the corresponding status bit, is reset to 4-20 mA whenever another operating mode is selected.

#### TimerMode

It is the control bit used for selecting timer mode

	Cycle timer mode:
0:	The pump repeats a cyclical dosing of the batch volume that can be programmed from the Modbus with data registers SetBatchDosingVolume and SetBatchDosingTime.
	Week timer mode:
	I to 16 time-controlled dosing procedures are defined for a week

 Up to 16 time-controlled dosing procedures are defined for a week. These procedures have to be programmed via the pump HMI or the GO app .

SlowMode

It is the control bit used for slowing down the suction stroke velocity.

0:	SlowMode disabled:
	No slow-down of suction stroke velocity.
1:	SlowMode enabled: Slows down the suction stroke velocity to the velocity selected with control bit Velocity.

#### Velocity

It is the control bit used for selecting SlowMode suction stroke velocity.

0:	Select SlowMode velocity 50 %
1:	Select SlowMode velocity 25 %

The toggling of this bit has no effect unless the pump operates in SlowMode. The suction stroke is reset to 50 % velocity whenever SlowMode is disabled.

#### AutoDeaeratingEnable

0:	Automatic pump de-aeration disabled	
----	-------------------------------------	--

Automatic pump de-aeration enabled:
 The pump is automatically de-aerated (degassed) at regular intervals.

Data register 00319 OutputRelays, bit 2, signals whenever automatic pump de-aeration is active.

#### FlowControlEnable

\_

When the FlowControl function is enabled, various faults and deviations related to the dosing process are detected and indicated.

0:	FlowControl function disabled
1:	FlowControl function enabled

The enabling or disabling of FlowControl means enabling or disabling of all alarms and warnings that are associated with flow measurement.

If the FlowControl function is disabled, the AutoFlowAdapt function (see control bits AutoFlowAdaptEnable) cannot be enabled.

#### ModbusWatchdogEnable

The Modbus watchdog is used for monitoring the Modbus connection. If the connection is broken, the DDA pump stops dosing and indicates a Modbus communication fault.

0:	Disable Modbus watchdog
1:	Enable Modbus watchdog

When the bus/cloud control is selected via the pump HMI or the GO app, the Modbus watchdog will monitor the communication. If the Modbus communication is somehow interrupted, that is, there is no communication with a Modbus master, this is detected, and the DDA pump stops within 10 s with an alarm indicating "Communication with main network is lost" (code 15).

The Modbus master can enable or disable the Modbus watchdog at any time.

When the bus/cloud control is disabled via the pump HMI or the GO app, the Modbus watchdog stops monitoring the Modbus communication.

The DDA pump also supports a GENIbus watchdog monitoring the CIU 900 connection to the pump. Action and timeout are the same as for the Modbus watchdog. The GENIbus watchdog is enabled when control from bus/cloud is enabled and can only be disabled for DDA model C and only with the GO app.

See more watchdog setting details in the Modbus commissioning chapter.

#### AutoFlowAdaptEnable

The AutoFlowAdapt function detects changes in various parameters and responds accordingly to keep the flow constant. Dosing accuracy is increased when this function is enabled.

0:	AutoFlowAdapt function disabled
1:	AutoFlowAdapt function enabled

The AutoFlowAdapt function can only be enabled if the FlowControl function is also enabled.

#### PulseMemoryEnable

The pulse memory function can be used in operating mode Pulse. When it is enabled, up to 65000 unprocessed pulses can be saved for subsequent processing.

0:	Pulse memory function disabled
1:	Pulse memory function enabled

#### ResetFault

When this control bit is toggled  $0 \rightarrow 1$ , the pump attempts to reset pending alarms and warnings and to restart the pump if it was stopped due to an alarm.

#### Pulse

When this control bit is toggled  $0 \rightarrow 1$ , a pulse signal is sent to the pump. This can be used in operating modes Pulse and Batch, and is equivalent to a pulse signal from the signal inputs.

#### ResetVolumeCounter

When this control bit is toggled  $0\rightarrow 1$ , the VolumeTripCounter (module 30) is reset to "0".

#### SetRTC

.

1

\_

When this control bit is toggled  $0 \rightarrow 1$ , the internal real-time clock (RTC) in the DDA pump is updated. The values have to be previously written to the SetDataTime (registers 00116-00122).

#### **Related information**

8.9 Measurement data modules

8.10 Alarms and warning

#### 8.4.3 Explanation of control mode

It is the control enumeration for the remote start/stop of the pump.

Value	Name
0	ReqStart If the pump is ready to be controlled from the Modbus (status register 00201: bit 0: ActRemoteAccess = "1"), this value starts the pump and dosing according to the selected operating mode. If the pump is stopped via the pump HMI or the GO app, it restarts when ▶/■ is pressed.
	ReqStop

If the pump is ready to be controlled from the Modbus (status register 00201: bit 0: ActRemoteAccess = "1"), this value stops the pump and the pump HMI or the GO app shows II. If the

pump is stopped from the Modbus, it cannot be started via the pump HMI or the GO app, unless Bus control is deselected. ReqStop cannot stop the pump when it is de-aerating.

#### 8.4.4 Explanation of operating mode

It is the control enumeration for selecting the operating mode.

Value	Name
0	<b>Manual</b> In this operating mode, the pump constantly doses the dosing flow set via the SetpointManual (register 00106-00107), the GO app, or the pump HMI.
1	Pulse In this operating mode, the pump doses the volume set via the SetPulseVolume (register 00108-00109), the GO app or the pump HMI for each incoming pulse. Reception of the pulse command from the Modbus has the same effect as an incoming contact pulse signal. If the pump receives more pulses than it can process at the maximum dosing flow, excess pulses are ignored if the memory function (PulseMemoryEnable bit) is not enabled.
2	Analog In this operating mode, the pump doses according to the external analog signal. It can operate according to a 4-20 mA or 0-20 mA signal selected via the AnalogMode bit, the GO app, or the pump HMI. If the input value in analog mode 4-20 mA falls below 2 mA, an alarm is displayed and the pump stops. The relation between analog signal and dosing value is called
	analog scaling and must be set via the pump HMI or the GO app.
3	<b>Timer</b> The time the dosing should take place is controlled by a cyclic timer or by week timers. The selection is done via the TimerMode bit, the pump HMI, or the GO app. Some other parameters are related to timer dosing. They can only be programmed via the pump HMI or the GO app.
	Batch
4	In this operating mode, the pump doses the volume set via the SetBatchDosingVolume (register 00110-00111) over a time period of the SetBatchDosingTime (register 00112-00113) for each incoming pulse (or Modbus Pulse command). These settings can also be done via the pump HMI or the GO app. The remaining batch volume during dosing can be read from the RemainingDosingVolume (register 00310-00311). The batch trigger source and the timer settings related to Timer cycle trigger source can only be programmed via the pump HMI

#### 8.5 Dosing settings

Unless otherwise stated, the data type used for counters and scaled values is always an unsigned integer.

Address	Register name	Scale	Description
	SetSetpointManualHI SetSetpointManualLO		It is for setting the setpoint used in operating mode Manual.
00106		0.1 ml/h	It can also be set via the pump HMI or the GO app.
00107			The present value can always be read from the ActualSetpointManual (register 00207-00208).
00400	SotBulso\/olumoHI		It is for setting the pulse volume used in operating mode Pulse.
00108	SetPulseVolumeLO	1 nl	It can also be set via the pump HMI or the GO app.
00109			The present value can always be read from the ActualPulseVolume (register 00209-00210).
	SetBatchDosingVolumeHI SetBatchDosingVolumeLO	0.001 ml	It is for setting the batch dosing volume used in operating mode Batch.
00110			It can also be set via the pump HMI or the GO app.
00111			The present value can always be read from the ActualBatchDosingVolume (register 00211-00212).
00110	SetBatchDosingTimeHI SetBatchDosingTimeLO	0.1 s	It is for setting of the batch dosing time used in operating mode Batch.
00112			It can also be set via the pump HMI or the GO app.
00110			The present value can always be read from the ActualBatchDosingTime (register 00213-00214).
00114	SetPressureMax	0.1 bar	It is for setting the pressure alarm limit.
			It can also be set via the pump HMI or the GO app.
			The present value can always be read from the ActualPressureMax (register 00215).

#### 8.6 Other settings

Unless otherwise stated, the data type used for counters and scaled values is always an unsigned integer.

Address	Register name	Scale	Description
00115		Bits	It is used for enabling and disabling the output relays 1 and 2. A relay has to be set to Bus control via the pump HMI or the GO app if it is to be controllable from the Modbus via the SetOutputRelays register. Via the pump HMI or the GO app, the relays can also be individually configured to be of type NO or NC.
	SetOutputRelays		Bit U:Relay 1 control: 0: Not active 1: Active. Bit 1:Relay 2 control: 0: Not active 1: Active. 1: Active.
			The present status of the output relays can always be read from the OutputRelays (register 00319).
00116	SetAnalogOutput	0.001 mA	It is used for controlling the analog output signal. The type of signal (4-20 mA or 0-20 mA) follows the setting of the AnalogMode bit. The analog output has to be set to Bus control via the pump HMI or the GO app if it is to be controllable from Modbus. The present value of the analog output signal can always be read from the AnalogOutput (register 00317).
00117	SetDateTimeYear		It is used for setting the internal real-time clock (RTC): Year (from year 2000)
00118	SetDateTimeMonth	_	Month [1-12] Day [1-31] Hour [0-23]
00119	SetDateTimeDay	PCD string	Minute [0-59] Second [0-59].
00120	SetDateTimeHour	- BCD stilling	Each byte is a binary-coded decimal (BCD) value. Example:
00121	SetDateTimeMinute	_	15:38:00, April 24 2011, is coded with hexadecimal numbers as: Year = 11 h, Month = 04 h, Day = 24 h, Hour = 15 h, Minute = 38 h, Second = 00 h.
00122	SetDateTimeSecond	_	The present value of the real-time clock can always be read from the DateTime status registers 00220-00225.

