

Modbus for GRUNDFOS iSOLUTIONS MONITOR

Functional profile and user manual



Original functional profile and user manual

This functional profile describes Grundfos Modbus for GRUNDFOS iSOLUTIONS MONITOR. This specification is for BMS and SCADA integration.

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

1. General information**1.1 Hazard statements**

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

**DANGER**

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

**WARNING**

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

**CAUTION**

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

The hazard statements are structured in the following way:

**SIGNAL WORD****Description of hazard**

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

1.2 Notes

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



Observe these instructions for explosion-proof products.



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



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



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



Tips and advice that make the work easier.

2. Introduction

2.1 About this functional profile

This functional profile applies to the following Grundfos product:

- GRUNDFOS iSOLUTIONS MONITOR, GiM.

2.2 Assumptions

This functional profile assumes that the reader is familiar with the commissioning and programming of Modbus devices. The reader should also have some basic knowledge of the Modbus protocol and technical specifications.

It is also assumed that an existing Modbus network with a Modbus master is present.

2.3 Definitions and abbreviations

BMS	Building Management System (Modbus)
CIM 280	3G/4G communication interface module for Grundfos Remote Management (GRM) and Grundfos iSolutions Cloud (GiC).
CIM 500/550	Ethernet communication interface module for Grundfos Remote Management (GRM) and Grundfos iSolutions Cloud (GiC).
GiM IO board	Main controller board for data processing and connection of communication wires.
GiC	Grundfos iSolutions Cloud.
GiM	GRUNDFOS iSOLUTIONS MONITOR.
GRM	Grundfos Remote Management.
VTU	Vibration, Temperature, Ultrasonic.
VTU board	Add-on module with connection to VTU sensor.

3. Specification

3.1 Modbus RTU

The table below provides an overview of the specifications for GiM Modbus RTU. For further details, refer to the specific sections of this functional profile.

Modbus RTU specifications	Description	Comments
Modbus connector	Screw-type terminal	3 pins
Modbus connection type	RS-485, 2-wire + common	Conductors: D0, D1 and Common/GND
Maximum cable length	1200 m	Equals 4000 ft, cable length can be increased by using a RS-485 repeater.
Slave address	[1: 247]	Set via Grundfos GO Remote. Default: 247.
Line termination	ON or OFF	Set via DIP switches SW1 and SW2 on GiM IO board. Default: OFF.
Recommended cable cross-section	0.20 - 0.25 mm ²	AWG24 or AWG23
Supported transmission speeds	9600, 19200, 38400, 115200 bit/s	Set via Grundfos GO Remote. Default: 9600.
Start bit	1	Fixed value
Data bits	8	Fixed value
Stop bits	1, 2	Set via Grundfos GO Remote. Default: 1.
Parity bit	Even, odd, no parity	Set via Grundfos GO Remote. Default: Even.
Maximum number of Modbus devices	32	Using a RS-485 repeater, you can increase this number.
Maximum Modbus telegram size	256 bytes	Total length. Node address and CRC included.

