Modbus for MIXIT

Functional profile and user manual

GRUNDFOS

Modbus for MIXIT

English (GB)

Original functional profile and user manual

Table of contents

1. General information

This functional profile describes Grundfos Modbus MIXIT.

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

1.1 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.

1.2 Target group

This functional profile assumes that the reader is familiar with the commissioning and programming of Modbus devices. The reader is required to have basic knowledge of Modbus protocol and technical specifications. It is also assumed that an existing Modbus RTU network is present.

1.3 Definitions and abbreviations

CRC	Cyclic Redundancy Check. A data error detection method.
Device	A node on the Modbus RTU network.
Grundfos GO Remote	Grundfos GO Remote is an app for setting up, controlling and monitoring Grundfos products. The app can be downloaded for free in your preferred app store for both Android and iOS.
MAC	Unique network address for a piece of hardware.
Transmission speed	Bits transferred per second, bits/s.
Parity	An error checking method. When a message is transmitted, the parity bit is calculated and applied to the 8 bit data frame of each character transmitted. The receiving device checks the validity of each 8 bit characters frame if an error occurs the complete telegram is discarded.
Line termination resistors	Line termination must be connected at each of the two ends of the wire. The MIXIT unit is fitted with a built-in optional line termination resistor.
Upgrade packages	MIXIT can be upgraded with DYNAMIC and CONNECT license packages Activate your upgrade in Grundfos GO by entering the activation code or scanning the QR code provided with your upgrade purchase. See the installation and operating instructions. **DYNAMIC:** The DYNAMIC upgrade offers balancing limiters functions and pressure independence. It also gives access to the Grundfos BuildingConnect Free Monitoring solution. **CONNECT:** CONNECT is suitable when MIXIT operates as a subsystem in large installations where a BMS system is already in place. The upgrade enables you to connect MIXIT to a building management system via fieldbus (BACnet or Modbus) and gives access to Grundfos BuildingConnect Professional. The DYNAMIC and CONNECT upgrades can be combined.

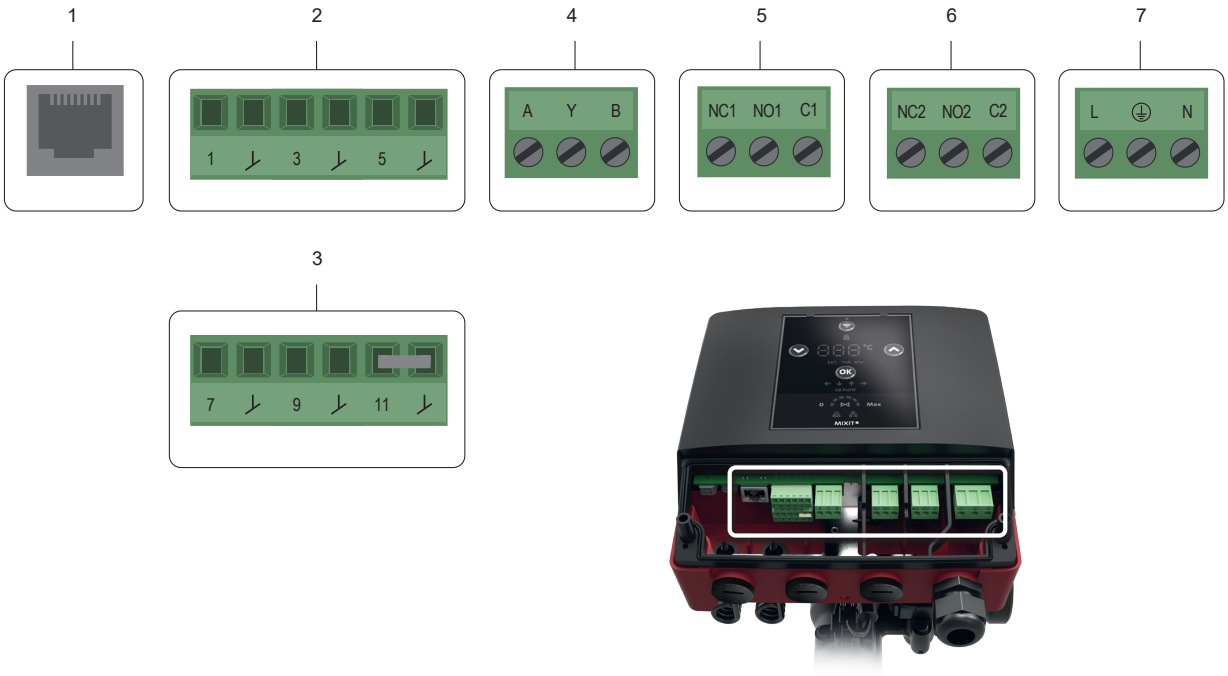
2. Important information before setting up the system

2.1 Specifications

Modbus RTU	Description	Comments
Connector	Screw-type terminal	3 pins.
Wire configuration	RS-485, screened, twisted-pair + ground	Conductors: A(+), B(-) and Y(ground).
Maximum cable length	1200 m	Equals 4000 ft., using repeaters this distance can be increased.
Recommended cross-section of cable	0.20 - 0.25 mm^2	AWG24 or AWG23.
Modbus address	1-247 (default: 1)	Set via Grundfos GO ("Fieldbus address").
Line termination	On or Off (default: Off)	Set via DIP switch See *3.5 Setting up a Modbus RTU connection in Grundfos GO Remote*.
Supported transmission speeds [bits/s]	9600, 19200, 38400, 76800 (default: 9600)	Set via Grundfos GO.
Data bits	8	Fixed value.
Stop bits	0, 1, 2 (default: 1)	Set via Grundfos GO.
Parity	None, even, odd (default: even)	Set via Grundfos GO.
Maximum number of devices	32	Using repeaters, this number can be increased.
Modbus RTU master/slave	Yes	The MIXIT unit is a Modbus RTU slave device.
Fieldbus integration	Licence package "CONNECT upgrade" must be installed.	Set via Grundfos GO.

Modbus TCP	Description	
Ethernet cable	CAT5 or better	
Max. cable length	100 metres	
Transmission speed	10/100 Mbit/s auto-detected	
DHCP support	Yes, selectable (default: disabled)	Set via Grundfos GO.
Licence	Licence package "CONNECT upgrade" must be installed.	Set via Grundfos GO.

2.2 Terminal connections overview



Pos.	Description
1	Ethernet RJ45 (BACnet IP, Modbus TCP, GDP)
2	Configurable I/O
3	Configurable I/O
4	RS485 transceiver (BACnet MS/TP, Modbus RTU)
5	Relay 1
6	Relay 2
7	Mains supply. Carry out the electrical connection and protection according to local regulations.

! The terminals are coded in such a way that the relay terminal plugs cannot be used in the RS485 input and the configurable inputs and outputs cannot be switched around.

3. Connecting Fieldbus to MIXIT

3.1 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 a single register
	16	0x10	Write multiple registers

Reading or writing coils and diagnostic are not supported.

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

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

3.2 Modbus register addresses

For register names prefixed by "Set" or "SetBit", the value is not retained during power off but will revert to "Power on default".

For register names prefixed by "Config" or "ConfigBit", the value is stored in non-volatile memory and retained during power off.

HI/LO registers combine two 16-bit registers into a 32-bit register value:

- VALUE = HI register value × 65536 + LO register value.

3.3 Modbus interface configuration

Address	Register name	Modbus unit	R/W	Description
00003*	Config.BusAddress	Enum	W	For configuration of an active Modbus address. Range: 1-247 (factory default: 1).
00004*	Config.BitRate	Enum	W	For configuration of an active Modbus bit rate. 0: 1200 bits/s. 1: 2400 bits/s. 2: 4800 bits/s. 3: 9600 bits/s (default). 4: 19200 bits/s. 5: 38400 bits/s. 6: 57600 bits/s. 7: 76800 bits/s. 8: 96000 bits/s. 9:115200 bits/s.
00005	Config.AutoAckControlBits	Enum	W	0: Rising edge triggered control bits are manually lowered. 1: Rising edge triggered control bits are automatically lowered when the module receives the event (default).
00009*	Config.ModbusParity	Enum	W	Configuration of an active Modbus parity. 0: No parity. 1: Even parity (default). 2: Odd parity.
00010*	Config.ModbusStopBits	Enum	W	Configuration of an active Modbus stop bit number. 0: Will default to 1 stop bit. 1: 1 stop bit (default). 2: 2 Stop bits.

* Share settings made from Grundfos GO Remote and may be overwritten from Grundfos GO Remote. They must be set either from Grundfos GO Remote or from the fieldbus.

3.4 Modbus interface status

Address	Register name	Modbus unit	R/W	Description
00023	VersionNumber	Unscaled	R	Modbus interface software version number (BCD digit 1-4).
00030	GrundfosUnitFamily	Enum	R	Grundfos product family.
00031	GrundfosUnitType	Enum	R	Grundfos product type number.
00032	GrundfosUnitVersion	Enum	R	Grundfos product version number.
00034	ProductSoftwareVersionHI	Unscaled	R	Product software version (BCD digit 1-4 aa.bb).
00035	ProductSoftwareVersionLO	Unscaled	R	Product software version (BCD digit 5-8 cc.dd).
00036	ProductSoftwareDayMonth	Unscaled	R	Product software date (BCD ddmm).
00037	ProductSoftwareYear	Unscaled	R	Product software date (BCD yyyy).
00038	ProductSoftwareBuildHI	Unscaled	R	Product software build (BCD digit 1-4).
00039	ProductSoftwareBuildLO	Unscaled	R	Product software version (BCD digit 5).

3.5 Setting up a Modbus RTU connection in Grundfos GO Remote

Cut in the termination resistor for line termination if the unit is set as the last station on the network. Set the DIP switch to "ON" to activate. The termination resistor is fitted inside the MIXIT unit and has a value of 120 Ω.

When MIXIT has been started up and connected to the Grundfos GO Remote app, the connection between MIXIT and a Modbus connection can be made.

If it is the first time MIXIT is connected to Grundfos GO Remote, the setup is done via the **Initial startup** wizard. The wizard guides you through the setup.

The connection can also be set up via the **Settings** menu. Do as follows:

1. Press **Setpoint**.
2. Press **Reconfigure setpoint input** at the bottom of the screen.
3. Select **Setpoint from fieldbus connection** and press **Next**.
4. Select Modbus RTU and press **Next**.
5. Define the transmission speed and press **Next**.
   All devices on the network must communicate at the same transmission speed.
6. Select parity (stop bit) and press **Next**.

   All devices on a Modbus network must use the same parity. If no parity checking is selected, then no parity bit is transmitted and no parity check is made. However, two stop bits are always transmitted for the no parity selection.

7. Select the address and press **Next**.
8. If not done already, connect a bus cable to MIXIT. Follow the instructions given by Grundfos GO Remote. Press **Next**.
9. A summary is given. Press **Save** to complete the setup.

3.6 Setting up a Modbus TCP connection in Grundfos GO Remote

When MIXIT has been started up and connected to the Grundfos GO Remote app, the connection between MIXIT and a Modbus connection can be made.

If it is the first time MIXIT is connected to Grundfos GO Remote, the setup is done via the **Initial startup** wizard. The wizard guides you through the setup.

