Modbus for Grundfos MIXIT

Functional profile and user manual

GRUNDFOS

Original functional profile and user manual.

This functional profile describes Grundfos Modbus for the MIXIT unit.

CONTENTS

Read this document before configuring the product. Configuration must comply with local regulations and accepted codes of good practice.

1. General information

1.1 Hazard statements

The symbols and hazard statements below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious personal injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious personal injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate personal injury.

The hazard statements are structured in the following way:

SIGNAL WORD

Description of hazard

Consequence of ignoring the warning.
- Action to avoid the hazard.

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1.2 Notes

The symbols and notes below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

Observe these instructions for explosion-proof products.

A blue or grey circle with a white graphical symbol indicates that an action must be taken.

A red or grey circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.

If these instructions are not observed, it may result in malfunction or damage to the equipment.

Tips and advice that make the work easier.

1.3 Definitions and abbreviations

CRC	Cyclic Redundancy Check. A data error detection method.
Grundfos GO Remote	A Grundfos application designed to control Grundfos products via infrared or radio communication. Available for iOS and Android devices.
LED	Light-Emitting Diode
Modbus address	Unique network address for a piece of hardware.
Modbus	A serial communications protocol commonly used in industry and building automation systems.
RTU	Remote Terminal Unit.
Transmission speed	Bits transferred per second, bits/s.

1.4 Target group

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

2. Specifications

Modbus RTU	Description	Comments
Connector	Screw-type terminal	3 pins.
Connection type	RS-485, screened, twisted-pair	Conductors: 1A, 1B and Y1. See fig. 2.
Maximum cable length	1200 m	Equals 4000 ft. Using repeaters, this number can be increased.
Recommended cross-sectional area	0.20 - 0.25 mm^2	AWG24 or AWG23.
Address	1-247	Set via Grundfos GO Remote, "Fieldbus address".
Line termination	On or Off	Set via DIP switch 2. See section 4.4 Termination resistor.
Supported transmission speeds [bits/s]	1200, 2400, 4800, 9600 (default), 19200, 38400	Set via Grundfos GO Remote.
Data bits	8	Fixed value.
Stop bits	1 (default), 2	Set via Grundfos GO Remote.
Parity	None, even (default), odd	Set via Grundfos GO Remote.
Maximum number of devices	32	Using repeaters, this number can be increased.
Maximum telegram size	256 bytes.	According to Modbus RTU protocol specifications.

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3. Configuration

3.1 How to configure Modbus on the MIXIT unit

1. Launch Grundfos GO Remote on your iOS device. Make sure that Bluetooth is enabled.
   When your device is within reach of the MIXIT unit, the Bluetooth "Connect" button on Grundfos GO Remote appears.

2. Press Bluetooth "Connect" and then press the Bluetooth button on the MIXIT operating panel. See fig. 1.

3. If the MIXIT unit has not been configured before, complete the system setup guide. If the MIXIT unit has been configured before, go to step 4.

4. On the Grundfos GO Remote dashboard, press "Functional packages".

5. Check that either "Building Automation System Integration Standard" or "Builing Automation System Integration Premium" is installed. An open lock indicates that the package is installed. If installed, go to step 10.

6. Press on the building automation package that you want to install.

7. A description of the package appears. Press the "Activate" button.

8. Enter the activation code (printed on the product), press "OK" and finally press "Proceed". If you do not have an activation code, contact your local Grundfos sales representative.

9. The software package is now installed.

10. From the dashboard, select "Settings" and press the "Bus configuration" menu.

11. Press "Fieldbus" to open the menu. Find Modbus on the rotation wheel and press "OK".

12. In the "Bus configuration" menu, Modbus is now available. Select "Modbus".

13. Make a configuration that is suitable for your system.

14. In the "Settings" menu, the "Bus configuration" field shows the selected fieldbus protocol.
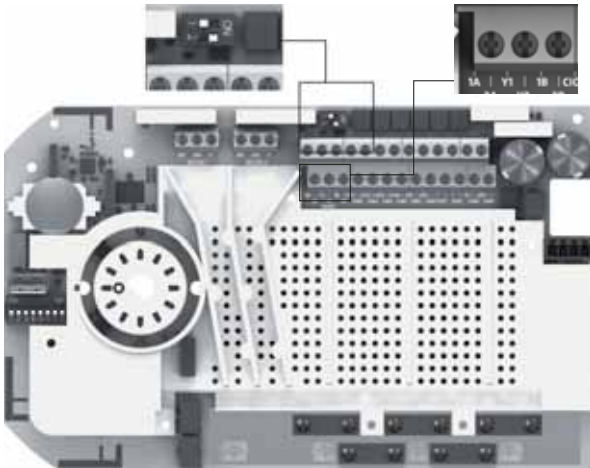

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Fig. 1　MIXIT operating panel

4. Modbus RTU

4.1 Connecting to the Modbus network

Fig. 2 Inside view of the terminal board

Use a screened, twisted-pair cable.

Modbus terminal	Recommended colour	Data signal
1A	Yellow	Positive
1B	Brown	Negative
Y1	Grey	Ground

The transmission speed must be set correctly before the MIXIT unit is ready to communicate on the Modbus RTU network.

The transmission speed is set from Grundfos GO Remote under "Settings" > "Bus configuration" > "Modbus". The default transmission speed is 9600 bit/s. All devices on the Modbus RTU network must communicate at the same transmission speed.

4.2 Setting the parity

You set the parity from Grundfos GO Remote under "Settings" > "Bus configuration" > "Modbus". The following three configurations are supported: No parity (two stop bits), Odd parity (one stop bit) and even parity (one stop bit).

The default byte format is (11 bits):
• 1 start bit
• 8 data bits, least significant bit sent first
• Even parity
• 1 stop bit.

4.3 Selecting the Modbus address

To set the Modbus address, use Grundfos GO Remote. Select "Settings" > "Bus configuration" > "Modbus" > "Fieldbus address". This function is only available if you have enabled the fieldbus package. See section *3. Configuration*.

The Modbus address must be within the range of 1 to 247 and must be unique on the Modbus RTU segment.

4.4 Termination resistor

A termination resistor for line termination is fitted on the MIXIT unit and has a value of 120 Ω. It is to be cut in if the unit is set as the last device on the network. Set the DIP switch 2 to "ON" to activate.

Fig. 3 Cutting the termination resistor in and out

5. Modbus function code overview

The supported function codes are shown in the table below:

Type	Code	Hex	Name
16-bit data, registers	03	0x03	Read holding registers
	04	0x04	Read input registers
	06	0x06	Write single register
	16	0x10	Write multiple registers
Diagnostics	08	08	Diagnostics See section *9.6 Diagnostics (0x08)* for subcodes.

