BACnet for MIXIT

Functional profile and user manual

GRUNDFOS

BACnet for MIXIT

English (GB) Functional profile and user manual

Original functional profile and user manual

Table of contents

1. General information

This functional profile describes Grundfos BACnet 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 startup and programming of BACnet devices. The reader is required to have basic knowledge of BACnet protocol and technical specifications. It is also assumed that an existing BACnet MS/TP or BACnet IP 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, pressure independence and energy monitoring. **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 Building Connect Professional. The DYNAMIC and CONNECT upgrades can be combined.

1.4 BACnet bus topology

BACnet MS/TP is a multi-master system, meaning that there can be more than one master on the network. It uses a token to control access to the bus network. A master node may initiate the transmission of a data telegram when it holds the token. Both master and slave nodes may transmit data telegrams in response to requests from master nodes, but slaves never hold the token. Master nodes pass the token between them. A BACnet MS/TP segment is a single contiguous medium to which BACnet nodes are attached. Segments can be connected by use of repeaters or bridges, thus forming networks. Multiple networks may be interconnected by BACnet routers to form a BACnet inter-network.
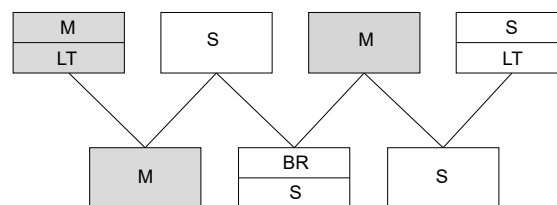
TM044274

Pos.	Description
M	Master
S	Slave
BR	Bias resistor
LT	Line termination

1.4.1 Line termination resistors

Line termination must be connected at each of the two ends of the segment medium. The MIXIT unit is fitted with built-in optional line termination resistor.

Related information

3.1 Configuring BACnet MS/TP

1.4.2 Bias resistors

The BACnet system integrator must specify if and where a bias resistor is needed. A bias resistor ensures that an undriven communications line will be held in a guaranteed logical one state. The bias provides a reliable way for stations to detect the presence or absence of signals on the line. An unbiased line will take an indeterminate state in the absence of any driving node. The MIXIT unit has no bias resistors.

2. Important information before setting up the system

2.1 Specifications

BACnet MS/TP	Description	Comments
BACnet connector	Screw-type terminal	3 pins.
BACnet connection type	RS-485	
BACnet wire configuration	Two wire + Ground	Conductors: Plus, Minus and Ground.
Maximum cable length	1200 m	Equals 4000 ft.
Recommended cross-section of BACnet cable	0.20 - 0.25 mm^2	AWG24 or AWG23.
MAC address	0-127	Set via Grundfos GO ("Fieldbus address").
Line termination	On or Off	Set via DIP switch.
Supported transmission speeds [bits/s]	9600, 19200, 38400, 76800	Set via Grundfos GO.
Data bits	8	Fixed value.
Stop bits	1	Fixed value.
Parity	None	Fixed value.
Maximum number of BACnet devices	32	This number can be increased using repeaters.
Grundfos BACnet vendor ID	227	
BACnet segmentation support	No	
Character set support	ANSI X3.4	Base definition for the widely used character code known as ASCII.
BACnet device profile	B-ASC	BACnet Application-Specific controller.
BACnet MS/TP master	Yes	The MIXIT unit is a BACnet MS/TP master device.
Manual slave address binding	No	
BACnet protocol revision	15	
Max. master range	1-127	

BACnet IP	Description
Application layer	HTTP, BACnet IP
Transport layer	UDP
Internet layer	Internet protocol V4 (IPv4)
Link layer	ARP, media access control
Ethernet cable	CAT5, CAT 5e, CAT6
Max. cable length	100 metres at 10/100 Mbit/s
Transmission speed detected	10/100 Mbit/s auto-detected
Ind. Ethernet protocol	BACnet IP
BACnet protocol revision	15
Max. APDU length	1496 (fix)
Default UDP port	47808
Max. master range	1-127

2.2 Cables

BACnet MS/TP

We recommend that the maximum cable length within a BACnet MS/TP segment is 1200 meters (4000 ft) with a 0.82 mm^2 (AWG 18) cable.

Connection between the BACnet modules must be made by using a screened, twisted-pair cable with a characteristic impedance between 100 and 130 Ω.

Use a screened, twisted-pair cable and connect the 3 wires according to below table:

Terminal	Recommended colour	Data signal
1A	Red	Positive
1B	Green	Negative
Y1	Grey	Ground

The wiring must follow the ANSI/ASHRAE BACnet standard. The standard states that the cable screen must only be earthed at one end of the segment to prevent earth fault currents.

BACnet IP

Use RJ45 plug and Ethernet cable. If available, connect the cable shield to protective earth at both ends.

The standard cable length is max. 100 meters.

2.3 Device Object Instance Number

The Device Object Identifier value consists of two components:

* a 10-bit Object Type (bits 22 to 31)
* a 22-bit Instance Number (bits 0 to 21)

The Object Type is fixed and determines that it is a Device Object. The Instance Number is a numeric code used to identify the device. It must be unique inter-network-wide, that is on all interconnected networks.

The MIXIT unit offers two different approaches to setting the BACnet Device Object Instance Number: default and custom, both described in the following subsections.

2.3.1 Default Device Object Instance Number

The Default Device Object Instance Number for the MIXIT unit is 227005. You can change the number via Grundfos GO Remote.

2.3.2 Custom Device Object Instance Number

The MIXIT unit uses a custom Device Object Instance Number, which is 231. You can activate the number via Grundfos GO Remote and change it via AV,0.

ID	Object name	R/W
AV,0	Config Custom Device Object Instance Number	R/W

2.4 Terminal connections overview

TM071470
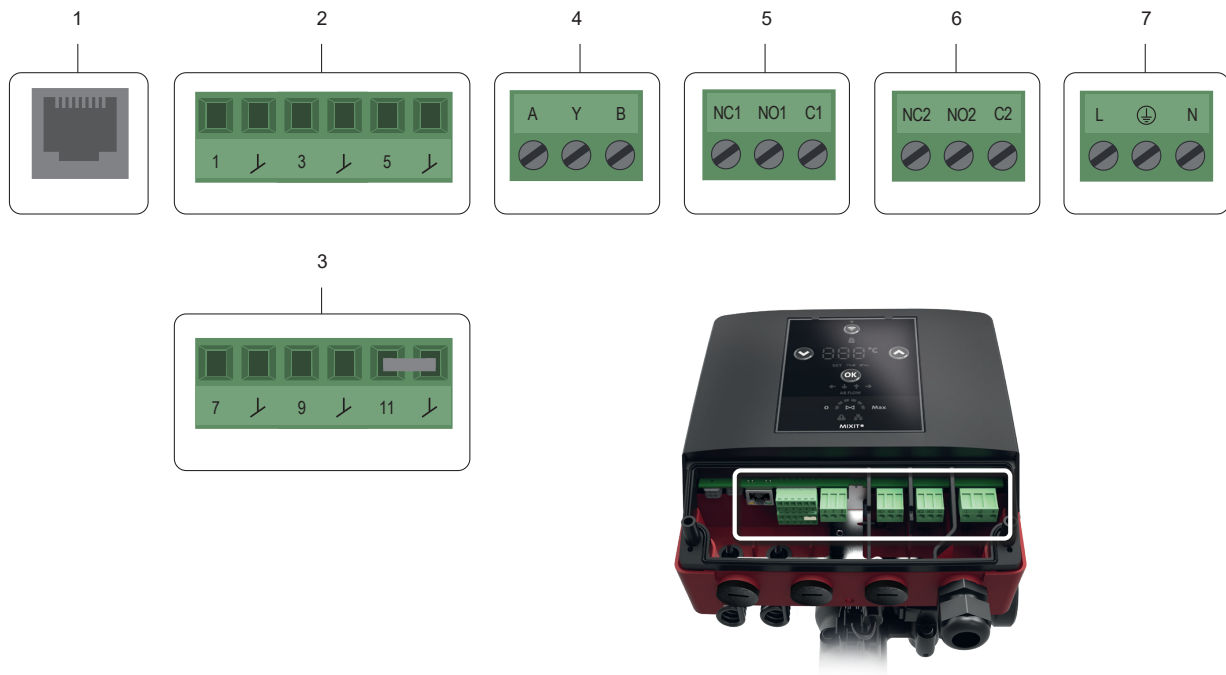
Pos.	Description
1	Ethernet RJ45 (BACnet IP, Modbus TCP)
2	Configurable I/O
3	Configurable I/O
4	RS485 transceiver (BACnet MS/TP, Modbus RTU)
5	Relay 1
6	Relay 2
7	Mains supply. Carry out the electrical connection and protection according to local regulations.

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 Configuring BACnet MS/TP

The CONNECT upgrade must be activated on the MIXIT unit in order for fieldbus connectivity to be unlocked.

