

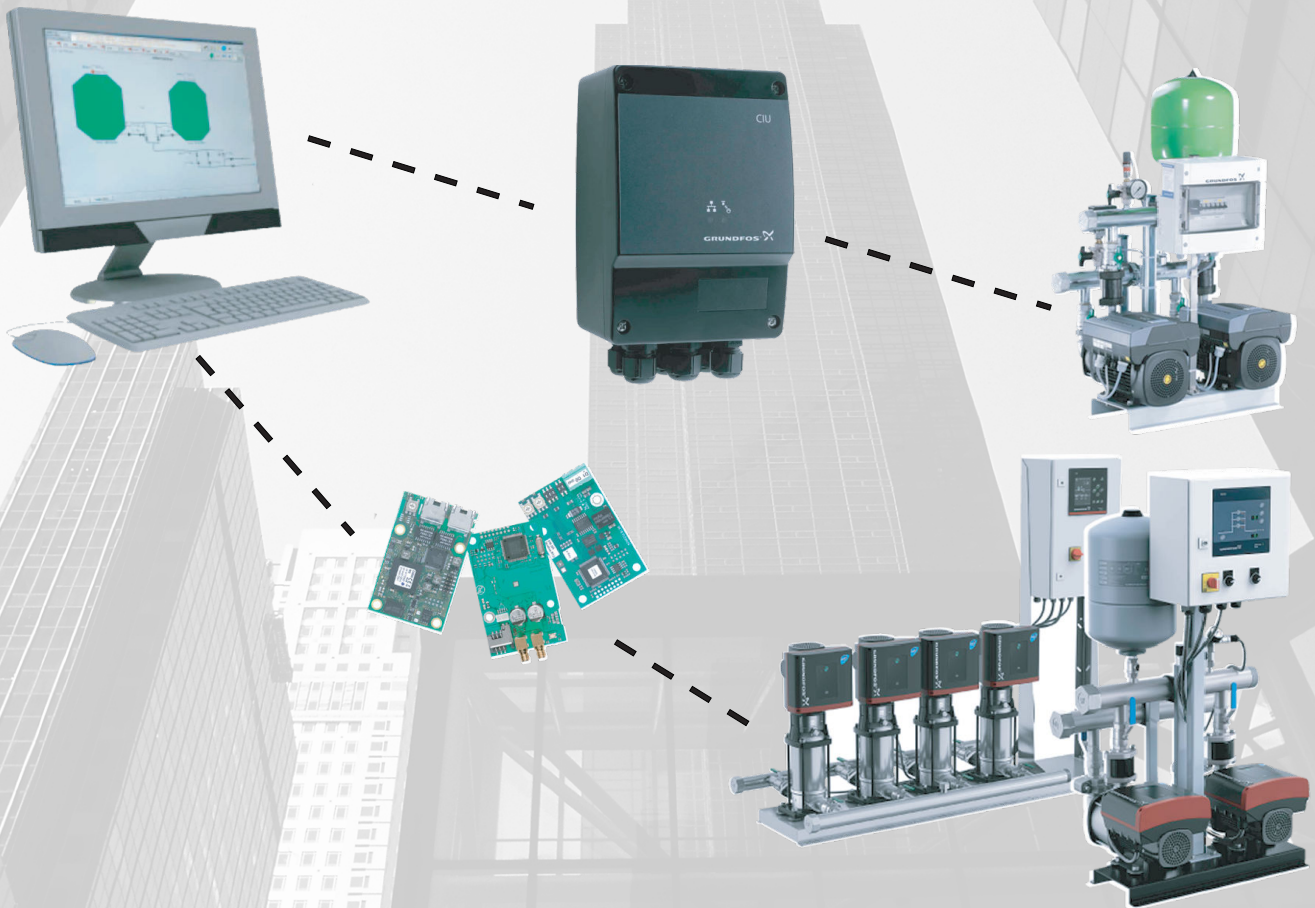
# Modbus for Grundfos boosters

**CIM/CIU 200 Modbus RTU**

**CIM/CIU 260 3G/4G cellular**

**CIM/CIU 500 Ethernet for Modbus TCP**

Functional profile and user manual





# Modbus for Grundfos boosters

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## English (GB)

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## Original functional profile and user manual

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## 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.



#### CAUTION

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

This functional profile describes the following modules and units:

- CIM/CIU 200 Modbus RTU
- CIM/CIU 260 Modbus 3G/4G cellular
- CIM/CIU 500 Modbus Ethernet for Modbus TCP

This functional profile applies to the following Grundfos booster systems:

- Grundfos Hydro Multi-B (CU 323)
- Grundfos Hydro MPC (CU 35X)
- Grundfos Control MPC (CU 35X)
- Grundfos DDD (CU 354)
- Grundfos Hydro Multi-E model G
- Grundfos Hydro Multi-E model H, I, J and K
- Grundfos TPED model H, I, J and K, twin-head pump
- Grundfos MAGNA3-D, twin-head pump

All Multi-E systems that are based on MGE model G and earlier models are referred to as Multi-E model G.

All Multi-E systems that are based on MGE model H and later models are referred to as Multi-E model H.

The register blocks for Hydro MPC and Control MPC are identical, so in the following, only Hydro MPC is mentioned. If not specifically mentioned, Hydro Multi-B, Hydro MPC, DDD, Hydro Multi-E model G and Hydro Multi-E model H are referred to as "booster system".

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 Modbus devices. The reader should also have some basic knowledge of the Modbus protocol and technical specifications.

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

## 2.3 Definitions and abbreviations

0b	Prefix for a binary number.
0x	Prefix for a hexadecimal number.
3G	Third-generation mobile telephony network.
4G	Fourth-generation mobile telephony network.
ARP	Address Resolution Protocol. Translates IP addresses into MAC addresses.
Auto-MDIX	Ensures that both crossover cable types and non-crossover cable types can be used.
CAT5	Ethernet cable type with four twisted pairs of wires.
CAT5e	Enhanced CAT5 cable with better performance.
CAT6	Ethernet cable compatible with CAT5 and CAT5e and with very high performance.
CIM	Communication Interface Module.
CIU	Communication Interface Unit.
CRC	Cyclic Redundancy Check. A data error detection method.
CSD	Circuit Switched Data. Connection is established via a fixed connection that is a physical circuit or a reserved data channel.
CU 323	Grundfos Control Unit used in Hydro Multi-B booster systems.
CU 352	Grundfos Control Unit used in Hydro MPC booster systems.
CU 354	Grundfos Control Unit used in Demand Driven Distribution.
DDD	Demand Driven Distribution. A Grundfos system for municipal water supply.
DHCP	Dynamic Host Configuration Protocol. Used to configure network devices to enable them to communicate on an IP network.
DNS	Domain Name System. Used to resolve 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.
H	Head (pressure).
HTTP	HyperText 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	A serial communications protocol commonly used in industry and building automation systems.
Modbus RTU	Modbus is a fieldbus used worldwide. The RTU version is used for wired networks and CIM 200.
Modbus TCP	Modbus is a fieldbus used worldwide. The TCP version is adapted for use as an application protocol on TCP/IP using either CIM 260 3G/4G cellular or CIM 500 Ethernet as the basis.
MPC	Multi-Pump Controller.
PIN	Personal Identification Number. For SIM cards.
Ping	Packet InterNet Groper. A software utility that tests connectivity between two TCP/IP hosts.
PUK	Personal Unblocking Key. For SIM cards.
Q	Flow rate.
SELV	Separated or Safety Extra-Low Voltage.
SIM	Subscriber Identity Module. SIM card.
SMA	SubMiniature version A. Coaxial radio signal cable connection standard.
SMTP	Simple Mail Transfer Protocol.
SNTP	Simple Network Time Protocol. Used for clock synchronisation between computer systems.

TCP	Transmission Control Protocol. Protocol for Internet communication and Industrial Ethernet communication.
TCP/IP	Transmission Control Protocol/Internet Protocol. Protocol for Internet communication.
Transmission speed	Bits transferred per second, bit/s.
URL	Uniform Resource Locator. The IP address used to connect to a server.
UTC	Coordinated Universal Time. The primary time standard by which the world regulates clocks and time.
UTF-8	Unicode Transformation Format. Character encoding.
	Virtual Private Network.
VPN	A network using the Internet to connect nodes. These systems use encryption and other security mechanisms to ensure that only authorised users can access the network and that the data cannot be intercepted.

### 3. System description

#### 3.1 Modbus

The system diagrams give an overview of the different technologies and how to connect the module or unit to the Grundfos Booster that you connect to a Modbus network.

Note that the Hydro MPC and Control MPC are available in two variants: with a CU 351 or a CU 352 control unit. They have different CIM/CIU connections, as described below.

#### CIM solution

The Communication Interface Module (CIM) is an add-on communication module that you install into the back of these control units:

- CU 352 Hydro MPC
- CU 323 Hydro Multi-B
- CU 354 DDD.

You can fit it inside the terminal box of the master pump in a Hydro Multi-E model H and later booster system.

You can also fit it in the master pump of the twin pump types TPED and MAGNA3-D.

In this setup, the booster system will supply power to CIM 200. See fig. Example of a CIM 200 solution. The module is installed inside the CU 352 controller.

#### CIU solution

The Communication Interface Unit (CIU) is a unit incorporating a power supply module and a CIM Modbus module. You can mount it either on a DIN rail or on a wall. See fig. Example of a CIU 200 solution for Hydro Multi-E model G.

You use CIU 200 with the older products:

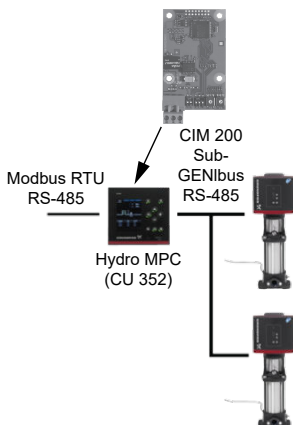
- CU 351 MPC
- Multi-E model G.

Further, you must fit CU 351 MPC with an add-on module for the external GENibus connection to connect to the CIU unit.

#### Related information

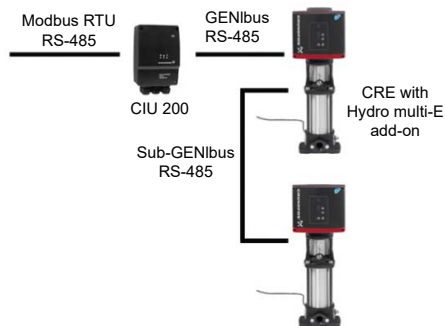
##### 3.2 CIM 200 Modbus RTU

#### 3.2 CIM 200 Modbus RTU



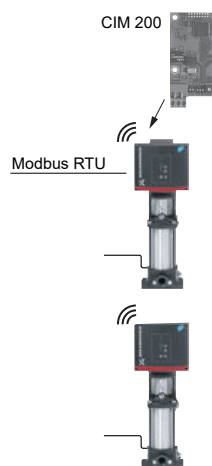
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Example of a CIM 200 solution. The module is installed inside the CU 352 controller



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Example of a CIU 200 solution for Hydro Multi-E model G

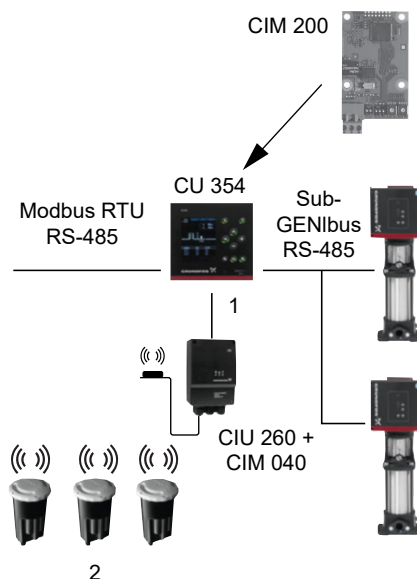


TM079824

Example of a CIM 200 solution for Hydro Multi-E model H and later. Pumps connected via built-in radio communication (Grundfos Glowpan)

The example for Multi-E model H and later is identical for TPED model H and later and MAGNA3-D. In all cases, mount the CIM module in the master pump placed to the left.

For the purpose of redundancy, you can mount a second CIM module in pump 2 for TPED and Multi-E (not MAGNA3-D). In that case, all writings from the Modbus master must be send to both CIM modules.



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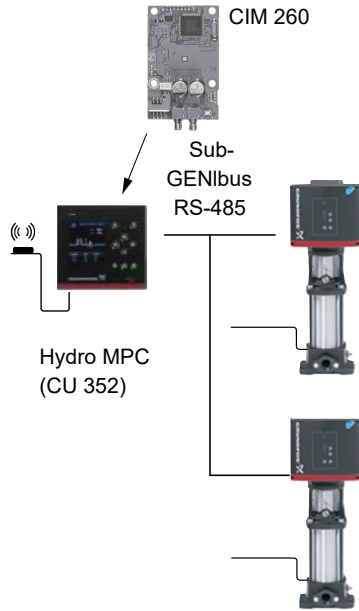
Example of a CIM 200 solution for Demand Driven Distribution

Pos.	Description
1	Service port
2	DDD sensors

### 3.3 CIM 260 3G/4G cellular Modbus

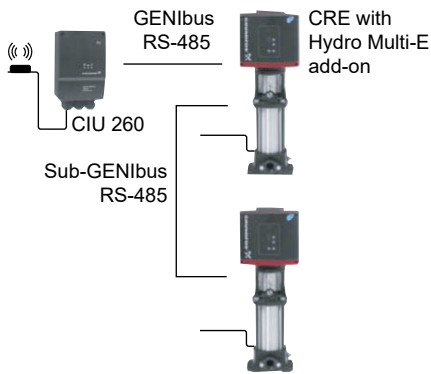
You can establish remote communication via CIM/CIU 260 by using one of the following options:

- Modbus TCP protocol via a cellular data connection
- SMS commands from a mobile phone.



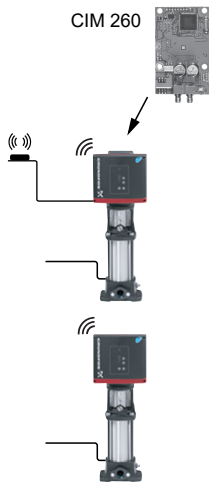
Example of a CIM 260 solution. The module is installed inside the CU 352 controller

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CIU 260 cellular solution for Hydro Multi-E model G

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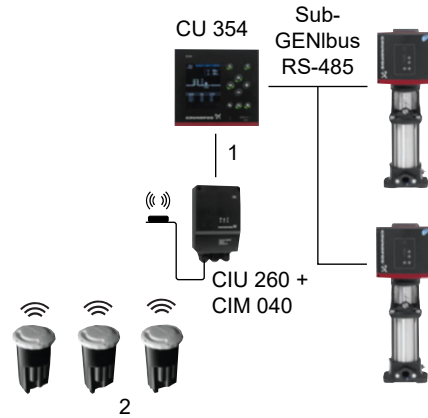


Example of a CIM 260 cellular solution for Hydro Multi-E model H and later. Pumps connected via built-in radio communication (Grundfos Glowpan)

TM079830

The example for Multi-E model H and later is identical for TPED model H and later and MAGNA3-D. In all cases, mount the CIM module in the master pump placed to the left.

For the purpose of redundancy, you can mount a second CIM module in pump 2 for TPED and Multi-E (not MAGNA3-D). In that case, all writings from the Modbus master must be sent to both CIM modules.

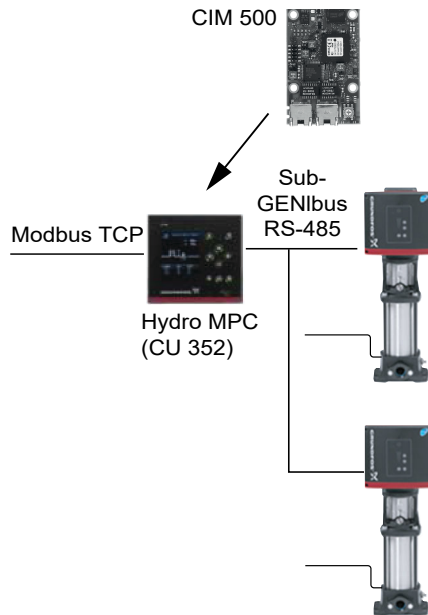


Example of a CIU 260 cellular solution for Demand Driven Distribution

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Pos.	Description
1	Service port
2	DDD sensors

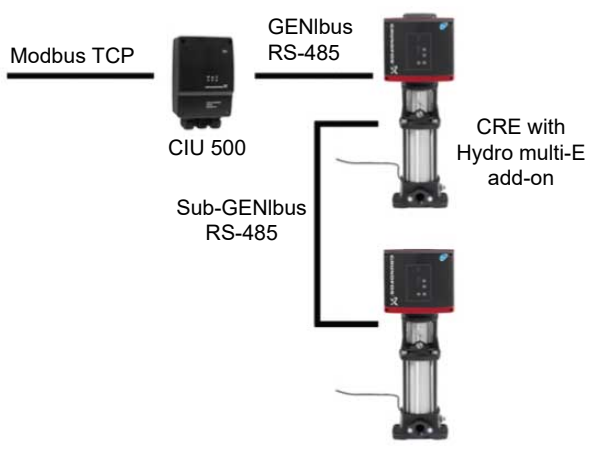
### 3.4 CIM 500 Modbus TCP



Example of a CIM 500 solution. The module is installed inside the CU 352 controller

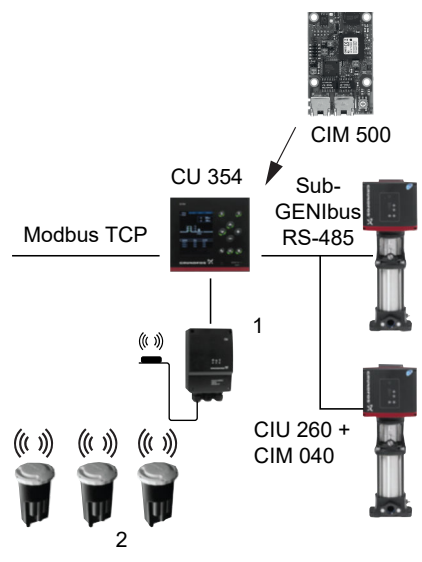
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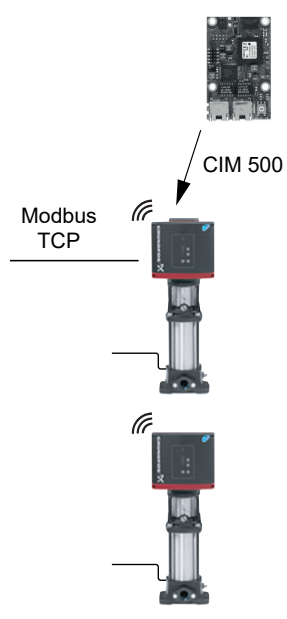
Example of a CIU 500 solution for Hydro Multi-E model G

TM079819



Example of a CIM 500 solution for Demand Driven Distribution

TM079839



Example of a CIM 500 solution for Hydro Multi-E model H and later. Pumps connected via built-in radio communication (Grundfos Glowpan)

TM079838

The example for Multi-E model H and later is identical for TPED model H and later and MAGNA3-D. In all cases, mount the CIM module in the master pump placed to the left.

For the purpose of redundancy, you can mount a second CIM module in pump 2 for TPED and Multi-E (not MAGNA3-D). In that case, all writings from the Modbus master must be sent to both CIM modules.

Pos.	Description
1	Service port
2	DDD sensors

## 4. Specifications

### 4.1 CIM module

General data	Description	Comments
Ambient humidity	30 % to 95 %	Relative, non-condensing.
Operating temperature	-20 to +45 °C	
Storage temperature	-25 to +70 °C	
Battery, lithium-ion	You can only charge the battery if the battery temperature is between 0 and 45 °C.	CIM 260 only.
GENIbus visual diagnostics	LED2	The LED will be in one of these states: Off, permanently green, flashing red, permanently red.
Power supply (CIU)	24-240 V	Located in the unit.
GENIbus connection type (CIU)	RS-485, 3-wire + screen	Conductors: A, B and Y.
CIU box enclosure class	IP54	
CIU box dimensions (H × W × D)	182 × 108 × 82 mm	

#### Related information

[5.5 Status LEDs](#)

### 4.2 CIM 200 Modbus RTU

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

Modbus RTU specifications	Description	Comments
Modbus connector	Screw-type terminal	3 pins.
Modbus connection type	RS-485, 2-wire + common	Conductors: D0, D1 and Common.
Maximum cable length	1200 m	Equals 4000 ft.
Slave address	1-247	Set via rotary switches SW6 and SW7.
Line termination	On or Off	Set via 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 bit/s	Set via DIP switches SW4 and SW5.
Start bit	1	Fixed value.
Data bits	8	Fixed value.
Stop bits	1 or 2	Set via DIP switch SW3.
Parity bit	Even parity, odd parity <sup>1)</sup> or no parity	Set via DIP switch SW3.
Modbus visual diagnostics	LED1	Off, flashing green, flashing red, permanently red.
Maximum number of Modbus devices	32	Using repeaters, you can increase this number. Legal address range is 1-247.
Maximum Modbus telegram size	256 bytes	Total length. Node address and CRC included.

1) Can only be set via software.

#### Related information

[5. CIM 200 Modbus RTU setup](#)

[5.1 Setting the Modbus transmission speed](#)

[5.2 Setting the stop bits and the parity bit](#)

[5.3 Modbus address selection](#)

[5.4 Termination resistor](#)

[5.5 Status LEDs](#)

[13. Modbus RTU telegram examples](#)

### 4.3 CIM 260 3G/4G cellular

The table below provides an overview of the specifications for Grundfos CIM/CIU 260. For further details, refer to the specific sections of this functional profile.

Modbus cellular specifications	Description	Comments
Data protocol	Modbus TCP	Data connection uses Modbus TCP.
Slave address	Factory 231 (0xE7)	You can change the address via Modbus register 00003, SoftwareDefinedModbusAddress.
Cellular connection visual diagnostics	LED1	
Maximum Modbus telegram size	260 bytes	Total Modbus TCP/IP application data unit.

#### Related information

[6.2 Status LEDs](#)

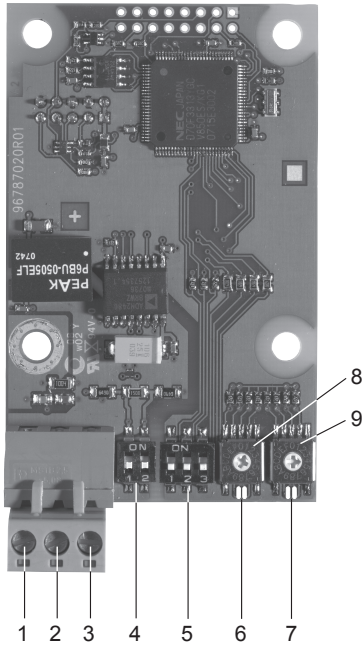
[12.2 Subscription](#)

### 4.4 CIM 500 Modbus TCP

The table below provides an overview of the specifications for Grundfos CIM/CIU 500 for 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 to select Modbus TCP.
Transport layer	TCP	
Internet layer	Internet protocol V4 (IPv4)	
Link layer	ARP, media access control (Ethernet)	
Ethernet cable	CAT5, CAT5e or CAT6	Supports auto cable-crossover detecting (Auto-MDIX).
Maximum cable length	100 metres	Corresponds to 328 feet.
Transmission speed	10 Mbit/s, 100 Mbit/s	Auto-detected.