# 8.7 Overview of DDA settings and controls

	Selectable from bus	Selectable from HMI/GO app	Preserved after power cycling	DDA Model C	DDA XL
General dosing settings					
Main network watchdog (enable, disable)	1	✓ <sup>3)</sup>	✓ <sup>4)</sup>	1	1
Bus control (enable, disable)		1	1	√	1
Stop after power failure (enable, disable)		1	1	1	1
Auto de-aerating (enable, disable)	1	1	1	1	1
Flow control (enable, disable)	1	1	1	1	1
Delay (short, medium, long)		1	1	1	1
Sensitivity (low, medium, high)		1	1	1	1
Auto FlowAdapt (enable, disable)	1	1	1	1	✓
Pressure monitor					
Min. pressure		1	1	1	
Max. pressure	1	1	1	1	1
Min. pressure alarm (On, Off)		1	1	1	1
Max. capacity		1	1	1	
Slow mode (enable, disable)	1	1	1	1	
Velocity (25 %, 50 %)					
Action commands	-	-		•	
Reset fault	J	1	J	J	
Generate single pulse <sup>5)</sup>			•		
De-serating (100 %)	· · · · · · · · · · · · · · · · · · ·			•	• •
Poset volume counter				<u>۲</u>	• •
Reset volume counter				<b>v</b>	
	✓				v
Reset Statistics counters					
		✓	<b>v</b>	1	V
Operation control					
Requested start	<b>v</b>	<b>v</b>	1	J	<b>_</b>
Requested stop		1	1	1	1
Operating mode					
Manual	1	1	1	1	1
Manual setpoint	1	1	1	1	✓
Pulse	1	1	1	1	1
Pulse volume	1	1	1	1	1
Pulse memory enable	1	1	1	1	1
Analog	1	1	1	1	1
Analog mode (0-20 mA, 4-20 mA)	1	1	1	1	√
Analog scaling		1	1	1	1
Timer	1	1	1		1
Timer mode (cycle, week)	1	1	1		1
Batch	1	1	1	1	1
Batch dosing volume	1	1	1	1	1
Batch dosing time	1	1	1	1	1
Batch priority (volume, time)		1	1	1	
Batch trigger		1	1	1	
Batch cycle time		1	1	1	
Batch week procedures		1	1	1	
Batch start delay		1	1	1	
Output signal control/setting					
Control output relay (On/off)	1	6)	1	1	✓
Control analog output value		<b>4</b> 7)	J	J	
Relay function selection	•				
		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	• ./	• ./
Debounce of pulse input (apple, displa)		· · · · · · · · · · · · · · · · · · ·	• 	• ./	•
HMI/Display/bus sottings		•	•	•	
Kow lock		/	/	1	
			· · · · · · · · · · · · · · · · · · ·	۲ ۲	· ·
Display settings			<b>√</b>	<b>√</b>	<b>√</b>

	Selectable from bus	Selectable from HMI/GO app	Preserved after power cycling	DDA Model C	DDA XL
Bluetooth (enable, disable)		1	1	1	
CIM 200 Modbus address	·	1	1	1	1
RS485, AYB (Modbus protocol settings)	1	1	1	1	
Ethernet (protocol settings)	·	1	1	1	
Advanced functions					
Condition check		1	1	1	
Sensor calibration		1	1	1	1
Analog border input/output		✓ <sup>3)</sup>	1	1	
Analog calibration input/output		<b>√</b> <sup>3)</sup>	1	1	

 $^{3)}\;$  It is only possible with the DDA model C and only from the GO app.

 $^{\rm 4)}~$  It is only possible with the DDA model C.

5) In Pulse or Batch mode, a pulse command from the bus can trigger dosing. In Batch mode on model C, only a batch can be triggered from the HMI.

 $^{6)}\,\,$  It can be done by toggling the NO/NC setting via the HMI or the GO just for test purposes.

7) Only the pump flow, back pressure and analog input can be set.

#### 8.8 Status registers

The following are the Modbus registers used for the status of the DDA pump settings. The actual status of all the pump modes and states are reflected, no matter if it is a result of a pump HMI setting, a GO app setting, or a setting written from the Modbus via the control registers (00101-00105).

	Actual m	ode/state settings [bits]
Address	Bit	Name
	0	ActRemoteAccess
	1	ActDeaerating (100 %)
	2	ActAnalogMode
00201	3	ActTimerMode
	4	ActSlowMode
	5	ActVelocity
	6-7	-
	Actual er	nable/disable function [bits]
Address	Bit	Name
	0	ActAutoDeaeratingEnable
	1	ActFlowControlEnable
00202	2	ActModbusWatchdogEnable
00202	3	ActAutoFlowAdaptEnable
	4	ActPulseMemoryEnable
	5-7	-
	Action c	ommand acknowledgement [bits]
Address	Bit	Name
	0	ResetFaultAck
	1	PulseAck
00203	2	ResetVolumeCounterAck
	3	SetRTCAck
	4-7	-
	Miscella	neous status [bits]
Address	Bit	Name
	0	Dosing (running)
	1	Warning
00204	2	Fault
	3	BusControlLocallyEnabled
	4-7	-
	ActualSt	artStop [enumeration]
Address	Value	Name

Actual mode/state settings [bits]			
	0	Started	
	1	Stopped	
00205	2	Calibrating	
	3	Service	
	4-255	-	
	ActualOp	peratingMode [enumeration]	
Address	Value	Name	
	0	Manual	
	1	Pulse	
	2	Analog	
00206	3	Timer	
	4	Batch	
	5	Batch, HMI or GO app controlled	
	6-255	-	

#### 8.8.1 Explanation of status bits

#### ActRemoteAccess

It is the status bit indicating whether the pump is in a state where it is controllable from Modbus.

0:	The pump can only be controlled from its HMI or the GO app and its external signal inputs. In this state, all control bits are in ControlModule and writing to any output module has no influence.

- In this state, the pump can be controlled by the bit settings in the control register 00101, as well as from the pump HMI or the GO app and external signal inputs, and the writing to the other output
- modules. To enter this state, the control register 00101 bit 0 must be set and the pump must be started via the pump HMI or the GO app by pressing ▶/■.

#### ActDeaerating

It is the status bit indicating whether the pump is de-aerating or not.

0:	The pump is not de-aerating.
1:	The pump is de-aerating.

#### ActAnalogMode

It is the status bit indicating the selected type of the analog input signal.

0:	0-20 mA.
1:	4-20 mA
	This is always the reading if the operating mode is not Analog.

#### ActTimerMode

It is the status bit indicating the selected timer mode.

0:	Cycle timer mode
1:	Week timer mode

#### ActSlowMode

It is the status bit indicating whether the SlowMode has been enabled.

0:	SlowMode disabled: There is no slow-down of suction stroke velocity.
	SlowMode enabled:

1: It slows down the suction stroke velocity to the velocity selected with control bit Velocity.

#### Velocity

It is the status bit indicating the selected SlowMode suction stroke velocity.

0:	Selected SlowMode velocity 50 %		
	This is always the reading if SlowMode is disabled.		
1:	Selected SlowMode velocity 25 %		

#### ActAutoDeaeratingEnable

It is the status bit indicating whether automatic pump de-aeration has been enabled.

0:	Automatic pump de-aeration disabled			
	Automatic pump de-aeration enabled			
1:	OutputRelays (register 00319), bit 2, signals whenever the automatic pump de-aeration is active.			
A stElowControlEnship				

#### ActFlowControlEnable

It is the status bit indicating whether the FlowControl function has been enabled.

0: FlowControl function disabled		
----------------------------------	--	--

1: FlowControl function enabled

#### ActModbusWatchdogEnable

It is the status bit indicating whether the Modbus software watchdog has been enabled.

0:	Modbus software watchdog disabled
1:	Modbus software watchdog enabled

The Modbus watchdog is triggered if the Modbus communication is broken for more than 10 s, and the bus/cloud control has also been selected. The dosing pump will stop with a red display backlight and an alarm description "Communication with main network lost" (code 15) in the event log.

#### ActAutoFlowAdaptEnable

It is the status bit indicating whether the AutoFlowAdapt function has been enabled.

0:	AutoFlowAdapt function disabled
	This is always the reading if the FlowControl function is disabled.

1: AutoFlowAdapt function enabled

#### ActPulseMemoryEnable

It is the status bit indicating whether the pulse memory function is enabled.

0:	Pulse memory function disabled
1:	Pulse memory function enabled

#### Dosing (running)

It is the status bit indicating whether the DDA pump is dosing (running) at the moment.

0:	The pump is not dosing at the moment.			
1:	The pump is dosing at the moment.			

#### Warning

It is the warning status bit.

0:	No warning is present.				
1:	A warning is present.				
	The pump can, however, continue its precise dosing for the time being, but we recommend to have it serviced.				

For further details about possible warnings and faults, as well as the pump behaviour in these situations, see section Alarms and warning.