To set up the fieldbus connection, you must complete the following steps:

1. Turn on MIXIT and connect it to the pump. See separate installation and operating instructions for MIXIT.

2. Set up the fieldbus connection in the Grundfos GO Remote app.
   - 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** or **Upgrades** menu:
     - **Settings** menu: **Settings** > **Setpoint** > **Reconfigure setpoint input** > **Setpoint from fieldbus connection**. Press **Next**, select **BACnet MS/TP** and press **Next** again.
     - **Upgrades** menu: **Upgrades** > **CONNECT upgrade** > **Reconfigure** > **Fieldbus connectivity** > **BACnet MS/TP**.

3. Define the following in Grundfos GO Remote:
   a. **Baud rate (transmission speed)**
      The transmission speed must be set correctly before the MIXIT unit is ready to communicate on the BACnet MS/TP network. Use Grundfos GO Remote to set the transmission speed. All devices on the BACnet MS/TP network must communicate at the same transmission speed.
   b. **Range (MAC address and max. master)**
      The MAC address must be within the range of 0 to 127 and must be unique on the BACnet MS/ TP segment. An illegal value will result in a MAC address of 0. Max. master must be within the range of 1 and 127.
   c. **Device Object Instance Number**
      The Device Object Identifier value consists of a 10-bit Object Type (bits 22 to 31) and a 22-bit Instance Number (bits 0 to 2).
      The Object Type is fixed and determines that it is a Device Object. The Instance Number is a numeric code used to identify the device. It must be unique inter-network-wide, that is on all interconnected networks.
      The default BACnet Device Object Instance Number is 227000. The custom Device Object Instance Number, which is 231, can be activated in Grundfos GO Remote and customised via AV,0.

ID	Object name	R/W
AV,0	Config Custom Device Object Instance Number	R/W

4. Connect the fieldbus cable to MIXIT via the RS485 transceiver. Follow the instructions in Grundfos GO Remote. See also *2.2 Cables*.

5. Enable 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.

6. Define control source for MIXIT to accept remote BACnet commands.
   - Set BO,0 to 1 for the MIXIT unit to accept remote BACnet commands. As default, BO,0 is set to 0 (power on). This means that if the MIXIT unit has been power cycled, you must set BO,0 to 1 again in order to set the product back to bus control.
   - The actual control state is verified via BI,0.

ID	Object name	R/W	Description
BO,0	Set Control Source	W	0: Local control (default) 1: Bus control
BI,0	Status Control Source	R	0: Local control 1: Bus control

You are now ready to customise your BACnet MS/TP connection.

The property Device_Name is a fixed character string that is named "Grundfos MIXIT".

3.2 Configuring BACnet IP

💡 The CONNECT upgrade must be activated on the MIXIT unit in order for fieldbus connectivity to be unlocked.

To set up the fieldbus connection, you must complete the following steps:

1. Turn on MIXIT and connect it to the pump. See separate installation and operating instructions for MIXIT.

2. Set up the fieldbus connection in the Grundfos GO Remote app.
   - 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** or **Upgrades** menu:
     - **Settings** menu: **Settings** > **Setpoint** > **Reconfigure setpoint input** > **Setpoint from fieldbus connection**. Press **Next**, select **BACnet IP** and press **Next** again.
     - **Upgrades** menu: **Upgrades** > **CONNECT upgrade** > **Reconfigure** > **Fieldbus connectivity** > **BACnet IP**.

3. Define the following in Grundfos GO Remote:
   a. IP address
   b. Subnet mask
   c. Gateway
   d. DHCP (optional)
   e. UDP port number (optional)
   f. Device name
   g. Device location
   h. Custom Device Object Instance Number (optional)
   i. Foreign device settings (optional)

4. Connect the fieldbus cable to MIXIT via the Ethernet port. Follow the instructions in Grundfos GO Remote. See also *2.2 Cables*.
   a. Check data and link LEDs
      The RJ45 socket has two connectivity LEDs:
      Yellow on: Ethernet link on RJ45 is okay.
      Green on: Data communication ongoing.

5. Define control source for MIXIT to accept remote BACnet commands.
   - Set BO,0 to 1 for the MIXIT unit to accept remote BACnet commands. As default, BO,0 is set to 0 (power on). This means that if the MIXIT unit has been power cycled, you must set BO,0 to 1 again in order to set the product back to bus control.
   - The actual control state is verified via BI,0.

ID	Object name	R/W	Description
BO,0	Set Control Source	W	0: Local control (default)
			1: Bus control
BI,0	Status Control Source	R	0: Local control
			1: Bus control

You are now ready to customise your BACnet IP connection.

4. Setting the heating application type

1. Set the application type via MO,2.

2. Confirm via MI,1.

ID	Object name	R/W	Description
MO,2	Set Application Type [Enum]	W	1: Radiator heating 2: Underfloor heating 3: Heating coil 4: Cooling Coil
MI,1	Data Application Type [Enum]	R	1: Radiator heating 2: Underfloor heating 3: Heating coil 4: Cooling coil

5. Controlling the valve manually

Instead of using a temperature setpoint to control the valve, you can manually control the valve opening. This can be useful when you want to degas the system or for other service purposes.

- Control the valve opening via MO,1.

ID	Object name	R/W	Description
MO,1	Set Manual Valve Function	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 purposes.

6. Setting the temperature setpoint

Direct temperature setpoint

1. Set MV,0 to MV,3.

2. Provide the setpoint via AO,0.

Verification of the given setpoint is available in AI,0.

Setpoint from source

Configure the source of temperature setpoint via MV,0:

- 1: Setpoint is given via fieldbus.
- 2: Setpoint is given via analog input terminals.
  - Analog sensor inputs must be configured via Grundfos GO Remote. See *8.2 Configuring a setpoint from analog input*.
- 3: Direct temperature setpoint. Set the setpoint via AO,0.
- 4: Setpoint is given via an analog sensor. Outdoor sensor types Pt1000 and 0-10 V are available.
  - Configure a heat curve via AV,4 and AV5. See *7.6.1 Setting outdoor temperature compensation*.
  - The sensor must be configured via Grundfos GO Remote. See *8.1 Configuring an outdoor temperature sensor input and outdoor temperature compensation (heating)*.
- 5: Setpoint is controlled by the outdoor temperature via fieldbus.
- 6: Setpoint is given via an external sensor.

ID	Object name	R/W	Description

MV,0	Config Temp Setpoint Source [Enum]	R/W	This selects the source of the temperature setpoint.
			1: default_setpoint
			2: ana_temp_setpoint
			3: temp_setpoint_remote
			4: outdoor_temp
			5: outdoor_temp_remote
			6 and above: reserved
			
			• 1: Default
			• 2: Relates to setpoint from analog input terminals
			• 3: Relates to AO,0 (Set Temperature Setpoint Remote [°C])
			• 4: Associated with an analog sensor connected to the product and objects:
			  - AV,4 (Config Heat curve offset (+/-) [°C])
			  - AV,5 (Config Heat curve slope (+/-) [-]).
			• 5: Associated with objects:
			  - AO,1 (Set Outdoor Temperature Remote [°C])
			  - AI,1 (Data Outdoor Temp Remote [°C])
			  - AV,4 (Config Heat curve offset (+/-) [°C])
			  - AV,5 (Config Heat curve slope (+/-) [-])
			• 6 and above: Associated with AO,3 to AO,8 (external sensor inputs). See Automatic setpoint scheduling.
			
			For all options the actual temperature setpoint used by the algorithm can be read at AI,2 (Data Act Temp Setpoint).
			Configuration of analog input must be made via Grundfos GO Remote.

AO,0	Set Temperature Setpoint Remote [°C]	W	Temperature setpoint via fieldbus. Enabling: • Set MV,0 (Config Temp Setpoint Source [Enum]) to 3 • Set BO,0 (Set Control Source) to 1.
AO,1	Set Outdoor Temperature Remote [°C]	W	Outdoor temperature value via fieldbus. Enabling: • Set MV,0 (Config Temp Setpoint Source [Enum]) to 5 • Set BO,0 (Set Control Source) to 1.
AI,0	Data Temp Setpoint Remote [°C]	R	Actual value of remote temperature setpoint.
AI,1	Data Outdoor Temp Remote [°C]	R	Actual value of remote outdoor temperature.
AI,2	Data Act Temp Setpoint [°C]	R	Actual temperature setpoint used in temperature controller. If the limiter function is set to off, it is the same as the actual reference temperature derived from the set reference temperature mode via MV,0.
AV,4	Config Heat curve offset (+/-) [°C]	R/W	Adjusts the heat curve offset in degrees Celsius. It is used when MV,0 = 4 or MV,0 = 5.
AV,5	Config Heat curve slope (+/-) [-]	R/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.
AV,6	Config Default Temp Setpoint [°C]	R/W	Fall back temperature setpoint in case setpoint signal from bus or sensor is lost. Default: 40 °C.

