

EtherNet/IP for Grundfos pumps

CIM/CIU 500 Ethernet

Functional profile and user manual



Original functional profile and user manual.

This functional profile describes Grundfos EtherNet/IP for pumps.

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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:

- CIM/CIU 500 Ethernet for EtherNet/IP.

This functional profile applies to the following Grundfos products:

- Grundfos CRE/CRNE/CRIE, MTRE, CHIE, CME
- Grundfos TPE, TPE Series 2000, TPE3, NBE/NKE
- Grundfos CUE drive
- Grundfos MAGNA3.

In the following, the supported products are referred to as "E-pump".

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

2.2 EDS file

For this product, an associated Electronic Data Sheet file (Grundfos_EIP_Pump_Adapter_EDS.eds) can be downloaded from the Grundfos Product Center.

2.3 Assumptions

This functional profile assumes that the reader is familiar with commissioning and programming of EtherNet/IP devices.

2.4 Definitions and abbreviations

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, 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.
Enumeration	List of values.
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.
Local mode	The E-pump uses the setpoint, operating mode and control mode set with Grundfos GO Remote or by the use of buttons on the pump.
MAC	Media Access Control. Unique network address for a piece of hardware.
Ping	Packet InterNet Groper. A software utility that tests connectivity between two TCP/IP hosts.
Q	Flow rate

Remote mode	The E-pump uses the setpoint, operating mode and control mode set from EtherNet/IP.
SELV	Separated or Safety Extra-Low Voltage.
SELV-E	Separated or Safety Extra-Low Voltage with earth connection.
TCP/IP	Transmission Control Protocol/Internet Protocol. Protocol for Internet communication, and also used as middle-layer protocol for most Ethernet-based fieldbuses.
URL	Uniform Resource Locator. The address used to connect to a server.
UTC	Coordinated Universal Time. The primary time standard by which the world regulates clocks and time.
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 give an overview of how to connect CIM/CIU 500 to the Grundfos E-pump that is to be connected to a EtherNet/IP network.

CIM solution

The module is an add-on communication module that you install internally in a Grundfos E-pump, using a 10-pin connection. In this setup, the E-pump supplies power to the module. See fig. 1.

CIU solution

The unit is a box with power supply and a CIM 500 module. You can mount it either on a DIN rail or on a wall. See fig. 2.

You use it in conjunction with a Grundfos E-pump that does not support an internal, add-on communication module, CIM. The enclosure class is IP54.

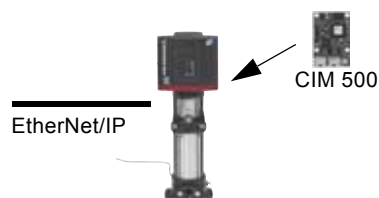


Fig. 1 Example of a CIM 500 solution. The module is installed inside the pump. The figure shows a CRE pump.

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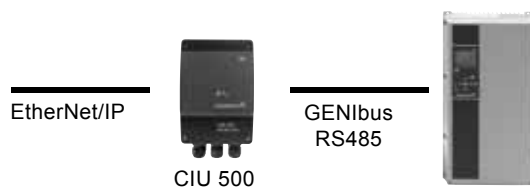


Fig. 2 Example of a CIU 500 solution. The figure shows a CUE drive for pumps.

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4. Specifications

4.1 CIM module

General data	Description	Comments
Ambient humidity	30-95 %	Relative, non-condensing.
Operating temperature	-20 to +45 °C	
Storage temperature	-25 to +70 °C	
GENIbus visual diagnostics	LED2	The LED will be in one of these states: Off, permanently green, flashing red, permanently red. See section 5.5 Status LEDs .
Power supply (CIU)	24-240 V	Integrated in the unit.
GENIbus connection type (CIU)	RS-485, 3-wire + screen	Conductors: A, B and Y.
CIU box enclosure class	IP54	
CIU box dimensions (H x W x D)	182 x 108 x 82 mm	

4.2 CIM 500 Ethernet

CIM 500 Ethernet specifications	Description	Comments
Application layer	DHCP, HTTP, Ping, FTP, SMTP, SNMP, fieldbus protocols	
Transport layer	TCP	
Internet layer	Internet protocol V4 (IPv4)	
Link layer	ARP, Media Access Control (Ethernet)	
Ethernet cable	CAT5, CAT5e or CAT6	Supports auto cable-crossover detecting (Auto-MDIX).
Maximum cable length	100 metres at 10/100 Mbits/s	Corresponds to 328 feet.
Transmission speed	10 Mbits/s, 100 Mbits/s	Auto-detected.
Industrial Ethernet fieldbus protocols	PROFINET IO, Modbus TCP, BACnet IP, EtherNet/IP, GRM IP, Grundfos iSolutions Cloud	Selected with rotary switch. See section 5.2 Selection of Industrial Ethernet protocol .

4.3 EtherNet/IP

EtherNet/IP specifications	Description
Minimum requested packet interval	15 ms
I/O data	505 bytes output 509 bytes input Maximum 255 bytes I/O data per assembly.
Number of IO connections	10 Default; configurable depending on available socket resources.
Number of encapsulation sessions	10 Default; configurable depending on available socket resources.
Number of explicit messaging connections	2 explicit messaging connections per encapsulation session 20 explicit messaging connections in total, configurable.
User-specific objects	Object 100. Depending on the connected product. <ul style="list-style-type: none"> • Grundfos pump • Grundfos booster • Grundfos dosing.
Maximum number of connections	2 explicit messaging connections x 10 encapsulation sessions Additional 10 I/O connections Total: 30 connections.
Standard objects	<ul style="list-style-type: none"> • Identity object (class 0x01) • Message Router object (class 0x02) • Assembly object (class 0x04). Assembly: up to 32 • Connection Manager object (class 0x06) • Device Level Ring (DLR) object (0x47) • Quality of Service (QoS) object (0x48) • TCP/IP Interface object (0xF5) • Ethernet Link object (0xF6)
DHCP	Supported
Functional scope	<ul style="list-style-type: none"> • Adapter • Support of 2 Ethernet Link objects for implementing ring and daisy chain topologies • Device Level Ring (DLR) protocol (announce-based ring node) • Quality of Service (QoS) • IPv4 Address Conflict Detection (ACD)
Watchdog	Communication watchdog with fixed 5 seconds time-out. It can be enabled via the CIM 500 web page.
Certificate	Plugfest December 2018, Conformance July 2019.

5. EtherNet/IP, CIM 500 setup



WARNING

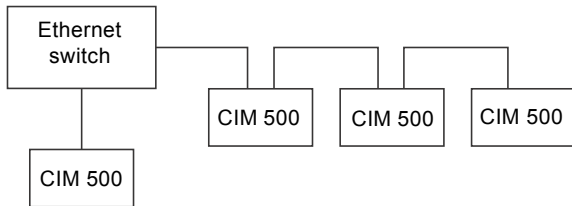
Electric shock

Death or serious personal injury
 - Connect CIM 500 only to SELV or SELV-E circuits.

5.1 Connecting the Ethernet cable

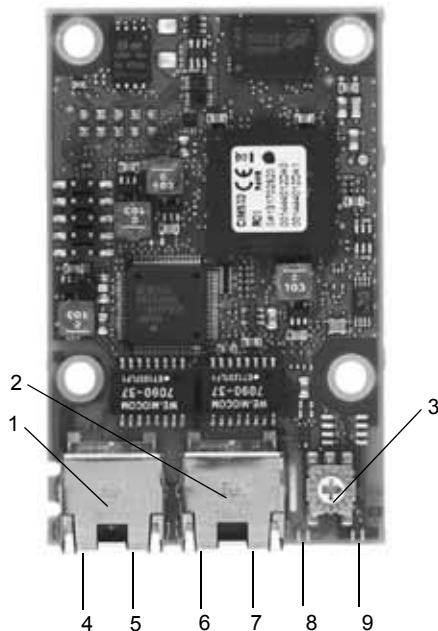
Use RJ45 plugs and an Ethernet cable. Connect the cable shield to protective earth at both ends.

