

Modbus for SEG AUTO *ADAPT*

CIU 202 Modbus RTU

CIU 262 3G/4G Cellular

CIU 502 Ethernet for Modbus TCP

Functional profile and user manual



Original functional profile and user manual.

This functional profile describes Grundfos Modbus for IPP.

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

1. General information

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 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:

- CIU 202 Modbus RTU
- CIU 262 Modbus 3G/4G cellular
- CIU 502 Modbus ethernet for Modbus TCP



You cannot order CIU 502 separately.
Order a CIU 902 box unit and a CIM 500 module to install in the CIU 902 box.

This functional profile applies to the following Grundfos products:

- DP, EF, SL1, SLV and SEG AUTO_{ADAPT} wastewater pumps.

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

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.
DHCP	Dynamic Host Configuration Protocol. Used to configure network devices so that they can 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 Remote	A Grundfos application designed to control Grundfos products via infrared or radio communication. Available for iOS and Android devices.
H	Head (pressure).
HTTP	Hyper Text Transfer Protocol. The protocol commonly used to navigate the world wide web.
IANA	Internet Assigned Numbers Authority.
IP	Internet Protocol.
LED	Light-Emitting Diode.
MAC	Media Access Control. Unique network address for a piece of hardware.
Modbus	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, CIM 200, and for call-up connections over telephone networks, CIM 260.
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 basis.
PIN	Personal Identification Number. For SIM cards.
Ping	Packet InterNet Groper. A software utility that tests the connectivity between two TCP/IP hosts.
PUK	Personal Unblocking Key (SIM cards).
Q	Flow rate.
SELV	Separated or Safety Extra-Low Voltage.
SELV-E	Separated or Safety Extra-Low Voltage with earth connection.
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 clocks synchronization 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, bits/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.
VPN	Virtual Private Network. 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

The system diagrams provide an overview of the different technologies and how to connect CIU XX2 to the Grundfos AUTO_{ADAPT} pump, that you connect to a Modbus network.

The CIU XX2 unit is a communication interface in a system consisting of up to four Grundfos DP, EF, SL1, SLV or SEG AUTO_{ADAPT} wastewater pumps installed in one or more pump pits. The pumps connect to CIU XX2 running communication over a separate pair of wires.

Each pump has an integrated pressure sensor that enables it to monitor the water level in the pump pit according to a common reference level and an intermittent operation scheme. By monitoring the water level, the pump obtains enough information to know when to start and stop pumping.

The CIU XX2 unit is not involved in the control of the water level, starting and stopping of pumps, but merely provides the interface necessary for the following:

- Configuration of the pump parameters required for the level control.
- Online monitoring of pit and pump values.
- Individual, manual, control of each pump (forced start and stop).
- Obtaining of measured and logged data that are valuable for pump service and pit optimisation.
- CIU XX2 can communicate with Grundfos GO Remote. This is not shown in the pictures and is not discussed further in this manual.

3.1 CIM 200 Modbus

Communication can be established by using the Modbus RTU connection in CIU 202.

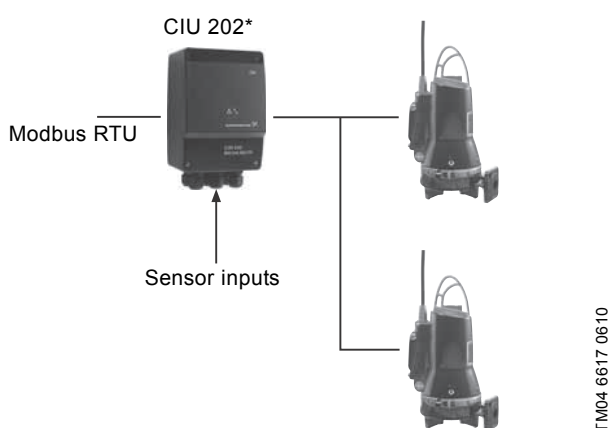


Fig. 1 CIU 202* solution for Grundfos DP, EF, SL1, SLV and SEG AUTO_{ADAPT} pumps

- * CIU 202 is a combination of a CIU 902 unit and a CIM 200 module.

3.2 CIM 260 Cellular Modbus

You can establish remote communication via CIU 262 by using one of the following options:

- Modbus RTU protocol via a call-up connection
- Modbus TCP protocol via a data connection
- SMS commands from a mobile phone.

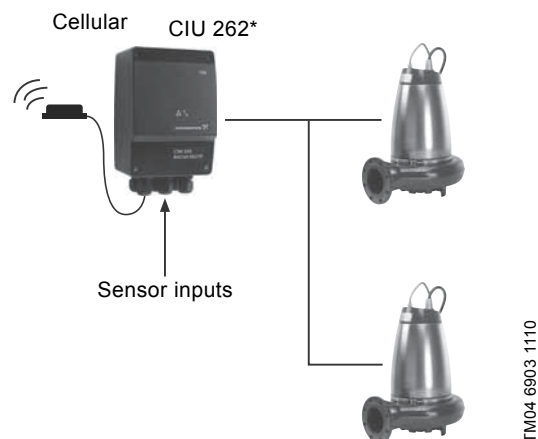


Fig. 2 CIU 262* solution for Grundfos DP, EF, SL1, SLV and SEG AUTO_{ADAPT} pumps

- * CIU 262 is a combination of a CIU 902 unit and a CIM 260 module.

3.3 CIM 500 Modbus TCP

You can establish communication by using the Modbus TCP ethernet connection in CIU 502*.

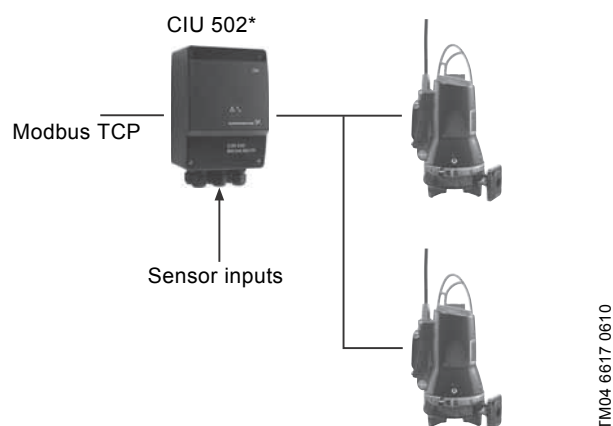


Fig. 3 CIU 502* solution for Grundfos DP, EF, SL1, SLV and SEG AUTO_{ADAPT} pumps

- * CIU 502 is a combination of a CIU 902 unit and a CIM 500 module.

4. Specifications

4.1 CIM module

General data	Description	Comments
Ambient humidity	30 % to 95 %	Relative, non-condensing.
Operating temperature	-20 °C to +45 °C	
Battery, lithium-ion	You can only charge the battery if the battery temperature is within 0 °C to +45 °C.	CIU 262 only.
GENIbus visual diagnostics	LED2	Will be in one of these states: Off, permanently green, flashing red, permanently red. See section 5.5 LEDs .
Power supply (CIU)	24-240 V	Located in the CIU.
CIU box enclosure class	IP54	
CIU box dimensions (H x W x D)	182 x 108 x 82 mm	
Storage temperature	-25 °C to +70 °C -13 °F to +158 °F	

4.2 CIU 202 Modbus RTU

The table below provides an overview of the specifications for Grundfos CIU 202. For further details, refer to the specific sections of this functional profile.

Modbus RTU specifications	Description	Comments
Modbus connector	Screw-type terminal	3 pins. See section 5. CIM 200 Modbus RTU setup .
Modbus connection type	RS-485, 2-wire + common	Conductors: D0, D1 and Common. See section 5. CIM 200 Modbus RTU setup .
Maximum cable length	1200 m	Equals 4000 ft.
Slave address	1-247	Set via rotary switches SW6 and SW7. See section 5.3 Modbus address selection .
Line termination	On or Off	Set via DIP switches SW1 and SW2. See section 5.4 Termination resistor .
Recommended cable cross-section	0.20 - 0.25 mm ²	AWG24 or AWG23
Supported transmission speeds	1200*, 2400*, 4800*, 9600, 19200, 38400 bits/s	Set via DIP switches SW4 and SW5. See section 5.1 Setting the Modbus transmission speed .
Start bit	1	Fixed value.
Data bits	8	Fixed value.
Stop bits	1 or 2	Set via DIP switch SW3. See section 5.2 Setting the parity .
Parity bit	Even parity, odd parity* or no parity	Set via DIP switch SW3. See section 5.2 Setting the parity .
Modbus visual diagnostics	LED1	Off, flashing green, flashing red, permanently red. See section 5.5 LEDs .
Maximum number of Modbus devices	32	Using repeaters, this number can be increased. Legal address range is 1-247.
Maximum Modbus telegram size	256 bytes	Total length. Node address and CRC included. See section 13. Modbus RTU telegram examples .

* Can only be set via software.

4.3 CIU 262 Cellular Modbus

The table below provides an overview of the specifications for Grundfos CIU 262. For further details, refer to the specific sections of this functional profile.

Modbus cellular specifications	Description	Comments
Data protocol	Modbus RTU/Modbus TCP	Call-up connection uses RTU. Data connection uses TCP.
Slave address	Factory 231 (0xE7)	Can be changed via Modbus register 00003, SoftwareDefinedModbusAddress.
Cellular-connection visual diagnostics	LED1	See section 6.2 LEDs .
Maximum Modbus telegram size	260 bytes	Total Modbus TCP/IP application data unit. See fig. 21 .

4.4 CIU 502 Modbus TCP

The table below provides an overview of the specifications for Grundfos CIU 502 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, SMTP, SNTP, Modbus TCP	Rotary switch in position 1.
Transport layer	TCP	
Internet layer	Internet protocol V4 (IPv4)	
Link layer	ARP, media access control (ethernet)	
Ethernet cable	Screened or twisted-pair cables, CAT5, CAT5e or CAT6	Supports Auto-MDIX
Maximum cable length	100 m	
Transmission speed	10 Mbits/s, 100 Mbits/s (auto-detected)	
Industrial ethernet protocols	PROFINET IO, Modbus TCP	Selected with rotary switch, section 7.2 Setting the Industrial Ethernet protocol .

5. CIM 200 Modbus RTU setup

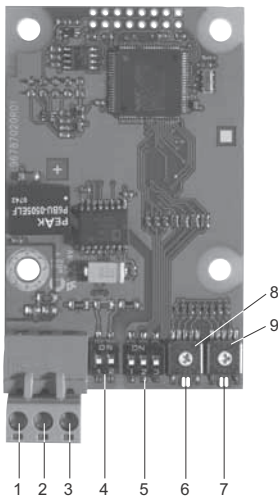


Fig. 4 CIM 200 Modbus module

Pos.	Designation	Description
1	D1	Modbus terminal D1 (positive data signal)
2	D0	Modbus terminal D0 (negative data signal)
3	Common/GND	Modbus terminal, Common and GND
4	SW1/SW2	On and off switches for termination resistor
5	SW3/SW4/SW5	Switches for selection of Modbus parity and transmission speed
6	LED1	Red and green status LED for Modbus communication
7	LED2	Red and green status LED for internal communication between CIM 200 and the CIU 202 unit.
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 to set the transmission speed. See fig. 5.

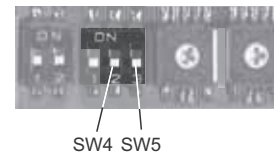


Fig. 5 Modbus transmission speed

DIP switch settings

Available transmission speeds in bits/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 [bits/s]	SW4	SW5
9600	OFF	ON
19200	OFF	OFF
38400	ON	OFF
Software-defined	ON	ON

Default transmission speed is 19200 bits per second, 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 sets a new transmission speed.

Use the following values for software-defined transmission speeds:

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

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

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

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



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

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5.2 Setting the parity

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). See fig. 6.

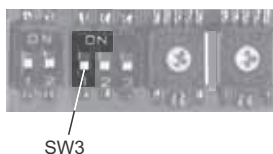


Fig. 6 Parity

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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 overrides the setting of SW3. See figures 5 and 6.

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

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

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



Before you set the parity and stop bits via software-defined settings, you must set SW4 and SW5 to ON.

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.

Use the two hexadecimal switches, SW6 and SW7, to set the transmission speed. See fig. 7.

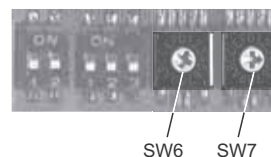


Fig. 7 Setting the Modbus address

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For a complete overview of Modbus addresses, see section 15. [Modbus RTU rotary switch addresses](#).



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

5.4 Termination resistor

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

CIM 200 has a DIP switch with two switches: SW1 and SW2 for cutting the termination resistor in and out. Figure 8 shows the DIP switches in cut-out state.

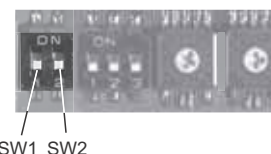


Fig. 8 Cutting the termination resistor in and out

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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:

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



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



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

5.5 LEDs

CIM 200 Modbus module has two LEDs. See fig. 4.

- 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.