Note Reading or writing coils 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.

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

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6. 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 a 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

6.1 Modbus interface configuration

Address	Register name	Scaling	R/W	Description
00003*	Config.BusAddress	Enum	R/W	For configuration of an active Modbus address. Range: 1-247 (factory default: 1).
00004*	Config.BitRate	Enum	R/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 (factory default) 5: 19200 bits/s 8: 38400 bits/s.
00005	Config.AutoAckControlBits	Enum	R/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 (factory default).
00009*	Config.ModbusParity	Enum	R/W	Configuration of an active Modbus parity. 0: No parity 1: Even parity (factory default) 2: Odd parity.
00010*	Config.ModbusStopBits	Enum	R/W	Configuration of an active Modbus stop bit number. 1: Stop bit (factory default) 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.

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6.2 Modbus interface status

Address	Register name	Scaling	R/W	Description
00023	VersionNumber	Unscaled	R	Modbus interface software version number.
00024	ActualModbusAddress	Enum	R	Actually used Modbus slave address.
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).

6.3 System control

Address	Register name	Scaling	R/W	Description
00101.7	SetBit.TempReduction	Bit	W	0: Temperature reduction disabled (power on default) 1: Temperature reduction enabled. When set to 1, the setpoint is reduced with the temperature differential set in 00106 *Set.FlowTempReduction [0.01 K]*. See 00201.12 *StatusBit.FlowTempReduction* for the actual state. The function can only be active for radiator heating application. The actual application is configured via Grundfos GO Remote.
00101.6	SetBit.OverheatProtection	Bit	W	0: Overheat protection disabled (power on default) 1: Overheat protection enabled (valve closes). See 00201.6 *StatusBit.OverheatProtectionED* for the actual state. The function can be active only for floor heating application. The actual application is configured via Grundfos GO Remote.
00101.5	SetBit.FrostProtection	Bit	W	0: Frost protection disabled (power on default) 1: Frost protection enabled (valve opens). See 00201.5 *StatusBit.FrostProtectionED* for the actual state. The function can be active only for heating coil application. The actual application is configured via Grundfos GO Remote.
00101.4	SetBit.AutoTuneTempController	Bit	W	The register is triggered by a rising edge. This function will execute auto tuning of the temperature controller. It will set 00205 *Status.TempCtrAutoTuneState* to 1 (active). The auto tuner will exit itself, either successfully or fail with a flag which can be read in 00205 *Status.TempCtrAutoTuneState*.
00101.3	ResetBit.AccumCounters	Bit	W	The register is triggered by a rising edge. This function resets the following counters: 00303 *Data.HeatEnergyTotalHI [1 kWh]*, 00304 *Data.HeatEnergyTotalLO [1 kWh]*, 00406 *Data.PumpEnergyHI [1 Wh]* and 00407 *Data.PumpEnergyLO [1 Wh]*.
00101.2	ResetBit.Alarm	Bit	W	The register is triggered by a rising edge. This function resets the pending alarm and attempts a restart.
00101.1	SetBit.StartStop	Bit	W	0: Stop (off) 1: Start (on, power on default). When set to 0, the pump will stop and the valve will close and 00204 *Status.SystemState [Enum]* will be set to 2 if there is no system failure. When set to 1, the valve and the pump is controlled from application software. See 00201.3 *StatusBit.ReqPumpOprMode* for the actual run state of the pump.
00101.0	SetBit.RemoteAccessReq	Bit	W	0: Bus control disabled (power on default) 1: Bus control enabled. This function enables all system control. See 00201.0 *StatusBit.ActualRemoteAccess* for the actual run state of the pump.
00102	Set.TempSetpointRemote	0.01 K	W	The register is triggered by a value change (power on default: 0). See 00311*Data.ActualTempSetpointRemote* for the actual value. The value is active as setpoint when 00166 *Config.TempSetpointSource [Enum]* is set to 2.
00103	Set.OutdoorTempRemote	0.01 K	W	The register is triggered by a value change (power on default: 0). See 00312 *Data.ActualOutdoorTempRemote* for the actual value. The value is active as setpoint when 00166 *Config.TempSetpointSource [Enum]* is set to 4.
00104	Set.SetUnixRtcHI	Unix time	W	The register is triggered by a value change (LO value). Set the real time clock in unix format. See 00301 *Data.UnixRtcHI [1 s]* and 00302 *Data.UnixRtcLO [1 s]* for the actual value.
00105	Set.SetUnixRtcLO			
00106	Set.FlowTempReduction	0.01 K	W	The register is triggered by a value change. Flow temperature reduction that is activated via 00101.7 *SetBit.TempReduction* when the application type is radiator heating (the application type must be configured at the product using Grundfos GO Remote).