#### Fault

It is the fault status bit. The pump stops dosing as long as the fault is present.

0:	No fault is present.
1:	A fault is present, and the pump remains stopped until the fault is corrected.

For further details about possible warnings and faults, as well as the pump behaviour in these situations, see section Alarms and warning.

#### BusControlLocallyEnabled

It is the status bit indicating whether Bus control has been enabled in the Settings menu on the pump HMI or the GO app.

- The bus control is not enabled via the pump HMI or the GO app. 0: Setting of the RemoteAccess bit in control register 00101 has no
- 0: Setting of the RemoteAccess bit in control register 00101 has no effect.
- 1: The bus control is enabled via the pump HMI or the GO app.

# English (GB)

#### Explanation of command acknowledge bits (register 00203)

If the ActRemoteAccess bit is not set (status register 00201, bit 0), Modbus commands, and writings in general, are prohibited and none of the acknowledge bits would be set. Command acknowledge bits can thus be used for checking whether a command from a control register was sent or not.

#### ResetFaultAck

It is an acknowledge bit belonging to the ResetFault control bit. It is set when the control bit is set and the command is executed. It is cleared when the control bit is cleared.

#### PulseAck

It is an acknowledge bit belonging to the pulse control bit. It is set when the control bit is set and the command is executed. It is cleared when the control bit is cleared.

#### ResetVolumeCounterAck

It is an acknowledge bit belonging to the ResetVolumeCounter control bit. It is set when the control bit is set and the command is executed. It is cleared when the control bit is cleared.

#### SetRTCAck

It is an acknowledge bit belonging to the SetRTC control bit. It is set when the control bit is set and the command is executed. It is cleared when the control bit is cleared.

#### **Related information**

8.10 Alarms and warning

#### 8.8.2 Explanation of the ActualStartStop (register 00205)

It is the status enumeration for reading whether the pump is Started, Stopped, Calibrating or in Service mode:

Value	Name					
	Started					
	This has the following meaning for the different operating modes:					
	• Manual:					
	The pump doses according to the ActualSetpointManual (register 00207-00208).					
	Analog:					
	The pump doses according to the analog input signal and the analog scaling.					
	Pulse:					
0	The pump doses according to the reception of pulses and the value of the ActualPulseVolume (register 00209-00210).					
	Batch:					
	The pump doses according to the reception of pulses and the values of the ActualBatchDosingVolume (register 00211-00212) and the ActualBatchDosingTime (register 00213-00214).					
	Timer:					
	The pump doses according to the timer functions using the batch dosing settings.					
	Stopped					
1	The pump is stopped by one of the control sources. The state of the control sources can be read from the ControlSourceStates (register 00216).					
	Calibrating					
2	The pump is calibrating the dosing accuracy.					
-	This is only possible via the pump $\ensuremath{HM}$ or the GO app by selecting Calibration in the Settings menu.					
	Service					
з	The pump has stopped and has been brought into service mode.					
3	This is only possible via the pump HMI and can be done by pressing ▶/■ and 100% simultaneously.					

#### 8.8.3 Explanation of the ActualOperatingMode

It is the status enumeration for reading the actual operating mode. For an explanation of these modes and the belonging enumeration, see section Explanation of operating mode.

#### **Related information**

8.4.4 Explanation of operating mode

#### 8.9 Measurement data modules

Unless otherwise stated, the data type used for counters and scaled values is always an unsigned integer.

Address	Register name	Scale	Description
00207	ActualSetpointManualHI	0.1 ml/h	It is the actual setpoint used in the operating mode Manual.
00208			It can be set via the SetpointManual (register 00106-00107), or the pump HMI or the GO app.
00209	ActualPulseVolumeHI ActualPulseVolumeLO	1 nl	It is the actual pulse volume used in the operating mode Pulse. It can be set via the SetPulseVolume (register 00108-00109), or the pump HMI or the GO app.
00211	Actual Patab Daging Valuma HI		It is the actual batch dosing volume used in the operating mode Batch.
00211	ActualBatchDosingVolumeLO	0.001 ml	It can be set via the SetBatchDosingVolume (register 00110-00111), or the pump HMI or the GO
00212	ActualPatabDasingTimeHI		app.
00213	ActualBatchDosingTimeLO	0.1 s	It can be set via the SetBatchDosingTime (register 00112-00113), or the pump HMI or the GO app.
00215	ActualPressureMax	0.1 bar	It is the actual value of pressure alarm limit setting. It can be set via the SetPressureMax (register 00114), or the pump HMI or the GO app.
00216	ControlSourceStates	Bits	It is the status of start/stop control sources where "1" means Active. They can be active simultaneously. Bit 0: Stop via pump the HMI or the GO app Bit 1: External stop Bit 2: Stop from bus
00217	FaultCode	Enum	_
00218	WarningCode	Enum	See section Alarms and warning.
00219	WarningBits	Bits	
00220	DateTimeYear	_	It is the present value of the internal real-time clock (RTC). It can be set via the SetDateTime (register 00117-00122), or the pump HMI or the GO app.
00221	DateTimeMonth	_	Year (from year 2000) Month [1-12]
00222	DateTimeDay	BCD	Day [1-31] Hour [0-23]
00223	DateTimeHour	string	Minute [0-59] Second [0-59]
00224	DateTimeMinute	-	Each byte is a binary-coded decimal (BCD) value. Example:
00225	DateTimeSecond	-	15:38:00, April 24 2011, is coded with hexadecimal numbers as: Year = 11 h, Month = 04 h, Day = 24 h, Hour = 15 h, Minute = 38 h, Second = 00 h .
00301	DosingPressureMax	Bar	It is the maximum dosing pressure, a fixed factory-set value for this pump type.
00302 00303	DosingCapacityMaxHI DosingCapacityMaxLO	0.1 ml/h	It is the maximum dosing capacity, a fixed factory-set value for this pump type.
00304 00305	DosingCapacityReferenceHI DosingCapacityReferenceLO	0.1 ml/h	It is the dosing capacity setpoint shown in the pump display. It represents the actual setpoint belonging to the actual operating mode and dosing state.
00306	MeasuredDosingCapacityHI	0.1 ml/h	It is the measured (actual) dosing capacity.
00308	MeasuredPressure	0.1 bar	The FlowControl bit in control register 00102 must be enabled. It corresponds to the Backpressure reading on the display.
00309	PulseInputFrequency	1 Hz/min	It shows the frequency of pulse input (external pulse input signal or Modbus Pulse command in control register 00103).
00310	RemainingDosingVolumeHI	0.001 ml	It shows the actual remaining volume to be dosed. It is used in Batch mode.
00311	RemainingDosingVolumeLO		
00312	Volume IotalHI VolumeTotalLO	0.001 l	It shows the total volume dosed (non-resettable).
00314	VolumeTripCounterHI	0.0011	It is the dosed-volume trip counter (reset with the ResetVolumeCounter command in control
00315	VolumeTripCounterLO	0.001 I	register 00103).
00316	AnalogInput	0.001 mA	It is the analog input signal 0-20 mA or 4-20 mA (used as setpoint in Analog mode).
00317	AnalogOutput	0.001 mA	It is the analog output signal. The parameter to map to the output is selected via the pump HMI or the GO app. If control from the Modbus is selected, the analog output signal is controlled from the SetAnalogOutput (register 00116).
00318	DigitalInputs	Bits	It is the status of the external digital inputs. Logical "0": The input is not active. Logical "1": The input is active. The relay input type (NO or NC) is selected via the pump HMI or the GO app. Signals are fixed to the following: Bit 0: Low-level signal Bit 1: Empty signal Bit 2: External stop.

Address	Register name	Scale	Description
			It is the status of the two output relays:
	OutputRelays		Logical "0": The output is not active.
			Logical "1": The output is active.
			The relay output type (NO or NC) is selected via the pump HMI or the GO app.
00319		Bits	The output relay modules are defined as follows:
00010		Bito	Bit 0: Relay 1 (select signal parameter via the pump HMI or the GO app).
			Bit 1: Relay 2 (select signal parameter via the pump HMI or the GO app).
			Bit 2: Auto de-aerating (de-aerating valve open).
			If Bus control is selected as the relay signal parameter, the relay can be controlled from the SetOutputRelays (register 00115) .
00320	NumberOfPowerOns	-	It counts the number of times the pump has been powered on (non-resettable).
00321	RunTimeHI	1	
00322	RunTimeLO	I	it counts the time the DDA pump has dosed (non-resettable).
00323	OperatingHoursHI	1.0	It counts the number of hours the DDA pump has been switched on. It counts both when the pump
00324	OperatingHoursLO	15	doses and when it does not.
00325	StrokeCounterHI		It counts the number of stakes (non-reactively)
00326	StrokeCounterLO	-	it counts the number of strokes (non-resettable).
00327	TimeToNextDosingHI		It shows the time before the payt desing takes place (only in Timer mode)
00328	TimeToNextDosingLO	15	it shows the time before the next dosing takes place (only in Timer mode).