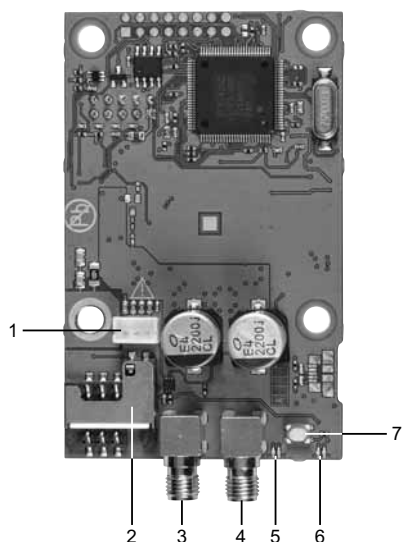
LED2

Status	Description
Off	CIM 200 has been switched off.
Flashing red	No internal communication between CIM 200 and the CIU 202 unit.
Permanently red	CIM 200 does not support the Grundfos product connected.
Permanently green	Internal communication between CIM 200 and the CIU 202 unit is OK.



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

6. CIM 260 Modbus 3G/4G Cellular setup



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Fig. 9 CIM 260 cellular module (top-side view)

Pos.	Designation	Description
1		Battery socket
2		SIM card holder
3		Secondary SMA connection for cellular antenna*.
4		Primary SMA connection for 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 CIM 260 and the CIU 262 unit.
7	SW1	To reset to factory settings, press and hold for at least 5 seconds.

* Only use this antenna connection if required by the telecom company.

6.1 Installation

CAUTION

Electric shock



Minor or moderate 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.



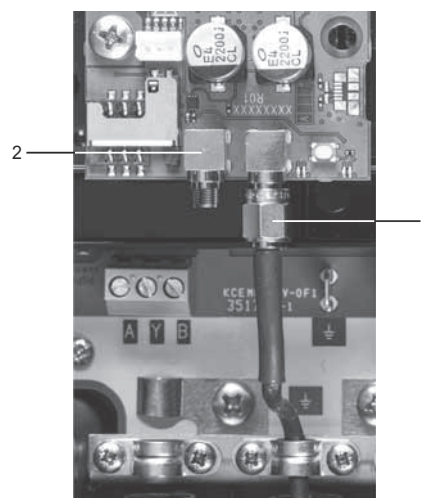
If CIU 262 is installed in a metal control cabinet, we recommend fitting an external antenna.

Grundfos offers different kinds of antennas. No antenna is supplied with CIU 262. You can order it separately.

External antenna

See fig. 10.

Connect the antenna cable to the SMA connection (pos. 1) of CIM 260. Install the antenna 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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Fig. 10 Fitting an external cellular antenna

Pos.	Description
1	Primary SMA connection for the cellular antenna. This antenna must always be connected
2	Secondary SMA connection for the cellular antenna *.

* Only use this antenna connection if required by the telecom company.

6.1.2 Inserting the SIM card

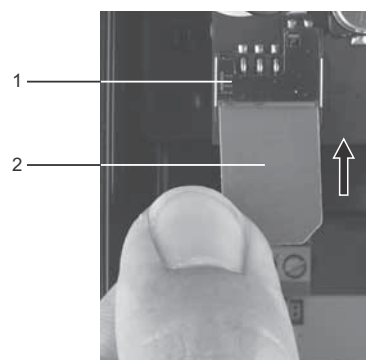
Before inserting the SIM card into CIM 260, remove the PIN code, or set the PIN code to "4321".

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 of the mobile phone.
3. Insert the SIM card into CIM 260. See fig. 11.



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. See fig. 11.



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Fig. 11 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 or SELV-E 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 should 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. 12.



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

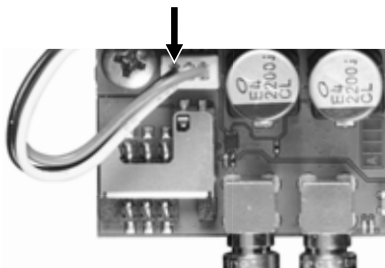


Fig. 12 Connecting the battery



You can only charge the battery if the battery temperature is within 0 °C to +45 °C.

Switch on the power supply. CIM 260 is powered either by the CIU 262 or by the battery.

LED1 flashes yellow, searching for cellular network. When the connection to the cellular network has been established, the LED1 will pulsate yellow; the cellular network is active. See fig. 13.

LED2 is permanently green, indicating that you have fitted CIM 260 correctly in CIU 262.

6.1.4 Configuration

For software configuration of CIU 262, 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 LEDs

CIM 260 module has two LEDs. See fig. 9.

- Yellow and green status LED1 for cellular communication.
- Red and green status LED2 for internal communication between CIM 260 and CIU 262.

LED1, yellow and green

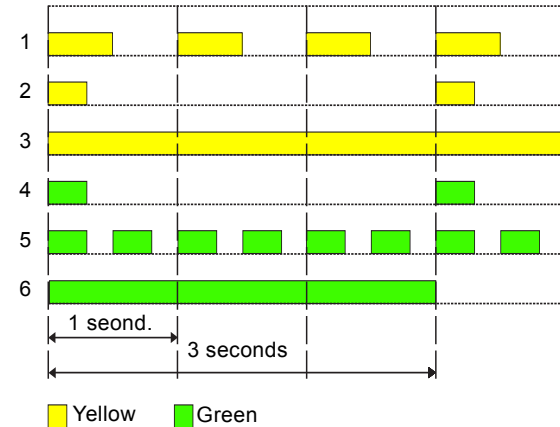


Fig. 13 LED1 status

Pos.	Status	Description
1	Flashing yellow	Searching for cellular network.
2	Pulsating yellow, single pulse	Connection to the cellular network has been established.
3	Permanently yellow	Call-up connection has been established.
4	Pulsating green, single pulse	Communication via data connection.
5	Pulsating green, double pulse	Communication via the call-up connection.
6	Green, 3 sec.	Sending or receiving an SMS message.

LED2, red and green

Status	Description
Off	CIM 260 is switched off.
Flashing red	No communication between CIM 260 and the CIU 262 unit.
Permanently red	CIM 260 does not support the connected Grundfos product.
Permanently green	The connection between CIM 260 and CIU 262 is OK.

TM07 1664 2418

TM04 5194 4412

7. CIM 500 Modbus TCP setup



CAUTION

Electric shock

Minor or moderate personal injury
 - Connect CIM 500 only to SELV or SELV-E 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 cable shield to earth through earth clamp or to connect cable shield to earth in the connector.

Maximum cable length

Speed [Mbits/s]	Cable type	Maximum cable length [m/ft]
10	CAT5	100 m / 328 ft
100	CAT5e, CAT6	100 m / 328 ft

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 of 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.

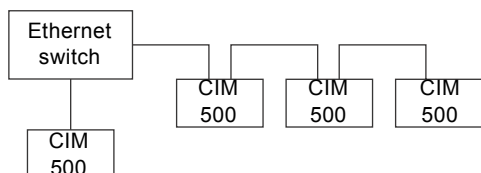


Fig. 14 Example of Industrial Ethernet network

TM05 6435 4711

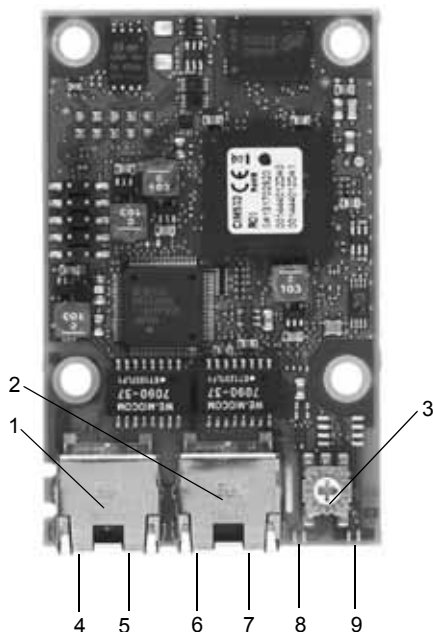


Fig. 15 Example of ethernet connection

TM05 7431 1013

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	LED 1
9	Green and red status LED for internal communication between the module and the CIU 502 unit.	LED 2

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. 16.



Fig. 16 Selecting the Industrial Ethernet protocol

TM05 7431 1013

Pos.	Description
0	PROFINET IO (default from factory)
1	Modbus TCP
2	BACnet IP
3	EtherNet/IP
4	GRM IP
5..E	Reserved, LED1 will be permanently red to indicate an invalid configuration
Reset to factory default.	
F	Note that the rotary switch has to 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 setting, when the module is powered on, will cause the module to restart.

7.3 Setting up the IP addresses

The CIM 500 ethernet module is 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	Configure the settings via the webserver.

7.4 Establish connection to the webserver

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

- Connect the PC and the CIM 500 module 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 section [A.1 How to configure an IP address on your PC](#) on page 57.
- Open a standard Internet browser and type 192.168.1.100 in the URL field.
- Log in to the webserver using the following:

User name	admin (default)
Password	Grundfos (default)



User name and password may have been changed from their default values.



TM05 6436 4712

Fig. 17 CIM 500 connected to PC via ethernet cable

For further information on how to use the webserver, see section [A.2 Webserver configuration](#) on page 58.



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



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

7.5 Status LEDs

The CIM 500 ethernet module has two Status LEDs: LED1 and LED2. See fig. 15.

- 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. See section 14.3.1 LED status .
Permanently red and green	Error in the firmware download. See section 14.3.1 LED status .
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 CIU 502 unit.
Permanently red	CIM 500 does not support the Grundfos product connected.
Permanently green	Internal communication between CIM 500 and CIU 502 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.

7.6 DATA and LINK LEDs

The CIM 500 ethernet module has two connectivity LEDs related to each RJ45 connector. See fig. 15.

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 on the RJ45 connector.

LINK1 and LINK2

These green LEDs shows 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.

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
	16	0x10	Write multiple registers
Diagnostics	08	08	Diagnostics See section 13.6 Diagnostics, 0x08 for subcodes.



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.

9. Modbus register overview

9.1 Register block overview

The Modbus registers are grouped in the following register blocks:

Starting 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	Pit control and configuration	W	Registers for control and configuration of wastewater pit.
00201	Pit status	R	Registers for status from wastewater pit.
00301	Pit data	R	Registers for measured values from wastewater pit.
00401	Pump 1	R	Registers containing pump 1 data and status.
00451	Pump 2	R	Registers containing pump 2 data and status.
00501	Pump 3	R	Registers containing pump 3 data and status.
00551	Pump 4	R	Registers containing pump 4 data and status.
00701	Alarm simulation	R/W	Features for simulation of alarms and warnings.
00751-00800	User registers	R/W	This area is for device labelling by the user.

All addresses contain registers. Some are bit-interpreted while others are 16-bit values, or part of 32-bit values. A data value of 65535 (0xFFFF) indicates "not available" when reading registers. The value of 65535 (0xFFFF) does not imply a "disable" when writing values.

Each register block will be specified in more detail in the following sections.

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 radio modem. The delay value is stored in the device and remains after a power-off. The delay set here is added to the internal delay in the device. Default value is 0.	•	-	-
00002	RegisterOffset	An address offset that is added to all addresses above 00100. Default value is 0. Note that this offset does not affect the CIM configuration register block or the CIM status register block addresses. The register offset value is stored in the device and remains after a power-off. For most applications, this offset should not be changed.	•	•	•
00003	SoftwareDefinedModbusAddress	This register holds the active Modbus address. The default value is 0xE7 (231), and there is normally no need to change this value. Note that for CIM 200 this value is used only when the transmission speed is set to "Software-defined" on the DIP switches SW4 and SW5. Otherwise, CIM 200 ignores it.	•	•	-
00004	SoftwareDefinedBitRate	Modbus software-defined transmission speed enumeration. The software-defined transmission speed value is stored in the device and remains after a power-off. 0: 1200 bits/s 1: 2400 bits/s 2: 4800 bits/s 3: 9600 bits/s 4: 19200 bits/s 5: 38400 bits/s. Note that this value is used only when the transmission speed is set to "Software-defined" on the 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	ReadWriteSeparation	Used to select value read-back behaviour. The value in this register is stored in the device and remains after a power-off. 0: Register values can be written by both the Modbus master and the CIM [default]. 1: Read-backs are put into separate registers by the CIM, hence separating inputs from outputs. See section 10.1 Separation of reads and writes .	•	•	•
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 to be used 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 the transmission speed is set to "Software-defined" on the DIP switches SW4 and SW5. Otherwise, CIM 200 ignores it.	•	-	-
00010	SoftwareDefinedStopBit	Stop bit setting to be used 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 the transmission speed is set to "Software-defined" on the DIP switches SW4 and SW5. Otherwise, CIM 200 ignores it.	•	-	-

Address	Register name	Description	CIM 200	CIM 260	CIM 500
00011	ScadaPinCode	PIN code for SCADA systems, etc. If GeneralStatus.ScadaPinCodeEnabled (register 00029, bit 0) is enabled, the correct PIN code must be entered in this register to gain access to remote control and configuration. Verify acceptance in GeneralStatus.WriteAccess (register 00029, bit 1). Programming of the SCADA PIN code made via the SMS command "SETSCADACODE". See "CIM 260 SMS commands" which you can download from Grundfos Product Center.	-	•	-
00012	RESERVED	RESERVED	-	-	-
00013	GENIbusDiodeOff	For disabling the GENIbus LED2. 0: GENIbus diode LED2 has normal function. 1: GENIbus diode LED2 is permanently switched off.	•	•	•

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	GENIbusCRCErrorCnt	Holds a CRC error counter for the GENIbus connection to the product.	•	•	•
00022	GENIbusDataErrorCnt	Holds a data error counter for the GENIbus connection to the product.	•	•	•
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 product on the GENIbus connection.	•	•	•
00026	GENIbusTXcountLO				
00027	GENIbusRXcountHI	Holds a receive counter for the total number of telegrams received from the product 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.			
00030	UnitFamily	Grundfos product family.	•	•	•
00031	UnitType	Grundfos product type.	•	•	•
00032	UnitVersion	Grundfos product version.	•	•	•
00033	BatteryState	State of 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 diget 1-4 aa.bb)	•	•	•
00035	ProductSoftwareVersionLO	Product software version (BCD diget 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 Pit control and 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 code 0x06 and 0x10.

