GS 4x.40 mod / GS 3x.40 mod / TS 3x.40 mod

Short interface explanation / Quick guide

Available Modbus protocols

- Modbus RTU (default)
- Modbus ASCII

Serial protocol via RS485

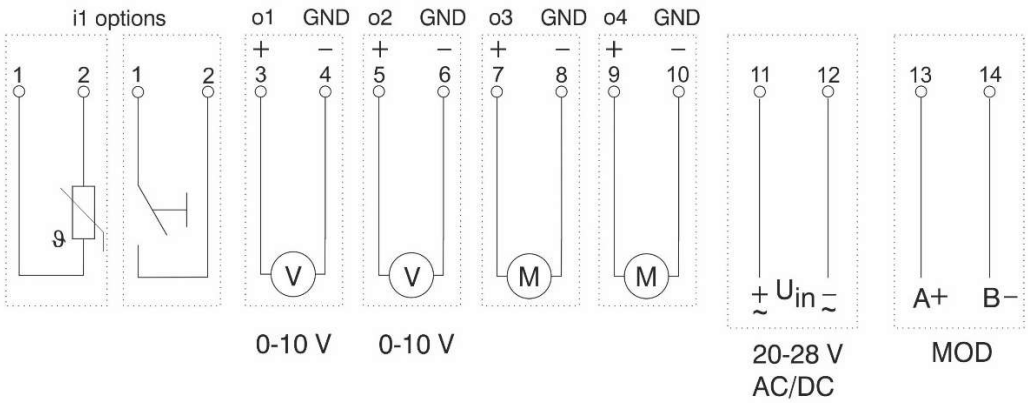
- Baud-Rates:
  - 4800
  - 9600
  - 19200 (default)
  - 38400

- Parity Modes:
  - Even (default)
  - Odd (1 stop bit)
  - None (2 stop bits)

Available Modbus device addresses

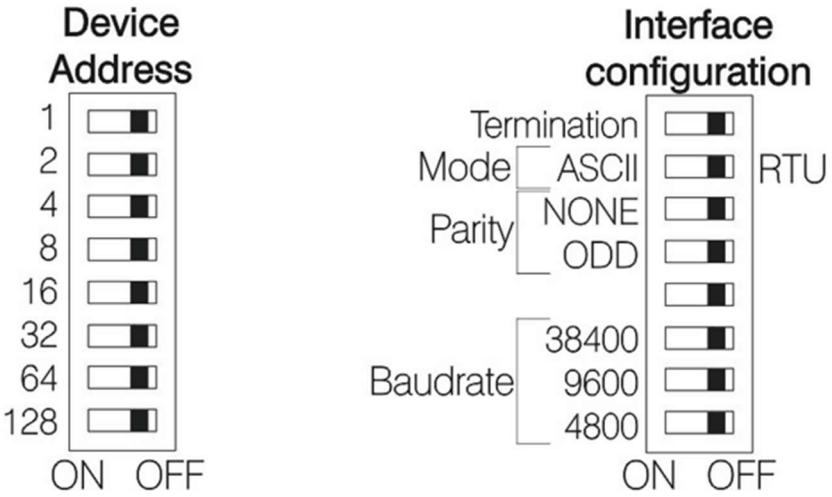
- Configurable addresses:
  - 1 (default address, also applicable while no address [0] is configured)
  - …
  - 247

Wiring diagram



The maximum output current is 1.2 A. For example, up to six A 40405 thermal actuators with 1 W can be connected to one output. The total current consumption then does not exceed 1.2 A.

DIP-switches for configuration (see device hardware)



Input-Registers (data registers)

- Format of all registers: 16 Bit signed integer
- Readable via Modbus function code 0x04 (read input register)

Available registers and descriptions:

Offset	Register	Decimal value / range	Description	Product types
0	**Temperature [1/10°C]**	-32768	Sensor error / Sensor not yet read or measurement value not yet available	TS 30.40 mod GS 30.40 mod GS 40.40 mod TS 31.40 mod GS 31.40 mod GS 41.40 mod
		-32767 … 32767	Room temperature in 1/10 °C e.g.: dec. 250 ≙ 25.0 °C Value range: 0.0°C – 50°C Resolution: 0.1°C	
1	**Relative humidity [1/10 %]**	-32768	Sensor error / Sensor not yet read or measurement value not yet available	GS 40.40 mod GS 41.40 mod GS 30.40 mod GS 31.40 mod
		-32767 … 32767	Relative humidity in 1/10 % e.g.: dec. 350 ≙ 35.0 % Value range: 0.0% - 100.0% Resolution: 0.1 %	
2	**Dew point [1/10 °C]**	-32768	Sensor error / Sensor not yet read or measurement value not yet available	GS 40.40 mod GS 41.40 mod GS 30.40 mod GS 31.40 mod
		-32767 … 32767	Dew point temperature in 1/10 °C e.g.: dec. 50 ≙ 5.0 °C Value range: -40°C – 125°C Resolution: 0.1°C	
3	**CO_2 [ppm]**	-32768	Sensor error / Sensor not yet read or measurement value not yet available	GS 40.40 mod GS 41.40 mod
		-32767 … 32767	CO_2 concentration in ppm e.g.: dec. 650 ≙ 650 ppm Value range: 425 ppm – 5000 ppm Resolution: 1 ppm	

4	**Absolute atmospheric air pressure [1/10 hPa]**	-32768	Sensor error / Sensor not yet read or measurement value not yet available	GS 40.40 mod GS 41.40 mod GS 30.40 mod GS 31.40 mod
		-32767 … 32767	Absolute air pressure in 1/10 hPa e.g.: dec. 10133 ≙ 1013.3 hPa Value range: 400.0 hPa – 1100.0 hPa Resolution: 0.1 hPa	
5	**Relative air pressure [1/10 hPa]**	-32768	Sensor error / Sensor not yet read or measurement value not yet available	GS 40.40 mod GS 41.40 mod GS 30.40 mod GS 31.40 mod
		-32767 … 32767	Absolute air pressure in 1/10 hPa e.g.: dec. 10133 ≙ 1013.3 hPa Value range: 400.0 hPa – 1100.0 hPa Resolution: 0.1 hPa	
6	**Software revision**	0..65535	Software revision number	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
7	**When external thermistor is used: External temperature (NTC) [1/10°C]**	-32768	Sensor error / Sensor not yet read or measurement value not yet available	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
		-32767 … 32767	Room temperature in 1/10 °C e.g.: dec. 250 ≙ 25.0 °C Value range: -40.0°C – +150°C Resolution: 0.1°C	
	When external switching contact is used: Switching Contact state	0..1	State of external switching contact: 0: contact open; 1: contact closed	
8	**Serial Number High Word**	0x0000-0xffff	Bits 16-31 of serial number	
9	**Serial Number Low Word**	0x0000-0xffff	Bits 0-15 of serial number	
10	**Absolute Air humidity [1/10 g/m³]**	-32768	Sensor error / Abs. Humidity not yet calculated	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod
		0..32767	Absolute Air humidity in 1/10 g/m³	
11	**Local setpoint [1/10 °C]**	-32767..32768	Local setpoint calculated from base setpoint shifted with local offset	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod

Holding Register

- Write offset value via Modbus Function Code 0x06 (Write Single Register)
- Read value via Modbus Function Code 0x03 (Read Holding Registers)
- Write multiple Holding Register via Modbus Function Code 0x10 (Write Multiple Registers)

Offset	Register	Decimal value / range	Description	Product types
0	**Temperature offset**	-32768 … 32767	Room temperature in 1/10 K e.g.: dec. 50 ≙ 5.0 K / -75≙-7.5 K Resolution: 0.1 K Value will be saved permanently	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
1	**Manual adjustment set temperature via the touch sensors [1/10 K]**	-32768 … 32767	Set temperature **offset** in 1/10 K e.g.: 25 ≙ 2.5 K Value range: -3.0 K – 3.0 K (default) Resolution: (default) 0.5 K – can be changed with step size holding reg	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
2	**0 … 10V for Output 1**	0 … 1000	Voltage Output in 1/100 V e.g.: 500 ≙ 5.00 V Resolution: 0.01 V Value out of Range = 0 V Factory Default: 0V **Resolution does not correspond to accuracy.**	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
3	**0 … 10V for Output 2**	0 … 1000	Voltage Output in 1/100 V e.g.: 500 ≙ 5.00 V Resolution: 0.01 V Value out of Range = 0 V Factory Default: 0V **Resolution does not correspond to accuracy.**	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
4	**Options regarding manual set temperature adjustment**		0x0000: default (touch enabled, write via bus enabled); 0x0001: touch blocked; 0x0002: write via bus blocked; 0x0003: both blocked; 0x0100: disabled (bus and touch blocked, LEDs off) Value will be saved permanently	TS 31.40 mod GS 31.40 mod GS 41.40 mod
5	**CO2 recalibration**		0xFFFF: trigger recalibration (cancel if allready active) Other values: ignore Read: 0: if inactive Other value: remaining time in [s] (countdown 600s)	GS 40.40 mod GS 41.40 mod
6	**Type / characteristics of the external sensor (contact, NTC, PT1000)**	NTC: resistance value at 25°C in kOhm PT1000: 1	0 -> switching contact 1 -> PT1000 20 -> 2k0 NTC 47 -> 4k7 NTC 100 -> 10k0 NTC (default) 120 -> 12k0 NTC 330 -> 33k0 NTC 470 -> 47k0 NTC all other values are interpreted as 10kOhm sensor (->100) Value will be saved permanently	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
7	**Elevation above sea level [m]**	-500..5000	Altitude for calculating relative air pressure Factory Default: 760m Value will be saved permanently	GS 40.40 mod GS 41.40 mod GS 30.40 mod GS 31.40 mod