#### **Related information**

8.10 Alarms and warning

# English (GB)

# 8.10 Alarms and warning

Address	Name	Description
00217	FaultCada	It is the code for active pump alarm.
00217	FaultCode	See the event code in the table below.
00218	WarpingCode	It is the code for the first active pump warning.
00210	WarningCode	See theevent code in the table below.
		It shows all active warnings. The belonging event code is shown in parenthesis.
		Byte 1
		Bit 0: Backpressure low (211) <sup>8)</sup>
		Bit 1: Gas in pump head (35) <sup>8)</sup>
		Bit 2: Cavitation (208) <sup>8)</sup>
		Bit 3: Discharge valve leakage (36) <sup>8)</sup>
		Bit 4: Suction valve leakage (37) <sup>8)</sup>
		Bit 5: reserved
		Bit 6: Service now (12)
00219	WarningBits	Bit 7: Service soon (33)
		Byte 2
		Bit 0: Low level in tank (206)
		Bit 1: reserved
		Bit 2: FlowControl cable defect (169) <sup>8)</sup>
		Bit 3: Real Time Clock out of order / Battery low (157)
		Bit 4: reserved
		Bit 5: Flow deviation / pumping capacity too low (17) <sup>8)</sup>
		Bit 6: reserved
		Bit 7: reserved

8) It requires the FlowControlEnable bit in control register 00102 to be set.

In case of a pump alarm or pump warning, the registers WarningCode and FaultCode contain an event code for the cause of the problem. The complete list of possible alarm or warning codes from a DDA pump is shown in the table below.

Alarm events make the pump stop. Some of them require acknowledgement of the alarm before the pump can be restarted. This acknowledgement can come from the pump HMI, or the GO app or the Modbus by using the ResetFault command in the control register 00103.

The pump can only indicate one active alarm at a time, even when there are many simultaneously active warnings. The complete status of warnings can be read from the WarningBits register.

Event code	Event group	Event description	Depends on FlowControl enabled	Event action	Auto- acknowledge
210	Pump head	Maximum pressure limit exceeded, ActualPressureMax (register 00215)	Yes	Alarm	Yes
211	Pump head	Backpressure too low Fixed underpressure limit: 1.5 bar	Yes	Alarm/ Warning <sup>9)</sup>	Yes
35	Pump head	Air bubbles, gas in pump head, de-aerating problem	Yes	Warning	Yes
208	Pump head	Cavitation	Yes	Warning	Yes
36	Pump head	Discharge (pressure) valve leakage	Yes	Warning	Yes
37	Pump head	Suction valve leakage	Yes	Warning	Yes
12	Pump head	Service now (time for service exceeded)	No	Warning	No
33	Pump head	Soon time for service (general service information)	No	Warning	No
17	Pump head	Flow deviation (performance requirement not met)	Yes	Warning	Yes
51	Pump head	Blocked motor or pump	No	Alarm	Yes
206	Tank	Low level in tank	No	Warning	Yes
57	Tank	Empty tank (dry running)	No	Alarm	Yes
169	Input signals	Cable breakdown on the FlowControl	Yes	Warning	Yes
15	Communication	Modbus communication fault (main network communication fault)	No	Alarm	No
159	Communication	CIU communication fault (GENIbus communication fault), defective cable between the CIU 900 and the DDA pump	No	Alarm <sup>11)</sup>	No
64	Motor head	The motor head is over heated	No	Alarm	Yes
157	RTC battery	Real Time Clock is out of order / low battery	No	Warning	Yes
165	Input signal	Setpoint signal fault, Analog input current above 21 mA	No	Alarm	Yes
97	Input signal	Setpoint signal fault, Analog input current below 2 mA	No	Alarm	Yes
247	Supply	Pump powered on	No	Alarm <sup>12)</sup>	No

9) Warning or alarm is selected in the "Settings" menu via the pump HMI or the GO app.

10) An alarm only occurs when the ActModbusWatchdogEnable bit is set and the control from the bus/cloud is enabled in DDA Settings > Communication menu.

11) An alarm only occurs when the control from the bus is enabled.

#### **Related information**

- 8.4.2 Explanation of control bits in control registers
- 8.8.1 Explanation of status bits

### 8.11 Device identification (DeviceIdentification)

Address	Name/description		
00030		1: DDA S	
	30: Smart digital dosing DDA	2: -	
		3: DDA XL	
		4: DDA-C	
00031	UnitType [enumeration]		
	According to description above.		
00032	UnitVersion [enumeration]		
	Used by Grundfos		

# 9. Modbus commissioning, step-by-step guides

#### 9.1 SoftCIM Modbus RTU commissioning, step-by-step guide

1. Use the Grundfos GO app menu Settings > Communication > RS485 AYB to configure the SoftCIM Modbus RTU port.

Protocol	Select Modbus RTU	
Address	Select the address as a number in the interval [1; 247]. The address must be unique on the Modbus RTU network.	
Baud rate	e Choose between 9600 bit/s, 19200 bit/s or 38400 bit/s. This must match the baud rate setting of the Modbus RTU master.	
Parity	Choose between Even, Odd or None. This must match the parity setting of the Modbus RTU master.	
Stop bits	Select between 1 or 2 stop bits. This must match the stop bits setting of the Modbus RTU master.	

- 2. Connect the RS485 cable from the Modbus RTU network to the M12 AYB terminals of the DDA pump, see the Modbus RTU setup.
- 3. If the DDA pump is an end device on the Modbus RTU network, activate the line termination, see the Modbus RTU setup.
- 4. The DDA pump is now ready to be accessed via the Modbus RTU network.

You can find the communication of the SoftCIM in the Grundfos GO app menu Settings > Communication > RS485 AYB.

No SoftCIM enabled	The protocol selection for the AYB terminals has not been set to the Modbus RTU.	
No communication	The DDA pump has not received any Modbus telegrams for 10s.	
Communication successful	The DDA pump has received at least one telegram within the last 10s and the error rate is below 10%.	
Fault in communication	The DDA pump has received telegrams with a CRC error rate above 10%.	
	The error rate must in this situation go below 1 % before "Communication successful" is indicated.	

When setting communication parameters via the Grundfos GO app, the app only allows legal settings, that is, selecting values outside the legal range is not possible. However, if the communication parameters are configured from the Modbus itself via registers 00003 SoftwareDefinedModbusAddr, 00004 SoftwareDefinedBitRate, 00009 SoftwareDefinedParity and 00010 SoftwareDefinedStopBit, illegal settings are possible and the SoftCIM behavior is as listed below:

Illegal baud rate	The SoftCIM sets the baud rate to default value 19200 bit/s.
Illegal parity	The SoftCIM sets the parity to default value Even.
Illegal stop bit setting	The SoftCIM sets the number of stop bits to default value 1.
Illegal address setting	The SoftCIM does not change the address value but keeps the current value.

- To be able to control the DDA pump from the fieldbus use the Grundfos GO app menu Settings > Communication > Bus/Cloud control and select On. With this setting, all other settings from the HMI or the Go app are disabled and changes can only be done from the fieldbus.
- 6. The communication watchdog with a fixed 10s timeout is automatically enabled the first time when bus/cloud control is enabled. It can, however, be enabled or disabled dynamically from the bus via the control bit 00102.2 ModbusWatchdogEnable or via the GO app. The setting is persistent, and thus, preserved during power cycling of the pump. The watchdog state can also be read from Modbus via the status bit 00202.2 ModbusWatchdogEnabled.

When the watchdog is triggered, dosing stops with a red display backlight and an alarm description "Communication with main network lost" (code 15) in the event log. If the GO app connection is active, the backlight remains blue, and the event log can be accessed via the GO app.

When communication is reestablished, the pump resumes dosing and returns to the normal display backlight.

#### 9.2 SoftCIM Modbus TCP commissioning, step-by-step guide

 Use the Grundfos GO app menu Settings > Communication > Ethernet RJ45. Set Ethernet to be 'On' and proceed with configuring the SoftCIM Modbus TCP port.

Protocol	Select the Modbus TCP.	Set via HMI or GO app, default = Off
	DHCP Enable/Disable	Set via HMI or GO app, default = product dependent
	Setting IP address	Set via HMI or GO app, default = product dependent
Network setting	Setting subnet mask	Set via HMI or GO app, default = product dependent
	Setting gateway Setting TCP port number	Set via HMI or GO app, default = product dependent
		Set via HMI or GO app, default = 502

- 2. Connect the Ethernet cable from the Modbus TCP network to the M12 Ethernet port of the DDA pump, see the Modbus TCP setup.
- The DDA pump is now ready to be accessed via the Modbus TCP network.
   You can find the communication state of the Soft CIM in the Grundfos GO app menu Settings > Communication > Ethernet RJ45.

No SoftCIM enabled	The protocol selection for the AYB terminals has not been set to the Modbus TCP.
No communication	The DDA pump has not received any Modbus TCP telegrams for 10s.
Communication successful	The DDA pump has received at least one telegram within the last 10s and the error rate is below 10 %.
Fault in communication	The DDA pump has received telegrams with a CRC error rate above 10 %. The error rate must in this situation go below 1 % before Communication successful is indicated.
Configuration error	Port number, IP address or subnet mask has value 0.

- 4. To be able to control the DDA pump from the fieldbus, use the Grundfos GO app menu Settings > Communication > Bus/Cloud control and select On. With this setting, all other settings from the HMI or the Go app are disabled and changes can only be done from the fieldbus.
- 5. The communication watchdog with a fixed 10s timeout is automatically enabled for the first time when the bus/cloud control is enabled. It can, however, be enabled or disabled dynamically from the bus via the control bit 00102.2 ModbusWatchdogEnable or via the GO app. The setting is persistent, and thus, preserved during power cycling of the pump. The watchdog state can also be read from Modbus via the status bit 00202.2 ModbusWatchdogEnabled.