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.



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Fig. 3 Example of Industrial Ethernet network with CIM 500



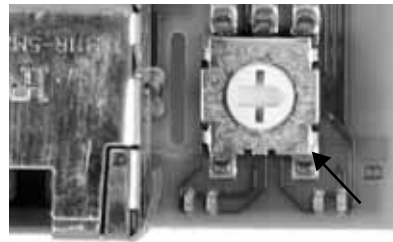
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Fig. 4 CIM 500 Ethernet module

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 module and pump	LED 2

5.2 Selection of Industrial Ethernet protocol

The module has a rotary switch for selection of the Industrial Ethernet protocol. See fig. 5.



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Fig. 5 Selecting the Industrial Ethernet protocol

Pos.	Description
0	PROFINET IO, default
1	Modbus TCP
2	BACnet IP
3	EtherNet/IP
4	GRM IP for Grundfos Remote Management, requires a contract with Grundfos.
5	Grundfos iSOLUTIONS Cloud (GiC)
6...E	Reserved. LED1 is permanently red to indicate an invalid configuration.
Resetting to factory settings.	
1. Set the rotary switch to this position	
2. LED1 starts to flash red and green for 20 seconds to indicate that factory resetting is about to take place.	
F	3. After 20 seconds, LED1 stops to flash and factory resetting is initiated.
4. When both LED1 and LED2 switch off, the resetting is completed. The rotary switch can be moved to another position.	



If the rotary switch position is changed when the module is powered on, the module will restart and use the protocol associated with the new position.

5.3 Setting the IP addresses

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

Default IP settings used by the webserver	IP address: 192.168.1.100
	Subnet mask: 255.255.255.0
	Gateway: 192.168.1.1
IP settings for EtherNet/IP	Make the settings via the webserver

5.4 Establishing a connection to the webserver

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

- Connect the PC and CIM 500 using an Ethernet cable.
- Configure the PC Ethernet port to the same subnetwork as CIM 500, for example 192.168.1.101, and the subnet mask to 255.255.255.0. See section [A.2 Webserver configuration](#) on page 29.
- Open a standard Internet browser and type 192.168.1.100 in the URL field.
- Log in to the webserver using the following:

User	admin (default)
Password	Grundfos (default)

The first time you log in, you will be asked to change the password.



The username and password may have been changed from their default values.

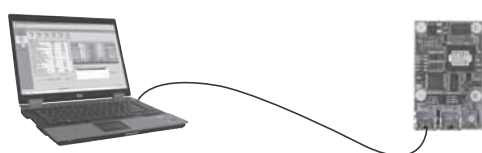


Fig. 6 CIM 500 connected to a PC

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



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

5.5 Status LEDs

The CIM 500 Ethernet module has two Status LEDs, LED1 and LED2. See fig. 4.

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

LED1

Status	Description
Off	Ethernet Link is not active.
Permanently green	Ethernet Link is active, connection is established.
Flashing green	Ethernet Link is active, no connection is established.
Permanently red	Ethernet Link is active, IP address conflict is detected.
Flashing red	Ethernet Link is active, any connection is timed out.

LED2

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



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

5.6 DATA and LINK LEDs

The CIM 500 Ethernet module has two connectivity LEDs related to each RJ45 connector. See fig. 4.

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 is ongoing on the RJ45 connector.
Permanently yellow	Heavy network traffic on the RJ45 connector.

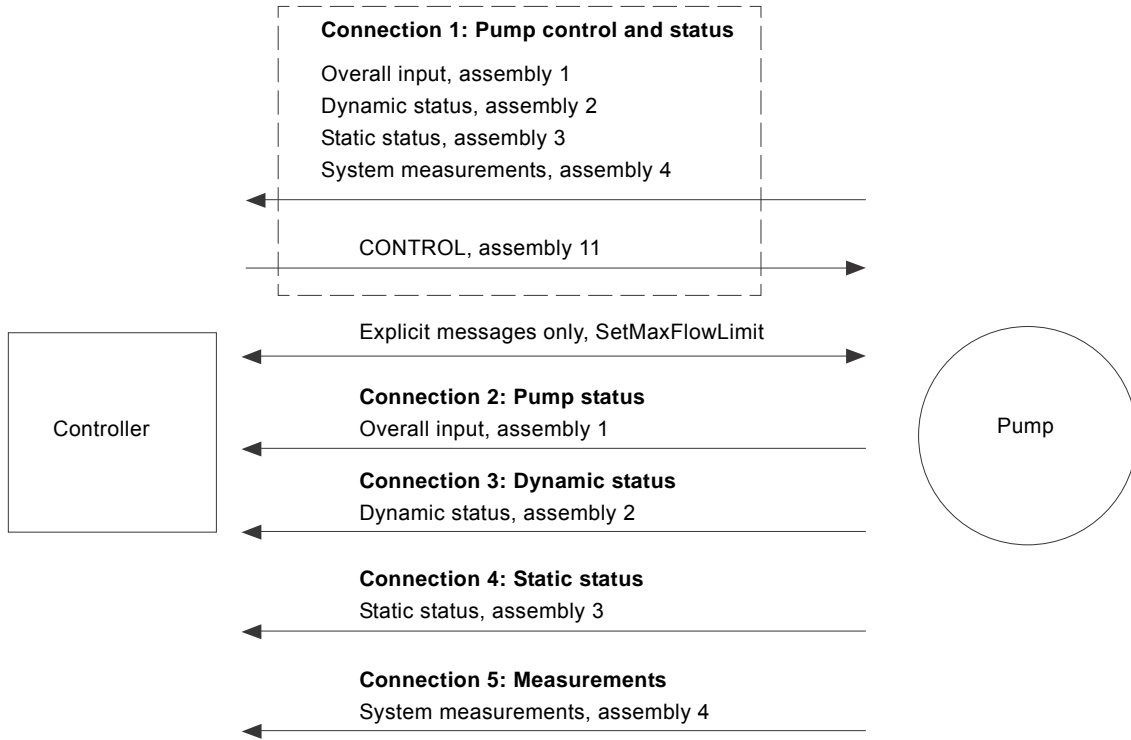
LINK1 and LINK2

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

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

6. Detailed description of data parameters

6.1 Connection and assembly overview



6.2 Control parameters, output assembly 11

Table legend

CUE: Pumps with CUE drive only.

MGE: Pumps with MGE motor only.

H: Only available on model H and later versions.

S: Sensor required.

•: Always available.

*: If the E-pump is a TPE3 or a TPE Series 2000, the value is estimated and always available.

Parameter	Name	Data type	Scaling	Range/ Resolution	Description	MGE 0.25 - 7.5 kW	MGE 11-22 kW + CUE	MAGNA3
1	SetRemoteLocal	SINT8, 0xC2	Bool (state)	0, 1	Setting of Remote/Local state	•	•	•
2	SetOnOff	SINT8, 0xC2	Bool (state)	0, 1	Setting of On/Off state	•	•	•
3	SetCopyToLocal	SINT8, 0xC2	Bool (state)	0, 1	Setting of Copy to local state	H	CUE	•
4	SetRelayOutput1	SINT8, 0xC2	Bool (state)	0, 1	Setting of Relay output 1	•	•	-
5	SetRelayOutput2	SINT8, 0xC2	Bool (state)	0, 1	Setting of Relay output 2	•	•	-
6	SetRelayOutput3	SINT8, 0xC2	Bool (state)	0, 1	Setting of Relay output 3	H	-	-
7	SetRelayOutput4	SINT8, 0xC2	Bool (state)	0, 1	Setting of Relay output 4	H	-	-
8	TrigResetAlarm	SINT8, 0xC2	Bool (event)	↑ 1 (edge)	Command: Triggers alarms reset	•	•	•
9	SetReserved1	SINT8, 0xC2	Bool	0, 1	Reserved	-	-	-
10	SetReserved2	SINT8, 0xC2	Bool	0, 1	Reserved	-	-	-
20	SetControlMode	SINT16, 0xC3	Enum	0-255	Select Control mode			
					0: Constant Speed	•	•	•
					1: Constant Frequency	•	•	•
					3: Constant Head	S	S	•
					4: Constant Pressure	S	S	•
					5: Constant Diff. Pressure	H+S	-	-
					6: Proportional Pressure	S	S	•
					7: Constant Flow	H+S*	-	•
					8: Constant Temperature	H+S	-	•
					9: Constant Temp. Difference	H+S	-	S
					10: Constant Level	H+S	-	-
					128: Auto-Adaption	S	MGE	•
					129: Flow Adaption	H+S	-	•
130: Closed Loop Sensor Control	H+S	-	-					
21	SetOperatingMode	SINT16, 0xC3	Enum	0-255	Select Operating mode			
					0: AutoControl	•	•	•
					4: Minimum	•	•	•
					6: Maximum	•	•	•
30	SetSetpoint	SINT16, 0xC3	0.01 %	0 - 327.67 %	Setting of SetSetpoint	•	•	•
40	SetRTCValue	SINT32, 0xC4	Unix time	0 - (2 ³¹ -1) s	Setting of Real Time Clock	H	-	•

