PRODUCT MANUAL

ABB i-bus® KNX

MG/S 11.100.1.1

Modbus RTU – KNX TP Gateway

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1 General

1.1 Using the product manual

This manual provides detailed technical information on the function, installation and programming of the ABB i-bus® KNX device.

1.2 Legal disclaimer

ABB AG reserves the right to make changes to the product or modify the contents of this document without prior notice.

The agreed properties are definitive for any orders placed. ABB AG does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

1.3 Explanation of symbols

1.	Instructions in specified sequence and result
2.	
⇨	
►	Individual actions
a)	Priorities
1)	Processes run by the device in a specific sequence
•	List level 1
-	List level 2

Table 1: Explanation of symbols

Notes and warnings are represented as follows in this manual:

DANGER

This symbol is a warning about electrical voltage and indicates high-risk hazards that will definitely result in death or serious injury unless avoided.

DANGER

Indicates high-risk hazards that will definitely result in death or serious injury unless avoided.

WARNING

Indicates medium-risk hazards that could result in death or serious injury unless avoided.

CAUTION

Indicates low-risk hazards that could result in slight or moderate injury unless avoided.

CAUTION

Indicates a risk of malfunctions or damage to property and equipment, but with no risk to life and limb.

Example

For use in application, installation and programming examples

Note

For use in tips on use and operation

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1.4 2D code

The packaging and the front of the device are labeled with a 2D code. These codes are used for unique identification of the device and include the following information:

- Link to the product page
- Order code
- Device serial number

The 2D codes can be read using any mobile device with an appropriate 2D code reader.

By scanning the 2D codes with the ABB Product Scanner, you can open additional digital services.

2 Safety

2.1 General safety instructions

▶ Protect the device from moisture, dirt and damage during transport, storage and operation.

▶ Only operate the device in an enclosed housing (distribution board).

▶ Do not operate the device outside the specified technical data.

▶ Mounting, installation, commissioning and maintenance must be carried out exclusively by qualified electricians.

▶ Disconnect the device from the electrical power supply before mounting.

2.2 Qualification of the specialist personnel

Programming the device requires detailed specialist knowledge of Modbus and KNX – particularly about the ETS commissioning software – acquired through KNX training courses.

2.3 Proper use

The Modbus RTU - KNX TP Gateway 100 Points, MG/S 11.100.1.1 enables a KNX TP system to access the data points and resources of Modbus servers belonging to the associated installation. For this purpose, the Gateway continuously polls the server and assigns the Modbus data points to the KNX Group Objects. This way, the KNX TP system perceives the entire Modbus installation as if it were another KNX device of the system.

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3 Product overview

3.1 Device description

The device is a modular installation device (MDRC). It is designed for installation in electrical distribution boards and small housings with a 35 mm mounting rail (to EN 60715).

The device is KNX-certified and can be used as a product in a KNX system.

The device is powered via the bus (ABB i-bus® KNX) and requires no additional auxiliary voltage. The device connects to the bus (ABB i-bus® KNX) via a bus connection terminal on the front of the housing.

The software application Engineering Tool Software (ETS) is used for physical address assignment and parameterization.

3.2 Product name description

Abbreviation	Description		
MG	Modbus Gateway		
/S	MDRC		
xx.	11	=	Modbus RTU Client
x.	100	=	100 Data points
x.	1	=	KNX TP
x.	1	=	Version 1

Tab. 2: Product name description

3.3 Ordering details

Description	MW	Type	Order no.	Packaging unit [pcs.]	Weight 1 pc. [g]
Modbus RTU – KNX TP Gateway 100 Points	2	MG/S 11.100.1.1	2CDG120089R0011	1	82.0

Tab. 3: Ordering details

3.4 Connections

The device has the following connections:

- RS-485 Modbus connection
- 1 bus connection

3.4.1 Inputs

This section is not relevant for this device.