4. IO board setup

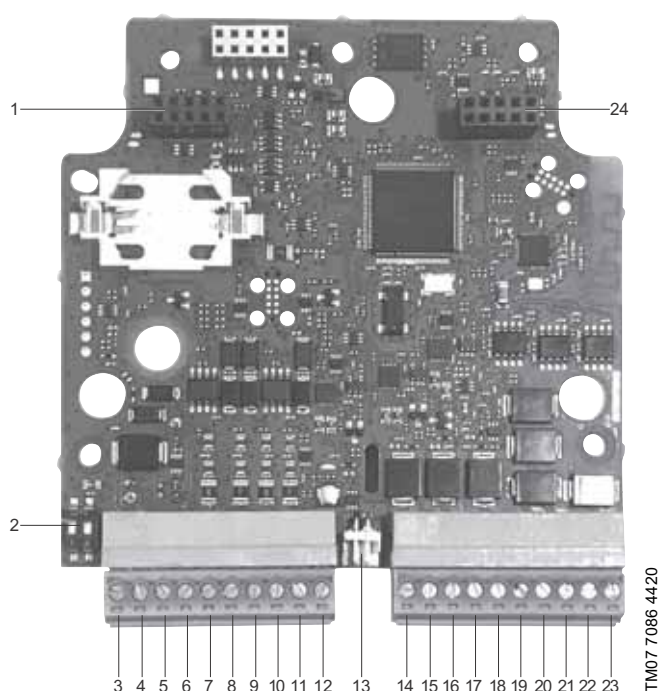


Fig. 1 GiM IO board

Pos.	Designation	Description
1	-	Connector for CIM module.
2	SW1/SW2	On/off switches for Modbus termination resistor. Default: OFF.
3	DI	Digital input.
4	GND	Ground.
5	DO NO	Digital output normally open terminal.
6	DO COM	Digital output common terminal.
7	Modbus D1	Modbus RTU terminal D1, for connection to Modbus master (SCADA/PLC).
8	Modbus GND	Modbus RTU terminal ground, for connection to Modbus master (SCADA/PLC).
9	Modbus D0	Modbus RTU terminal D0, for connection to Modbus master (SCADA/PLC).
10	GENIbus A	GENIbus slave terminal A, for connection to GENIbus master (for example GO Link).
11	GENIbus Y	GENIbus slave terminal Y, for connection to GENIbus master (for example GO Link).
12	GENIbus B	GENIbus slave terminal B, for connection to GENIbus master (for example GO Link).
13	-	Connector for Bluetooth button.
14	AI1/DI1	Fixed to analog input 1. Configurable 0.5 - 3.5 V, 0-5 V, 0-10 V, 0-20 mA and, 4-20 mA. Default: 0-10 V.
15	GND	Ground
16	AI2/DI1	Fixed to analog input 2. Configurable 0.5 - 3.5 V, 0-5 V, 0-10 V, 0-20 mA and, 4-20 mA. Default: 0-10 V.
17	GND	Ground.
18	AI3/DI1	Fixed to analog input 3. Configurable 0.5 - 3.5 V, 0-5 V, 0-10 V, 0-20 mA and, 4-20 mA. Default: 0-10 V.
19	GND	Ground.
20	Pt100/Pt1000	Pt temperature input, configurable Pt100 and Pt1000. Default: Pt100.
21	24 V DC EXT 1	24 V DC output 1, maximum current 50 mA.
22	24 V DC EXT 2	24 V DC output 2, maximum current 50 mA.
23	24 V DC EXT 3	24 V DC output 3, maximum current 50 mA.
24	-	Connector for VTU board.

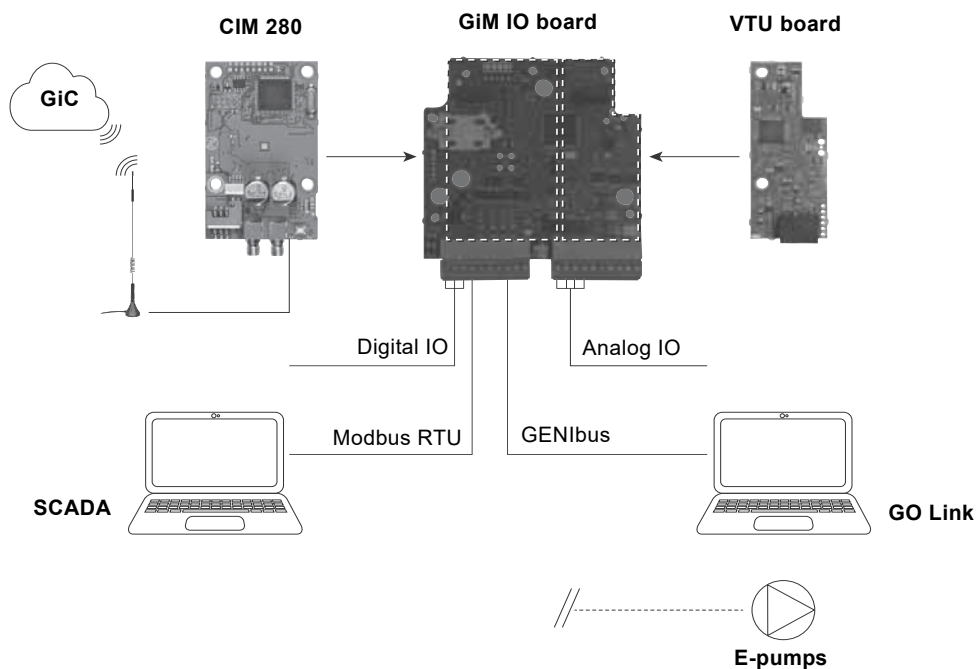


Fig. 2 Setup overview. The E-pump is connected via the CIU GENIbus connector. For connection to GiC via Ethernet, the CIM 500 or CIM 550 ethernet module can be used.

4.1 Termination resistor

The termination resistor is fitted on the GiM IO board and has a value of 150 Ω .

The GiM IO board has a DIP switch with two switches (SW1 and SW2) for cutting the termination resistor in and out. Figure 3 shows the DIP switches in cut-out state.



Fig. 3 SW1 and SW2

DIP switch settings

Status	SW1	SW2
Cut-in	ON	ON
	OFF	OFF
Cut-out	ON	OFF
	OFF	ON

Cable length

bit/s	Maximum cable length	
	Terminated cable	Unterminated cable
	[m/ft]	[m/ft]
1200-9600	1200/4000	1200/4000
19200	1200/4000	600/2000
38400	1200/4000	300/1000
115200	1200/4000	100/330



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

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 (write is not possible)
	04	0x04	Read input registers
	06	0x06	Write single register
	10	0x10	Write multiple registers



Reading and writing coils is not supported.