6.2.1 Explanation to event trigger

Rising edge

Control bits with a rising-edge event trigger behave like a command that is executed when a bit transition from "0" to "1" occurs. Each of them has a corresponding acknowledge bit in parameter 100, which is set when the command is executed, and cleared when the control bit is written back to "0".

State

Control bits with a state event trigger behave like a "state" that is forced upon the E-pump. In the CIM 500 module, the "actual state" of the E-pump is continuously compared with the "requested" state in the control bits, and the module writes the appropriate GENbus command to the E-pump to make the two states correspond to each other. Due to state restrictions or priorities, this might not always be possible, see the explanation to the bit in question.

6.2.2 Explanation to control bits

SetRemoteLocal

Control bit for setting the E-pump in remote mode (controlled from the bus), or in local mode (controlled from the operating panel or Grundfos GO Remote):

0:	The E-pump is set to local mode and operates according to its local operating mode, setpoint and control mode. With this setting, the other control bits will have no influence.
1:	The E-pump is set to remote mode and operates according to the operating mode, setpoint and control mode written to it. The other control bits will also be active.

However, certain commands from other control sources, for example Stop or Max. from a local source or external Stop from a digital input, have a higher priority and overrule the control from the bus. The RemoteLocal status bit will have the value "0" if this is the case. See section [6.4.1 Explanation to the dynamic status parameters](#).

SetOnOff

Control bit used to start and stop the E-pump:

0:	For stopping the E-pump remotely.
1:	For starting the E-pump remotely.

SetCopyToLocal

Control bit for making the E-pump copy its remote settings for the operating mode, setpoint and control mode to its local settings. Whenever this bit is set, switching the E-pump from remote to local, like the EtherNet/IP watchdog does, will not influence the behaviour of the E-pump.

Copy of Control Context, which is Control mode, Operating mode, On/Off and SetSetpoint, from the remote settings to the local settings takes place when CopyToLocal has been enabled, but only during a Remote->Local transition.

It is necessary to introduce such a transition whenever the user wants the local setting to be updated and stored in the EEPROM in the E-pump.

0:	Copy to local settings inactive.
1:	Copy to local settings active.

SetRelayOutput 1-4

This module can control the electromechanical relays in the E-pump if they are configured via a Grundfos PC Tool to be bus-controlled.

Only available for MGE and CUE based pumps.

Bit	Name	Event trigger	Description
0	OutputRelay1Control	State	
1	OutputRelay2Control	State	0: Relay inactive.
2	OutputRelay3Control	State	1: Relay active.
3	OutputRelay4Control	State	

Relay 3 and 4 are only available for MGE model H and later.

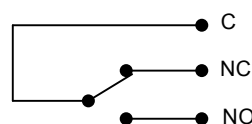


Fig. 7 Relay output shown in inactive state

TrigResetAlarm

Control bit that resets alarms and warnings. During transitions from "0" to "1" (positive edge triggered).

6.2.3 Explanation to control mode

SetControlMode

Control enumeration for selection of the remote control mode.

Control modes	Description	Illustration
<ul style="list-style-type: none"> > ConstSpeed (0) > ConstFreq (1) 	<p>The setpoint of the E-pump is a percentage of the maximum performance.</p> <p>No sensor is required, and in these modes the E-pump is operating in open-loop control.</p>	
<ul style="list-style-type: none"> > ConstHead (3) > ConstPressure (4) > ConstDiffPressure (5) 	<p>The setpoint of the E-pump is interpreted as the setpoint for the pressure.</p> <p>In these modes, the E-pump operates in closed-loop control and adapts its speed so that the pressure is constant, regardless of the flow.</p> <p>A pressure sensor is required for all pump types, except MAGNA3.</p>	
<ul style="list-style-type: none"> > ConstFlow (7) > ConstTemp (8) > ConstTempDiff (9) > ConstLev (10) 	<p>The setpoint of the E-pump is interpreted as the setpoint for the flow, temperature or level. ConstFlow is indicated in the figure.</p> <p>In these modes, the E-pump operates in closed-loop control, and a relevant sensor is required:</p> <ul style="list-style-type: none"> • a temperature sensor for temperature control • a level sensor for level control • a flow sensor for flow control. <p>MAGNA3 has a built-in sensor for ConstFlow and ConstTemp control.</p>	
<ul style="list-style-type: none"> > PropPress (6) 	<p>The setpoint of the E-pump is interpreted as a proportional-pressure setpoint as shown in the figure.</p> <p>This is a closed-loop control mode, and a pressure sensor is required for all pump types, except MAGNA3.</p>	
<ul style="list-style-type: none"> > AUTO_{ADAPT} (128) 	<p>In this control mode, the setpoint curve is a proportional-pressure curve where the setpoint has been set from factory.</p> <p>The AUTO_{ADAPT} algorithm in the pump will over time optimise the setpoint value according to the pipe characteristics of the system. The setpoint curve will always be adjusted in a downward direction.</p> <p>A pressure sensor is required for all pump types, except MAGNA3.</p>	
<ul style="list-style-type: none"> > FLOW_{ADAPT} (129) 	<p>This control mode works similar to AUTO_{ADAPT}, except that the flow-limiting function, FLOW_{LIMIT}, is always active and limits the flow to the value of SetMaxFlowLimit (parameter 50).</p> <p>A pressure sensor is required for all pump types, except MAGNA3.</p>	
<ul style="list-style-type: none"> > ClosedLoopSensor (130) 	<p>This is a general purpose closed-loop control mode, that you can use in cases where the pump is used for a type of control not covered by one of the other control modes.</p>	

H = Pressure (head)

Q = Flow

Important notes to control mode

Only valid control modes are accepted. Not all control modes are supported for all E-pump types. If not supported, the resulting control mode, as read from ControlMode (parameter 103) will remain equal to the last valid control mode set via EtherNet/IP.

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6.2.4 Explanation to operating mode

Control enumeration for selection of the remote operating mode.

0:	AutoControl This is the normal mode. The E-pump is controlled according to the selected control mode and setpoint. See section 6.2.3 Explanation to control mode .
4:	Minimum The E-pump operates at a fixed minimum frequency.
6:	Maximum The E-pump operates at a fixed maximum frequency.

6.2.5 Setpoint in closed-loop control

The setpoint is written to SetSetpoint (parameter 30) as a percentage value scaled in 0.01 % of the setpoint range. The selected setpoint is reflected in UserSetpoint (parameter 300). The actual setpoint, whether it has been set via Grundfos GO Remote, the pump display, the pump buttons or the fieldbus, can be read from ActualSetpoint (parameter 301). It is a percentage value of FeedbackSensorMax (parameter 114).

Generally, the actual setpoint value represents head, pressure, flow, temperature and so on, depending on what the feedback sensor has been set to measure. The unit of measure can be read from FeedbackSensorUnit (parameter 112).