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

Address	Register name	Scale	Description
	Bit 0: ResetAlarm	Bool	Control bit that resets system alarms and warnings. 0: No resetting 1: Resetting alarm. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
	Bit 1: ResetHistory	Bool	Control bit that resets pit history. 0: No resetting 1: Resetting history. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
	Bit 2: PitPump1ResetHistory	Bool	Control bit that resets counters in pump 1. 0: No resetting 1: Resetting history. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
	Bit 3: PitPump2ResetHistory	Bool	Control bit that resets counters in pump 2. 0: No resetting 1: Resetting history. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
00101	Bit 4: PitPump3ResetHistory	Bool	Control bit that resets counters in pump 3. 0: No resetting 1: Resetting history. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
	Bit 5: PitPump4ResetHistory	Bool	Control bit that resets counters in pump 4. 0: No resetting 1: Resetting history. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
	Bit 6: PitPump1ResetAlarm	Bool	Control bit that resets alarms and warnings from pump 1. 0: No resetting 1: Resetting alarm. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
	Bit 7: PitPump2ResetAlarm	Bool	Control bit that resets alarms and warnings from pump 2. 0: No resetting 1: Resetting alarm. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
	Bit 8: PitPump3ResetAlarm	Bool	Control bit that resets alarms and warnings from pump 3. 0: No resetting 1: Resetting alarm. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.

Address	Register name	Scale	Description
00101	Bit 9: PitPump4ResetAlarm	Bool	Control bit that resets alarms and warnings from pump 4. 0: No resetting 1: Resetting alarm. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
	Bit 10: PitPump1PumpDown	Bool	Control bit that starts pump 1 as if the level control has started it, and pump 1 will pump down the water level and then be stopped by the level control. 0: No pumping 1: Pump down. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
	Bit 11: PitPump2PumpDown	Bool	Control bit that starts pump 2 as if the level control has started it, and pump 2 will pump down the water level and then be stopped by the level control. 0: No pumping 1: Pump down. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
	Bit 12: PitPump3PumpDown	Bool	Control bit that starts pump 3 as if the level control has started it, and pump 3 will pump down the water level and then be stopped by the level control. 0: No pumping 1: Pump down. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
	Bit 13: PitPump4PumpDown	Bool	Control bit that starts pump 4 as if the level control has started it, and pump 4 will pump down the water level and then be stopped by the level control. 0: No pumping 1: Pump down. This control bit is triggered on rising edge only, meaning setting logical 0 to 1. See section 9.2 CIM configuration register block , address 00005, for acknowledgement behaviour.
00102	SetSinglePitStopLevel	0.01 m	Setting of stop level, pit. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00103	SetSinglePitStartLevelMax	0.01 m	Setting of start level max., pit. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00104	SetSinglePitStartLevelBand	0.01 m	Setting of start level band, pit. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00105	SetSinglePitHighWaterLevel	0.01 m	Setting of high water level, pit. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00106	SetMultiPitPump1StopLevel	0.01 m	Setting of stop level, pump 1. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00107	SetMultiPitPump1StartLevelMax	0.01 m	Setting of start level max., pump 1. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00108	SetMultiPitPump1StartLevelBand	0.01 m	Setting of start level band, pump 1. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00109	SetMultiPitPump1HighWaterLevel	0.01 m	Setting of high water level, pump 1. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00110	SetMultiPitPump2StopLevel	0.01 m	Setting of stop level, pump 2. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00111	SetMultiPitPump2StartLevelMax	0.01 m	Setting of start level max., pump 2. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00112	SetMultiPitPump2StartLevelBand	0.01 m	Setting of start level band, pump 2. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00113	SetMultiPitPump2HighWaterLevel	0.01 m	Setting of high water level, pump 2. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00114	SetMultiPitPump3StopLevel	0.01 m	Setting of stop level, pump 3. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.

Address	Register name	Scale	Description
00115	SetMultiPitPump3StartLevelMax	0.01 m	Setting of start level max., pump 3. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00116	SetMultiPitPump3StartLevelBand	0.01 m	Setting of start level band, pump 3. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00117	SetMultiPitPump3HighWaterLevel	0.01 m	Setting of high water level, pump 3. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00118	SetMultiPitPump4StopLevel	0.01 m	Setting of stop level, pump 4. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00119	SetMultiPitPump4StartLevelMax	0.01 m	Setting of start level max., pump 4. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00120	SetMultiPitPump4StartLevelBand	0.01 m	Setting of start level band, pump 4. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00121	SetMultiPitPump4HighWaterLevel	0.01 m	Setting of high water level, pump 4. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00122	PitPump1Control	Enum	Remote manual control of pump 1. 0: "Auto" mode 1: Forced start 2: Forced stop.
00123	PitPump2Control	Enum	Remote manual control of pump 2. 0: "Auto" mode 1: Forced start 2: Forced stop.
00124	PitPump3Control	Enum	Remote manual control of pump 3. 0: "Auto" mode 1: Forced start 2: Forced stop.
00125	PitPump4Control	Enum	Remote manual control of pump 4. 0: "Auto" mode 1: Forced start 2: Forced stop.

9.6 Pit status register block

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

Address	Register name	Scale	Description
00201	Bit 0: ResetAlarmAck	Bool	Indicates if a ResetAlarm control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0:: Not acknowledged 1: Acknowledged.
	Bit 1: ResetHistoryAck	Bool	Indicates if a ResetHistory control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
	Bit 2: PitPump1ResetHistoryAck	Bool	Indicates if a PitPump1ResetHistory control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
	Bit 3: PitPump2ResetHistoryAck	Bool	Indicates if a PitPump2ResetHistory control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
	Bit 4: PitPump3ResetHistoryAck	Bool	Indicates if a PitPump3ResetHistory control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
	Bit 5: PitPump4ResetHistoryAck	Bool	Indicates if a PitPump4ResetHistory control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
	Bit 6: PitPump1ResetAlarmAck	Bool	Indicates if a PitPump1ResetAlarm control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
	Bit 7: PitPump2ResetAlarmAck	Bool	Indicates if a PitPump2ResetAlarm control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
	Bit 8: PitPump3ResetAlarmAck	Bool	Indicates if a PitPump3ResetAlarm control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
	Bit 9: PitPump4ResetAlarmAck	Bool	Indicates if a PitPump4ResetAlarm control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged. Register continues on next page

Address	Register name	Scale	Description
	Bit 10: PitPump1PumpDownAck	Bool	Indicates if a PitPump1PumpDown control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
	Bit 11: PitPump2PumpDownAck	Bool	Indicates if a PitPump2PumpDown control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
	Bit 12: PitPump3PumpDownAck	Bool	Indicates if a PitPump3PumpDown control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
	Bit 13: PitPump4PumpDownAck	Bool	Indicates if a PitPump4PumpDown control bit is acknowledged by the device. This bit is only active if AutoAckControlBits (register 00005, bit 0) is set to "0". 0: Not acknowledged 1: Acknowledged.
00202	Bit 0: AlarmInPumpOrPit	Bool	Main status of warning(s). 0: No active warnings. 1: One or more active warnings.
	Bit 1: WarningInPumpOrPit	Bool	Main status of alarm(s). 0: No active alarms. 1: One or more active alarms.
	Bit 2: ManualControlStatus	Bool	Main status of manual pump control. 0: No manual pump control enabled (full "Auto") 1: Manual pump control enabled (partly or completely).
	Bit 3: RESERVED	-	-
00203	PitMode	Enum	Pit mode. 0: Single-pit mode 1: Multi-pit mode. See section 10.4 Single-pit and multi-pit mode .
00204	SinglePitStopLevel	0.01 m	Stop level, pit. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00205	SinglePitStartLevelMax	0.01 m	Start level max., pit. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00206	SinglePitStartLevelBand	0.01 m	Start level band, pit. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00207	SinglePitHighWaterLevel	0.01 m	High water level, pit. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00208	MultiPitPump1StopLevel	0.01 m	Stop level, pump 1. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00209	MultiPitPump1StartLevelMax	0.01 m	Start level max., pump 1. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00210	MultiPitPump1StartLevelBand	0.01 m	Start level band, pump 1. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00211	MultiPitPump1HighWaterLevel	0.01 m	Actual high water level, pump 1. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00212	MultiPitPump2StopLevel	0.01 m	Stop level, pump 2. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00213	MultiPitPump2StartLevelMax	0.01 m	Start level max., pump 2. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00214	MultiPitPump2StartLevelBand	0.01 m	Start level band, pump 2. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00215	MultiPitPump2HighWaterLevel	0.01 m	High water level, pump 2. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00216	MultiPitPump3StopLevel	0.01 m	Stop level, pump 3. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00217	MultiPitPump3StartLevelMax	0.01 m	Start level max., pump 3. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00218	MultiPitPump3StartLevelBand	0.01 m	Start level band, pump 3. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.

Address	Register name	Scale	Description
00219	MultiPitPump3HighWaterLevel	0.01 m	High water level, pump 3. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00220	MultiPitPump4StopLevel	0.01 m	Stop level, pump 4. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00221	MultiPitPump4StartLevelMax	0.01 m	Start level max., pump 4. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00222	MultiPitPump4StartLevelBand	0.01 m	Start level band, pump 4. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00223	MultiPitPump4HighWaterLevel	0.01 m	High water level, pump 4. Used in multi-pit mode only. Pit mode: 1. Pit mode is set in register 00203.
00224	PitPump1OperationMode	Enum	Operating mode of pump 1. 0: "Auto" mode 1: Started 2: Stopped.
00225	PitPump2OperationMode	Enum	Operating mode of pump 2. 0: "Auto" mode 1: Started 2: Stopped.
00226	PitPump3OperationMode	Enum	Operating mode of pump 3. 0: "Auto" mode 1: Started 2: Stopped.
00227	PitPump4OperationMode	Enum	Operating mode of pump 4. 0: "Auto" mode 1: Started 2: Stopped.
00228	AlarmCode	Enum	A Grundfos-specific alarm code. See section 14.2 CIU 262 .
00229	WarningCode	Enum	A Grundfos-specific warning code. See section 14.2 CIU 262 .
00230	Bit 0: Pitpump1Present	Bool	Presence of pump 1. 0: Not present 1: Present.
	Bit 1: Pitpump2Present	Bool	Presence of pump 2. 0: Not present 1: Present.
	Bit 2: Pitpump3Present	Bool	Presence of pump 3. 0: Not present 1: Present.
	Bit 3: Pitpump4Present	Bool	Presence of pump 4. 0: Not present 1: Present.
00231	Bit 0: Pitpump1Running	Bool	Running state of pump 1. 0: Not running 1: Running.
	Bit 1: Pitpump2Running	Bool	Running state of pump 2. 0: Not running 1: Running.
	Bit 2: Pitpump3Running	Bool	Running state of pump 3. 0: Not running 1: Running.
	Bit 3: Pitpump4Running	Bool	Running state of pump 4. 0: Not running 1: Running.
00232	Bit 0: Pitpump1Alarm	Bool	Alarm state of pump 1. 0: No alarm 1: Alarm.
	Bit 1: Pitpump2Alarm	Bool	Alarm state of pump 2. 0: No alarm 1: Alarm.
	Bit 2: Pitpump3Alarm	Bool	Alarm state of pump 3. 0: No alarm 1: Alarm.
	Bit 3: Pitpump4Alarm	Bool	Alarm state of pump 4. 0: No alarm 1: Alarm.