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6.4 System configuration

Address	Register name	Scaling	R/W	Description
00151.3	ConfigBit.CoilPreheatED	Bit	R/W	The register is triggered by a value change 1: Enable (factory default) 0: Disable. This function enables coil preheat when the MIXIT unit is configured for heating coil application. The application can only be set via Grundfos GO Remote.
00151.2	ConfigBit.SummerModeED	Bit	R/W	The register is triggered by a value change. 1: Enable 0: Disable (factory default). Summer mode: when set to 1, the valve will close and the pump will stop when the outdoor temperature average has been above the threshold set in 00179 *Config.SummerModeTempTreshold [0.01 K]* for the configured number of days set via 00180 *Config.SummerModeAvgPeriod [days]*.
00151.1	ConfigBit.FloorOverheatDetectionED	Bit	R/W	The register is triggered by a value change. Internal high temperature protection of the floor. 1: Enable 0: Disable (factory default).
00151.0	ConfigBit.CoilFrostProtectED	Bit	R/W	The register is triggered by a value change. Internal coil frost protection. 1: Enable (factory default) 0: Disable.
00152.2	ConfigBit.ThermalPowerLimitingED	Bit	R/W	The register is triggered by a value change. Thermal power limiting using valve position. 1: Enable 0: Disable (factory default).
00152.1	ConfigBit.ReturnTempLimitingED	Bit	R/W	The register is triggered by a value change. Return temperature limiting using valve position. 1: Enable 0: Disable (factory default).
00152.0	ConfigBit.SupplyFlowLimitingED	Bit	R/W	The register is triggered by a value change. Supply flow limiting using valve position. 1: Enable 0: Disable (factory default).
00153	Config.PumpControlMode	Enum	R/W	The register is triggered by a value change. This function configures the control mode of the pump. 0: Constant pressure 1: Proportional pressure 2: Constant speed 8: Constant flow.
00154	Config.PumpHeadSetpoint	0.001 bar	R/W	The register is triggered by a value change. Desired setpoint for constant and proportional pressure.
00155	Config.PumpFlowSetpoint	0.1 m^3/h	R/W	The register is triggered by a value change. Desired setpoint for proportional pressure and flow control.
00156	Config.PumpSpeedSetpoint	0.01 %	R/W	The register is triggered by a value change. Desired speed in control mode constant speed. Percentaqe of maximum speed. Factory default: 50 %.
00157	Config.CoilOffTimeMin	1 s	R/W	The register is triggered by a value change. Sets the minimum off time for a heating coil. Factory default: 120 s.
00158	Config.CoilPreheatReturnTemp	0.01 K	R/W	The register is triggered by a value change. Return temperature limit indicating that the coil has been flushed. Factory default: 30 °C (303.15 K).
00159	Config.ReturnTempFrostLimit	0.01 K	R/W	The register is triggered by a value change. Return temperature limit indicating frost in the coil. Factory default: 8 °C (281.15 K).
00160	Config.AirTempFrostLimit	0.01 K	R/W	The register is triggered by a value change. Air temperature limit indicating frost in the coil. Factory default: 5 °C (278.15 K).
00161	Config.FloorMaxTemp	0.01 K	R/W	The register is triggered by a value change. Maximum forward temperature for floor protection in a floor heating application. Factory default: 50 °C (323.15 K).
00162	Config.ThermalPowerLimit	0.1 kW	R/W	The register is triggered by a value change. Thermal power limit. See 00152.2 *ConfigBit.ThermalPowerLimitingED*.

Address	Register name	Scaling	R/W	Description
00163	Config.ReturnTempLimit	0.01 K	R/W	The register is triggered by a value change. Return temperature limit. See 00152.1 *ConfigBit.ReturnTempLimitingED*
00164	Config.SupplyFlowLimit	0.1 m³/h	R/W	The register is triggered by a value change. Threshold for the supply flow limiter. See 00152.0 *ConfigBit.SupplyFlowLimitingED*.
00165	Config.SetpointExceedWarnTime	1 s	R/W	The register is triggered by a value change. The time before a limit exceed warning is set. Relates to 00152.0 *ConfigBit.SupplyFlowLimitingED*, 00152.1 *ConfigBit.ReturnTempLimitingED* and 00152.2 *ConfigBit.ThermalPowerLimitingED*. Factory default: 3600 s.
00166	Config.TempSetpointSource	Enum	R/W	The register is triggered by a value change. Select the source of the temperature setpoint. 0: Fixed setpoint (factory default) 1: Setpoint from analog input 2: 00102 Set.TempSetpointRemote 3: Setpoint from outdoor sensor 4: 00103 Set.OutdoorTempRemote.
00167	Config.DefaultSetpoint	0.01 K	R/W	The register is triggered by a value change. Fall back temperature setpoint in case the setpoint signal (bus/sensor) is lost. Factory default: 40 °C (313.15 K).
00168	Config.TempSetpoint1	0.01 K	R/W	The register is triggered by a value change. Temperature setpoint associated with -20 °C outdoor temperature. Factory default: 60 °C (333.15 K).
00169	Config.TempSetpoint2	0.01 K	R/W	The register is triggered by a value change. Temperature setpoint associated with -10 °C outdoor temperature. Factory default: 57 °C (330.15 K).
00170	Config.TempSetpoint3	0.01 K	R/W	The register is triggered by a value change. Temperature setpoint associated with 0 °C outdoor temperature. Factory default: 50 °C (323.15 K).
00171	Config.TempSetpoint4	0.01 K	R/W	The register is triggered by a value change. Temperature setpoint associated with 10 °C outdoor temperature. Factory default: 35 °C (308.15 K).
00172	Config.TempSetpoint5	0.01 K	R/W	The register is triggered by a value change. Temperature setpoint associated with 20 °C outdoor temperature. Factory default: 30 °C (303.15 K).
00173	Reserved			
00174	Reserved			
00175	Reserved			
00176	Reserved			
00177	Reserved			
00178	Config.ValveKVLimit	0.1 m³/h	R/W	The register is triggered by a value change. The maximum valve kv limit for a two-way injection configuration (hydraulic configuration is configured at the product using Grundfos GO Remote).
00179	Config.SummerModeTempTreshold	0.01 K	R/W	The register is triggered by a value change. Temperature threshold for activating summer stop. Factory default: 18 °C (291.15 K).
00180	Config.SummerModeAvgPeriod	days	R/W	The register is triggered by a value change. Averaging period for outdoor temperature (1 day, 2 days, 3 days) Factory default: 2 days.
00181	Config.ProportionalGainTempCtrl	0.01	R/W	The register is triggered by a value change. Temperature controller proportional gain, Kp. Factory default: 1.
00182	Config.IntegralTimeTempCtrl	s	R/W	The register is triggered by a value change. Temperature controller integral time, Ti. Factory default: 150 s.