The connection can also be set up via the **Settings** menu. Do as follows:

1. Press **Setpoint**.
2. Press **Reconfigure setpoint input** at the bottom of the screen.
3. Select **Setpoint from fieldbus connection** and press **Next**.
4. Select **Modbus TCPNext**.

5. Define the IP protocol setting:
   If a DHCP server is present (Dynamic Host Configuration Protocol), the server can assign the MIXIT unit with an IP address and other network settings, and the connection will be established. It is also possible to add that information manually from Grundfos Go remote, and in that case the following information is needed:
   - TCP port number (default = 502)
   - IP address
   - Subnet mask
   - Gateway.
6. If not done already, connect a network cable to MIXIT. Follow the instructions given by Grundfos GO Remote. Press **Next**.
7. A summary is given. Press **Save** to complete the setup.
8. Check data and link LEDs.
   The RJ45 socket has two connectivity LEDs.
   - Green on: Ethernet link on RJ45 is okay.
   - Yellow on or flashing: Data communication ongoing.

3.7 Setting MIXIT to Remote access in Modbus

Define control source for MIXIT to accept remote Modbus commands.

1. Set **00101.0 SetBit.RemoteAccessReq** to 1 for the MIXIT unit to accept a setpoint from Modbus (or for writing any other Modbus register).

   As default the **00101.0 SetBit.RemoteAccessReq** is set to 0 as default (power on). If the MIXIT unit has been power cycled, you must toggle **00101.0 SetBit.RemoteAccessReq** to put the product in bus control again.

   The actual control state is verified via **00201.0 StatusBit.ActualRemoteAccess**.

Address	Register name	Modbus unit	R/W	Description
00101.0	SetBit.RemoteAccessReq	Bit	W	0: Bus control disabled (power-on default) 1: Bus control
00201.0	Status.ActualRemoteAccess	Bit	R	0: Remote control disable 1: Remote control enable

4. Setting the application type

1. Set the application type via **00112 ConfigApplicationType**.

Address	Register name	Modbus unit	R/W	Description
00112	Config.ApplicationType	Enum	W	0 = Radiator Heating 1 = Floor heating 2 = Heating coil 255 = Not available / Invalid

2. Confirm via **00211 Status.ApplicationType**.

Address	Register name	Modbus unit	R/W	Description
00211	Status.ApplicationType	Enum	R	0 = Radiator Heating 1 = Floor heating 2 = Heating coil 255 = Not available / Invalid

3. Switch between heating and cooling application via **00137 Config.ThermalApplicationType**. Configure the heating types in **00113 Status.ApplicationTypeHeat** and cooling modes in **00133 Config.PumpControlModeCool**.
   MIXIT can control both heating and cooling applications.

Address	Register name	Modbus unit	R/W	Description
00137	Config.ThermalApplicationType	Enum	R/W	0 = Heating 1 = Cooling
00113	Status.ApplicationTypeHeat	Enum	R	0 = Constant pressure 1 = Proportional pressure (default) 2 = Constant speed 5 = Autoadapt 8 = Constant flow
00133	Config.PumpControlModeCool	Enum	R/W	0 = Constant pressure 1 = Proportional pressure (default) 2 = Constant speed 5 = Autoadapt 8 = Constant flow

4.1 Controlling the valve manually

Instead of using a temperature setpoint to control the valve, you can control the valve opening directly. This can be useful when you want to degas or flush the system or when servicing the product.

1. Set the application type via **00111 Config.ManualValveFunction**.

Address	Register name	Modbus unit	R/W	Description
00111	Config.ManualValveFunction	Enum	W	1: Off (default) 2: 100 % open 3: 50 % open 4: 25 % open 5: 0 % (closed) Function for manual setting of the valve opening, e.g. for degassing use or other service purpose.

4.2 Setting the temperature setpoint, heating

The temperature setpoint for heating can be set in the following ways:

- Direct temperature setpoint (local)
- Temperature setpoint given by analog input
- Temperature setpoint given via fieldbus
- Outdoor temperature setpoint given by an analog sensor. Outdoor sensor types Pt1000 and 0-10 V are available

- Outdoor temperature setpoint given by fieldbus.

Set the source of the temperature setpoint via **00117 Config.TempSetpointSource**.

Address	Register name	Modbus unit	R/W	Description
00117	Config.TempSetpointSource	Enum	W	0: Local input (default) 1: Analog input 2: Fieldbus input 3: Outdoor temp. analog input 4: Outdoor temp. fieldbus input 255: Not available / Invalid

Setpoint from source

The **local input (default)** is given via **00118 Config.DefaultTempSetpoint**.

1. **Analog input** setpoints are given via the analog input terminal on the MIXIT unit.
   - Analog sensor inputs must be configured in Grundfos GO Remote. See *5.2 Configuring a setpoint from analog input*.
2. **Fieldbus input** setpoint is given via **00102 Control.SetTempSetpointRemote**.
   - The actual value of the fieldbus temperature setpoint is confirmed by **00311 MeasuredData.ActualTempSetpointRemote**.
3. **Outdoor temperature analog input** is given via an analog sensor. Outdoor sensors of the type Pt1000 and 0-10 V are available.
   - Configure a heat curve via **00126 Config.HeatCurveOffset**. See *6.6.1 Setting outdoor temperature compensation (heating)*.
   - The sensor must be configured via Grundfos Go Remote. See *5.1 Configuring an outdoor temperature sensor input and outdoor temperature compensation (heating)*.
4. **Outdoor temperature fieldbus input** is given via **00103 Control.SetOutdoorTempRemote**.
   - The actual value of the remote outdoor temperature is confirmed by **00312 MeasuredData.ActualOutdoorTempRemote.**

Address	Register name	Modbus unit	R/W	Description
00118	Config.DefaultTempSetpoint	K	W	Default temperature setpoint
00102	Control.SetTempSetpointRemote	K	W	Temperature setpoint set via fieldbus
00311	MeasuredData.ActualTempSetpointRemote	K	R	The actual temperature setpoint from fieldbus
00126	Config.HeatCurveOffset	K	W	Adjusts the heat curve offset
00103	Control.SetOutdoorTempRemote	K	R	Outdoor temperature value from fieldbus
00312	MeasuredData.ActualOutdoorTempRemote	K	R	The actual outdoor temperature from fieldbus

4.3 Setting the temperature setpoint, cooling

The temperature setpoint for cooling can be set in the following ways:

- Direct temperature setpoint (local)
- Temperature setpoint given by analog input
- Temperature setpoint given via fieldbus.

Set the source of the temperature setpoint via **00117 Config.TempSetpointSource**.

Address	Register name	Modbus unit	R/W	Description
00117	Config.TempSetpointSource	Enum	W	0: Local input (default) 1: Analog input 2: Fieldbus input 255: Not available / Invalid

Setpoint from source

The **local input (default)** is given via **00118 Config.DefaultTempSetpoint**.

1. **Analog input** setpoints are given via the analog input terminal on the MIXIT unit.
   - Analog sensor inputs must be configured in Grundfos GO Remote. See *5.2 Configuring a setpoint from analog input*.
2. **Fieldbus input** setpoint is given via **00102 Control.SetTempSetpointRemote**.
   - The actual value of the fieldbus temperature setpoint is confirmed by **00311 MeasuredData.ActualTempSetpointRemote**.

Address	Register name	Modbus unit	R/W	Description
00118	Config.DefaultTempSetpoint	K	W	Default temperature setpoint
00102	Control.SetTempSetpointRemote	K	W	Temperature setpoint set via fieldbus
00311	MeasuredData.ActualTempSetpointRemote	K	R	The actual temperature setpoint from fieldbus

5. Configuring inputs in Grundfos GO Remote

5.1 Configuring an outdoor temperature sensor input and outdoor temperature compensation (heating)

When setting an outdoor temperature sensor input in Grundfos GO Remote, you have the option to configure the function **Outdoor temperature compensation** as well.

Grundfos GO Remote menu:

Main menu > **Settings** > **Setpoint**

1. Press **Reconfigure setpoint input** at the bottom of the screen.
2. Select **Outdoor temperature sensor** and press **Next**.
3. Select outdoor sensor type, either Pt1000 or 0-10 V, and press **Next**.
   a. If a 0-10 V sensor is selected, you must define its range.
4. Configure a heat curve to set the **Outdoor temperature compensation** function.
   a. Offset and slope
      Alter the heat curve by the means of offset and slope. Use the temperature buttons to adjust the offset, and use the **Up** and **Down** buttons to adjust the slope of the curve.
      Press **Next** or customise the heat curve, see step B.
   b. Customised heat curve (optional)
      Press **Customise heat curve** and define the desired setpoints for each of the five outdoor temperature points.
5. Connect a sensor cable to MIXIT. Follow the instructions given in Grundfos GO Remote and press **Next**.
6. A summary is given. Press **Save** to complete the setup.

5.2 Configuring a setpoint from analog input

Grundfos GO Remote menu:

Main menu > **Settings** > **Setpoint**

1. Press **Configure setpoint input** at the bottom of the screen.
2. Select **Setpoint from analog input** and press **Next**.
3. Select signal type and press **Next**.
   Select 0-10 V, 0-20 mA or 4-20 mA.
4. Define the range and press **Next**.
5. Connect a cable to MIXIT. Follow the instructions given by Grundfos GO Remote. Press **Next**.
6. A summary is given. Press **Save** to complete the setup.

6. Functions

6.1 Functions overview

All needed functions and controls of a mixing loop are built into MIXIT. Not only does this mean simple implementation and installation, but also an efficient, reliable and smooth operation.

		MIXIT valve unit	MIXIT DYNAMIC valve unit	DYNAMIC upgrade	CONNECT upgrade
Standard functions	Temperature controller	•	•		
	Underfloor overheat protection (for underfloor heating systems)	•	•		
	Coil preheat and frost protection (for air handling unit systems)	•	•		
	Frost protection (cooling and combined applications)	•	•		
	Pump control modes [1] • AUTO$_{ADAPT}$ • Proportional pressure • Constant pressure • Constant flow • Constant curve/constant speed	•	•		
	Outdoor temperature compensation	•	•		
Eco schedule and warm-weather shutdown		•	•		
Eco functions	Pressure independence		•	•	
	Energy monitor		•	•	
	Balancing limiters • Supply flow limit • Return temperature limit • Thermal power limit • Differential temperature limit		•	•	
Monitoring and control	Grundfos BuildingConnect Free Monitoring	•	•	•	
	Grundfos BuildingConnect Professional				•
	Fieldbus integration (BACnet and Modbus)				•

1 These modes are not available for all applications.

The standard functions are always included. The DYNAMIC and CONNECT upgrades can be combined.