Address	Register name	Scale	Description
00233	Bit 0: Pitpump1CommFault	Bool	Indicates if there is a communication fault on pump 1. 0: No fault 1: Fault.
	Bit 1: Pitpump2CommFault	Bool	Indicates if there is a communication fault on pump 2. 0: No Fault 1: Fault.
	Bit 2: Pitpump3CommFault	Bool	Indicates if there is a communication fault on pump 3. 0: No fault 1: Fault.
	Bit 3: Pitpump4CommFault	Bool	Indicates if there is a communication fault on pump 4. 0: No fault 1: Fault.
00234	OperatingMode	Enum	Used in single-pit mode only. Pit mode: 0. Operating mode of the pump pit. 0: Standby 1: Startup delay 2: Pumping (level control) 5: Stopped (level control) 9: Manuel control (all enabled pumps in manual control mode) 11: Mains supply failure 13: Alarm on all enabled pumps 14: All pumps out of operation.
00235	Bit 0: WarningInPumpOrPit		Main status of warning(s). 0: No warning(s) 1: Warning(s) on a pump or in the pit.
	Bit 1: AlarmInPumpOrPit		Main status of alarm(s). 0: No alarm(s) 1: Alarm(s) on a pump or in the pit.
	Bit 2: RESERVED		-
	Bit 3: ManualControlStatus		Main status of manual pump control. 0: No manual pump control enabled (full "Auto") 1: Manual pump control enabled (partly or completely).
00236	SignalLevelActual	1 %	Actual level of cellular network signal. CIM 260 only
00237	SignalLevelAverage	1 %	Average level of cellular network signal. CIM 260 only
00238	IPAddressHI	Unscaled	IP address for data communication. CIM 260 only
00239	IPAddressLO		
00240	Bit 0: AlarmBitsExternalFault		External fault signal
	Bit 1: AlarmBitsCommunicationFault		Communication fault, pump
	Bit 2: RESERVED		-
	Bit 3: AlarmBitsPump1Fault		Pump 1 fault
	Bit 4: AlarmBitsPump2Fault		Pump 2 fault
	Bit 5: AlarmBitsPump3Fault		Pump 3 fault
	Bit 6: AlarmBitsPump4Fault		Pump 4 fault
	Bit 7: AlarmBitsSensorLimit2Exceeded		Sensor limit 2 exceeded (High level)
	Bit 8: AlarmBitsSetupConflict		Setup conflict
00241	Bit 0: RESERVED		-
	Bit 1: WarningBitsCommunicationFault		Communication fault, pump
	Bit 2: WarningBitsVerificationError		Verification error, code area (ROM, FLASH)
	Bit 3 -7: RESERVED		-
	Bit 8: WarningBits.SetupConflict		Setup conflict

9.7 Pit data register block

Registers in this block can be read by means of function codes 0x03 and/or 0x04. It is not possible to write to these registers. 0xFFFF indicates that the data value is not available.

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

Address	Register name	Scale	Description
00301	WaterLevel	0.01 m	Average of the pit water level as estimated by the pumps. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00302	MaxWaterLevel	0.01 m	Maximum value that the pit water level has had. Can be reset with register 00101, bit 1: ResetHistory. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00303 00304	PowerHI PowerLO	1 W	Pit power consumption.
00305 00306	EnergyTripCntHI EnergyTripCntLO	1 kWh	Pit energy consumption. Can be reset with register 00101, bit 1: ResetHistory.
00307 00308	OnTimeCntHI OnTimeCntLO	1 minute	Power-on time for the CIU. Cannot be reset.
00309 00310	OprTimeTripCntHI OprTimeTripCntLO	1 minute	Pit operating time where one or more pumps have been operating. Can be reset with register 00101, bit 1: ResetHistory.
00311	PumpOperationTimePct	0.01 %	Percentage of time where one or more pumps have been operating within the last 30 days. Can be reset with register 00101, bit 1: ResetHistory. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00312	MultiPumpOperationTimePct	0.01 %	Percentage of the pump operating time where more than one pump have been operating within the last 30 days. Can be reset with register 00101, bit 1: ResetHistory. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00313	MultiPumpOperationTimeMax	1 second	Logged value of maximum pump operating time where more than one pump have been operating continuously within the last 30 days. Can be reset with register 00101, bit 1: ResetHistory. Used in single-pit mode only. Pit mode: 0. Pit mode is set in register 00203.
00314	DigitalInput	Bits	Digital inputs.

9.8 Pump 1 register block

All register values are read-only, and 0xFFFF indicates that the data value is not available.

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

Address	Register name	Scale	Description
00401	Pump1.MotorTemperature	0.01 K	Motor temperature, pump 1.
00402	Pump1.ElectronicTemperature	0.01 K	Electronics temperature, pump 1.
00403	Pump1.AverageLineVoltage	0.1 V	Average supply voltage, pump 1.
00404	Pump1.AverageLineCurrent	0.1 A	Average supply current, pump 1.
00405	Pump1.AverageLineCurrentLatest	0.1 A	Average supply current the last time pump 1 was operating.
00406	Pump1.LineFrequency	0.1 Hz	Frequency of power supply, pump 1.
00407	Pump1.PhaseSequence	Bool	Phase sequence of power supply, pump 1.
00408	Pump1.CosPhi	0.01	Power factor, pump 1.
00409	Pump1.Power	1 W	Power consumption, pump 1.
00410	Pump1.EnergyTripCounterHI	1 kWh	Energy consumption, pump 1. Can be reset with register 00101, bit 2: PitPump1ResetHistory.
00411	Pump1.EnergyTripCounterLO		
00412	Pump1.WaterLevel	0.01 m	Water level as estimated by pump 1.
00413	Pump1.WaterLevelMax	0.01 m	Logged maximum value of water level, pump 1. Can be reset with register 00101, bit 2: PitPump1ResetHistory.
00414	Pump1.MaxContinuousTime	1 minute	Logged maximum value of continuous operating time within the last 30 days, pump 1. Can be reset with register 00101, bit 2: PitPump1ResetHistory.
00415	Pump1.TotalPoweredTimeHI	1 minute	Total time that pump 1 has been powered on. Used as time stamp for alarms in the alarm log the moment the alarm appears.
00416	Pump1.TotalPoweredTimeLO		
00417	Pump1.OperationTimeHI	1 minute	Total time that pump 1 has been operating.
00418	Pump1.OperationTimeLO		
00419	Pump1.OperationTimeTripCounterHI	1 minute	Trip counter of the total time that pump 1 has been operating. Can be reset with register 00101, bit 2: PitPump1ResetHistory.
00420	Pump1.OperationTimeTripCounterLO		
00421	Pump1.NumberOfStartsHI	Unscaled	Total number of starts, pump 1.
00422	Pump1.NumberOfStartsLO		
00423	Pump1.NumberOfStartsTripCounterHI	Unscaled	Trip counter of total number of starts, pump 1.
00424	Pump1.NumberOfStartsTripCounterLO		
00425	Pump1.AlarmCode	Unscaled	Grundfos-specific alarm code, pump 1. See section 14.2 CIU 262 .
00426	Pump1.WarningCode	Unscaled	Grundfos-specific warning code, pump 1. See section 14.2 CIU 262 .
00427	Pump1.OperatingMode	Bits	Operating mode of pump 1. 0: "Auto" mode (power-on default) 1: Forced start 2: Forced stop.
00428	Bit 0: Subpump1AlarmsPhaseSequence		Phase sequence reversed
	Bit 1: Subpump1AlarmsOvervoltage		Overvoltage
	Bit 2: Subpump1AlarmsUndervoltage		Undervoltage
	Bit 3: Subpump1AlarmsOverload		Overload
	Bit 4: Subpump1AlarmsBlockedMotor		Blocked motor/pump
	Bit 5: Subpump1AlarmsAlarmBit5		-
	Bit 6: Subpump1AlarmsMotorTemperature		Motor temperature
	Bit 7: Subpump1AlarmsElectronicTemperature		Temperature, control electronics
	Bit 8: Subpump1AlarmsTermoRelay1		Temperature relay 1 in motor, for example Klixon
	Bit 9: Subpump1AlarmsTermoRelay2		Temperature relay 2 in motor, for example thermistor
	Bit 10: Subpump1AlarmsVerificationError		Verification error, code area (ROM, FLASH)
	Bit 11: Subpump1AlarmsAlarmBit11		-
	Bit 12: Subpump1AlarmsSensorFault		Sensor fault
	Bit 13: Subpump1AlarmsAlarmBit13		-

Address	Register name	Scale	Description
00429	Bit 0: Subpump1WarningsWarningsPhaseSequence		Phase sequence reversed
	Bit 1: Subpump1WarningsOvervoltage		Overvoltage
	Bit 2: Subpump1WarningsUndervoltage		Undervoltage
	Bit 3: Subpump1WarningsOverload		Overload
	Bit 4: Subpump1WarningsBlockedMotor		Blocked motor or pump
	Bit 5: Subpump1WarningsAlarmBit5		-
	Bit 6: Subpump1WarningsMotorTemperature		Motor temperature
	Bit 7: Subpump1WarningsElectronicTemperature		Temperature, control electronics
	Bit 8: Subpump1WarningsTermoRelay1		Temperature relay 1 in motor, for example Klixon
	Bit 9: Subpump1WarningsTermoRelay2		Temperature relay 2 in motor, for example thermistor
	Bit 10: Subpump1WarningsVerificationError		Verification error, code area (ROM, FLASH)
	Bit 11: Subpump1WarningsAlarmBit11		-
	Bit 12: Subpump1WarningsSensorFault		Sensor fault
	Bit 13: Subpump1WarningsAlarmBit13		-

9.9 Pump 2 register block

All register values are read-only, and 0xFFFF indicates that the data value is not available.

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

Address	Register name	Scale	Description
00451	Pump2.MotorTemperature	0.01 K	Motor temperature, pump 2.
00452	Pump2.ElectronicTemperature	0.01 K	Electronics temperature, pump 2.
00453	Pump2.AverageLineVoltage	0.1 V	Average supply voltage, pump 2.
00454	Pump2.AverageLineCurrent	0.1 A	Average supply current, pump 2.
00455	Pump2.AverageLineCurrentLatest	0.1 A	Average supply current the last time pump 2 was operating.
00456	Pump2.LineFrequency	0.1 Hz	Frequency of power supply, pump 2.
00457	Pump2.PhaseSequence	Bool	Phase sequence of power supply, pump 2.
00458	Pump2.CosPhi	0.01	Power factor, pump 2.
00459	Pump2.Power	1 W	Power consumption, pump 2.
00460	Pump2.EnergyTripCounterHI	1 kWh	Energy consumption, pump 2.
00461	Pump2.EnergyTripCounterLO		Can be reset with register 00101, bit 3: PitPump2ResetHistory.
00462	Pump2.WaterLevel	0.01 m	Water level as estimated by pump 2.
00463	Pump2.WaterLevelMax	0.01 m	Logged maximum value of water level, pump 2. Can be reset with register 00101, bit 3: PitPump2ResetHistory.
00464	Pump2.MaxContinuousTime	1 minute	Logged maximum value of continuous operating time within the last 30 days, pump 2. Can be reset with register 00101, bit 3: PitPump2ResetHistory.
00465	Pump2.TotalPoweredTimeHI	1 minute	Total time that pump 2 has been powered on.
00466	Pump2.TotalPoweredTimeLO		Used as time stamp for alarms in the alarm log the moment the alarm appears.
00467	Pump2.OperationTimeHI	1 minute	Total time that pump 2 has been operating.
00468	Pump2.OperationTimeLO		
00469	Pump2.OperationTimeTripCounterHI	1 minute	Trip counter of the total time that pump 2 has been operating.
00470	Pump2.OperationTimeTripCounterLO		Can be reset with register 00101, bit 3: PitPump2ResetHistory.
00471	Pump2.NumberOfStartsHI	Unscaled	Total number of starts, pump 2.
00472	Pump2.NumberOfStartsLO		
00473	Pump2.NumberOfStartsTripCounterHI	Unscaled	Trip counter of total number of starts, pump 2.
00474	Pump2.NumberOfStartsTripCounterLO		
00475	Pump2.AlarmCode	Unscaled	Grundfos-specific alarm code, pump 2. See section 14.2 CIU 262 .
00476	Pump2.WarningCode	Unscaled	Grundfos-specific warning code, pump 2. See section 14.2 CIU 262 .
00477	Pump2.OperatingMode	Bits	Operating mode of pump 2. 0: "Auto" mode (power-on default) 1: Forced start 2: Forced stop.
00478	Bit 0: Subpump2AlarmsPhaseSequence		Phase sequence reversed
	Bit 1: Subpump2AlarmsOvervoltage		Overvoltage
	Bit 2: Subpump2AlarmsUndervoltage		Undervoltage
	Bit 3: Subpump2AlarmsOverload		Overload
	Bit 4: Subpump2AlarmsBlockedMotor		Blocked motor/pump
	Bit 5: Subpump2AlarmsAlarmBit5		-
	Bit 6: Subpump2AlarmsMotorTemperature		Motor temperature
	Bit 7: Subpump2AlarmsElectronicTemperature		Temperature, control electronics
	Bit 8: Subpump2AlarmsTermoRelay1		Temperature relay 1 in motor, for example Klixon
	Bit 9: Subpump2AlarmsTermoRelay2		Temperature relay 2 in motor, for example thermistor
	Bit 10: Subpump2AlarmsVerificationError		Verification error, code area (ROM, FLASH)
	Bit 11: Subpump2AlarmsAlarmBit11		-
	Bit 12: Subpump2AlarmsSensorFault		Sensor fault
	Bit 13: Subpump2AlarmsAlarmBit13		-

Address	Register name	Scale	Description
	Bit 0: Subpump2WarningsWarningsPhaseSequence		Phase sequence reversed
	Bit 1: Subpump2WarningsOvervoltage		Overvoltage
	Bit 2: Subpump2WarningsUndervoltage		Undervoltage
	Bit 3: Subpump2WarningsOverload		Overload
	Bit 4: Subpump2WarningsBlockedMotor		Blocked motor or pump
	Bit 5: Subpump2WarningsAlarmBit5		-
00479	Bit 6: Subpump2WarningsMotorTemperature		Motor temperature
	Bit 7: Subpump2WarningsElectronicTemperature		Temperature, control electronics
	Bit 8: Subpump2WarningsTermoRelay1		Temperature relay 1 in motor, for example Klixon
	Bit 9: Subpump2WarningsTermoRelay2		Temperature relay 2 in motor, for example thermistor
	Bit 10: Subpump2WarningsVerificationError		Verification error, code area (ROM, FLASH)
	Bit 11: Subpump2WarningsAlarmBit11		-
	Bit 12: Subpump2WarningsSensorFault		Sensor fault
	Bit 13: Subpump2WarningsAlarmBit13		-

9.10 Pump 3 register block

All register values are read-only, and 0xFFFF indicates that the data value is not available.