## 5. CIM 200 Modbus RTU setup



TM041697

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/CIU 200 and the booster system
8	SW6	Hexadecimal rotary switch for setting the Modbus address, four most significant bits
9	SW7	Hexadecimal rotary switch for setting the Modbus address, four least significant bits

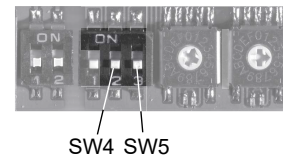
Use a screened, twisted-pair cable. Connect the cable screen to protective earth at both ends.

### Recommended connection

Modbus terminal	Colour code	Data signal
D1-TXD1	Yellow	Positive
D0-TXD0	Brown	Negative
Common/GND	Grey	Common/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 for setting the transmission speed.



SW4 SW5

TM041710

#### Modbus transmission speed

#### DIP switch settings

Available transmission speeds in bit/s: 1200, 2400, 4800, 9600, 19200 and 38400.

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

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

Default transmission speed is 19200 bit/s, as per the Modbus RTU standard.

#### Software-defined

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

Use the following values for software-defined transmission speeds:

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

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

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

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



When software defined has been selected, then communication speed, parity bit, stop bits and address are all set via specific registers.

#### Related information

[5.2 Setting the stop bits and the parity bit](#)

[5.3 Modbus address selection](#)

## 5.2 Setting the stop bits and the parity bit



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

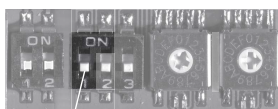
You can set the parity either manually by using SW3 or via software-defined settings.

### Manual setting of parity

Default byte format (11 bits):

- 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 DIP switch SW3. You can change the parity to no parity (2 stop bits).



SW3

TM041709

### Parity

### DIP switch settings

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

### Software-defined parity and stop bits

When SW4 and SW5 are set to "software-defined", the value in the holding registers at addresses 00009 and 00010 will override the setting of SW3.

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.



For software-defined parity and stop bits to become active, you must set SW4 and SW5 to ON.

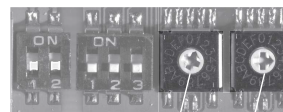
### Related information

[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.

To set the Modbus address, use two hexadecimal rotary switches, SW6 and SW7.



SW6 SW7

TM041706

### Setting the Modbus address

For a complete overview of Modbus addresses, see section Modbus RTU rotary switch addresses.



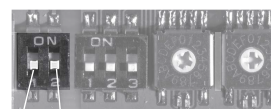
When software-defined transmission speed is enabled, software-defined address is also enabled and you set the address via register 00003.

You must set the Modbus address decimally from 1 to 247.

## 5.4 Termination resistor

The termination resistor is fitted on CIM 200 Modbus and has a value of 120 Ω.

CIM 200 has two DIP switches, SW1 and SW2, for cutting the termination resistor in and out.



SW1 SW2

TM041701

### 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: Termination resistor cut out.

### Cable length

We recommend the following maximum lengths:

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



To ensure 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 will be effective immediately after setting the values. No power-off is needed.

## 5.5 Status LEDs

CIM 200 Modbus has two status LEDs: LED1 and LED2.

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

### LED1

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

### LED2

Status	Description
Off	CIM 200 has been switched off.
Flashing red	No internal communication between CIM 200 and the Grundfos product.
Permanently red	CIM 200 does not support the Grundfos product connected.
Permanently green	Internal communication between CIM 200 and the Grundfos product is OK.

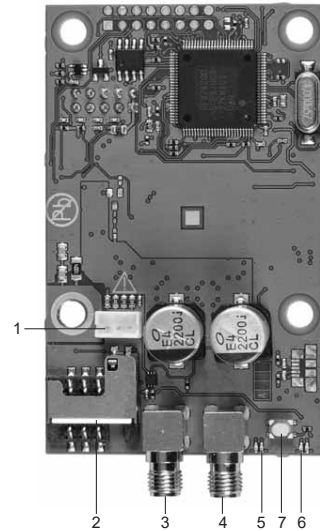


During startup, there is a delay of up to 5 seconds before LED2 status is updated.

### Related information

[5. CIM 200 Modbus RTU setup](#)

## 6. CIM 260 3G/4G cellular Modbus setup



CIM 260 cellular module (top view)

Pos.	Designation	Description
1		Battery socket
2		SIM card holder
3		Secondary SMA connection for cellular antenna <sup>2)</sup>
4		Primary SMA connection for the cellular antenna. This antenna must always be connected.
5	LED1	Yellow and green status LED for cellular communication
6	LED2	Red and green status LED for internal communication between CIU 260 and the Grundfos product
7	SW1	To reset to factory settings, press and hold for at least 5 seconds.

<sup>2)</sup> Use this antenna connection only if required by the telecom company.

### 6.1 Installation

#### WARNING

#### Electric shock

Death or serious personal injury



- Before installation, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

#### 6.1.1 Fitting a cellular antenna

Connect an antenna to CIM 260 to establish connection to the cellular network.

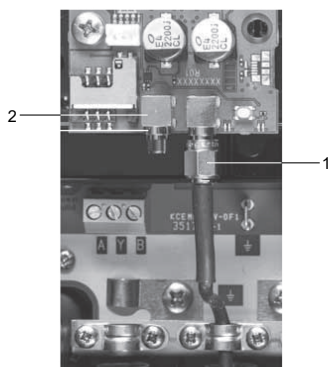


If CIU 260 is installed in a metal control cabinet, we recommend fitting an external antenna.

Grundfos offers different kinds of antennas. No antenna is supplied with CIU 260. You can order it separately.

#### External antenna

Connect the antenna cable to the SMA connection (pos. 1) of CIM 260. The antenna must be installed outside the control cabinet in a position with good reception conditions. If required by the telecom company, connect an additional antenna.



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### Fitting an external cellular antenna

Pos.	Description
1	Primary SMA connection for the cellular antenna
2	Secondary SMA connection for the cellular antenna <sup>3)</sup>

<sup>3)</sup> Use this antenna connection only if required by the telecom company.

### 6.1.2 Inserting the SIM card

Before inserting the SIM card into CIM 260, remove the PIN code, or set the PIN code to "4321".

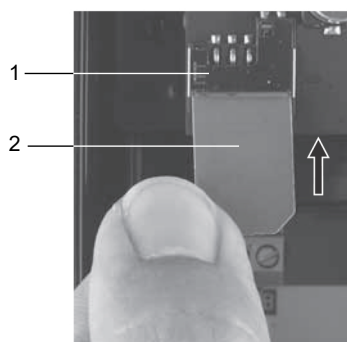
#### Procedure

1. Insert the SIM card into a mobile phone.
2. Remove the PIN code from the SIM card, or set the PIN code to "4321". See the manual for the mobile phone.
3. Insert the SIM card into the CIM 260.



The slanted edge of the SIM card must point downwards, away from the connector.

The connectors on the SIM card must face inwards towards CIM 260.



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### Inserting the SIM card

Pos.	Description
1	SIM card holder
2	SIM card

### 6.1.3 Connecting the battery and power supply



#### WARNING

##### Electric shock

- Death or serious personal injury
- Connect CIM 260 only to SELV circuits.



#### WARNING

##### Flammable material

- Death or serious personal injury
- The safety precautions listed below must be observed carefully as improper handling of the lithium-ion battery may result in injury or damage from electrolyte leakage, heating ignition or explosion.

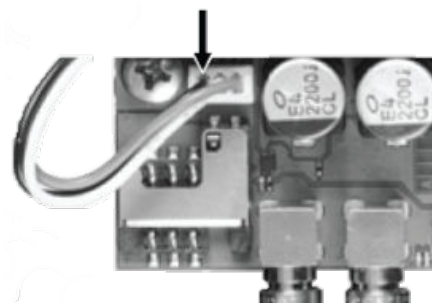
These safety precautions must be observed:

- Only insert the approved Grundfos battery pack (97631960).
- Never use this battery pack in other battery chargers.
- Do not dismantle or modify the battery.
- Do not heat or incinerate the battery.
- Do not pierce, crush or cause mechanical damage to the battery.
- Do not short-circuit the battery.
- Do not allow the battery to get wet or be immersed in water.
- Do not strike or throw the battery.
- For long periods of storage, the temperature must be below 35 °C.

You can fit CIM 260 with a lithium-ion battery (order no. 97631960), which ensures sustained cellular connection with the product in which it is mounted, even if the power is switched off. The battery is secured by a velcro strap which absorbs vibrations and simplifies replacement. Connect the battery to CIM 260 as shown in fig. Connecting the battery.



If a battery is not connected, the user will not receive any information in case of a power cut.



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### Connecting the battery



You can only charge the battery if the battery temperature is between 0 and 45 °C.

Switch on the power supply. CIM 260 is powered either by CIU 260 or by the battery.

LED1 flashes yellow, searching for cellular network. When the connection to the cellular network has been established, LED1 pulsates yellow: the cellular network is active. See fig. LED1 status in Section LEDs.

LED2 is permanently green, indicating that you have fitted CIM 260 correctly in CIU 260.

#### Related information

##### [6.2 Status LEDs](#)

### 6.1.4 Configuration

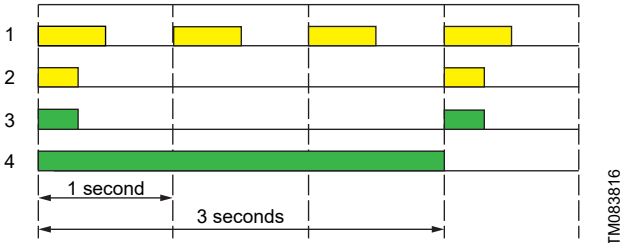
For software configuration of CIU 260, which includes setting of SMS functions and SCADA communication parameters, see "CIM 260 SMS commands", which you can download from Grundfos Product Center.

### 6.2 Status LEDs

The CIM 260 module has two LEDs.

- Yellow and green status LED1 for cellular communication.
- Red and green status LED2 for internal communication between CIM 260 and the Grundfos product.

#### LED1, yellow and green



#### LED1 status

Pos.	Status	Description
1	Flashing yellow	Searching for cellular network.
2	Pulsating yellow, single pulse	Connection to the cellular network has been established.
3	Pulsating green, single pulse	Communication via data connection.
4	Green, 3 seconds	Sending or receiving an SMS message.

#### LED2, red and green

Status	Description
Off	CIM 260 has been switched off.
Flashing red	No communication between CIM 260 and the Grundfos product.
Permanently red	CIM 260 does not support the connected version of the Grundfos product.
Permanently green	The connection between CIM 260 and the Grundfos product is OK.

## 7. CIM 500 Modbus TCP setup



### WARNING

#### Electric shock

Death or serious personal injury

- Connect CIM 500 only to SELV circuits.

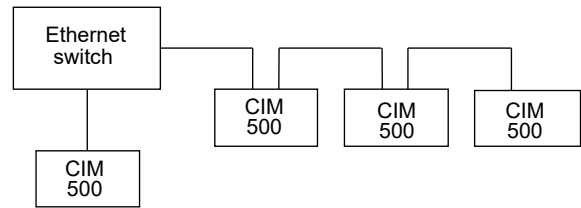
### 7.1 Connecting the Ethernet cable

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

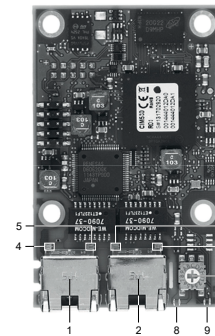


It is important to connect the cable shield to earth through an earth clamp or to connect the cable shield to earth in the connector.

CIM 500 is designed for flexible network installation; the built-in two port switch makes it possible to daisy chain from product to product without the need for 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



Example of Ethernet connection

Pos.	Description	Designation
1	Industrial Ethernet RJ45 connector 1	ETH1
2	Industrial Ethernet RJ45 connector 2	ETH2
3	Rotary switch for protocol selection	SW1
4	Data activity LED for connector 1	DATA1
5	Link LED for connector 1	LINK1
6	Data activity LED for connector 2	DATA2
7	Link LED for connector 2	LINK2
8	Green and red status LED for Ethernet communication	LED1
9	Green and red status LED for internal communication between the module and the product.	LED2



## 7.2 Setting the Industrial Ethernet protocol

The CIM 500 Ethernet module has a rotary switch for selection of the Industrial Ethernet protocol. See fig. Selecting the Industrial Ethernet protocol.



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Selecting the Industrial Ethernet protocol

Pos.	Description
0	PROFINET IO (default)
1	Modbus TCP
2	BACnet IP
3	EtherNet/IP
4..E	Reserved, LED1 will be permanently red to indicate an invalid configuration.  Reset to factory default.
F	Note that the rotary switch must be set in this position for 20 seconds to reset to factory default. During this period, LED1 flashes red and green at the same time to indicate that a reset will occur.



Every change of the rotary switch while the module is powered on will cause the module to restart.

## 7.3 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	Make the settings via the webserver

## 7.4 Establishing connection to the webserver

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

- Connect the PC and CIM 500 using an Ethernet cable.
- Configure the PC Ethernet port to the same subnetwork as CIM 500, for example 192.168.1.101, and the subnet mask to 255.255.255.0. See sections How to configure an IP address on your PC using Windows 7 and How to configure an IP address on your PC using Windows 10 .
- Open a standard internet browser and type 192.168.1.100 in the URL field.
- Log in to the webserver:

Username	Default: admin
Password	Default: Grundfos



Username and password may have been changed from their default values.



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CIM 500 connected to PC via Ethernet cable

For further information on how to use the webserver, see section Login.



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



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

### Related information

[A.1.1. How to configure an IP address on your PC using Windows 10](#)

[A.2. Login](#)

## 7.5 Status LEDs

The CIM 500 Ethernet module has two status LEDs: LED1 and LED2.

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

### LED1

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

**LED2**

Status	Description
Off	CIM 500 is switched off.
Flashing red	No internal communication between CIM 500 and the Grundfos product.
Permanently red	CIM 500 does not support the Grundfos product connected.
Permanently green	Internal communication between CIM 500 and the Grundfos product is OK.
Permanently red and green	Memory fault.



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

**Related information**

- [7.1 Connecting the Ethernet cable](#)
- [14.3.1 LED status](#)

**7.6 DATA and LINK LEDs**

The CIM 500 Ethernet module has two connectivity LEDs related to each RJ45 connector.

**DATA1 and DATA2**

These yellow LEDs indicate data traffic activity.

Status	Description
Yellow off	No data communication on the RJ45 connector.
Yellow flashing	Data communication ongoing on the RJ45 connector.
Permanently yellow	Heavy network traffic.

**LINK1 and LINK2**

These green LEDs show whether the Ethernet cable is properly connected.

Status	Description
Green off	No Ethernet link on the RJ45 connector.
Green on	Ethernet link on the RJ45 connector is OK.

**Related information**

- [7.1 Connecting the Ethernet cable](#)

**8. Modbus function code overview**

The supported function codes are shown in the table below:

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



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

**Related information**

- [13.6 Diagnostics, 0x08](#)

## 9. Modbus register addresses

### 9.1 Register block overview

The Modbus registers are grouped in the following register blocks:

Start address	Register block	Permissions	Description
00001	CIM configuration	R/W	Configuration of the CIM module.
00021	CIM status	R	Status registers for the CIM module.
00101	Control	R/W	Registers for control of the booster system.
00201	Status	R	Registers for reading mode status from the booster system.
00301	Data	R	Registers for reading measured data values from the booster system.
00401	Pump 1	R	Registers for pump 1 data and status.
00411	Pump 2	R	Registers for pump 2 data and status.
00421	Pump 3	R	Registers for pump 3 data and status.
00431	Pump 4	R	Registers for pump 4 data and status.
00441	Pump 5	R	Registers for pump 5 data and status.
00451	Pump 6	R	Registers for pump 6 data and status.
00461	Pilot pump	R	Registers for the pilot pump data and status.
00471	Backup pump	R	Registers for the backup pump data and status.
00701	Alarm simulation	R/W	Registers for simulating alarms and warnings.
00751-00800	User registers	R/W	This area is for device labelling by the user.

All addresses contain 16 bit registers. Some registers are bit-interpreted, consisting of one or more parameters of type bool, while others are 16-bit values or high/low order parts of 32 bit values. When a 32 bit value is split in two 16 bit registers, the names will be labeled HI and LO at the end of the register name. Re-combining into a 32 bit value is done like this:

Parameter32bit = Parameter16bitHI × 65536 + Parmeter16bitLO

### 9.2 CIM configuration register block

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

Address	Register name	Description	CIM 200	CIM 260	CIM 500
00001	SlaveMinimumReplyDelay	The minimum reply delay from the slave in ms. Value range: 0-10000, i.e. up to 10 seconds reply delay. This delay is typically used in conjunction with a 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. Default setting: 0.	•	-	-
00002		RESERVED			
00003	SoftwareDefinedModbusAddress	If the Modbus address switch has not been set correctly, meaning outside the 1 to 247 range, the value in this register is used as Modbus address. See section <a href="#">Modbus address selection</a> . The value is stored in the device and remains after a power-off. Note that for CIM 200, this value is used only when you have set the transmission speed to "software-defined" on DIP switches SW4 and SW5. Otherwise, CIM 200 ignores it.	•	•	•
00004	SoftwareDefinedBitRate	Modbus software-defined value for transmission speed. The software-defined value for transmission speed is stored in the device and remains after a power-off. 0: 1200 bit/s 1: 2400 bit/s 2: 4800 bit/s 3: 9600 bit/s 4: 19200 bit/s 5: 38400 bit/s. Note that for CIM 200, this value is used only when you have set the transmission speed to "software-defined" on DIP switches SW4 and SW5. Otherwise, CIM 200 ignores it.	•	-	-
00005	AutoAckControlBits	Used to select the behaviour of control bit acknowledgements from the CIM/CIU. 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 (default).	•	•	•
00006		RESERVED			

Address	Register name	Description	CIM 200	CIM 260	CIM 500
00007		RESERVED			
00008	NoDataActivityTimeout	The elapsed time with no data activity before the module issues a restart of the APN connection.	-	•	-
00009	SoftwareDefinedParity	Parity setting when using software-defined settings. 0: No parity (default) 1: Even parity 2: Odd parity. Note that for CIM 200, this value is used only when you set the transmission speed to "software-defined" on DIP switches SW4 and SW5. Otherwise, CIM 200 ignores it.	•	-	-
00010	SoftwareDefinedStopBit	Stop bit setting when using software-defined settings. 0: No stop bit 1: 1 stop bit (default) 2: 2 stop bits. Note that for CIM 200, this value is used only when you set the transmission speed to "software-defined" on DIP switches SW4 and SW5. Otherwise, CIM 200 ignores it.	•	-	-
00011	ScadaPinCode	PIN code for SCADA systems, etc. If GeneralStatus.ScadaPinCodeEnabled (register 00029, bit 0) is enabled, enter the correct PIN code in this register in order to gain access to remote control and configuration. Verify acceptance in GeneralStatus.WriteAccess (register 00029, bit 1). You programme the SCADA PIN code via the SMS command "SETSCADACODE". See "CIM 260 SMS commands", which you can download from Grundfos Product Center.	-	•	-
00012	Watchdog	Configuration of watchdog timeout. [5; 3600 s], default: Disabled='0'. Minimum value 5 s <ul style="list-style-type: none"> <li>• Watchdog is fed whenever the device is addressed by a valid telegram.</li> <li>• An interruption of telegrams for more than the timeout time activates the watchdog.</li> <li>• Action: The booster will be set to Local mode.</li> <li>• Values 1-4 set timeout to 5 s. Values &gt;3600 set timeout value to 3600 s.</li> </ul>	•	-	•
00013	GENIbusDiodeOff	For disabling the GENIbus LED2. 0: GENIbus diode LED2 has normal function. 1: GENIbus diode LED2 is permanently switched off.	•	•	•

## Related information

### [5.3 Modbus address selection](#)

### 9.3 CIM status register block

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

Address	Register name	Description	CIM 200	CIM 260	CIM 500
00021	GENIbusCRCErrCnt	Holds a CRC error counter for the GENIbus connection to the booster system.	•	•	•
00022	GENIbusDataErrCnt	Holds a data error counter for the GENIbus connection to the booster system.	•	•	•
00023	VersionNumber	A Grundfos-specific version number. This is an unsigned integer value.	•	•	•
00024	ActualModbusAddress	Holds the current Modbus slave address of the device. Valid value range: 1...247.	•	•	•
00025	GENIbusTXcountHI	Holds a transmit counter for the total number of telegrams sent to the booster system on the GENIbus connection.	•	•	•
00026	GENIbusTXcountLO				
00027	GENIbusRXcountHI	Holds a receive counter for the total number of telegrams received from the booster system on the GENIbus connection.	•	•	•
00028	GENIbusRXcountLO				
00029	GeneralStatus Bit 0: ScadaPinCodeEnabled	PIN code functionality. 0: No PIN code required 1: PIN code required to perform remote control and configuration. Activation of SCADA Pin-code protection takes place via the SMS command "SCADACODE". See "CIM 260 SMS commands", which you can download from Grundfos Product Center.	-	•	-
	GeneralStatus Bit 1: WriteAccess	Remote write access. 0: No write access, the PIN code is incorrect. 1: Full write access, the PIN code is either correct or not enabled.			
	GeneralStatus Bit 2: LoginBlocked	Login blocked due to too many login attempts			
		UnitFamily		UnitType	
00030	UnitFamily	1 Circulator pumps	5 UPE, 3 phase		• • •
00031	UnitType		7 Magna, 1 phase		• • •
00032	UnitVersion		9 Magna, 1 phase, small		• • •
			10 MAGNA3		
		2 E-pump	2 MGE, 1 phase, model C or earlier		
			3 MGE, 3 phase, model D		
			4 MGE, 3 phase, large (> 7.5 kW), model F		
			5 CUE frequency drive		
			6 MGE, 3 phase, model G		
			7 MGE model H/I/J		
			8 CUE II frequency drive		
			9 MGE model K		
		7 Motor Protector	1 MP 204		
		17 Hydro Multi-E	1 Multi-E with 1 phase MGE model G		
			2 Multi-E with 3 phase MGE model G		
		21 Hydro/Control MPC	1 CU 351/352 MPC		
			2 CU 323, Multi-B		
			3 CU 354, DDD		
			4 CU xxx MPC II		
		26 Dedicated Controls	1 CU 361/362		
		28 CIU xx2 SEG AutoAdapt	1 1 CIU xx2 SEG AutoAdapt wastewater		
		30 Smart Digital Dosing, DDA	1 Small DDA dosing pump		
			3 DDA XL dosing pump		
			4 DDA II dosing pump		
			10 MAGNA3-D		
		38 Circulator twin pump	7 Multi-E or TPED with MGE model H/I/J		
			9 Multi-E or TPED with MGE model K		
		46 LC Controller, water supply	1 LC 242, modular type		
			2 LC 232, wall mounted type		
		48 LC Controller, waste water	1 LC 241, modular type		
			2 LC 231, wall mounted type		
		65 SQ Controller	1 Pressure control		
			2 Solar application		

Address	Register name	Description	CIM 200	CIM 260	CIM 500
00033	BatteryState	State of CIM 260 module battery 0: Battery not present 1: Battery must be replaced 2: Battery charging 3: Battery needs charging, but temperature too high 4: Battery needs charging, but temperature too low 5: Battery low 6: Battery OK 255: Battery state not available	-	•	-
00034	ProductSoftwareVersionHI	Product software version - BCD digit 1-4 aa.bb	•	•	•
00035	ProductSoftwareVersionLO	Product software version - BCD digit 5-8 cc.dd	•	•	•
00036	ProductSoftwareDayMonth	Product software date - BCD ddmm	•	•	•
00037	ProductSoftwareYear	Product software date - BCD yyyy	•	•	•

## 9.4 Cellular network Real Time Clock

Address	Register name	Description	CIM 200	CIM 260	CIM 500
00080	SetUNIXRealTimeClockHI	Set real time clock (32 bit UNIX format)	-	•	-
00081	SetUNIXRealTimeClockLO	Triggered on value change	-	•	-
00082	SetRtcSecond	Set real time clock - seconds	-	•	-
00083	SetRtcMinute	Set real time clock - minutes	-	•	-
00084	SetRtcHour	Set real time clock - hours	-	•	-
00085	SetRtcDay	Set real time clock - day	-	•	-
00086	SetRtcMonth	Set real time clock - month	-	•	-
00087	SetRtcYear	Set real time clock - year	-	•	-
00088	Bit 0: SetRtc	Triggers setting of real time clock - s/m/h/d/m/y format	-	•	-
00089	StatusUNIXRealTimeClockHI	Real time clock (32 bit UNIX format)	-	•	-
00090	StatusUNIXRealTimeClockLO		-	•	-
00091	StatusRtcSecond	Real time clock - seconds	-	•	-
00092	StatusRtcMinute	Real time clock - minutes	-	•	-
00093	StatusRtcHour	Real time clock - hours	-	•	-
00094	StatusRtcDay	Real time clock - day of month	-	•	-
00095	StatusRtcMonth	Real time clock - month	-	•	-
00096	StatusRtcYear	Real time clock - year (after 2000)	-	•	-
00097	Bit 0: StatusSetRTCAck	Acknowledge of set RTC command	-	•	-

## 9.5 Control register block

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

1 For Multi-E with a module in the master pump, only set the master pump CopyToLocal bit to value "1". For Multi-E with a module in two pumps, always set CopyToLocal reg. 00101 bit 4 to value "1" in both pumps. Any writings to the control registers 00101, 00102, 00103 and 00104 must be written to each pump.