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



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

6. Modbus RTU telegram examples



The Modbus data model states that registers numbered X are addressed in telegrams as X - 1, for example register 00104 (setpoint) is addressed as 00103 in a Modbus telegram.

Note that CRC fields are not shown in the following examples.

6.1 Modbus telegram overview

The maximum size of a Modbus RTU telegram is 256 bytes. Telegrams must be separated by a silent interval of at least 3.5 character times.

The standard Modbus RTU telegram format is shown in the table below.

Slave address	Function code	Data	CRC
1 byte	1 byte	0 to 252 bytes	2 bytes

A telegram starts with the slave address occupying one byte. Then comes a variable-size data field. For each telegram, a CRC is calculated and appended to the telegram, two bytes total. All bytes in the telegram, except for the CRC itself, are included in the check.

Note that the CRC bytes are not shown in the examples in the following sections.

6.2 Read holding registers, 0x03

This function is used for reading holding registers from the slave. The request telegram specifies the starting address, that is the address of the first register to be read, and the number of holding registers to read. In the telegram, register addresses start from zero, meaning that registers numbered 0-16 are addressed as 0-15.

Example of request from master to slave

Field	Value
Address	0x01
Function code	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, meaning register 0x006C.

Example of response from slave to master

Field	Value
Address	0x01
Function code	0x03
Byte count	0x06
Register 108 HI	0x00
Register 108 LO	0x01
Register 109 HI	0x00
Register 109 LO	0x01
Register 110 HI	0x00
Register 110 LO	0x01

In the response, the byte count is six since there are three registers of two bytes. All three registers hold the value of 0x0001.

6.3 Read input registers, 0x04

This function is used for reading input registers from the slave. Input registers are read-only registers by definition. The request telegram specifies the starting address, that is the address of the first register to be read, and the number of holding registers to read. In the telegram, register addresses start from zero, meaning that registers numbered 0-16 are addressed as 0-15.

Example of request from master to slave

Field	Value
Address	0x01
Function code	0x04
Start address HI	0x10
Start address LO	0x10
Quantity HI	0x00
Quantity LO	0x03

In the request, the slave with address 1 is asked to deliver three contiguous registers starting from address 0x1010, meaning register 0x1011.

Example of response from slave to master

Field	Value
Address	0x01
Function code	0x04
Byte count	0x06
Register 4113 HI	0x22
Register 4113 LO	0x22
Register 4114 HI	0x22
Register 4114 LO	0x22
Register 4115 HI	0x22
Register 4115 LO	0x22

In the response, the byte count is six since there are three registers of two bytes. All three registers hold the value of 0x2222.

6.4 Write single register, 0x06

This function is used for writing a single holding register in the slave. The request telegram specifies the address of the register that is to be written. Register addresses start from zero, meaning that a register numbered 10 is addressed as 9.

The normal response is an echo of the request, indicating that the value was written.

Example of request from master to slave

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

In the request, the slave with address 1 is asked to write the value of 0xAFFE to the register at address 0x1000, meaning register 0x1001.

Example of response from slave to master

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

The response is an echo of the request.

6.5 Write multiple registers, 0x10

This function is used for writing a block of contiguous holding registers in the slave. Register addresses start from zero, meaning that a register numbered 100 is addressed as 99.

Example of request from master to slave

Field	Value
Address	0x01
Function code	0x10
Start address HI	0x00
Start address LO	0x20
Quantity HI	0x00
Quantity LO	0x02
Byte count	0x04
Register 33 HI	0x00
Register 33 LO	0x01
Register 34 HI	0xB0
Register 34 LO	0xB0

In the request, the slave with address 1 is asked to write the value of 0x0001 to the register at address 0x0020, meaning 0x0021, and the value of 0xB0B0 to the register at address 0x0021, meaning 0x0022.

Example of response from slave to master

Field	Value
Address	0x01
Function code	0x10
Start address HI	0x00
Start address LO	0x20
Quantity written HI	0x00
Quantity written LO	0x02

The response returns the function code, starting address and quantity of registers written.