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

Address	Register name	Scale	Description
00501	Pump3.MotorTemperature	0.01 K	Motor temperature, pump 3.
00502	Pump3.ElectronicTemperature	0.01 K	Electronics temperature, pump 3.
00503	Pump3.AverageLineVoltage	0.1 V	Average supply voltage, pump 3.
00504	Pump3.AverageLineCurrent	0.1 A	Average supply current, pump 3.
00505	Pump3.AverageLineCurrentLatest	0.1 A	Average supply current the last time pump 3 was operating.
00506	Pump3.LineFrequency	0.1 Hz	Frequency of power supply, pump 3.
00507	Pump3.PhaseSequence	Bool	Phase sequence of power supply, pump 3.
00508	Pump3.CosPhi	0.01	Power factor, pump 3.
00509	Pump3.Power	1 W	Power consumption, pump 3.
00510	Pump3.EnergyTripCounterHI	1 kWh	Energy consumption, pump 3.
00511	Pump3.EnergyTripCounterLO		Can be reset with register 00101, bit 4: PitPump3ResetHistory.
00512	Pump3.WaterLevel	0.01 m	Water level as estimated by pump 3.
00513	Pump3.WaterLevelMax	0.01 m	Logged maximum value of water level, pump 3. Can be reset with register 00101, bit 4: PitPump3ResetHistory.
00514	Pump3.MaxContinuousTime	1 minute	Logged maximum value of continuous operating time within the last 30 days, pump 3. Can be reset with register 00101, bit 4: PitPump3ResetHistory.
00515	Pump3.TotalPoweredTimeHI	1 minute	Total time that pump 3 has been powered on.
00516	Pump3.TotalPoweredTimeLO		Used as time stamp for alarms in the alarm log the moment the alarm appears.
00517	Pump3.OperationTimeHI	1 minute	Total time that pump 3 has been operating.
00518	Pump3.OperationTimeLO		
00519	Pump3.OperationTimeTripCounterHI	1 minute	Trip counter of the total time that pump 3 has been operating.
00520	Pump3.OperationTimeTripCounterLO		Can be reset with register 00101, bit 4: PitPump3ResetHistory.
00521	Pump3.NumberOfStartsHI	Unscaled	Total number of starts, pump 3.
00522	Pump3.NumberOfStartsLO		
00523	Pump3.NumberOfStartsTripCounterHI	Unscaled	Trip counter of total number of starts, pump 3.
00524	Pump3.NumberOfStartsTripCounterLO		
00525	Pump3.AlarmCode	Unscaled	Grundfos-specific alarm code, pump 3. See section 14.2 CIU 262 .
00526	Pump3.WarningCode	Unscaled	Grundfos-specific warning code, pump 3. See section 14.2 CIU 262 .
00527	Pump3.OperatingMode	Bits	Operating mode of pump 3. 0: "Auto" mode (power-on default) 1: Forced start 2: Forced stop.
00528	Bit 0: Subpump3AlarmsPhaseSequence		Phase sequence reversed
	Bit 1: Subpump3AlarmsOvervoltage		Overvoltage
	Bit 2: Subpump3AlarmsUndervoltage		Undervoltage
	Bit 3: Subpump3AlarmsOverload		Overload
	Bit 4: Subpump3AlarmsBlockedMotor		Blocked motor/pump
	Bit 5: Subpump3AlarmsAlarmBit5		-
	Bit 6: Subpump3AlarmsMotorTemperature		Motor temperature
	Bit 7: Subpump3AlarmsElectronicTemperature		Temperature, control electronics
	Bit 8: Subpump3AlarmsTermoRelay1		Temperature relay 1 in motor, for example Klixon
	Bit 9: Subpump3AlarmsTermoRelay2		Temperature relay 2 in motor, for example thermistor
	Bit 10: Subpump3AlarmsVerificationError		Verification error, code area (ROM, FLASH)
	Bit 11: Subpump3AlarmsAlarmBit11		-
	Bit 12: Subpump3AlarmsSensorFault		Sensor fault
	Bit 13: Subpump3AlarmsAlarmBit13		-

Address	Register name	Scale	Description
00529	Bit 0: Subpump3WarningsWarningsPhaseSequence		Phase sequence reversed
	Bit 1: Subpump3WarningsOvervoltage		Overvoltage
	Bit 2: Subpump3WarningsUndervoltage		Undervoltage
	Bit 3: Subpump3WarningsOverload		Overload
	Bit 4: Subpump3WarningsBlockedMotor		Blocked motor or pump
	Bit 5: Subpump3WarningsAlarmBit5		-
	Bit 6: Subpump3WarningsMotorTemperature		Motor temperature
	Bit 7: Subpump3WarningsElectronicTemperature		Temperature, control electronics
	Bit 8: Subpump3WarningsTermoRelay1		Temperature relay 1 in motor, for example Klixon
	Bit 9: Subpump3WarningsTermoRelay2		Temperature relay 2 in motor, for example thermistor
	Bit 10: Subpump3WarningsVerificationError		Verification error, code area (ROM, FLASH)
	Bit 11: Subpump3WarningsAlarmBit11		-
	Bit 12: Subpump3WarningsSensorFault		Sensor fault
	Bit 13: Subpump3WarningsAlarmBit13		-

9.11 Pump 4 register block

All register values are read-only, and 0xFFFF indicates that the data value is not available.

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

Address	Register name	Scale	Description
00551	Pump4.MotorTemperature	0.01 K	Motor temperature, pump 4.
00552	Pump4.ElectronicTemperature	0.01 K	Electronics temperature, pump 4.
00553	Pump4.AverageLineVoltage	0.1 V	Average supply voltage, pump 4.
00554	Pump4.AverageLineCurrent	0.1 A	Average supply current, pump 4.
00555	Pump4.AverageLineCurrentLatest	0.1 A	Average supply current the last time pump 4 was operating.
00556	Pump4.LineFrequency	0.1 Hz	Frequency of power supply, pump 4.
00557	Pump4.PhaseSequence	Bool	Phase sequence of power supply, pump 4.
00558	Pump4.CosPhi	0.01	Power factor, pump 4.
00559	Pump4.Power	1 W	Power consumption, pump 4.
00560	Pump4.EnergyTripCounterHI	1 kWh	Energy consumption, pump 4.
00561	Pump4.EnergyTripCounterLO		Can be reset with register 00101, bit 5: PitPump4ResetHistory.
00562	Pump4.WaterLevel	0.01 m	Water level as estimated by pump 4.
00563	Pump4.WaterLevelMax	0.01 m	Logged maximum value of water level, pump 4. Can be reset with register 00101, bit 5: PitPump4ResetHistory.
00564	Pump4.MaxContinuousTime	1 minute	Logged maximum value of continuous operating time within the last 30 days, pump 4. Can be reset with register 00101, bit 5: PitPump4ResetHistory.
00565	Pump4.TotalPoweredTimeHI	1 minute	Total time that pump 4 has been powered on.
00566	Pump4.TotalPoweredTimeLO		Used as time stamp for alarms in the alarm log the moment the alarm appears.
00567	Pump4.OperationTimeHI	1 minute	Total time that pump 4 has been operating.
00568	Pump4.OperationTimeLO		
00569	Pump4.OperationTimeTripCounterHI	1 minute	Trip counter of the total time that pump 4 has been operating.
00570	Pump4.OperationTimeTripCounterLO		Can be reset with register 00101, bit 5: PitPump4ResetHistory.
00571	Pump4.NumberOfStartsHI	Unscaled	Total number of starts, pump 4.
00572	Pump4.NumberOfStartsLO		
00573	Pump4.NumberOfStartsTripCounterHI	Unscaled	Trip counter of total number of starts, pump 4.
00574	Pump4.NumberOfStartsTripCounterLO		
00575	Pump4.AlarmCode	Unscaled	Grundfos-specific alarm code, pump 4. See section 14.2 CIU 262 .
00576	Pump4.WarningCode	Unscaled	Grundfos-specific warning code, pump 4. See section 14.2 CIU 262 .
00577	Pump4.OperatingMode	Bits	Operating mode of pump 4. 0: "Auto" mode (power-on default) 1: Forced start 2: Forced stop.
00528	Bit 0: Subpump4AlarmsPhaseSequence		Phase sequence reversed
	Bit 1: Subpump4AlarmsOvervoltage		Overvoltage
	Bit 2: Subpump4AlarmsUndervoltage		Undervoltage
	Bit 3: Subpump4AlarmsOverload		Overload
	Bit 4: Subpump4AlarmsBlockedMotor		Blocked motor or pump
	Bit 5: Subpump4AlarmsAlarmBit5		-
	Bit 6: Subpump4AlarmsMotorTemperature		Motor temperature
	Bit 7: Subpump4AlarmsElectronicTemperature		Temperature, control electronics
	Bit 8: Subpump4AlarmsTermoRelay1		Temperature relay 1 in motor, for example Klixon
	Bit 9: Subpump4AlarmsTermoRelay2		Temperature relay 2 in motor, for example thermistor
	Bit 10: Subpump4AlarmsVerificationError		Verification error, code area (ROM, FLASH)
	Bit 11: Subpump4AlarmsAlarmBit11		-
	Bit 12: Subpump4AlarmsSensorFault		Sensor fault
	Bit 13: Subpump4AlarmsAlarmBit13		-

Address	Register name	Scale	Description
00529	Bit 0: Subpump4WarningsWarningsPhaseSequence		Phase sequence reversed
	Bit 1: Subpump4WarningsOvervoltage		Overvoltage
	Bit 2: Subpump4WarningsUndervoltage		Undervoltage
	Bit 3: Subpump4WarningsOverload		Overload
	Bit 4: Subpump4WarningsBlockedMotor		Blocked motor or pump
	Bit 5: Subpump4WarningsAlarmBit5		-
	Bit 6: Subpump4WarningsMotorTemperature		Motor temperature
	Bit 7: Subpump4WarningsElectronicTemperature		Temperature, control electronics
	Bit 8: Subpump4WarningsTermoRelay1		Temperature relay 1 in motor, for example Klixon
	Bit 9: Subpump4WarningsTermoRelay2		Temperature relay 2 in motor, for example thermistor
	Bit 10: Subpump4WarningsVerificationError		Verification error, code area (ROM, FLASH)
	Bit 11: Subpump4WarningsAlarmBit11		-
	Bit 12: Subpump4WarningsSensorFault		Sensor fault
	Bit 13: Subpump4WarningsAlarmBit13		-

9.12 Alarm simulation register block

See alarm simulation example in section [10.3 Alarm simulation example](#).

Address	Register name	Scale	Description
00701	Simulation.AlarmCode	Enum	The Grundfos-specific alarm code to simulate. See section 14.2 CIU 262 .
00702	Simulation.WarningCode	Enum	The Grundfos-specific warning code to simulate. See section 14.2 CIU 262 .
00703	Bit 0: Simulation.Activate	Bool	Activation of alarm or warning simulation. 0: Deactivate simulation 1: Activate simulation.
00704	Bit 0: Simulation.Active	Bool	Status of alarm or warning simulation. 0: Simulation not active 1: Simulation active.

9.13 User register block

Address	Register name	Scale	Description
00751-00800	UserRegisters	Unscaled	This area is for device labelling by the user. The CIU unit will not modify this area. The user area values are stored in the device and remain after a power-off.

10. Detailed descriptions of registers

10.1 Separation of reads and writes

This functional profile supports Modbus holding registers, which means that registers can be both read and written. By default, most of the register values meant for writing by the Modbus master is also updated by the CIU unit itself to reflect the actual value used by CIU.