MIXIT, valve unit variant

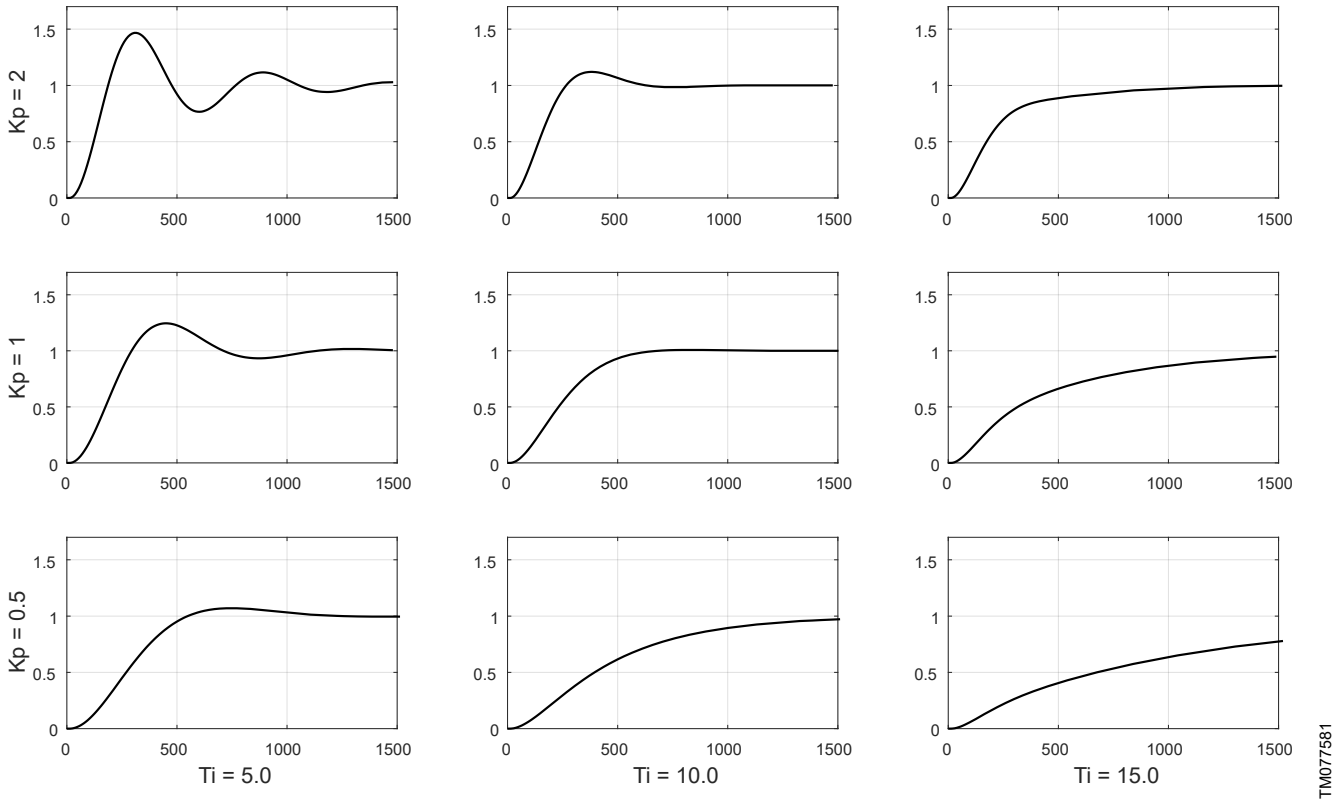
The functions in MIXIT are standard and are mainly suited for three-way installations in large buildings, such as schools, with no need for monitoring, pressure independence or balancing.

MIXIT gives access to Grundfos BuildingConnect Free Monitoring.

MIXIT can be upgraded with DYNAMIC and CONNECT.

6.2 Temperature controller

From factory MIXIT is configured so that the temperature response of the system in most cases corresponds to the centre graph in the figure. This is the ideal response, however, in some cases it maybe necessary to adjust it.



Typical responses to a step input for PI controlled systems such as MIXIT

By increasing the proportional gain (Kp) of the controller, as shown in the top row in the figure, the response rises more rapidly. If the gain is too high, undamped oscillations occur. If the gain is even higher, the oscillation of the temperature will continue, causing instability. By decreasing the proportional gain of the controller, as shown in the bottom row in the figure, the response becomes slower.

By increasing the integral time (Ti), as shown in the right column in the figure, the response takes longer time to reach the setpoint. Decreasing the integral time has the opposite effect, which is shown in the left column in the figure.

This function can only be adjusted via Grundfos GO Remote.

6.2.1 Setting the temperature controller

Grundfos GO Remote menu:
Main menu > **Settings** > **Application settings** > **Temperature controller**

The gain (Kp) and integral time (Ti) are preset from factory. However, if the factory setting is not the optimum setting, you can change the gain and integral time.

1. Set the gain (Kp) within the range from 0.1 to 20.
2. Set the integral time (Ti) within the range from 1 to 3600 seconds.

6.3 Underfloor overheat protection

This function is only available if the application setting is set to underfloor heating.

By defining a maximum forward flow temperature, you ensure that the temperature will never exceed the given value, thus protecting the floor from overheating.

The setpoint can be set to a maximum of 5 °C below the set maximum forward-flow temperature.

6.3.1 Setting the underfloor overheat protection

The function can only be active for underfloor heating applications.

1. Enable the function by setting **00101.4 ControlBits.OverHeatProtectionED** to 1.
2. The function is configured via Grundfos GO Remote: **Main menu** > **Settings** > **Application settings** > **Floor overheat protection**.
   - Activate the function by pressing the grey slide-button in the top right corner of the screen. Press **Max. flow temperature** to define a maximum forward-flow temperature. The temperature in the system will never exceed the given value.
   - The setpoint can be set to a maximum of 5 °C below the set maximum forward-flow temperature.

   The actual status is read via **00313 MeasuredData.FlowTemp** in [K].

   If the flow temperature is above the configured value, the MIXIT unit gives a notification by setting **00212 Status.SystemState** to 6.

Address	Register name	Modbus unit	R/W	Description
00101.4	ControlBits.OverHeatProtectionED	Enum	W	0: Overheat protection disabled. 1: Overheat protection enabled.
00212	Status.Systemstate	Enum	R	0: Powering up (~30 s). 1: Fault (fault relay activated). 2: Ready. 3: Preheating heating coil. 4: Temperature control state. 5: Coil frost protection (ready relay activated). 6: Underfloor overheat protection. 7: Shut down due to removal of the start signal. 8: Auto tuner on. 9: Backup control 1. 10: Backup control 2.
00313	MeasuredData.FlowTemp	K	R	Actual flow temperature.

6.4 Heating coil preheat and frost protection

When choosing the application type **Heating coil**, you can activate the coil preheat and frost protection functions.

Coil preheat

With MIXIT you can preheat the coil before allowing the fan to start.

Frost protection

You can protect the coil from freezing by defining an air and return flow temperature. If the temperature falls below one of the two temperature limits, MIXIT will react by fully opening the valve in order to circulate hot water in the system.

The return flow temperature is measured by the sensor in port B of MIXIT. To measure the air temperature, you will need to install a temperature sensor in the coil.

6.4.1 Setting the coil preheat

The function can only be active for heating coil applications and can only be set via Grundfos GO Remote.

1. Activate the function by pressing the grey slide-button.
2. Press **Coil preheat temperature** to define a return temperature threshold.

   When the MIXIT unit is in coil preheat state **00212 StatusSystemstate** enum = 3 the coil frost protection **00212 StatusSystemstate** enum = 5 is activated, and the Fan and Dampers status **00201.4 Status.FanAndDampersED** is set to 0 (Disabled).

Read the system state via **00212 StatusSystemstate**. If set to 4, MIXIT is preheating the coil.

Address	Register name	Modbus unit	R/W	Description
00212	Status.Systemstate	Enum	R	0: Powering up (~30 s) 1: Fault (fault relay activated) 2: Ready 3: Preheating heating coil 4: Temperature control state 5: Coil frost protection (ready relay activated) 6: Underfloor overheat protection 7: Shut down due to removal of the start signal 8: Auto tuner on 9: Backup control 1 10: Backup control 2
00201.4	Status.FanAndDampersED	Bits	R	0: Fan and dampers are disabled 1: Fans and dampers are enabled

6.4.2 Setting the frost protection, heating

The function can only be active for heating coil applications.

1. Frost protection is enabled by setting **00101.5 ControlBits.FrostProtectionHeatED** to 1. When enabled, the valve opens fully. The default value is 0.
2. Return temperature limit and air temperature limit is configured via Grundfos GO Remote:**Main menu** > **Settings** > **Application settings** > **Coil preheat and frost protection**.
   a. Activate the function by pressing the grey slide-button.
   b. Press **Frost return temperature limit** to define a return temperature threshold. Press **OK**.
   c. Press **Frost air temperature limit** to define an air temperature threshold. Press **OK**.
   d. Press **Forced pump start** to define a temperature threshold for the antifreeze sensor. Press **OK**

Read the system state via **00212 StatusSystemstate**. If set to 6, MIXIT is protecting the coil against frost.

If coil frost is detected, a notification is given via **00204.4 Status.CoilFrostRisk** and is set to 1.

Address	Register name	Modbus unit	R/W	Description
00212	StatusSystemstate	Enum	R	0: Powering up (~30 s) 1: Fault (fault relay activated) 2: Ready 3: Preheating heating coil 4: Temperature control state 5: Coil frost protection (ready relay activated) 6: Underfloor overheat protection 7: Shut down due to removal of start signal 8: Auto tuner on 9: Backup control 1 10: Backup control 2
00204.4	Status.CoilFrostRisk	Enum	R	0: Ok - no frost detected 1: Coil frost risk state

6.4.3 Setting the frost protection, cooling

The function can only be active for cooling application.

1. Frost protection is enabled by setting **00101.7 ControlBits.FrostProtectionCoolED** to 1. When enabled, the valve opens fully. The default value is 0.
2. Return temperature limit and air temperature limit is configured via Grundfos GO Remote: **Main menu** > **Settings** > **Application settings** > **Frost protection**
   a. Activate the function by pressing the grey slide-button.
   b. Press **Frost return temperature limit** to define a return temperature threshold. Press **OK**.

Read the system state via **00212 StatusSystemstate**.

Address	Register name	Modbus unit	R/W	Description
00101.7	ControlBits.FrostProtectionCoolED	Bool	W	0: frost protection disabled 1: frost protection enabled
00212	StatusSystemstate	Enum	R	0: Powering up (~30 s) 1: Fault (fault relay activated) 2: Ready 3: Preheating heating coil 4: Temperature control state 5: Coil frost protection (ready relay activated) 6: Underfloor overheat protection 7: Shut down due to removal of start signal 8: Auto tuner on 9: Valve 100 % open (for backup) 10: Return temperature control

6.5 Pump control modes

When MIXIT is connected to the pump, the control mode is by default set to the control mode that best suits the application in which MIXIT operates. You can choose between five different control modes:

- $AUTO_{ADAPT}$

  During operation, the pump automatically makes the necessary adjustment to the actual system characteristic. Recommended for most heating systems.
- Proportional pressure

  Default control mode for radiator heating systems. Typically used in systems with relatively large pressure losses in the distribution pipes.
- Constant pressure

  Default control mode for underfloor heating systems. We recommend this control mode in systems with relatively small pressure losses such as underfloor heating systems.
- Constant curve/constant speed

  Default control mode for air handling units. The pump operates according to a constant curve and is suitable for systems where both a constant flow rate and a constant head are required.
- Constant flow

  The pump maintains a constant flow in the system independently of the head. We recommend that you use this control mode in air handling unit systems.
- In the cooling system, a pump can operate on all five different control modes.

6.5.1 Configuring the pump control mode, heating

1. Configure the pump control mode via **00113 Config.PumpControlModeHeat**.
2. Verify the actual pump control mode via **00210 Status.PumpControlMode**.