8	**Relative humidity offset [1/10%]**	-32768..32767	Offset in percent to correct measurement Value will be saved permanently	GS 40.40 mod GS 41.40 mod GS 30.40 mod GS 31.40 mod
9	**CO_2 offset [ppm]**	-32768..32767	Offset in ppm to correct measurement Value will be saved permanently	GS 40.40 mod GS 41.40 mod
10	**Output temperature offset calibration register 1**	0	Bit field data, not to be changed by customers! Shall only be set to value 0 unless being told to write any other value by our customer support! Value will be saved permanently	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
11	**Output temperature offset calibration register 2**	0	Bit field data, not to be changed by customers! Shall only be set to value 0 unless being told to write any other value by our customer support! Value will be saved permanently	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
12	**Device Identification [s]**	0..65535	0: device identification disabled 1..65535: device identification enabled for n seconds (frontside LED blinking 500ms on, 500ms off) * **This feature (when activated) disables setpoint offset display on frontside LEDs**	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
13	**Power On Value for Voltage Output 1 [1/100V]**	0..1000	Voltage Output in 1/100 V e.g.: 500 ≙ 5.00 V Resolution: 0.01 V Value out of Range = 0 V Value will be saved permanently	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
14	**Power On Value for Voltage Output 2 [1/100V]**	0..1000	Voltage Output in 1/100 V e.g.: 500 ≙ 5.00 V Resolution: 0.01 V Value out of Range = 0 V Value will be saved permanently	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
15	**Base setpoint [1/10 °C]**	-32768..32767	Base setpoint from building management system Resolution: 0.1°C Value will be saved permanently	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
16	**Local temperature offset step size [1/10 K]**	1..10	Size of one single offset step Resolution: 0.1K Value will be saved permanently	GS 41.40 mod GS 40.40 mod GS 31.40 mod GS 30.40 mod TS 31.40 mod TS 30.40 mod
17	**Dewpoint temperature offset [1/10 K]**	-32768..32767	Offset for Dewpoint correction Factory Default: 0 Value will be saved permanently	GS 40.40 mod GS 41.40 mod GS 30.40 mod GS 31.40 mod

***device location function**

The top most LED on frontside can be configured to blink for a specific time period.

This feature can be activated with writing a value to Holding reg with offset 12.

This value will be interpreted as seconds. For this number of seconds the LED will be blinking.

The value being read by this register represents the remaining time oft he feature being activated.

When that period is expired, the device resumes normal operation (i.e: displays local setpoint offset level on frontside).

Writing a value of ‚0' to it will deactivate the feature immediately.

Coils Register

- Read state via Modbus Function Code 0x01 (Read Coils)
- Set state via Modbus Function Code 0x05 (Write Single Coil)
- Set multiple states via Modbus Finction Code 0x0F (Write Multiple Coils)