3.4.2 Outputs

This section is not relevant for this device.

3.5 MG/S 11.100.1.1 Modbus RTU – KNX TP Gateway, 100 Points

Fig. 1: Device illustration, MG/S 11.100.1.1

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3.5.1 Dimension drawing

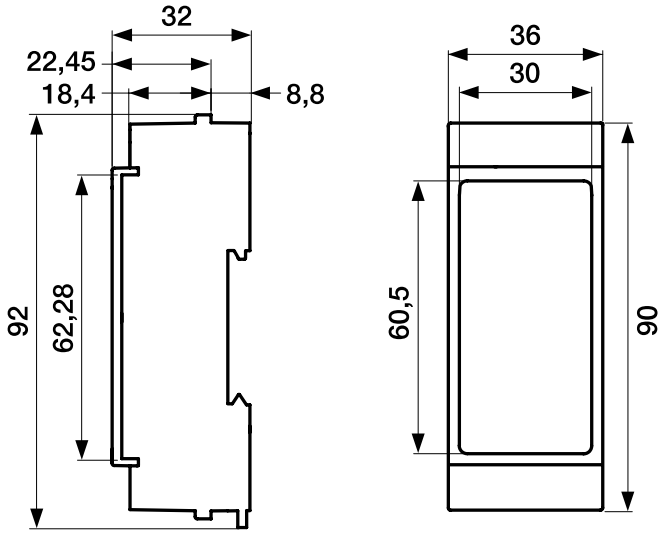

Fig. 2: Dimension drawing

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3.5.2 Connection diagram

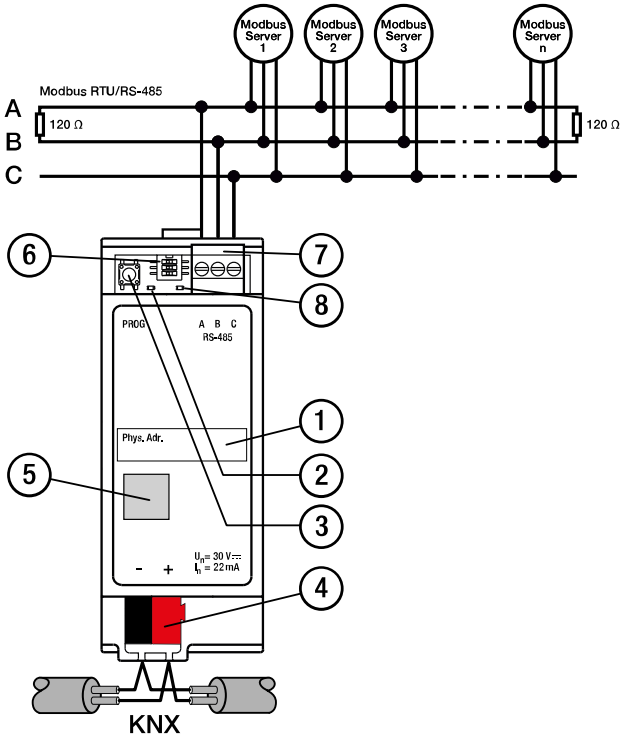

Fig. 3: Connection diagram

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Legend

1 Labeling field

2 *KNX programming* LED (red)

3 *KNX programming* button

4 KNX connection

5 2D code

6 DIP switch

7 RS-485 Modbus connection

8 *Power/Modbus activity* LED (yellow)

3.5.3 Operating controls and display elements

Operating control/LED	Description/function	Display
 KNX programming button/LED	Assignment of the physical address	LED on: Device in programming mode LED flashing: Visual localization of the device
 DIP switch	Switching: Position 1: • ON: 120 Ohm termination active • OFF: 120 Ohm termination inactive (default) Positions 2 and 3: • ON: Polarization active (default) • OFF: Polarization inactive	ON: DIP switch x set to ON position OFF: DIP switch x set to OFF position
 Power/Modbus activity LED		OFF: Device switched off ON: Device switched on without communication Slow flashing: Invalid response or no response received from a server Fast flashing: Valid telegram received from the configured server

Tab. 4: Operating controls and display elements

Note

When you install the gateway at one end of the RS-485 bus, you activate the termination resistor function by setting DIP switch 1 to the ON position. The RS-485 bus only permits two termination resistors.