A TPED model H is essentially a Multi-E model H with two pumps. If a CIM module is mounted in each pump head, always set CopyToLocal bit to value "1" in both pump heads. Any writings to control bits and registers must be written to each pump head.

2 If pump 2 also has a CIM mounted (for redundancy), any writings to control bits and registers must be written for each pump head.

Modbus address	Register name	Description	Multi-B	MPC	DDD	Multi-E model G	Multi-E/TPED model H and later <sup>2</sup>	MAGNA3-D
00101	Bit 0: RemoteAccessReq	Control bit that sets local or remote control. 0: Local 1: Remote (controlled by Modbus master). Set this bit to 1 if a Modbus master should control the booster system. For Hydro MPC and DDD, it is also necessary to enable bus control via the CU 35X control panel ("Settings" > "Secondary functions" > "Control source", select "From bus"). If the RemoteAccessReq bit is set to logical 0, the Hydro MPC or DDD will operate with local mode settings as selected on the CU 35X control panel. If you want local control, select this from the CU 35X control panel ("Settings" > "Secondary functions" > "Control source", select "From the CU 35X"), and set the RemoteAccessReq bit to 0.	•	•	•	-	•	•
	Bit 1: OnOffReq	Control bit that switches the booster system to on or off. 0: Off (stop) 1: On (start).	•	•	•	•	•	•
	Bit 2: ResetAlarm	Control bit that resets alarms and warnings from the booster system. 0: No resetting 1: Resetting alarm. This control bit is triggered on rising edge only, i.e. setting logical 0 to 1. See section <a href="#">CIM configuration register block</a> , address 00005, for acknowledgement behaviour.	•	•	•	•	•	•
	Bit 3: RESERVED	-						
	Bit 4: CopyToLocal <sup>1</sup>	Copies ControlMode, OperationMode and Setpoint to Local, when changing from Remote to Local.	-	-	-	-	•	•
	Bit 5: ResetAccCounters	Resets the accumulation counters (volume and energy). 0: No resetting 1: Resetting.	-	•	•	-	•	•
	Bits 6-15: RESERVED	-						
00102	ControlMode	Sets the control mode.						
		0: Constant speed	-	•	-	-	•	•
		1: Constant frequency	-	•	-	-	•	•
		3: Constant head	-	•	•	-	•	•
		4: Constant pressure	•	•	•	•	•	•
		5: Constant differential pressure	-	- <sup>4)</sup>	-	-	•	-
		6: Proportional pressure	-	•	•	-	•	•
		7: Constant flow	-	- <sup>4)</sup>	-	-	•	•
		8: Constant temperature	-	- <sup>4)</sup>	-	-	•	•
		9: Constant temp. difference	-	- <sup>4)</sup>	-	-	•	•
		10: Constant level	-	- <sup>4)</sup>	-	-	•	-
		128: AutoAdapt (Automatic adaption for DDD)	-	-	•	-	•	•
		129: FlowAdapt	-	-	-	-	•	•
		130: Closed-loop sensor	-	-	-	-	•	-
See section <a href="#">Control modes</a> .								
<b>Note:</b> If MPC or DDD is set to control source "From the CU 35X", it is still possible to change ControlMode from Modbus if the RemoteAccessReq bit is set to "1".								

Modbus address	Register name	Description	Multi-B	MPC	DDD	Multi-E model G	Multi-E/TPED model H and later <sup>2</sup>	MAGNA3-D
00103	OperationMode	A state to control the operating mode of the booster system.						
		0: Auto-control	•	•	•	•	•	•
		4: OpenLoopMin	-	•	-	-	•	•
		6: OpenLoopMax	-	•	-	•	•	•
		Note that "OnOffReq" has higher priority than the OperationMode, meaning that you must set "OnOffReq" to "On" for the OperationMode to have any effect.						
		The Hydro Multi-E model G can only run in auto-control mode and OpenLoopMax.						
00104	Setpoint	Sets the setpoint of the booster. The scale is 0.01 %, so the value must be from 0 to 10000 to represent the entire 0-100 % range. Closed loop: MPC, Multi-E: Percentage of closed-loop feedback sensor maximum value. TPED, MAGNA3-D: Percentage of the setpoint range.	•	•	•	•	•	•
		Open loop: MPC, Multi-E: Percentage of the maximum performance. TPED, MAGNA3-D: Percentage of the nominal pump frequency. 4700: 47 % 8000: 80 %. See section <a href="#">Setpoint in closed-loop control</a> .						
00105	ControlPump1	Forces the control of pump 1. Default is auto-control.						
		0: Auto-control (controlled by the booster system) 1: Forced start. 2: Forced stop.	•	•	•	-	-	-
00106	ControlPump2	Forces the control of pump 2. Default is auto-control.						
		0: Auto-control (controlled by the booster system) 1: Forced start. 2: Forced stop.	•	•	•	-	-	-
00107	ControlPump3	Forces the control of pump 3. Default is auto-control.						
		0: Auto-control (controlled by the booster system) 1: Forced start. 2: Forced stop.	•	•	•	-	-	-
00108	ControlPump4	Forces the control of pump 4. Default is auto-control.						
		0: Auto-control (controlled by the booster system) 1: Forced start. 2: Forced stop.	•	•	•	-	-	-
00109	ControlPump5	Forces the control of pump 5. Default is auto-control.						
		0: Auto-control (controlled by the booster system) 1: Forced start. 2: Forced stop.	-	•	•	-	-	-
00110	ControlPump6	Forces the control of pump 6. Default is auto-control.						
		0: Auto-control (controlled by the booster system) 1: Forced start. 2: Forced stop.	-	•	•	-	-	-
00111	SetTankFillStartLimit	Sets the start limit in tank-filling mode. The scale is 0.01 % of tank height. See register 00215 for actual tank height. For tank-filling mode, see section <a href="#">Tank-filling applications</a> .	•	-	-	-	-	-
00112	SetTankFillStopLimit	Sets the stop limit in tank-filling mode. The scale is 0.01 % of tank height.	•	-	-	-	-	-
00113	SetTankFillAlarmHighLimit	Sets the alarm high-limit in tank-filling mode. The scale is 0.01 % of tank height.	•	-	-	-	-	-
00114	SetTankFillWarningLowLimit	Sets the warning low-limit in tank-filling mode. The scale is 0.01 % of tank height.	•	-	-	-	-	-



Modbus address	Register name	Description	Multi-B	MPC	DDD	Multi-E model G	Multi-E/TPED model H and later <sup>2</sup>	MAGNA3-D
00115	SetPropControlReduction	Sets reduction in % in proportional-pressure mode. The scale is 0.01 %.	-	•	•	-	•	-
00116	SetPropControlFlowMax	Sets manual flow max. in proportional-pressure mode. The scale is 0.1 m <sup>3</sup> /h.	-	•	•	-	•	-
00117	ControlPilotpump	Forces the control of the pilot pump. Default is auto-control. 0: Auto-control (controlled by the booster system) 1: Forced start. 2: Forced stop.	-	•	-	-	-	-
00118	ControlBackuppump	Forces the control of the backup pump. Default is auto-control. 0: Auto-control (controlled by the booster system) 1: Forced start. 2: Forced stop.	-	•	-	-	-	-
00119	SetpointDDDSensor1	Sets DDD remote sensor 1 setpoint. The scale is 0.001 bar.	-	-	•	-	-	-
00120	SetpointDDDSensor2	Sets DDD remote sensor 2 setpoint. The scale is 0.001 bar.	-	-	•	-	-	-
00121	SetpointDDDSensor3	Sets DDD remote sensor 3 setpoint. The scale is 0.001 bar.	-	-	•	-	-	-
00122	SetpointDDDSensor4	Sets DDD remote sensor 4 setpoint. The scale is 0.001 bar.	-	-	•	-	-	-
00123	SetpointDDDSensor5	Sets DDD remote sensor 5 setpoint. The scale is 0.001 bar.	-	-	•	-	-	-
00124	SetpointDDDSensor6	Sets DDD remote sensor 6 setpoint. The scale is 0.001 bar.	-	-	•	-	-	-
00125	SetpointDDDSensor7	Sets DDD remote sensor 7 setpoint. The scale is 0.001 bar.	-	-	•	-	-	-
00126	SetpointDDDSensor8	Sets DDD remote sensor 8 setpoint. The scale is 0.001 bar.	-	-	•	-	-	-
00127	SetpointDDDSensor9	Sets DDD remote sensor 9 setpoint. The scale is 0.001 bar.	-	-	•	-	-	-
00128	SetpointDDDSensor10	Sets DDD remote sensor 10 setpoint. The scale is 0.001 bar.	-	-	•	-	-	-
00129	ControlSystemFeedbackSensor	3: Flow sensor 6: Pressure sensor	-	•	-	-	-	-
00130	Control.RemoteSensor1	Writes the value of remote sensor 1 to MPC. Scale: 0.01 %.	-	•	-	-	-	-
00131	Control.RemoteSensor2	Writes the value of remote sensor 2 to MPC. Scale: 0.01 %.	-	•	-	-	-	-
00132	Control.RemoteSensor3	Writes the value of remote sensor 3 to MPC. Scale: 0.01 %.	-	•	-	-	-	-
00133	Control.RemoteSensor4	Writes the value of remote sensor 4 to MPC. Scale: 0.01 %.	-	•	-	-	-	-
00134	Control.RemoteSensor5	Writes the value of remote sensor 5 to MPC. Scale: 0.01 %..	-	•	-	-	-	-
00135	Control.RemoteSensor6	Writes the value of remote sensor 6 to MPC. Scale: 0.01 %.	-	•	-	-	-	-
00136	SetPump1Speed							
00137	SetPump2Speed							
00138	SetPump3Speed							
00139	SetPump4Speed							
00140	SetPump5Speed	Set the manual speed setpoint for pumps 1-6, pilot pump and backup pump. Scaling 0.01 %	-	•	-	-	-	-
00141	SetPump6Speed							
00142	SetPilotPumpSpeed							
00143	SetBackupPumpSpeed							
00144	SetKp	Set system PI controller proportional gain. Scaling 0.1, ZERO=-10.0	-	•	•	-	-	-
00145	SetTi	Set system PI controller integral action time. Scaling 0.1 s	-	•	•	-	-	-
00146	BusSensorMeasId	Sensor ID for the DDD block of fieldbus sensor meas (1-10).	-	-	•	-	-	-
00147	BusSensorMeasSeqId	Sequence ID for the DDD block of fieldbus sensor meas.	-	-	•	-	-	-

Modbus address	Register name	Description	Multi-B	MPC	DDD	Multi-E model G	Multi-E/TPED model H and later <sup>2</sup>	MAGNA3-D
00148	BusSensorMeasBlockSize	Size of the DDD block of fieldbus sensor meas (1-8).						
00149	BusSensorMeasValue1	DDD fieldbus sensor measurement 1. Scaling 0.001 bar.						
00150	BusSensorMeasValue2	DDD fieldbus sensor measurement 2. Scaling 0.001 bar.						
00151	BusSensorMeasValue3	DDD fieldbus sensor measurement 3. Scaling 0.001 bar.						
00152	BusSensorMeasValue4	DDD fieldbus sensor measurement 4. Scaling 0.001 bar.						
00153	BusSensorMeasValue5	DDD fieldbus sensor measurement 5. Scaling 0.001 bar.						
00154	BusSensorMeasValue6	DDD fieldbus sensor measurement 6. Scaling 0.001 bar.						
00155	BusSensorMeasValue7	DDD fieldbus sensor measurement 7. Scaling 0.001 bar.						
00156	BusSensorMeasValue8	DDD fieldbus sensor measurement 8. Scaling 0.001 bar.						

4) Select the appropriate sensor and select ControlMode = Constant pressure

### Related information

[9.2 CIM configuration register block](#)

[10.1 Control modes](#)

[10.2 Tank-filling applications](#)

[10.3 Setpoint in closed-loop control](#)

## 9.6 Status register block

Registers in this register block can be read by means of function codes 0x03 and/or 0x04. They are read-only.

Address	Register name	Description	Multi-B	MPC	DDD	Multi-E model G	Multi-E/ TPED model H and later	MAGNA3-D
00201	Bit 0: RESERVED	-						
	Bit 1: CopyToLocal	Copies remote settings to local settings. 1: Enable, 0: Disable.	-	-	-	-	•	•
	Bit 2: ResetAccCountersAck	Acknowledgement of ResetAccCounters (volume and energy). 0: No acknowledgement 1: Command acknowledged. This functionality is only used when AutoAcknowledgeEvents is disabled. See section <a href="#">CIM configuration register block</a> .	-	•	•	-	•	•
	Bit 3: ResetAlarmAck	Indicates if a ResetAlarm command was acknowledged by the device. This bit is set when the module or unit have accepted a ResetAlarm command, and the programmer can clear the ResetAlarm bit. The CIM/CIU will automatically clear the ResetAlarmAck bit to 0 when the master device clears the ResetAlarm bit, and you can attempt a new ResetAlarm command by raising the ResetAlarm bit again. 0: No acknowledgement 1: Command acknowledged. This functionality is only used when AutoAcknowledgeEvents is disabled. See section <a href="#">CIM configuration register block</a> .	•	•	•	•	•	•
	Bit 4: SetpointInfluence	Setpoint influence status 0: No setpoint influence 1: Setpoint influence active	-	•	•	-	•	•
	Bit 5: AtMaxPower	Running at power limit 0: Not at power limit 1: At power limit	-	-	-	-	•	•
	Bit 6: Rotation	Indicates if any pumps are rotating (running) or not. 0: No rotation 1: Rotation.	•	•	•	•	•	•
	Bit 7: RESERVED	-						
	Bit 8: AccessMode	Indicates if the booster system is locally or remotely controlled. 0: Local (a local control source with higher priority controls the system) 1: Remote (controlled by Modbus master).	•	•	•	•	•	•
	Bit 9: OnOff	Indicates if the booster system is on or off. 0: Off (stopped, the green LED on the booster system flashes) 1: On (started, the green LED on the booster system is on). "Started" does not necessarily indicate rotation, for instance in case of low-flow stop.	•	•	•	•	•	•
	Bit 10: Alarm	Indicates if there is an alarm or not. 0: No alarm 1: Alarm (red LED on the booster system is on).	•	•	•	•	•	•
	Bit 11: Warning	Indicates if there is a warning or not. 0: No warning 1: Warning (red LED on the booster system is on). The system will continue running even if there is a warning.	•	•	•	-	•	•
	Bit 12: RESERVED	-						
	Bit 13: AtMaxSpeed	Indicates if the system is running at maximum speed. 0: No 1: Yes.	-	•	-	•	•	•
	Bit 14: RESERVED	-						
Bit 15: AtMinSpeed	Indicates if the system is running at minimum speed. 0: No 1: Yes.	-	•	-	•	•	•	

Address	Register name	Description	Multi-B	MPC	DDD	Multi-E model G	Multi-E/ TPED model H and later	MAGNA3-D
00202	ProcessFeedback	<p>Indicates the actual process feedback from the booster system. The scale is 0.01 %, so the valid value range is from 0 to 10000. This value can be compared with the setpoint value. Closed loop: MPC, Multi-E: Percentage of closed-loop feedback sensor maximum value. TPED, MAGNA3-D: Percentage of the setpoint range.</p> <p>Open loop: MPC, Multi-E: Percentage of the maximum performance. TPED, MAGNA3-D: Percentage of the nominal pump frequency. Common examples 4700: 47 % 8000: 80 %.</p>	•	•	•	•	•	•
00203	ControlMode	<p>Indicates the actual control mode.</p> <p>0: Constant speed</p> <p>1: Constant frequency</p> <p>3: Constant head</p> <p>4: Constant pressure</p> <p>5: Constant differential pressure</p> <p>6: Proportional pressure</p> <p>7: Constant flow</p> <p>8: Constant temperature</p> <p>9: Constant temp. difference</p> <p>10: Constant level</p> <p>128: AUTO<sub>ADAPT</sub> (Automatic adaption for DDD)</p> <p>129: FLOW<sub>ADAPT</sub></p> <p>130: Closed-loop sensor</p> <p>See section <a href="#">Control modes</a>.</p> <p><b>Note:</b> If MPC or DDD is set to control source "From the CU 35X", it is still possible to change ControlMode from Modbus if the RemoteAccessReq bit is set to "1".</p>	-	•	-	-	•	•
00204	OperationMode	<p>Indicates the actual operating mode.</p> <p>0: Auto-control (setpoint control according to selected control mode)</p> <p>4: OpenLoopMin (running at minimum speed)</p> <p>6: OpenLoopMax (running at maximum speed).</p>	•	•	•	•	•	•
00205	AlarmCode	The Grundfos-specific alarm code. See section <a href="#">16. Grundfos alarm and warning codes</a> .	•	•	•	•	•	•
00206	WarningCode	The Grundfos-specific warning code. See section <a href="#">16. Grundfos alarm and warning codes</a> .	•	•	•	-	•	•
00207	RESERVED	-						
00208	PumpsPresent	<p>Indicates presence of pumps. This value is bit-interpreted: Bit 0: Pump 1 Bit 1: Pump 2 Bit 2: Pump 3 Bit 3: Pump 4 Bit 4: Pump 5 Bit 5: Pump 6 Bit 6: Pilot pump Bit 7: Backup pump A bit value of "1" indicates that the pump is present.</p>	•	•	•	•	•	•
00209	PumpsRunning	<p>Indicates the running status of pumps. This value is bit-interpreted: Bit 0: Pump 1 Bit 1: Pump 2 Bit 2: Pump 3 Bit 3: Pump 4 Bit 4: Pump 5 Bit 5: Pump 6 Bit 6: Pilot pump Bit 7: Backup pump A bit value of "1" indicates that the pump is running.</p>	•	•	•	•	•	•

Address	Register name	Description	Multi-B	MPC	DDD	Multi-E model G	Multi-E/ TPED model H and later	MAGNA3-D
00210	PumpsAlarm	<p>Indicates alarm status of pumps. This value is bit-interpreted:</p> <ul style="list-style-type: none"> <li>Bit 0: Pump 1</li> <li>Bit 1: Pump 2</li> <li>Bit 2: Pump 3</li> <li>Bit 3: Pump 4</li> <li>Bit 4: Pump 5</li> <li>Bit 5: Pump 6</li> <li>Bit 6: Pilot pump</li> <li>Bit 7: Backup pump</li> </ul> <p>A bit value of "1" indicates that the pump has an alarm.</p>	•	•	•	•	•	•
00211	PumpsCommFault	<p>Indicates communication status of pumps. This value is bit-interpreted:</p> <ul style="list-style-type: none"> <li>Bit 0: Pump 1</li> <li>Bit 1: Pump 2</li> <li>Bit 2: Pump 3</li> <li>Bit 3: Pump 4</li> <li>Bit 4: Pump 5</li> <li>Bit 5: Pump 6</li> <li>Bit 6: Pilot pump</li> <li>Bit 7: Backup pump</li> </ul> <p>A bit value of "1" indicates that there is no communication with the pump.</p>	•	•	•	•	•	•
00212	SystemActiveFunctions	<p>Indicates active system functions. Hydro MPC supports all bits. Hydro Multi-B only supports bits 7 and 12.</p> <ul style="list-style-type: none"> <li>Bit 0: -</li> <li>Bit 1: Emergency Run function active</li> <li>Bit 2: Standby pumps active</li> <li>Bit 3: Pump test run active</li> <li>Bit 4: Alternative setpoint active</li> <li>Bit 5: Clock program active</li> <li>Bit 6: Remote VNC, Virtual Network Connection, active</li> <li>Bit 7: Remote bus active</li> <li>Bit 8: Remote service port active</li> <li>Bit 9: Pressure relief function active</li> <li>Bit 10: Soft pressure function active</li> <li>Bit 11: Low-flow boost active</li> <li>Bit 12: Low-flow stop active</li> <li>Bit 13: Proportional pressure active.</li> </ul>	•	•	•	-	-	-
00213	PumpsAutoMode	<p>Indicates auto-control mode status of pumps. This value is bit-interpreted:</p> <ul style="list-style-type: none"> <li>Bit 0: Pump 1</li> <li>Bit 1: Pump 2</li> <li>Bit 2: Pump 3</li> <li>Bit 3: Pump 4</li> <li>Bit 4: Pump 5</li> <li>Bit 5: Pump 6</li> <li>Bit 6: Pilot pump</li> <li>Bit 7: Backup pump</li> </ul> <p>A bit value of "0" indicates that the pump is manually operated (Forced to Start or Stop). A bit value of "1" indicates that the pump is in auto-control mode.</p>	•	•	•	-	-	-
00214	ApplicationType	<p>Indicates system application type status. You cannot change application type from Modbus.</p> <ul style="list-style-type: none"> <li>0: Unknown</li> <li>1: Pressure boosting</li> <li>2: Heating pumps on hot side</li> <li>3: Heating pumps on cold side</li> <li>4: AirCon pumps on hot side</li> <li>5: AirCon pumps on cold side</li> <li>6: MPC S2000 heating pumps on hot side</li> <li>7: MPC S2000 heating pumps on cold side</li> <li>8: MPC S2000 AirCon pumps on hot side</li> <li>9: MPC S2000 AirCon pumps on cold side</li> <li>10: Tank filling (level sensor)</li> <li>11: Tank filling (float switches).</li> </ul>	•	•	-	-	-	-
00215	TankFillTankHeight	<p>Indicates actual tank height in tank-filling mode. The scale is 0.01 % of tank height.</p>	•	-	-	-	-	-

Address	Register name	Description	Multi-B	MPC	DDD	Multi-E model G	Multi-E/ TPED model H and later	MAGNA3-D
00216	TankFillStartLimit	Indicates actual start limit in tank-filling mode. The scale is 0.01 % of tank height.	•	-	-	-	-	-
00217	TankFillStopLimit	Indicates actual stop limit in tank-filling mode. The scale is 0.01 % of tank height.	•	-	-	-	-	-
00218	TankFillAlarmHighLimit	Indicates actual alarm high-limit in tank-filling mode. The scale is 0.01 % of tank height.	•	-	-	-	-	-
00219	TankFillWarningLowLimit	Indicates actual warning low-limit in tank-filling mode. The scale is 0.01 % of tank height.	•	-	-	-	-	-
00220	FeedBackSensorUnit	Unit of feedback sensor. 0: bar 1: mbar 2: m 3: kPa 4: psi 5: ft 6: m <sup>3</sup> /h 7: m <sup>3</sup> /s 8: l/s 9: gpm 10: °C 11: °F 12: % 13: K 14: l/h 255: -	•	•	•	-	•	•
00221	FeedBackSensorMin	Minimum of feedback sensor.	•	•	•	-	•	•
00222	FeedBackSensorMax	Maximum of feedback sensor.	•	•	•	-	•	•
00223	SystemFeedbackSensor	3: Flow sensor 6: Pressure sensor	-	•	-	-	-	-
00224	AnalogIn1Unit	Scaling factors for analog input readings AI1-AI7. Values can be found in registers 00376-00382.						
00225	AnalogIn2Unit	<u>Enum</u>						
00226	AnalogIn3Unit	51						
00227	AnalogIn4Unit	95						
00228	AnalogIn5Unit	84						
00229	AnalogIn6Unit	110						
00230	AnalogIn7Unit	83						
		7						
00230	AnalogIn7Unit	107						
00231	Kp		-	•	•	-	-	-
00232	Ti		-	•	•	-	-	-

## Related information

[9.2 CIM configuration register block](#)

[10.1 Control modes](#)

## 9.7 System data register block

Registers in this block can be read by means of function codes 0x03 and/or 0x04. They are read-only. The table below shows which registers are supported by each booster system type.