7. Functions

7.1 Functions overview

Functions	Valve unit variants		Upgrades	
	MIXIT	**MIXIT DYNAMIC**	**DYNAMIC**	**CONNECT**
Temperature controller	•	•	•	•
Underfloor overheat protection (available in underfloor heating systems)	•	•	•	•
Coil preheat and frost protection (available in air handling unit systems)	•	•	•	•
Frost protection (cooling and combined applications)	•	•		
Pump control modes • AUTOADAPT • Proportional pressure • Constant pressure • Constant flow • Constant curve/constant speed	•	•	•	•
Outdoor temperature compensation (only for heating)	•	•	•	•
Eco schedule and warm-weather shutdown (only for heating)	•	•	•	•
Pressure independence		•	•	
Limiters • Supply flow limit • Return temperature limit • Thermal power limit • Differential power limit		•	•	
Energy monitor		•	•	

Related information

7.2 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.
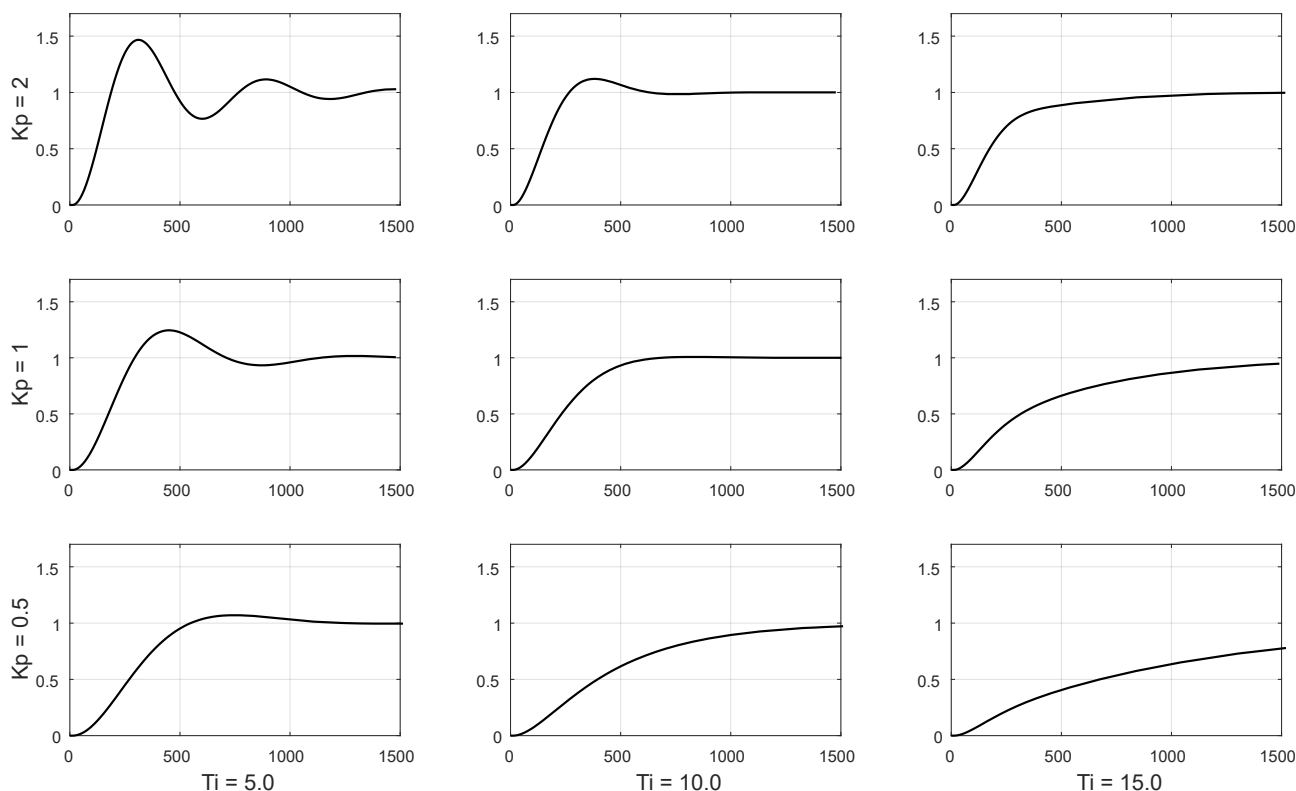
Typical responses to a step input for PI controlled systems such as MIXIT

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.

7.2.1 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.

7.3 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.

7.3.1 Setting the underfloor overheat protection

The function can be active only for underfloor heating application.

1. Enable the function by setting BO,3 to 1. When enabled, the valve is closed.

2. The function is configured via Grundfos GO Remote:

   Main menu > **Settings** > **Application settings** > **Floor overheat protection**.

   a. Activate the function by pressing the grey slide-button in the top right corner of the screen.

   b. 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.

Actual status is read via BI,6.

if the flow temperature is above the configured value, the MIXIT unit gives a notification by setting BI,6 to 1.

D	Object name	R/W	Description
BO,3	Enable Overheat Protection	W	0: Disable overheat protection (default)
			1: Enable overheat protection
BI,6	Notification Flow Temp High	R	0: Not detected
			1: Detected.

7.4 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.

7.4.1 Setting coil preheat

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

Grundfos GO Remote menu:

Main menu > **Settings** > **Application settings** > **Coil preheat and frost protection**

1. Activate the function by pressing the grey slide-button.

2. Press **Coil preheat temperature** to define a return temperature threshold.

Read the system state via MI,2 (Status System State [Enum]). If MI,2 is set to 4, MIXIT is preheating the coil.

ID	Object name	R/W	Description
MI,2	Status System State [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:Frost protection
			7: Underfloor overheat protection
			8: Shut down due to removal of start signal
			9: Auto Tuner on
			10: Valve 100 % open (for backup)
			11: Return temperature control.

7.4.2 Setting frost protection for heating coil

The function can be active only for heating coil applications.

1. Frost detection is enabled by setting BO,4 to 1. When enabled, the valve opens fully. 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 MI,2 (Status System State [Enum]).

If coil frost is detected, a notification is given via BI,7 to 1.

ID	Object name	R/W	Description
BO,4	Enable Frost Protection	W	0: Disable frost protection (default) 1: Enable frost protection
BI,7	Notification Frost Risk Detected	R	0: Not detected 1: Detected The notification is not resettable but it will reset itself
MI,2	Status System State [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: Frost protection 7: Underfloor overheat protection 8: Shut down due to removal of start signal 9: Auto Tuner on 10: Valve 100 % open (for backup) 11: Return temperature control.

7.4.3 Setting frost protection, cooling

The function can be active only for cooling applications.

1. Frost detection is enabled by setting BO,8 to 1. When enabled, the valve opens fully. 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 MI,2 (Status System State [Enum]).

If the frost on the cooling system is detected, a notification is given via BI,7 to 1.

ID	Object name	R/W	Description
BO,8	Enable Frost Protection Cooling Mode	W	0: Disable frost protection (default) 1: Enable frost protection
BI,7	Notification Frost Risk Detected	R	0: Not detected 1: Detected
MI,2	Status System State [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: Frost protection 7: Underfloor overheat protection 8: Shut down due to removal of start signal 9: Auto Tuner on 10: Valve 100 % open (for backup) 11: Return temperature control.

7.5 Pump control modes

7.5.1 Configuring the pump control mode, heating

1. Configure the pump control mode via MO,0.

2. Verify the current pump control mode via MI,0.

3. Set the duty point via either AV,7, AV,8 or AV,9 depending on your chosen control mode.

ID	Object name	R/W	Description
MO,0	Config Pump Control Mode [Enum]	W	This sets the pump control mode: 1: Constant speed 2: Constant pressure 3: Proportional pressure 4: AUTOADAPT 5: Constant flow
MI,0	Status Pump Control Mode [Enum]	R	The current pump control mode: 1: Constant speed 2: Constant pressure 3: Proportional pressure 4: AUTOADAPT 5: Constant flow.
AV,7	Config Pump Head Duty Point [m]	R/W	Desired pressure duty point for constant or proportional pressure control modes.
AV,8	Config Pump Flow Duty Point [m³/h]	R/W	Desired flow duty point for proportional pressure and flow control modes.
AV,9	Config Pump Speed Duty Point [%]	R/W	Desired speed for constant speed control mode. Depending on pump model, the minimum speed may be larger than the minimum accepted speed at data point (larger than 30 %)

7.5.2 Configuring the pump control mode, cooling

1. Configure the pump control mode via MO,3.

2. Verify the current pump control mode via MI,0.

3. Set the duty point via either AV,14, AV,15 or AV,16 depending on your chosen control mode.

ID	Object name	R/W	Description
MO, 3	Config Pump Control Mode Cooling [ENUM]	W	1: Constant speed 2: Constant pressure 3: Proportional pressure 4: AUTOADAPT 5: Constant flow
MI,0	Status Pump Control Mode [Enum]	R	The current pump control mode: 1: Constant speed 2: Constant pressure 3: Proportional pressure 4: AUTOADAPT 5: Constant flow.
AV, 14	Config Pump Head Duty Point Cooling [m]	R/W	Desired pressure duty point for constant or proportional pressure. [R/W] to/from Pump Head Reference Geni parameter when Control Mode is Constant Pressure and Pump Head duty point at all other Control Modes.
AV, 15	Config Pump Flow Duty Point Cooling [m3/h]	R/W	Desired flow duty point for proportional pressure and flow control. [R/W] to/from Pump Flow Reference Geni parameter when Control Mode is Constant Flow and Pump Flow duty point at all other Control Modes
AV, 16	Config Pump Speed Duty Point Cooling [%]	R/W	Desired speed in control mode constant speed. Notice, depending on pump model the minimum speed may be larger than minimum accepted at datapoint (larger than 30 %).