Example:

Address	Register name	Modbus unit	R/W	Description
00113	Config.PumpControlModeHeat	Enum	W	0: Constant pressure 1: Proportional pressure (default) 2: Constant speed 5: $AUTO_{ADAPT}$ 8: Constant flow.
00210	Status.PumpControlMode	Enum	R	0: Constant pressure 1: Proportional pressure (default) 2: Constant speed 5: $AUTO_{ADAPT}$ 8: Constant flow. 255: Not available / invalid

6.5.2 Configuring the pump control mode, cooling

1. Configure the pump control mode via **00133 Config.PumpControlModeCool**.
2. Verify the actual pump control mode via **00210 Status.PumpControlMode**.

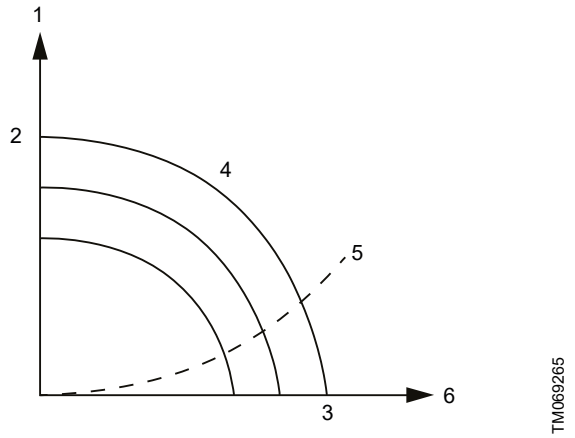
Address	Register name	Modbus unit	R/W	Description
00133	Config.PumpControlModeCool	Enum	R/W	0: Constant pressure 1: Proportional pressure (default) 2: Constant speed 5: Autoadapt 8: Constant flow
00210	Status.PumpControlMode	Enum	R	0: Constant pressure 1: Proportional pressure (default) 2: Constant speed 5: AUTOADAPT 8: Constant flow. 255: Not available / invalid

6.5.3 Setting the duty point for constant-speed control mode

The duty point for heating is set via **00116 Config.PumpSpeedDutyPoint**, while the duty point for cooling is set via **00136 Config.PumpSpeedDutyPointCool**.

The duty point is the percentage of maximum speed. In these control modes, the pump speed will be constant at the configured speed duty point.

Address	Register name	Modbus unit	R/W	Description
00116	Config.PumpSpeedDutyPointHeat	0.01 %	W	The desired speed in the control mode constant speed.
00136	Config.PumpSpeedDutyPointCool	0.01 %	R/W	Desired speed in control mode Constant speed for cooling mode



Constant-speed control curve

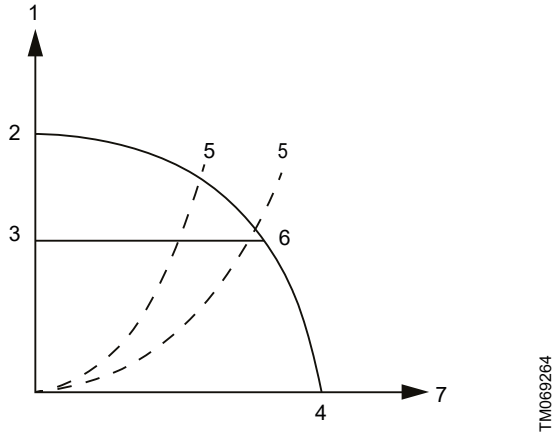
Pos.	Description
1	Head [m]
2	$H_{max.}$
3	$Q_{max.}$
4	Constant speed curves
5	System curve
6	Flow [m^3/h]

6.5.4 Setting the duty point for constant-pressure control mode

The duty point for heating is set via **00114.Config.PumpHeadDutyPoint**, while the duty point for cooling is set via **00134 Config.PumpHeadDutyPointCool**.

The duty point is the pressure in metres. In these control modes, the pump will have a constant pressure at the configured duty point.

Address	Register name	Modbus unit	R/W	Description
00114	Config.PumpHeadDutyPointHeat	m	W	The desired pressure in the constant pressure mode.
00134	Config.PumpHeadDutyPointCool	m	R/W	Desired pressure duty point for const./prop. pressure for cooling mode



Constant-pressure control curve

Pos.	Description
1	Head [m]
2	$H_{max.}$
3	Duty point
4	$Q_{max.}$
5	System curves
6	Control curve
7	Flow [m^3/h]

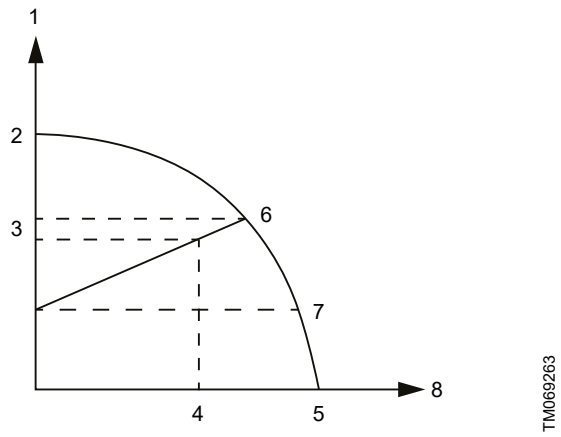
6.5.5 Setting the duty point for proportional-pressure control mode

The duty point for heating is set via **00114 Config.PumpHeadDutyHeat** (head duty point) and **00115 Config.PumpFlowDutyPointHeat** (flow duty point).

The duty point for cooling is set via **00134 Config.PumpHeadDutyPointCool** (head duty point) and **00135 Config.PumpFlowDutyPointCool** (flow duty point).

The control curve will be a straight sloped line through the configured duty point.

Address	Register name	Modbus unit	R/W	Description
00114	Config.PumpHeadDutyHeat	m	W	The desired head duty point.
00115	Config.PumpFlowDutyPointHeat	0.1 m^3/h	W	The desired flow duty point.
00134	Config.PumpHeadDutyPointCool	m	R/W	Desired pressure duty point for const./prop. pressure for cooling mode.
00135	Config.PumpFlowDutyPointCool	0.1 m^3	R/W	Desired flow duty point for proportional pressure and flow limit control for cooling mode.



Proportional-pressure control curve

Pos.	Description
1	Head [m]
2	$H_{max.}$
3	00114 Config.PumpHeadDuty
4	00115 Config.PumpFlowDutyPoint
5	$Q_{max.}$
6	H_0
7	$H_0/2$
8	Flow [m^3/h]

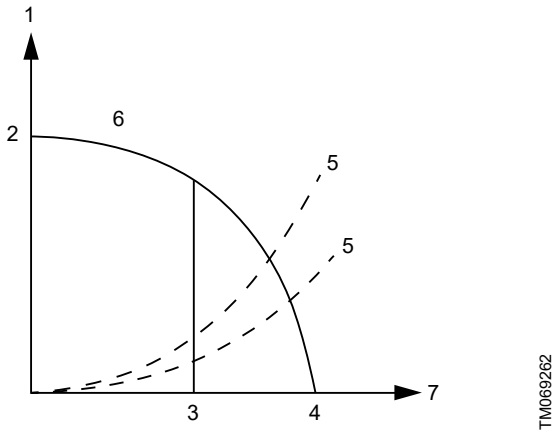
The footpoint of the proportional-pressure curve at zero flow is always half of the head where the proportional-pressure curve crosses the pump curve for maximum speed.

6.5.6 Setting the duty point for constant-flow control mode

The duty point for heating is set via **00115 Config.PumpFlowDutyPointHeat** (flow duty point). In this control mode, the pump flow will be constant. This control mode is recommended for heating coils. For pumps without a dedicated flow control function, the auxiliary control function flow limit **00107 Config.SupplyFlowLimitHeat** is activated. For hydraulic circuits with low hydraulic resistance, such as heating coils, this is effectively flow control mode. In order to activate the flow limits set the **00106.0 ConfigBits.SupplyFlowLimitingHeatED** to 1.

The duty point for cooling is set via **00135 Config.PumpFlowDutyPointCool** (flow duty point). In this control mode, the pump flow will be constant. This control mode is recommended for cooling. For pumps without a dedicated flow control function, the auxiliary control function flow limit **00129 Config.SupplyFlowLimitCool** is activated. For hydraulic circuits with low hydraulic resistance, this is effectively flow control mode. In order to activate the flow limits set the **00128.0 ConfigBits.SupplyFlowLimitingCoolED** to 1.

Address	Register name	Modbus unit	R/W	Description
00115	Config.PumpFlowDutyPointHeat	0.1 m^3/h	W	Set the desired flow duty point.
00107	Config.SupplyFlowLimitHeat	0.1 m^3/h	W	Set the desired supply flow limit.
00106.0	ConfigBits.SupplyFlowLimitingHeatED	Bool	W	0: Supply flow-limiting disabled. 1: Supply flow-limiting enabled.
00135	Config.PumpFlowDutyPointCool	0.1 m^3/h	R/W	Desired flow duty point for proportional pressure and flow limit control for cooling mode.
00128.0	ConfigBits.SupplyFlowLimitingCoolED	Bool	R/W	0: Supply flow limiting disabled 1: Supply flow limiting enabled
00129	Config.SupplyFlowLimitCool	0.1 m^3/h	R/W	Set supply flow limit for cooling mode (under license)



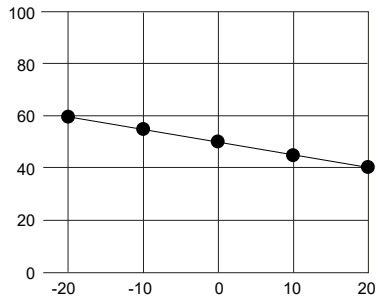
Pos.	Description
1	Head [m]
2	$H_{max.}$
3	00115 Config.PumpFlowDutyPoint
4	$Q_{max.}$
5	System curves
6	Control curve
7	Flow [m^3/h]

6.6 Outdoor temperature compensation (heating)

With the outdoor temperature compensation function activated, the product automatically adjusts the mixed flow temperature according to the outdoor temperature.

Outdoor temperature compensation is set by means of a five-point temperature curve. The curve allows you to predefine five liquid temperature setpoints. MIXIT interpolates between the setpoints and automatically adjusts the liquid temperature accordingly to compensate for the heat demand.

For heating-coil applications, the curve defines the air temperature.



TM072831

Example of five point temperature curve. Y axis: Setpoint [°C]. X axis: Outdoor temperature [°C].

6.6.1 Setting outdoor temperature compensation (heating)

The control source must be set to remote mode **00101.0 ControlBits.RemoteAcessReq** set to 1 in order to control temperature compensation by Modbus.

1. The setpoint source is configured by setting **00117 Config.TempSetpointSource** to 4. It is also possible to use an analog sensor connected to the MIXIT unit by setting **00117 Config.TempSetpointSource** to 3. The analog sensor must be configured via Grundfos GO Remote. See *Configuring an outdoor temperature sensor input and outdoor temperature compensation (heating)*. Outdoor sensor types Pt1000 and 0-10 V are available.
   - If **00117 Config.TempSetpointSource** is set to 4, the outdoor temperature value is given via **00103 Control.SetOutdoorTempRemote**.
   - The actual value of remote outdoor temperature is read via **00310 MesuredData.OutdoorTemp**.
2. Adjust the heat curve offset by **00126 Config.HeatCurveOffset** in K.