Offset	Register	Decimal value/range	Description	Product types
0	**Relay Output 1**	Bit	Off=0 On=1 Default after Reset can be set by Power On State for Relay 1	TS 30.40 mod GS 30.40 mod GS 40.40 mod TS 31.40 mod GS 31.40 mod GS 41.40 mod
1	**Relay Output 2**	Bit	Off=0 On=1 Default after Reset can be set by Power On State for Relay 2	TS 30.40 mod GS 30.40 mod GS 40.40 mod TS 31.40 mod GS 31.40 mod GS 41.40 mod
2	**Manual adjustment set temperature** **via touch blocked**	Bit	Off=0 (default) On=1 (local offset adaption with touch disabled) Value will be saved permanently	TS 31.40 mod GS 31.40 mod GS 41.40 mod
3	**Manual adjustment set temperature** **via bus blocked**	Bit	Off=0 (default) On=1 (local offset adaption using bus disabled) Value will be saved permanently	TS 31.40 mod GS 31.40 mod GS 41.40 mod
4	**Manual adjustment set temperature via touch and bus blocked**	Bit	Off=0 (default) On=1 (local offset adaption using touch and bus disabled, LEDs are switched off Value will be saved permanently	TS 31.40 mod GS 31.40 mod GS 41.40 mod
5	**CO2 recalibration**	Bit	Off=0 (default) On=1 When changed, CO2 recalibration is started (0->1) or aborted otherwise(1->0); Setting with current value does not have any effect	GS 40.40 mod GS 41.40 mod
6	**Indicate device communication**	Bit	Off=0 (default) On=1 (activate frontside LED while communicating, and and additional power LED on frontside) Value will be saved permanently* **This feature (when activated) disables setpoint offset display on frontside LEDs**	TS 30.40 mod GS 30.40 mod GS 40.40 mod TS 31.40 mod GS 31.40 mod GS 41.40 mod

7	**Power On State for relay 1**	Bit	Off=0: FET output is open on startup (default) On=1: FET output is closed on startup Value will be saved permanently	TS 30.40 mod GS 30.40 mod GS 40.40 mod TS 31.40 mod GS 31.40 mod GS 41.40 mod
8	**Power On State for relay 2**	Bit	Off=0: FET output is open on startup (default) On=1: FET output is closed on startup Value will be saved permanently	TS 30.40 mod GS 30.40 mod GS 40.40 mod TS 31.40 mod GS 31.40 mod GS 41.40 mod

***Indicate device communication**

The bottom-most LED will be switched on for 250 ms while the device is sending a message response to the bus interface.
While this feature is activated, the topmost LED will remain permanently on.

This feature is activated by setting the coil with offset 6 to '1'.
It must be manually deactivated by writing '0' to this coil.
The coil value is stored permanently, so cutting off power will not reset it.

These features are useful for easily detecting or locating a specific device among others for maintenance tasks.
Both features can be used simultaneously, resulting in the topmost LED blinking permanently and the bottom-most LED indicating device responses.

Important: The device communication feature will not stop automatically!
It must also be deactivated manually when used in combination with the locating feature.

Discrete Input Register

- Read state via Modbus Function Code 0x02 (Read Discrete Inputs)

Offset	Register	Decimal value / range	Description	Product types
0	**When external switching contact is used: External Input Contact State**	Bit	Off=0 (contact open) On=1 (contact closed)	TS 30.40 mod GS 30.40 mod GS 40.40 mod TS 31.40 mod GS 31.40 mod GS 41.40 mod
	When external thermistor is used: Ext. Temp sensor Error	Bit	Off=0: external temperature has valid measurement On=1: external temperature sensor has invalid measurement (not connected, wrong sensor connected, value out of range, …)	
1	**Temperature sensor error**	Bit	0=Temperature reg is valid 1=Temperature reg is invalid	TS 30.40 mod GS 30.40 mod GS 40.40 mod TS 31.40 mod GS 31.40 mod GS 41.40 mod
2	**Relative humidity sensor error**	Bit	0=rh reg is valid 1=rh reg is invalid	GS 30.40 mod GS 31.40 mod GS 40.40 mod GS 41.40 mod

3	**Dewpoint sensor error**	Bit	0=Dewpoint reg is valid 1=Dewpoint reg is invalid	GS 30.40 mod GS 31.40 mod GS 40.40 mod GS 41.40 mod
4	**CO_2 sensor error**	Bit	0=CO_2 reg is valid 1=CO_2 reg is invalid	GS 40.40 mod GS 41.40 mod
5	**Pressure sensor error**	Bit	0=Pressure reg is valid 1=Pressure reg is invalid	GS 30.40 mod GS 31.40 mod GS 40.40 mod GS 41.40 mod

Device encapsulation interface transport

- Retrievable via Modbus function code 0x2b

Read device identification (0x0E)

- Retrievable via encapsulation subfunction code 0x0E
- Basic and regular device identification available (stream mode; read device ID code 0x01-0x06)