7.5.3 Switching the pump control mode between heating and cooling

1. Switch the pump control mode via MO,4.

2. Configure the heating pump control mode via MO,0.

3. Configure the heating pump control mode via MO,3.

4. Verify the current pump control mode via MI,3.

ID	Object name	R/W	Description
MO,0	Config Pump Control Mode Heating [Enum]	W	1: Constant speed 2: Constant pressure 3: Proportional pressure 4: AUTOADAPT 5: Constant flow
MO,3	Config Pump Control Mode Cooling [ENUM	W	1: Constant speed 2: Constant pressure 3: Proportional pressure 4: AUTOADAPT 5: Constant flow
MO,4	Config Thermal selection [Enum]	W	1: Heating 2: Cooling
MI,3	Status Thermal selection [Enum]	R	1: Heating 2: Cooling

7.5.4 Setting the duty point for constant-speed control mode

This duty point is set via AV,9 (speed duty point). The duty point is a percentage of the maximum speed. In this control mode, the pump speed will be constant at the configured speed duty point.
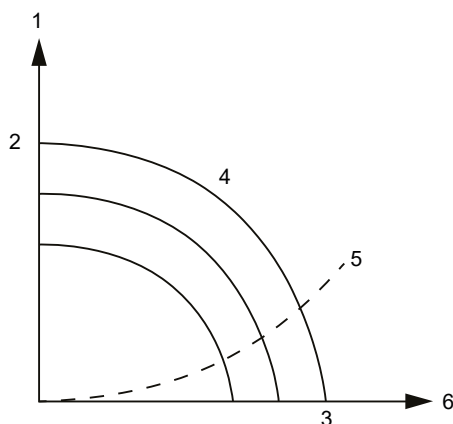
Constant-speed control curve

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

7.5.5 Setting the duty point for constant-pressure control mode

The duty point is set via AV,7 (speed duty point). The duty point is the pressure in meters. In this control mode, the pump speed will have a constant pressure at the configured duty point.
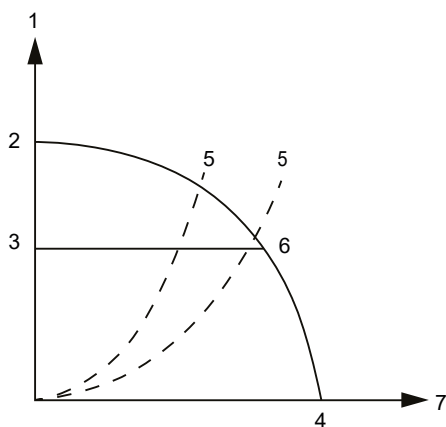
Constant-pressure control curve

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

7.5.6 Setting the duty point for proportional-pressure control mode

The duty point is set via AV,7 (head duty point) and AV,8 (flow duty point). The control curve will be a straight sloped line through the configured duty point.
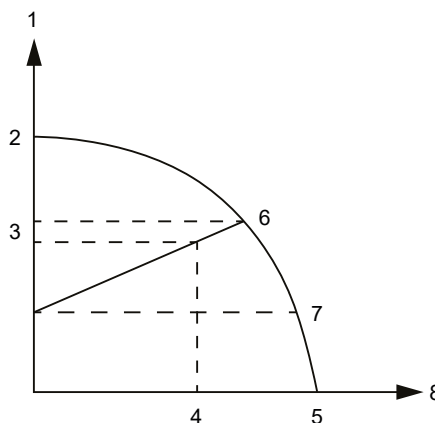
Proportional-pressure control curve

Pos.	Description
1	Head [m]
2	$H_{max.}$
3	AV,7
4	AV,8
5	$Q_{max.}$
6	H_0
7	$H_0/2$
8	Flow [m^3/h]

The foot point 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.

7.5.7 Setting the duty point for constant-flow control mode

The duty point is set via AV,8 (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 is activated. For hydraulic circuits with a low hydraulic resistance, such as heating coils, this is effectively flow control mode.
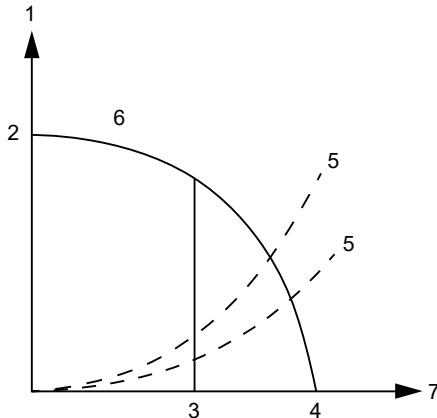
Pos.	Description
1	Head [m]
2	$H_{max.}$
3	AV,8
4	$Q_{max.}$
5	System curves
6	Control curve
7	Flow [m³/h]

7.6 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.
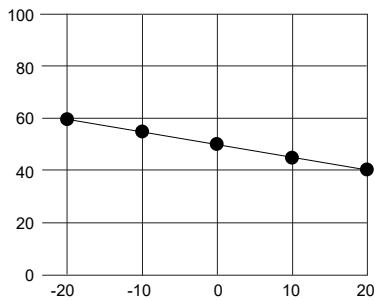
Example of five point temperature curve. Y axis: Setpoint [°C]. X axis: Outdoor temperature [°C].

7.6.1 Setting outdoor temperature compensation

1. The control source must be set to bus control by setting BO,0 to 1. See BI, 1 for actual state.

2. The setpoint source is configured by setting MV,0 to 5. It is also possible to use an analog sensor connected to the MIXIT unit by setting MV,0 to 4. The 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 MV,0 is set to 5, the outdoor temperature value is given via AO,1. Actual value of remote outdoor temperature is read via AI,1.

3. Adjust the heat curve offset in AV,4.
   - BI,14 indicates if the heat curve offset value is out of range.

4. Adjust the slope of the heat curve in AV,5.
   - BI,13 indicates whether the base curve is linear or non-linear.
   - BI,15 indicates if the heat curve slope factor value is out of range.

In case the signal from a bus or sensor is lost, the MIXIT unit will use the fall back temperature setpoint. By default it is 40 °C. It can be changed via AV,6.

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

ID	Object name	R/W	Description
BO,0	Set Control Source	W	0: Local control (default) 1: Bus control
BI,1	Status Fan And Dampers ED	R	0: Disabled 1: Enabled This status indicates that the system is in temperature control state.
MV,0	Config Temp Setpoint Source [Enum]	R/W	This selects the source of the temperature setpoint. 1: default_setpoint 2: ana_temp_setpoint 3: temp_setpoint_remote 4: outdoor_temp 5: outdoor_temp_remote 6 and above: reserved • 4: Associated with an analog sensor connected to the product and objects: - AV,4 (Config Heat curve offset (+/-) [°C]) - AV,5 (Config Heat curve slope (+/-) [-]). • 5: Associated with objects: - AO,1 (Set Outdoor Temperature Remote [°C]) - AI,1 (Data Outdoor Temp Remote [°C]) - AV,4 (Config Heat curve offset (+/-) [°C]) - AV,5 (Config Heat curve slope (+/-) [-]) For all options the actual temperature setpoint used by the algorithm can be read at AI,2 (Data Act Temp Setpoint [°C]).
AO,1	Set Outdoor Temperature Remote [°C]	W	Outdoor temperature value via fieldbus. It is enabled via MV,0 = 5 and by setting the control source to bus control via BO,0.
AI,1	Data Outdoor Temp Remote [°C]	R	Actual value of remote outdoor temperature.
AI,2	Data Act Temp Setpoint [°C]	R	Actual temperature setpoint used in temperature controller. If the limiter function is set to off, it is the same as the actual reference temperature derived from the set reference temperature mode via MV,0.
AV,4	Config Heat curve offset (+/-) [°C]	R/W	Adjusts the heat curve offset in degrees Celsius. It is used when MV,0 = 4 or MV,0 = 5.
AV,5	Config Heat curve slope (+/-) [-]	R/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.

ID	Object name	R/W	Description
AV,6	Config Default Temp Setpoint [°C]	R/W	Default: 40 °C. Fall back temperature setpoint in case setpoint signal from bus or sensor is lost.
BI,13	Heat Curve Slope Factor Enabled	R	0: False 1: True Indicates whether base curve is linear or non-linear.
BI,14	Heat Curve Offset Range Exceeded	R	0: Exceeded 1: Not exceeded Used for indicating that heat curve offset value is out of range [-15 ; 15].
BI,15	Heat Curve Slope Factor Range Exceeded	R	0: Exceeded 1: Not exceeded Indicating that heat curve slope factor value is out of range [0.4 ; 2.0].

7.7 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.

7.7.1 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).

7.7.2 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.

7.7.3 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.

7.8 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.

7.8.1 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.

7.9 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.