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

A data value of 0xFFFF indicates "not available". See section LEDs for descriptions.

Many of the measurement modules for the booster system require a particular sensor to be present. As a limited number of sensors are available, only a few of the measurement modules can be available simultaneously.

See section Sensor-based Modbus registers for the relation between the sensor-related modbus registers and for sensor setup of your booster system.

Address	Register name	Description	Scale	Multi-B	MPC	DDD	Multi-E model G	Multi-E/ TPED model H and later	MAGNA3-D
00301	Head	Actual system head/pressure.	0.001 bar	-	S	S	S	S	•
00302	VolumeFlow	Actual system flow.	0.1 m <sup>3</sup> /h	-	S	S	S	S	•
00303	RelativePerformance	Performance relative to maximum performance.	0.01 %	•	•	•	•	•	•
00304	RESERVED	-							
00305	RESERVED	-							
00306	DigitalInput	Logical value of external digital input signals.	Bits	•	•	•	•	•	•
00307	DigitalOutput	Logical value of external digital output signals.	Bits	•	•	•	•	•	•
00308	ActualSetpoint	Actual setpoint, according to control mode. See register 00104 for scaling description.	0.01 %	•	•	•	•	•	•
00309	MotorCurrent	Actual motor current.	0.1 A	-	-	-	•	-	-
00310	RESERVED	-							
00311	RESERVED	-							
00312	PowerHI	Total power consumption of the system.	1 Watt	•	•	•	•	•	•
00313	PowerLO	Total power consumption of the system.	1 Watt	•	•	•	•	•	•
00314	RESERVED	-							
00315	InletPressure	System inlet pressure, relative to atmospheric pressure. Has an offset of -1.000 bar.	0.001 bar	S	S	S	-	S	-
00316	RemotePressure1	Measured pressure 1 at external sensor, relative to atmospheric pressure.	0.001 bar	-	S	-	-	S	S
00317	StorageTankLevel	Storage tank level. Has an offset of -100.00 metres.	0.01 m	-	S	S	S	S	-
00318	RESERVED	-							
00319	RESERVED	-							
00320	RemoteTemp1	Temperature 1 at external sensor.	0.01 K	-	S	-	S	S	-
00321	RESERVED	-							
...	RESERVED	-							
00324	RESERVED	-							
00325	AuxSensorInput	Auxiliary sensor input.	0.01 %	-	-	-	S	S	-
00326	RESERVED	-							
00327	OperationTimeHI	Total operating time of the system.	1 hour	•	•	•	•	•	•
00328	OperationTimeLO	Total operating time of the system.	1 hour	•	•	•	•	•	•
00329	TotalPoweredTimeHI	Total power-on time of the system.	1 hour	-	-	-	•	-	-
00330	TotalPoweredTimeLO	Total power-on time of the system.	1 hour	-	-	-	•	-	-
00331	RESERVED	-							
00332	EnergyHI	Total energy consumption of the system.	1 kWh	•	•	•	•	•	•
00333	EnergyLO	Total energy consumption of the system.	1 kWh	•	•	•	•	•	•
00334	RESERVED	-							
00335	RESERVED	-							
00336	RESERVED	-							
00337	AmbientTemp	Ambient temperature	0.01 K	-	S	-	-	S	-
00338	InletTemp	Inlet water temperature.	0.01 K	-	S	-	-	-	-
00339	OutletTemp	Outlet water temperature.	0.01 K	-	S	-	-	-	-
00340	TempDifference	Differential temperature.	0.01 K	-	S	-	-	-	-
00341	OutletPressure	System outlet pressure.	0.001 bar	S	S	S	-	S	-
00342	FeedTankLevel	Tank feed level. It has an offset of -100.00 metres.	0.01 m	-	S	S	-	S	-
00343	UserSetpoint	Setpoint before modifications. See register 00104 for scaling description.	0.01 %	•	•	•	-	•	•
00344	AnalogueInfluence	Setpoint attenuator.	0.01 %	•	•	•	-	•	•

Address	Register name	Description	Scale	Multi-B	MPC	DDD	Multi-E model G	Multi-E/ TPED model H and later	MAGNA3-D
00345	NumberOfPowerOns	Number of times the booster system has been powered on.	Unscaled	•	•	•	-	-	-
00346	SpecificEnergy	Specific energy.	0.1 Wh/m <sup>3</sup>	-	S	•	-	S	•
00347	SpecificEnergyAverage	Average specific energy.	0.1 Wh/m <sup>3</sup>	-	S	•	-	-	-
00348	FlowMeasurement 1	Flow measurement 1.	0.1 m <sup>3</sup> /h	-	S	S	-	-	-
00349	FlowMeasurement 2	Flow measurement 2.	0.1 m <sup>3</sup> /h	-	S	S	-	-	-
00350	FlowMeasurement 3	Flow measurement 3.	0.1 m <sup>3</sup> /h	-	S	S	-	-	-
00351	PropControlReduction	Proportional control reduction.	0.01 %	-	•	•	-	•	-
00352	PropControlFlowMax	Proportional control maximum flowpoint.	0.1 m <sup>3</sup> /h	-	•	•	-	•	-
00353	RemotePressure2	Measured pressure 2 at external sensor (relative to atmospheric pressure).	0.001 bar	-	-	-	-	S	-
00354	RemoteTemp2	Temperature 2 at external sensor.	0.01 K	-	-	-	-	S	S
00355	MediumTemp	Medium temperature.	0.01 K	-	-	-	-	S	•
00356	DifferentialPressure	Differential pressure.	0.001 bar	-	-	-	-	S	•
00357	DifferentialInletPressure	Differential inlet pressure.	0.001 bar	-	-	-	-	S	-
00358	DifferentialOutletPressure	Differential outlet pressure.	0.001 bar	-	-	-	-	S	-
00359	DifferentialRemotePressure	Differential remote pressure.	0.001 bar	-	-	-	-	S	-
00360	RemoteFlow	Flow measurement from remote sensor.	0.1 m <sup>3</sup> /h	-	-	-	-	S	-
00361	LatestNightFlowAverage	Average night flow for the latest night.	0.1 m <sup>3</sup> /h	-	-	•	-	S	-
00362	LatestNightPressAverage	Average night pressure for the latest night.	0.001 bar	-	-	•	-	S	-
00363	VolumeHI	The pumped volume.	0.1 m <sup>3</sup>	-	S	S	-	S	S
00364	VolumeLO								
00365	HeatingEnergyCounterHI	Life time accumulated heat energy.	1 kWh	-	-	-	-	S	S
00366	HeatEnergyCounterLO	Ext. temp. sensor required.							
00367	HeatPowerHI	Current heat power.	1 W	-	-	-	-	S	S
00368	HeatPowerLO	Ext. temp. sensor required.							
00369	HeatDiffTemp	Forward/Return differential temperature. Ext. temp. sensor required.	0.01 °C	-	-	-	-	S	S
00370	HeatEnergyCounter2HI	Accumulated heat energy direction 2. Ext. temp. sensor required.	1 kWh	-	-	-	-	•	•
00371	HeatEnergyCounter2LO								
00372	Volume1HI	Pumped volume direction 1.	0.01 m <sup>3</sup>	-	-	-	-	•	•
00373	Volume1LO	Ext. flow sensor required.							
00374	Volume2HI	Pumped volume direction 2.	0.01 m <sup>3</sup>	-	-	-	-	•	•
00375	Volume2LO	Ext. flow sensor required.							
00376	AnalogIn1Value	Scaled value of analogue inputs 1-7, AI1-AI7 Use associated scaling factor from registers 00224-00225		-	•	-	-	-	-
00377	AnalogIn2Value								
00378	AnalogIn3Value								
00379	AnalogIn4Value								
00380	AnalogIn5Value								
00381	AnalogIn6Value								
00382	AnalogIn7Value								
00481	Pump1.Energy	Energy consumption of pump 1	1 kWh	-	•	•	-	•	S
00482	Pump2.Energy	Energy consumption of pump 2	1 kWh	-	•	•	-	•	S
00483	Pump3.Energy	Energy consumption of pump 3	1 kWh	-	•	•	-	•	-
00484	Pump4.Energy	Energy consumption of pump 4	1 kWh	-	•	•	-	•	-
00485	Pump5.Energy	Energy consumption of pump 5	1 kWh	-	•	•	-	•	-
00486	Pump6.Energy	Energy consumption of pump 6	1 kWh	-	•	•	-	•	-
00487	PilotPump.Energy	Energy consumption of pilot pump	1 kWh	-	•	-	-	-	-
00488	BackupPump.Energy	Energy consumption of backup pump	1 kWh	-	•	-	-	-	-

S: Sensor required. See section Sensor-based Modbus registers.

•: Always available.

## Related information

### [6.2 Status LEDs](#)

### [10.9 Sensor-based Modbus registers](#)



## 9.8 Pump 1 register block

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

Address	Register name	Scale	Notes
00401	Bit 0: AccessMode	Bool	Indicates if the pump is locally or remotely controlled. 0: Local, controlled by buttons on pump 1: Remote, controlled by the booster system. Note that this bit is not available for Hydro Multi-E model G.
	Bit 1: OnOff	Bool	Indicates if the pump is on or off. 0: Off 1: On.
	Bit 2: Alarm	Bool	Indicates if a pump has an alarm or not. 0: No alarm 1: Alarm.
00402	AlarmCode	Unscaled	The Grundfos-specific alarm code. See section 16. <i>Grundfos alarm and warning codes.</i>
00403 00404	OperationTimeHI OperationTimeLO	1 hour	Operating time of the pump.
00405	Speed	0.01 %	Speed of the pump motor. Note that this data point is not available for Hydro Multi-E model G.
00406	LineCurrent	0.1 A	Average value of line currents on the pump. Note that this data point is not available for Hydro Multi-E model G.
00407	Power	10 W	Power consumption of the pump. Note that this data point is not available for Hydro Multi-E model G.
00408	MotorTemperature	0.01 K	Motor temperature of the pump. Note that this data point is not available for Hydro Multi-E model G.
00409	ControlSource	Enum	Control source of the pump. 0: Unknown 1: Buttons on the pump 2: GENIbus (booster controller) 3: GENlink/GENlair (from handheld controller) 4: External control. Note that this data point is not available for Hydro Multi-E model G.
00410	RESERVED	-	-

A register value of 0xFFFF indicates "not available".

## 9.9 Pump 2 register block

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

Address	Register name	Scale	Notes
00411	Bit 0: AccessMode	Bool	Indicates if the pump is locally or remotely controlled. 0: Local, controlled by buttons on pump 1: Remote, controlled by the booster system. Note that this bit is not available for Hydro Multi-E model G.
	Bit 1: OnOff	Bool	Indicates if the pump is on or off. 0: Off 1: On.
	Bit 2: Alarm	Bool	Indicates if a pump has an alarm or not. 0: No alarm 1: Alarm.
00412	AlarmCode	Unscaled	The Grundfos-specific alarm code. See section <a href="#">16. Grundfos alarm and warning codes</a> .
00413	OperationTimeHI	1 hour	Operating time of the pump.
00414	OperationTimeLO		
00415	Speed	0.01 %	Speed of the pump motor. Note that this data point is not available for Hydro Multi-E model G.
00416	LineCurrent	0.1 A	Average value of line currents on the pump. Note that this data point is not available for Hydro Multi-E model G.
00417	Power	10 W	Power consumption of the pump. Note that this data point is not available for Hydro Multi-E model G.
00418	MotorTemperature	0.01 K	Motor temperature of the pump. Note that this data point is not available for Hydro Multi-E model G.
00419	ControlSource	Enum	Control source of the pump. 0: Unknown 1: Buttons on the pump 2: GENIbus (booster controller) 3: GENlink/GENlair (from handheld controller) 4: External control. Note that this data point is not available for Hydro Multi-E model G.
00420	RESERVED	-	-

A register value of 0xFFFF indicates "not available".

## 9.10 Pump 3 register block

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

Address	Register name	Scale	Notes
00421	Bit 0: AccessMode	Bool	Indicates if the pump is locally or remotely controlled. 0: Local, controlled by buttons on pump 1: Remote, controlled by the booster system. Note that this bit is not available for Hydro Multi-E model G.
	Bit 1: OnOff	Bool	Indicates if the pump is on or off. 0: Off 1: On.
	Bit 2: Alarm	Bool	Indicates if a pump has an alarm or not. 0: No alarm 1: Alarm.
00422	AlarmCode	Unscaled	The Grundfos-specific alarm code. See section 16. <i>Grundfos alarm and warning codes</i> .
00423	OperationTimeHI	1 hour	Operating time of the pump.
00424	OperationTimeLO		
00425	Speed	0.01 %	Speed of the pump motor. Note that this data point is not available for Hydro Multi-E model G.
00426	LineCurrent	0.1 A	Average value of line currents on the pump. Note that this bit is not available for Hydro Multi-E model G.
00427	Power	10 W	Power consumption of the pump. Note that this bit is not available for Hydro Multi-E model G.
00428	MotorTemperature	0.01 K	Motor temperature of the pump. Note that this bit is not available for Hydro Multi-E model G.
00429	ControlSource	Enum	Control source of the pump. 0: Unknown 1: Buttons on the pump 2: GENIbus (booster controller) 3: GENlink/GENlair (from handheld controller) 4: External control. Note that this bit is not available for Hydro Multi-E model G.
00430	RESERVED	-	-

A register value of 0xFFFF indicates "not available".

## 9.11 Pump 4 register block

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

Address	Register name	Scale	Notes
00431	Bit 0: AccessMode	Bool	Indicates if the pump is locally or remotely controlled. 0: Local, controlled by buttons on pump 1: Remote, controlled by the booster system. Note that this bit is not available for Hydro Multi-E model G.
	Bit 1: OnOff	Bool	Indicates if the pump is on or off. 0: Off 1: On.
	Bit 2: Alarm	Bool	Indicates if a pump has an alarm or not. 0: No alarm 1: Alarm.
00432	AlarmCode	Unscaled	The Grundfos-specific alarm code. See section <a href="#">16. Grundfos alarm and warning codes</a> .
00433	OperationTimeHI	1 hour	Operating time of the pump.
00434	OperationTimeLO		
00435	Speed	0.01 %	Speed of the pump motor. Note that this data point is not available for Hydro Multi-E model G.
00436	LineCurrent	0.1 A	Average value of line currents on the pump. Note that this bit is not available for Hydro Multi-E model G.
00437	Power	10 W	Power consumption of the pump. Note that this bit is not available for Hydro Multi-E model G.
00438	MotorTemperature	0.01 K	Motor temperature of the pump. Note that this bit is not available for Hydro Multi-E model G.
00439	ControlSource	Enum	Control source of the pump. 0: Unknown 1: Buttons on the pump 2: GENIbus (booster controller) 3: GENlink/GENlair (from handheld controller) 4: External control. Note that this bit is not available for Hydro Multi-E model G.
00440	RESERVED	-	-

A register value of 0xFFFF indicates "not available".

## 9.12 Pump 5 register block

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

Address	Register name	Scale	Notes
00441	Bit 0: AccessMode	Bool	Indicates if the pump is locally or remotely controlled. 0: Local, controlled by buttons on pump 1: Remote, controlled by the booster system. Note that this bit is not available for Hydro Multi-E model G.
	Bit 1: OnOff	Bool	Indicates if the pump is on or off. 0: Off 1: On.
	Bit 2: Alarm	Bool	Indicates if a pump has an alarm or not. 0: No alarm 1: Alarm.
00442	AlarmCode	Unscaled	The Grundfos-specific alarm code. See section <a href="#">16. Grundfos alarm and warning codes</a> .
00443	OperationTimeHI	1 hour	Operating time of the pump.
00444	OperationTimeLO		
00445	Speed	0.01 %	Speed of the pump motor. Note that this data point is not available for Hydro Multi-E model G.
00446	LineCurrent	0.1 A	Average value of line currents on the pump. Note that this bit is not available for Hydro Multi-E model G.
00447	Power	10 W	Power consumption of the pump. Note this bit is not available for Hydro Multi-E model G.
00448	MotorTemperature	0.01 K	Motor temperature of the pump. Note this bit is not available for Hydro Multi-E model G.
00449	ControlSource	Enum	Control source of the pump. 0: Unknown 1: Buttons on the pump 2: GENIbus (booster controller) 3: GENlink/GENlair (from handheld controller) 4: External control. Note that this bit is not available for Hydro Multi-E model G.
00450	RESERVED	-	-

A register value of 0xFFFF indicates "not available".

### 9.13 Pump 6 register block

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

Address	Register name	Scale	Notes
00451	Bit 0: AccessMode	Bool	Indicates if the pump is locally or remotely controlled. 0: Local, controlled by buttons on pump 1: Remote, controlled by the booster system. Note that this bit is not available for Hydro Multi-E model G.
	Bit 1: OnOff	Bool	Indicates if the pump is on or off. 0: Off 1: On.
	Bit 2: Alarm	Bool	Indicates if a pump has an alarm or not. 0: No alarm 1: Alarm.
00452	AlarmCode	Unscaled	The Grundfos-specific alarm code. See section 16. <i>Grundfos alarm and warning codes</i> .
00453	OperationTimeHI	1 hour	Operating time of the pump.
00454	OperationTimeLO		
00455	Speed	0.01 %	Speed of the pump motor. Note that this data point is not available for Hydro Multi-E model G.
00456	LineCurrent	0.1 A	Average value of line currents on the pump. Note that this bit is not available for Hydro Multi-E model G.
00457	Power	10 W	Power consumption of the pump. Note that this bit is not available for Hydro Multi-E model G.
00458	MotorTemperature	0.01 K	Motor temperature of the pump. Note that this bit is not available for Hydro Multi-E model G.
00459	ControlSource	Enum	Control source of the pump. 0: Unknown 1: Buttons on the pump 2: GENIbus (booster controller) 3: GENlink/GENlair (from handheld controller) 4: External control. Note that this bit is not available for Hydro Multi-E model G.
00460	RESERVED	-	-

A register value of 0xFFFF indicates "not available".

## 9.14 Pilot pump register block, Hydro MPC only

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

Address	Register name	Scale	Notes
	Bit 0: AccessMode	Bool	Indicates if the pump is locally or remotely controlled. 0: Local, controlled via buttons on pump 1: Remote, controlled by the booster system.
00461	Bit 1: OnOff	Bool	Indicates if the pump is on or off. 0: Off 1: On.
	Bit 2: Alarm	Bool	Indicates if a pump has an alarm or not. 0: No alarm 1: Alarm.
00462	AlarmCode	Unscaled	The Grundfos-specific alarm code. See section 16. <i>Grundfos alarm and warning codes.</i>
00463	OperationTimeHI	1 hour	Operating time of the pump.
00464	OperationTimeLO		
00465	Speed	0.01 %	Speed of the pump motor.
00466	LineCurrent	0.1 A	Average value of line currents on the pump.
00467	Power	10 W	Power consumption of the pump.
00468	MotorTemperature	0.01 K	Motor temperature of the pump.
00469	ControlSource	Enum	Control source of the pump. 0: Unknown 1: Buttons on the pump 2: GENIbus (booster controller) 3: GENlink/GENIair (from handheld controller) 4: External control.
00470	RESERVED	-	-

A register value of 0xFFFF indicates "not available".

## 9.15 Backup pump register block, Hydro MPC only

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

Address	Register name	Scale	Notes
	Bit 0: AccessMode	Bool	Indicates if the pump is locally or remotely controlled. 0: Local, controlled via buttons on pump 1: Remote, controlled by the booster system.
00471	Bit 1: OnOff	Bool	Indicates if the pump is on or off. 0: Off 1: On.
	Bit 2: Alarm	Bool	Indicates if a pump has a alarm or not. 0: No alarm 1: Alarm.
00472	AlarmCode	Unscaled	The Grundfos-specific alarm code. See section <a href="#">16. Grundfos alarm and warning codes</a> .
00473	OperationTimeHI	1 hour	Operating time of the pump.
00474	OperationTimeLO		
00475	Speed	0.01 %	Speed of the pump motor.
00476	LineCurrent	0.1 A	Average value of line currents on the pump.
00477	Power	10 W	Power consumption of the pump.
00478	MotorTemperature	0.01 K	Motor temperature of the pump.
00479	ControlSource	Enum	Control source of the pump. 0: Unknown 1: Buttons on the pump 2: GENIbus (booster controller) 3: GENlink/GENIair (from handheld controller) 4: External control.
00480	RESERVED	-	-

A register value of 0xFFFF indicates "not available".



## 9.16 DDD Remote Sensor Data

For a DDD system to run with Automatic adaption, you must have a number of remote sensors. (1 to 10). The following data are only available for DDD systems.