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6.5 System status

Address	Register name	Scaling	R/W	Description
00201.12	StatusBit.FlowTempReduction	Bit	R	0: Inactive 1: Active. Activated via 00101.7 *SetBit.TempReduction*.
00201.11	StatusBit.CoilFrostRiskDetected	Bit	R	0: Not detected 1: Detected. A coil frost risk is detected or activated via 00101.5 *SetBit.FrostProtection* or by activating DI6 when the product is configured for a heating coil application. A frost risk can also be detected by the product if 00151.0 *ConfigBit.CoilFrostProtectED* is set to 1.
00201.10	StatusBit.FlowTempHigh	Bit	R	0: Not above 1: Above. A floor overheat risk is detected or activated via 00101.6 *SetBit.OverheatProtection* or by activating DI6 when the product is configured for a floor heating application. A floor overheat risk can also be detected by the product if 00151.1 *ConfigBit.FloorOverheatDetectionED* is set to 1.
00201.9	StatusBit.SupplyFlowHigh	Bit	R	0: Not above 1: Above. The register is set to 1 if the supply flow rises above the threshold 00164 *Config.SupplyFlowLimit [0.1 m^3/h]* for a longer period than the time set in 00165 *Config.SetpointExceedWarnTime [1 s]*.
00201.8	StatusBit.ThermalPowerHigh	Bit	R	0: Not above 1: Above. The register is set to 1 if the thermal power rises above the threshold 00162 *Config.ThermalPowerLimit [0.1 kW]* for a longer period than the time set in 00165 *Config.SetpointExceedWarnTime [1 s]*.
00201.7	StatusBit.ReturnTempHigh	Bit	R	0: Not above 1: Above. The register is set to 1 if the return temperature rises above the threshold 00163 *Config.ReturnTempLimit [0.01 K]* for a longer period than the time set in 00165 *Config.SetpointExceedWarnTime [1 s]*.
00201.6	StatusBit.OverheatProtectionED	Bit	R	0: Disabled 1: Enabled. The internal floor-overheating monitoring is activated via this function. The temperature threshold is set via 00161 *Config.FloorMaxTemp [0.01 K]*.
00201.5	StatusBit.FrostProtectionED	Bit	R	0: Disabled 1: Enabled. The internal coil-frost monitoring is activated via this function. The temperature thresholds for this function is set via 00159 *Config.ReturnTempFrostLimit [0.01 K]* and 00160 *Config.AirTempFrostLimit [0.01 K]*.
00201.4	StatusBit.FanAndDampersED	Bit	R	0: Disabled 1: Enabled. Enable fan and dampers pulled together with Relay 1. When enabled, the product is in temperature control state.
00201.3	StatusBit.ReqPumpOprMode	Bit	R	0: Stop 1: Start. Requested pump operating mode. This state is set automatically.
00201.2	StatusBit.Ready	Bit	R	0: Not ready 1: Ready. System is ready for operation.
00201.1	StatusBit.Fault	Bit	R	0: No fault 1: Fault. The system has stopped due to an alarm.
00201.0	StatusBit.ActualRemoteAccess	Bit	R	0: Local control (power on default) 1: Bus control. The function is set via 00101.0 *SetBit.RemoteAccessReq*.
00202	Status.WarningCode	Enum	R	Warning code. See section *10.2 MIXIT warning codes*.
00203	Status.AlarmCode	Enum	R	Alarm code. See section *10.1 MIXIT alarm codes*.

Address	Register name	Scaling	R/W	Description
00204	Status.SystemState	Enum	R	0: Powering up (~30s) 1: Fault (fault relay activated) 2: Ready (ready relay activated) 3: Preheating heating coil 4: Temperature control state 5: Coil frost protection 6: Floor overheat protection 7: Shut down due to removal of start signal 8: Auto tuner on 9: Backup control 1 10: Backup control 2.
00205	Status.TempCtrAutoTuneState	Enum	R	0: Inactive 1: Active 2: Failed due to low flow 3: Failed due to timeout 4: Failed due to the pump is stopped 5: Amplitude and period detection failure 6: General abort 7: Auto tuning finished. The function is activated via 00101.4 *SetBit.AutoTuneTempController*.

6.6 System data

Address	Register name	Scaling	R/W	Description
00301	Data.UnixRtcHI	Unix time	R	Unix Real Time clock value.
00302	Data.UnixRtcLO			
00303	Data.HeatEnergyTotalHI	1 kWh	R	Accumulated energy in total lifetime. Reset the value via 00101.3 *ResetBit.AccumCounters*.
00304	Data.HeatEnergyTotalLO			
00305	Data.HeatPower	0.1 kW	R	Current heat power.
00306	Data.HeatTempDifference	0.01 °C	R	Numerical value of forward pipe and return pipe differential temperature. It is used for heat transfer calculation.
00307	Data.PowerOnTimeHI	1 s	R	Power on time.
00308	Data.PowerOnTimeLO			
00309	Data.AnalogueTempSetpoint	0.01 %	R	Temperature setpoint from the analog input. Percentage of configured range.
00310	Data.OutdoorTemp	0.01 K	R	Outdoor temperature from the PT1000 input.
00311	Data.ActualTempSetpointRemote	0.01 K	R	Actual value of remote temperature setpoint.
00312	Data.ActualOutdoorTempRemote	0.01 K	R	Actual value of remote outdoor temperature.
00313	Data.FlowTemp	0.01 K	R	Normally equal to pump media temperature.
00314	Data.SupplyTemp	0.01 K	R	Supply temperature.
00315	Data.ShuntTemp	0.01 K	R	Shunt temperature.
00316	Data.ZoneAirTemp	0.01 K	R	Air temperature, PT1000 input.
00317	Data.SupplyDiffPress	0.001 bar	R	Differential pressure across valve and filter (A-port).
00318	Data.RelativeShuntPress	0.001 bar	R	Relative shunt pressure.
00319	Data.LogicalValveOpening	0.01 %	R	Valve opening. Percentage of full open.
00320	Data.ValveSupplyFlow	0.1 m^3/h	R	Estimated primary flow rate.
00321	Data.ActTempSetpoint	0.01 K	R	Actual temperature setpoint used in the temperature controller If the limiter function is off, this is the same as the externally supplied reference.
00322	Data.ReturnTempEstimate	0.01 K	R	Estimated return temperature.
00323	Data.ControlledTemp	0.01 K	R	Actual controlled temperature: Zone air or flow temperature.
00324	Data.BoilerSetpoint	0.01 K	R	Setpoint for the supply temperature from the boiler.

6.7 Pump status

Address	Register name	Scaling	R/W	Description
00401	Status.PumpWarningCode	Enum	R	Pump warning code. See section *10.4 Pump warning codes*.
00402	Status.PumpAlarmCode	Enum	R	Pump alarm code. See section *10.3 Pump alarm codes*.
00403	Status.ActualRunState	Enum	R	Actual feedback from the pump has started or stopped. 0: Stopped 1: Started.

6.8 Pump data

Address	Register name	Scaling	R/W	Description
00404	Data.PumpFlow	0.1 m^3/h	R	Pump flow.
00405	Data.PumpHead	0.001 bar	R	Pump head.
00406	Data.PumpEnergyHI	1 Wh	R	Pump energy.
00407	Data.PumpEnergyLO			
00408	Data.PumpPower	1 W	R	Pump power.

6.9 Alarm/warning simulation

Address	Register name	Scaling	R/W	Description
00701	Set.Simulation.AlarmCode	Enum	W	Alarm code to simulate. Must be supported by the MIXIT unit. See section *10.1 MIXIT alarm codes*.
00702	Set.Simulation.WarningCode	Enum	W	Warning code to simulate. Must be supported by the MIXIT unit. See section *10.2 MIXIT warning codes*.
00703	Set.Simulation.Activate	Bool	W	Activate alarm and warning simulation. 0: Inactive 1: Active.
00704	Status.Simulation.Active	Bool	R	Status of alarm and warning simulation. 0: Inactive 1: Active.