7.10 Limiters

For these functions to be unlocked, the DYNAMIC upgrade must be activated on the MIXIT unit or the unit must be a MIXIT DYNAMIC. See *7.1 Functions overview*.

All limiters can run simultaneously.

The actual temperature setpoint can be monitored via AI,2.

ID	Object name	R/W	Description
AI,2	Data Act Temp Setpoint [°C]	R	Actual temperature setpoint used in temperature controller. If the limiter function is set to off, it is the same as the actual reference temperature derived from the set reference temperature mode via MV,0. See *10.2.4 Temperature Setpoint and Feedback*.

7.10.1 Configuring the supply flow limit, heating

1. Enable the supply flow by setting BV,0 to 1.

2. Configure the limit via AV,10.

Both values are stored in the product.

If the supply flow limit is surpassed, the MIXIT unit gives a notification by setting BI,8 to 1.

All limiters can run simultaneously.

ID	Object name	R/W	Description
BV,0	Config Supply Flow Limiting Heating ED	R/W	0: Disabled 1: Enabled.
AV,10	Config Supply Flow Limit heating [m³/h]	R/W	Primary flow limit for hydronic balancing. The primary flow limit is enabled by BV,0
BI,8	Notification Supply Flow High	R	0: Not above 1: Above. The supply flow is above the limit in AV,10 for extended time (3600 s). The notification is not resettable, but it will reset itself.

7.10.2 Configuring the supply flow limit, cooling

1. Enable the supply flow by setting BV,4 to 1.

2. Configure the limit via AV,17.

Both values are stored in the product.

If the supply flow limit is surpassed, the MIXIT unit gives a notification by setting BI,8 to 1.

All limiters can run simultaneously.

ID	Object name	R/W	Description
BV,4	Config Supply Flow Limiting Cooling ED	R/W	0: Disabled 1: Enabled.
AV,17	Config Supply Flow Limit Cooling [m³/h]	R/W	Primary flow limit for hydronic balancing in cooling mode. The primary flow limit is enabled by BV,4.
BI,8	Notification Supply Flow High	R	0: Not above 1: Above. The supply flow is above the limit in AV,10 for extended time (3600 s). The notification is not resettable, but it will reset itself.

7.10.3 Configuring the return temperature limit, heating

1. Enable the return temperature limit by setting BV,2 to 1.

2. Configure the limit via AV,12.
   For heating applications, the value works as an upper threshold.

Both values are stored in the product.

If the return temperature limit is above (heating) or below (cooling) the given value, the MIXIT unit gives a notification by setting BI,10 to 1.

All limiters can run simultaneously.

ID	Object name	R/W	Description
BV,2	Config Return Temp Limiting Heating ED	R/W	0: Disabled. 1: Enabled.
AV,12	Config Return Temp Limit Heating [°C]	R/W	Return temperature limit for hydronic balancing. The return temperature limit is enabled by BV,2.
BI,10	Notification Return Temperature Threshold	R	0: Not above (heating). Not below (cooling). 1: Above (heating). Below (cooling). Return temperature exceeds the limit in AV,12 for extended time (3600s). The notification is not resettable, but it will reset itself.

7.10.4 Configuring the return temperature limit, cooling

1. Enable the return temperature limit by setting BV,6 to 1.

2. Configure the limit via AV,19.
   For cooling applications, the value works as a lower threshold.

Both values are stored in the product.

If the return temperature limit is above (heating) or below (cooling) the given value, the MIXIT unit gives a notification by setting BI,10 to 1.

All limiters can run simultaneously.

ID	Object name	R/W	Description
BV,6	Config Return Temp Limiting Cooling ED	R/W	0: Disabled. 1: Enabled.
AV,19	Config Return Temp Limit Cooling [°C]	R/W	Return temperature limit for hydronic balancing in cooling mode. The return temperature limit is enabled by BV,6.
BI,10	Notification Return Temperature Threshold	R	0: Not above (heating). Not below (cooling). 1: Above (heating). Below (cooling). Return temperature exceeds the limit in AV,12 for extended time (3600s). The notification is not resettable, but it will reset itself.

7.10.5 Configuring the thermal power limit, heating

1. Enable the thermal power limit by setting BV,1 to 1.
2. Configure the limit via AV,11.

Both values are stored in the product.

If the thermal power limit is surpassed, the MIXIT unit gives a notification by setting BI,9 to 1.

All limiters can run simultaneously.

ID	Object name	R/W	Description
BV,1	Config Thermal Power Limiting Heating ED	R/W	0: Disabled 1: Enabled.
AV,11	Config Thermal Power Limit Heating [kW]	R/W	Thermal power limit for hydronic balancing. The thermal power limit is enabled by BV,1.
BI,9	Notification Thermal Power High	R	0: Not above 1: Above. Thermal power is above the limit in AV,11 for extended time (3600s). The warning is not resettable but will reset itself.

7.10.6 Configuring the thermal power limit, cooling

1. Enable the thermal power limit by setting BV,5 to 1.
2. Configure the limit via AV,18.

Both values are stored in the product.

If the thermal power limit is surpassed, the MIXIT unit gives a notification by setting BI,9 to 1.

All limiters can run simultaneously.

ID	Object name	R/W	Description
BV,5	Config Thermal Power Limiting Cooling ED	R/W	0: Disabled 1: Enabled.
AV,18	Config Thermal Power Limit Cooling [kW]	R/W	Thermal power limit for hydronic balancing in cooling mode. The thermal power limit is enabled by BV,5.
BI,9	Notification Thermal Power High	R	0: Not above 1: Above. Thermal power is above the limit in AV,11 for extended time (3600s). The warning is not resettable but will reset itself.

7.10.7 Configuring the differential temperature limit, heating

1. Enable the supply flow by setting BV,3 to 1.
2. Configure the limit via AV,13.

Both values are stored in the product.

If the differential temperature limit is surpassed, the MIXIT unit gives a notification by setting BI,11 to 1.

All limiters can run simultaneously.

ID	Object name	R/W	Description
BV,3	Config Primary Delta T Limiting Heating ED	R/W	0: Disabled 1: Enabled.
AV,13	Config Primary Delta T Limit Heating [°C]	R/W	Differential temperature limit for hydronic balancing. The differential temperature limit is enabled by BV,3. The value is used as an absolute value (always positive) for both heating and cooling applications
BI,11	Notification Differential Temperature High	R	0: Not above 1: Above. Primary differential temperature exceeds the limit in AV,13 for extended time (3600s). The warning is not resettable but will reset itself.

7.10.8 Configuring the differential temperature limit, cooling

1. Enable the supply flow by setting BV,7 to 1.
2. Configure the limit via AV,20.

Both values are stored in the product.

If the differential temperature limit is surpassed, the MIXIT unit gives a notification by setting BI,11 to 1.

All limiters can run simultaneously.

ID	Object name	R/W	Description
BV,7	Config Primary Delta T Limiting Cooling ED	R/W	0: Disabled 1: Enabled.
AV,20	Config Primary Delta T Limit Cooling [°C]	R/W	Differential temperature limit for hydronic balancing in cooling mode. The differential temperature limit is enabled by BV,7. The value is used as an absolute value (always positive) for both heating and cooling applications.
BI,11	Notification Differential Temperature High	R	0: Not above 1: Above. Primary differential temperature exceeds the limit in AV,13 for extended time (3600s). The warning is not resettable but will reset itself.

7.11 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.

ID	Object name	R/W	Description
AI,39	Data HeatingVolume [m^3]	R	Totally pumped heating volume
AI,40	Data CoolingVolume [m^3]	R	Totally pumped cooling volume
AI,41	Data VolWeightAvgT1Heat [°C m^3]	R	Totally volume weighted average for T1, Heating (Inlet)
AI,42	Data VolWeightAvgT2Heat [°C m^3] R		Totally volume weighted average for T2, Heating (Outlet)
AI,43	Data VolWeightAvgT1Cool [°C m^3]	R	Totally volume weighted average for T1, Cooling (Inlet)
AI,44	Data VolWeightAvgT2Cool [°C m^3]	R	Totally volume weighted average for T2, Cooling (Outlet)

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.
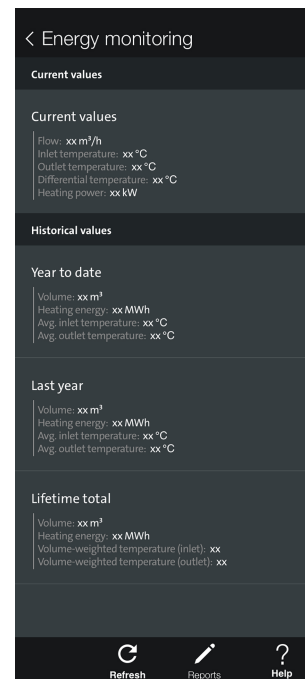
Energy monitoring display in heating/cooling application