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

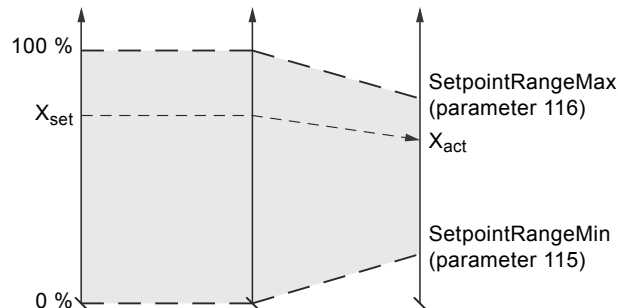
$$X_{act}[unit] = X_{set}[\%] \times (r_{max} - r_{min}) + r_{min}$$

Where:

$$r_{max} = \text{SetpointRangeMax} \times \text{FeedbackSensorMax} \times \text{FeedbackSensorUnit}$$

$$r_{min} = \text{SetpointRangeMin} \times \text{FeedbackSensorMax} \times \text{FeedbackSensorUnit}$$

SetSetpoint* (parameter 30)	UserSetpoint* (parameter 300)	ActualSetpoint** (parameter 301)
--------------------------------	----------------------------------	-------------------------------------



* Percentage of setpoint range.
** Percentage of sensor maximum.

Fig. 8 Setpoint in closed-loop control

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MAGNA3 40-100 example:

SetpointRangeMin: 5 %
SetpointRangeMax: 50 %
FeedbackSensorMax: 20
FeedbackSensorUnit: m

$$r_{max} = \text{SetpointRangeMax} \times \text{FeedbackSensorMax} \times \text{FeedbackSensorUnit} = 50 \% \times 20 \times \text{m} = 10 \text{ m}$$

$$r_{min} = \text{SetpointRangeMin} \times \text{FeedbackSensorMax} \times \text{FeedbackSensorUnit} = 5 \% \times 20 \times \text{m} = 1 \text{ m}$$

$$X_{act}[unit] = X_{set}[\%] \times (r_{max} - r_{min}) + r_{min}$$

$$X_{set}[\%] \times (10 \text{ m} - 1 \text{ m}) + 1 \text{ m}$$

$$X_{set}[\%] \times 9 \text{ m} + 1 \text{ m}$$

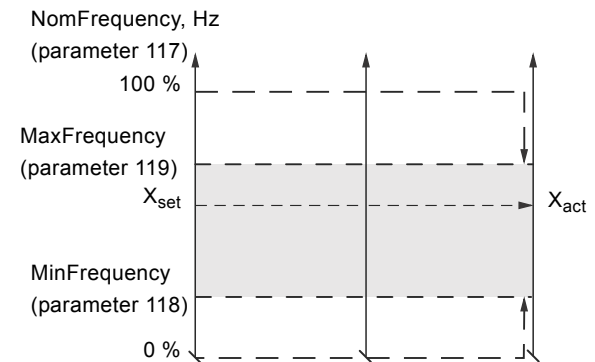
If $X_{set}[\%]$ has a value of 40 %, the pump will have an actual setpoint of $40 \% \times 9 \text{ m} + 1 \text{ m} = 4.6 \text{ m}$.

6.2.6 Setpoint in open-loop control

The setpoint is written to SetSetpoint (parameter 30) as a percentage value scaled in 0.01 % of the nominal frequency f_{nom} represented by NomFrequency (parameter 117). The selected setpoint is reflected in UserSetpoint (parameter 300) with the same scaling. From the fieldbus, it gets the value written to SetSetpoint, but from the pump display and Grundfos GO Remote, it is truncated to range $[f_{min}; f_{max}]$, represented by MaxFrequency (parameter 119) and MinFrequency (parameter 118).

The actual setpoint, whether it has been set via Grundfos GO Remote, the pump display, the pump buttons or the fieldbus, can be read from ActualSetpoint (parameter 301), and it always reflects the frequency limitations. It equals the value that the pump actually uses.

SetSetpoint* (parameter 30)	UserSetpoint* (parameter 300)	ActualSetpoint* (parameter 301)
--------------------------------	----------------------------------	------------------------------------



* Percentage of f_{nom} .

Fig. 9 Setpoint in open-loop control

TM07 0155 4317

6.2.7 Set RTC value

Use this output to set the internal real-time clock of the pump. The format of the clock value is Unix Time format. It is not possible to read the actual value of the real-time clock.

Only E-pumps with a graphical display support a built-in real-time clock. The real-time clock is used for time stamping of alarms, warnings and internal data logging. It has a built-in battery backup. If the power supply to the pump is switched off, the real-time clock will keep running and a new setting is not required.

6.3 Configuration parameters, Input/Output explicit messaging

Use this output parameter to adjust the maximum flow limit of the pump.

The pump flow will be limited by the maximum flow limit in any control mode if the $FLOW_{LIMIT}$ function has been enabled on the pump.

Only MAGNA3, TPE series 2000 and TPE3 support the $FLOW_{LIMIT}$ function.

Table legend

H: Only available on model H and later versions.

●: Always available.

Parameter	Name	Data type	Scaling	Range/ Resolution	Description	MGE 0.25 - 7.5 kW	MGE 11-22 kW + CUE	MAGNA3
50	SetMaxFlowLimit	SINT16, 0xC3	0.1 m ³ /h	0 - 3276.7 m ³ /h	Max flow limit of pump	H	-	●

6.4 Dynamic status parameters, input assembly 2

Dynamic status parameters are parameters that describe the actual modes and states of the E-pump. They are variables that can often change during operation of the E-pump.

This assembly is included in assembly 1.

Table legend

H: Only available on model H and later versions.

●: Always available.

CUE: Pumps with CUE drive only.

Parameter	Name	Data type	Scaling	Range/ Resolution	Description	MGE 0.25 - 7.5 kW	MGE 11-22 kW + CUE	MAGNA3
100	PumpStatus	WORD, 0xD2	Array of Bools		Miscellaneous states/modes			
	0: RemoteLocal		Bool (state)	0, 1	Present status of Remote/Local state	●	●	●
	1: OnOff				Present status of On/Off state	●	●	●
	2: CopyToLocal				Present status of Copy to local state	H	CUE	●
	3: AtMinSpeed				Speed at Min status	●	●	●
	4: AtMaxSpeed				Speed at Max status	●	●	●
	5: AtMaxPower				Power at Max status	H	-	●
	6: Rotation				Rotation	●	●	●
	7: Direction				Direction of rotation	●	●	●
	8: SetpointInfluence				Setpoint influence is active	H	-	●
	9: ResetAlarmAck				Set when "ResetAlarm" is triggered	●	●	●
	10: SetRTCAck				Set when SetRTC is triggered	●	-	●
	11: ForcedToLocal				Forced to local activated at pump	H	-	●
	12: LowFlowStop				Pump stopped due to low flow	H	-	●
	13: FlowEstBelowRange				Estimated flow is below range	H	-	●
14: FlowEstAboveRange	Estimated flow is above range	H			-	●		
101	Digital Outputs	BYTE, 0xD1	Array of Bools		Digital outputs			
	0: DO1		Bool (state)	0, 1	Status of Digital Output 1	●	●	●
	1: DO2				Status of Digital Output 2	●	●	●
	2: DO3				Status of Digital Output 3	H	-	-
	3: DO4				Status of Digital Output 4	H	-	-
102	Digital Inputs	BYTE, 0xD1	Array of Bools		Digital inputs			
	0: DI1		Bool (state)	0, 1	Status of Digital Input 1	●	●	●
	1: DI2				Status of Digital Input 2	●	●	●
	2: DI3				Status of Digital Input 3	●	●	●
	3: DI4				Status of Digital Input 4	●	●	-