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7. Applications

7.1 Control source

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

Note that 00101.0 *SetBit.RemoteAccessReq* is set to 0 as default (power on). This means that 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*.

7.2 Outdoor curve adjustments

The MIXIT unit has a five point outdoor curve. The outdoor curve defines the flow temperature as a function of the outdoor temperature. The five data points defining the outdoor curve are:

- 00168 *Config.TempSetpoint1 [0.01 K]*: Flow temperature setpoint at -20 °C outdoor temperature
- 00169 *Config.TempSetpoint2 [0.01 K]*: Flow temperature setpoint at -10 °C outdoor temperature
- 00170 *Config.TempSetpoint3 [0.01 K]*: Flow temperature setpoint at 0 °C outdoor temperature
- 00171 *Config.TempSetpoint4 [0.01 K]*: Flow temperature setpoint at 10 °C outdoor temperature
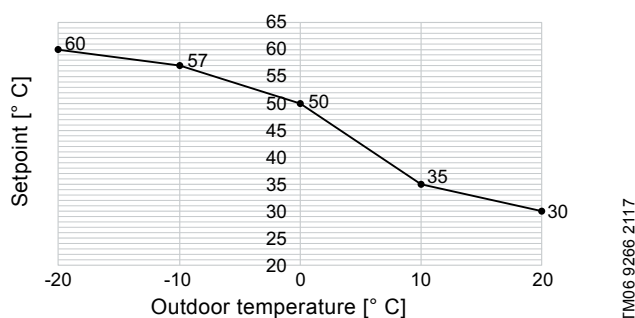- 00172 *Config.TempSetpoint5 [0.01 K]*: Flow temperature setpoint at 20 °C outdoor temperature.

Fig. 4 The curve is defined by the default values of the five data points

The setpoint source is configured via 00166 *Config.TempSetpointSource [Enum]*. Activate the outdoor curve by setting 00166 *Config.TempSetpointSource [Enum]* to 4 and supplying the actual outdoor temperature in 00103 *Set.OutdoorTempRemote [0.01 K]*. Verification of the given outdoor temperature is available in 00312 *Data.ActualOutdoorTempRemote*.

It is also possible to use the above curve with an analog sensor connected to the MIXIT unit by setting 00166 *Config.TempSetpointSource [Enum]* to 3. However, additional configuration of the sensor type using Grundfos GO Remote is necessary. Outdoor sensor types PT1000 and 0-10 V are supported, for example, see the MIXIT Installation and Operating instructions, or the instructions in Grundfos GO Remote: "Settings" > "Assisted setpoint source" > "Outdoor temperature".

If no outdoor temperature source is connected, the product will give the warning code 125 in 00202 *Status.WarningCode* except if the temperature source is configured for a 0-10 V analog sensor.

7.3 Configuration of summer mode

The MIXIT unit can stop if the average outdoor temperature has been above a certain threshold for a period. It will start again when the average temperature has been below the threshold temperature for an equal amount of time. The threshold is configured in 00179 *Config.SummerModeTempTreshold [0.01 K]* between 15 °C and 25 °C. The period is configured in 00180 *Config.SummerModeAvgPeriod [days]* and can be 1, 2 or 3 days (factory default: 2 days).

The summer mode function is enabled by setting 00151.2 *ConfigBit.SummerModeED* to 1 (factory default: 0). If no outdoor temperature source is connected and the summer mode is enabled, the product will show the warning code 125 in 00202 *Status.WarningCode*, except if the temperature source is configured for a 0-10 V analog sensor.

7.4 Direct temperature setpoint

A direct temperature setpoint may be provided in 00102 *Set.TempSetpointRemote [0.01 K]*. For the setpoint to have effect, you must set 00166 *Config.TempSetpointSource [Enum]* to 2 and enable bus control. Verification of the given setpoint is available in 00311 *Data.ActualTempSetpointRemote*. See also section *8. Fault finding the product*.

7.5 Limiters

The MIXIT unit can limit either the primary flow (hydronic flow balancing), the return temperature and/or the thermal power (hydronic power balancing). The Building Automation System Integration Premium must be enabled for the limiter functions to be available. See section *3. Configuration* on how to enable the package. It is possible to run all three limiters simultaneously.

7.5.1 Primary flow limiter

Enable the primary flow limiter by setting 00152.0 *ConfigBit.SupplyFlowLimitingED* to 1 and configure the limit via 00164 *Config.SupplyFlowLimit [0.1 m³/h]*. Both values are stored in the product.

7.5.2 Return temperature limiter

Enable the return temperature limiter by setting 00152.1 *ConfigBit.ReturnTempLimitingED* to 1 and configure the limit via *00163 Config.ReturnTempLimit [0.01 K]*. Both values are stored in the product.

7.5.3 Thermal power limiter

Enable the thermal power limiter by setting 00152.2 *ConfigBit.ThermalPowerLimitingED* to 1 and configure the limit via *00162 Config.ThermalPowerLimit [0.1 kW]*. Both values are stored in the product.

7.5.4 Monitoring of actual setpoint

The limiter functions are implemented in cascade so they subtract from the setpoint if a limit is exceeded. The actual setpoint derived from a given setpoint and subtraction due to limiter functions can be monitored via 00321 *Data.ActTempSetpoint [0.01 K]*. See also section *8. Fault finding the product*.

7.5.5 Configuration of limit exceed warning

If the configured limits are exceeded by a certain time, the MIXIT unit gives a warning in:

- 00201.9 *StatusBit.SupplyFlowHigh* equal to 1
- 00201.8 *StatusBit.ThermalPowerHigh* equal to 1
- 00201.7 *StatusBit.ReturnTempHigh* equal to 1.

The product takes no further actions than setting the bit by these three events. The time for setpoint exceed is configurable via 00165 *Config.SetpointExceedWarnTime [1 s]*. The default time is 3600 seconds.