Note

The bus must only be polarized at one point on the line, preferably on the client side. To deactivate the gateway's line polarization, switches 2 and 3 must be in the OFF position.

3.5.4 Technical data

3.5.4.1 General technical data

Device	Dimensions	92 × 36 × 32 mm (H x W x D)
	Mounting width in space units	2 modules, 18 mm each
	Weight	0.048 kg
	Mounting position	Any
	Mounting variant	35 mm mounting rail
	Degree of protection	IP20
	Protection class	II
	Overvoltage category	III
	Overload protection	Hiccup mode
	Reverse voltage protection	60 V
	Short-circuit proof	Continuous short-circuit proof
	Pollution degree	2
Materials	Housing	Plastic, halogen free Flammability V-0 as per UL94
Electronics	Rated voltage, bus	30 V DC
	Voltage range, bus	21 … 33 V DC
	Current consumption, bus	11 … 22 mA
	Maximum current, device	22 mA
	Power loss, device	≤ 3 W
	Power loss, bus	≤ 0.58 W
	KNX safety extra low voltage	SELV
Connections	Connection type, KNX bus	Plug-in terminal
	Cable diameter, KNX bus	0.6 … 0.8 mm, solid
	Connection type, Modbus	3-pole terminal block with screw locking (RS-485)
	Pitch	KNX: 5.84 mm Modbus: 3.5 mm
	Tightening torque, screw terminals	0.5 … 0.6 Nm
	Conductor cross section, fine stranded	1 x (0.5 mm^2 ... 1.5 mm^2) 2 x (0.5 mm^2 ... 0.75 mm^2) 3 x (not permissible)
	Conductor cross section, single core	1 x (0.5 mm^2 ... 1.5 mm^2) 2 x (0.5 mm^2 ... 0.75 mm^2) 3 x (not permissible)
Certificates and declarations	CE declaration of conformity	→ 9AKK108464A0431
Ambient condition	Operation	0°C ... +60°C
	Humidity	≤ 95%
	Condensation allowed	No
	Atmospheric pressure	Atmosphere up to 2,000 m

Tab. 5: General technical data

3.5.5 Device type – KNX interface

Device type	Modbus RTU – KNX TP Gateway 100 Points	MG/S 11.100.1.1
	Application	Modbus RTU Gateway, 100p/...
		… = current version number of the application
	Maximum number of Group Objects	205 100 Status Group Objects 100 Control Group Objects 4 Error Status Group Objects 1 optional Group Object for In Operation
	Maximum number of group addresses	700
	Maximum number of connections	700

Tab. 6: Device type – KNX interface

3.5.6 Device type – Modbus interface

Device type	Maximum number of Modbus addresses	254
	Maximum number of data points	100
	Maximum number of servers supported	100
	Type of Modbus server	Modbus RTU (EIA-485)

Tab. 7: Device type – Modbus interface

Note

The number of servers supported is directly dependent on the maximum number of data points and is therefore limited to 100 servers.

Example

There are 8 servers connected to the gateway; each with 10 data points. There are 80 data points in total. The gateway could therefore support another 20 servers with one data point each. The limit is specified by the number of data points.

Note

A repeater is required if you are installing more than 32 devices. This limit is specified by the Modbus protocol.

Note

See software information on the website → www.abb.com/knx

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4 Function

4.1 Device functions

The Modbus KNX Gateway is a compact modular installation device for the integration of Modbus RTU servers and KNX TP devices.