Differences arise due to internal value limitations and because some settings and control values can have other sources, for example service port and display that can change the actual values. To avoid such conflicts, the profile has the option of read and write separation with the option `Config.ReadWriteSeparation` (register 00006, bit 1 = 1). Using this option means that all writing registers [W] use an associated reading location [R] where the resulting status of the writing always can be verified. In this case, reading and writing never takes place via the same registers, Alarm simulation registers being the only exceptions. Reading a writing register only means reading what has previously been written to the Modbus interface, and in the general case this will not reflect what value the CIU unit is actually using.

Example 1

Setting and reading overflow level with `ReadWriteSeparation` disabled [default].

The user writes a new value to `SinglePitStopLevel` (register 00102).

The resulting overflow level is then read from `SinglePitStopLevel` (register 00102).



`ReadWriteSeparation` is disabled by default.

Example 2

Setting and reading overflow level with `ReadWriteSeparation` enabled.

The user writes a new value to `SinglePitStopLevel` (register 00102).

The resulting overflow level is then read from `SinglePitStopLevel` (register 00204), hence separating reads from writes.

10.2 Control bit acknowledgement

All control bits in the functional profile are triggered on the rising edge of a bit. The system supports two different approaches to control bit acknowledgement: Auto and manual.

The `AutoAckControlBits` setting (register 00005) sets the desired approach:

0: Disabled.

Control bits are not automatically lowered when accepted by the device. The user must lower the control bit manually before the control bit can be triggered again. When a control bit is accepted by the device, the corresponding control bit acknowledgement is raised, and the user can lower the control bit.

1: Enabled.

Control bits are automatically lowered when accepted by the device, so the user does not have to lower it manually [default].

Example 1

`ResetAlarm` with auto-acknowledgement enabled [default].

The user sets the `PitControl.ResetAlarm` control bit (register 00101, bit 0) to 1 to reset an alarm. When accepted by the slave, the `PitControl.ResetAlarm` control bit is automatically reset to 0. The user can then set the `PitControl.ResetAlarm` control bit to 1 again to reset an alarm again.



`AutoAckEnabled` is the default setting.

Example 2

`ResetAlarm` with auto-acknowledgement disabled.

The user sets the `PitControl.ResetAlarm` control bit (register 00101, bit 0) to 1 to reset an alarm. When accepted by the slave, the `AcknowledgeRegister.ResetAlarmAck` (register 00201, bit 0) is set to 1, and the `PitControl.ResetAlarm` is still 1. The user must then manually set `PitControl.ResetAlarm` to 0 before another alarm can be reset. When doing so, the `AcknowledgeRegister.ResetAlarmAck` will revert to 0 as well.

10.3 Alarm simulation example

It is possible to simulate alarms or warnings for testing purposes. This is done by writing to one of the following registers:

- `Simulation.AlarmCode` (register 00701)
- `Simulation.WarningCode` (register 00702)

and afterwards activate simulation with the `Simulation.Activate` function (register 00703, bit 0). The simulated alarm or warning is indicated as a real alarm or warning, but system operation is not influenced. The `Simulation.Active` (register 00704, bit 0) can be used to check whether simulation is active or not. By writing a 0 to `Simulation.Activate`, the simulation is deactivated.

Procedure to simulate an alarm:

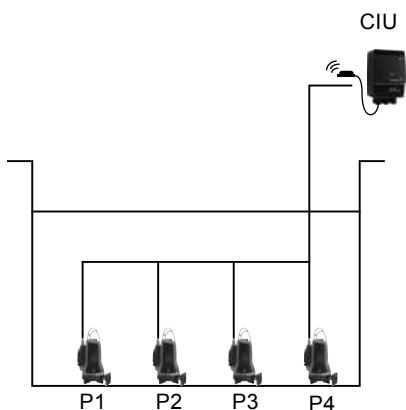
- Write the value 51 to register 00701 to simulate a "Blocked motor/pump" alarm.
- Activate alarm simulation by writing 1 to `Simulation.Activate` (register 00703).

10.4 Single-pit and multi-pit mode

10.4.1 Single-pit mode

In single-pit mode, all pumps connected to the CIU unit are installed in the same pit. The electronics in the pumps ensure that the load is automatically distributed among the pumps, meaning pump alternation or operation in parallel, if necessary.

Actual pit mode can be read from register 00203.

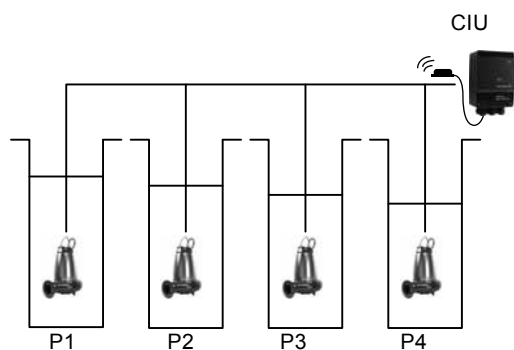


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Fig. 18 Single-pit mode

10.4.2 Multi-pit mode

In multi-pit mode, all pumps connected to the CIU unit are installed in separate pump pits. One CIU can monitor up to four pits. The pumps operate as individual pumps.



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Fig. 19 Multi-pit mode

In multi-pit mode, the CIU unit does not regard the connected pumps as one system, but as four systems with their own settings.

CIU will not monitor parameter mismatch between pumps or calculate common pit parameters.

Switching between single-pit and multi-pit mode can only be done via the Grundfos PC Tool Water Utility for sewage applications or with a Grundfos remote control (Service mode). Details can be found in the SEG AUTO_{ADAPT} multi-pit application note.



It is not possible to combine single-pit mode and multi-pit mode.

11. CIU 202 Modbus RTU commissioning, step-by-step guides



If the sensor configuration is changed, restart CIU XX2 unit to ensure a correct scaling of the sensor value.

11.1 Hardware setup, CIU 202

Step	Action
1	Complete the system configuration. This can be done either via Grundfos GO Remote or Grundfos PC Tool Wastewater.
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 necessary cables from CIU 202 to the Modbus network.
7	Connect the power supply cable to CIU 202, and switch the unit on.
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.

CIU 202 is now ready to be accessed via the Modbus network.

11.2 Hardware setup, CIU 262 call-up connection

Step	Action
1	Connect the communication cables from CIU 260 to the wastewater pumps. See CIU quick guide instruction.
2	Fit an antenna to the CIM module SMA connector. See section 6.1.1 Fitting a cellular antenna .
3	Insert the SIM card in the CIM 260. See section 6.1.2 Inserting the SIM card .
4	Connect the mains cable to CIU 262 and power on the CIU 262. See the CIU quick guide instruction.
5	Power on the Grundfos product
6	Observe that LED2 turns permanently green indicating that CIM 260 is fitted correctly in the CIU unit. See section 6.2 LEDs .
7	Observe that LED1 blinks yellow and changes to yellow pulsing after approximately 30 s, indicating that the cellular network connection is working. See section 6.2 LEDs . By making a call-up from a phone the connection can be verified, LED1 turns permanently yellow.
8	To configure CIU 262 for a call-up connection, follow the instructions in the "CIM 260 SMS commands installation and operating instructions", which you can find in Grundfos Product Center.
9	To verify the settings after completion, use the SMS command "SMSSETTINGS".

CIU 262 is now ready to be accessed from a Modbus RTU master via call-up or via SMS commands.

11.3 Hardware setup, CIU 262 data connection

Step	Action
1	Connect the communication cables from CIU 262 to the wastewater pumps. See CIU quick guide instruction.
2	Fit an antenna to the CIM module SMA connector. See section 6.1.1 Fitting a cellular antenna .
3	Insert the SIM card in CIM 260. See section 6.1.2 Inserting the SIM card .
4	Connect the mains cable to CIU 262, and power on the CIU 262. See the CIU quick-guide instruction
5	Power on the Grundfos product.
6	Observe that LED2 turns permanently green, indicating that CIM 260 is fitted correctly in the CIU unit. See section 6.2 LEDs .
7	Observe that LED1 blinks yellow and changes to yellow pulsing after approximately 30 s, indicating that the data connection is working. See section 6.2 LEDs .
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.

CIU 262 is now ready to be accessed from a Modbus TCP master via a data connection or via SMS commands.

11.4 CIU 502 Modbus TCP communication setup

Step	Action
1	Check that both CIU 502 and the wastewater pump are powered off.
2	Remove the front cover of the CIU 502 unit.
3	Select position 1 at the CIM 500 module protocol rotary switch. See section 7.2 Setting the Industrial Ethernet protocol .
4	Connect the communication cables from CIU 502 to the wastewater pump. See CIU quick guide.
5	Power on the CIU 502 unit and the wastewater pump, and observe LED2 turn permanently green and LED1 remaining off.
6	Connect one of the CIU 502 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. See section A.1 How to configure an IP address on your PC on page 57.
8	Open your internet browser and make contact to the CIM 500 webserver. Default address: 192.168.1.100
9	Log in to the webserver. Default: User name: 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 webbrowser.

CIU 502 is now ready to be accessed from a Modbus TCP master via one of its ethernet ports. Use the IP address selected under step 10. The Modbus address (Unit ID) in the Modbus TCP telegram is not used.

- The CIU 502 LED 1 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.

12. Detailed descriptions of functionality

12.1 Call-up

12.1.1 Call-up functional description

The call-up function is used for SCADA system communication via the cellular network. Connection is established when the SCADA system dials CIU 262. CIU 262 automatically 'picks up the phone' and waits for data traffic in the form of Modbus RTU telegrams.

If legal data traffic is not initiated within one minute, CIU 262 hangs up the line. This silence timeout is active during the whole communication session. Whenever the SCADA system has completed the Modbus communication, it hangs up the line. This is detected by CIU 262, which also hangs up the line, and the call-up communication session is thereby completed. See fig. 20.

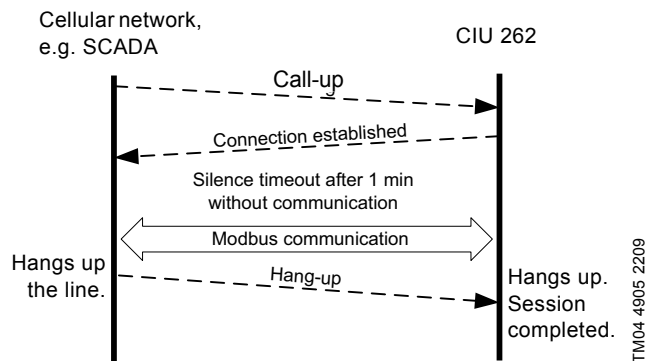


Fig. 20 Illustration of a call-up session

12.1.2 SCADA PIN code protection

It is always possible to get read access via Modbus, but if CIU 262 is SCADA PIN-code protected (GeneralStatus register 00029, bit 0: 1), write access requires that the correct PIN code (ScadaPinCode, register 00011) is written. Writing the correct PIN code triggers the write access control, and write access is opened, which can be verified with GeneralStatus, register 00029, bit 1: 1).

For call-up connections with PIN code protection, the ScadaPinCode register has to be written each time a new call-up is made.

12.1.3 Call-up options setup

To prepare CIU 262 for Modbus communication with a SCADA system via a call-up connection, some settings have to be made via SMS commands:

- Setting a SCADA PIN code:
SETSCADACODE <access code> enables 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 value is 231.

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

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

12.2 APN

12.2.1 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 262 is within range of the service. With it, 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 itself 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. 21.

12.2.2 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 will also get from the service provider.

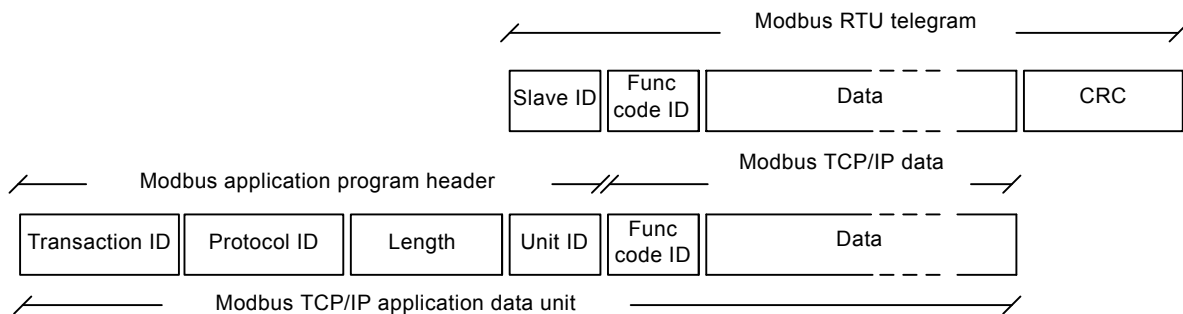


Fig. 21 Modbus TCP telegram

12.2.3 Installation

To prepare CIU 262 for data communication, configure some settings 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.

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 value is "Normal".
- Select Connection type:
CONNECTION <SERVER | CLIENT | DISABLE>
Default value is "Server".
- Set data roaming:
DATAROAMING: <ON | OFF>
Default value is "Off".
- Select Modbus TCP port number:
MODBUSPORT <port number>
Default value is 502.
- Select GENIpro port number:
GENIPROPORT <port number>
Default value is 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>,<GENIproport>,<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.