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7.6 Pump control mode and setpoint

Configure the pump control mode via 00153 *Config.PumpControlMode [Enum]*

Proportional-pressure control mode (00153 set to 1)

The setpoint is set via 00154 *Config.PumpHeadSetpoint [0.001 bar]* and 00155 *Config.PumpFlowSetpoint [0.1 m^3/h]*. The control curve will be a straight line through the configured setpoint.
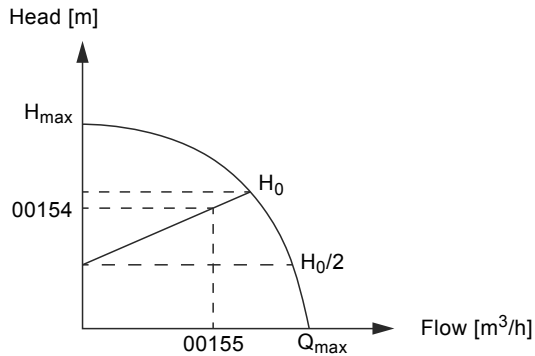

Fig. 5   Proportional-pressure control curve

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.

Constant-pressure control mode (00153 set to 0)

The setpoint is set via 00154 *Config.PumpHeadSetpoint [0.001 bar]*. The control curve will be horizontal, passing through the configured head setpoint.
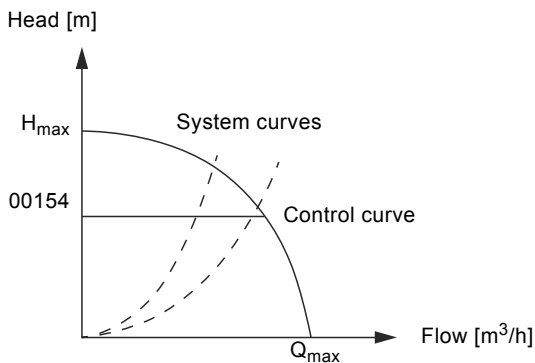

Fig. 6   Constant-pressure control curve

Constant-speed control mode (00153 set to 2)

The setpoint is set via 00156 *Config.PumpSpeedSetpoint [0.01 %]* . The speed setpoint is a percentage of maximum speed. In this control mode, the pump speed will be constant at the configured speed setpoint.
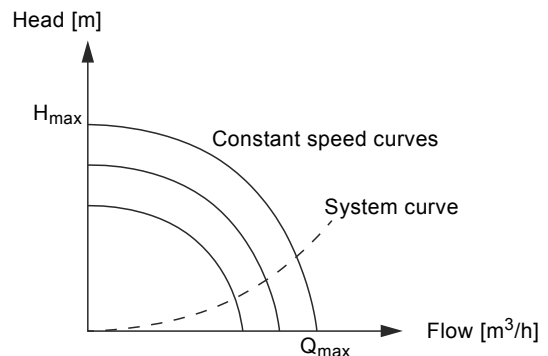

Fig. 7   Constant-speed control curve

Constant-flow control mode (00153 set to 8)

The setpoint is set via 00155 *Config.PumpFlowSetpoint [0.1 m^3/h]*. In this control mode, the pump flow will be constant. We recommend this control mode for heating coils. For pumps without a dedicated flow control function, the auxiliary control function flow limit is activated. For heating circuits with a low hydraulic resistance, such as heating coils, this is effectively flow control mode.
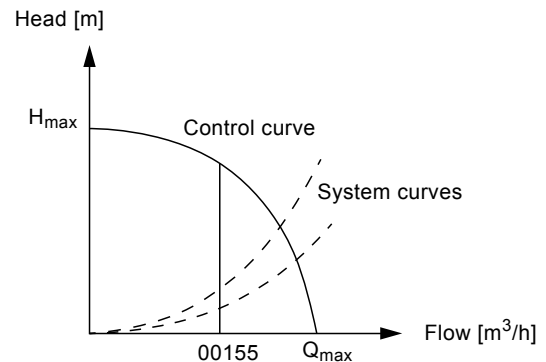

Fig. 8   Constant-flow control curve

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7.7 Application specific functions for heating coils

When the MIXIT unit is configured for heating coil application, control of air temperature is assumed. The measured air temperature from the coil is available in 00316 *Data.ZoneAirTemp [0.01 K]*. Configuration of the application must happen via Grundfos GO Remote: "Settings" > "Application" > "Application type".

7.7.1 Coil preheat

Coil preheat is available and is enabled by setting 00151.3 *ConfigBit.CoilPreheatED* to 1 (factory default). The actual return temperature threshold that must be reached for proper coil preheat is available in 00158 *Config.CoilPreheatReturnTemp [0.01 K]*. When the MIXIT unit is in coil preheat state, 00201.5 *StatusBit.FrostProtectionED* is set to 0 and 00201.4 *StatusBit.FanAndDampersED* is set to 0.

When the coil preheat has finished and the product is in temperature control mode, it is safe to start fans and open dampers in the air handling unit. This is signalled by setting 00201.4 *StatusBit.FanAndDampersED* to 1.

7.7.2 Coil frost protection

For heating coil application, frost detection is available. Frost detection is enabled via 00151.0 *ConfigBit.CoilFrostProtectED* set to 1. The lower temperature thresholds, which independently detect frost, are frost limit associated with return temperature (00159 *Config.ReturnTempFrostLimit [0.01 K]*) and frost limit associated with air temperature (00160 *Config.AirTempFrostLimit [0.01 K]*). When either of these preset limits are reached, the valve will open fully towards the heat supply.

The MIXIT unit can also be set into frost protection state by setting 00101.5 *SetBit.FrostProtection* to 1. When the MIXIT unit is in frost protection state 00201.5 *StatusBit.FrostProtectionED* is set to 1 and 00201.4 *StatusBit.FanAndDampersED* is set to 0.

7.8 Application specific functions for floor heating

When the product is configured for floor heating application, overheat detection of the floor is available. Configuration of the application is set via Grundfos GO Remote: "Settings" > "Application" > "Application type".

The overheat detection function is enabled by setting 00151.1 *ConfigBit.FloorOverheatDetectionED* to 1 (factory default is 0). The overheat limit associated with the flow temperature is 00161 *Config.FloorMaxTemp [0.01 K]*. When this preset limit is reached, the valve will close fully towards the heat supply.

The product can also be set to overheat protection by setting 00101.6 *SetBit.OverheatProtection* to 1.

When the product is in overheat protection state, 00201.4 *StatusBit.FanAndDampersED* is set to 1.

7.9 Application specific functions for radiator heating

When the product is configured for radiator heating application, domestic hot water priority is available. Configuration of the application is set via Grundfos GO Remote: "Settings" > "Application" > "Application type".

When setting 00101.7 *SetBit.TempReduction*, the given setpoint is reduced by the differential temperature stated in 00106 *Set.FlowTempReduction*.

The actual temperature setpoint can be verified via 00321 *Data.ActTempSetpoint [0.01 K]*.