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

Address	Register name	Scale	Notes
00601	Bit 0: BatteryWarningDDDSensor1	Bool	
	Bit 1: BatteryWarningDDDSensor2	Bool	
	Bit 2: BatteryWarningDDDSensor3	Bool	
	Bit 3: BatteryWarningDDDSensor4	Bool	
	Bit 4: BatteryWarningDDDSensor5	Bool	0: Sensor battery is OK
	Bit 5: BatteryWarningDDDSensor6	Bool	1: Sensor battery must be replaced
	Bit 6: BatteryWarningDDDSensor7	Bool	
	Bit 7: BatteryWarningDDDSensor8	Bool	
	Bit 8: BatteryWarningDDDSensor9	Bool	
	Bit 9: BatteryWarningDDDSensor10	Bool	
00602	Bit 0: PressureLowDDDSensor1	Bool	
	Bit 1: PressureLowDDDSensor2	Bool	
	Bit 2: PressureLowDDDSensor3	Bool	
	Bit 3: PressureLowDDDSensor4	Bool	
	Bit 4: PressureLowDDDSensor5	Bool	0: Pressure is OK
	Bit 5: PressureLowDDDSensor6	Bool	1: Pressure is below warning limit
	Bit 6: PressureLowDDDSensor7	Bool	
	Bit 7: PressureLowDDDSensor8	Bool	
	Bit 8: PressureLowDDDSensor9	Bool	
	Bit 9: PressureLowDDDSensor10	Bool	
00603	Bit 0: MissingDataDDDSensor1	Bool	
	Bit 1: MissingDataDDDSensor2	Bool	
	Bit 2: MissingDataDDDSensor3	Bool	
	Bit 3: MissingDataDDDSensor4	Bool	
	Bit 4: MissingDataDDDSensor5	Bool	0: Pressure data received
	Bit 5: MissingDataDDDSensor6	Bool	1: Pressure data missing
	Bit 6: MissingDataDDDSensor7	Bool	
	Bit 7: MissingDataDDDSensor8	Bool	
	Bit 8: MissingDataDDDSensor9	Bool	
	Bit 9: MissingDataDDDSensor10	Bool	
00604	Bit 0: DataWarningDDDSensor1	Bool	
	Bit 1: DataWarningDDDSensor2	Bool	
	Bit 2: DataWarningDDDSensor3	Bool	
	Bit 3: DataWarningDDDSensor4	Bool	
	Bit 4: DataWarningDDDSensor5	Bool	0: Data model is OK
	Bit 5: DataWarningDDDSensor6	Bool	1: Data model inconsistency warning
	Bit 6: DataWarningDDDSensor7	Bool	
	Bit 7: DataWarningDDDSensor8	Bool	
	Bit 8: DataWarningDDDSensor9	Bool	
	Bit 9: DataWarningDDDSensor10	Bool	
00605	PressureYesterdayDDDSensor1	0.001 bar	The pressure from 24 hours ago at DDD remote sensor 1
00606	PressureYesterdayDDDSensor2	0.001 bar	The pressure from 24 hours ago at DDD remote sensor 2
00607	PressureYesterdayDDDSensor3	0.001 bar	The pressure from 24 hours ago at DDD remote sensor 3
00608	PressureYesterdayDDDSensor4	0.001 bar	The pressure from 24 hours ago at DDD remote sensor 4
00609	PressureYesterdayDDDSensor5	0.001 bar	The pressure from 24 hours ago at DDD remote sensor 5
00610	PressureYesterdayDDDSensor6	0.001 bar	The pressure from 24 hours ago at DDD remote sensor 6
00611	PressureYesterdayDDDSensor7	0.001 bar	The pressure from 24 hours ago at DDD remote sensor 7
00612	PressureYesterdayDDDSensor8	0.001 bar	The pressure from 24 hours ago at DDD remote sensor 8
00613	PressureYesterdayDDDSensor9	0.001 bar	The pressure from 24 hours ago at DDD remote sensor 9
00614	PressureYesterdayDDDSensor10	0.001 bar	The pressure from 24 hours ago at DDD remote sensor 10
00615	ActualSetpointDDDSensor1	0.001 bar	The pressure setpoint at DDD remote sensor 1
00616	ActualSetpointDDDSensor2	0.001 bar	The pressure setpoint at DDD remote sensor 2
00617	ActualSetpointDDDSensor3	0.001 bar	The pressure setpoint at DDD remote sensor 3

Address	Register name	Scale	Notes
00618	ActualSetpointDDDSensor4	0.001 bar	The pressure setpoint at DDD remote sensor 4
00619	ActualSetpointDDDSensor5	0.001 bar	The pressure setpoint at DDD remote sensor 5
00620	ActualSetpointDDDSensor6	0.001 bar	The pressure setpoint at DDD remote sensor 6
00621	ActualSetpointDDDSensor7	0.001 bar	The pressure setpoint at DDD remote sensor 7
00622	ActualSetpointDDDSensor8	0.001 bar	The pressure setpoint at DDD remote sensor 8
00623	ActualSetpointDDDSensor9	0.001 bar	The pressure setpoint at DDD remote sensor 9
00624	ActualSetpointDDDSensor10	0.001 bar	The pressure setpoint at DDD remote sensor 10
00625	UNIXlatestDataTimeDDDSensor1HI	1 s	Latest data timestamp received from sensor 1
00626	UNIXlatestDataTimeDDDSensor1LO		
00627	UNIXlatestDataTimeDDDSensor2HI	1 s	Latest data timestamp received from sensor 2
00628	UNIXlatestDataTimeDDDSensor2LO		
00629	UNIXlatestDataTimeDDDSensor3HI	1 s	Latest data timestamp received from sensor 3
00630	UNIXlatestDataTimeDDDSensor3LO		
00631	UNIXlatestDataTimeDDDSensor4HI	1 s	Latest data timestamp received from sensor 4
00632	UNIXlatestDataTimeDDDSensor4LO		
00633	UNIXlatestDataTimeDDDSensor5HI	1 s	Latest data timestamp received from sensor 5
00634	UNIXlatestDataTimeDDDSensor5LO		
00635	UNIXlatestDataTimeDDDSensor6HI	1 s	Latest data timestamp received from sensor 6
00636	UNIXlatestDataTimeDDDSensor6LO		
00637	UNIXlatestDataTimeDDDSensor7HI	1 s	Latest data timestamp received from sensor 7
00638	UNIXlatestDataTimeDDDSensor7LO		
00639	UNIXlatestDataTimeDDDSensor8HI	1 s	Latest data timestamp received from sensor 8
00640	UNIXlatestDataTimeDDDSensor8LO		
00641	UNIXlatestDataTimeDDDSensor9HI	1 s	Latest data timestamp received from sensor 9
00642	UNIXlatestDataTimeDDDSensor9LO		
00643	UNIXlatestDataTimeDDDSensor10HI	1 s	Latest data timestamp received from sensor 10
00644	UNIXlatestDataTimeDDDSensor10LO		

## 9.17 Alarm simulation register block

Registers in this register block can be read by means of function codes 0x03 and/or 0x04.

Address	Register name	Description	Multi-B	MPC	DDD	Multi-E model G	Multi-E/ TPED model H and later	MAGNA3-D
00701 00702	RESERVED		-	-	-	-	-	-
00703	Simulation.EventCode	Code for the event (Alarm) to simulate. See section <a href="#">Alarm simulation register block</a> .	•	•	•	-	•	•
00704	Simulation.DeviceType	Code for the device. 0: CU 351/352 controller 1: - 2: Pump 3: IO 351 pump module 4: Primary sensor 5: Redundant sensor 6: Secondary sensor 7: IO 351 I/O module 8: System 9: Analog input 10: Pilot pump 11: Limit exceeded function 12: Backup pump.	•	•	•	-	-	-
00705	Simulation.DeviceNumber	Code for the device number, according to device type. For example if Simulation.DeviceType: 2, then this register determines the pump number [1-8].	•	•	•	-	-	-
00706	Simulation.ActionType	Type of action for simulated event 0: Stop 1: Stop with delay 2: Minimum 3: User-defined 4: Maximum 5: Set pumps to local 6: No action, warning only 7: Emergency run.	-	•	•	-	-	-
00707	Simulation.ResetType	0: Manual 1: Automatic.	-	•	•	-	-	-
00708	Simulation.Activate	Used to activate alarm simulation with alarms and warnings. 0: Deactivate simulation 1: Activate simulation.	•	•	•	-	•	•
00709	Simulation.Active	Status of alarm simulation. 0: Alarm simulation not active 1: Alarm simulation active.	•	•	•	-	•	•

## 9.18 User register block

Address	Register name	R/W	Scale	Description
00751-00800	UserRegisters	R/W	Unscaled	This area is for device labelling by the user. The user area values are stored in the device and will remain after a power-off.

## 10. Detailed descriptions of functionality

### 10.1 Control modes

The supported control modes are described further in this section.



If Hydro MPC or DDD is set to control source "From the CU 35X" on the display, it is still possible to change the control mode from Modbus if the RemoteAccessReq bit is set to "1".

Control modes	Description	Illustration
<ul style="list-style-type: none"> <li>&gt; Constant speed (0)</li> <li>&gt; Constant frequency (1)</li> </ul>	<p>Open loop:</p> <p>The setpoint of the booster is interpreted as the setpoint for the performance.</p> <p>The setpoint value is a percentage of the maximum performance of the booster.</p> <p>No sensor is required in these modes.</p>	<p>TM079755</p>
<ul style="list-style-type: none"> <li>&gt; Constant head (3)</li> <li>&gt; Constant pressure (4)</li> <li>&gt; Constant differential pressure (5)</li> </ul>	<p>Closed loop:</p> <p>The setpoint of the booster is interpreted as the setpoint for the pressure.</p> <p>The booster adapts the speed so that the pressure is constant, regardless of the flow.</p> <p>A pressure sensor is required.</p>	<p>TM079756</p>
<ul style="list-style-type: none"> <li>&gt; Constant flow (7)</li> <li>&gt; Constant temperature (8)</li> <li>&gt; Constant level (10)</li> </ul>	<p>Closed loop:</p> <p>The setpoint of the booster is interpreted as the setpoint for the flow, temperature or level.</p> <p>Constant flow is indicated in the diagram.</p> <p>A relevant sensor is required:</p> <ul style="list-style-type: none"> <li>a flow sensor for flow control</li> <li>a temperature sensor for temperature control</li> <li>a level sensor for level control.</li> </ul>	<p>TM079754</p>
<ul style="list-style-type: none"> <li>&gt; Proportional pressure (6)</li> </ul>	<p>Closed loop:</p> <p>The setpoint of the booster system is interpreted as a proportional-pressure setpoint as shown in the fig. A pressure sensor is required.</p>	<p>TM079757</p>
<ul style="list-style-type: none"> <li>&gt; DDD AUTOADAPT (128)</li> </ul>	<p>The setpoint of the DDD system is interpreted as a proportional-pressure setpoint as shown in the figure. The proportional curve is adjusted automatically once a day according to remote DDD sensor data.</p>	<p>TM053241</p>
<ul style="list-style-type: none"> <li>&gt; FLOWADAPT (129)</li> </ul>	<p>This control mode works similar to AUTOADAPT, except that the flow-limiting function, FLOWLIMIT, is always active and limits the flow to the value ActualMaxFlowLimit.</p>	<p>TM053242</p>
<ul style="list-style-type: none"> <li>&gt; Closed-loop sensor (130)</li> </ul>	<p>This is a general purpose closed-loop control mode that you can use in cases where the pump is used for a type of control not covered by one of the other control modes.</p> <p>A relevant sensor is required.</p>	

H: Pressure (Head)

Q: Flow

## 10.2 Tank-filling applications

Normally, the Hydro Multi-B runs in pressure-boosting mode, but you can also set it to run in tank-filling mode.

Proceed as follows:

1. Set the application to tank-filling mode on CU 323 via Grundfos PC Tool E-Products. This cannot be set via Modbus.
2. To enable bus control via Modbus, set RemoteAccessReq, register 000101, bit 0, to the value of "1".
3. Set the tank height with Setpoint, register 00104, to 0.01 m.
4. Set start and stop levels as well as alarm and warning limits with registers 00111, 00112, 00113 and 00114. Note that these values are set in percentage of the total tank height.



Tank-filling mode is not possible with Hydro MPC and Multi-E.

## 10.3 Setpoint in closed-loop control

### Hydro MPC and Multi-E

The setpoint is written to register 00104 Setpoint as a percentage value scaled in 0.01 % of the sensor maximum value, register 00222 FeedbackSensorMax. The sensor minimum value is always 0. The selected setpoint is reflected in register 00343 UserSetpoint with the same scaling.

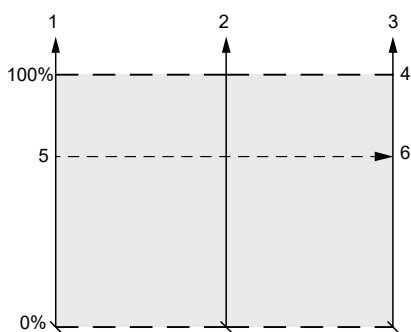
The actual setpoint, whether it has been set via Grundfos GO, the pump display, the pump buttons or the fieldbus, can be read from register 00308 ActualSetpoint. It is a percentage value scaled in 0.01 % of register 00222 FeedbackSensorMax.

Generally, the actual setpoint value represents head, pressure, flow, temperature and so on depending on how the feedback sensor has been set to measure. The unit of measure can be read from register 00220 FeedbackSensorUnit.

Unless a setpoint influencing function, like proportional influence, is active, ActualSetpoint equals UserSetpoint.

It is possible to calculate back and forth between the setpoint in percent and its scaled value:

$$X_{act}[\text{unit}] = X_{set}[\%] \times \text{FeedbackSensorMax} \times \text{FeedbackSensorUnit}$$



TM079760

Setpoint in closed-loop control for Hydro MPC and Multi-E

Pos.	Description
1	Setpoint <sup>5)</sup> (Register 00104)
2	UserSetpoint <sup>5)</sup> (Register 00343)
3	ActualSetpoint <sup>5)</sup> (Register 00308)
4	FeedbackSensorMax (Register 00222)
5	$X_{set}$
6	$X_{act}$

5) Percentage of sensor maximum.

### TPED and MAGNA3-D

The setpoint is written to register 00104 Setpoint as a percentage value scaled in 0.01 % of the setpoint range [ $r_{min}$ ;  $r_{max}$ ]. The selected setpoint is reflected in register 00343 UserSetpoint with the same scaling.

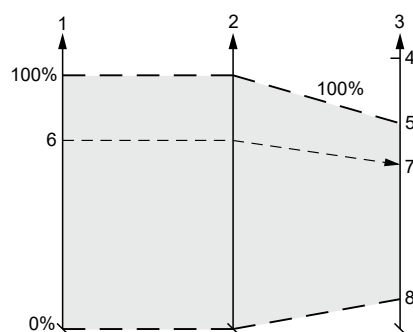
The actual setpoint, whether it has been set via Grundfos GO, the pump display, the pump buttons or the fieldbus, can be read from register 00308 ActualSetpoint. It is a percentage value scaled in 0.01 % of register 00222 FeedbackSensorMax.

Generally, the actual setpoint value represents head, pressure, flow, temperature and so on depending on how the feedback sensor has been set to measure. The unit of measure can be read from register 00220 FeedbackSensorUnit.

It is possible to calculate back and forth between ActualSetpoint in percent and its scaled value:

$$X_{act}[\text{unit}] = X_{act}[\%] \times \text{FeedbackSensorMax} \times \text{FeedbackSensorUnit}$$

The setpoint range limits  $r_{min}$  and  $r_{max}$  cannot be read from the fieldbus but are found in the pump data sheet or in the Grundfos GO "Setpoint" menu.



TM079761

Setpoint in closed-loop control for TPED and MAGNA3-D

Pos.	Description
1	Setpoint <sup>6)</sup> (Register 00104)
2	UserSetpoint <sup>6)</sup> (Register 00343)
3	ActualSetpoint <sup>7)</sup> (Register 00308)
4	FeedbackSensorMax (Register 00222)
5	$r_{max}$
6	$X_{set}$
7	$X_{act}$
8	$r_{min}$

6) Percentage of setpoint range.

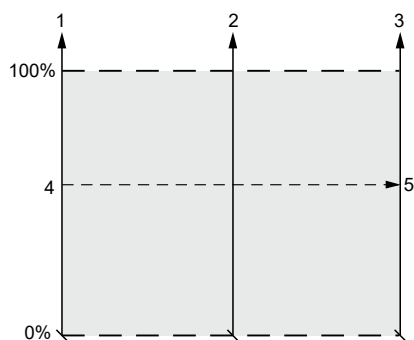
7) Percentage of sensor maximum.

## 10.4 Setpoint in open-loop control

### Hydro MPC and Multi-E

The setpoint is written to register 00104 Setpoint as a percentage value scaled in 0.01 % of the maximum performance. The selected setpoint is reflected in register 00338 UserSetpoint with the same scaling.

The actual setpoint, whether it has been set via Grundfos GO, the pump or controller display or buttons, or the fieldbus, can be read from register 00308 ActualSetpoint, and it reflects whatever limitations, for example power or frequency limits, that might be active in the system. It equals the value that the booster system actually uses.



TM079762

Setpoint in open-loop control for Hydro MPC and Multi-E

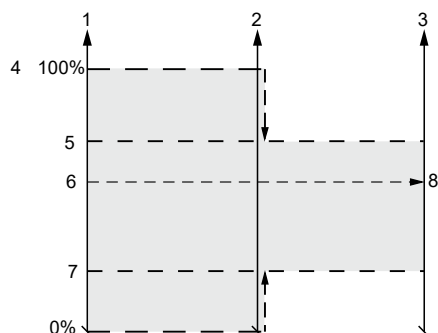
Pos.	Description
1	Setpoint <sup>8)</sup> (Register 00104)
2	UserSetpoint <sup>8)</sup> (Register 00343)
3	ActualSetpoint <sup>8)</sup> (Register 00308)
4	$X_{set}$
5	$X_{act}$

<sup>8)</sup> Percentage of system performance.

### TPED and MAGNA3-D

The setpoint is written to register 00104 Setpoint as a percentage value scaled in 0.01 % of the nominal pump frequency  $f_{nom}$ . The selected setpoint is reflected in register 00338 UserSetpoint with the same scaling. From the fieldbus, it will get whatever value written to Setpoint but from the pump display and Grundfos GO, it is truncated to the internal pump frequency limits [ $f_{min}$ ;  $f_{max}$ ].

The actual setpoint, whether it has been set via Grundfos GO, the pump display, the pump buttons or the fieldbus, can be read from register 00308 ActualSetpoint, and it always reflects the frequency limitations. It equals the value that the pump actually uses. Values of  $f_{min}$ ,  $f_{max}$  and  $f_{nom}$  can be read in Grundfos GO.



TM079763

Setpoint in open-loop control for TPED and MAGNA3-D

Pos.	Description
1	Setpoint <sup>9)</sup> (Register 00104)
2	UserSetpoint <sup>9)</sup> (Register 00343)
3	ActualSetpoint <sup>9)</sup> (Register 00308)
4	$f_{nom}$
5	$f_{max}$
6	$X_{set}$
7	$f_{min}$
8	$X_{act}$

<sup>9)</sup> Percentage of  $f_{nom}$ .

## 10.5 Temperature calculation

All temperatures are available in Kelvin.

Conversion formulas for Celsius and Fahrenheit:

$$T_C = T_K - 273.15$$

$$T_F = T_K \times 9/5 - 459.67$$

## 10.6 Reading DDD remote sensor data

The DDD system is used for smart pressure management in municipal water supply systems. In automatic adaptation mode, it will maintain a stable pressure in critical points, where remote pressure sensors, data loggers, are installed.

Pressure data is logged every 15 minutes in remote sensors and sent to the DDD controller via text messages once a day. This means that the measured pressure data is not "live" in the Modbus profile. The registers from 00605 to 00614 show the data delayed by 24 hours and are updated every 15 minutes, for creating graph on a supervisory system for the remote sensors. Sensor warnings, for example low battery voltage, are displayed as soon as they are detected.



DDD systems always require a flow meter and an outlet pressure sensor at the pumping station.

## 10.7 Alarms and warnings from the booster system

Address	Name	Description
00206	WarningCode	Code for booster system warning.
00205	FaultCode	Code for booster system alarm.

In the WarningCode register, the cause of a booster system warning can be read. A warning has no influence on the booster system operation.

In the FaultCode register, the cause of a booster system alarm can be read. A booster system alarm always leads to a reaction in the booster system operation. Usually the booster system is stopped, but some alarms in some booster system types have programmable alarm action types.

The complete list of possible alarm and warning codes is shown below. Not all codes apply to all booster system types.

Code	Alarm/warning description	Reset type <sup>10)</sup>	Action type <sup>11)</sup>
3	External fault signal	A/M	Prog.
10	Communication fault, pump	A	None
80	Hardware fault, IO 351 pump module	A	None
80	Hardware fault, IO 351 I/O module	A	None
83	Verification error, EEPROM parameter area	A	None
88	Sensor fault, general measuring sensor	A	None
89	Signal fault, closed-loop feedback sensor	A/M	Prog.
91	Temperature sensor 1 signal fault	A/M	Prog.
157	Real-time clock error	A	None
161	Sensor supply fault, 5 V	A	None
162	Sensor supply fault, 24 V	A	None
165	Signal fault, analog input 1	A/M	Prog.
166	Signal fault, analog input 2	A/M	Prog.
167	Signal fault, analog input 3	A/M	Prog.
175	Temperature sensor 2 signal fault	A/M	Prog.
190	Limit exceeded, supervised item 1	A/M	Prog.
191	Limit exceeded, supervised item 2	A/M	Prog.
203	Alarm on all pumps	A/M	Prog.
204	Inconsistency between sensors	A	None
208	Operation outside performance range	A/M	Prog.
210	Overpressure	A/M	Prog.
211	Underpressure	A/M	Prog.
213	VFD not ready	A	None
214	Water shortage	A/M	Prog.
215	Soft pressure buildup time-out	A/M	Prog.
216	Pilot pump alarm	A	None
219	Pressure relief not adequate	A	None
231	Ethernet: No IP address from DHCP server	A	None
232	Ethernet: Auto-disabled due to misuse	A	None

Code	Alarm/warning description	Reset type <sup>10)</sup>	Action type <sup>11)</sup>
248	Fault, battery/UPS	A	None
253	SMS data not received within time	A	None
254	Water pipe system model data inconsistency	A	None
From device	Pump alarms	-	None

<sup>10)</sup> For Hydro/Control MPC, this can be automatic (A) or selectable Automatic/Manual (A/M)

<sup>11)</sup> For Hydro/Control MPC, this can be none or programmable (Prog.).

Event action programmable: Stop, Stop with delay, Min., UserDef, Max., Pumps in local, Emergency run.

The Hydro Multi-E is always stopped in case of an alarm.

### Related information

[10.8 Alarms from the individual pumps](#)

## 10.8 Alarms from the individual pumps

Address	Name	Description
00402	AlarmCode	Alarm code from pump 1
00412	AlarmCode	Alarm code from pump 2
00422	AlarmCode	Alarm code from pump 3
00432	AlarmCode	Alarm code from pump 4
00442	AlarmCode	Alarm code from pump 5
00452	AlarmCode	Alarm code from pump 6
00462	AlarmCode	Alarm code from the pilot pump
00472	AlarmCode	Alarm code from the backup pump

The alarm code of an actual pump alarm can be read from each of the pump register blocks. Above, the registers are summarised for all the possible pumps while the codes that can possibly occur are described below.