   00205.0 Status.HeatCurveDeltaOffsetRangeExceeded indicates if the heat curve offset value is out of range.
3. Adjust the slope of the heat curve in **00127 Config.HeatCurveSlope** (0.4 - 2.0).

   00205.1 Status.HeatCurveSlopeFactorRangeExceeded indicates the heat curve slope factor is of range.

In case the signal from a bus or sensor is lost, the MIXIT unit will use the fallback temperature setpoint. By default, it is 40 °C. It can be changed via **00118 Config.DefaultTempSetpoint**.

If no outdoor temperature source is connected, the product will give the warning code 125 in **00205.2 Status.HeatCurveSlopeFactorEnabled**, except if the temperature source is configured for a 0-10 V analog sensor.

Changing heat curves

For this function to be unlocked, the DYNAMIC upgrade must be activated on the MIXIT unit, or the unit must be a MIXIT DYNAMIC. See *Functions overview*.

It is possible to change the heat curves separately in both Grundfos GO Remote and in Modbus. See *Configuring an outdoor temperature sensor input and outdoor temperature compensation (heating)*. The protocol for Modbus temperature compensation are as follows:

1. 00119 Control.TempCompensationSensor1
2. 00120 Control.TempCompensationSensor2
3. 00121 Control.TempCompensationSensor3
4. 00122 Control.TempCompensationSensor4
5. 00123 Control.TempCompensationSensor5
6. 00124 Control.TempCompensationSensor6.

Address	Register name	Modbus unit	R/W	Description
00101.0	ControlBits.RemoteAcessReq	Bits	W	0: Remote control disabled. 1: Remote control enabled.
00117	Config.TempSetpointSource	Enum	W	0: Local input (default). 1: Analog input. 2: Fieldbus input. 3: Outdoor temp. analog input. 4: Outdoor temp. fieldbus input. 255: Not available / Invalid.
00119	Control.TempCompensationSensor1		R/W	Set temperature sensor 1 value (raw), requires Remote mode (under license)
00120	Control.TempCompensationSensor2		R/W	Set temperature sensor 2 value (raw), requires Remote mode (under license)
00121	Control.TempCompensationSensor3		R/W	Set temperature sensor 3 value (raw), requires Remote mode (under license)
00122	Control.TempCompensationSensor4		R/W	Set temperature sensor 4 value (raw), requires Remote mode (under license)
00123	Control.TempCompensationSensor5		R/W	Set temperature sensor 5 value (raw), requires Remote mode (under license)
00124	Control.TempCompensationSensor6		R/W	Set temperature sensor 6 value (raw), requires Remote mode (under license)
00126	Config.HeatCurveOffset	K	W	Adjusts the heat curve offset.
00127	Config.HeatCurveSlope	0.01	W	Adjusts the slope of the configured heat curve. 1 equals the configured heat curve, and 1.5 equals the configured slope multiplied by 1.5.
00205.0	Status.HeatCurveDeltaOffsetRangeExceeded	Bits	R	0: Not exceeded. 1: Exceeded. Used for indicating that heat curve offset value is out of range [-15 ; 15].
00205.1	Status.HeatCurveSlopeFactorRangeExceeded	Bits	R	0: Exceeded. 1: Not exceeded. Indicating that heat curve slope factor value is out of range [0.4 ; 2.0].

6.7 Eco schedule

In some applications it can be useful to predefine a start and stop schedule and apply an automatic temperature setback function in order to minimise consumption, and thereby energy costs.

With the Eco schedule you can configure start and stop intervals on a weekly basis as well as set single events.

This function can only be set via Grundfos GO Remote.

6.7.1 Scheduling Eco periods

Grundfos GO Remote menu:

Main menu > **Settings** > **Eco functions** > **Eco schedule**

To customise the start and stop intervals of the system, do the following:

1. Activate the scheduling function by pressing the grey slide-button in the top right corner of the screen.
2. Select the weekday for which you want to schedule the pump performance.
3. Insert a time period by pressing the light grey perimeter of the clock.
4. Customise the time period by dragging the bar clockwise or counterclockwise on the light grey perimeter.
5. You can assign more weekdays to the same schedule by pressing the weekdays at the bottom of the screen. Days are chosen when they are shown as green.

   You can insert up to four time periods per day.

   Delete a time period by holding and dragging it to the wastebin in the top left corner.
6. Press **Save** to complete the setup.

Specify whether MIXIT must run according to a temperature setback or shut down in the defined Eco period(s).

6.7.2 Setting temperature setback and system turn off

Grundfos GO Remote menu:

Main menu > **Settings** > **Eco functions** > **Eco schedule**

A temperature setback can be defined for the period in which MIXIT runs according to **Eco schedule**. In this period, MIXIT sets the normal operating temperature back with the number of degrees set in Grundfos GO Remote. Temperature setback is only available for heating applications. MIXIT can also be set to turn off during the **Eco period**.

Do as follows:

1. Make sure that **Eco schedule** has been activated and one or more periods have been defined.
2. When in the **Eco schedule** menu, press **Settings** at the bottom of the screen.
3. Select **Eco period**.
4. Define a setback temperature or press **MIXIT off** to have MIXIT turn off.
5. Press the arrow back at the top of the screen to save and return to the **Settings** menu.

6.7.3 Setting single events

Grundfos GO Remote menu:

Main menu > **Settings** > **Eco functions** > **Eco schedule**

1. Activate **Eco schedule**.
2. Press **Events** at the bottom of the screen, and press **Add event**. Up to 10 single events can be set.
3. Define an action for the event. Choose if the system must act according to a temperature setback or shut down.
4. Define a date and time for the event. Press **Next**.
5. According to your chosen action, define a temperature setback or confirm that MIXIT turns off in the given period.
6. Press **Next** to save the setting and return to the **Events** menu.

6.8 Warm-weather shutdown

When a defined maximum outdoor temperature has been surpassed one to three days in a row, MIXIT automatically shuts down and the pump stops. MIXIT and the pump start again when the average outdoor temperature falls below the temperature limit one to three days in a row, depending on the defined settings.

The temperature signal must be available from either an outdoor temperature sensor or fieldbus.

Once the function has been activated or the function settings have been changed, MIXIT will immediately act accordingly.

This function can only be set via Grundfos GO Remote.

6.8.1 Setting warm weather shutdown

Grundfos GO Remote menu:

Main menu > **Settings** > **Eco functions** > **Warm weather**

1. Activate the function by pressing the grey slide-button in the top right corner of the screen.
2. Press **Outdoor temperature threshold** and define a maximum outdoor temperature. Press **OK** to save the setting.
3. Press **Average period** to define the number of days the outdoor temperature is allowed to surpass the defined threshold.
4. Press **OK** to save the setting.

6.9 Pressure independence

If the differential pressure varies on the primary side, the relation between the valve opening and the flow through the valve changes. These changes will affect the control performance and can result in slow temperature responses or fluctuating temperatures. By comparing the valve opening with the forward and return temperature measurements, MIXIT support such changes, along with changes in the pump flow, supply temperature, and return temperature. This allows the system to perform optimally, which increases both comfort and energy efficiency.

The function is automatically activated when MIXIT is upgraded with the DYNAMIC upgrade or if the MIXIT unit is a MIXIT DYNAMIC.

6.10 Limiters

The MIXIT unit can limit either the primary flow (hydronic flow balancing), the return temperature, and/or the thermal power (hydronic power balancing).

It is possible to run all three limiters simultaneously.

6.10.1 Configuring the supply flow limit, heating

For this function to be unlocked, the DYNAMIC upgrade must be activated on the MIXIT unit or the unit must be a MIXIT DYNAMIC. See Functions overviewOverview of the functions available in MIXIT. .

1. Enable the primary flow limiter by setting **00106.0 ConfigBits.SupplyFlowLimitingHeatED** to 1.
2. Configure the flow limit via **00107 ConfigBits.SupplyFlowLimitHeat** [m^3/h].

If the supply flow limit is surpassed, MIXIT unit gives a notification by setting **00204.2 Status.SupplyFlowHigh** to 1. When the supply flow is above the limit for an extended time (3600 s) the notification bit is set. The notification is not resettable, it will reset itself.

Address	Register name	Modbus unit	R/W	Description
00106.0	ConfigBits.SupplyFlowLimitingHeatED	Bool	R/W	0: Supply flow-limiting disabled. 1: Supply flow-limiting enabled.
00107	Config.SupplyFlowLimitHeat	0.1 m^3/h	R/W	Set the desired supply flow limit.
00204.2	Status.SupplyFlowHigh	Bool	R	0: Ok. 1: Supply flow high state.

6.10.2 Configuring the supply flow limit, cooling

For this function to be unlocked, the DYNAMIC upgrade must be activated on the MIXIT unit or the unit must be a MIXIT DYNAMIC. See Functions overviewOverview of the functions available in MIXIT. .

1. Enable the primary flow limiter by setting **00128.0 ConfigBits.SupplyFlowLimitingCoolED** to 1.
2. Configure the flow limit via **00129 Config.SupplyFlowLimitCool** [m^3/h].

If the supply flow limit is surpassed, MIXIT unit gives a notification by setting **00204.2 Status.SupplyFlowHigh** to 1. When the supply flow is above the limit for an extended time (3600 s) the notification bit is set. The notification is not resettable, it will reset itself.

Address	Register name	Modbus unit	R/W	Description
00128.0	ConfigBits.SupplyFlowLimitingCoolED	Bool	R/W	0: Supply flow-limiting disabled. 1: Supply flow-limiting enabled.
00129	Config.SupplyFlowLimitCool	0.1 m^3/h	R/W	Set supply flow limit for cooling mode (under license)
00204.2	Status.SupplyFlowHigh	Bool	R	0: Ok. 1: Supply flow high state.

6.10.3 Configuring the return temperature limit, heating

For this function to be unlocked, the DYNAMIC upgrade must be activated on the MIXIT unit, or the unit must be a MIXIT DYNAMIC. See Functions overviewOverview of the functions available in MIXIT. .

1. Enable the return temperature limit by setting **00106.2 ConfigBits.ReturnTempLimitingHeatED** to 1.
2. Configure the temperature limit via **00109 ConfigReturnTempLimitHeat**[K].
   For heating applications, the value works as an upper threshold.

If the return temperature limit is surpassed, the MIXIT unit gives a notification by setting **00204.0 Status.ReturnTempHigh** to 1. When the return temperature is above the limit for an extended time (3600 s), the notification bit is set. The notification is not resettable, it will reset itself.

Address	Register name	Modbus unit	R/W	Description
00106.2	ConfigBits.ReturnTempLimitingHeatED	Bool	R/W	0: Return temperature limiting disabled. 1: Return temperature limiting enabled.
00109	Config.ReturnTempLimitHeat	K	R/W	Set the desired return temperature limit.
00204.0	Status.ReturnTempHigh	Bool	R	0: Ok. 1: Return temperature high state.

6.10.4 Configuring the return temperature limit, cooling

For this function to be unlocked, the DYNAMIC upgrade must be activated on the MIXIT unit, or the unit must be a MIXIT DYNAMIC. See Functions overviewOverview of the functions available in MIXIT. .