The Modbus RTU – KNX TP Gateway is a bidirectional gateway with 100 freely configurable data points. The device functions as a Modbus RTU client and makes it easy to integrate Modbus servers that support the RTU protocol via RS-485.

4.2 Software functions

The software application Engineering Tool Software (ETS) is used for physical address assignment and parameterization.

Each server has its own parameter window. A user-friendly table in ETS allows you to make assignments between Modbus registers and KNX Group Objects.

The gateway uses KNX standard data points (DPTs) to ensure smooth integration.

Additional functions (arithmetical and logical operations) are available for each data point.

There is also a device configuration app (DCA) available to make configuration easier by allowing you to import and export device templates.

There is a comprehensive database of ready-made templates available for import.

The DCA is also used for firmware updates.

4.2.1 Device Configuration App (DCA)

For easy configuration, the DCA "MG/S 11.100.1.1 Template Configuration" is recommended. With this DCA, the mapping of the Modbus KNX data points of a server can be exported as a reusable template. The DCA can also be used to import ready-made device templates from a database.

The DCA "ABB MG/S11.100.1.1 Template Configuration" is available for download from the KNX Shop.

Note

The DCA is a device-specific app and is not available for demo versions of ETS.

Note

For information on how to activate the DCA, see the KNX article for ETS Version 5 and the KNX article for ETS Version 6.

4.3 Special operating states

The device's reaction if there is a bus voltage failure, after bus voltage recovery and after ETS download is predetermined by the gateway and cannot be parameterized.

4.3.1 Reaction on bus voltage failure

Bus voltage failure describes the failure of the bus voltage, e.g. due to a power failure.

The device is powered via the bus (ABB i-bus® KNX). A bus voltage failure may switch off the device or prevent it from working correctly.

Note

The front of the gateway features two LEDs that indicate its local operating state. See 3.5.3.

4.3.2 Reaction after bus voltage recovery

Bus voltage recovery is the state that exists after the bus voltage is restored. After a bus voltage recovery, the device restarts and executes the following actions:

- Keeps the configuration parameters
- Resets the timers
- Scans the Modbus servers
- Updates Status Group Objects

4.3.3 Reaction on ETS reset

An ETS reset restarts the ETS application in the device. ETS reset can be performed in ETS using the Commissioning menu item, in the function Reset device (from ETS version 6: Restart device).

After an ETS reset, the device restarts and executes the following actions:

- Keeps the configuration parameters
- Resets the timers
- Scans the Modbus servers
- Updates Status Group Objects

4.3.4 Reaction during download

Downloading describes loading a modified or updated ETS application onto the device. The device is not ready to operate during a download.

Note

The ETS application is not preloaded on the device. We recommend using the *Full Download* option when configuring the device for the first time.

Note

The device will no longer operate after the application is uninstalled or the download is canceled.
▶ Download again.

5 Mounting and installation

5.1 Information about mounting

DANGER – Severe injuries due to touch voltage

Electric feedback from different phase conductors can cause contact voltages and lead to serious injuries.

▶ Only operate the device in an enclosed housing (distribution board).

▶ Disconnect all phases before working on the electrical connection.

The device can be mounted in any position as required on a 35 mm mounting rail.

The connection to the bus (ABB i-bus® KNX) is made using the bus connection terminal supplied. The terminal designation is located on the housing.

The connection to Modbus is made via the supplied 3-pole terminal block with screw locking (RS-485). The terminal designation is located on the housing.

Note

The maximum permissible current consumption on a KNX line must not be exceeded.

▶ During planning and installation, ensure that the KNX line is correctly dimensioned. The device has a maximum current consumption of 22 mA.

Note

A repeater is required if you are installing more than 32 server devices. This limit is specified by the Modbus protocol.