Code	Alarm/warning description
1	Leakage current
2	Missing phase
3	External fault signal
4	Too many restarts
7	Too many hardware shutdowns
14	Electronic DC link protection activated (ERP)
16	Other
29	Turbine operation, impellers forced backwards
30	Change bearings (specific service information)
31	Change varistor(s) (specific service information)
32	Overvoltage
40	Undervoltage
41	Undervoltage transient
42	Cut-in fault (dV/dt)
45	Voltage asymmetry
48	Overload
49	Overcurrent (i_line, i_dc, i_mo)
50	Motor protection function (MPF), general shutdown
51	Blocked motor or pump
54	Motor protection function, 3 sec. limit
55	Motor current protection (MCP) activated
56	Underload
57	Dry-running
60	Low input power
64	Overtemperature
65	Motor temperature 1 (t_m or t_mo or t_mo1)
66	Temperature, control electronics
67	Temperature too high, internal frequency converter module (t_m)
70	Thermal relay 2 in motor (for example thermistor)
72	Hardware fault, type 1
73	Hardware shutdown (HSD)
76	Internal communication fault
77	Communication fault, twin-head pump
80	Hardware fault, type 2
83	Verification error, FE parameter area (EEPROM)
84	Memory access error
85	Verification error, BE parameter area (EEPROM)
88	Sensor fault
89	Signal fault, (feedback) sensor 1
91	Signal fault, temperature 1 sensor
93	Signal fault, sensor 2
96	Setpoint signal outside range
105	Electronic rectifier protection activated (ERP)

Code	Alarm/warning description
106	Electronic inverter protection activated (EIP)
148	Motor bearing temperature high (Pt100) in drive end (DE)
149	Motor bearing temperature high (Pt100) in non-drive end (NDE)
155	Inrush fault
156	Communication fault, internal frequency converter module
157	Real-time clock error
161	Sensor supply fault, 5 V
162	Sensor supply fault, 24 V
163	Measurement fault, motor protection
164	Signal fault, Liqtec sensor
165	Signal fault, analog input 1
166	Signal fault, analog input 2
167	Signal fault, analog input 3
175	Signal fault, temperature 2 sensor
176	Signal fault, temperature 3 sensor
190	Limit exceeded, sensor 1
191	Limit exceeded, sensor 2
240	Lubricate bearings (specific service information)
241	Motor phase failure
242	Automatic motor model recognition failed



## 10.9 Sensor-based Modbus registers

The tables below show the relation between the sensor-related Modbus registers and the sensor setup for the individual booster systems.

Hydro/Control MPC				
Address	Register name	FeedBack SensorUnit	Measuring sensor, options	Primary sensor, options
00301	Head	16: 0.01 m	Differential pressure, pump (zero equals -100 m)	Differential pressure, pump Differential pressure, Series 2000
00302	VolumeFlow	3: 0.1 m <sup>3</sup> /h	Flow rate	Flow rate Flow rate, Series 2000
00315	InletPressure	7: 0.001 bar	Differential pressure, inlet	Differential pressure, inlet
00316	RemotePressure	5: 0.001 bar	Differential pressure, external External pressure	Differential pressure, external External pressure
00320	RemoteTemp	18: 0.01 K	Return-pipe temperature, external	Return-pipe temperature, external
00337	AmbientTemp	22: 0.01 K	Ambient temperature	Ambient temperature
00338	InletTemp	20: 0.01 K	Return-pipe temperature	Return-pipe temperature
00339	OutletTemp	19: 0.01 K	Flow-pipe temperature	Flow-pipe temperature
00340	TemperatureDifference	21: 0.01 K	Differential temperature	Differential temperature
00341	OutletPressure	6: 0.001 bar	Outlet pressure Differential pressure, outlet	Outlet pressure Differential pressure, outlet
-	-	-	0-100 % signal	0-100 % signal

The table below shows the relationship between the measurement modules for the Hydro Multi-E model G Modbus and the measurement unit selected with Grundfos GO for the feedback sensor. Only one of the measurement module groups in the table below will be available at a time.

Hydro Multi-E model G	
Sensor unit configuration with the Grundfos GO	Modbus data register generated from feedback sensor measurement
bar	
mbar	
m	Head (00301)
kPa	OutletPressure (00341)
psi	
ft	
m <sup>3</sup> /h	
m <sup>3</sup> /s	VolumeFlow (00302)
l/s	
gpm	
°C	RemoteTemperature (00316)
°F	
%	-

The process feedback scaled according to ProcessFeedBackUnit can be calculated from this formula:

$$\text{Feedback (scaled)} = \text{ProcessFeedBack} \times (\text{FeedBackSensorMax} - \text{FeedBackSensorMin}) / 100 \% + \text{FeedBackSensorMin}$$

See also section Control modes.

**Hydro Multi-E/TPED model H or later**

Measured parameters (Selected from display or Grundfos GO)			Mapped to Modbus register
Parameter	Analog input AI1, AI2, AI3	Temperature Pt100 input T1, T2	
Inlet pressure	•		InletPressure (00315)
Inlet differential pressure	•		InletDiffPressure (00356)
Outlet pressure	•		OutletPressure (00341)
Outlet differential pressure	•		OutletDiffPressure (00358)
Remote pressure 1	•		RemotePressure1 (00316)
Remote pressure 2	•		RemotePressure2 (00353)
Remote differential pressure	•		RemoteDiffpressure (00359)
Feed tank level	•		FeedTankLevel (00342)
Storage tank level	•		StorageTankLevel (00350)
Flow	•		VolumeFlow (00302)
Remote flow	•		RemoteFlow (00360)
Temperature 1	•	•	RemoteTemp1 (00320)
Temperature 2	•	•	RemoteTemp2 (00354)
Ambient temperature	•	•	AmbientTemp (00337)
Other parameter	•		AuxSensorInput (00325)

**MAGNA3-D**

Measured parameters (Selected from display or Grundfos GO)			Mapped to Modbus register
Parameter	Analog input AI1, AI2, AI3	Temperature Pt100 input T1, T2	
Remote pressure 1	•		RemotePressure1 (00316)
Temperature 2	•		RemoteTemp2 (00354)

**Related information**

[10.1 Control modes](#)

**11. Modbus RTU commissioning, step-by-step guides**

If the sensor configuration is changed, restart the CIM module or CIU unit to ensure a correct scaling of the sensor value.

**11.1 Hardware setup, CIM 200**

Step	Action
1	Install CIM 200 in the Grundfos booster system according to the booster system documentation.
2	Complete the booster system configuration, for example sensor configuration and local mode. This can be done either on the booster system control panel, via Grundfos GO or Grundfos PC Tool E-Products.
3	Select the Modbus slave address (1-247).
4	Select the bit rate of the Modbus slave.
5	Select parity and stop bits of the Modbus slave, even parity with 1 stop bit or no parity with 2 stop bits.
6	If necessary, set line termination.
7	Connect the necessary cables from CIM 200 to the Modbus network.
8	Confirm 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.

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

## 11.2 Hardware setup, CIU 200

Step	Action
1	Complete the booster system configuration, for example sensor configuration and local mode. This can be done either via Grundfos GO or Grundfos PC Tool E-Products.
2	Select the Modbus slave address (1-247).
3	Select the transmission speed of the Modbus slave.
4	Select parity and stop bits of the Modbus slave, even parity with 1 stop bit or no parity with 2 stop bits.
5	If necessary, set line termination.
6	Connect the GENIbus cable from CIU 200 to the booster system.
7	Connect the necessary cables from CIU 200 to the Modbus network.
8	Connect the power cable to CIU 200, and switch the unit on.
9	Confirm 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.

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

### 11.3 Hardware setup, CIM 260 data connection

Step	Action
1	Install CIM 260 in the Grundfos product according to the product documentation.
2	Fit an antenna to the CIM module SMA connector.
3	Insert the SIM card in CIM 260.
4	Power on the Grundfos product.
5	Observe that LED2 turns permanently green.
6	Observe that LED1 blinks yellow and changes to yellow pulsing after approximately 30 seconds, indicating that the cellular network connection is working. See section LEDs.
7	To configure CIM 260 for a data connection, follow the instructions in the "CIM 260 SMS commands", which you can download from Grundfos Product Center.
8	To verify the APN settings after completion, use the SMS command "APNSETTINGS". To verify that the data connection is working, use the SMS command "APNSTATUS". The connection state must be "Context active" if ready and "Connected" if a Modbus TCP master is already communicating.

CIM 260 is now ready to be accessed from a Modbus TCP master via a data connection, or via SMS commands.

#### Related information

[6.1.1 Fitting a cellular antenna](#)

[6.1.2 Inserting the SIM card](#)

[6.2 Status LEDs](#)

### 11.4 Hardware setup, CIU 260 data connection

Step	Action
1	Connect the GENIbus cable from CIU 260 to the Grundfos product, see the CIU quick guide instruction.
2	Fit an antenna to the CIM module SMA connector.
3	Insert the SIM card in CIM 260.
4	Connect the mains cable to CIU 260. See the CIU quick-guide instruction, and power on CIU 260.
5	Power on the Grundfos product.
6	Observe that LED2 turns permanently green, indicating that the GENIbus connection is working.
7	Observe that LED1 blinks yellow and changes to yellow pulsing after approximately 30 seconds, indicating that the cellular network connection is working.
8	To configure CIM 260 for a data connection, follow the instructions in the "CIM 260 SMS commands", which you can download from Grundfos Product Center.
9	To verify the APN settings after completion, use the SMS command "APNSETTINGS". To verify that the data connection is working, use the SMS command "APNSTATUS". The connection state must be "Context active" if ready and "Connected" if a Modbus TCP master is already communicating.

CIU 260 is now ready to be accessed from a Modbus TCP master via a data connection, or via SMS commands.

#### Related information

[6.1.1 Fitting a cellular antenna](#)

[6.1.2 Inserting the SIM card](#)

[6.2 Status LEDs](#)

### 11.5 CIM 500 Modbus TCP communication setup

Step	Action
1	Install CIM 500 in the Grundfos booster system according to the booster system documentation.
2	Select position 1 at the protocol rotary switch.
3	Power on the booster system, and observe LED2 turning permanently green and LED1 remaining off.
4	Complete the booster system configuration, for example sensor configuration and selection of local Operating mode, local Control mode and local Setpoint, for example via Grundfos GO.
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 CIM 500, for example 192.168.1.1, 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: 192.168.1.100
8	Log in to the webserver. Default: User: admin Password: Grundfos
9	In the menu column to the left, select "Configuration" > "Real time Ethernet protocol".

Step	Action
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 factory default values.
12	Click [Submit] to transfer the new settings, and close the internet browser.

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 9. The Modbus address (Unit ID) in the Modbus TCP telegram is not used.

CIM 500 LED1 flashes green when Modbus TCP communication takes place.

You can use the two Ethernet ports to daisy chain 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 PC Tool CIM/CIU while connected to another Modbus TCP master.

#### Related information

[A.1.1. How to configure an IP address on your PC using Windows 10](#)

[7.2 Setting the Industrial Ethernet protocol](#)

### 11.6 CIU 500 Modbus TCP communication setup

Step	Action
1	Check that both the CIU 500 unit and the booster system are powered off.
2	Remove the front cover of CIU 500.
3	Select position 1 at the CIM 500 module protocol rotary switch.
4	Connect the GENIbus cable from CIU 500 to the booster system. See the CIU quick guide.
5	Power on CIU 500 and the booster system, and observe LED2 turning permanently green and LED1 remaining off.
6	Connect one of the CIU 500 Ethernet ports (RJ45) to a PC using an Ethernet cable.
7	Configure the PC Ethernet port to the same subnetwork as CIM 500, for example 192.168.1.1 and the subnet mask to 255.255.255.0.
8	Open your internet browser, and make contact to the CIM 500 webserver. Factory default address: 192.168.1.100
9	Log in to the webserver. Default: Username: admin Password: Grundfos
10	In the menu column to the left, select "Configuration" > "Real time Ethernet protocol".
11	Type in an IP address belonging to the same subnet as your PC, for example 192.168.1.2.
12	Type in the subnet mask 255.255.255.0, and leave the rest of the settings at their factory default values.
13	Click [Submit] to transfer the new settings and close the internet browser.

CIU 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.

CIU 500 LED1 flashes green when Modbus TCP communication takes place.

You can use the two Ethernet ports to daisy chain 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 PC Tool CIM/CIU while connected to another Modbus TCP master.

#### Related information

[A.1.1. How to configure an IP address on your PC using Windows 10](#)

[7.2 Setting the Industrial Ethernet protocol](#)

## 12. Detailed description of APN

### 12.1 What is APN and Modbus TCP?

An APN connection (Access Point Name) is a wireless, "always on" connection that remains active as long as CIU 260 is within range of the service. With a data connection, it is possible to establish a wireless connection to the Internet and thus enable a remote connection to a SCADA system computer or another PC application.

The APN connection takes care of the wireless data transfer via the cellular network. It plays the same role as Ethernet in a wired network. We will refer to an APN connection as a data connection, and it also makes use of the TCP/IP protocol, which enables easy integration with the Internet. The Modbus TCP protocol is used on the application layer communicating with a TCP port number (default 502). The difference when compared to the fieldbus protocol Modbus RTU is the exclusion of the 16-bit CRC checksum and the adding of a Modbus application program header as illustrated in fig. Modbus TCP telegram in section Subscription.

#### Related information

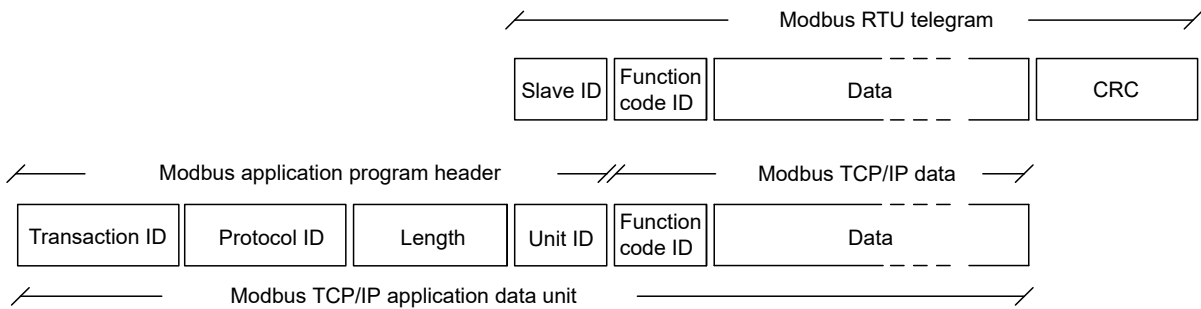
[12.2 Subscription](#)

### 12.2 Subscription

You have to select the service provider and the technical solution that best suits your system, and it must be based on static IP addressing. You will get the following from the service provider:

- A Subscriber Identity Module (SIM card).
- An Access Point Name (APN), for example "Internet".
- A fixed user name that cannot be changed by the user.
- A fixed password that cannot be changed by the user.
- A static IP address.

Solutions based on a VPN, Virtual Private Network, involve the use of special routers, for example GRE, Generic Routing Encapsulation, routers, which you also get from the service provider.



Modbus TCP telegram

## 12.3 Installation

To prepare CIU 260 for data communication, some settings have to be made via SMS commands:

- Select Access Point Name: APN <ASCII string> This is always mandatory.
- Select Username: USERNAME <ASCII string> The need for a user name depends on your operator and the type of subscription.
- Select Password: PASSWORD <ASCII string> The need for a password depends on your operator and the type of subscription.
- Setting a SCADA PIN code: SETSCADACODE <access code> will enable write access protection. Default is an empty SCADA PIN code, meaning no protection.
- Activating the SCADA PIN code: SCADACODE <ON | OFF>. Default is "Off".
- Selecting the Modbus address: MODBUSADDR <1-247>. Default setting: 231.

To verify the SCADA settings after completion, use the SMS command "SCADA".

Some advanced APN-related settings have default values that usually work, but in special cases it might be necessary to change some of them. This is also done via SMS commands.

- Select Authentication: AUTHENTICATION <NORMAL | SECURE> Only used by some service providers. Default setting: NORMAL.
- Select Connection type: CONNECTION <SERVER | CLIENT | DISABLE> Default setting: SERVER.
- Set data roaming: DATAROAMING: <ON | OFF> Default setting: OFF.
- Select Modbus TCP port number: MODBUSPORT <port number> Default setting: 502.
- Select GENIpro port number: GENIPROPOT <port number> Default setting: 49152. This is only relevant when using Grundfos PC Tools.

It is possible to configure the APN connection with a single multi-parameter command:

- SETAPN <parameter 1, parameter 2, parameter 3, ...>
  - <parameters>: <APN>, <Modbus port>, <GENIpro port>, <username>, <password>, <authentication>, <connection>, <data roaming>, <data silence time out>.

### Example

SETAPN

Grundfos.dk2.tdc,502,49888,Grundfos,4321,normal,server,off,60

To verify the APN settings after completion, use the SMS command "APNSETTINGS". The command "APNSTATUS" can verify if the APN connection is working.

The connection states have the following meaning:

- "Detached": Trying to locate APN connection service.
- "Attached": APN connection service located.
- "Context active": IP address has been assigned, ready for a client to establish a socket connection.
- "Connected": A client has established a socket connection. The system is ready for TCP/IP data exchange, or already exchanging data.

For details about the use of SMS commands, see "CIM 260 SMS commands", which you can download from Grundfos Product Center.

## 12.4 Operation

When you power on a booster with the correct APN settings, the following connection sequence takes place:

1. The booster locates the APN service. The connection state changes from "Detached" to "Attached".
2. The booster attempts to connect to the APN it has been given and requests an IP address. The base station looks through its record of legal SIM cards and finds the IP address, the address associated with this SIM card, to assign to the booster. After the booster has got the IP address, the connection state changes to "Context active".
3. The booster is now ready for a client, for example a SCADA system, to establish a socket connection and begin TCP/IP data exchange. When a client connects the booster, the connection state changes to "Connected", and the CIM 260 connection status LED1 indicates when data transfer takes place.



When no data is being transferred, the connection states "Attached", "Context active" and "Connected". All show the same LED1 status, short pulse.

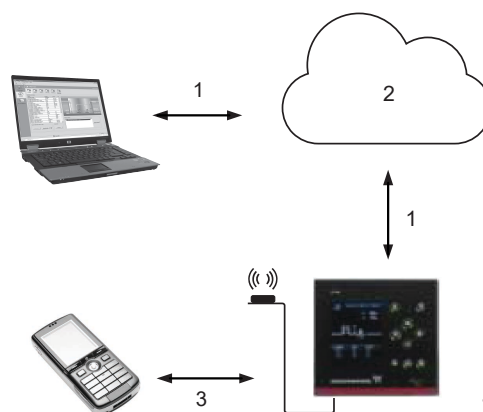
A client, for example SCADA, establishes connection to a booster by specifying the IP address and the TCP port 502. Data transfer is always initiated from the client in the form of a Modbus TCP telegram embedded in a TCP/IP frame and directed to TCP port 502. To the client software, the connection to a booster is completely transparent.

The protection against unauthorised data access is high. The access to the private network from the internet can only take place via the VPN tunnel. See fig. Data connection via VPN tunnel. Moreover, data transfer requires a Modbus master client, knowledge of the Modbus functional profile and the use of a SCADA PIN code, if enabled.

The booster supervises the connection to ensure that it is still working. An automatic procedure ensures restarting of the booster and repetition of the connection sequence in case a deadlock situation has occurred. It also closes down socket connections that are left open by the client and unused for more than 24 hours.

It is possible to use SMS communication while data communication is active. However, in the "Connected" state the delay time between reception and reply increases.

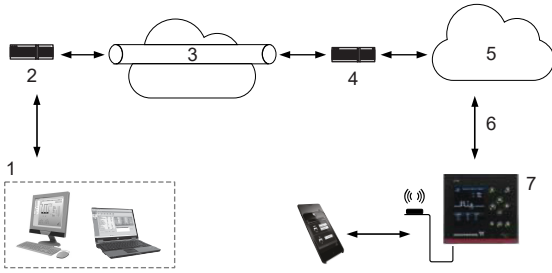
A total of three Modbus clients can be connected to the Modbus TCP port of a booster and communicate simultaneously. Each connection, called a socket connection, is handled independently. If all three sockets are used simultaneously, a "Silence time-out" of only one minute is used to prevent a complete occupation for a long time.



Data connection directly from a PC to a booster via a public APN

TM083728

Pos.	Description
1	"Static" IP address
2	Cellular network Base station APN
3	Setup, status and control commands via SMS
4	Booster with CIM 260 and SIM card



Data connection via VPN tunnel

Pos.	Description
1	PC tool and SCADA system clients
2	GRE router by customer
3	VPN tunnel over the internet
4	GRE router by operator
5	Private cellular network, base station APN
6	"Static" IP address
7	Booster with CIM 260 and SIM card

### 13. Modbus RTU telegram examples



The Modbus data model states that registers numbered X are addressed in telegrams as X - 1, for example register 00104 (setpoint) is addressed as 00103 in a Modbus telegram.

Note that CRC fields are not shown in the following examples.

#### 13.1 Modbus telegram overview

The maximum size of a Modbus RTU telegram is 256 bytes. Telegrams must be separated by a silent interval of at least 3.5 character times.

The standard Modbus RTU telegram format is shown in the table below.

Slave address	Function code	Data	CRC
1 byte	1 byte	0 to 252 bytes	2 bytes

A telegram starts with the slave address occupying one byte. Then comes a variable-size data field. For each telegram, a CRC is calculated and appended to the telegram, two bytes total. All bytes in the telegram, except for the CRC itself, are included in the check. Note that the CRC bytes are not shown in the examples in the following sections.

#### 13.2 Read holding registers, 0x03

This function is used for reading holding registers from the slave. The request telegram specifies the starting address, that is the address of the first register to be read, and the number of holding registers to read. In the telegram, register addresses start from zero, meaning that registers numbered 0-16 are addressed as 0-15.

##### Example of request from master to slave

Field	Value
Address	0x01
Function code	0x03
Start address HI	0x00
Start address LO	0x6B
Quantity HI	0x00
Quantity LO	0x03

In the request, the slave with address 1 is asked to deliver three contiguous registers starting from address 0x006b: 107, meaning register 108.

##### Example of response from slave to master

Field	Value
Address	0x01
Function code	0x03
Byte count	0x06
Register 108 HI	0x00
Register 108 LO	0x01
Register 109 HI	0x00
Register 109 LO	0x01
Register 110 HI	0x00
Register 110 LO	0x01

In the response, the byte count is six since there are three registers of two bytes. All three registers hold the value of 0x0001.



### 13.3 Read input registers, 0x04

This function is used for reading input registers from the slave. Input registers are read-only registers by definition. The request telegram specifies the starting address, that is the address of the first register to be read, and the number of holding registers to read. In the telegram, register addresses start from zero, meaning that registers numbered 1-16 are addressed as 0-15.

#### Example of request from master to slave

Field	Value
Address	0x01
Function code	0x04
Start address HI	0x10
Start address LO	0x10
Quantity HI	0x00
Quantity LO	0x03

In the request, the slave with address 1 is asked to deliver three contiguous registers starting from address 0x1010: 4112, meaning register 4113.

#### Example of response from slave to master

Field	Value
Address	0x01
Function code	0x04
Byte count	0x06
Register 4113 HI	0x22
Register 4113 LO	0x22
Register 4114 HI	0x22
Register 4114 LO	0x22
Register 4115 HI	0x22
Register 4115 LO	0x22

In the response, the byte count is six since there are three registers of two bytes. All three registers hold the value of 0x2222.