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8. Fault finding the product

Fault	Cause	Remedy
1. The ⊞ icon is not switched on.	a) The configuration may have failed. b) The connections at the terminal board are incorrect.	• If the icon is switched off, then check the Modbus interface configuration via Grundfos GO Remote. See section *4.3 Selecting the Modbus address*. If the interface configuration is correct and the icon is still switched off, then try switching wires at A2 and B2 terminals. When a fieldbus connection is established and data is transferred, the ⊞ icon on the MIXIT operating panel will light up. The light will switch off 30 minutes after data communication via the fieldbus has stopped.
2. Data is read from the MIXIT unit but it is not reacting on a setpoint change.	a) The product is in local control instead of bus control.	• Check that MIXIT is configured for bus control. The actual state is read at 00201.0 *StatusBit.ActualRemoteAccess*. The status is changed via 00101.0 *SetBit.RemoteAccessReq*. Note that local control is the default setting. • Check also that 00166 *Config.TempSetpointSource [Enum]* is configured correctly: 00166 set to 2: the product reads 00102 *Set.TempSetpointRemote* 00166 set to 4: the product reads 00103 *Set.OutdoorTempRemote*.
3. The controlled temperature is much different than the requested temperature for more than 10-20 minutes.	a) The setpoint source is not configured correctly. b) The limiters may be enabled which reduces the setpoint. c) The gain of the closed loop controller is too low.	• If the controlled temperature at 00323 *Data.ControlledTemp [0.01 K]* is much different than the setpoint at 00311 *Data.ActualTempSetpointRemote*, after several minutes, then check if the setpoint in 00311 *Data.ActualTempSetpointRemote* is the same as that requested in 00102 *Set.TempSetpointRemote [0.01 K]*. If not, 00166 *Config.TempSetpointSource [Enum]* may not be configured for remote setpoint. • Also check if the actual setpoint in 00321 *Data.ActTempSetpoint [0.01 K]* is the same as the registered remote setpoint in 00311 *Data.ActualTempSetpointRemote*. If not, check if limiters are enabled in, for example, 00152.2 *ConfigBit.ThermalPowerLimitingED* set to 1 and/or 00152.1 *ConfigBit.ReturnTempLimitingED* set to 1 and/or 00152.0 *ConfigBit.SupplyFlowLimitingED* set to 1. If one or more limiters are active, and the MIXIT unit is running at or above the threshold associated with the active limiter (00162 *Config.ThermalPowerLimit [0.1 kW]* to 00164 *Config.SupplyFlowLimit [0.1 m³/h]*), the remote setpoint in 00321 *Data.ActTempSetpoint* is reduced below 00311 *Data.ActualTempSetpointRemote* until the threshold is reached. • If limiters are not active and the response is too slow, then run the auto-tuning function from Grundfos GO Remote: "Settings" > "Temperature controller" > "Automatic tune". Alternatively, increase the proportional gain in 00181 *Config.ProportionalGainTempCtrl [0.01]* with 10 % of the actual gain at a time until the response is satisfactory. Wait for several minutes between each increase. If necessary, adjust the integral time in 00182 *Config.IntegralTimeTempCtrl [s]*. Factory default values are listed in the table in section *6.4 System configuration*.
4. The MIXIT unit was put into bus control but it is now in local control again.	a) The MIXIT unit starts in local control. The actual status from bus is not kept during a power cycle.	• Check the status in 00201.0 *StatusBit.ActualRemoteAccess*. If it is set to 0, then set 00101.0 *SetBit.RemoteAccessReq* to 1 again.
5. The MIXIT unit was stopped from Modbus command but it has started again.	a) 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 *StatusBit.ReqPumpOprMode*. If it is set to 1, then first set 00101.0 *SetBit.RemoteAccessReq* to 1 and then 00101.1 *SetBit.StartStop* to 0.
6. The MIXIT unit does not start the pump when a start signal is given in 00101.1 *SetBit.StartStop*.	a) The pump state is incorrect.	• Check the requested pump run state in 00201.3 *StatusBit.ReqPumpOprMode*. It must be set to 1 to start the pump. • If 00201.3 *StatusBit.ReqPumpOprMode* is set to 1 and the pump still does not start, then check if the pump is stopped locally via the pump interface. At the MAGNA3 pump, local stop has priority over bus control.

Fault	Cause	Remedy
7. The MIXIT unit does not stop the pump when a stop signal is given in 00101.1 *SetBit.StartStop*.	a) The pump state is incorrect.	• Check the requested pump run state in 00201.3 *StatusBit.ReqPumpOprMode*. It must be 0 to stop the pump. • If 00201.3 *StatusBit.ReqPumpOprMode* is set to 0 and the pump still does not stop, then check if the pump is running at maximum speed. At the MAGNA3 pump, local maximum has priority over bus control.

9. Modbus RTU telegram examples

> **Note** The Modbus data model states that registers numbered X are addressed in telegrams as X - 1, e.g. register 00104 (setpoint) is addressed as 00103 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.

> **Note** 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 0-16 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 register 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 0-16 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 register 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.

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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
Address HI	0x10
Address LO	0x00
Value HI	0xAF
Value LO	0xFE

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

Example of a response from the slave to the master

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

The response is an echo of the request.

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 100 is addressed as 99.

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.

9.6 Diagnostics (0x08)

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

The following subcodes are supported:

Subcode	Name
0x00	Return query data. Data in this request are to be echoed in the response. The response must be identical to the request, so this function is often used to verify Modbus communication.
0x01	Restart communications. All communication counters are cleared, and the device is restarted.
0x02	Return diagnostics register. The 16-bit diagnostics register is returned. See section *9.7 Diagnostics register interpretation*.
0x04	Forced listen-only mode. The device is forced into listen-only mode. This effectively mutes the device, making it unable to communicate on the network. To bring the device back to normal mode, a "Restart communications" command (code 0x08, subcode 0x01) must be issued.
0x0A	Clear counters and diagnostics register. All counters and the diagnostics register are cleared (these are also cleared on power-up and restart).
0x0B	Return bus message count. The number of messages detected by the slave is returned.
0x0C	Return bus CRC error count. The number of CRC errors in the slave is returned.
0x0D	Return bus exception count. The number of Modbus exception responses that the slave has transmitted is returned.
0x0E	Return slave message count. The number of messages that the slave has processed is returned.
0x0F	Return slave no response count. The number of messages for which the slave has sent no response is returned.
0x12	Return bus character overrun count. The number of overruns in the slave is returned.
0x14	Clear overrun counter. The overrun counter is cleared (this is also cleared on power-up and restart).