5.2 Mounting on mounting rail

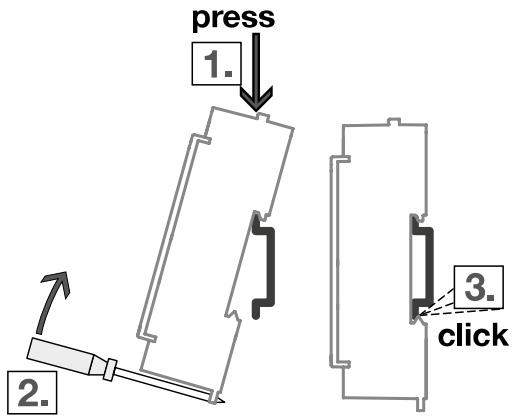

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Fig. 4: Mounting on mounting rail

1. Place the mounting rail holder on the upper edge of the mounting rail and push down.
2. Pull down the lower latching lever with the aid of a screwdriver or similar tool.
3. Push the lower part of the device toward the mounting rail and let the latching lever return to its original position until the mounting rail holder engages.
   ⇨ The device is now mounted on the mounting rail.
4. Relieve the pressure on the top of the housing.

6 Commissioning

6.1 Prerequisites for commissioning

To commission the device, a PC with ETS is required along with a connection to the bus (ABB i-bus® KNX), e.g. via a KNX interface.

- Required ETS version: 5.7.7 or later

6.2 Commissioning overview

After the bus voltage is activated for the first time, the following factory settings will be selected automatically:

- Physical address of the device: 15.15.255
- ETS application: not preloaded. We recommend using the *Full Download* option when configuring the device for the first time.

The device can be programmed only using ETS.

Note

You need to download the entire ETS application. Downloads may take longer after an application is uninstalled or when changing applications.

6.3 Putting the device into operation

1. Connect the device to the bus (ABB i-bus® KNX).
2. Switch on the bus voltage.
   ⇨ Device is ready for operation.

6.4 Assignment of the physical address

Note

If it is set in ETS that the application is to be downloaded during programming, the download will begin after assignment of the physical address.

Triggering assignment of the physical address via ETS:

1. Press the *Programming* button.
   ⇨ Programming mode is active. *Programming* LED on.
2. Start programming process in ETS.
   ⇨ Physical address is assigned. Device restarts.

Note

The device performs an ETS reset during assignment of the physical address. All states are reset.

6.5 Software/application

6.5.1 Download reaction

Depending on the PC, it can take up to 90 seconds for the progress bar to appear during a download.

Using an interface that supports "long frames" (e.g. USB/S 1.2 or IPR/S 3.5.1) can significantly shorten the download time.

6.5.2 Copying, exchanging and converting

This section is not relevant for this device.

6.6 Device Configuration App (DCA)

For easy configuration, the DCA "MG/S 11.100.1.1 Template Configuration" is recommended. With this DCA, the mapping of the Modbus KNX data points of a server can be exported as a reusable template. The DCA can also be used to import ready-made device templates from a database.

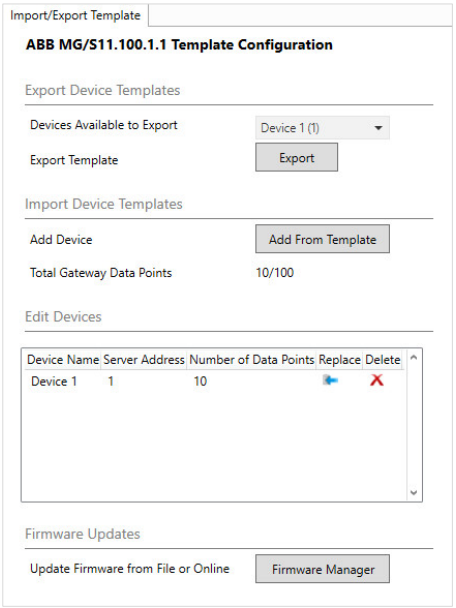
The DCA "ABB MG/S11.100.1.1 Template Configuration" is available for download from the KNX Shop.