12.2.4 Operation

When powering on CIU 262 with the correct APN settings, the following APN connection sequence takes place:

1. CIU 262 locates the APN service. The connection state changes from "Detached" to "Attached".
2. CIU 262 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 associated with this SIM card to assign to CIU 262. After CIU 262 has got the IP address, the connection state changes to "Context active".
3. CIU 262 is now ready for a client, for example SCADA system to establish a socket connection and begin TCP/IP data exchange. When a client connects CIU 262, the connection state changes to "Connected", and the cellular connection status LED1 indicates when data transfer takes place. See section [5.5 LEDs](#).



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 CIU 262 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 CIU 262 is completely transparent.

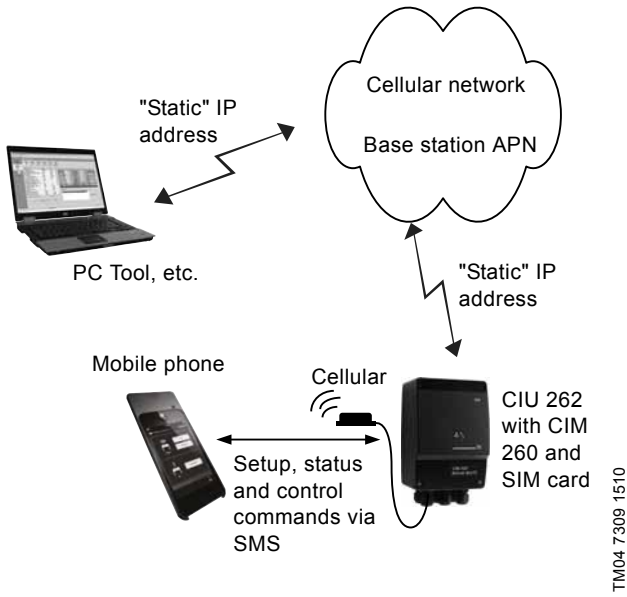
The protection against unauthorised data access is high. The access to the APN network from the Internet can only take place via the VPN tunnel. See fig. 23. Moreover, data transfer requires a Modbus master client, knowledge of the Modbus functional profile and the use of a SCADA PIN code, if enabled.

CIU 262 supervises the APN connection system to ensure that it is still working. An automatic procedure ensures restarting of CIU 262 and repetition of the APN 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.

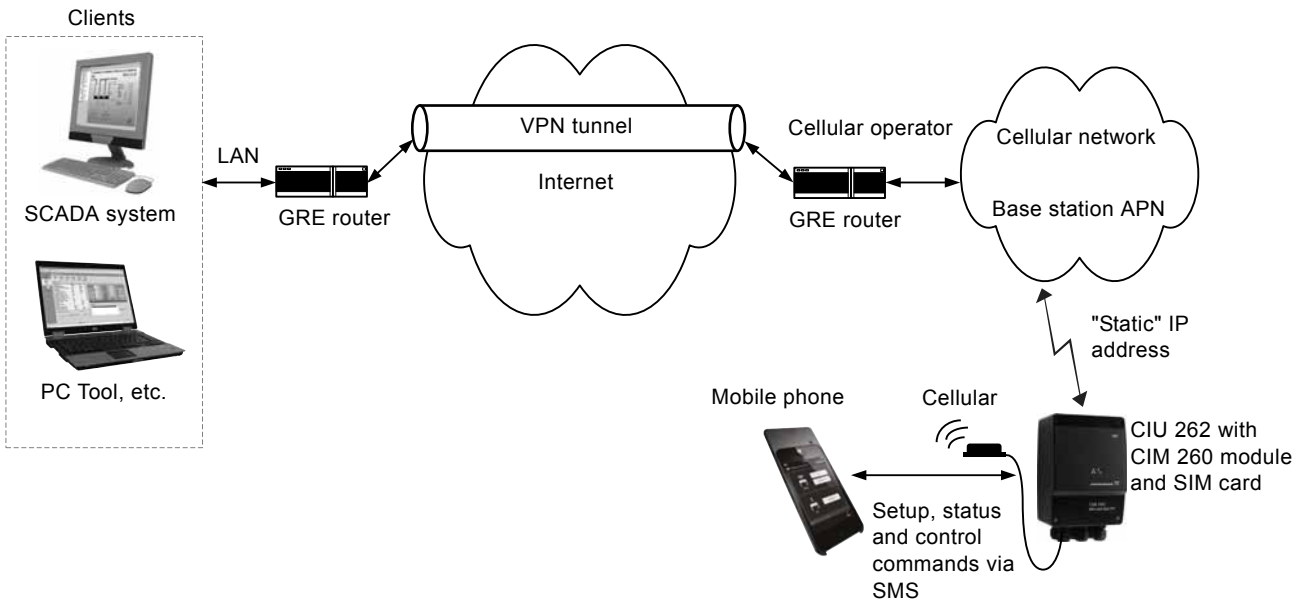
If the connection state is different from "Connected", it is possible to establish a call-up connection. When the call-up connection is established, APN data exchange is blocked until the call-up is terminated by the caller.

A total of three Modbus clients can be connected to the Modbus TCP port of CIU 262 and communicate simultaneously. Each connection, called a socket connection, is handled independently. If all three sockets are used simultaneously, a "Silence timeout" of only one minute is used to prevent a complete occupation for a long time.



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Fig. 22 Data connection from a PC to the CIU 262 directly



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Fig. 23 Cellular connection via VPN tunnel

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 (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 0-16 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

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 13.7 Diagnostics register interpretation .
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/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.
0x12	Return bus character overrun count Returns the number of overruns in the slave.
0x14	Clear overrun counter Clears the overrun counter (this is also cleared on power-up/restart).

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

13.7 Diagnostics register interpretation

The diagnostics register is interpreted as follows:

Bit	Description
0	Communication failure with the Grundfos product.
1	EEPROM self-test failed. The test is carried out when system is booted.
2	Grundfos product not supported.
3	Modbus address offset is different from default value, i.e. it differs from 0.
4	Using software-defined Modbus transmission speed (Modbus RTU only).
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 section [14. Fault finding](#).

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: 0x0001
Start address LO	0x00	
Quantity HI	0x00	Number of registers: 0x0004
Quantity LO	0x04	

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 : 0x000A
00001 LO	0x0A	
00002 HI	0x00	RegisterOffset: 0x0000
00002 LO	0x00	
00003 HI	0x00	Reserved value: 0x0000
00003 LO	0x00	
00004 HI	0x00	SoftwareDefinedBitRate: 0x0004
00004 LO	0x04	

If there is no response from the slave, see section [14. Fault finding](#).

13.10 Reading the pit water level

This section shows how to read and interpret the water level of the pit. 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	0x01	Start address (00301):0x012D
Start address LO	0x2C	
Quantity HI	0x00	Number of registers: 0x0001
Quantity LO	0x01	

Example of response from slave to master

Field	Value	Description
Slave address	0x01	-
Function code	0x04	Read input registers
Byte count	0x02	2 bytes follow
00301 HI	0x00	Pit water level: 0x00DC (220)
00301 LO	0xDC	

A pit water level value of 220 [0.01 m] equals a water level of 2.20 metres.

If there is no response from the slave, see section [14. Fault finding](#).

13.11 Reset alarm

This section shows how to reset an alarm. In the example, slave address 0x01 (1) is used. The ResetAlarm is the first bit in register 00101, so the bit must be set from 0 to 1.

Request from master to slave

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

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: 00101 (0x0065)
Start address LO	0x64	-
Value HI	0x00	Set the value to 1.
Value LO	0x01	-

If there is no response from the slave, see section [14. Fault finding](#).

14. Fault finding

14.1 CIU 202

You can detect faults in a CIU 202 by observing the status of the two communication LEDs. See the table below and section [4. Specifications](#).

14.1.1 LED status

Fault (LED status)	Possible cause	Remedy
1. LED1 and LED2 remain off when the power supply is connected.	a) CIM 200 is fitted incorrectly in CIU 202. b) CIU 202 is defective.	Ensure that CIM 200 is fitted correctly. Replace CIU 202.
2. LED2 for internal communication is flashing red.	a) No internal communication between CIM 200 and CIU 202.	Ensure that CIM 200 is fitted correctly in CIU 202.
3. The LED2 for internal communication is permanently red.	a) CIM 200 does not support the in which it is installed.	Contact the nearest Grundfos company.
4. The Modbus LED1 is permanently red.	a) Fault in the CIM 200 Modbus configuration.	<ul style="list-style-type: none"> • 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 bits/s. • Check that the Modbus address (switches SW6 and SW7) has a valid value [1-247].
5. The Modbus LED1 is flashing red.	a) Fault in the Modbus communication (fault in parity or cyclic redundancy check).	<ul style="list-style-type: none"> • Check the transmission speed, switches SW4 and SW5. See section 5.1 Setting the Modbus transmission speed. • Check the parity settings, switch SW3. See section 5.2 Setting the parity. • Check the cable connection between CIM 200 and the Modbus network. • Check the termination resistor settings, switches SW1 and SW2. See section 5.4 Termination resistor.

14.1.2 CIU 202 Modbus communication faults

Fault	Possible cause	Remedy
1. The slave does not respond to telegrams.	a) Configuration or wiring error.	<ul style="list-style-type: none"> Check the visual diagnostics on the Modbus slave. Is the Grundfos GENiBus LED flashing green and the Modbus LED off or flashing green? Ensure that the cable between the Modbus master and the Modbus slave is connected correctly. See section 5. CIM 200 Modbus RTU setup for wiring recommendations. Ensure that the slave address is configured correctly, and that the correct slave address is used in the Modbus master poll. See section 5.3 Modbus address selection for slave address selection. Ensure that the transmission speed and stop bit/parity settings are configured correctly in both master and slave. Ensure that each end of the Modbus trunk cable is terminated, if necessary. See section 5.4 Termination resistor for line termination of the Grundfos slave. Ensure that the bus topology for a Modbus network is correct.
	b) The slave may be in listen-only mode.	Either send a restart communications diagnostics command, or restart the Grundfos product manually.
	c) 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 timeout span in the master in order to communicate.
2. The slave responds with exception response 0x01: "Invalid function".	a) The master is trying to use an unsupported function in CIU 202.	See section 8. Modbus function code overview for supported function codes. Note that reading and writing coils are not supported, so only register functions and diagnostics will be valid.
3. The slave responds with exception response 0x02: "Invalid data address".	a) 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"> Avoid reading or writing invalid data addresses. Ensure that register X is addressed as X - 1 in Modbus telegrams, according to the Modbus standard.
	b) 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.
4. The slave returns data value 0xFFFF (65535).	a) 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 Grundfos product.	See section 9. Modbus register overview for available data.
	b) The Grundfos product is not configured to show the value or lacks a sensor to read the value.	See section 9.7 Pit data register block for data values that require a sensor.
5. The slave does not change Modbus transmission speed with register 0004.	a) Configuration error.	Set the transmission speed switches to "Software-defined". Otherwise, the value in register 0004 is ignored by the slave.
	b) An invalid value may be set in register 00004.	See section 5.1 Setting the Modbus transmission speed for invalid values, and set correct value in register 00004.

14.2 CIU 262

You can detect faults in CIU 262 by observing the status of the two communication LEDs. See the table below and section [4. Specifications](#).

14.2.1 LED status

Fault (LED status)	Possible cause	Remedy
1. LED1 and LED2 remain off when the power supply is connected.	a) CIM 260 is fitted incorrectly in the Grundfos product.	Ensure that CIM 260 is fitted and connected correctly.
	b) CIM 260 is defective.	Replace CIM 260.
2. LED2 for internal communication is flashing red.	a) No internal communication between CIM 260 and the Grundfos product.	Ensure that CIM 260 is fitted correctly in the Grundfos product.
3. LED2 for internal communication is permanently red.	a) CIM 260 does not support the Grundfos product connected.	Contact the nearest Grundfos company.
4. LED1 for cellular communication is flashing yellow. See signal 1 in fig. 13.	a) The SIM card has not been inserted.	Insert the SIM card. See section 6.1.2 Inserting the SIM card .
	b) The SIM card has not been inserted correctly.	Insert the SIM card. See section 6.1.2 Inserting the SIM card .
	c) The SIM card PIN code is not correct.	Enter the correct PIN code. See section 6.1.2 Inserting the SIM card .
	d) No connection to the cellular network.	<ul style="list-style-type: none"> • Check the connection to the antenna. • Check the cellular coverage of the area using for example a mobile phone. • Use an external antenna and experiment with the position.
5. LED1 for cellular communication is pulsating yellow with single pulse, but CIM 260 cannot send or receive SMS messages.	a) CIM 260 has not been initialised.	Follow the configuration procedure in "CIM 260 SMS commands" which you can download from Grundfos Product Center..