Parameter	Name	Data type	Scaling	Range/ Resolution	Description	MGE 0.25 - 7.5 kW	MGE 11-22 kW + CUJE	MAGNA3		
103	ControlMode	SINT16, 0xC3	Enum	0-255	Present status of Control mode	•	•	•		
104	OperatingMode				Present status of Operating mode	•	•	•		
110	AlarmCode				Alarm code	•	•	•		
111	WarningCode				Warning code	•	•	•		
112	FeedbackSensorUnit				Feedback sensor unit 0: bar 1: mbar 2:m 3: kPa 4: psi 5: ft. 6: m ³ /h 7: m ³ /s 8: l/s 9: gpm 10: °C 11: °F 12: % 13: kelvin 14: l/h	•	•	•		
113	FeedbackSensorMin				1	0 - 32767	Feedback sensor minimum value	•	•	•
114	FeedbackSensorMax						Feedback sensor maximum value	•	•	•
115	SetpointRangeMin				0.01 %	0 - 327.67 %	Minimum setpoint in % of sensor maximum	H	-	•
116	SetpointRangeMax						Maximum setpoint in % of sensor maximum	H	-	•
117	NomFrequency				0.1 Hz	0 - 3276.7 Hz	Nominal pump frequency	H	-	•
118	MinFrequency				0.01 %	0 - 327.67 %	Minimum frequency in % of nom. frequency	H	-	•
119	MaxFrequency						Maximum frequency in % of nom. frequency	H	-	•

6.4.1 Explanation to the dynamic status parameters

RemoteLocal

Status bit indicating whether the E-pump is controlled from the bus or from some other control source.

-
- | | |
|----|---|
| 0: | The E-pump is controlled from a local source, buttons or Grundfos GO Remote or from an external digital input |
| 1: | The E-pump is controlled from EtherNet/IP, remotely |
-

To allow the E-pump to be controlled from the bus, the SetRemoteLocal control bit must be set to "1". However, certain commands from other control sources, for example Stop or Max. from a local source or external Stop from a digital input, have a higher priority. If active RemoteLocal bit reads "0", it indicates that the actual control source is not the bus.

OnOff

Status bit indicating whether the E-pump is started or stopped.

-
- | | |
|----|-----------------------|
| 0: | The E-pump is stopped |
| 1: | The E-pump is started |
-

The E-pump can be started and stopped from the bus by using the OnOff control bit SetOnOff.

"Started" does not necessarily indicate that the E-pump is pumping as it might be in a "low-flow stop" condition.

CopyToLocal

Indicates if the remote settings of setpoint operating mode, control mode and OnOff state must be automatically copied to local settings.

-
- | | |
|----|------------------|
| 0: | Copying disabled |
| 1: | Copying enabled |
-

AtMinSpeed

Status bit indicating that the E-pump is running at minimum speed.

-
- | | |
|----|--|
| 0: | The E-pump is not running at minimum speed |
| 1: | The E-pump is running at minimum speed |
-

AtMaxSpeed

Status bit indicating that the E-pump is running at maximum speed.

-
- | | |
|----|--|
| 0: | The E-pump is not running at maximum speed |
| 1: | The E-pump is running at maximum speed |
-

Only available on MAGNA3 and MGE model H and later.

AtMaxPower

Status bit indicating that the E-pump is running at maximum power limit.

Only available on MAGNA3 and MGE model H and later.

-
- | | |
|----|--|
| 0: | The E-pump is not running at maximum power limit |
| 1: | The E-pump is running at maximum power limit |
-

Rotation

Status bit indicating that the motor is rotating (consuming power).

-
- | | |
|----|-------------|
| 0: | No rotation |
| 1: | Rotation |
-

Direction

Status bit indicating the direction of rotation of the E-pump as seen from ventilator side.

-
- | | |
|----|------------------------|
| 0: | Clockwise (CW) |
| 1: | Counterclockwise (CCW) |
-

SetPointInfluence

Status bit indicating if the setpoint is influenced, for example by analog input or by temperature. If influenced, the ActualSetpoint (parameter 301) will differ from the UserSetpoint (parameter 300). Only available on MAGNA3 and MGE model H and later.

-
- | | |
|----|----------------------------|
| 0: | No setpoint influence |
| 1: | The setpoint is influenced |
-

ResetAlarmAck

Acknowledge bit belonging to the ResetAlarm control bit. It will be set when the control bit is set and the command has been executed. It will be cleared when the control bit is cleared.

SetRTCAck

Acknowledge bit belonging to the SetRTCValue. It is set when the real-time clock is updated.

ForcedToLocal

Status bit indicating that the E-pump has been "Forced to local mode" from display or from Grundfos GO Remote.

Only available on MAGNA3 and MGE model H and later.

-
- | | |
|----|---|
| 0: | The E-pump has not been "forced to local" |
| 1: | The E-pump has been "forced to local" |
-

LowFlowStop

Status bit indicating that the E-pump has stopped due to low flow. Only available on MAGNA3 and MGE model H and later.

-
- | | |
|----|-----------------------------|
| 0: | Low Flow Stop not activated |
| 1: | Low Flow Stop activated |
-

FlowEstimateBelowRange

The flow estimation is below its normal minimum range and a higher inaccuracy can be expected.

Only available on MAGNA3 and MGE model H and later.

-
- | | |
|----|---|
| 0: | The flow estimation is not below its normal range |
| 1: | The flow estimation is below its normal range |
-

FlowEstimateAboveRange

The flow estimation is above its normal maximum range and a higher inaccuracy can be expected.

Only available on MAGNA3 and MGE model H and later.

-
- | | |
|----|---|
| 0: | The flow estimation is not above its normal range |
| 1: | The flow estimation is above its normal range |
-

ControlMode

Status enumeration showing the actual E-pump control mode.

See section [6.2.3 Explanation to control mode](#) for detailed explanation to the various control modes.

OperatingMode

Status enumeration showing the actual E-pump operating mode.

See section [6.2.4 Explanation to operating mode](#) for detailed explanation to the various operating modes.

6.5 Illustration of closed-loop control

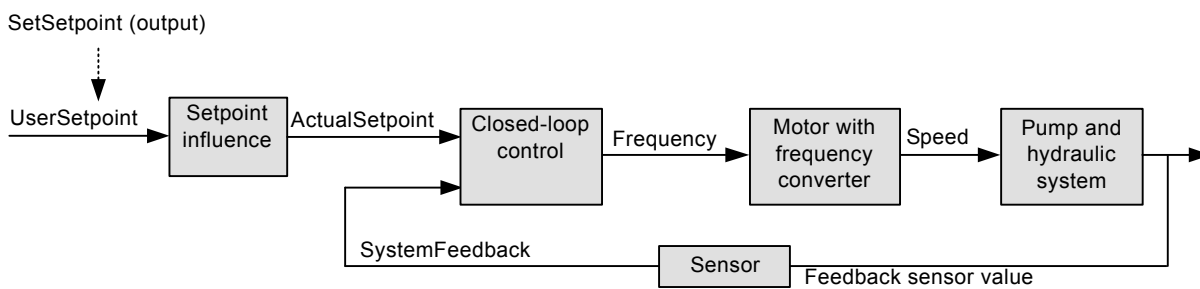


Fig. 10 Illustration of closed-loop control and the associated data parameters

SystemFeedback

In closed-loop control, this is the value of the controlled system variable (feedback/primary sensor). The system variable can always be compared directly with the ActualSetpoint variable. If no setpoint influence is active, it can also be compared with the SetSetpoint parameter.

In open-loop control, SetSetpoint is mapped to SystemFeedback. The value of the feedback sensor can be read in the corresponding measurement parameter. See section [6.8 Measured parameters, input assembly 4](#).

6.6 Alarms and warnings

Parameter	Name	Description
110	AlarmCode	Code for E-pump alarm.
111	WarningCode	Code for E-pump warning.

In the AlarmCode parameter, the cause of an E-pump alarm can be read. An E-pump alarm always leads to a reaction in the E-pump operation, usually the E-pump is stopped, but some alarms in some E-pump types have programmable alarm action types.

In the WarningCode parameter, the cause of an E-pump warning can be read. A warning has no influence on the E-pump operation.