### 13.4 Write single register, 0x06

This function is used for writing a single holding register in the slave. The request telegram specifies the address of the register that is to be written. Register addresses start from zero, meaning that a register numbered 10 is addressed as 9.

The normal response is an echo of the request, indicating that the value was written.

#### Example of request from master to slave

Field	Value
Address	0x01
Function code	0x06
Address HI	0x10
Address LO	0x00
Value HI	0xAF
Value LO	0xFE

In the request, the slave with address 1 is asked to write the value of 0xAFFE to the register at address 0x1000.

#### Example of response from slave to master

Field	Value
Address	0x01
Function code	0x06
Address HI	0x10
Address LO	0x00
Value HI	0xAF
Value LO	0xFE

The response is an echo of the request.

### 13.5 Write multiple registers, 0x10

This function is used for writing a block of contiguous holding registers in the slave. Register addresses start from zero, meaning that a register numbered 100 is addressed as 99.

#### Example of request from master to slave

Field	Value
Address	0x01
Function code	0x10
Start address HI	0x00
Start address LO	0x20
Quantity HI	0x00
Quantity LO	0x02
Byte count	0x04
Register 33 HI	0x00
Register 33 LO	0x01
Register 34 HI	0xB0
Register 34 LO	0xB0

In the request, the slave with address 1 is asked to write the value of 0x0001 to the register at address 0x0020 and the value of 0xB0B0 to the register at address 0x0021.

#### Example of response from slave to master

Field	Value
Address	0x01
Function code	0x10
Start address HI	0x00
Start address LO	0x20
Quantity written HI	0x00
Quantity written LO	0x02

The response returns the function code, starting address and quantity of registers written.

### 13.6 Diagnostics, 0x08

Only supported by CIM 200 Modbus RTU.

This function provides a test for checking the communication system between the master and the Grundfos slave. It contains a single-byte subcode to identify the test to be performed.

The following subcodes are supported:

Subcode	Name
0x00	Return query data Data in this request are to be echoed in the response. The response must be identical to the request, so this function is often used to verify Modbus communication.
0x01	Restart communications All communication counters are cleared, and the device is restarted.
0x02	Return diagnostics register Returns the 16-bit diagnostics register. See section <a href="#">Diagnostics register interpretation</a> .
0x04	Force listen only Forces the device into listen-only mode. This effectively mutes the device, making it unable to communicate on the network. To bring the device back to normal mode, a "Restart communications" command, code 0x08, subcode 0x01, must be issued.
0x0A	Clear counters and diagnostics register Clears all counters and the diagnostics register. These are also cleared on power-up and restart
0x0B	Return bus message count Returns the number of messages detected by the slave.
0x0C	Return bus CRC error count Returns the number of CRC errors in the slave.
0x0D	Return bus exception count Returns the number of Modbus exception responses that the slave has transmitted.
0x0E	Return slave message count Returns the number of messages that the slave has processed.
0x0F	Return slave no response count Returns the number of messages for which the slave has sent no response.

#### Example of request from master to slave

Field	Value
Address	0x01
Function code	0x08
Subcode	0x00
Data	0xAB
Data	0xCD

The response is identical to the request.

#### Example of response from slave to master

Field	Value
Address	0x01
Function code	0x08
Subcode	0x00
Data	0xAB
Data	0xCD

#### Related information

[13.7 Diagnostics register interpretation](#)

### 13.7 Diagnostics register interpretation

The diagnostics register is interpreted as follows:

Bit	Description
0	Communication failure, with the Grundfos booster system.
1	RESERVED
2	Grundfos booster system is not supported.
3	Modbus address offset is different from default value, i.e. it differs from 0.
4	Using software-defined Modbus transmission speed.
5	RESERVED
6	RESERVED
7	RESERVED
8	RESERVED
9	RESERVED
10	RESERVED
11	RESERVED
12	RESERVED
13	RESERVED
14	RESERVED
15	RESERVED

A bit value of 1 means true, unless otherwise specified. The diagnostics register is read using function code 0x08 and subcode 0x02.

#### 13.8 Diagnostics: Return query data

This function is useful to ensure that the communication path and slave configuration are correct. It will echo the request in the response.

In the example, slave address 0x01 is used.

#### Request from master to slave

Field	Value	Description
Slave address	0x01	-
Function code	0x08	Diagnostics
Subcode	0x00	Echo request
Data	0xAB	Test data
Data	0xCD	Test data

#### Example of response from slave to master

Field	Value	Description
Slave address	0x01	-
Function code	0x08	Diagnostics
Subcode	0x00	Echo request
Data	0xAB	Test data
Data	0xCD	Test data

If there is no response from the slave, see Fault finding.

#### Related information

[14.1.2 CIM/CIU 200 Modbus communication faults](#)

[14.2.2 CIM/CIU 260 Modbus connection communication faults](#)

### 13.9 Reading the CIM configuration register block

This section shows how to read the first four registers of the CIM configuration register block.

In the example, slave address 0x01 is used.

#### Request from master to slave

Field	Value	Description
Slave address	0x01	-
Function code	0x04	Read input registers
Start address HI	0x00	Start address
Start address LO	0x00	= 0x0001
Quantity HI	0x00	Number of registers
Quantity LO	0x04	= 0x0004

#### Example of response from slave to master

Field	Value	Description
Slave address	0x01	-
Function code	0x04	Read input registers
Byte count	0x08	8 bytes follow
00001 HI	0x00	SlaveMinimumReplyDelay:
00001 LO	0x0A	0x000A
00002 HI	0x00	RegisterOffset:
00002 LO	0x00	0x0000
00003 HI	0x00	Reserved value:
00003 LO	0x00	0x0000
00004 HI	0x00	SoftwareDefinedBitRate:
00004 LO	0x04	0x0004

If there is no response from the slave, see Fault finding.

#### Related information

[14.1.2 CIM/CIU 200 Modbus communication faults](#)

[14.2.2 CIM/CIU 260 Modbus connection communication faults](#)

### 13.10 Setting the setpoint

This section shows how to set a new setpoint (reference).

In the example, slave address 0x01 is used, and a value of 55 % (5500 = 0x157C) is set as new setpoint.

#### Request from master to slave

Field	Value	Description
Slave address	0x01	-
Function code	0x06	Write single register
Start address HI	0x00	Setpoint address:
Start address LO	0x67	00104 (0x0068)
Value HI	0x15	New setpoint value:
Value LO	0x7C	5500 (0x157C)

#### Example of response from slave to master

Field	Value	Description
Slave address	0x01	-
Function code	0x06	Write single register
Start address HI	0x00	Setpoint address:
Start address LO	0x67	00104 (0x0068)
Value HI	0x15	New setpoint value:
Value LO	0x7C	5500 (0x157C)

If there is no response from the slave, see Fault finding.

#### Related information

[14.1.2 CIM/CIU 200 Modbus communication faults](#)

[14.2.2 CIM/CIU 260 Modbus connection communication faults](#)

### 13.11 Setting the control mode

This section shows how to set a control mode.

In the example, slave address 0x01 is used, and the control mode is set to 1 (Constant frequency).

#### Request from master to slave

Field	Value	Description
Slave address	0x01	-
Function code	0x06	Write single register
Start address HI	0x00	ControlMode address
Start address LO	0x65	= 00102 (0x0066)
Value HI	0x00	New ControlMode value
Value LO	0x01	= 1 (0x0001)

#### Example of response from slave to master

Field	Value	Description
Slave address	0x01	-
Function code	0x06	Write single register
Start address HI	0x00	ControlMode address
Start address LO	0x65	= 00102 (0x0066)
Value HI	0x00	New ControlMode value
Value LO	0x01	= 1 (0x0001)

If there is no response from the slave, see Fault finding.

#### Related information

[14.1.2 CIM/CIU 200 Modbus communication faults](#)

[14.2.2 CIM/CIU 260 Modbus connection communication faults](#)

### 13.12 Starting the booster system

This section shows how to start the booster system.

In the example, slave address 0x01 is used.

Set the ControlRegister to the following values:

Bit 0:	1 (set the booster system to remote mode)
Bit 1:	1 (start the booster system)
Bit 2:	0 (do not send a reset fault command)
Bit 3:	0 (direction = clockwise rotation)
Bit 4:	0 (do not copy remote settings to local)
Bits 5-15:	0 (do not reset accumulated counters)

Hence the value to set is 0b0000000000000011 = 0x0003.

#### Request from master to slave

Field	Value	Description
Slave address	0x01	-
Function code	0x06	Write single register
Start address HI	0x00	ControlRegister address:
Start address LO	0x64	00101 (0x0065)
Value HI	0x00	ControlRegister value: 3
Value LO	0x03	(0x0003)

#### Example of response from slave to master

Field	Value	Description
Slave address	0x01	-
Function code	0x06	Write single register
Start address HI	0x00	ControlRegister address:
Start address LO	0x64	00101 (0x0065)
Value HI	0x00	ControlRegister value:
Value LO	0x03	3 (0x0003)

If there is no response from the slave, see Fault finding.

#### Related information

[14.1.2 CIM/CIU 200 Modbus communication faults](#)

[14.2.2 CIM/CIU 260 Modbus connection communication faults](#)

### 13.13 Stopping the booster system

This section shows how to stop the booster system.

In the example, slave address 0x01 is used.

Set the ControlRegister to the following values:

Bit 0:	1 (set the booster system to remote mode)
Bit 1:	0 (stop the booster system)
Bit 2:	0 (do not send a reset fault command)
Bit 3:	0 (direction = clockwise rotation)
Bit 4:	0 (do not copy remote settings to local)
Bits 5-15:	0 (do not reset accumulated counters)

Hence the value to set is 0b0000000000000001 = 0x0001.

#### Request from master to slave

Field	Value	Description
Slave address	0x01	-
Function code	0x06	Write single register
Start address HI	0x00	ControlRegister address:
Start address LO	0x64	00101 (0x0065)
Value HI	0x00	ControlRegister value:
Value LO	0x01	1 (0x0001)

#### Example of response from slave to master

Field	Value	Description
Slave address	0x01	-
Function code	0x06	Write single register
Start address HI	0x00	ControlRegister address:
Start address LO	0x64	00101 (0x0065)
Value HI	0x00	ControlRegister value:
Value LO	0x01	1 (0x0001)

If there is no response from the slave, see Fault finding.

#### Related information

[14.1.2 CIM/CIU 200 Modbus communication faults](#)

[14.2.2 CIM/CIU 260 Modbus connection communication faults](#)

## 14. Fault finding the product

### 14.1 CIM 200

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

#### Related information

[3.2 CIM 200 Modbus RTU](#)

#### 14.1.1 LED status

##### CIM 200 fitted in a Grundfos booster system

Fault (LED status)	Possible cause	Remedy
LED1 and LED2 remain off when the power supply is connected.	CIM 200 is fitted incorrectly in the Grundfos product.	Ensure that CIM 200 is fitted and connected correctly.
	CIM 200 is defective.	Replace CIM 200.
LED2 for internal communication is flashing red.	No internal communication between CIM 200 and the Grundfos product.	Ensure that CIM 200 is fitted correctly in the Grundfos product.
LED2 for internal communication is permanently red.	CIM 200 does not support the Grundfos product connected.	Contact the nearest Grundfos company.
Modbus LED1 is permanently red.	Fault in the CIM 200 Modbus configuration.	<ul style="list-style-type: none"> <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 Modbus. Try one of the preselected transmission speeds, for example 19200 bit/s.</li> <li>Check that the Modbus address, switches SW6 and SW7, has a valid value [1-247].</li> </ul>
Modbus LED1 is flashing red.	Fault in the Modbus communication (fault in parity or cyclic redundancy check).	<ul style="list-style-type: none"> <li>Check the transmission speed, switches SW4 and SW5. See section <a href="#">Setting the Modbus transmission speed</a>.</li> <li>Check the parity setting, switch SW3. See section <a href="#">Setting the stop bits and the parity bit</a>.</li> <li>Check the cable connection between CIM 200 and the Modbus network.</li> <li>Check the termination resistor settings, switches SW1 and SW2. See section <a href="#">Termination resistor</a>.</li> </ul>

##### CIM 200 fitted in CIU 200

Fault (LED status)	Possible cause	Remedy
LED1 and LED2 remain off when the power supply is connected.	CIU 200 is defective.	Replace CIU 200.
LED2 for internal communication is flashing red.	No internal communication between CIU 200 and the Grundfos product.	<ul style="list-style-type: none"> <li>Check the cable connection between the Grundfos product and CIU 200.</li> <li>Check that the individual conductors have been fitted correctly.</li> <li>Check the power supply to the Grundfos product.</li> </ul>
LED2 for internal communication is permanently red.	CIU 200 does not support the Grundfos product connected.	Contact the nearest Grundfos company.
Modbus LED1 is permanently red.	Fault in the CIM 200 Modbus configuration.	<ul style="list-style-type: none"> <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 Modbus. Try one of the preselected transmission speeds, for example 19200 bit/s.</li> <li>Check that the Modbus address, switches SW6 and SW7, has a valid value [1-247].</li> </ul>
Modbus LED1 is flashing red.	Fault in the Modbus communication (fault in parity or cyclic redundancy check).	<ul style="list-style-type: none"> <li>Check the transmission speed, switches SW4 and SW5.</li> <li>Check the parity setting, switch SW3.</li> <li>Check the cable connection between CIM 200 and the Modbus network.</li> <li>Check the termination resistor settings, switches SW1 and SW2.</li> </ul>

#### Related information

[5.1 Setting the Modbus transmission speed](#)

[5.2 Setting the stop bits and the parity bit](#)

[5.4 Termination resistor](#)

## 14.1.2 CIM/CIU 200 Modbus communication faults

Fault	Possible cause	Remedy
The slave does not respond to telegrams.	Configuration or wiring error.	<ul style="list-style-type: none"> <li>Check the visual diagnostics on the Modbus slave. Is the Grundfos GENiBus LED flashing green and the Modbus LED off or flashing green?</li> <li>Ensure that the cable between the Modbus master and the Modbus slave is connected correctly. See section <a href="#">CIM 200 Modbus RTU setup</a> for wiring recommendations.</li> <li>Ensure that the slave address is configured correctly, and that the correct slave address is used in the Modbus master poll. See section <a href="#">Modbus address selection</a> for slave address selection.</li> <li>Ensure that the transmission speed and stop bit/parity settings are configured correctly in both master and slave.</li> <li>Ensure that each end of the Modbus trunk cable is terminated, if necessary. See section <a href="#">Termination resistor</a> for line termination of the Grundfos slave.</li> <li>Ensure that the bus topology for a Modbus network is correct.</li> </ul>
	The slave may be in listen-only mode.	Either send a restart communications diagnostics command, or restart the booster system manually.
	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 in order to communicate.
The slave responds with exception response 0x01: "Invalid function".	The master is trying to use an unsupported function in the module or unit.	See section <a href="#">Modbus function code overview</a> for supported function codes. Note that reading and writing coils are not supported, so only register functions and diagnostics will be valid.
The slave responds with exception response 0x02: "Invalid data address".	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 will cause problems if some of the registers in the block are not supported. An example would be reading the CIM configuration and CIM status blocks in one telegram. This is not possible since there are unused addresses between the blocks.	<ul style="list-style-type: none"> <li>Avoid reading or writing invalid data addresses.</li> <li>Ensure that register X is addressed as X-1 in Modbus telegrams, according to the Modbus standard.</li> </ul>
	The register address offset may have been changed from default.	Read the holding register at address 00002 "Register Offset" to see if this value is different from 0. If so, write the value 0 to this address to make the slave return to the default used in this functional profile.
The slave returns data value 0xFFFF (65535).	The value is unavailable. A data value of 0xFFFF does not necessarily indicate an error condition. It means that the value is unavailable from the booster system.	See section for available data.
	The booster system is not configured to show the value or lacks a sensor to read the value.	See section <a href="#">System data register block</a> for data values that require a sensor.
The slave does not change Modbus transmission speed with register 00004.	Configuration error.	Set the transmission speed switches to software-defined. Otherwise, the value in register 00004 is ignored by the slave.
	An invalid value may be set in register 00004.	See section <a href="#">Setting the Modbus transmission speed</a> for invalid values, and set correct value in register 00004.

## Related information

[5. CIM 200 Modbus RTU setup](#)

[5.1 Setting the Modbus transmission speed](#)

[5.3 Modbus address selection](#)

[8. Modbus function code overview](#)

[9.7 System data register block](#)

## 14.2 CIM/CIU 260

You can detect faults in CIU 260 by observing the status of the two communication LEDs.

### Related information

[3.3 CIM 260 3G/4G cellular Modbus](#)

#### 14.2.1 LED status

##### CIU 260 fitted in a Grundfos booster system

Fault (LED status)	Possible cause	Remedy
LED1 and LED2 remain off when the power supply is connected.	CIU 260 is defective.	Replace CIU 260.
LED2 for internal communication is flashing red.	No internal communication between CIU 260 and the Grundfos product.	<ul style="list-style-type: none"> <li>Check the cable connection between the booster system and CIU 260.</li> <li>Check that the individual conductors have been fitted correctly.</li> <li>Check the power supply to the booster system.</li> </ul>
LED2 for internal communication is permanently red.	CIU 260 does not support the Grundfos product connected.	Contact the nearest Grundfos company.
LED1 for cellular communication is flashing yellow. See signal 1 in fig. Figure 1 on page Figure 1.	The SIM card has not been inserted.	Insert the SIM card.
	The SIM card has not been inserted correctly.	Insert the SIM card.
	The SIM card PIN code is not correct.	Enter the correct PIN code.
	No connection to the cellular network.	<ul style="list-style-type: none"> <li>Check the connection to the antenna.</li> <li>Check the cellular coverage of the area using for example a mobile phone.</li> <li>Use an external antenna and experiment with the position.</li> </ul>
The LED1 for cellular communication is pulsating yellow with single pulse, but CIM 260 cannot send or receive SMS messages.	CIM 260 has not been initialised.	Follow the configuration procedure in "CIM 260 SMS commands", which you can download from Grundfos Product Center.

##### CIM 260 fitted in CIU 260

Fault (LED status)	Possible cause	Remedy
LED1 and LED2 remain off when the power supply is connected.	CIM 260 is fitted incorrectly in the Grundfos product.	Ensure that CIM 260 is fitted and connected correctly.
	CIM 260 is defective.	Replace CIM 260.
LED2 for internal communication is flashing red.	No internal communication between CIM 260 and the Grundfos product.	Ensure that CIM 260 is fitted correctly in the Grundfos product.
The LED2 for internal communication is permanently red.	The 260 does not support the Grundfos product.	Contact the nearest Grundfos company.
	The SIM card has not been inserted.	Insert the SIM card.
	The SIM card has not been inserted correctly.	Insert the SIM card.
	The SIM card PIN code is not correct.	Enter the correct PIN code.
LED1 for cellular communication is flashing yellow. See signal 1 in fig. Figure 1 on page Figure 1.	No connection to the cellular network.	<ul style="list-style-type: none"> <li>Check the connection to the antenna.</li> <li>Check the cellular coverage of the area using for example a mobile phone.</li> <li>Use an external antenna and experiment with the position.</li> </ul>
	CIM 260 has not been initialised.	Follow the configuration procedure in "CIM 260 SMS commands", which you can download from Grundfos Product Center.

### Related information

[6.1.2 Inserting the SIM card](#)

[6.2 Status LEDs](#)

## 14.2.2 CIM/CIU 260 Modbus connection communication faults

Fault	Possible cause	Remedy
The slave does not respond to telegrams.	Configuration or installation error.	<ul style="list-style-type: none"> <li>Ensure that CIU 260 has connection to the cellular network. LED1 must be pulsing yellow. If the LED1 signal is incorrect, see section <a href="#">CIM 260 3G/4G cellular Modbus setup</a> for correct installation of CIM 260.</li> <li>Ensure that the correct slave address is used in the Modbus master poll. See register 00003 SoftwareDefinedModbusAddress (factory value is 00231).</li> </ul>
	The slave may be in listen-only mode.	Either send a restart communications diagnostics command, or restart the booster system manually.
	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 reply delay in the master, or reduce the "SlaveMinimumReplyDelay" in order to communicate.
The slave responds with exception response 0x01: "Invalid function".	The master is trying to use an unsupported function in CIM/CIU 260.	See section <a href="#">Modbus RTU telegram examples</a> for supported function codes. Note that reading and writing coils are not supported, so only register functions and diagnostics will be valid.
The slave responds with exception response 0x02: "Invalid data address".	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 will cause problems if some of the registers in the block are not supported. An example would be reading the CIM configuration and CIM status register blocks in one telegram. This is not possible since there are unused addresses between the blocks.	Avoid reading or writing invalid data addresses. Ensure that register X is addressed as X-1 in Modbus telegrams, according to the Modbus standard.
The slave returns data value 0xFFFF (65535).	The availability of data will in some cases depend on a configuration or the actual conditions of the system. For example, trying to request data from a booster system which is not present will return "data not available" (0xFFFF).	See section for available data.
	With its present configuration or operating mode, the booster system is unable to supply the requested data.	See sections <a href="#">Pump 1 register block</a> to <a href="#">Pump 6 register block</a> for data values that require a sensor.
The slave does not react to control actions or to writing of settings.	CIU 260 is SCADA PIN-code-protected (GeneralStatus register 00029, bit 0: 1), and an incorrect PIN code has been written.	Write access requires a correct PIN code (ScadaPinCode, register 00011). Writing the correct PIN code value triggers the write access control, and write access is open, which can be verified with GeneralStatus, register 00029, bit 1: 1.

## Related information

[6. CIM 260 3G/4G cellular Modbus setup](#)

[9.8 Pump 1 register block](#)

[9.13 Pump 6 register block](#)

[13. Modbus RTU telegram examples](#)



### 14.3 CIM 500

You can detect faults in CIM 500 by observing the status of the two communication LEDs.

#### Related information

[4.4 CIM 500 Modbus TCP](#)

#### 14.3.1 LED status

##### CIU 500 fitted in a Grundfos booster system

Fault (LED status)	Possible cause	Remedy
LED1 and LED2 remain off when the power supply is connected.	CIM 500 is fitted incorrectly in the Grundfos product. CIM 500 is defective.	Check that CIM 500 is fitted and connected correctly. Replace CIM 500.
The LED2 for internal communication is flashing red.	No internal communication between CIM 500 and the Grundfos product.	Check that CIM 500 is fitted correctly in the Grundfos product.
The LED2 for internal communication is permanently red.	CIM 500 does not support the Grundfos product connected.	Contact the nearest Grundfos company.
The Modbus LED1 is permanently red.	Fault in the CIM 500 Modbus TCP configuration.	Check that the rotary switch SW1 is set to 1. Check that the Modbus TCP/IP address configuration is correct.
LED1 is permanently red and green at the same time.	Error in firmware download.	Use the webserver to download the firmware again.
LED2 is permanently red and green at the same time.	Memory fault.	Replace CIM 500.