7. Modbus register addresses

7.1 Device status [R]

Register	Access	Modbus parameter name	Description	Modbus scale
00030	R	GrundfosUnitFamily	Grundfos product family.	Enum
00031	R	GrundfosUnitType	Grundfos product type number.	Unscaled
00032	R	GrundfosUnitVersion	Grundfos product version number.	Unscaled
00038	R	Reserved	-	-
00039	R	Reserved	-	-
00040	R	Reserved	-	-
00041	R	Reserved	-	-
00042	R	Reserved	-	-
00043	R	Reserved	-	-
00044	R	Reserved	-	-
00045	R	Reserved	-	-
00046	R	GiMIOBoardSoftwareVersionHI	GiM IO-board software version high (BCD digit 1-4 aa.bb).	BCD number
00047	R	GiMIOBoardSoftwareVersionLO	GiM IO-board software version low (BCD digit 5-8 cc.dd).	BCD number
00048	R	GiMIOBoardSoftwareBuildHI	GiM IO-board software build (BCD digit 1).	BCD number
00049	R	GiMIOBoardSoftwareBuildLO	GiM IO-board software version (BCD digit 2-5).	BCD number
00050	R	GiMIOBoardSoftwareDayMonth	GiM IO-board software date (BCD ddmm).	BCD number
00051	R	GiMIOBoardSoftwareDayYear	GiM IO-board software date (BCD yyyy).	BCD number
00052	R	GiMVTUBoardSoftwareVersionHI	GiM VTU-board software version high (BCD digit 1-4 aa.bb).	BCD number
00053	R	GiMVTUBoardSoftwareVersionLO	GiM VTU-board software version low (BCD digit 5-8 cc.dd).	BCD number
00054	R	GiMVTUBoardSoftwareBuildHI	GiM VTU-board software build (BCD digit 1).	BCD number
00055	R	GiMVTUBoardSoftwareBuildLO	GiM VTU-board software version (BCD digit 2-5).	BCD number

7.2 Control and configuration [W]

Register	Access	Modbus parameter name	Description	Modbus scale
00101.0	W	Control.ResetAlarm	Resets alarms and warnings (rising edge).	Bool

7.3 Status [R]

Register	Access	Modbus parameter name	Description	Modbus scale
00201.0	R	Status.ResetAlarmAck	Acknowledge of reset alarm	Bool
00202	R	Status.WarningCode	<p>Grundfos-specific warning codes.</p> <p>Code 3: External alarm signal from digital input</p> <p>Code 24: mechanical vibration is critical</p> <p>Code 30: change bearings</p> <p>Code 61: water hammer is critical</p> <p>Code 44: undertemperature</p> <p>Code 46: External warning signal from digital input</p> <p>Code 57: dry-running state has occurred for more than 10 s</p> <p>Code 64: overtemperature</p> <p>Code 76: internal communication error</p> <p>Code 88: sensor fault or no sensor attached</p> <p>Code 131: mechanical unbalance is critical</p> <p>Code 133: generic sensor limit exceeded</p> <p>Code 152: add-on module communication fault</p> <p>Code 157: Real Time Clock fault</p> <p>Code 159: CIM module communication fault</p> <p>Code 162: sensor supply fault, 24 V</p> <p>Code 165: generic analog input signal fault</p> <p>Code 208: cavitation is critical.</p>	Enum
00203	R	Status.AlarmCode	<p>Grundfos-specific alarm codes.</p> <p>Code 3: External alarm signal from digital input</p> <p>Code 24: mechanical vibration is critical</p> <p>Code 30: change bearings</p> <p>Code 61: water hammer is critical</p> <p>Code 44: undertemperature</p> <p>Code 46: External warning signal from digital input</p> <p>Code 57: dry-running state has occurred for more than 10 s</p> <p>Code 64: overtemperature</p> <p>Code 76: internal communication error</p> <p>Code 88: sensor fault or no sensor attached</p> <p>Code 131: mechanical unbalance is critical</p> <p>Code 133: generic sensor limit exceeded</p> <p>Code 152: add-on module communication fault</p> <p>Code 157: Real Time Clock fault</p> <p>Code 159: CIM module communication fault</p> <p>Code 162: sensor supply fault, 24 V</p> <p>Code 165: generic analog input signal fault</p> <p>Code 208: cavitation is critical.</p>	Enum
00204	R	Status.SubWarningCode	<p>Grundfos-specific sub codes.</p> <p>Main code 133: Generic sensor limit exceeded.</p> <ul style="list-style-type: none"> • Subcode 1001: Limit 1 exceeded • Subcode 1002: Limit 2 exceeded • Subcode 1003: Limit 3 exceeded • Subcode 1004: Limit 4 exceeded • Subcode 1005: Limit 5 exceeded • Subcode 1006: Limit 6 exceeded • Subcode 1007: Limit 7 exceeded • Subcode 1008: Limit 8 exceeded. 	Enum
00205	R	Status.SubAlarmCode	<p>Main code 162: Sensor supply fault, 24 V.</p> <ul style="list-style-type: none"> • Subcode 1001: 24 V output 1 out of range • Subcode 1002: 24 V output 2 out of range • Subcode 1003: 24 V output 3 out of range. <p>Main code 165: Signal fault, generic analog input.</p> <ul style="list-style-type: none"> • Subcode 1001: Signal fault, analog AI1 • Subcode 1002: Signal fault, analog AI2 • Subcode 1003: Signal fault, analog AI3 • Subcode 2001: Signal fault, Pt sensor 1. 	
00206.0	R	StatusWarnBits.VibrationCritical	Mechanical vibration is critical, code 24.	Bool
00206.1	R	StatusWarnBits.ChangeBearings	Change bearings, code 30.	Bool
00206.2	R	StatusWarnBits.DryRunState	Dry-running state has occurred for more than 10 s, code 57.	Bool
00206.3	R	StatusWarnBits.SensorFault	Sensor fault or no sensor attached, code 88.	Bool
00206.4	R	StatusWarnBits.InternalCommFault	Internal communication error, code 76.	Bool
00206.5	R	StatusWarnBits.CavitationCritical	Cavitation is critical, code 208.	Bool
00206.6	R	StatusWarnBits.Overtemperature	Overtemperature, code 64.	Bool
00206.7	R	StatusWarnBits.Undertemperature	Undertemperature, code 44.	Bool