Note

The DCA is a device-specific app and is not available for demo versions of ETS.

Note

For information on how to activate the DCA, see the KNX article for ETS Version 5 and the KNX article for ETS Version 6.



The following functions are available in the DCA:

- Export Device Templates
- Import Device Templates
- Edit Devices
- Firmware Updates

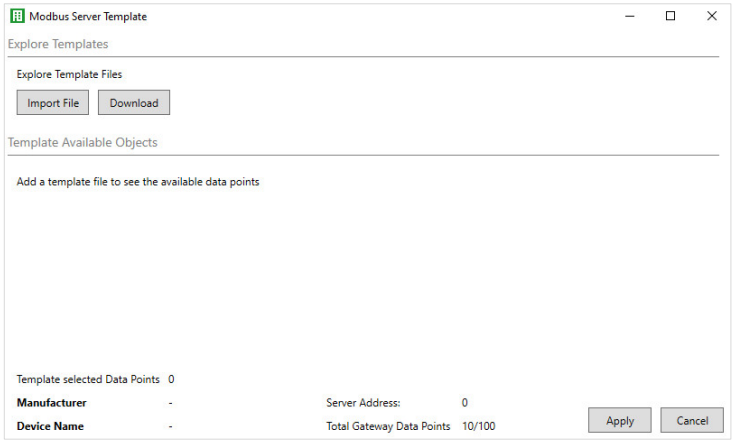
6.6.1 Export Device Templates

Servers are configured in the ETS application. Configurations can be exported as templates in .knxmbr file format.

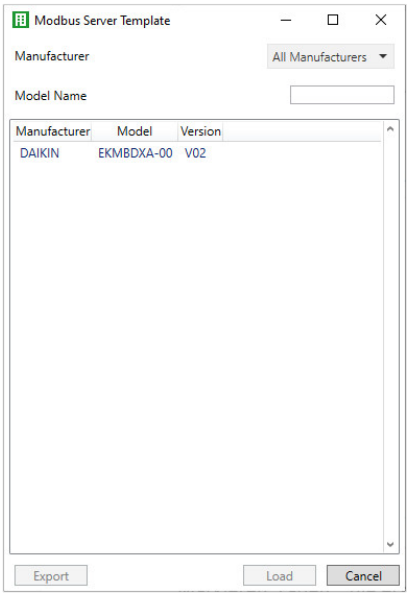
1. In the list, select the device (server) you wish to export.
2. Select "Export".
3. Specify a local storage location and click "Save".

6.6.2 Import Device Templates

1. Select "Add From Template".
2. A new window opens, showing the two options for importing templates: "Import File" and "Download".



1. To select a template from the local storage location, select "Import File".
2. To select a template from the online database, select "Download".
When you select "Download", the following window appears:



1. Select the manufacturer and device (model).
2. Click "Load" to import the required template.
3. Optional: Online templates can also be saved locally using the "Export" button.

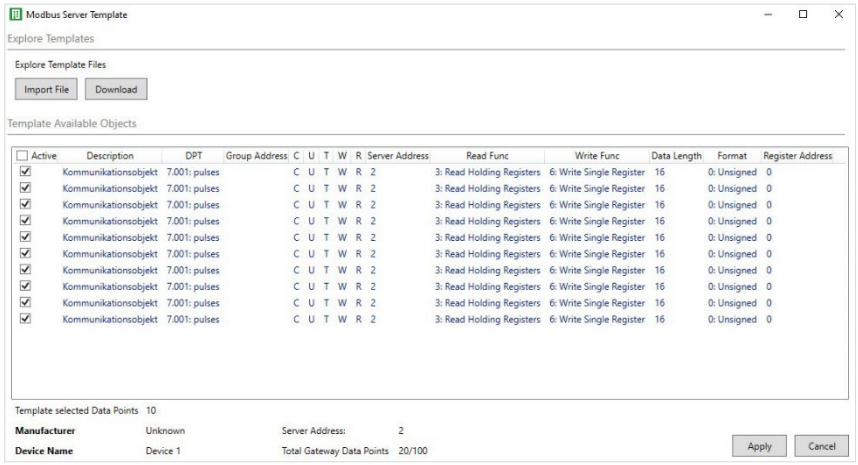
Note

More templates will be added to the database in due course.