When the watchdog is triggered, dosing stops with a red display backlight and an alarm description "Communication with main network lost" (code 15) in the event log. If the GO app connection is active, the backlight remains blue, and the event log can be accessed via the GO app.

When communication is reestablished, the pump resumes dosing and returns to the normal display backlight.

#### 9.3 CIM 200 Modbus RTU commissioning, step-by-step guide

- 1. Install the CIM 200 in the CIU 900 according to CIU 900 documentation.
- 2. Select the transmission speed of the Modbus slave, see section Setting the Modbus transmission speed.
- 3. Select the parity and stop bits of the Modbus slave, see section Setting the parity.
- 4. If necessary, set line termination, see section Termination resistor.
- 5. Connect the CIU 900 with CIM 200 inside to the dosing pump and power the devices on. Observe LED2 turn steady green and LED1 remaining off.

Note that the DDA XL always uses GENIbus protocol at the RS485 terminals. The DDA model C can use both Modbus and GENIbus (default) at the RS485 terminals and for connecting to a CIM module, GENIbus must be the selected protocol. This can be checked in the **Settings > Communication > RS485 AYB menu**.

 The CIM 200 module will identify itself, and a pop up menu appears at the pump HMI where the Modbus address [1; 247] and bus/cloud control enable/disable is selected. This selection can later be changed via the Settings > Communication menu from GO app or pump HMI.

Note that the CIM 200 turn switch address selector is not used with DDA dosing pumps.

7. The Modbus RTU communication watchdog with a fixed 10s timeout is automatically enabled for the first time when the bus/cloud control is enabled. It can, however, be enabled or disabled dynamically from the bus via the control bit 00102.2 ModbusWatchdogEnable or via the GO app for DDA model C. The setting is persistent and thus preserved during power cycling of the pump. The watchdog state can also be read from Modbus via the status bit 00202.2 ModbusWatchdogEnabled.

The Modbus RTU watchdog is triggered only if "Control from bus/cloud" is enabled and Modbus RTU communication is lost for more than 10 s. Dosing stops with a red display backlight and an alarm description: "Communication with main network lost" (code 15) in the event log. If for DDA model C the GO app connection is active the backlight will remain blue and access to the event log is via the GO app. When Modbus RTU communication is reestablished, the pump resumes dosing and returns to the normal display backlight.

 The GENIbus communication watchdog with a fixed 10 s timeout, which monitors the connection between CIU 900 and the DDA pump, is enabled for the first time when the bus/cloud control has been selected. For DDA model C, it can be enabled/disabled with the GO app. For DDA XL, it is always enabled.

The GENIbus watchdog is triggered only if "Control from bus/cloud" is enabled, and the communication is lost between the CIU 900 and the pump for more than 10 s. Dosing will stop with a red display backlight and an alarm description "Communication with CIM module lost" (code 159) in the event log.

When GENIbus communication is reestablished, the pump resumes dosing and returns to the normal display backlight.

- 9. Connect the necessary cables from the CIM 200 to the Modbus network.
- 10. Make sure that the GENIbus LED is permanently green, and that the Modbus LED is either off if no master is actively polling the slave, or flashing green, indicating error-free communication.

The CIM 200 is now ready to be accessed via the Modbus network.

#### **Related information**

- 5.1 Setting the Modbus transmission speed
- 5.2 Setting the parity
- 5.4 Termination resistor
- 5.5 Status LEDs

#### 9.4 CIM 500 Modbus TCP commissioning, step-by-step guide

- 1. Install the CIM 500 in the CIU 900 according to the CIU 900 documentation.
- 2. Select position 1 at the protocol rotary switch.
- 3. Power on the pump, and observe the LED2 turning steady green and LED1 remaining off.
- 4. The CIM 500 module identifies itself, and a pop up menu appears at the pump HMI, where bus/cloud control enable/disable is selected. This selection can later be changed via the **Settings > Communication** menu from GO app or pump HMI.
- 5. Connect one of the CIM 500 Ethernet ports (RJ45) to a PC using an ethernet cable.
- 6. Configure the PC Ethernet port to the same subnetwork as that of the CIM 500 (for example, 192.168.1.X) and the subnet mask to 255.255.255.0.
- 7. Open your internet browser and make contact to the CIM 500 webserver. Factory default address is 192.168.1.100. Ignore the security warnings from the browser.
- 8. Log in to the webserver with the default data below. The system requires a new, more secure password after the first login.

Username	Password
admin	Grundfos

9. In the menu column to the left, select Configuration > Real time Ethernet protocol. Press F5 to refresh the screen.

- 10. Type in an IP address belonging to the same subnet as your PC (for example, 192.168.1.2).
- 11. Type in the subnet mask 255.255.255.0, and leave the rest of the settings at their default values.
- 12. Select Submit to transfer the new settings, and close the web browser. The CIM 500 is now ready to be accessed from a Modbus TCP master via one of its Ethernet ports. Use the IP address selected under step 10. The Modbus address (Unit ID) in the Modbus TCP telegram is not used.
  - The CIM 500 LED1 is flashing green when the Modbus TCP communication takes place.
  - · You can use the two Ethernet ports to daisy chain the CIM 500 modules.
  - It is possible to have connection to the webserver simultaneously with a connection to a Modbus TCP master.
  - It is possible to have connection to more Modbus TCP masters simultaneously, for example, to have connection to the PC Tool CIM while connected to another Modbus TCP master.
- 13. The Modbus TCP communication watchdog with a fixed 10s timeout is automatically enabled for the first time when the bus/cloud control is enabled. It can, however, be enabled or disabled dynamically from the bus via the control bit 00102.2 ModbusWatchdogEnable or via the GO app for DDA model C. The setting is persistent, and thus, preserved during power cycling of the pump. The watchdog state can also be read from Modbus via the status bit 00202.2 ModbusWatchdogEnabled.

The Modbus TCP watchdog is triggered only if "Control from bus/cloud" is enabled and Modbus RTU communication is lost for more than 10 s. Dosing will stop with a red display backlight and an alarm description "Communication with main network lost" (code 15) in the event log. If for DDA model C, the GO app connection is active the backlight will remain blue and access to the event log is via the GO app. When the Modbus TCP communication is reestablished, the pump resumes dosing and returns to the normal display backlight.

14. The GENIbus communication watchdog with a fixed 10 s timeout, which monitors the connection between CIU 900 and the DDA pump, is enabled for the first time when the bus/cloud control has been selected. For DDA model C it can be enabled/disabled with the GO app. For DDA XL it is always enabled.

The GENIbus watchdog is triggered only if "Control from bus/cloud" is enabled and communication is lost between CIU 900 and the pump for more than 10 s. Dosing will stop with a red display backlight and an alarm description "Communication with CIM module lost" (code 159) in the event log.

When GENIbus communication is reestablished, the pump resumes dosing and returns to the normal display backlight.

#### Related information

6.2 Setting the industrial Ethernet protocol

#### 10.1 SoftCIM Modbus RTU

#### 10.1.1 The DDA pump does not respond to telegrams.

Cause	Re	medy
There are faults in the network wiring or the Modbus RTU parameter settings.	•	Check if the wire connections AYB are correct, if A and B are not reversed.
	•	Confirm that the cable screen is connected to the screen clamps and the DDA pump is properly connected to earth.
	•	Confirm that the Modbus network is terminated correctly.
	•	Make sure that the Modbus RTU protocol, and not the GENIbus, has been selected with the Grundfos GO or the pump HMI.
	•	Confirm on the Grundfos GO or the pump HMI that the following Modbus RTU parameter settings match the master settings:
		- Communication speed (baud rate)
		- Parity
		- Stop bit.
	•	Check the Address setting with the Grundfos GO or the pump HMI, and make sure all devices on the network have unique addresses.
	•	Voltage potential problems with long cabled systems (particularly if different earthing systems are involved) can in rare cases necessitate a GND wire (use for example, double twisted pair cable and connect the second pair between the Y terminals).

#### 10.1.2 The DDA pump responds with the exception response 0x01: Invalid function.

Cause	Re	medy	
Request telegrams from the master use an illegal function code not supported by the DDA pump.		Check if the master telegrams only use the supported function codes, see the Modbus function code overview.	

#### 10.1.3 The DDA pump responds with the exception response 0x02: Invalid data address.

Cause	Remedy
The master is trying to read or write an invalid register address. If a master tries to read register addresses that are not listed in the functional profile tables, the slave might respond with this exception response. Some masters may automatically try to read large blocks in one telegram, which causes problems if some of the registers in the block are not supported.	<ul> <li>Find out which registers cause the exception and avoid reading them.</li> </ul>

#### 10.1.4 The DDA pump returns register value 0xFFFF (65535).

Cause	Remedy	
A data value of 0xFFFF does not necessarily indicate an error. It only means that the value is unavailable from the connected Grundfos product under the present conditions.	<ul> <li>If the value is based on a sensor reading, this is an indication that the sensor measurement does not work. Check the sensor setup and compare with the Grundfos GO or the pump HMI reading of the value.</li> </ul>	
	• Some parameters are closely related to specific Control/Operating Modes and might not be available in other Control/Operating Modes.	
	<ul> <li>Fault conditions in the pumping system might result in some parameters being unavailable. Normally, there is an associated alarm or warning indication.</li> </ul>	

#### 10.1.5 The DDA pump returns strange register values.

Cause	Re	medy
It is likely that the master is not requesting data from the correct registers or is not interpreting the values correctly.	•	Check if the telegrams comply with the Modbus Minus one rule stating that a register or a register block at address X is addressed in telegrams as X-1.
	•	Check if the correct functional profile manual is being used and not the manual for a similar Grundfos product.
	•	32-bit values are implemented in consecutive registers named HI for high order part and LO for low order part. Both registers must be read, and the resulting 32-bit value can be calculated as follows:
		Value32 = Value16HI × 65536 + Value16LO

Cause	Remedy
Faults in the network wiring or in the Modbus TCP parameter settings.	<ul> <li>Make sure there is a proper Ethernet wire connection to DDA M12 Ethernet port. The link diode in the master (or switch) port must be steady green.</li> </ul>
	Confirm that the DDA pump is properly connected to earth.
	<ul> <li>Make sure that the Modbus TCP protocol has been selected for the Ethernet port with the Grundfos GO or the pump HMI.</li> </ul>
	<ul> <li>Confirm on the Grundfos GO or the pump HMI that the following Modbus TCP parameter settings match the expected settings:</li> </ul>
	- IP address
	- Subnet mask
	- Default gateway.
	<ul> <li>Make sure that the subnetwork part of all IP addresses is identical and the host part of all IP addresses is unique.</li> </ul>

|--|

Cause	Re	emedy
Request telegrams from the master use an illegal function code not supported by the DDA pump.	•	Check if the master telegrams only use the supported function codes, see the Modbus function code overview.