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		Energy monitoring	
Heating	Cooling	Heating	**Cooling**
Current values		**Current values**	
Current values		Current values	
Flow: xx m³/h		Flow: xx m³/h	
Inlet temperature: xx °C		Inlet temperature: xx °C	
Outlet temperature: xx °C		Outlet temperature: xx °C	
Differential temperature: xx °C		Differential temperature: xx °C	
Heating power: xx kW		Cooling power: xx kW	
Historical values		**Historical values**	
Year to date		Year to date	
Volume: xx m³		Volume: xx m³	
Heating volume: xx m³		Cooling volume: xx m³	
Heating energy: xx MWh		Cooling energy: xx MWh	
Avg. inlet temperature: xx °C		Avg. inlet temperature: xx °C	
Avg. outlet temperature: xx °C		Avg. outlet temperature: xx °C	
Last year		Last year	
Volume: xx m³		Volume: xx m³	
Heating volume: xx m³		Cooling volume: xx m³	
Heating energy: xx MWh		Cooling energy: xx MWh	
Avg. inlet temperature: xx °C		Avg. inlet temperature: xx °C	
Avg. outlet temperature: xx °C		Avg. outlet temperature: xx °C	
Lifetime total		Lifetime total	
Volume: xx m³		Volume: xx m³	
Heating volume: xx m³		Cooling volume: xx m³	
Heating energy: xx MWh		Cooling energy: xx MWh	
Volume-weighted temperature (inlet): xx		Volume-weighted temperature (inlet): xx	
Volume-weighted temperature (outlet): xx		Volume-weighted temperature (outlet): xx	
⟳ ✎ ?		⟳ ✎ ?	
Refresh Reports Help		Refresh Reports Help	

TM082954

Energy monitoring display in Combined heating/cooling application

8. Configuring inputs in Grundfos GO Remote

8.1 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.

8.2 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.

9. 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

9.1 The external control icon is not switched on

Cause	Remedy
The configuration may have failed.	• Check the BACnet interface configuration via Grundfos GO Remote. When a fieldbus connection is established and data is transferred, the external control icon on the MIXIT operating panel will light up. The light will switch off 30 seconds after data communication via the fieldbus has stopped.
The connections at the terminal board are incorrect.	• Try switching wires at A2 and B2 terminals. When a fieldbus connection is established and data is transferred, the external control icon on the MIXIT operating panel will light up. The light will switch off 30 seconds after data communication via the fieldbus has stopped.

9.2 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 BI,0. The status is changed via BO,0. Note that local control is the default setting. • Check that MV,0 is configured correctly. - MV,0 = 3: temp_setpoint_remote - MV,0 = 5: outdoor_temp_remote

9.3 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 AI,22 is much different than the setpoint at AI,0, after several minutes, check if the setpoint in AI,0 is the same as requested in AO,0. 2. Check that MV,0 is configured for remote setpoint.
The limit functions may be enabled which reduces the setpoint.	1. Check that the actual setpoint in AI,2 is the same as the registered remote setpoint in AI,0. 2. Check if one or more limit functions are active. Check if BV,0, BV,1, BV,2, BV,3, BV,4, BV,5, BV,6 and BV,7 are set to 1.

Cause	Remedy
	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 (XX to XX), the remote setpoint in AI,0 is reduced until the threshold is reached.
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.

9.4 The MIXIT unit was put into 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 BI,0. • If it is set to 0, set BO,0 to 1 again.

9.5 The MIXIT unit was stopped from BACnet command, but it has started again

Cause	Remedy
The MIXIT unit is starting again. The actual start/stop status is not kept during a power cycle.	• Check the status in BI,2. • If it is set to 1, set BO,0 to 1 and then set BO,1 to 0.

9.6 The MIXIT unit does not start the pump when a start signal is given in BO,1

Cause	Remedy
The pump state is incorrect.	• Ensure the requested pump run state in BI,2 is set to 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.

9.7 The MIXIT unit does not stop the pump when a stop signal is given in BO,1

Cause	Remedy
The pump state is incorrect.	• Ensure the requested pump run state in BI,2 is set to 0 in order to stop the pump. • Check if the pump is running at maximum speed. At the MAGNA3/TPE3 pump, local max curve has priority over bus control.

9.8 Reading and resetting warnings and alarms

- Read out system warnings via AI,35.
- Read out system alarms via AI,37.
- Pump warnings codes are read via AI,5.
- Pump alarm codes are read via AI,6.
- Reset alarms and warnings via BO,2.

ID	Object name	R/W	Description
AI,35	Status System Warning Code [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.
AI,37	Status System Alarm Code [Enum]	R	10: Pump communication fault 39: Valve fault 91: Flow temperature sensor fault 236: Pump faulty.
AI,5	Status Pump Warning Code [Enum]	R	Actual pump warning code.
AI,6	Status Pump Alarm Code [Enum]	R	Actual pump alarm code.
BO,2	Reset fault	W	Resets pending alarms and warnings. The data point is rising edge triggered.

10. Index

The index contains all objects in the BACnet profile for MIXIT. The objects are divided by function, for example "System alarm/warning status and reset".

10.1 BACnet device object

The following properties are supported in the device object.

Property identifier	Data type	Description	Access
Object_identifier	BACnetObjectIdentifier	Device Object Instance Number	R
Object_name	Character string	Device Object Name	R/W
Object_Type	BACnetObjectType	Device	R
System_Status	BACnetDeviceStatus	Operational	R
Vendor_Name	Character string	Grundfos	R
Vendor_Identifier	Unsigned16	227	R
Model_Name_Family	Character string	Grundfos product family. This will show the Grundfos pump model to which the MIXIT unit is connected to.	R
Model_Name_type	GrundfosUnitType	Grundfos product type number.	R
Model_Name_version	GrundfosUnitVersion	Grundfos product version number.	R
Firmware_Revision	Character string	Revision number of the BACnet firmware in the MIXIT unit.	R
Application_Software_Version	Character string	Software build date, DD-MM-YYYY.	R
Location	Character string	The user can enter a location here (maximum 200 characters).	R/W
Description	Character string	The user can enter a description here (maximum 200 characters).	R/W
Protocol_Version	Unsigned	Actual revision of the BACnet protocol.	R
Protocol_Revision	Unsigned	Actual revision of the BACnet protocol.	R
Protocol_Services_Supported	BACnetServicesSupported	This indicates which standardised protocol services are supported.	R
Protocol_Object_Types_Supported	ProtocolObjectTypesSupported	This indicates which standardised protocol object types are supported.	R
Object_List	BACnetARRAY[N]ofBACnetObjectIdentifier	An array of objects available.	R
Max_APDU_length_Accepted	Unsigned	The maximum number of bytes that may be contained in a single APDU.	R
Segmentation_Supported	BACnetSegmentation	This indicates if segmentation of messages is possible. It will always read NO_SEGMENTATION to indicate that segmentation is not possible.	R
APDU_Timeout	Unsigned	This indicates the amount of time in ms before timeout.	R
Number_Of_APDU_Retries	Unsigned	This indicates the maximum number of times an APDU is to be retransmitted.	R
Max_Master	Unsigned	This specifies the highest possible address for master nodes and must be between 1 and 127. The default value is 127, but this value can be lowered by the user to reduce transmission overhead.	R/W
Max_Info_Frames	Unsigned	This specifies the maximum number of information frames that are sent before the token is passed on.	R
Device_Address_Binding	List of BACnetAdressBindings	This holds address bindings to other devices, if any.	R
Database_Revision	Unsigned	Logical revision number for the device database.	R

10.2 Functions for configuration and control

10.2.1 Remote operation

ID	Object name	R/W	Description
BO,0	Set Control Source	W	0: Local control (default) 1: Bus control Set to 1 to enable control via BACnet. See BI,0 for actual state.
BI,0	Status Control Source	R	0: Local control 1: Bus control Is 1 if the bus control is activated. Activation of bus control is done via BO, 0.

10.2.2 System Start/Stop and Status

ID	Object name	R/W	Description
BO,1	Set Start Stop	W	0: Stop (Off) (default) 1: Start (ON) If set to 0: • The pump stops • The valve closes • The value of MI,2 (Status System State) will be 3 if there is no system fault.
BI,1	Status Fan And Dampers ED	R	0: Disabled 1: Enabled. This status indicates whether or not the system is in temperature control state.
BI,2	Status Actual Run State Pump	R	0: Stopped 1: Started. This status shows the actual pump run status.
BI,3	Status Ready	R	0: Not ready 1: Ready. Indicates if the system is ready for operation or not.
BI4	Status Fault	R	0: No fault 1: Fault. If 1, the system is stopped due to an alarm.

10.2.3 Manual override

ID	Object name	R/W	Description
MO,1	Set Manual Valve Function	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.

10.2.4 Temperature Setpoint and Feedback

ID	Object name	R/W	Description

MV,0	Config Temp Setpoint Source [Enum]	R/W	This selects the source of the temperature setpoint.
			1: default_setpoint
			2: ana_temp_setpoint
			3: temp_setpoint_remote
			4: outdoor_temp
			5: outdoor_temp_remote
			6 and above: reserved
			• 1: Default
			• 2: Relates to setpoint from analog input terminals.
			• 3: Relates to AO,0 (Set Temperature Setpoint Remote [°C]).
			• 4: Associated with an analog sensor connected to the product and objects:
			  - AV,4 (Config Heat curve offset (+/-) [°C])
			  - AV,5 (Config Heat curve slope (+/-) [-]).
			• 5: Associated with objects:
			  - AO,1 (Set Outdoor Temperature Remote [°C])
			  - AI,1 (Data Outdoor Temp Remote [°C])
			  - AV,4 (Config Heat curve offset (+/-) [°C])
			  - AV,5 (Config Heat curve slope (+/-) [-])
			• 6 and above: Associated with AO,3 to AO,8 (external sensor inputs).
			For all options, the actual temperature setpoint used by the algorithm can be read at AI,2 Data Act Temp Setpoint.
			Configuration of analog input must happen via Grundfos GO Remote.