Register	Access	Modbus parameter name	Description	Modbus scale
00206.8	R	StatusWarnBits.WaterhammerCritical	Water hammer is critical, code 61.	Bool
00206.9	R	StatusWarnBits.UnbalanceCritical	Mechanical unbalance is critical, code 131.	Bool
00206.10	R	StatusWarnBits.RealTimeClockFault	Real Time Clock fault, code 157.	Bool
00206.11	R	StatusWarnBits.CIMCommFault	CIM module communication fault, code 159.	Bool
00206.12	R	StatusWarnBits.AddOnModuleCommFault	Add on module communication fault, code 152.	Bool
00206.13	R	StatusWarnBits.ExternalWarningSignal	External warning signal from digital input, code 46.	Bool
00207.0	R	StatusAlarmBits.VibrationCritical	Mechanical vibration is critical, code 24.	Bool
00207.1	R	StatusAlarmBits.ChangeBearings	Change bearings, code 30.	Bool
00207.2	R	StatusAlarmBits.DryRunState	Dry-running state has occurred for more than 10 s, code 57.	Bool
00207.3	R	StatusAlarmBits.SensorFault	Sensor fault or no sensor attached, code 88.	Bool
00207.4	R	StatusAlarmBits.InternalCommFault	Internal communication error, code 76.	Bool
00207.5	R	StatusAlarmBits.CavitationCritical	Cavitation is critical, code 208.	Bool
00207.6	R	StatusAlarmBits.Overtemperature	Overtemperature, code 64.	Bool
00207.7	R	StatusAlarmBits.Undertemperature	Undertemperature, code 44.	Bool
00207.8	R	StatusAlarmBits.WaterhammerCritical	Water hammer is critical, code 61.	Bool
00207.9	R	StatusAlarmBits.UnbalanceCritical	Mechanical unbalance is critical, code 131.	Bool
00207.10	R	StatusAlarmBits.RealTimeClockFault	Real Time Clock fault, code 157.	Bool
00207.11	R	StatusAlarmBits.CIMCommFault	CIM module communication fault, code 159.	Bool
00207.12	R	StatusAlarmBits.AddOnModuleCommFault	Add on module communication fault, code 152.	Bool
00207.13	R	StatusAlarmBits.ExternalAlarmSignal	External alarm signal from digital input, code 3.	Bool
00208	R	Status.UnixRtc_HI	Device time and date in UNIX format.	1 s
00209	R	Status.UnixRtc_LO		