Object ID	**Name / Description**	**Type**	**Value**	**Product types**
0x00	Manufacturer name	ASCII string	"Hugo Mueller GmbH & Co KG"	TS 30.40 mod GS 30.40 mod GS 40.40 mod TS 31.40 mod GS 31.40 mod GS 41.40 mod
0x01	Product code	ASCII String	"24655"	TS 30.40 mod
0x01	Product code	ASCII String	"24657"	TS 31.40 mod
0x01	Product code	ASCII String	"24658"	GS 30.40 mod
0x01	Product code	ASCII String	"24659"	GS 31.40 mod
0x01	Product code	ASCII String	"24623"	GS 40.40 mod
0x01	Product code	ASCII String	"24624"	GS 41.40 mod
0x02	Software version	ASCII string	<Revision Number>	TS 30.40 mod GS 30.40 mod GS 40.40 mod TS 31.40 mod GS 31.40 mod GS 41.40 mod
0x03	Vendor URL	ASCII String	“hugo-mueller.de”	TS 30.40 mod TS 31.40 mod GS 30.40 mod GS 31.40 mod GS 40.40 mod GS 41.40 mod
0x04	Product name	ASCII String	"TS 30.40 Modbus"	TS 30.40 mod
0x04	Product name	ASCII String	“TS 31.40 Modbus ”	TS 31.40 mod
0x04	Product name	ASCII String	“GS 30.40 Modbus ”	GS 30.40 mod
0x04	Product name	ASCII String	“GS 31.40 Modbus ”	GS 31.40 mod
0x04	Product Name	ASCII String	“GS 40.40 Modbus ”	GS 40.40 mod
0x04	Product name	ASCII String	"GS 41.40 Modbus"	GS 41.40 mod
0x05	Model Name	ASCII String	“Sensor / Actuator”	TS 30.40 mod TS 31.40 mod GS 30.40 mod GS 31.40 mod GS 40.40 mod GS 41.40 mod

0x06	UserApplicationName	ASCII String	“Room Climate Sensor”	TS 30.40 mod TS 31.40 mod GS 30.40 mod GS 31.40 mod GS 40.40 mod GS 41.40 mod

Examples on how to retrieve data (RTU):

Read Coils

Request from client (central unit): **01 01 00 04 00 01 BC 0B**

Response from server: **01 01 01 00 51 88**

Description: Read state of 1 coil starting at register offset 4 from device with ID 0x01

Read Discrete Inputs

Request from client: **01 02 00 00 00 06 F8 08**

Response from server: **01 02 01 10 A0 44**

Description: Read the state of the first 6 discrete inputs from device with ID 1

Read Holding Registers

Request from client: **01 03 00 00 00 01 84 0A**

Response from server: **01 03 02 00 05 78 47**

Description: Read 1 holding register from device with ID 1 starting at offset 0

Read Input Registers

Request from client (central unit)**: 01 04 00 00 00 05 30 09**

Server response: **01 04 0A 00 F4 01 56 00 4C 02 42 24 83 FA B3**

Description: for example: Request the first five input registers from device with address 0x01

Write Single Coil

Request from client: **01 05 00 02 00 00 6C 0A**

Response from server: **01 05 00 02 00 00 6C 0A**

Description: Set Coil state on device with ID 0x01 at offset 2

Write Single Register

Request from client: **01 06 00 0E FF FF E9 B9**

Response from server: **01 06 00 0E FF FF E9 B9**

Description: Set register on device with ID 0x01 at offset 14

Write Multiple Coils

Request from client: **01 0F 00 02 00 02 01 00 A7 57**

Response from server: **01 0F 00 02 00 02 75 CA**

Description: Set 2 coils on device with ID 0x01 starting at offset 2

Write Multiple Registers

Request from client: **01 10 00 01 00 02 04 00 00 00 00 32 63**

Response from server: **01 10 00 01 00 02 10 08**

Description: Set 2 registers on device with ID 0x01 starting at offset 1

Read Device Identification

Request from client (central unit): **01 2B 0E 01 00 00 76 E4**

Description: Request basic device identification from device with address 0x01

Server Response (example; data payload values depends on specific device variant):

01 2B 0E 01 01 00 00 03 00 19 48 75 67 6F 20 4D 75 65 6C 6C 65 72 20 47 6D 62 48 20 26 20 43 6F 20 4B 47 01 0C 47 53 20 34 31 2E 34 30 20 4D 4F 44 02 10 52 20 30 30 30 31 2E 30 30 30 30 2E 30 32 33 34 47 53 E4 AD