The complete list of possible alarm and warning codes is shown below.

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

Code	Alarm and warning description
106	Electronic inverter protection activated (EIP)
148	Motor bearing temperature high (Pt100) in drive end (DE)
149	Motor bearing temperature high (Pt100) in non-drive end (NDE)
155	Inrush fault
156	Communication fault, internal frequency converter module
157	Real-time clock out of order
161	Sensor supply fault, 5 V
162	Sensor supply fault, 24 V
163	Measurement fault, motor protection
164	Signal fault, LiqTec sensor
165	Signal fault, analog input 1
166	Signal fault, analog input 2
167	Signal fault, analog input 3
175	Signal fault, temperature 2 sensor (t_mo2)
176	Signal fault, temperature 3 sensor (t_mo3)
190	Limit exceeded, sensor 1
191	Limit exceeded, sensor 2
215	Soft pressure buildup timeout
240	Lubricate bearings (specific service information)
241	Motor phase failure
242	Automatic motor model recognition failed

6.7 Static status parameters, input assembly 3

Static status parameters are parameters that describe characteristics of the E-pump. They are constants unable to change. This assembly is included in assembly 1.

Table legend

●: Always available.

Parameter	Name	Data type	Scaling	Range/ Resolution	Description	MGE 0.25 - 7.5 kW	MGE 11-22 kW + CUE	MAGNA3
200	UnitFamily	SINT8, 0xC2	Enum	0 - 127	Unit family	●	●	●
201	UnitType				Unit type	●	●	●
202	UnitVersion				Unit version	●	●	●
203	CIMSoftwareVersion		1		CIM 500 software version	●	●	●
204	CIMSoftwareRevision				CIM 500 software revision	●	●	●
205	CIMSoftwareFix				CIM 500 software fix	●	●	●
206	StatusReserved1				Reserved	-	-	-
207	StatusReserved2		Reserved		-	-	-	

6.7.1 Device identification

The UnitFamily and the UnitType parameters identify what E-pump product EtherNet/IP is connected to.

UnitFamily [enumeration]	UnitType [enumeration]
1: UPE/MAGNA/MAGNA3 circulator pump	5: UPE, 3-phase 7: MAGNA, 1-phase 9: MAGNA, 1-phase, small 10: MAGNA3
2: E-pump, 1-phase/3-phase, based on MGE motor or CUE frequency converter	2: MGE, 1-phase, model F or earlier 3: MGE, 3-phase, model F or earlier 4: MGE, 3-phase, large 5: CUE frequency converter 6: MGE, 3-phase, model G 7: MGE, 3-phase, model H and later 8: CUE II, frequency converter

6.8 Measured parameters, input assembly 4

Measured parameters are physical values measured by internal and external sensors and values calculated by the E-pump itself based on measured values and its state/mode behaviour.

This assembly is included in assembly 1.

Table legend

3-ph: 3-phase only.

CUE: Pumps with CUE drive only.

MGE: Pumps with MGE motor only.

G: Only available on model G and later versions.

H: Only available on model H and later versions.

S: Sensor required.

•: Always available.

Parameter	Name	Data type	Scaling	Range/ Resolution	Description	MGE 0.25 - 7.5 kW	MGE 11-22 kW + CUE	MAGNA3
300	UserSetpoint	SINT16, 0xC3	0.01 %	0 - 327.67 %	User setpoint (0-100% of range)	•	•	•
301	ActualSetpoint				Actual setpoint, % of max value	•	•	•
302	SystemFeedback				Status of closed loop feedback	S ¹	S ¹	•
303	Head		0 - 32.767 bar	Head value	S	S	•	
304	OutletPressure			Pump outlet pressure	H+S	-	-	
305	DiffOutletPressure			Pump differential outlet pressure	H+S	-	-	
306	InletPressure		0.001 bar	-1.000 to +32.767 bar	Pump inlet pressure	G+S	S	-
307	DiffInletPressure				Pump differential inlet pressure	H+S	-	-
308	DiffPressure				Pump differential pressure	H+S	-	•
309	RemotePressure1		0 - 32.767 bar	Remotely measured pressure 1	G+S	S	S	
310	RemotePressure2			Remotely measured pressure 2	H+S	-	-	
311	RemoteDiffPressure			Remotely meas. diff. pressure	H+S	-	-	
312	Flow		0.1 m ³ /h	0 - 3276.7 m ³ /h	Pump flow	S ²	S ²	•
313	RemoteFlow				Remotely measured flow	G+S	S	-
314	RemoteTemperature1		0.01 °C	-273.15 to +327.67 °C	Remotely measured temp 1	S	S	-
315	RemoteTemperature2				Remotely measured temp 2	H+S	-	S
316	RemoteDiffTemperature				Remotely meas. diff. temp.	H+S	-	-
317	AmbientTemperature				Ambient temperature	H+S	-	-
318	FluidTemperature				Fluid temperature	G+S	S	•
319	HeatDiffTemperature		Heat metering diff. temp.	H+S	-	S		
320	StorageTankLevel		0.01 m	-10.00 to +327.67 m	Storage tank level	H+S	-	-
321	FeedTankLevel				Feed tank level	H+S	S	-
322	AuxSensorInput		0.01 %	0 - 327.67 %	Auxiliary sensor input	S	S	-
323	MotorTemperature		0.01 °C	-273.15 to +327.67 °C	Motor temperature	G+S +3ph	S	-
324	ElectrTemperature				Electronics temperature	H	MGE	•
325	PowerElectrTemperature				Power electronics (drive) temp.	•	•	•
326	BearingsTemperatureDE				Pump bearings temp. drive end	S	CUE+S	-
327	BearingsTemperatureNDE				Pump bearings temp. non-drive end	S	CUE+S	-
328	LoadPct		0.01 %	0 - 327.67 %	Load percentage	H	-	-
329	RelativePerformance				Relative performance	•	•	•
330	Frequency		0.01 Hz	Motor frequency	•	•	•	
331	Speed		1 rpm	0 - 32767 rpm	Motor speed	•	•	•
332	SpecificEnergy		1 Wh/m ³	0 - 32767 Wh/m ³	Specific energy	H+S	CUE+S	•
333	DCLinkVoltage		0.1 V	0 - 3276.7 V	DC link voltage (drive)	•	•	•
334	MotorVoltage				Motor voltage	G only	•	-
335	MotorCurrent		0.1 A	0 - 3276.7 A	Motor current	•	•	•
336	MotorTorque		0.1 Nm	0 - 3276.7 Nm	Motor torque	-	•	-
337	MeasReserved1	-	-32767 to +32767	Reserved for future use	-	-	-	

Parameter	Name	Data type	Scaling	Range/Resolution	Description	MGE 0.25 - 7.5 kW	MGE 11-22 kW + CUE	MAGNA3
338	NoOfStarts	SINT32, 0xC4	1	0 - (2 ³¹ -1)	No of starts	•	•	•
350	Volume		1 m ³	0 - (2 ³¹ -1) m3	Pumped volume	H+S ²	CUE+ S ²	•
351	Power		1 W	0 - (2 ³¹ -1) W	Pump power	•	•	•
352	Energy		1 Wh	0 - (2 ³¹ -1) Wh	Pump energy consumption	•	•	•
353	OperatingTime		h	0 - (2 ³¹ -1) h	Pump operating time	•	•	•
354	TotalPoweredTime				Total powered time	•	•	•
355	HeatPower		1 W	0 - (2 ³¹ -1) W	Heat metering power	H+S	-	S
356	HeatEnergy		1 Wh	0 - (2 ³¹ -1) Wh	Heat metering energy	H+S	-	S
357	RealTimeClock		Unix time	0 - (2 ³¹ -1) s	Present value of Real Time Clock	•	-	•
358	HeatEnergy2		1 Wh	0 - (2 ³¹ -1) Wh	Heat metering energy (direction 2)	S	-	S
359	Volume2		1 m ³	0 - (2 ³¹ -1) m3	Pumped volume (direction 2)	S	-	•
500	RPILimits	UINT32, 0xC8	1 ms	10000 - 200000 ms	Requested Packet Interval	•	•	•
600	TCPIPCapability	DWORD32, 0xD3	-	-	For Logix EDS AOP integration	•	•	•

¹ If the E-pump is in an open-loop control mode, this parameter will read the open-loop setpoint.