7.4 Data [R]

Register	Access	Modbus parameter name	Description	Modbus scale
00301	R	MeasuredData.MotorSpeed	Motor speed.	1 rpm
00302	R	Reserved	-	-
00303	R			
00304	R			
00305	R	MeasuredData.Unbalance	Mechanical unbalance level, normalised.	0.01 mm/s
00306	R	MeasuredData.UnbalanceWarnLimit	Mechanical unbalance level, warning limit.	0.01 mm/s
00307	R	MeasuredData.UnbalanceAlarmLimit	Mechanical unbalance level, alarm limit.	0.01 mm/s
00308	R	MeasuredData.UnbalanceUpperLimit	Mechanical unbalance level, max. upper limit.	0.01 mm/s
00309	R	MeasuredData.UnbalanceState	State of mechanical unbalance. 1: Good 2: Poor, warning 3: Bad, alarm 255: Not detectable.	Enum
00310	R	MeasuredData.Cavitation	Cavitation level, normalised.	0.01
00311	R	MeasuredData.CavitationWarnLimit	Cavitation level, warning limit.	0.01
00312	R	MeasuredData.CavitationAlarmLimit	Cavitation level, alarm limit.	0.01
00313	R	MeasuredData.CavitationUpperLimit	Cavitation level, max. upper limit.	0.01
00314	R	MeasuredData.CavitationState	State of pump cavitation. 1: Good 2: Poor, warning 3: Bad, alarm 255: Not detectable.	Enum
00315	R	MeasuredData.WaterHammer	Water hammer level, normalised.	0.01
00316	R	MeasuredData.WaterHammerWarnLimit	Water hammer level, warning limit.	0.01
00317	R	MeasuredData.WaterHammerAlarmLimit	Water hammer level, alarm limit.	0.01
00318	R	MeasuredData.WaterHammerUpperLimit	Water hammer level, max. upper limit.	0.01
00319	R	MeasuredData.WaterHammerState	State of water hammer. 1: Good 2: Poor, warning 3: Bad, alarm 255: Not detectable.	Enum
00320	R	Reserved	-	-
00321	R			
00322	R			
00323	R			
00324	R	Reserved	-	-
00325	R			
00326	R			
00327	R			
00328	R	MeasuredData.VibrationUpperLimit	Vibration level, maximum upper limit	0.01 mm/s
00329	R	MeasuredData.VibrationState	State of mechanical vibration. 1: Good 2: Poor, warning 3: Bad, alarm 255: Not detectable.	Enum
00330	R	MeasuredData.DryRunning	Current status of dry-running detection.	Bool
00331	R	MeasuredData.LiquidTemp	Temperature of pumped liquid.	0.01 K
00332	R	MeasuredData.LowLiquidTempWarnLimit	Pumped liquid low temperature, warning limit.	0.01 K
00333	R	MeasuredData.LowLiquidTempAlarmLimit	Pumped liquid low temperature, alarm limit.	0.01 K

Register	Access	Modbus parameter name	Description	Modbus scale
00334	R	MeasuredData.LowLiquidTempLowerLimit	Pumped liquid low temperature, minimum lower limit (range).	0.01 K
00335	R	MeasuredData.LowLiquidTempState	State of low liquid temperature. 1: Good 2: Poor, warning 3: Bad, alarm 255: Not detectable.	Enum
00336	R	MeasuredData.HighLiquidTempWarnLimit	Pumped liquid high temperature, warning limit.	0.01 K
00337	R	MeasuredData.HighLiquidTempAlarmLimit	Pumped liquid high temperature, alarm limit.	0.01 K
00338	R	MeasuredData.HighLiquidTempUpperLimit	Pumped liquid high temperature, maximum upper limit (range).	0.01 K
00339	R	MeasuredData.HighLiquidTempState	State of high liquid temperature. 1: Good 2: Poor, warning 3: Bad, alarm 255: Not detectable.	Enum

7.5 Reserved registers [R]

Register	Access	Modbus parameter name	Modbus notes, development
00360-00376	R	Reserved	Reserved, 16-bit measured data.
00377-00386	R	Reserved	Reserved, 16-bit configuration parameters.
00387-00396	R	Reserved	Reserved, 16-bit reference values, setpoints.

7.6 GiM IO board control

Register	Access	Name	Description	Scaling
01201-10	-	-	-	-

7.7 GiM IO board configuration

Register	Access	Name	Description	Scaling
01211.0	W	GiMIO.SetLimit1ExcededED	Configuration of Limit 1 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01211.1	W	GiMIO.SetLimit2ExcededED	Configuration of Limit 2 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01211.2	W	GiMIO.SetLimit3ExcededED	Configuration of Limit 3 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01211.3	W	GiMIO.SetLimit4ExcededED	Configuration of Limit 4 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01211.4	W	GiMIO.SetLimit5ExcededED	Configuration of Limit 5 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01211.5	W	GiMIO.SetLimit6ExcededED	Configuration of Limit 6 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01211.6	W	GiMIO.SetLimit7ExcededED	Configuration of Limit 7 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01211.7	W	GiMIO.SetLimit8ExcededED	Configuration of Limit 8 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01212-20	-	-	-	-

7.8 GiM IO board configuration status

Register	Access	Name	Description	Scaling
01221.0	R	GiMIO.Limit1ExceededED	Status of Limit 1 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01221.1	R	GiMIO.Limit2ExceededED	Status of Limit 2 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01221.2	R	GiMIO.Limit3ExceededED	Status of Limit 3 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01221.3	R	GiMIO.Limit4ExceededED	Status of Limit 4 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01221.4	R	GiMIO.Limit5ExceededED	Status of Limit 5 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01221.5	R	GiMIO.Limit6ExceededED	Status of Limit 6 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01221.6	R	GiMIO.Limit7ExceededED	Status of Limit 7 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01221.7	R	GiMIO.Limit8ExceededED	Status of Limit 8 exceeded function E/D, 0: Disabled 1: Enabled.	Bool
01222-30	-	-	-	-