AO,0	Set Temperature Setpoint Remote [°C]	W	Temperature setpoint via fieldbus. Enabling: • Set MV,0 (Config Temp Setpoint Source [Enum]) to 3 • Set BO,0 (Set Control Source) to 1.
AI,0	Data Temp Setpoint Remote [°C]	R	Actual value of remote temperature setpoint.
AO,1	Set Outdoor Temperature Remote [°C]	W	Outdoor temperature value via fieldbus. Enabling: • Set MV,0 (Config Temp Setpoint Source [Enum]) to 5 • Set BO,0 (Set Control Source) to 1.
AI,1	Data Outdoor Temp Remote [°C]	R	Actual value of remote outdoor temperature.
AV,4	Config Heat curve offset (+/-) [°C]	R/W	Adjusts the heat curve offset in degrees Celsius. It is used when MV,0 = 4 or MV,0 = 5.
AV,5	Config Heat curve slope (+/-) [-]	R/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.
BI,13	Heat Curve Slope Factor Enabled	R	0: False 1: True Used to indicate whether base curve is linear or non-linear.
BI,14	Heat Curve Offset Range Exceeded	R	0: Exceeded 1: Not exceeded Used to indicate that heat curve offset value is out of range [-15 ; 15].
BI,15	Heat Curve Slope Factor Range Exceeded	R	0: Exceeded 1: Not exceeded Used to indicate that heat curve slope factor value is out of range [0.4 ; 2.0].
AV,6	Config Default Temp Setpoint [°C]	R/W	Fall back temperature setpoint in case setpoint signal from bus or sensor is lost. Default: 40 °C.
AI,2	Data Act Temp Setpoint [° C]	R	Actual temperature setpoint used in temperature controller. If the limiter function is set to off, it is the same as the actual reference temperature derived from the set reference temperature mode via MV,0.

10.2.5 System alarm/warning status and reset

ID	Object name	R/W	Description
AI,35	Status System Warning Code [Enum]	R	Warning codes for the MIXIT unit: 84: Memory storage media faulty 91: Secondary flow temperature sensor fault(pump) 97: Missing analog input 125: Outdoor sensor fault 126: Remote air temperature sensor fault 157: Real time clock battery fault 161: 5 V/12 V internal supply fault 162: 24 V internal supply fault 169: Flow sensor fault 175: Supply (forward) temp. sensor fault 176: Return temperature sensor fault 236: Multi-pump alarm for pump 1 237: Multi-pump alarm for pump 2
AI,36	Status System Sub Warning Code [Enum]	R	TBU
AI,37	Status System Alarm Code [Enum]	R	Alarm codes for the MIXIT code: 10: Pump communication fault 25: Wrong configuration 39: Valve fault 72: Internal hardware fault 91: Flow temperature sensor fault 132: Missing GSC file configuration 203: Pump alarm 230: MAC address not configured 236: Pump faulty.
AI,38	Status System Sub Alarm Code [Enum]	R	TBU
AI,5	Status Pump Warning Code [Enum]	R	Actual pump warning code.
AI,6	Status Pump Alarm Code [Enum]	R	Actual pump alarm code.
BO,2	Reset fault	W	Resets pending alarms and warnings. The data point is rising edge triggered.

10.2.6 Date and time

ID	Object name	R/W	Description
AV,1	Config Product time and date	R/W	Product time and date in Unix format (seconds since 00:00 01-01-1970).

10.2.7 Pump control mode and setpoint

ID	Object name	R/W	Description
MO,0	Config Pump Control Mode, heating [Enum]	W	1: Constant speed 2: Constant pressure 3: Proportional pressure 4: AUTOADAPT 5: Constant flow Sets the pump control mode.
MO,3	Config Pump Control Mode Cooling [ENUM	W	1: Constant speed 2: Constant pressure 3: Proportional pressure 4: AUTOADAPT 5: Constant flow
MO,4	Config Thermal selection [Enum]	W	1: Heating 2: Cooling
MI,0	Status Pump Control Mode, heating and cooling[Enum]	R	1: Constant speed 2: Constant pressure 3: Proportional pressure 4: AUTOADAPT 5: Constant flow Shows the current pump control mode.
AV,7	Config Pump Head Duty Point, heating [m]	R/W	Desired pressure duty point for constant or proportional pressure control modes.
AV,8	Config Pump Flow Duty Point, heating [m3/h]	R/W	Desired flow duty point for proportional pressure and flow control.
AV,9	Config Pump Speed Duty Point, heating [%]	R/W	Desired speed in control mode constant speed. Depending on pump model, the minimum speed may be larger than minimum accepted at data point (larger than 30%).

ID	Object name	R/W	Description
AV,14	Config Pump Head Duty Point Cooling [m]	R/W	Desired pressure duty point for constant or proportional pressure. [R/W] to/from Pump Head Reference Geni parameter when Control Mode is Constant Pressure and Pump Head duty point at all other Control Modes.
AV,15	Config Pump Flow Duty Point Cooling [m3/h]	R/W	Desired flow duty point for proportional pressure and flow control. [R/W] to/from Pump Flow Reference Geni parameter when Control Mode is Constant Flow and Pump Flow duty point at all other Control Modes
AV,16	Config Pump Speed Duty Point Cooling [%]	R/W	Desired speed in control mode constant speed. Depending on the pump model, the minimum speed may be larger than minimum accepted at datapoint (larger than 30%).
MI,3	Status Thermal selection [Enum]	R	1: Heating 2: Cooling

10.3 Simulation functions

10.3.1 Protection functions

ID	Object name	R/W	Description
BO,3	Enable Overheat Protection	W	0: Disable overheat protection (default) 1: Enable overheat protection When enabled, the valve is closed. The function is only active for underfloor heating application. Actual status is read via BI,6 (Warning Flow Temperature High).
BO,4	Enable Frost Protection, heating	W	0: Disable frost protection (default) 1: Enable frost protection When enabled, the valve opens fully. The function is only active for heating coil application. Actual status is read via BI,7 (Notification Frost Risk Detected).
BO,8	Enable Frost Protection Cooling Mode	W	0: Disable frost protection (default) 1: Enable frost protection

10.3.2 Alarm/warning simulation

ID	Object name	R/W	Description
AV,2	Set Simulation Event Code [Enum]	R/W	Set alarm/warning code to simulate.
AV,3	Set Simulation Event Sub Code [Enum]	R/W	Set sub error code to simulate.
BO,5	Set Fault Simulation ED [Bool]	W	Activate (rising edge) or deactivate (falling edge) the alarm/warning simulation.
BI,5	Status Alarm Simulation	R	0: Inactive 1: Active Status of alarm/warning simulation.

10.4 System monitoring

10.4.1 System state

ID	Object name	R/W	Description
MI,2	Status System State [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: Frost protection 7: Underfloor overheat protection 8: Shut down due to removal of start signal 9: Auto Tuner on 10: Valve 100 % open (for backup) 11: Return temperature control.