1. Enable the return temperature limit by setting **00128.2 ConfigBits.ReturnTempLimitingCoolED** to 1.
2. Configure the temperature limit via **00131 Config.ReturnTempLimitCool**[K].
   For cooling applications, the value works as a lower threshold.

If the return temperature limit is surpassed, the MIXIT unit gives a notification by setting **00204.0 Status.ReturnTempHigh** to 1. When the return temperature is above the limit for an extended time (3600 s), the notification bit is set. The notification is not resettable, it will reset itself.

Address	Register name	Modbus unit	R/W	Description
00128.2	ConfigBits.ReturnTempLimitingCoolED	Bool	R/W	0: Return temperature limiting disabled. 1: Return temperature limiting enabled.
00131	Config.ReturnTempLimitCool	K	R/W	Set return temp limit for cooling mode(under license)
00204.0	Status.ReturnTempHigh	Bool	R	0: Ok. 1: Return temperature high state.

6.10.5 Configuring the thermal power limit, heating

For this function to be unlocked, the DYNAMIC upgrade must be activated on the MIXIT unit, or the unit must be a MIXIT DYNAMIC. See Functions overviewOverview of the functions available in MIXIT. .

1. Enable the thermal power limit by setting**00106.1 ConfigBits.ThermalPowerLimitingHeatED** to 1.
2. Configure the thermal power limit via **00108 ConfigThermalPowerLimitHeat** [kW].

If the thermal power limit is surpassed, MIXIT gives a notification by setting **00204.1 Status.ThermalPowerHigh** to 1. When the thermal power is above the limit for an extended time (3600 s), the notification is sent. The notification is not resettable, it will reset itself.

Address	Register name	Modbus unit	R/W	Description
00106.1	ConfigBits.ThermalPowerLimitingHeatED	Bool	R/W	0: Thermal power limiting disabled. 1: Thermal power limiting enabled.
00108	ConfigThermalPowerLimitHeat	kW	R/W	Set the desired thermal power limit.
00204.1	Status.ThermalPowerHigh	Bool	R	0: Ok. 1: Thermal power high state.

6.10.6 Configuring the thermal power limit, cooling

For this function to be unlocked, the DYNAMIC upgrade must be activated on the MIXIT unit, or the unit must be a MIXIT DYNAMIC. See Functions overviewOverview of the functions available in MIXIT. .

1. Enable the thermal power limit by setting**00128.1 ConfigBits.ThermalPowerLimitingCoolED** to 1.
2. Configure the thermal power limit via **00130 Config.ThermalPowerLimitCool** [kW].

If the thermal power limit is surpassed, MIXIT gives a notification by setting **00204.1 Status.ThermalPowerHigh** to 1. When the thermal power is above the limit for an extended time (3600 s), the notification is sent. The notification is not resettable, it will reset itself.

Address	Register name	Modbus unit	R/W	Description
00128.1	ConfigBits.ThermalPowerLimitingCoolED	Bool	R/W	0: Thermal power limiting disabled. 1: Thermal power limiting enabled.
00130	Config.ThermalPowerLimitCool	kW	R/W	Set thermal power limit for cooling mode(under license)
00204.1	Status.ThermalPowerHigh	Bool	R	0: Ok. 1: Thermal power high state.

6.10.7 Configuring the differential temperature limit, heating

1. Enable the differential temperature limit by setting **00106.3 ConfigBits.PrimaryDeltaTLimitingHeatED** to 1.
2. Configure the differential temperature limit via **00110 Config.PrimaryDeltaTLimitHeat** [K].

If the differential temperature limit is surpassed, MIXIT gives a notification by setting **00204.5 Status.DiffTempHigh** to 1. When the differential temperature is above the limit for an extended time (3600 s), the notification bit is set. The notification is not resettable, it will reset itself.

Address	Register name	Modbus unit	R/W	Description
00106.3	ConfigBits.PrimaryDeltaTLimitingHeatED	Bool	R/W	0: Primary delta T limiting disabled. 1: Primary delta T limiting enabled.
00110	Config.PrimaryDeltaTLimitHeat	K	R/W	Set the differential temperature limit.
00204.5	Status.DiffTempHigh	Bool	R	0: Ok. 1: Differential temperature high state.

6.10.8 Configuring the differential temperature limit, cooling

1. Enable the differential temperature limit by setting **00128.3 ConfigBits.PrimaryDeltaTLimitingCoolED** to 1.
2. Configure the differential temperature limit via **00130 Config.PrimaryDeltaTLimitCool** [K].

If the differential temperature limit is surpassed, MIXIT gives a notification by setting **00204.5 Status.DiffTempHigh** to 1. When the differential temperature is above the limit for an extended time (3600 s), the notification bit is set. The notification is not resettable, it will reset itself.

Address	Register name	Modbus unit	R/W	Description
00128.3	ConfigBits.PrimaryDeltaTLimitingCoolED	Bool	R/W	0: Primary delta T limiting disabled. 1: Primary delta T limiting enabled.
00132	Config.PrimaryDeltaTLimitCool	K	R/W	Set primary delta t limit for cooling mode(under license).
00204.5	Status.DiffTempHigh	Bool	R	0: Ok. 1: Differential temperature high state.

6.11 Energy monitor

With the energy monitor function it is possible to monitor the energy consumption in individual zones. This function does not require any additional sensors or any additional settings to the system.

The function is automatically activated when MIXIT is upgraded with the DYNAMIC upgrade or if the MIXIT unit is a MIXIT DYNAMIC.

Energy monitoring register

Registers are available for cloud, Grundfos GO Remote and via fieldbus.

- Life time, last year and year to date counters are available on GO Remote
- Life time counters are available via fieldbus

The registers for energy monitoring are shown in below table.

Address	Register name	ModBus unit	R/W	Description
00305	MeasuredData.HeatingPower	1 kW	R	Current thermal power for product running in heating mode.
00306	MeasuredData.HeatingTempDifference	0.01 °C	R	Numerical value of forward pipe and return pipe differential Temperature. Used for heat transfer calculation.
00325	MeasuredData.HeatingEnergyHI	1 kWh	R	Accumulated heating energy in total lifetime. Reset via 00101.3 (Reset Accumulated Counters).
00326	MeasuredData.HeatingEnergyLO	1 kWh	R	Accumulated heating energy in total lifetime. Reset via 00101.3 (Reset Accumulated Counters).
00327	MeasuredData.CoolingPower	1 kW	R	Current thermal power for product running in cooling mode.
00339	MeasuredData.HeatingVolumeHI	0.01 m^3	R	Accumulated heating volume in total lifetime. Reset via 00101.3 (Reset Accumulated Counters).
00340	MeasuredData.HeatingVolumeLO	0.01 m^3	R	Accumulated heating volume in total lifetime. Reset via 00101.3 (Reset Accumulated Counters).
00341	MeasuredData.CoolingVolumeHI	0.01 m^3	R	Accumulated cooling volume in total lifetime. Reset via 00101.3 (Reset Accumulated Counters).
00342	MeasuredData.CoolingVolumeLO	0.01 m^3	R	Accumulated cooling volume in total lifetime. Reset via 00101.3 (Reset Accumulated Counters).
00343	MeasuredData.CoolingEnergyHI	1 kWh	R	Accumulated cooling energy in total lifetime. Reset via 00101.3 (Reset Accumulated Counters).
00344	MeasuredData.CoolingEnergyLO	1 kWh	R	Accumulated cooling energy in total lifetime. Reset via 00101.3 (Reset Accumulated Counters).
00345	MeasuredData.VolWeightAvgT1HeatHI	0.01 °C m^3	R	Total volume weighted average for T1, Heating (Inlet). Reset via 00101.3 (Reset Accumulated Counters).
00346	MeasuredData.VolWeightAvgT1HeatLO	0.01 °C m^3	R	Total volume weighted average for T1, Heating (Inlet). Reset via 00101.3 (Reset Accumulated Counters).
00347	MeasuredData.VolWeightAvgT2HeatHI	0.01 °C m^3	R	Total volume weighted average for T2, Heating (Outlet). Reset via 00101.3 (Reset Accumulated Counters).
00348	MeasuredData.VolWeightAvgT2HeatLO	0.01 °C m^3	R	Total volume weighted average for T2, Heating (Outlet). Reset via 00101.3 (Reset Accumulated Counters).
00349	MeasuredData.VolWeightAvgT1CoolHI	0.01 °C m^3	R	Total volume weighted average for T1, Cooling (Inlet). Reset via 00101.3 (Reset Accumulated Counters).
0035	MeasuredData.VolWeightAvgT1CoolLO	0.01 °C m^3	R	Total volume weighted average for T1, Cooling (Inlet). Reset via 00101.3 (Reset Accumulated Counters).
00351	MeasuredData.VolWeightAvgT2CoolHI	0.01 °C m^3		Total volume weighted average for T2, Cooling (Outlet). Reset via 00101.3 (Reset Accumulated Counters).
00352	MeasuredData.VolWeightAvgT2CoolLO	0.01 °C m^3		Total volume weighted average for T2, Cooling (Outlet). Reset via 00101.3 (Reset Accumulated Counters).

Grundfos GO Remote menu:

Main menu > **Monitoring** > **Heat energy monitor**

Grundfos GO Remote menu:

Grundfos Go displays the register values. It displays the values of the current system in use, ie. heating or cooling.

TM082953

Energy monitoring display in heating/cooling application

In Combined heating/cooling application the user is able to switch between parameters for heating or cooling. The values in the energy monitoring screen reflect the actual status of the system, if currently heating, it shows the heating parameters and vice versa.

Energy monitoring display in Combined heating/cooling application

7. Fault finding the product

This is a complete list of alarm and warning codes for the MIXIT fieldbus connection. For more information about fault finding of MIXIT and MAGNA3/TPE3, see the installation and operating instructions of the products

7.1 The external control icon is not switched on

Cause	Remedy
The configuration may have failed.	• Check the Modbus interface configuration via Grundfos GO Remote. When a fieldbus connection is established, the external control icon on the MIXIT operating panel will light up.
The connections at the terminal board are incorrect.	• Try switching wires at A2 and B2 terminals. When a fieldbus connection is established, the external control icon on the MIXIT operating panel will light up.

7.2 Data is read from the MIXIT unit, but it is not reacting on a setpoint change

Cause	Remedy
The product is in local control instead of bus control.	• Check that MIXIT is in bus control. The actual state is read at 00201.0 ActualRemoteAccess. The status is changed via 00101.0 RemoteAccessReq. Note that local control is the default setting. • Check that 00117 TempSetpointSource is configured correctly. - 00212 = 2: Fieldbus input. - 00212 = 4: Outdoor temperature fieldbus input.