14.2.2 CIU 262 Modbus connection communication faults

Fault	Possible cause	Remedy
1. The slave does not respond to telegrams.	a) Configuration or installation error.	<ul style="list-style-type: none"> Ensure that CIU 262 has contact with the cellular network. LED1 should be pulsing yellow. If the LED1 signal is incorrect, see section 6. CIM 260 Modbus 3G/4G Cellular setup for correct installation of the CIM 260. Ensure that the correct slave address is used in the Modbus master poll. See register 00003 SoftwareDefinedModbusAddress (factory value is 00231).
	b) The slave may be in listen-only mode.	Either send a restart communications diagnostics command, or restart the product manually.
	c) 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.
2. The slave responds with exception response 0x01: "Invalid function".	a) The master is trying to use an unsupported function in CIU 262.	See section 13. Modbus RTU telegram examples for supported function codes. Note that reading and writing coils is not supported, so only register functions and diagnostics will be valid.
3. The slave responds with exception response 0x02: "Invalid data address".	a) 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 among 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.
4. The slave returns data value 0xFFFF (65535).	a) 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 pump which is not present will return "data not available", 0xFFFF.	See section 9. Modbus register overview for available data.
	b) With its present configuration or operating mode, the Grundfos product is unable to supply the requested data.	See section 9.7 Pit data register block for data values that require a sensor.
5. The slave does not react to control actions or to writing of settings.	a) CIU 262 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.

14.3 CIU 502

You can detect faults in CIU 502 by observing the status of the two communication LEDs. See the table below and section [4.4 CIU 502 Modbus TCP](#).

14.3.1 LED status

Fault (LED status)	Possible cause	Remedy
1. LED1 and LED2 remain off when the power supply is connected.	a) CIM 500 is fitted incorrectly in the Grundfos product.	Ensure that CIM 500 is fitted and connected correctly.
2. LED2 for internal communication is flashing red.	a) No internal communication between CIU 502 and the Grundfos product.	<ul style="list-style-type: none"> • Check the cable connection between the Grundfos product and CIU 502. • Check that the individual conductors have been fitted correctly, for example not reversed. • Check the power supply to the Grundfos product.
3. LED2 for internal communication is permanently red.	a) CIM 500 does not support the Grundfos product connected.	Contact the nearest Grundfos company.
4. The ethernet LED1 is permanently red.	a) Fault in CIM 500 Modbus TCP configuration.	<ul style="list-style-type: none"> • Check that the rotary switch SW1 is set to 1. • Check that Modbus TCP IP address configuration is correct. See section A.4 Modbus TCP configuration on page 58.
5. LED1 is permanently red and green at the same time.	a) Error in firmware download.	Use the webserver to download the firmware again.
6. LED2 is permanently red and green at the same time.	a) Memory fault.	Replace CIM 500.

14.3.2 CIU 502 Modbus TCP communication faults

Fault	Possible cause	Remedy
1. The slave does not respond to telegrams	a) Configuration or wiring error	<ul style="list-style-type: none"> • Check the visual diagnostics on the Modbus slave. Normal conditions are that the Grundfos GENIbus LED2 is permanently green and that the Modbus TCP LED1 is off or flashing green. If this is not fulfilled, see section 14.3.1 LED status. • Ensure that the cable between the Modbus TCP master and the Modbus slave is connected correctly. See section 7.1 Connecting the ethernet cable. • Ensure that the slave IP address is configured correctly, and that the correct slave IP address is used in the Modbus master poll. See section 7.3 Setting up the IP addresses.
2. The slave responds with exception response 0x01 "Invalid function"	a) The master is trying to use an unsupported function in CIU 502.	See section 8. Modbus function code overview . Modbus function code overview for supported function codes. Note that reading and writing coils is not supported, so only register functions and diagnostics will be valid.
3. The slave responds with exception response 0x02 "Invalid data address"	a) 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.
	b) 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.
4. The slave returns data value 0xFFFF (65535)	a) 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 Grundfos product.	See section 9. Modbus register overview for available data.
	b) The Grundfos product is not configured to show the value or lacks a sensor to read the value.	See section 9.7 Pit data register block for data values that require a sensor.

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

Code	Description	Code	Description	Code	Description
106	Electronic inverter protection activated (EIP)	141	-	176	Signal fault, temperature sensor 3 (t_mo3)
107	-	142	-	177	Signal fault, Smart trim gap sensor
108	-	143	-	178	Signal fault, vibration sensor
109	-	144	Motor temperature 3 (Pt100, t_mo3)	179	Signal fault, bearing temperature sensor (Pt100), general or top bearing
110	Skew load, electrical asymmetry	145	Bearing temperature high (Pt100), in general or top bearing	180	Signal fault, bearing temperature sensor (Pt100), middle bearing
111	Current asymmetry	146	Bearing temperature high (Pt100), middle bearing	181	Signal fault, PTC sensor (short-circuited)
1112	Cosφ too high	147	Bearing temperature high (Pt100), bottom bearing	182	Signal fault, bearing temperature sensor (Pt100), bottom bearing
113	Cosφ too low	148	Motor bearing temperature high (Pt100) in drive end (DE)	183	Signal fault, extra temperature sensor
114	Motor heater function activated (frost protection)	149	Motor bearing temperature high (Pt100) in non-drive end (NDE)	184	Signal fault, general-purpose sensor
115	Too many grinder reversals or grinder reversal attempt failed	150	Fault (add-on) pump module	185	Unknown sensor type
116	Grinder motor overtemperature	151	Fault, display (HMI)	186	Signal fault, power meter sensor
117	Intrusion (door opened)	152	Communication fault, add-on module	187	Signal fault, energy meter
118	Signal fault, hydrogen sulfide H2S sensor	153	Fault, analog output	188	Signal fault, user-defined sensor
119	Signal fault, analog input AI4	154	Communication fault, display	189	Signal fault, level sensor
120	Auxiliary winding fault (single phase motors)	155	Inrush fault	190	Limit exceeded, sensor 1 (for example alarm level in WW application)
121	Auxiliary winding current too high (single-phase motors)	156	Communication fault, internal frequency converter module	191	Limit exceeded, sensor 2 (for example high level in WW application)
122	Auxiliary winding current too low (single-phase motors)	157	Real-time clock out of order	192	Limit exceeded, sensor 3 (for example overflow level in WW application)
123	Start capacitor, low (single-phase motors)	158	Hardware circuit measurement fault	193	Limit exceeded, sensor 4 (for example low level in WW/tank filling application)
124	Run capacitor, low (single-phase motors)	159	CIM fault (Communication Interface Module)	194	Limit exceeded, sensor 5
125	Signal fault, outdoor temperature sensor	160	Cellular modem, SIM card fault	195	Limit exceeded, sensor 6
126	Signal fault, air temperature sensor	161	Sensor supply fault, 5 V	196	Operation with reduced efficiency
127	Signal fault, shunt relative pressure sensor	162	Sensor supply fault, 24 V	197	Operation with reduced pressure
128	Strainer clogged	163	Measurement fault, motor protection	198	Operation with increased power consumption
129	-	164	Signal fault, LiqTec sensor	199	Process out of range (monitoring, estimation, calculation, control)
130	-	165	Signal fault, analog input 1	200	Application alarm
131	-	166	Signal fault, analog input 2	201	External sensor input high
132	-	167	Signal fault, analog input 3	202	External sensor input low
133	-	168	Signal fault, pressure sensor	203	Alarm on all pumps
134	-	169	Signal fault, flow sensor	204	Inconsistency between sensors
135	-	170	Signal fault, water-in-oil (WIO) sensor	205	Level float switch sequence inconsistency
136	-	171	Signal fault, moisture sensor	206	Water shortage, level 1
137	-	172	Signal fault, atmospheric pressure sensor	207	Water leakage
138	-	173	Signal fault, rotor position sensor (Hall sensor)	208	Cavitation
139	-	174	Signal fault, rotor origo sensor	209	Non-return valve fault
140	-	175	Signal fault, temperature sensor 2 (t_mo2)	210	High pressure

Code	Description	Code	Description	Code	Description
211	Low pressure	226	Communication fault, I/O module	241	Motor phase failure
212	Diaphragm tank precharge pressure out of range	227	Combi event	242	Automatic motor model recognition failed
213	VFD not ready	228	Night flow max. limit exceeded	243	Motor relay has been forced (manually operated or commanded)
214	Water shortage, level 2	229	Water on floor	244	Fault, On/Off/Auto switch
215	Soft pressure buildup time-out	230	Network alarm	245	Pump continuous runtime too long
216	Pilot pump alarm	231	Ethernet: No IP address from DHCP server	246	User-defined relay has been forced (manually operated or commanded)
217	Alarm, general-purpose sensor high	232	Ethernet: Auto-disabled due to misuse	247	Power-on notice, (device or system has been switched off)
218	Alarm, general-purpose sensor low	233	Ethernet: IP address conflict	248	Fault, battery/UPS
219	Pressure relief not adequate	234	Backup pump alarm	249	User-defined event 1
220	Fault, motor contactor feedback	235	Gas detected	250	User-defined event 2
221	Fault, mixer contactor feedback	236	Pump 1 fault	251	User-defined event 3
222	Time for service, mixer	237	Pump 2 fault	252	User-defined event 4
223	Time for service, mixer	238	Pump 3 fault	253	SMS data from DDD sensor not received within time
224	Pump fault, due to auxiliary component or general fault	239	Pump 4 fault	254	Inconsistent data model
225	Communication fault, pump module	240	Lubricate bearings (specific service information)		

Appendix

The appendix describes the parts of the CIM 500 webserver needed for the configuration of a Modbus TCP ethernet connection. For other CIM 500 webserver features not specifically related to Modbus TCP, see the installation and operating instructions for CIM 500.

A.1 How to configure an IP address on your PC

To connect a PC to CIM 500 via ethernet, the PC must be set up to use a fixed, static, IP address belonging to the same subnetwork as CIM 500.

Note that before you can access the webserver, your PC must first be given an alternate IP address. If you have not already done this, follow the steps below:

Windows 10:

1. Click "Start".
2. Enter "Ethernet".
3. Select "Change adapter options".
4. Right-click "Ethernet".
5. Select "Properties".
6. Right-click "Internet protocol V4".
7. Select "Properties".
8. Select "Alternate configuration".

Windows 7:

1. Open "Control Panel".
2. Enter "Network and Sharing Center".
3. Select "Change adapter settings".
4. Right-click "Ethernet adapter".
5. Select "Local area connections".
6. Right-click "Internet protocol V4".
7. Select "Properties".
8. Select "Alternate configuration".

Key in IP address 192.168.1.10 and Subnet mask 255.255.255.0.

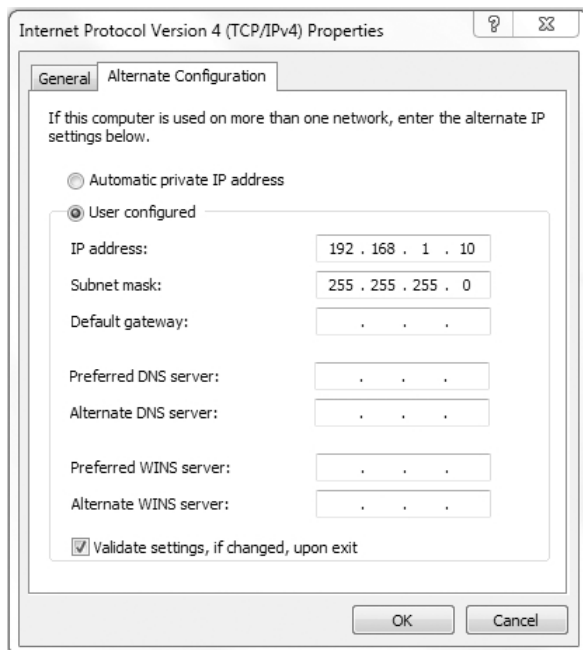


Fig. 1 Example from Windows 7

TM05 7422 1814

A.2 Webserver configuration

The built-in webserver is an easy and effective way to monitor the status of the CIM 500 module and configure the available functions and Industrial Ethernet protocols. The webserver also makes it possible to update the firmware of the CIM module and store or restore settings.

To establish a connection from a PC to CIM 500, proceed as follows:

Before configuration

- Check that the PC and CIM module are connected via an ethernet cable.
- Check that the PC ethernet port is set to the same network as the CIM module. For network configuration, see section [A.1 How to configure an IP address on your PC](#).

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

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

A.3 Login

Fig. 2 Login

TM05 6063 1814

User name	Enter user name. Default: admin.
-----------	----------------------------------

Password	Enter password. Default: Grundfos.
----------	------------------------------------



User name and password can be changed on the webserver under "User Management".

A.4 Modbus TCP configuration

Fig. 3 Real Time Ethernet Protocol Configuration - Modbus TCP

TM05 6064 1814

Object	Description
TCP Port Number	The default value is 502, the official IANA-assigned Modbus TCP port number. Number 502 will always be active implicitly. If you select another value in the webserver configuration field, both the new value and value 502 will be active.
IP Address	The static IP address for CIM 500 on the Modbus TCP network.
Subnet Mask	The subnet mask for the CIM 500 module on the Modbus TCP network.
Gateway	The default gateway for the Modbus TCP network.
Use DHCP	The CIM 500 module can be configured to automatically obtain the IP address from a DHCP server on the network.

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