² If the E-pump is a TPE3 or a TPE Series 2000, the value is estimated and always available.

►: The availability of these measurements requires that the parameter VolumeFlow (parameter 312) is available, and a differential temperature measurement is established by one of the below means:

MGE model H and later

- Direct measurement, where an analog or temperature input has been configured to Remote differential temperature RemoteDiffTemp (parameter 316).
- FluidTemperature (parameter 318) measured by a built-in Grundfos sensor and RemoteTemperature2 (parameter 315) measured by an analog or temperature input.
- RemoteTemperature1 (parameter 314) and RemoteTemperature2 (parameter 315) measured by an analog or temperature input.

MAGNA3

For the calculation, an estimated flow value and measurement of the liquid temperature by the built-in temperature sensor is used. Connection of an external temperature sensor is needed for the pump to calculate the needed differential temperature.



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



An estimated flow can be used for monitoring purposes only. We do not recommend it for controlling purposes.

6.9 Sensor-dependent measurements

As appears from the table, many of the measurement parameters require a particular sensor to be present.

Because a limited number of sensors are available, only a few of the "S" marked data parameters are available simultaneously.

The sections following describe the relation between the available EtherNet/IP measurement parameters and the setup of sensors. The description is split in sections for different pump types, because the approach varies.

Old MAGNA and UPE pump types

- No connection of external sensor possible.

MAGNA3

- Connection of a temperature sensor and selection of the analog input function "Constant temperature control" will make RemoteTemp2 measurement available.
- Connection of a pressure sensor and selection of the analog input function "Constant pressure control" will make RemotePressure1 measurement available.

CUE and all E-pump types except model H and later.

Sensor unit configuration with Grundfos GO Remote	EtherNet/IP data parameter generated from sensor measurement		
	Feedback sensor (AI1)	Measuring sensor* (AI2)	Measuring sensor** (AI3)
bar			
mbar			
m	Head (303)	Head (303) and FeedTankLevel (321) ⁺ or InletPressure (306)	Head (303) and FeedTankLevel (321) ⁺ or RemotePressure1 (309)
kPa	FeedTankLevel (321) ⁺		
psi			
ft			
m ³ /h			
m ³ /s	Flow (312)	Flow (312) or RemoteFlow (313)	Flow (312) or RemoteFlow (313)
l/s			
gpm			
°C			FluidTemperature (318) or RemoteTemperature1 (314)
°F	RemoteTemperature1 (314)	FluidTemperature (318)	
%	AuxSensorInput (322)	AuxSensorInput (322)	AuxSensorInput (322)

* CUE and 11-22 kW E-pumps only.

** CUE, 11-22 kW E-pumps and model G only.

+) Only if "m" or "ft" is selected.

E-pump model H and later

Measured parameters Selected from Grundfos GO Remote display	Analog input AI1, AI2, AI3	Temperature Pt100 input T1, T2	Grundfos built-in sensor	Grundfos LiqTec sensor	Mapped to EtherNet/IP data parameter
Pump inlet pressure	•				InletPressure (306)
Pump inlet diff. press.	•				DiffInletPressure (307)
Pump outlet pressure	•				OutletPressure (304)
Pump outlet diff. press.	•				DiffOutletPressure (305)
Pump diff. pressure	•		•		DiffPressure (308)
Remote pressure 1	•				RemotePressure1 (309)
Remote pressure 2	•				RemotePressure2 (310)
Remote diff. pressure	•				RemoteDiffPressure (311)
Feed tank level	•				FeedTankLevel (321)
Storage tank level	•				StorageTankLevel (320)
Pump flow	•				Flow (312)
Remote flow	•				RemoteFlow (313)
Pumped liquid temp	•	•	•	•	FluidTemp (318)
Temperature 1	•	•			RemoteTemperature1 (314)
Temperature 2	•	•			RemoteTemperature2 (315)
Remote diff. temp	•				RemoteDiffTemp (316)
Ambient temperature	•	•			AmbientTemperature (317)
Motor bearing temp. BE		•			BearingsTemperatureDE (326)
Motor bearing temp. NDE		•			BearingsTemperatureNDE (327)
Other parameter	•				AuxSensorInput (322)

6.10 Special parameter, input explicit messaging

Parameter	Name	Data type	Scaling	Range/ Resolution	Description	MGE 0.25 - 7.5 kW	MGE 11-22 kW + CUE	MAGNA3
500	RPILimits	UINT32, 0xC8	1 µs	15000 - 200000 µs	Requested Packet Interval	•	•	•
500	TCPIPCapability	DWORD32, 0xD3	-	-	For Logix EDS AOP integration	•	•	•

7. Product simulation

The CIM module can be put in product simulation mode in which case it will generate life-like simulated values of all the EtherNet/IP input data parameters.

It will thus be possible to connect an EtherNet/IP master to CIU 500 without this device being connected to a real pump in a real-life system. In an office environment, it can then be verified that communication works and data is being received and handled correctly by the master application program, for example PLC program, before the equipment is installed under real-life conditions.

Product simulation mode is entered via the webserver. See section [Webserver configuration](#) on page 27.

The below functional profiles can be selected from the webserver.

Simulated product

 Pump profile

 Booster system profile

 Digital Dosing DDA profile

Only input parameters are simulated. The data read has dummy values and no real product functionality is simulated.

8. Fault finding the product

8.1 EtherNet/IP

You can detect faults in a module by observing the status of the two status LEDs. See the table below.

CIM 500 fitted in a Grundfos product or CIM 500 fitted in a CIU 500



Ensure that SW1 is in position "3".

Fault (LED status)	Possible cause	Remedy
1. Both LEDs remain off when the power supply is connected.	a) The module is fitted incorrectly in the Grundfos product.	Check that the module is fitted and connected correctly.
	b) The module is defective.	Replace the module.
	c) CIU 500 is defective.	Replace CIU 500.
2. LED1 remains off.	a) SW1 is not set correctly.	Set the switch to "3".
3. LED2 is flashing red.	a) No internal communication between the module and the Grundfos product.	Check that the module is fitted correctly.
	b) No internal communication between the CIU 500 and the Grundfos product.	<ul style="list-style-type: none"> • Check the cable connection between the Grundfos product and CIU 500. • Check that the individual conductors have been connected correctly, for example not reversed. • Check the power supply to the Grundfos product.
4. LED2 is permanently red.	a) The module does not support the connected Grundfos product.	Contact the nearest Grundfos company.
5. LED1 is permanently red.	a) IP address conflict.	Check the IP address configuration.
	b) SW1 is in illegal position	Check that SW1 is set to "3".
6. LED1 is flashing red.	a) Connection time-out.	Verify the connection and communication between PLC and CIM 500.
7. LED1 is permanently red and green at the same time.	a) Error in firmware download.	Use the webserver to download the firmware again. See section Update in the appendix.
8. LED2 is permanently red and green at the same time.	a) Memory fault.	Replace the module.

9. Disposing of the product

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

10. 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)
112	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 limit
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)		

1. Webserver configuration

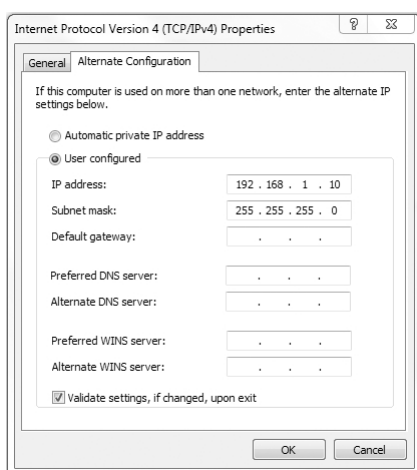
The built-in webserver offers easy monitoring of the CIM 500 module, and makes it possible to configure the selected Industrial Ethernet protocol. Using the webserver, you can also update the firmware of the CIM 500 module and store or restore settings, among other functions.