7.3 The controlled temperature is much different than the requested temperature for more than 10-20 minutes

Cause	Remedy
The setpoint source is not configured correctly.	1. If the controlled temperature at **00323 MeasuredData.Controlled.Temp** is much different than the setpoint at **00311 ActualTempSetpointRemote**, after several minutes, check if the setpoint in **00311 ActualTempSetpointRemote** is the same as the requested in **00102 SetTempSetpointRemote**. 2. Check that **00117 TempSetpointSource** is configured for remote setpoint.
The limit functions may be enabled which reduces the setpoint.	1. Check that the actual setpoint in **00321 ActualTempSetpoint** is the same as the registered remote setpoint in **00311 ActualTempSetpointRemote**. 2. Check if one or more limit functions are active. Check if **00106.0 SupplyFlowLimiting**, **00106.1 ThermalPowerLimiting** and **00106.2 ReturnTempLimiting** is set to 1. If one or more limit functions are active and the MIXIT unit is running at or above the threshold associated with the active limit function (00107 SupplyFlowLimit, 00108 ThermalPowerLimit, 00109 TeturnTempLimit), then the remote setpoint in **00321 ActualTempSetpoint** is reduced below **00311 ActualTempSetpointRemote** until the threshold is reached. 3. If no limit functions are active and the response is too slow, run the auto-tuning function from Grundfos GO Remote:**Settings** > **Temperature controller** > **Automatic tune**.
The gain of the closed-loop controller is too low.	1. Increase the proportional gain with Grundfos GO Remote with 10 % of the actual gain at a time until the response is satisfactory. Wait for several minutes between each increase. 2. If necessary, adjust the integral time with Grundfos GO Remote.

7.4 The MIXIT unit was set to bus control, but it is now in local control again

Cause	Remedy
The MIXIT unit starts in local control. The actual status is not kept during a power cycle.	• Check the status in **00201.0 ActualRemoteAccess**. • If it is set to 0, set **00101.0 RemoteAccessReq** to 1 again.

7.5 The MIXIT unit was stopped from Modbus command, but it has started again

Cause	Remedy
The MIXIT unit is starting again. The actual start/stop status from bus is not kept during a power cycle.	• Check the status in **00201.3 ActualRunStatePump**. • If it is set to 1, set **00101.0 RemoteAccessReq** to 1 and then set **00101.1 OnOff** to 0.

7.6 The MIXIT unit does not start the pump when a start signal is given in 00101.1 (ON/OFF)

Cause	Remedy
The pump state is incorrect.	• Ensure the requested pump run state in **00201.3 ActualRunStatePump** has value 1 in order to start the pump. • Check if the pump is stopped locally via the pump interface. At the pump, local stop has priority over bus control.

7.7 The MIXIT unit does not stop the pump when a stop signal is given in 00101.1 (ON/OFF)

Cause	Remedy
The pump state is incorrect.	• Ensure the requested pump run state in **00201.3 ActualRunStatePump** has value 0 in order to stop the pump. • Check if the pump is running at maximum speed. At the pump, local stop and local max. has priority over bus control.

7.8 Reading and resetting warnings and alarms

- Readout system warnings in 00207 Status.WarningCode.
- Readout system alarms in 00206 Status.AlarmCode.
- Readout system subwarnings in 00209 Status.SubWarningCode.
- Readout system subalarms in 00208 Status.SubAlarmCode.
- Pump warnings codes are read via 00401 MeasuredData.PumpWarningsCode.
- Pump alarm codes are read via 00402 MeasuredData.PumpAlarmCode.
- Reset alarms and warnings by setting 00101.2 ControlBits.ResetAlarm to 1.

Address	Register name	Modbus unit	R/W	Description
00206	Status.AlarmCode	Enum	R	10: Pump communication fault 39: Valve fault 91: Secondary flow temperature sensor fault(pump) 236: Multi-pump alarm for pump 1.
00207	Status.WarningCode	Enum	R	97: Missing external setpoint 125: Outdoor temp. sensor fault 126: Air temp. sensor fault 127: System pressure sensor fault 157: Real-time clock battery fault 169: Signal fault, flow sensor 175: Supply temp. sensor fault 176: Return temp. sensor fault 211: System pressure low.
00208	Status.SubAlarmCode	Enum	R	**Main Event Code 10: Pump communication fault:** Subcodes: 1001: Pump communication fault 1002: Multiple MIXIT connected to the same pump. **Main Event Code 25: Wrong configuration:** Subcodes: 1001: I/O terminals configuration mismatch. 1002: A change in the configuration is detected. 1003: A change in the configuration is detected. 1004: Wrong sensor type connected. 1005: Level control settings wrong. **Main Event Code 39: Valve fault:** Subcodes: 1001: The valve is blocked and cannot rotate. 1002: Valve calibration outside the tolerance 1003: Valve calibration failed, optical sensor 1 defect. 1004: Valve calibration failed, optical sensor 2 defect.
00209	Status.SubWarningCode	Enum	R	
00401	MeasuredData.PumpWarningsCode	Enum	R	Actual pump warning code.
00402	MeasuredData.PumpAlarmCode	Enum	R	Actual pump alarm code.
00101.2	ControlBits.ResetAlarm	Bool	W	0: No resetting 1: Reset alarm

8. Index

8.1 Functions for configuration and control

8.1.1 Remote operation

Address	Register name	Modbus unit	R/W	Description
00101.0	ControlBits.RemoteAccessReq	Bool	W	0: Remote control disabled. 1: Remote control enabled. Set to 1 to enable control via Modbus. See 00201.0 for the actual state.
00201.0	Status.ActualRemoteAccess	Bool	R	0: Remote control disabled. 1: Remote control enabled.

8.1.2 System Start/Stop and status

Address	Register name	Modbus unit	R/W	Description
00101.1	ControlBits.OnOff	Bool	W	0: Stop (Off) (default) 1: Start (ON) If set to 0: • The pump stops. • The valve closes. • The value of 00212 (Status.SystemState) will be 2 if there is no system fault.
00201.1	Status.Fault	Bool	R	0: No fault 1: Fault present If 1, the system is stopped due to alarm.
00201.2	Status.Ready	Bool	R	0: Not ready 1: Ready Indicates if the system is ready for operation or not.
00201.3	Status.ActualRunStatePump	Bool	R	0: Not running 1: Running This status shows the actual pump running state.
00201.4	Status.FanAndDampersED	Bool	R	0: Disabled 1: Enabled.

8.1.3 Switching between heating and cooling

Address	Register name	Modbus unit	R/W	Description
00137	Config.ThermalApplicationType	Enum	R/W	0: Heating 1: Cooling Control of thermal regulation mode (requireing setpoint source = fieldbus)

8.1.4 Manual override

Address	Register name	Modbus unit	R/W	Description
00111	Config.ManualValveFunction	Enum	W	1: Manual Valve Off 2: Manual Valve 100 % Open 3: Manual Valve 50 % open 4: Manual Valve 25 % open 5: Manual Valve Fully Closed Function for manual setting of the valve opening, e.g. for degassing use or other service purpose.

8.1.5 Temperature Setpoint and Feedback

Address	Register name	Modbus unit	R/W	Description
00117	Config.TempSetpointSource	Enum	W	0: Local input (default) 1: Analog input 2: Fieldbus 3: Outdoor Temp. Analog Input 4: Outdoor Temp. Fieldbus 255: Not available / Invalid.
00118	Config.DefaultTempSetpoint	K	W	Default temperature setpoint Fall back temperature setpoint in case setpoint signal from bus or sensor is lost. Default: 40 °C.
00102	Control.SetTempSetpointRemote	K	W	Temperature setpoint set via fieldbus.
00311	MeasuredData.ActualTempSetpointRemote	K	R	The actual temperature setpoint from fieldbus.
00126	Config.HeatCurveOffset	K	W	Adjusts the heat curve offset.
00103	Control.SetOutdoorTempRemote	K	R	Outdoor temperature value from fieldbus.
00312	MeasuredData.ActualOutdoorTempRemote	K	R	The actual outdoor temperature from fieldbus.
00127	Config.HeatCurveSlope	0.01	W	Adjusts the slope of the configured heat curve. 1 equals the configured heat curve, and 1.5 equals the configured slope multiplied by 1.5.
00205.0	Status.HeatCurveDeltaOffsetRangeExceede	Bits	R	0: Not exceeded 1: Exceeded Used for indicating that heat curve offset value is out of range [-15; 15].
00205.1	Status.HeatCurveSlopeFactorRangeExceede	Bits	R	0: Exceeded 1: Not exceeded Indicating that heat curve slope factor value is out of range [0.4; 2.0].

8.1.6 System alarm/warning status and reset

Address	Register name	Modbus unit	R/W	Description
00101.2	ControlBits.ResetAlarm	Bool	W	0: No resetting 1: Reset alarm Resets pending alarms and warnings. The data point is rising edge triggered.
00206	Status.AlarmCode	Enum	R	10: Pump communication fault 39: Valve fault 91: Flow temperature sensor fault 236: Pump faulty.
00207	Status.WarningCode	Enum	R	97: Missing analog input 125: Outdoor sensor fault 126: Remote air temperature sensor fault 127: System pressure sensor fault 157: Real-time clock battery fault 169: Flow sensor fault 175: Supply (forward) temp. sensor fault 176: Return temperature sensor fault 211: System pressure low.
00208	Status.SubAlarmCode	Enum	R	**Main Event Code 10: Communication fault, pump:** Subcodes: 1001: Communication fault with the pump. 1002: More than one master in GlowPan network. **Main Event Code 25: Setup conflict:** Subcodes: 1001: IO terminal configuration fault. 1002: Service concept configuration conflict. 1003: Service confirmation fault. 1004: Configured sensor conflicts with attached sensor. 1005: Level control settings wrong. **Main Event Code 39: Valve stuck/defective:** Subcodes: 1001: Valve blocked or cannot be controlled. 1002: Valve calibration outside the tolerance. 1003: Valve calibration failed, optical sensor 1 defect. 1004: Valve calibration failed, optical sensor 2 defect.

Address	Register name	Modbus unit	R/W	Description
00209	Status.SubWarningCode	Enum	R	
00212	StatusSystemstate	Enum	R	1: Powering up (~30 s) 2: Fault (fault relay activated) 3: Ready 4: Preheating heating coil 5: Temperature control state (ready relay activated) 6: Coil frost protection 7: Underfloor overheat protection 8: Shut down due to removal of start signal 9: Auto tuner on 10: Backup control 1 11: Backup control 2.
00401	MeasuredData.PumpWarningCode	Enum	R	Actual pump warning code.
00402	MeasuredData.PumpAlarmCode	Enum	R	Actual pump alarm code.

8.1.7 Date and time

Address	Register name	Modbus unit	R/W	Description
00104	Control.SetUnixRtcHI	Seconds	W	Product time and date in Unix format (seconds since 00:00 01-01-1970).
00105	Control.SetUnixRtcLO			
00216	Status.UnixRtcHI	Seconds	R	Return actual time and date.
00217	Status.UnixRtcLO			

8.1.8 Pump control mode and setpoint

Address	Register name	Modbus unit	R/W	Description
00113	Config.PumpControlModeHeat	Enum	W	0: Constant pressure 1: Proportional pressure (default) 2: Constant speed 5: $AUTO_{ADAPT}$ 8: Constant flow.
00114	Config.PumpHeadDutyPointHeat	m	W	The desired pressure in the constant pressure mode.
00115	Config.PumpFlowDutyPointHeat	0.1 m^3/h	W	The desired flow duty point.
00116	Config.PumpSpeedDutyPointHeat	0.01 %	W	The desired speed in the control mode constant speed.
00133	Config.PumpControlModeCool	Enum	R/W	0: Constant pressure 1: Proportional pressure (default) 2: Constant speed 5: Autoadapt 8: Constant flow
00134	Config.PumpHeadDutyPointCool	m	R/W	Desired pressure duty point for const./prop. pressure for cooling mode.
00135	Config.PumpFlowDutyPointCool	0.1 m^3/h	R/W	Desired flow duty point for proportional pressure and flow limit control for cooling mode
00136	Config.PumpSpeedDutyPointCool	0.01 %	R/W	Desired speed in control mode Constant speed for cooling mode
00210	Status.PumpControlMode	Enum	R	0: Constant pressure 1: Proportional pressure (default) 2: Constant speed 5: $AUTO_{ADAPT}$ 8: Constant flow 255: Not available / invalid.