7.9 GiM IO board event status

Register	Access	Name	Description	Scaling
01231.0	R	GiMIO.Limit1Exceeded	Limit 1 exceeded (Code 133.1001). 0: Event not active 1: Event active.	Bool
01231.1	R	GiMIO.Limit2Exceeded	Limit 2 exceeded (Code 133.1002). 0: Event not active 1: Event active.	Bool
01231.2	R	GiMIO.Limit3Exceeded	Limit 3 exceeded (Code 133.1003). 0: Event not active 1: Event active.	Bool
01231.3	R	GiMIO.Limit4Exceeded	Limit 4 exceeded (Code 133.1004). 0: Event not active 1: Event active.	Bool
01231.4	R	GiMIO.Limit5Exceeded	Limit 5 exceeded (Code 133.1005). 0: Event not active 1: Event active.	Bool
01231.5	R	GiMIO.Limit6Exceeded	Limit 6 exceeded (Code 133.1006). 0: Event not active 1: Event active.	Bool
01231.6	R	GiMIO.Limit7Exceeded	Limit 7 exceeded (Code 133.1007). 0: Event not active 1: Event active.	Bool
01231.7	R	GiMIO.Limit8Exceeded	Limit 8 exceeded (Code 133.1008). 0: Event not active 1: Event active.	Bool
01232.0	R	GiMIO.AnalogIn1OutOfRange	Analog Input 1 outside range (Code 165.1001). 0: Event not active 1: Event active.	Bool
01232.1	R	GiMIO.AnalogIn2OutOfRange	Analog Input 2 outside range (Code 165.1002). 0: Event not active 1: Event active.	Bool
01232.2	R	GiMIO.AnalogIn3OutOfRange	Analog Input 3 outside range (Code 165.1003). 0: Event not active 1: Event active.	Bool
01233.0	R	GiMIO.24V1OutOfRange	24V output 1 outside range (Code 162.1001). 0: Event not active 1: Event active.	Bool

Register	Access	Name	Description	Scaling
01233.1	R	GiMIO.24V2OutOfRange	24V output 2 outside range (Code 162.1002). 0: Event not active 1: Event active.	Bool
01233.2	R	GiMIO.24V3OutOfRange	24V output 3 outside range (Code 162.1003). 0: Event not active 1: Event active.	Bool
01234.0	R	GiMIO.PtSensorOutOfRange	Pt temperature sensor, outside range or no sensor attached (Code 165.2001). 0: Event not active 1: Event active.	Bool
01235-40	-	-	-	-

7.10 GiM IO board digital status

Register	Access	Name	Description	Scaling
01241.0	R	GiMIO.DigitalInput	DI, fixed digital input. 0: Not active 1: Active.	Bool
01242.0	R	GiMIO.RelayOutput	DO, fixed relay output. 0: Not active 1: Active.	Bool
01243-50	-	-	-	-

7.11 GiM IO board sensor measurements

Register	Access	Name	Description	Scaling
01251	R	GiMIO.AnalogInput1scaled	Analog input 1 scaled.	Unit
01252	R	GiMIO.AnalogInput1Relative	Analog input 1 relative to range.	0.1 %*
01253	R	GiMIO.AnalogInput1Unit	Analog input 1 scaling unit.	Enum**
01254	R	GiMIO.AnalogInput1Min	Analog input 1 scaling range minimum value.	Unit
01255	R	GiMIO.AnalogInput1Max	Analog input 1 scaling range maximum value.	Unit
01256	R	GiMIO.AnalogInput2Scaled	Analog input 2 scaled.	Unit
01257	R	GiMIO.AnalogInput2Relative	Analog input 2 relative to range.	0.1 %*
01258	R	GiMIO.AnalogInput2Unit	Analog input 2 scaling unit.	Enum**
01259	R	GiMIO.AnalogInput2Min	Analog input 2 scaling range minimum value.	Unit
01260	R	GiMIO.AnalogInput2Max	Analog input 2 scaling range maximum value.	Unit
01261	R	GiMIO.AnalogInput3Scaled	Analog input 3 scaled.	Unit
01262	R	GiMIO.AnalogInput3Relative	Analog input 3 relative to range.	0.1 %*
01263	R	GiMIO.AnalogInput3Unit	Analog input 3 scaling unit.	Enum**
01264	R	GiMIO.AnalogInput3Min	Analog input 3 scaling range minimum value.	Unit
01265	R	GiMIO.AnalogInput3Max	Analog input 3 scaling range maximum value.	Unit
01266	R	GiMIO.TemperatureInput	Pt1, temperature input 1 (Pt100/Pt1000 configurable).	0.01 K
01267-70	-	-	-	-

* Percentage of the sensor scaling range.