To connect a PC to CIM 500, proceed as follows:

1. Connect the PC and the module using an Ethernet cable.
2. Configure the Ethernet port of the PC to the same subnetwork as CIM 500, for example 192.168.1.101. See section [How to configure an IP address on your PC using Windows 7](#) or [1.2 How to configure an IP address on your PC using Windows 10](#).
3. Open a standard Internet browser and type 192.168.1.100 in the URL field.

1.1 How to configure an IP address on your PC using Windows 7

1. Open "Control Panel".
2. Select "Network and Sharing Center".
3. Click [Change adapter settings].
4. Right-click and select "Properties" for the Ethernet adapter. Typically "Local Area Connection".
5. Select properties for "Internet Protocol Version 4 (TCP/IPv4)".
6. Select the "Alternate Configuration" tab and enter the user-configured IP address and the subnet mask you would like to assign to your PC. See fig. 1.



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Fig. 1 Example from Windows 7

1.2 How to configure an IP address on your PC using Windows 10

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

1.3 Login

For administration of username and password, see also [User Management](#).

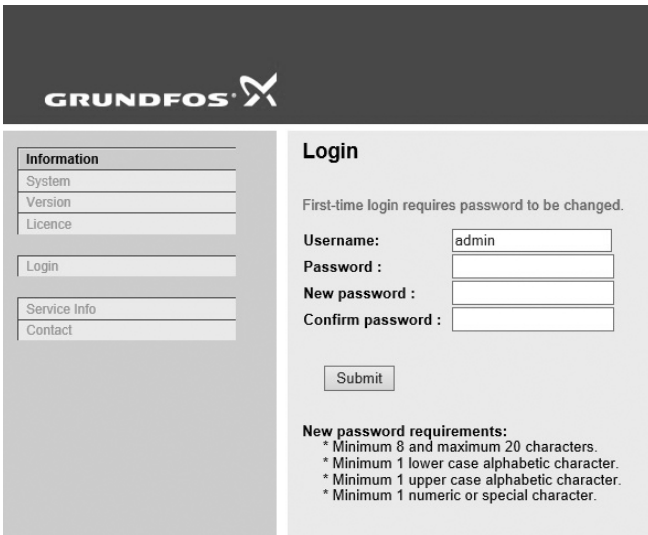


Fig. 2 Login

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

1.4 EtherNet/IP configuration

This web page is used to configure all the parameters relevant to the EtherNet/IP protocol standard.

Fig. 3 Real Time Ethernet Protocol Configuration - EtherNet/IP

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Object	Description
IP Address	Configuration of the static IP address if a DHCP server is not used. EtherNet/IP is not allowed to share the IP address with a CIM 500 webserver.
Subnet Mask	Configuration of the subnet mask if a DHCP server is not used.
Gateway	Configuration of the gateway address if a DHCP server is not used.
Use DHCP	The CIM 500 module can be configured to automatically obtain its EtherNet/IP network settings from a DHCP server, if available on the network. Default: No use of DHCP.
Communication Watchdog	For enabling of a 5 seconds communication watchdog timer. Only active for pump or booster products. Unchecked: Watchdog is disabled (default). Checked: Watchdog is enabled, time-out is 5 seconds. Watchdog action: The pump or the booster is set to local mode.
Grundfos product simulation	The module can be put in product simulation mode to generate realistic simulated values of all the EtherNet/IP input data. It will thus be possible to connect an EtherNet/IP master to a module fitted in a CIU or an E-box without installing this device in a real industrial process system. In an office environment, it can then be verified that communication works, and data is received and handled correctly by the EtherNet/IP master application program (for example PLC program) before installing the device. To enable product simulation, select a product type from the dropdown list. To terminate product simulation, select "No Simulation".



You need a contract with Grundfos and an external router with Internet connection to gain access to the GRM server.

1.5 Network settings

This web page is used to configure the network settings of the webserver and of the GENIpro TCP protocol. The network settings here are also used for BACnet IP. Additional configuration of BACnet IP is done in the Real Time Ethernet Protocol menu. See [EtherNet/IP configuration](#).

The screenshot shows the Grundfos network settings web interface. The top header features the Grundfos logo. On the left, there is a sidebar menu with sections: 'Information' (System, Version, Licence), 'Configuration' (Real Time Ethernet Protocol, Network Settings, GENIpro TCP Protocol, User Management, Firmware Update / Restart), 'Logout', 'Service Info', and 'Contact'. The main content area is titled 'Network Settings' and includes the text 'This setting is used for: Web Server, BACnet IP, GENIpro TCP'. Below this, there are input fields for 'IP Address' (192.168.1.100), 'Subnet Mask' (255.255.255.0), 'Gateway' (192.168.1.1), and 'DNS Server' (0.0.0.0). There is also a 'Use DHCP' checkbox which is currently unchecked, and a 'Submit' button at the bottom.

Fig. 4 Network settings

TM07 4524 1919

Object	Description
IP Address	Configuration of the static IP address if a DHCP server is not used. Default: 192.168.1.100.
Subnet Mask	Configuration of the subnet mask if a DHCP server is not used. Default: 255.255.255.0.
Gateway	Configuration of the gateway address if a DHCP server is not used. Default: 192.168.1.1.
DNS Server	The module can be configured to use a specific domain name server, if available on the network. Default: 0.0.0.0.
Use DHCP	The module can be configured to automatically obtain the IP address from a DHCP server, if available on the network. Default: Do not use DHCP.

1.6 User Management

A login is required for any change of the CIM 500 settings, and this web page is used to configure the username and password. See [Login](#).



It is only possible to configure one user.

GRUNDFOS

Information

- System
- Version
- Licence

Configuration

- Real Time Ethernet Protocol
- Network Settings
- GENpro TCP Protocol
- User Management
- Firmware Update / Restart

Logout

Service Info

Contact

User Management

Type	Username	New password	Confirm password
Administration	admin		

Submit

Administration:

- * User has all access rights.

User name requirements:

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

Password requirements:

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

Fig. 5 User management

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1.7 Update

You can update the firmware by means of the built-in webserver. The binary file is supplied by Grundfos.

To make installation and configuration easier, you can upload the configuration to a PC for backup or distribution to multiple modules.

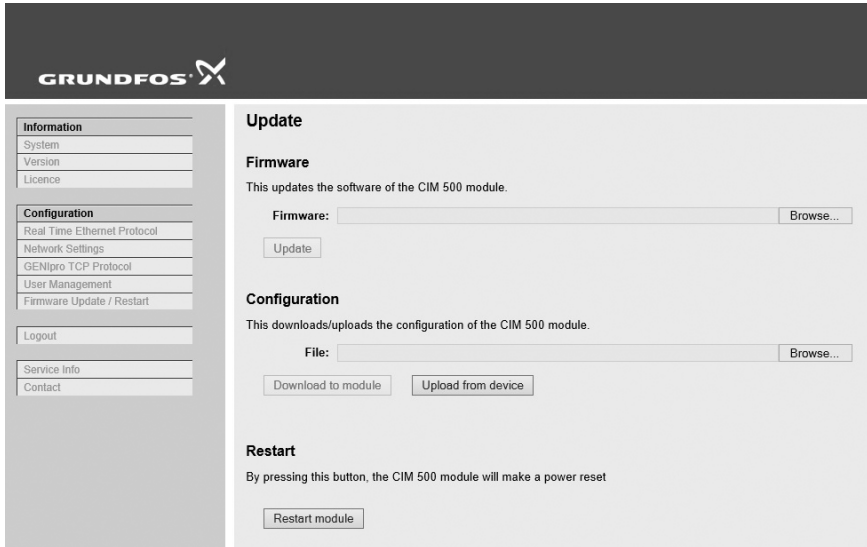


Fig. 6 Update

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

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