8.2 Simulation functions

8.2.1 Simulation functions

Address	Register name	Modbus unit	R/W	Description
00708	Simulation.Activate	Bool	W	0: Deactivate 1: Activate Activation of Alarm/Warning simulation (requires Remote mode)
00709	Simulation.Active	Bool	R	Status of Alarm/Warning simulation
00701	Simulation.EventCode	Enum	W	Write a supported event code (warning or alarm)
00702	Simulation.EventSubCode	Enum	W	Write a supported event subcode (warning or alarm)

8.2.2 Alarm/warning simulation

Address	Register name	Modbus unit	R/W	Description
00206	Status.AlarmCode	Enum	R	MIXIT system alarm code
00207	Status.WarningCode	Enum	R	MIXIT system warning code
00208	Status.SubAlarmCode	Enum	R	MIXIT system subalarm code
00209	Status.SubWarningCode	Enum	R	MIXIT system subwarning code

8.3 System monitoring

8.3.1 System state

Address	Register name	Modbus unit	R/W	Description
00212	Status.Systemstate	Enum	R	0: Powering up (~30 s) 1: Fault (fault relay activated) 2: Ready (ready relay activated) 3: Preheating heating coil 4: Temperature control state 5: Coil frost protection 6: Underfloor overheat protection 7: Shut down due to removal of the start signal 8: Auto tuner on 9: Backup control 1 10: Backup control 2.

8.3.2 Application configuration and monitoring

Address	Register name	Modbus unit	R/W	Description
00112	ConfigApplicationType	Enum	W	0 = Radiator Heating 1 = Floor heating 2 = Heating coil 3 = Cooling coil 255 = Not available / Invalid.
00211	Status.ApplicationType	Enum	R	0 = Radiator Heating 1 = Floor heating 2 = Heating coil 3 = Cooling coil 255 = Not available / Invalid.
00106.0	ConfigBits.SupplyFlowLimitingHeatED	Bool	W	0: Supply flow-limiting disable 1: Supply flow-limiting enabled Enabling of supply flow limit. When enabled, the consumed primary flow is limited below the configuration in 00107 Config.SupplyFlowLimit.
00106.1	ConfigBits.ThermalPowerLimitingHeatED	Bool	W	0: Disabled (default) 1: Enabled. Enabling of thermal power limiter. When enabled, the delivered thermal power is limited below the configuration in 00108 Config.ThermalPowerLimit.
00106.2	ConfigBits.ReturnTempLimitingHeatED	Bool	W	0: Disabled (default) 1: Enabled. Enabling of return temperature limiter. When enabled, the return temperature is limited below (above for cooling applications) the configuration in 00109 Config.ReturnTempLimit [K].
00106.3	ConfigBits.PrimaryDeltaTLimitingHeatED	Bool	W	0: Disabled (default) 1: Enabled. Enabling of primary differential temperature limiter. When enabled, the differential temperature on the primary side is limited below the configuration in 00110 Config.PrimaryDeltaTLimit [K].
00128.0	ConfigBits.SupplyFlowLimitingCoolED	Bool	R/W	0: Supply flow limiting disabled 1: Supply flow limiting enabled
00128.1	ConfigBits.ThermalPowerLimitingCoolED	Bool	R/W	0: Thermal power limiting disabled 1: Thermal power limiting enabled
00128.2	ConfigBits.ReturnTempLimitingCoolED	Bool	R/W	0: Return temp. limiting disabled 1: Return temp. limiting enabled
00128.3	ConfigBits.PrimaryDeltaTLimitingCoolED	Bool	R/W	0: Primary delta T limiting disabled 1: Primary delta T limiting enabled
00107	Config.SupplyFlowLimitHeat	m^3/h	W	Primary flow limit for hydronic balancing.
00108	Config.ThermalPowerLimitHeat	kW	W	Thermal power limit for the hydronic balancing.
00109	Config.ReturnTempLimitHeat	K	W	Return temperature limit for hydronic balancing. For heating applications, the value works as an upper threshold. For cooling applications, the value works as a lower threshold.
00110	Config.PrimaryDeltaTLimitHeat	K	W	Differential temperature limit for hydronic balancing. The value is positive for both heating and cooling applications.
00129	Config.SupplyFlowLimitCool	0.1 m^3/h	R/W	Set supply flow limit for cooling mode (under license)
00130	Config.ThermalPowerLimitCool	kW	R/W	Set thermal power limit for cooling mode(under license)
00131	Config.ReturnTempLimitCool	K	R/W	Set return temp limit for cooling mode(under license)
00132	Config.PrimaryDeltaTLimitCool	K	R/W	Set primary delta t limit for cooling mode(under license)
00204.0	Status.ReturnTempHigh	Bool	R	0: Not above (heating), not below. 1: Above (heating), below. If 1, the return temperature exceeds the limit in 00109 Config.ReturnTempLimit for extended time (3600 s). The notification is not resettable, but it will reset itself. The supply flow limit function is enabled and disabled via Grundfos GO Remote or 00106.2 ConfigBits.ReturnTempLimitingED.

Address	Register name	Modbus unit	R/W	Description
00204.1	Status.ThermalPowerHigh	Bool	R	0: Not above 1: Above. If 1, the thermal power is above the limit in 00108 Config.ThermalPowerLimit for an extended time (3600 s). The notification is not resettable, but it will reset itself. The supply flow limiter function is enabled and disabled via Grundfos GO Remote or 00106.1 ConfigBits.ThermalPowerLimitingED.
00204.2	Status.SupplyFlowHigh	Bool	R	0: Not above 1: Above. If 1, the supply flow is above the limit in 00107 Config.SupplyFlowLimit for an extended time (3600 s). The notification is not resettable, but it will reset itself. The supply flow limit function is enabled and disabled via Grundfos GO Remote or 00106.0 ConfigBits.SupplyFlowLimitingED.
00204.3	Status.FlowTempHigh	Bool	R	0: Not detected 1: Detected. If 1, the flow temperature above the configured value is detected. The notification is not resettable. The internal detection function is configured via Grundfos GO Remote. The function is associated with the underfloor heating application.
00204.4	Status.CoilFrostRisk	Bool	R	0: Not detected 1: Detected. If 1, coil frost risk is detected. The notification is not resettable. The internal detection function is configured via Grundfos GO Remote. The function is associated with the heating coil application.
00204.5	Status.DiffTempHigh	Bool	R	0: Not above 1: Above. If 1, the primary differential temperature exceeds the limit in 00110 Config.PrimaryDeltaTLimit for extended time (3600 s). The notification is not resettable, but it will reset itself. The supply flow limiter function is enabled and disabled via Grundfos GO Remote or BV,3 (Config Primary Delta T Limiting ED).

8.3.3 Heat energy monitoring

Address	Register name	Modbus unit	R/W	Description
00305	MeasuredData.HeatPower	kW	R	Current thermal power for product running in heating mode.
00306	MeasuredData.HeatTempDifference	K	R	Numerical value of forward pipe and return pipe differential temp. Used for heat transfer calculation.
00325	MeasuredData.HeatingEnergy	kWh	R	Accumulated heating energy in total lifetime. Reset via 00101.3 (Reset Accumulated Counters).
00326	MeasuredData.CoolingEnergy	kWh	R	Accumulated cooling energy in total lifetime. Reset via 00101.3 (Reset Accumulated Counters).
00327	MeasuredData.CoolingPower	kW	R	Current thermal power for product running in cooling mode.
00407	MeasuredData.PercentageSpeed	0.01%	R	Percentage of maximum pump speed.
00408	MeasuredData.PumpEnergyHI	kWh	R	Accumulated pump energy. Reset via 00101.3 (Reset Accumulated Counters).
00409	MeasuredData.PumpEnergyLO	kWh	R	Accumulated pump energy. Reset via 00101.3 (Reset Accumulated Counters).
00410	MeasuredData.PumpOperatingHoursHI	h	R	Counter for pump operating hours. Reset via 00101.3 (Reset Accumulated Counters).
00411	MeasuredData.PumpOperatingHoursLO	h	R	Counter for pump operating hours. Reset via 00101.3 (Reset Accumulated Counters).
00101.3	ControlBits.ResetAccumulatedCounters	Bool	W	This resets the following counters: • Data Heating Energy • Data Cooling Energy • Data Pump Energy • Data Pump Operating Hours. The reset function is rising edge triggered.

8.3.4 Integrated sensors and signals

Address	Register name	Modbus unit	R/W	Description
00313	MeasuredData.FlowTemp	K	R	Flow temperature measured on the secondary side via the connected pump.
00314	MeasuredData.SupplyTemp	K	R	Supply temperature measured at the valve.
00319	MeasuredData.LogicalValveOpening	%	R	Valve opening request, linear from algorithm.
00320	MeasuredData.ValveSupplyFlow	m^3/h	R	Flow rate at primary side measured at the A-port.
00322	MeasuredData.Return.Temp	K	R	Return temperature measured at the valve.
00323	MeasuredData.Controlled.Temp	K	R	Actual controlled temperature: Zone air, flow temperature, or feedback signal at 00125 Control.BusTempFeedback.
00324	MeasuredData.SupplySourceSetpoint	K	R	Supply source temperature reference derived from setpoint and mode of mixing loop.
00404	MeasuredData.PumpFlow	m^3/h	R	Actual pump flow.
00405	MeasuredData.PumpHead	m	R	Actual pump head.

8.3.5 External sensor inputs

Address	Register name	Modbus unit	R/W	Description
00310	MeasuredData.OutdoorTemp	K	R	Outdoor temperature measured at analog input. The outdoor temperature sensor configuration is done via Grundfos GO.
00316	MeasuredData.ZoneAirTemp	K	R	Air temperature measured at analog input. The air temperature sensor configuration is done via Grundfos GO Remote.

9. Modbus RTU telegram examples

The Modbus data model states that registers numbered X are addressed in telegrams as X - 1, e.g. register 00108 (ThermalPowerLimit) is addressed as 00107 in a Modbus telegram.

9.1 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	0-252 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.

The CRC bytes are not shown in the examples in the following sections.

9.2 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 1-16 are addressed as 0-15.

Example of a request from the master to the 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 first register to read is 108).

Example of a response from the slave to the 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.

9.3 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 (the address of the first register to be read) and the number of holding registers to read. In the telegram, register addresses start from zero, meaning that registers numbered 1-16 are addressed as 0-15.

Example of a request from the master to the 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 first register to read is 4113).

Example of a response from the slave to the 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.

9.4 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 a request from the master to the slave

Field	Value
Address	0x01
Function code	0x06
Start address HI	0x10
Start 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 (meaning register 0x1001).

Example of a response from the slave to the master

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

The response is an echo of the request.

9.5 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 0x0021 is addressed as 0x0020.

Example of a request from the master to the 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 a response from the slave to the 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.

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