##### CIM 500 fitted in CIU 500

Fault (LED status)	Possible cause	Remedy
LED1 and LED2 remain off when the power supply is connected.	CIU 500 is defective.	Replace CIU 500.
The LED2 for internal communication is flashing red.	No internal communication between CIU 500 and the Grundfos product.	<ul style="list-style-type: none"> <li>Check the cable connection between the Grundfos product and CIU 500.</li> <li>Check that the individual conductors have been fitted correctly, for example not reversed.</li> <li>Check the power supply to the Grundfos product.</li> </ul>
The LED2 for internal communication is permanently red.	CIM 500 does not support the Grundfos product connected.	Contact the nearest Grundfos company.
The Ethernet LED1 is permanently red.	Fault in the CIM 500 Modbus TCP configuration.	Check that the rotary switch SW1 is set to 1. Check that the Modbus TCP/IP address configuration is correct. See section <a href="#">Modbus TCP configuration</a> .
LED1 is permanently red and green at the same time.	Error in firmware download.	Use the webserver to download the firmware again.
LED2 is permanently red and green at the same time.	Memory fault.	Replace CIM 500.

#### Related information

[A.3. Modbus TCP configuration](#)

## 14.3.2 CIM/CIU 500 Modbus TCP communication faults

Fault	Possible cause	Remedy
The slave does not respond to telegrams.	Configuration or wiring error.	<ul style="list-style-type: none"> <li>Check the visual diagnostics on the Modbus slave. Normal conditions are that the Grundfos GENbus LED2 is permanently green and that the Modbus TCP LED1 is off or flashing green. If this is not fulfilled, see section <a href="#">LED status</a>.</li> <li>Ensure that the cable between the Modbus TCP master and the Modbus slave is connected correctly. See section <a href="#">Connecting the Ethernet cable</a>.</li> <li>Ensure that the cable between the Modbus TCP master and the Modbus slave is connected correctly. See section <a href="#">Connecting the Ethernet cable</a>.</li> </ul>
The slave responds with exception response 0x01: "Invalid function".	The master is trying to use an unsupported function in CIM/CIU 500.	See section <a href="#">Modbus function code overview</a> for supported function codes. Note that reading and writing coils are not supported, so only register functions and diagnostics are valid.
The slave responds with exception response 0x02: "Invalid data address".	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 will cause problems if some of the registers in the block are not supported. An example would be reading the CIM configuration and CIM status blocks in one telegram: this is not possible since there are unused addresses between the blocks.	Avoid reading or writing invalid data addresses. Ensure that a block of registers starting at address X is addressed as X-1 in Modbus telegrams, according to the Modbus standard.
	The register address offset may have been changed from default.	Read the holding register at address 00002 "Register Offset" to see if this value is different from 0. If so, write the value 0 to this address to make the slave return to the default used in this functional profile.
The slave returns data value 0xFFFF (65535).	The value is unavailable. A data value of 0xFFFF does not necessarily indicate an error condition. It means that the value is unavailable from the booster system.	See section <a href="#">Modbus register addresses for available data</a> .
	The booster system is not configured to show the value or lacks a sensor to read the value.	See section <a href="#">Pump 1 register block to Pump 6 register block</a> for data values that require a sensor.
The slave does not react to control actions or to writing of settings.	The booster system might be in "Local" mode, in which case Operating mode, Control mode and Setpoint cannot be changed from the bus. Register 00201 bit 8 AccessMode must be "1" (=Remote) for bus control to be active.	Set the booster system in "Remote mode" by setting register 00101 bit 0 RemoteAccessReq to "1" (=Remote).

**Related information**

[7.1 Connecting the Ethernet cable](#)

[7.3 Setting the IP addresses](#)

[8. Modbus function code overview](#)

[9.8 Pump 1 register block](#)

[9.13 Pump 6 register block](#)

[14.3.1 LED status](#)

## 15. Modbus RTU rotary switch addresses

Modbus address	SW6	SW7	Modbus address	SW6	SW7	Modbus address	SW6	SW7	Modbus address	SW6	SW7	Modbus address	SW6	SW7
1	0	1	51	3	3	101	6	5	151	9	7	201	C	9
2	0	2	52	3	4	102	6	6	152	9	8	202	C	A
3	0	3	53	3	5	103	6	7	153	9	9	203	C	B
4	0	4	54	3	6	104	6	8	154	9	A	204	C	C
5	0	5	55	3	7	105	6	9	155	9	B	205	C	D
6	0	6	56	3	8	106	6	A	156	9	C	206	C	E
7	0	7	57	3	9	107	6	B	157	9	D	207	C	F
8	0	8	58	3	A	108	6	C	158	9	E	208	D	0
9	0	9	59	3	B	109	6	D	159	9	F	209	D	1
10	0	A	60	3	C	110	6	E	160	A	0	210	D	2
11	0	B	61	3	D	111	6	F	161	A	1	211	D	3
12	0	C	62	3	E	112	7	0	162	A	2	212	D	4
13	0	D	63	3	F	113	7	1	163	A	3	213	D	5
14	0	E	64	4	0	114	7	2	164	A	4	214	D	6
15	0	F	65	4	1	115	7	3	165	A	5	215	D	7
16	1	0	66	4	2	116	7	4	166	A	6	216	D	8
17	1	1	67	4	3	117	7	5	167	A	7	217	D	9
18	1	2	68	4	4	118	7	6	168	A	8	218	D	A
19	1	3	69	4	5	119	7	7	169	A	9	219	D	B
20	1	4	70	4	6	120	7	8	170	A	A	220	D	C
21	1	5	71	4	7	121	7	9	171	A	B	221	D	D
22	1	6	72	4	8	122	7	A	172	A	C	222	D	E
23	1	7	73	4	9	123	7	B	173	A	D	223	D	F
24	1	8	74	4	A	124	7	C	174	A	E	224	E	0
25	1	9	75	4	B	125	7	D	175	B	F	225	E	1
26	1	A	76	4	C	126	7	E	176	B	0	226	E	2
27	1	B	77	4	D	127	7	F	177	B	1	227	E	3
28	1	C	78	4	E	128	8	0	178	B	2	228	E	4
29	1	D	79	4	F	129	8	1	179	B	3	229	E	5
30	1	E	80	5	0	130	8	2	180	B	4	230	E	6
31	1	F	81	5	1	131	8	3	181	B	5	231	E	7
32	2	0	82	5	2	132	8	4	182	B	6	232	E	8
33	2	1	83	5	3	133	8	5	183	B	7	233	E	9
34	2	2	84	5	4	134	8	6	184	B	8	234	E	A
35	2	3	85	5	5	135	8	7	185	B	9	235	E	B
36	2	4	86	5	6	136	8	8	186	B	A	236	E	C
37	2	5	87	5	7	137	8	9	187	B	B	237	E	D
38	2	6	88	5	8	138	8	A	188	B	C	238	E	E
39	2	7	89	5	9	139	8	B	189	B	D	239	E	F
40	2	8	90	5	A	140	8	C	190	B	E	240	F	0
41	2	9	91	5	B	141	8	D	191	B	F	241	F	1
42	2	A	92	5	C	142	8	E	192	C	0	242	F	2
43	2	B	93	5	D	143	8	F	193	C	1	243	F	3
44	2	C	94	5	E	144	9	0	194	C	2	244	F	4
45	2	D	95	5	F	145	9	1	195	C	3	245	F	5
46	2	E	96	6	0	146	9	2	196	C	4	246	F	6
47	2	F	97	6	1	147	9	3	197	C	5	247	F	7
48	3	0	98	6	2	148	9	4	198	C	6			
49	3	1	99	6	3	149	9	5	199	C	7			
50	3	2	100	6	4	150	9	6	200	C	8			

Example: To set the slave address to the value 142, set the rotary switches SW6 and SW7 to "8" and "E", respectively. Note that 0 is not a valid slave address as this is used for broadcasting.



It is very important to ensure that two devices do not have the same address on the network. If two devices have the same address, the result will be an abnormal behaviour of the whole serial bus.

## 16. Grundfos alarm and warning codes

This is a complete list of alarm and warning codes for Grundfos products. For the codes supported by this product, see the alarms and warnings section.

Code	Description	Code	Description	Code	Description
1	Leakage current	2	Missing phase	3	External fault signal
4	Too many restarts	5	Regenerative braking	6	Mains fault
7	Too many hardware shutdowns	8	PWM switching frequency reduced	9	Phase sequence reversal
10	Communication fault, pump	11	Water-in-oil fault (motor oil)	12	Time for service (general service information)
13	Moisture alarm, analog	14	Electronic DC-link protection activated (ERP)	15	Communication fault, main system (SCADA)
16	Other	17	Performance requirement cannot be met	18	Commanded alarm standby (trip)
19	Diaphragm break (dosing pump)	20	Insulation resistance low	21	Too many starts per hour
22	Moisture switch alarm, digital	23	Smart trim gap alarm	24	Vibration
25	Setup conflict	26	Load continues even if the motor has been switched off	27	External motor protector activated (for example MP 204)
28	Battery low	29	Turbine operation (impellers forced backwards)	30	Change bearings (specific service information)
31	Change varistor(s) (specific service information)	32	Overvoltage	33	Soon time for service (general service information)
34	No priming water	35	Gas in pump head, de-aerating problem	36	Outlet valve leakage
37	Inlet valve leakage	38	Vent valve defective	39	Valve stuck or defective
40	Undervoltage	41	Undervoltage transient	42	Cut-in fault (dV/dt)
43	-	44	-	45	Voltage asymmetry
46	-	47	-	48	Overload
49	Overcurrent (i_line, i_dc, i_mo)	50	Motor-protection function, general shutdown (MPF)	51	Blocked motor or pump
52	Motor slip high	53	Stalled motor	54	Motor-protection function, 3 sec. limit
55	Motor current protection activated (MCP)	56	Underload	57	Dry running
58	Low flow	59	No flow	60	Low input power
61	-	62	-	63	-
64	-	65	Motor temperature 1 (t_m or t_mo or t_mo1)	66	Temperature, control electronics (t_e)
67	Temperature too high, internal frequency converter module (t_m)	68	External temperature or water temperature (t_w)	69	Thermal relay 1 in motor, for example Klixon
70	Thermal relay 2 in motor, for example thermistor	71	Motor temperature 2 (Pt100, t_mo2)	72	Hardware fault, type 1
73	Hardware shutdown (HSD)	74	Internal supply voltage too high	75	Internal supply voltage too low
76	Internal communication fault	77	Communication fault, twin-head pump	78	Fault, speed plug
79	Functional fault, add-on module	80	Hardware fault, type 2	81	Verification error, data area (RAM)
82	Verification error, code area (ROM, FLASH)	83	Verification error, FE parameter area (EEPROM)	84	Memory access error
85	Verification error, BE parameter area (EEPROM)	86	Fault (add-on) I/O module	87	-
88	Sensor fault	89	Signal fault, (feedback) sensor 1	90	Signal fault, speed sensor
91	Signal fault, temperature sensor 1	92	Calibration fault, (feedback) sensor	93	Signal fault, sensor 2
94	Limit exceeded, sensor 1	95	Limit exceeded, sensor 2	96	Setpoint signal outside range
97	Signal fault, setpoint input	98	Signal fault, input for setpoint influence	99	Signal fault, input for analog setpoint
100	RTC time synchronisation with cellular network occurred	101	-	102	Dosing pump not ready
103	Emergency stop	104	Software shutdown	105	Electronic rectifier protection activated (ERP)
106	Electronic inverter protection activated (EIP)	107	-	108	-
109	-	110	Skew load, electrical asymmetry	111	Current asymmetry
112	Cosφ too high	113	Cosφ too low	114	Motor heater function activated (frost protection)
115	Too many grinder reversals or grinder reversal attempt failed	116	Grinder motor overtemperature	117	Intrusion (door opened)
118	Signal fault, hydrogen sulfide H2S sensor	119	Signal fault, analog input AI4	120	Auxiliary winding fault (single phase motors)

Code	Description	Code	Description	Code	Description
121	Auxiliary winding current too high (single-phase motors)	122	Auxiliary winding current too low (single-phase motors)	123	Start capacitor, low (single-phase motors)
124	Run capacitor, low (single-phase motors)	125	Signal fault, outdoor temperature sensor	126	Signal fault, air temperature sensor
127	Signal fault, shunt relative pressure sensor	128	Strainer clogged	129	-
130	-	131	-	132	-
133	-	134	-	135	-
136	-	137	-	138	-
139	-	140	-	141	-
142	-	143	-	144	Motor temperature 3 (Pt100, t_mo3)
145	Bearing temperature high (Pt100), in general or top bearing	146	Bearing temperature high (Pt100), middle bearing	147	Bearing temperature high (Pt100), bottom bearing
148	Motor bearing temperature high (Pt100) in drive end (DE)	149	Motor bearing temperature high (Pt100) in non-drive end (NDE)	150	Fault (add-on) pump module
151	Fault, display (HMI)	152	Communication fault, add-on module	153	Fault, analog output
154	Communication fault, display	155	Inrush fault	156	Communication fault, internal frequency converter module
157	Real-time clock out of order	158	Hardware circuit measurement fault	159	CIM fault (Communication Interface Module)
160	Cellular modem, SIM card fault	161	Sensor supply fault, 5 V	162	Sensor supply fault, 24 V
163	Measurement fault, motor protection	164	Signal fault, LiqTec sensor	165	Signal fault, analog input 1
166	Signal fault, analog input 2	167	Signal fault, analog input 3	168	Signal fault, pressure sensor
169	Signal fault, flow sensor	170	Signal fault, water-in-oil (WIO) sensor	171	Signal fault, moisture sensor
172	Signal fault, atmospheric pressure sensor	173	Signal fault, rotor position sensor (Hall sensor)	174	Signal fault, rotor origo sensor
175	Signal fault, temperature sensor 2 (t_mo2)	176	Signal fault, temperature sensor 3 (t_mo3)	177	Signal fault, Smart trim gap sensor
178	Signal fault, vibration sensor	179	Signal fault, bearing temperature sensor (Pt100), general or top bearing	180	Signal fault, bearing temperature sensor (Pt100), middle bearing
181	Signal fault, PTC sensor (short-circuited)	182	Signal fault, bearing temperature sensor (Pt100), bottom bearing	183	Signal fault, extra temperature sensor
184	Signal fault, general-purpose sensor	185	Unknown sensor type	186	Signal fault, power meter sensor
187	Signal fault, energy meter	188	Signal fault, user-defined sensor	189	Signal fault, level sensor
190	Limit exceeded, sensor 1 (for example alarm level in WW application)	191	Limit exceeded, sensor 2 (for example high level in WW application)	192	Limit exceeded, sensor 3 (for example overflow level in WW application)
193	Limit exceeded, sensor 4 (for example low level in WW/tank filling application)	194	Limit exceeded, sensor 5	195	Limit exceeded, sensor 6
196	Operation with reduced efficiency	197	Operation with reduced pressure	198	Operation with increased power consumption
199	Process out of range (monitoring, estimation, calculation, control)	200	Application alarm	201	External sensor input high
202	External sensor input low	203	Alarm on all pumps	204	Inconsistency between sensors
205	Level float switch sequence inconsistency	206	Water shortage, level 1	207	Water leakage
208	Cavitation	209	Non-return valve fault	210	High pressure
211	Low pressure	212	Diaphragm tank precharge pressure out of range	213	VFD not ready
214	Water shortage, level 2	215	Soft pressure buildup time-out	216	Pilot pump alarm
217	Alarm, general-purpose sensor high	218	Alarm, general-purpose sensor low	219	Pressure relief not adequate
220	Fault, motor contactor feedback	221	Fault, mixer contactor feedback	222	Time for service, mixer
223	Time for service, mixer	224	Pump fault, due to auxiliary component or general fault	225	Communication fault, pump module
226	Communication fault, I/O module	227	Combi event	228	Night flow max. limit exceeded
229	Water on floor	230	Network alarm	231	Ethernet: No IP address from DHCP server
232	Ethernet: Auto-disabled due to misuse	233	Ethernet: IP address conflict	234	Backup pump alarm
235	Gas detected	236	Pump 1 fault	237	Pump 2 fault
238	Pump 3 fault	239	Pump 4 fault	240	Lubricate bearings (specific service information)
241	Motor phase failure	242	Automatic motor model recognition failed	243	Motor relay has been forced (manually operated or commanded)

Code	Description	Code	Description	Code	Description
244	Fault, On/Off/Auto switch	245	Pump continuous runtime too long	246	User-defined relay has been forced (manually operated or commanded)
247	Power-on notice, (device or system has been switched off)	248	Fault, battery/UPS	249	User-defined event 1
250	User-defined event 2	251	User-defined event 3	252	User-defined event 4
253	SMS data from DDD sensor not received within time limit	254	Inconsistent data model		

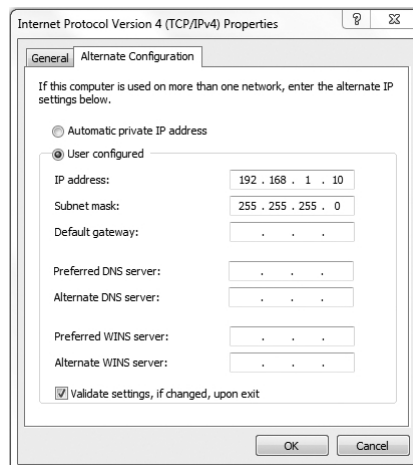
## A.1. Webserver configuration

The built-in webserver offers easy monitoring of the CIM 500 module and makes it possible to configure the selected Industrial Ethernet protocol. Using the webserver, you can also update the firmware of the CIM 500 module and store or restore settings, among other functions. To connect a PC to CIM 500, proceed as follows:

1. Connect the PC and the module using an Ethernet cable.
2. Configure the Ethernet port of the PC to the same subnetwork as CIM 500, for example 192.168.1.101.
3. Open a standard Internet browser and type 192.168.1.100 in the URL field.

### A.1.1. How to configure an IP address on your PC using Windows 10

1. Search for "Ethernet" in Windows.
2. Select "Change Ethernet setting".
3. Select "Change adapter options".
4. Right-click "Ethernet" and select "Properties".
5. Select properties for "Internet Protocol Version 4 (TCP/IPv4)".
6. Select the "Alternate Configuration" tab and enter the user-configured IP address and subnet mask you would like to assign to your PC.



*Example from windows 10*

## A.2. Login

For administration of username and password, see also A. 4. User Management.



If you experience problems with logging in to the webserver after a firmware update, perform a factory reset.

**GRUNDFOS**

**Information**

System

Version

Licence

**Login**

Service Info

Contact

**Login**

First-time login requires password to be changed.

Username:

Password :

New password :

Confirm password :

**New password requirements:**

- \* Minimum 8 and maximum 20 characters.
- \* Minimum 1 lower case alphabetic character.
- \* Minimum 1 upper case alphabetic character.
- \* Minimum 1 numeric or special character.

TM074522

### Login

Object	Description
<b>Username</b>	Enter username. Default: admin.
<b>Password</b>	Enter password. Default: Grundfos. After the first log in, you are forced to change the password. The password must contain: <ul style="list-style-type: none"> <li>• at least 8 and maximum 20 characters</li> <li>• at least one lower case letter</li> <li>• at least one upper case letter</li> <li>• at least one numeric or special character.</li> </ul> When logging in, you have four attempts before a back-off algorithm starts an exponentially increasing time delay between each attempt. Power cycling CIM 500 resets the back-off algorithm.

### Related information

[A.4. User Management](#)



### A.3. Modbus TCP configuration

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

**GRUNDFOS**

**Real Time Ethernet Protocol Configuration - Modbus TCP**

**Protocol Settings**

TCP Port Number:

IP Address:

Subnet Mask:

Gateway:  x

Use DHCP:

**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.

TM074523

#### Real Time Ethernet Protocol Configuration - Modbus TCP

Object	Description
<b>TCP Port Number</b>	The default value is 502, the official IANA-assigned Modbus 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.
<b>IP Address</b>	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.
<b>Subnet Mask</b>	Configuration of the subnet mask if a DHCP server is not used.
<b>Gateway</b>	Configuration of the gateway address if a DHCP server is not used.
<b>Use DHCP</b>	The module can be configured to automatically obtain its Modbus TCP network settings from a DHCP server if available on the network. Default: DHCP disabled. "Use DHCP" is unchecked.

## A.4. User Management

A login is required for any change of the CIM 500 settings, and this web page is used to configure the username and password.



It is only possible to configure one user.

**Information**

System

Version

Licence

---

**Configuration**

Real Time Ethernet Protocol

Network Settings

GENpro TCP Protocol

User Management

Firmware Update / Restart

---

Logout

---

Service Info

Contact

### User Management

Type	Username	New password	Confirm password
Administration	admin		

**Administration:**

- \* User has all access rights.

**User name requirements:**

- \* Minimum 1 character and maximum 20 characters.
- \* Can only contain alphanumerics.

**Password requirements:**

- \* Minimum 8 characters and maximum 20 characters.
- \* Minimum 1 lower case alphabetic character.
- \* Minimum 1 upper case alphabetic character.
- \* Minimum 1 numeric or special character.

*User management*

### Related information

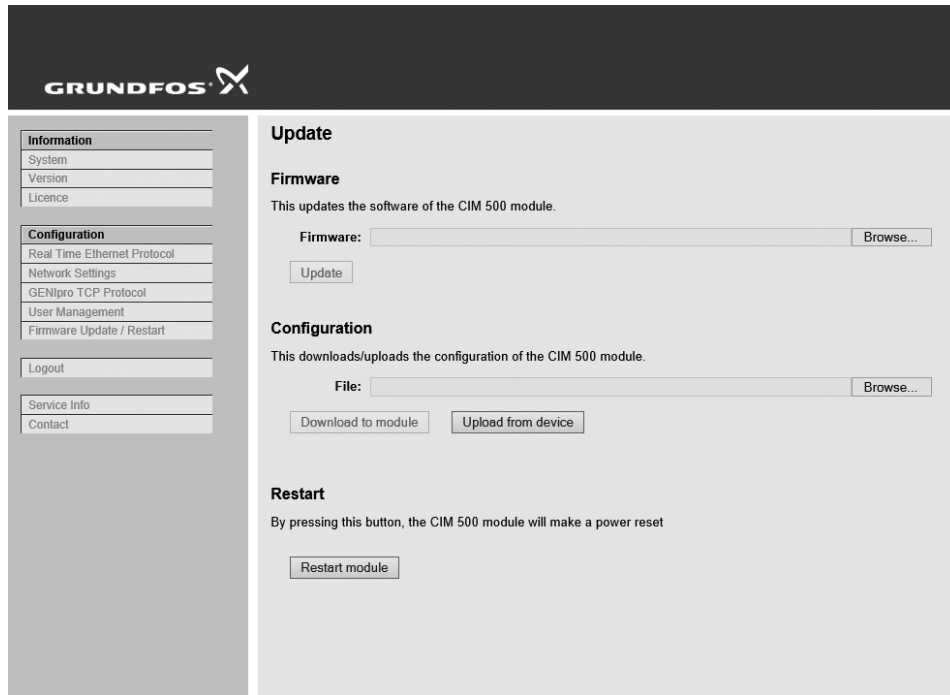
[A.2. Login](#)

### A.4.1. Update

You can update the firmware by means of the built-in webserver. The binary file is supplied by Grundfos. To make installation and configuration easier, you can upload the configuration to a PC for backup or distribution to multiple modules.



If you experience problems with logging in to the webserver after a firmware update, perform a factory reset.



TM074526

#### Update

Object	Description
Firmware	Path to binary firmware image that can be used for updating the module.
Update	Click [Update] to start the update. The procedure takes approximately one minute.
File	Path to the configuration file.
Download to module	Click here to transfer the configuration file to the module.
Upload from device	Click here to upload the configuration of the module to a file on your PC.
Restart module	By pressing this button, the CIM 500 module performs a power-up reset.



<b>98393459</b> 03.2023
ECM: 1360613