10.4.2 Application configuration and monitoring

ID	Object name	R/W	Description
MO,2	Set Application Type [Enum]	W	1: Radiator heating 2: Underfloor heating 3: Heating coil This sets the application type. It may be used to switch between heating and cooling applications when the product is connected to a dual pipe system.
MI,1	Data Application Type [Enum]	R	1: Radiator heating 2: Underfloor heating 3: Heating coil The registered application type via MO,2.
BI,6	Notification Flow Temp High	R	0: Not detected 1: Detected. If 1, flow temperature above the configured value is detected. The notification is not resettable. The internal detection function is configured with Grundfos GO Remote. The function is associated with the underfloor heating application.
BI,7	Notification Frost Risk Detected	R	0: Not detected 1: Detected. If 1, frost risk is detected. The notification is not resettable. The internal detection function is configured with Grundfos GO Remote.
BI,8	Notification Supply Flow High	R	0: Not above 1: Above. If 1, the supply flow is above the limit in AV,10 for extended time (3600 s). The notification is not resettable, but it will reset itself. The supply flow limit function is enabled and disabled with Grundfos GO Remote or BV,0 (Config Supply Flow Limiting ED).
BI,9	Notification Thermal Power High	R	0: Not above 1: Above. • If 1, the thermal power is above the limit in AV,11 for extended time (3600 s). The notification is not resettable, but it will reset itself. The supply flow limiter function is enabled and disabled with Grundfos GO Remote or BV,1 (Config Thermal Power Limiting ED).
BI,10	Notification Return Temperature Threshold	R	0: Not above (heating), not below (cooling) 1: Above (heating), below (cooling). If 1, the return temperature exceeds the limit in AV,12 for extended time (3600 s). The notification is not resettable, but it will reset itself. The supply flow limit function is enabled and disabled with Grundfos GO Remote or BV,2 (Config Return Temp Limiting ED).
BI,11	Notification Differential Temperature High	R	0: Not above. 1: Above. If 1, the primary differential temperature exceeds the limit in AV,13 for extended time (3600 s). The notification is not resettable, but it will reset itself. The supply flow limiter function is enabled and disabled with Grundfos GO Remote or BV,3 (Config Primary Delta T Limiting ED).
BV,0	Config Supply Flow Limiting, heating ED	R/W	0: Disabled (default) 1: Enabled. Enabling of supply flow limit. When enabled, the consumed primary flow is limited below the configuration in AV,10 (Config Supply Flow Limit [m3/h]).
BV,1	Config Thermal Power Limiting, heating ED	R/W	0: Disabled (default) 1: Enabled. Enabling of thermal power limiter. When enabled, the delivered thermal power is limited below the configuration in AV,11 (Config Thermal Power Limit [kW].
BV,2	Config Return Temp Limiting, heating ED	R/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 AV,12 (Config Return Temp Limit [°C]).
BV,3	Config Primary DeltaT Limiting, heating ED	R/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 AV,13 (Config Primary Delta T Limit [°C]).
BV,4	Config Supply Flow Limiting Cooling ED	R/W	0: disabled 1: enabled
BV,5	Config Thermal Power Limiting Cooling ED	R/W	0: disabled 1: enabled
BV,6	Config Return Temp Limiting Cooling ED	R/W	0: disabled 1: enabled
BV,7	Config Primary Delta T Limiting Cooling ED	R/W	0: disabled 1: enabled

ID	Object name	R/W	Description
AV,10	Config Supply Flow Limit [m^3/h]	R/W	Primary flow limit for hydronic balancing. The primary flow limit is enabled BV,0 (Config Supply Flow Limiting ED).
AV,11	Config Thermal Power Limit [kW]	R/W	Thermal power limit for the hydronic balancing. The thermal power limit is enabled by BV,1 (Config Thermal Power Limiting ED).
AV,12	Config Return Temp Limit [°C]	R/W	Return temperature limit for hydronic balancing. The return temperature limit is enabled by BV,2 (Config Return Temp Limiting ED). For heating applications the value works as an upper threshold. For cooling applications the value works as a lower threshold.
AV,13	Config Primary DeltaT Limit [°C]	R/W	Differential temperature limit for hydronic balancing. The differential temperature limit is enabled by BV,3 (Config Primary Delta T Limiting ED). The value is positive for both heating and cooling applications.
AV,17	Config Supply Flow Limit Cooling [m3/h]	R/W	Primary flow limit for hydronic balancing in cooling mode. The primary flow limit is enabled by BV,4.
AV,18	Config Thermal Power Limit Cooling [kW]	R/W	Thermal power limit for hydronic balancing in cooling mode. The thermal power limit is enabled by BV,5.
AV,19	Config Return Temp Limit Cooling [°C]	R/W	Return temperature limit for hydronic balancing in cooling mode. The return temperature limit is enabled by BV,6. For cooling applications, the value works as a lower threshold.
AV,20	Config Primary Delta T Limit Cooling [°C]	R/W	Differential temperature limit for hydronic balancing in cooling mode. The differential temperature limit is enabled by BV,7. The value is used as an absolute value (always positive) for both heating and cooling applications.

10.4.3 Energy monitoring

ID	Object name	R/W	Description
AI,7	Data Heating Energy [kWh]	R	Accumulated heating energy in total lifetime. Reset via BO,6 (Reset Accumulated Counters).
AI,8	Data Heating Power [kW]	R	Current thermal power for product running in heating mode.
AI,9	Data Cooling Energy [kWh]	R	Accumulated cooling energy in total lifetime. Reset by BO, 6 (Reset Accumulated Counters).
AI,10	Data Cooling Power [kW]	R	Current thermal power for product running in cooling mode.
AI,11	Data Heat Temp Difference [°C]	R	Numerical value of forward pipe and return pipe differential temp. Used for heat transfer calculation.
AI,12	Data Pump Power [W]	R	Current electrical power consumption of pump.
AI,13	Data Percentage Speed [%]	R	Percentage of maximum pump speed.
AI,14	Data Pump Operating Hours [h]	R	Counter for pump operating hours. Reset by BO,6 (Reset Accumulated Counters).
AI,15	Data Pump Energy [kWh]	R	Accumulated pump energy. Reset by BO,6 (Reset Accumulated Counters).
BO,6	Reset Accumulated Counters	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.

10.4.4 Integrated sensors and signals

ID	Object name	R/W	Description
AI,16	Data Flow Temp [°C]	R	Flow temperature measured in the secondary side via the connected pump.
AI,17	Data Supply Temp [°C]	R	Supply temperature measured at the valve.
AI,19	Data Logical Valve Opening [%]	R	Valve opening request, linear from algorithm.
AI,20	Data Valve Supply Flow [m³/h]	R	Flow rate at primary side measured at the A-port.
AI,21	Data Return Temperature [°C]	R	Return temperature measured at the valve.
AI,22	Data Controlled Temp [°C]	R	Actual controlled temperature: zone air, flow temperature.
AI,23	Data Supply Source Setpoint [°C]	R	Supply source temperature reference derived from setpoint and mode of mixing loop.
AI,24	Data Pump Flow [m³/h]	R	Actual pump flow.
AI,25	Data Pump Head [m]	R	Actual pump head.

10.4.5 External sensor inputs

ID	Object name	R/W	Description
AI,26	Data Outdoor Temp [°C]	R	Outdoor temperature measured at analog input. The outdoor temperature sensor configuration is done via Grundfos GO Remote.
AI,27	Data Zone Air Temp [°C]	R	Air temperature measured at analog input. The air temperature sensor configuration is done via Grundfos GO Remote.

11. BACnet telegrams

11.1 BACnet MS/TP telegram overview

All BACnet MS/TP telegrams have the following format:

Preamble	Telegram type	Destination	Source	Length	Header CRC	Data	Data CRC	Pa
2 bytes: 0x55 0xFF	1 byte	1 byte	1 byte	2 bytes, MSB first	1 byte	Variable [0-501] bytes	2 bytes, LSB first	At most 1 byte 0xFF

For BACnet MS/TP, the destination address and source address are MAC addresses. A destination address of 255 (0xFF) denotes broadcast. The length field specifies the length in bytes of the data field which must be between 0 and 501 bytes long.

11.1.1 Telegram types

The available telegram types are listed below:

Type	Name	Description
00	Token	Used to pass network mastership to the destination device.
01	Poll for master	Used to discover the presence of other master devices on the network.
02	Reply to poll for master	Used by a master to indicate a wish to enter the token ring.
03	Test request	Used to initiate a loop-back test.
04	Test response	A reply to a test request telegram.
05	BACnet data, expecting reply	Used for data transmission where a reply is expected.
06	BACnet data, not expecting reply	Used for data transmission where no reply is expected.
07	Reply postponed	Used by master devices to defer sending a BACnet data reply.

12. Supported services

BACnet Interoperability Building Blocks (BIBBs) are collections of one or more BACnet services. These are described in terms of an "A" and a "B" device. Both devices are nodes on a BACnet inter-network. In most cases, the "A" device will act as the user of data (client), and the "B" device will be the provider of this data (server).

The MIXIT unit is a BACnet Application-Specific Controller (BASC) with a few additional services.

12.1 Data-sharing services

Name	BACnet BIBB code	Description	Initiate	Execute
ReadProperty	DS-RP-B	The MIXIT unit can be the provider of data.	-	●
ReadPropertyMultiple	DS-RPM-B	The MIXIT unit can be the provider of data and return multiple values at one time.	-	●
WriteProperty	DS-WP-B	The MIXIT unit allows a value to be changed over the network.	-	●
WritePropertyMultiple	DS-WPM-B	The MIXIT unit allows multiple values to be changed over the network.	-	●
SubscribeCOV	DS-COV-B	The MIXIT unit can be the provider of "Change Of Value" data. The unit supports up to 10 simultaneous COV subscriptions. Subscription lifetime can be limited or unlimited.	-	●
ConfirmedCOVNotification			●	-
UnconfirmedCOVNotification			●	-

12.2 Device management services

Name	BACnet BIBB code	Description	Initiate	Execute
Who-Is	DM-DDB-A	The MIXIT unit can seek information about device attributes of other devices and interpret device announcements.	●	-
I-Am			-	●
Who-Is	DM-DDB-B	The MIXIT unit can provide information about its device attributes and respond to requests to identify itself.	-	●
I-Am			●	
Who-Has	DM-DOB-B	The MIXIT unit can provide address information about their objects upon request.	-	●
I-Have			●	-
DeviceCommunicationControl	DM-DCC-B	The MIXIT unit can respond to communication control requests. It supports both limited and unlimited duration. Password (where required) is Grundfos.	-	●

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