Example of a request from the master to the slave

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

The response is identical to the request.

Example of a response from the slave to the master

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

9.7 Diagnostics register interpretation

The diagnostics register is interpreted as follows:

Bit	Description
0	Communication with the MIXIT unit has failed
1	The EEPROM self-test has failed (the test is carried out when the system is booted).
2	The MIXIT unit is not supported.
3	The Modbus address offset is different from the default value, i.e. it differs from 0.
4	Software-defined Modbus transmission speed is used.
5	RESERVED
6	RESERVED
7	RESERVED
8	RESERVED
9	RESERVED
10	RESERVED
11	RESERVED
12	RESERVED
13	RESERVED
14	RESERVED
15	RESERVED

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

9.8 Diagnostics: Return query data

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

In the example, slave address 0x01 is used.

Request from the master to the slave

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

Example of a response from the slave to the master

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

10. Alarm and warning codes

10.1 MIXIT alarm codes

Code	Description	Cause	Remedy
10	Pump communication fault	a) There is no radio communication between the MIXIT unit and the MAGNA3 pump.	• Check that the MAGNA3 pump has been switched on. If the pump is switched on and communication is not reestablished within 2 minutes, pair the MIXIT unit and the MAGNA3 pump again via local operating panel. It is application dependent.
39	Valve blocked	a) The valve cannot detect a calibration position.	• If the valve cannot rotate at power-up, it is stuck.
91	Flow temperature sensor fault	a) The flow temperature sensor at the MAGNA3 pump is faulty.	• Check the actual warning code on the MAGNA3 operating panel and contact your Grundfos sales representative. It is application dependent.
236	Pump alarm	a) The MAGNA3 pump is faulty.	• Check the actual warning code on the MAGNA3 operating panel and if necessary contact your Grundfos sales representative. It is application dependent.

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10.2 MIXIT warning codes

Code	Description	Cause	Remedy
97	Missing external setpoint	a) The product is configured for an analog setpoint input 4-20 mA signal type and the signal is out of range. Alternatively, the product is configured to receive a remote setpoint from bus, and there has been no communication to the fieldbus address holding the setpoint within 30 minutes.	• Check the wire or Modbus connection and signal. The default setpoint is used.
125	Outdoor sensor fault	a) The product is configured for outdoor temperature compensation via external PT1000 sensor and the outdoor temperature sensor is faulty. Alternatively, the product is configured to receive an outdoor temperature from bus, and there has been no communication to the fieldbus address holding the outdoor temperature within 30 minutes.	• Check the wire or Modbus connection and signal. The default setpoint is used.
126	Air temperature sensor fault	a) The product is configured for a heating coil application and the air temperature sensor signal is faulty.	• Check the wire connections and PT1000 air temperature sensor. • The product will do return temperature control using the configured heating coil purge return temperature threshold as setpoint.
127	Relative pressure	a) The relative pressure sensor at the B-port is faulty.	• The sensor must be replaced. Contact your Grundfos sales representative. • The MIXIT Unit will continue to run without performance loss for the temperature control. The system-pressure monitoring will not be functional.
157	Real-time clock battery fault	a) The battery to keep the real-time clock alive during power off is worn out, or not mounted.	• Replace the battery. Battery type CR2032-3V. (For authorised persons only, the front lid of the MIXIT unit has to be removed, align with alarm code 39) • The calendar-based operation will malfunction after a power cycle.
168	Differential pressure	a) The differential-pressure sensor at the A-port is faulty.	• The sensor must be replaced. Contact your Grundfos sales representative. • The MIXIT unit will continue to run. Performance may be reduced at high differential pressure across the unit.
175	Supply (forward) temperature sensor	a) The temperature sensor at the A-port is faulty.	• The sensor must be replaced. Contact your Grundfos sales representative. • The MIXIT unit will continue to run. Some features are disabled.
176	Return-temperature sensor	a) The temperature sensor at the B-port is faulty.	• The sensor must be replaced. Contact your Grundfos sales representative. • The MIXIT unit will continue to run. Some features are disabled.
211	System pressure low	a) The system pressure is below the configured warning threshold.	• Verify that there are no leaks in the system and pressurise the system.

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10.3 Pump alarm codes

Code	Description	Cause	Remedy
10	Pump communication fault	a) Communication fault between different parts of the electronics.	• Contact Grundfos, or replace the pump. • Check if the pump is running in turbine operation. See alarm code 29 "Forced pumping".
29	Forced pumping	a) Other pumps or sources force flow through the pump even if the pump is stopped and switched off.	• Switch off the pump on the main switch. If the light in Grundfos Eye is on, the pump is running in forced-pumping mode. • Check the system for defective non-return valves and replace the valves, if necessary. • Check the system for correct position of non-return valves, etc.
40 and 75	Undervoltage	a) The supply voltage to the pump is too low.	• Make sure that the power supply is within the specified range.
51	Blocked pump	a) The pump is blocked.	• Dismantle the pump, and remove any foreign matter or impurities preventing the pump from rotating.
64	High motor temperature	a) The temperature in the stator windings is too high.	• Contact Grundfos, or replace the pump.
72 and 155	Internal fault	There is an internal fault in the pump electronics. a) Irregularities in the voltage supply can cause alarm 72.	• There might be turbine flow in the application that forces a flow through the pump. • Check if the sensor is blocked by sediments. This can occur if the media is impure. • Contact Grundfos, or replace the pump.
74	Overvoltage	a) The supply voltage to the pump is too high.	• Make sure that the power supply is within the specified range.

10.4 Pump warning codes

Code	Description	Cause	Remedy
77	Communication fault, twin-head pump	a) The communication between the pump heads was disturbed or broken.	• Make sure that the second pump head is powered on or connected to the power supply.
84, 85 and 157	Internal fault	a) There is a fault in the pump electronics.	• Contact Grundfos, or replace the pump.
88	Internal sensor fault	a) The pump is receiving a signal from the internal sensor which is outside the normal range.	• Make sure that the plug and cable are connected correctly in the sensor. The sensor is located on the back of the pump housing. • Contact Grundfos, or replace the sensor.
93	External sensor fault	a) The pump is receiving a signal from the external sensor which is outside the normal range.	• Does the electrical signal set, 0-10 V or 4-20 mA, match the sensor output signal? • If not, change the setting of the analog input, or replace the sensor with one that matches the setup. • Check the sensor cable for damage. • Check the cable connection at the pump and at the sensor. Correct the connection, if required. • The sensor has been removed, but the analog input has not been disabled. • Contact Grundfos, or replace the sensor.

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