** GENIpro units. The enum is equivalent to GENIpro UNIT index. See section [7.13 Generic scaling of GiM IO board analog measurements AI1, AI2 and AI3](#).

7.12 GiM IO board sensors mapped to parameters

Register	Access	Name	Description	Scaling
01271	R	GiMIO.InletPressure	Pump inlet pressure.	0.001 bar
01272	R	GiMIO.InletDiffPressure	Pump inlet differential pressure.	0.001 bar
01273	R	GiMIO.OutletPressure	Pump outlet pressure.	0.001 bar
01274	R	GiMIO.OutletDiffPressure	Pump outlet differential pressure.	0.001 bar
01275	R	GiMIO.DiffPressure	Pump differential pressure.	0.001 bar
01276	R	GiMIO.RemotePressure1	Remote pressure 1.	0.001 bar
01277	R	GiMIO.RemotePressure2	Remote pressure 2.	0.001 bar
01278	R	GiMIO.RemoteDiffPressure	Remote differential pressure.	0.001 bar
01279	R	GiMIO.FeedTankLevel	Feed tank level.	0.01 m
01280	R	GiMIO.StorageTankLevel	Storage tank level.	0.01 m
01281	R	GiMIO.Flow	Pump flow.	0.1 m ³ /h
01282	R	GiMIO.RemoteFlow	Remote flow.	0.1 m ³ /h
01283	R	GiMIO.LiquidTemperature	Pumped medium (liquid) temperature.	0.01 K
01284	R	GiMIO.RemoteTemperature1	Remote temperature 1.	0.01 K
01285	R	GiMIO.RemoteTemperature2	Remote temperature 2.	0.01 K
01286	R	GiMIO.RemoteDiffTemperature	Remote differential temperature.	0.01 K
01287	R	GiMIO.AmbientTemperatureOutdoor	Ambient temperature, outdoor.	0.01 K
01288	R	GiMIO.AmbientTemperatureRoom	Ambient temperature, room.	0.01 K
01289	R	GiMIO.BearingTemperatureDE	Bearing temperature, Drive End.	0.01 K
01290	R	GiMIO.BearingTemperatureNDE	Bearing temperature, Non-Drive End.	0.01 K
01291	R	GiMIO.AuxSensorInput	Auxiliary sensor input.	0.1 %
01292-00	-	-	-	-

7.13 Generic scaling of GiM IO board analog measurements AI1, AI2 and AI3

Introduction of information that enables a SCADA system to automatically scale the analog measurements:

$X_{phy} = Unit \times X_{scaled} = Unit \times (X_{relative} \times (S_{max} - S_{min}) / 1000 + S_{min})$ // Full range is 1000, because the analog input counts in 0.1 %.

X_{phy}	Calculated physical value.
X_{scaled}	The parameter scaled in a physical unit with a scaling factor (see table below).
$X_{relative}$	The relative value of the parameter (scaled in 0.1 %).
S_{max}	The maximum value of the analog sensor scaling range.
S_{min}	The minimum value of the analog sensor scaling range.
Unit	The physical unit with a scaling factor. The Modbus register reads the unit index [enum] in the lookup table below.

Description	Unit	Unit Index
Water level or head	0.01 m	83
Current	0.1 A	1
Kelvin temperature	0.01 K	84
Temperature difference	0.01 K	110
Electrical potential difference	0.1 V	3
Power	10 W	8
Pressure	mbar	51
Relative value (percentage)	0.1 %	12
Energy	0.1 kWh	103
Volume flow	0.1 m ³ /h	22

8. Grundfos GO configuration of the GiM IO board

Below is an overview of the GiM IO board configuration done with Grundfos GO Remote. Only a small part of this data marked with crosses can be accessed from Modbus.

Source	Parameter for configuration via Grundfos GO Remote	Modbus	
		Writing	Reading
DI	Function, default: none.	-	-
DO	Function, default: dry-run alarm.	-	-
AI1, AI2, AI3	Signal type, default: 0-10 V.	-	-
	Measured parameter, default: none.	-	-
	Min/max/scaling unit.	-	x
Pt	Pt100/Pt1000 selection, default: Pt100.	-	-
	Measurement, default: none.	-	-
Limit exceeded	E/D Limit exceeded limits, default: disabled.	x	x
	Limits 1-8.	-	-
Modbus	Address [1: 247], default: 247.	-	-
	Communication speed: 9600, 19200, 38400, 115200 bit/s. Default: 9600.	-	-
	Stop bits: 1 (default), 2.	-	-
	Parity bit: Even (default), odd, none.	-	-

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