#### 10.2.3 The DDA pump responds with the exception response 0x02: Invalid data address.

Cause	Remedy
The master is trying to read or write an invalid register address. If a master tries to read register addresses that are not listed in the functional profile tables, the slave might respond with this exception response. Some masters may automatically try to read large blocks in one telegram, which causes problems if some of the registers in the block are not supported.	<ul> <li>Find out which registers cause the exception and avoid reading them.</li> </ul>

#### 10.2.4 The DDA pump returns register value 0xFFFF (65535)

10.2.4 The DDA pump returns register value 0xFFFF (05555).	
Cause	Remedy
A data value of 0xFFFF does not necessarily indicate an error. It only means that the value is unavailable from the connected Grundfos product under the present conditions.	• If the value is based on a sensor reading, this is an indication that the sensor measurement does not work. Check the sensor setup and compare with the Grundfos GO or the pump HMI reading of the value.
	<ul> <li>Some parameters are closely related to specific Control/Operating Modes and might not be available in other Control/Operating Modes.</li> </ul>
	<ul> <li>Fault conditions in the pumping system might result in some parameters being unavailable. Normally, there is an associated alarm or warning indication.</li> </ul>
10.2.5 The DDA pump returns strange register values.	
Cause	Remedy
It is likely that the master is not requesting data from the correct registers or is not interpreting the values correctly.	• Check if the telegrams comply with the Modbus Minus one rule stating that a register or a register block at address X is addressed in telegrams as X-1.
	• Check if the correct functional profile manual is being used and not the manual for a similar Grundfos product.
	<ul> <li>32-bit values are implemented in consecutive registers named HI for high order part and LO for low order part. Both registers must be read, and the resulting 32-bit value can be calculated as follows:</li> </ul>

# 10.3 CIM 200

You can detect faults in the CIM 200 by observing the status of the two communication LEDs.

10.3.1 LED status

#### 10.3.1.1 Both LED1 and LED2 remain off when the power supply is connected.

Cause	Remedy
The CIM 200 is fitted incorrectly in the CIU 900.	Make sure that the CIM 200 is fitted and connected correctly.
The cable from the CIU 900 to the DDA pump is improperly connected or defective.	Check the cable connection between the CIU 900 and the DDA pump.
The CIM 200 is defective.	Replace the CIM 200.
10.3.1.2 LED2 for internal communication is flashing red.	
Cause	Remedy
There is no internal communication between the CIM and the CIU 900.	<ul> <li>Make sure that the CIM 200 is fitted correctly in the CIU 900, and that the cable connection between the CIU 900 and the DDA pump is fitted correctly.</li> </ul>
10.3.1.3 LED2 for internal communication is permanently red	
Cause	Remedy
The CIM does not support the dosing pump connected.	Contact the nearest Grundfos company.
10.3.1.4 LED1 for the Modbus connection is permanently red.	
Cause	Remedy
There is a fault in the Modbus configuration of the CIM.	<ul> <li>Check the transmission speed (switches SW4 and SW5). If the switches are set to software-defined, an invalid value may have been set via the Modbus. Try one of the preselected transmission speeds, for example, 19200 bits/s.</li> </ul>
	<ul> <li>Check if the Modbus address, switches SW6 and SW7, has a valid value [1-247].</li> </ul>
10.3.1.5 LED1 for Modbus connection is flashing red.	
Cause	Remedy
There is fault in the Modbus communication: a fault in parity or cyclic redundancy check.	Check the transmission speed, switches SW4 and SW5. See section Setting the Modbus transmission speed.
	• Check the parity setting, switch SW3. See section Setting the stop bits and the parity bit.
	Check the cable connection between the CIM 200 and the Modbus network.
	<ul> <li>Check the termination resistor settings, switches SW1 and SW2.</li> <li>See section Termination resistor.</li> </ul>

# 10.3.2 Communication faults

#### 10.3.2.1 The slave does not respond to telegrams.

Cause	Remedy
There is a configuration or wiring error.	Check the visual diagnostics on the Modbus slave, including whether the Grundfos GENIbus LED is flashing green and the Modbus LED is off or flashing green.
	<ul> <li>Make sure that the cable between the Modbus master and the Modbus slave is connected correctly. See section CIM 200 Modbus RTU setup for wiring recommendations.</li> </ul>
	<ul> <li>Confirm that the slave address is configured correctly, and that the correct slave address is used in the Modbus master poll. See section Modbus address selection for slave address selection.</li> </ul>
	• Make sure that each end of the Modbus trunk cable is terminated, if necessary. See section Termination resistor for line termination of the Grundfos slave.
	Confirm that the bus topology for a Modbus network is correct.
If the holding register of address 00001 SlaveMinimumReplyDelay is set too high, the master may time out before receiving the response from the slave.	Increase the time-out span in the master to communicate.

#### 10.3.2.2 The slave responds with the exception response 0x01: Invalid function.

Remedy
See section Modbus function code overview for supported function codes. Note that reading and writing coils are not supported, so only register functions and diagnostics are valid.
nvalid data address.
Remedy
<ul> <li>Avoid reading or writing invalid data addresses.</li> <li>Make sure that register X is addressed as X-1 in the Modbus telegrams, according to the Modbus standard.</li> </ul>
r

Cause	Remedy
The value is unavailable. A data value of 0xFFFF does not necessarily indicate an error. It means that the value is unavailable from the DDA pump either momentarily, or due to a missing setting parameter.	See section Modbus register addresses for available data.

#### 10.3.2.5 The slave does not change the Modbus transmission speed with register 0004.

Cause	Remedy
There is a configuration error.	<ul> <li>Set the transmission speed switches to Software-defined.</li> <li>Otherwise, the value in register 0004 is ignored by the slave.</li> </ul>
An invalid value may be set in register 00004.	<ul> <li>See section Setting the Modbus transmission speed for invalid values, and set correct value in register 00004.</li> </ul>

#### 10.3.2.6 The slave does not react to control commands or to writing of settings.

Cause Rem		emedy	
Control source Bus has not been selected at the DDA HMI or the GO app.	•	From the DDA HMI setting menu or the GO app, Control from bus must be selected.	
Access mode Remote has not been selected from the Modbus.	•	The DDA pump might be in Local mode, thus Modbus writing is not possible. Register 00201 bit 8 AccessMode must be "1" (= Remote) for the Modbus writing to be active.	

#### 10.4 CIM 500

If the CIM 500 misbehavior is observed, before doing anything else, it is recommended to do a factory reset by switching the protocol selector in position F for more than 20 s. The configuration must be done again via the webserver. You can detect faults in the CIM 500 by observing the status of the two communication LEDs.

#### Related information

4.3 CIM 500 Modbus TCP

#### 10.4.1 LED status

#### 10.4.1.1 Both LED1 and LED2 remain off when the power supply is connected.

Cause	Remedy	
The CIM 500 is fitted incorrectly in the CIU 900.	Confirm that the CIM 500 is fitted and connected correctly.	
The cable from the CIU 900 to the DDA pump is improperly connected or defective.	Check the cable connection between the CIU 900 and the DDA pump.	
The CIM 500 is defective.	Replace the CIM 500.	
10.4.1.2 LED2 for internal communication is flashing red.		
Cause	Remedy	
There is no internal communication between the CIM and the CIU 900.	<ul> <li>Make sure that the CIM 200 is fitted correctly in the CIU 900, and that the cable connection between the CIU 900 and the DDA pump is fitted correctly.</li> </ul>	
10.4.1.3 LED2 for internal communication is permanently red		
Cause	Remedy	
The CIM does not support the dosing pump connected.	Contact the nearest Grundfos company.	

#### 10.4.1.4 LED1 for the Modbus connection is permanently red.

Cause	Remedy	
There is a fault in the Modbus configuration of the CIM.	<ul> <li>Check the transmission speed (switches SW4 and SW5). If the switches are set to software-defined, an invalid value may have been set via the Modbus. Try one of the preselected transmission speeds, for example, 19200 bits/s.</li> </ul>	
	<ul> <li>Check if the Modbus address, switches SW6 and SW7, has a valid value [1-247].</li> </ul>	
10.4.1.5 LED1 is permanently red and green at the same time		
Cause	Remedy	
There is an error in the firmware download.	Use the webserver to download the firmware again.	
10.4.1.6 LED2 is permanently red and green at the same time		
Cause	Remedy	
There is a memory fault.	Replace the CIM.	

### 10.4.2 Communication faults

#### 10.4.2.1 The slave does not respond to telegrams.

Cause	Remedy	
There is a configuration or wiring error.	<ul> <li>Check the visual diagnostics on the Modbus slave. Normally, the Grundfos GENIbus LED2 is permanently green and the Modbus TCP LED1 is off or flashing green. If this is not fulfilled, see section LED status.</li> </ul>	
	• Make sure that the cable between the Modbus TCP master and the Modbus slave is connected correctly. See section Connecting the Ethernet cable.	
	• Make sure that the slave IP address is configured correctly, and the correct slave IP address is used in the Modbus master poll.	
10.4.2.2 The slave responds with the exception response 0x01: In	alid function.	
Cause	Remedy	
The master is trying to use an unsupported function in the CIM 500.	<ul> <li>See section Modbus function code overview for supported function codes. Note that reading and writing coils are not supported, so only register functions and diagnostics are valid.</li> </ul>	

### 10.4.2.3 The slave responds with the exception response 0x02: Invalid data address.

Cause	Remedy	
The master is trying to read or write an invalid data address. If a master tries to read register addresses that are not listed in the tables, the slave responds with this exception response. Some masters may automatically try to read large blocks in one telegram, which causes problems if some of the registers in the block are not supported. An example would be reading the CIM configuration and the CIM status register blocks in one telegram. This is not possible since there are unused addresses between the blocks.	<ul> <li>Avoid reading or writing invalid data addresses.</li> <li>Make sure that register X is addressed as X-1 in the Modbus telegrams, according to the Modbus standard.</li> </ul>	

#### 10.4.2.4 The slave returns data value 0xFFFF (65535).

Cause	Ren	nedy
The value is unavailable. A data value of 0xFFFF does not necessarily indicate an error. It means that the value is unavailable from the DDA pump either momentarily, or due to a missing setting parameter.	• (	See section Modbus register addresses for available data.

#### 10.4.2.5 The slave does not react to control commands or to writing of settings.

Cause	Remedy	
The DDA pump might be in Local mode, thus Operating mode, Control mode and Setpoint cannot be changed from the bus. Register 00201 bit 8 AccessMode must be "1" (= Remote) for the bus control to be active.	• Set the DDA pump in Remote mode by setting the register 00101 bit 0 RemoteAccessReq to "1" (= Remote). The DDA pump should show Controlled from the bus when the status is read by the Grundfos GO Remote.	
Control source Bus has not been selected at the DDA HMI.	From the DDA HMI setting menu Control from bus must be selected.	
Access mode Remote has not been selected from the Modbus.	<ul> <li>The DDA pump might be in Local mode, thus Modbus writing is not possible. Register 00201 bit 8 AccessMode must be "1" (= Remote) for the Modbus writing to be active.</li> </ul>	

## A.1. How to configure an IP address on your PC using Windows 11

Make sure that you have the necessary administrator rights.

- 1. Go to Ethernet settings (for example, use the Windows "Search" function).
- 2. Select the drop-down menu for the Ethernet port in question.
- 3. Select Edit at the IP assignment.
- 4. Fill in the settings as below. Note that all addresses belong to the CIM 500 subnetwork 192.168.1.x. but are unique (gateway and DNS can be identical).

Edit IP settings	
Manual	~
IPv4	
On On	
IP address	
192.168.1.10	
Subnet mask	
255.255.255.0	
Gateway	
192.168.1.1	
Preferred DNS	
192.168.1.1	
DNS over HTTPS	
Off	~
Alternate DNS	
DNS over HTTPS	
Off	~
IPv6 off	
Save	Cancel

Example from Windows 11

#### A.2. CIM 500

#### A.2.1. Webserver configuration

The built-in webserver is an easy and effective way to monitor the status of the CIM 500 and configure the available functions and industrial Ethernet protocols. The webserver also makes it possible to update the firmware of the CIM 500, and store or restore settings. To establish a connection from a PC to the CIM 500, proceed as follows:

#### Before configuration

- Make sure that the PC and the CIM 500 are connected via an Ethernet cable.
- Make sure that the PC Ethernet port is set to the same network as the CIM 500. For network configuration, see section How to configure an IP address on your PC.

To establish a connection from a PC to the CIM 500 for the first time, the following steps are required:

- 1. Open a standard internet browser and type 192.168.1.100 in the URL address field.
- 2. Log in to the webserver.

#### A.2.2. Login

GRUNDFOS'X		Grundfos CIM 500 Industrial Ethernet - Modbus TCP
Information	Login	
System	Username: admin	
Licence	Password:	
Login	Submit	
Contact		

TM056063\_4412\_GRAY

#### Login

User name	Enter the user name. Default: admin.
Password	Enter the password. Default: Grundfos.

The user name and password can be changed on the web server under Grundfos Management.

# Appendix A

TM074523

# A.2.3. Modbus TCP configuration

This web page is used for configuring all the parameters relevant to the Modbus TCP protocol standard.

GRUNDFOS .	<
Information	Real Time Ethernet Protocol Configuration - Modbus TCP
System Version Licence	Protocol Settings
Configuration Real Time Ethernet Protocol Network Settings GENIpro TCP Protocol Liner Management	TCP Port Number:         502           IP Address:         0.0.0           Subnet Mask:         0.0.0           Gateway:         0.0.0.d
Firmware Update / Restart	Use DHCP:
Logout Service Info	Submit
Contact	ATTENTION! To optimize data security if using Modbus TCP via a cellular router Grundfos strongly recommends that the cellular data connection is based on a private APN with static IP and no access to public internet.

Real Time Ethernet Protocol Configuration - Modbus TCP

Object	Description
	The default value is 502, the official IANA-assigned Modbus TCP port number.
TCP Port Number	The number 502 is always active implicitly.
	If you select another value in the webserver configuration field, both the new value and value 502 will be active.
IP Address	This is for the configuration of the static IP address if a DHCP server is not used. Modbus TCP is not allowed to share the IP address with the CIM 500 webserver.
Subnet Mask	This is for the configuration of the subnet mask if a DHCP server is not used.
Gateway	This is for the configuration of the gateway address if a DHCP server is not used.
Use DHCP	The module can be configured to automatically obtain its Modbus TCP network settings from a DHCP server if available on the network. Default: DHCP is disabled, "Use DHCP" is unchecked.

#### Argentina

Bombas GRUNDFOS de Argentina S.A. Ruta Panamericana km. 37.500industin 1619 - Garín Pcia. de B.A. Tel.: +54-3327 414 444 Fax: +54-3327 45 3190

#### Australia

GRUNDFOS Pumps Pty. Ltd. P.O. Box 2040 Regency Park South Australia 5942 Tel.: +61-8-8461-4611 Fax: +61-8-8340-0155

# Austria Austria GRUNDFOS Pumpen Vertrieb Ges.m.b.H. Grundfosstraße 2 A-5082 Grödig/Salzburg Tel: +43-6246-883-0 Fax: +43-6246-883-30

Belgium N.V. GRUNDFOS Bellux S.A. Boomsesteenweg 81-83 B-2630 Aartselaar Tel.: +32-3-870 7300 Fax: +32-3-870 7301

#### Bosnia and Herzegovina

GRUNDFOS Sarajevo Zmaja od Bosne 7-7A BiH-71000 Sarajevo Tel.: +387 33 592 480 Fax: +387 33 590 465 www.ba.grundfos.com E-mail: grundfos@bih.net.ba

#### Brazil

BOMBAS GRUNDFOS DO BRASIL Av. Humberto de Alencar Castelo Branco, 630 CEP 09850 - 300

São Bernardo do Campo - SP Tel.: +55-11 4393 5533 Fax: +55-11 4343 5015 Bulgaria

Grundfos Bulgaria EOOD Slatina District Granna District Iztochna Tangenta street no. 100 BG - 1592 Sofia Tel.: +359 2 49 22 200 Fax: +359 2 49 22 201 E-mail: bulgaria@grundfos.bg

Canada GRUNDFOS Canada inc. 2941 Brighton Road Oakville, Ontario L6H 6C9 Tel.: +1-905 829 9533 Fax: +1-905 829 9512

# China GRUNDFOS Pumps (Shanghai) Co. Ltd. 10F The Hub, No. 33 Suhong Road Minhang District Shanghai 201106 PRC Tel. + 86 21 612 252 22 Fax: +86 21 612 253 33

Colombia GRUNDFOS Colombia S.A.S. Km 1.5 vía Siberia-Cota Conj. Potrero Chico. Parque Empresarial Arcos de Cota Bod. 1A. Cota, Cundinamarca Tel.: +57(1)-2913444 Fax: +57(1)-8764586

#### Croatia

GRUNDFOS CROATIA d.o.o. Buzinski prilaz 38, Buzin HR-10010 Zagreb Tel.: +385 1 6595 400 Fax: +385 1 6595 499 www.hr.grundfos.com

Czech Republic

GRUNDFOS Sales Czechia and Slovakia s.r.o.

Čajkovského 21 779 00 Olomouc Tel.: +420-585-716 111

Denmark GRUNDFOS DK A/S Martin Bachs Vej 3 DK-8850 Bjerringbro Tel.: +45-87 50 50 50 Fax: +45-87 50 51 51 E-mail: info\_GDK@grundfos.com www.grundfos.com/DK

**Estonia** GRUNDFOS Pumps Eesti OÜ Peterburi tee 92G 11415 Tallinn Tel.: + 372 606 1690 Fax: + 372 606 1691

#### Finland

OY GRUNDFOS Pumput AB Trukkikuja 1 FI-01360 Vantaa Tel.: +358-(0) 207 889 500

France Pompes GRUNDFOS Distribution S.A. Parc d'Activités de Chesnes 57, rue de Malacombe F-38290 St. Quentin Fallavier (Lyon) Tel.: +33-4 74 82 15 15 Fax: +33-4 74 94 10 51

Germany GRUNDFOS GMBH Schlüterstr. 33 40699 Erkrath Tel.: +49-(0) 211 929 69-0 Fax: +49-(0) 211 929 69-3799 E-mail: infoservice@grundfos.de Service in Deutschland: kundendienst@grundfos.de

#### Greece

GRUNDFOS Hellas A.E.B.E. 20th km. Athinon-Markopoulou Av. P.O. Box 71 GR-19002 Peania Tel.: +0030-210-66 83 400 Fax: +0030-210-66 46 273

Hong Kong GRUNDFOS Pumps (Hong Kong) Ltd. Unit 1, Ground floor, Siu Wai industrial Centre 29-33 Wing Hong Street & 68 King Lam Street, Cheung Sha Wan Kowloon Tel.: +852-27861706 / 27861741 Fax: +852-27858664

#### Hungary

GRUNDFOS South East Europe Kft. Tópark u. 8 H-2045 Törökbálint Tel.: +36-23 511 110 Fax: +36-23 511 111

India GRUNDFOS Pumps India Private Limited 118 Old Mahabalipuram Road Thoraipakkam Chennai 600 097 Tel.: +91-44 2496 6800

Indonesia PT GRUNDFOS Pompa Graha intirub Lt. 2 & 3 Jln. Cililitan Besar No.454. Makasar, Jakarta Timur ID-Jakarta 13650 Tel.: +62 21-469-51900 Fax: +62 21-460 6910 / 460 6901

#### Ireland

GRUNDFOS (Ireland) Ltd. Unit A, Merrywell Business Park Ballymount Road Lower Dublin 12 Tel.: +353-1-4089 800 Fax: +353-1-4089 830

Italy GRUNDFOS Pompe Italia S.r.I. Via Gran Sasso 4 I-20060 Truccazzano (Milano) Tel.: +39-02-95838112 Fax: +39-02-95309290 / 95838461

# Japan GRUNDFOS Pumps K.K. 1-2-3, Shin-Miyakoda, Kita-ku Hamamatsu

431-2103 Japan Tel.: +81 53 428 4760 Fax: +81 53 428 5005

# **Kazakhstan** Grundfos Kazakhstan LLP

7' Kyz-Zhibek Str., Kok-Tobe micr. KZ-050020 Almaty Kazakhstan Tel.: +7 (727) 227-98-55/56

Korea GRUNDFOS Pumps Korea Ltd. 6th Floor, Aju Building 679-5 Yeoksam-dong, Kangnam-ku, 135-916 Seoul, Korea Tel.: +82-2-5317 600 Fax: +82-2-5633 725

#### Latvia

SIA GRUNDFOS Pumps Latvia Deglava biznesa centrs Augusta Deglava ielā 60 LV-1035, Rīga, Tel.: + 371 714 9640, 7 149 641 Fax: + 371 914 9646

#### Lithuania

GRUNDFOS Pumps UAB Smolensko g. 6 LT-03201 Vilnius Tel.: + 370 52 395 430 Fax: + 370 52 395 431

Malaysia GRUNDFOS Pumps Sdn. Bhd. 7 Jalan Peguam U1/25 Glenmarie industrial Park 40150 Shah Alam, Selangor Tel.: +60-3-5569 2922 Fax: +60-3-5569 2866

#### Mexico

MEXICO Bombas GRUNDFOS de México S.A. de C.V. Boulevard TLC No. 15 Parque industrial Stiva Aeropuerto Apodaca, N.L. 66600 Tel.: +52-81-8144 4000 Fax: +52-81-8144 4010

#### Netherlands

GRUNDFOS Netherlands Veluwezoom 35 1326 AE Almere Postbus 22015 1302 CA ALMERE Tel.: +31-88-478 6336 Fax: +31-88-478 6332 E-mail: info\_gnl@grundfos.com

#### New Zealand

GRUNDFOS Pumps NZ Ltd. 17 Beatrice Tinsley Crescent North Harbour Industrial Estate Albany, Auckland Tel.: +64-9-415 3240 Fax: +64-9-415 3250

Norway GRUNDFOS Pumper A/S Strømsveien 344 Postboks 235, Leirdal N-1011 Oslo Tel.: +47-22 90 47 00 Fax: +47-22 32 21 50 Poland

GRUNDFOS Pompy Sp. z o.o. ul. Klonowa 23 Baranowo k. Poznania PL-62-081 Przeźmierowo Tel.: (+48-61) 650 13 00 Fax: (+48-61) 650 13 50

Portugal Bombas GRUNDFOS Portugal, S.A. Rua Calvet de Magalhães, 241 Apartado 1079 P-2770-153 Paço de Arcos Tel.: +351-21-440 76 00 Fax: +351-21-440 76 90

Romania GRUNDFOS Pompe România SRL S-PARK BUSINESS CENTER, Clădirea A2, etaj 2 A2, etaj 2 Str. Tipografilor, Nr. 11-15, Sector 1, Cod 013714 Bucuresti, Romania Tel.: 004 021 2004 100 E-mail: romania@grundfos.ro

#### Serbia

Grundfos Srbija d.o.o. Omladinskih brigada 90b 11070 Novi Beograd Tel.: +381 11 2258 740 Fax: +381 11 2281 769 www.rs.grundfos.com

Singapore GRUNDFOS (Singapore) Pte. Ltd. 25 Jalan Tukang Singapore 619264 Tel.: +65-6681 9688 Faxax: +65-6681 9689

#### Slovakia

GRUNDFOS s.r.o. Prievozská 4D 821 09 BRATISLAVA Tel.: +421 2 5020 1426 sk.grundfos.com

#### Slovenia

GRUNDFOS LJUBLJANA, d.o.o. Leskoškova 9e, 1122 Ljubljana Tel.: +386 (0) 1 568 06 10 Fax: +386 (0) 1 568 06 19 E-mail: tehnika-si@grundfos.com

South Africa GRUNDFOS (PTY) LTD 16 Lascelles Drive, Meadowbrook Estate 1609 Germiston, Johannesburg Tel.: (+27) 10 248 6000 Fax: (+27) 10 248 6002 E-mail: lgradidge@grundfos.com

#### Spain

Bombas GRUNDFOS España S.A. Camino de la Euentecilla s/n E-28110 Algete (Madrid) Tel.: +34-91-848 8800 Fax: +34-91-628 0465

#### Sweden GRUNDFOS AB

Box 333 (Lunnagårdsgatan 6) 431 24 Mölndal Tel.: +46 31 332 23 000 Fax: +46 31 331 94 60

Switzerland GRUNDFOS Pumpen AG Bruggacherstrasse 10 CH-8117 Fällanden/ZH Tel.: +41-44-806 8111 Fax: +41-44-806 8115

#### Taiwan

GRUNDFOS Pumps (Taiwan) Ltd. 7 Floor, 219 Min-Chuan Road Taichung, Taiwan, R.O.C. Tel.: +886-4-2305 0868 Fax: +886-4-2305 0878

Thailand GRUNDFOS (Thailand) Ltd. 92 Chaloem Phrakiat Rama 9 Road Dokmai, Pravej, Bangkok 10250 Tel.: +66-2-725 8999 Fax: +66-2-725 8998

Turkey GRUNDFOS POMPA San. ve Tic. Ltd. Sti. Gebze Organize Sanayi Bölgesi Ihsan dede Caddesi 2. yol 200. Sokak No. 204 2. yol 200. Sonar No. 204 41490 Gebze/ Kocaeli Tel.: +90 - 262-679 7979 Fax: +90 - 262-679 7905 E-mail: satis@grundfos.com

#### Ukraine

Октаіпе ТОВ "ГРУНДФОС УКРАЇНА" Бізнес Центр Європа Столичне шосе, 103 м. Київ, 03131, Україна Tel.: (+38 044) 237 04 00 Fax: (+38 044) 237 04 01 E-mail: ukraine@grundfos.com

#### United Arab Emirates

**GRUNDFOS Gulf Distribution** P.O. Box 16768 Jebel Ali Free Zone, Dubai Tel.: +971 4 8815 166 Fax: +971 4 8815 136

#### United Kingdom

GRUNDFOS Pumps Ltd. Grovebury Road Leighton Buzzard/Beds. LU7 4TL Tel.: +44-1525-850000 Fax: +44-1525-850011

U.S.A. Global Headquarters for WU 856 Koomey Road Brookshire, Texas 77423 USA Phone: +1-630-236-5500

Kazakhstan in Uzbekistan

S8a, Oybek street, Tashkent Tel.: (+998) 71 150 3290 / 71 150 3291 Fax: (+998) 71 150 3292

#### Uzbekistan Grundfos Tashkent, Uzbekistan The Representative Office of Grundfos

**98473491 01.2025** ECM: 1400442



www.grundfos.com