Note

The connection to the database is made via an https website that uses Port 443.
Please contact ABB if you have any further questions about the database.

After importing the template from local storage or from the database, the following window appears:



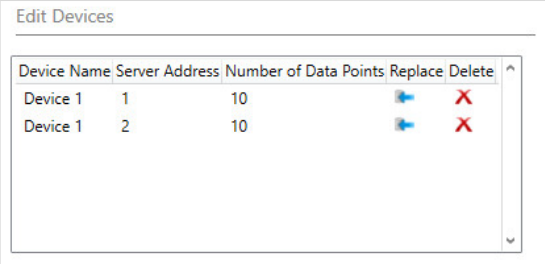
All the previously assigned data points from the imported template are listed. You can activate or deactivate data points by selecting them manually ("Active" checkbox).

The gateway will then create a new device that only includes the active data points.

Additional relevant information is listed in the lower part of the window:

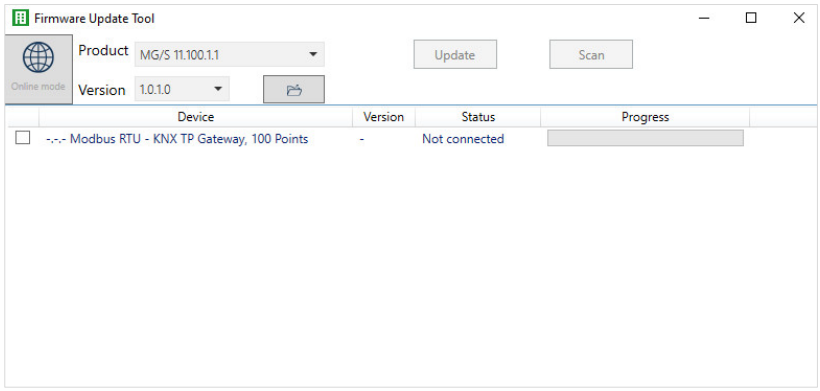
- Template selected Data Points: number of activated data points
- Manufacturer: template manufacturer
- Device Name: device name given to the template by the manufacturer
- Server Address: shows the first free server address
- Total Gateway Data Points: number of activated data points. If you activate more than 100 data points, a message appears.

6.6.3 Edit Devices



1. Click "Replace" to import a template into an existing device. Device name and data points are replaced by those of the template.
2. Click "Delete" to delete the device from the ETS application.

6.6.4 Firmware Updates



Click "Firmware Manager" to update the firmware of the gateway.

1. Select device(s)
2. There are two options:
    a. "Online mode" activated: use "Scan" to select firmware file from online database
    b. "Online mode" deactivated: select firmware file from local storage location

Note

The connection to the database is made via an https website that uses Port 443.
Please contact ABB if you have any further questions about the database.

7 Parameters

7.1 General

Note

ETS (Engineering Tool Software) is used to parameterize the device.

The following sections describe the device parameters based on the parameter windows. The parameter windows have a dynamic design. The parameter windows are shown or hidden depending on the number of Modbus servers.

The default values of the parameters are underlined, e.g.:

No (checkbox cleared)

Yes (checkbox ticked)

Note

The default values in the ETS application can vary from the values stated in the product manual depending on the product variant.

Note

If you add 1 new device to the ETS project, 1 active data point will be shown. Data points are configurable and can be customized for each project.

7.2 Parameter windows

7.2.1 General parameter window

The following settings can be made in this parameter window:

- General settings for KNX
- General settings for Modbus

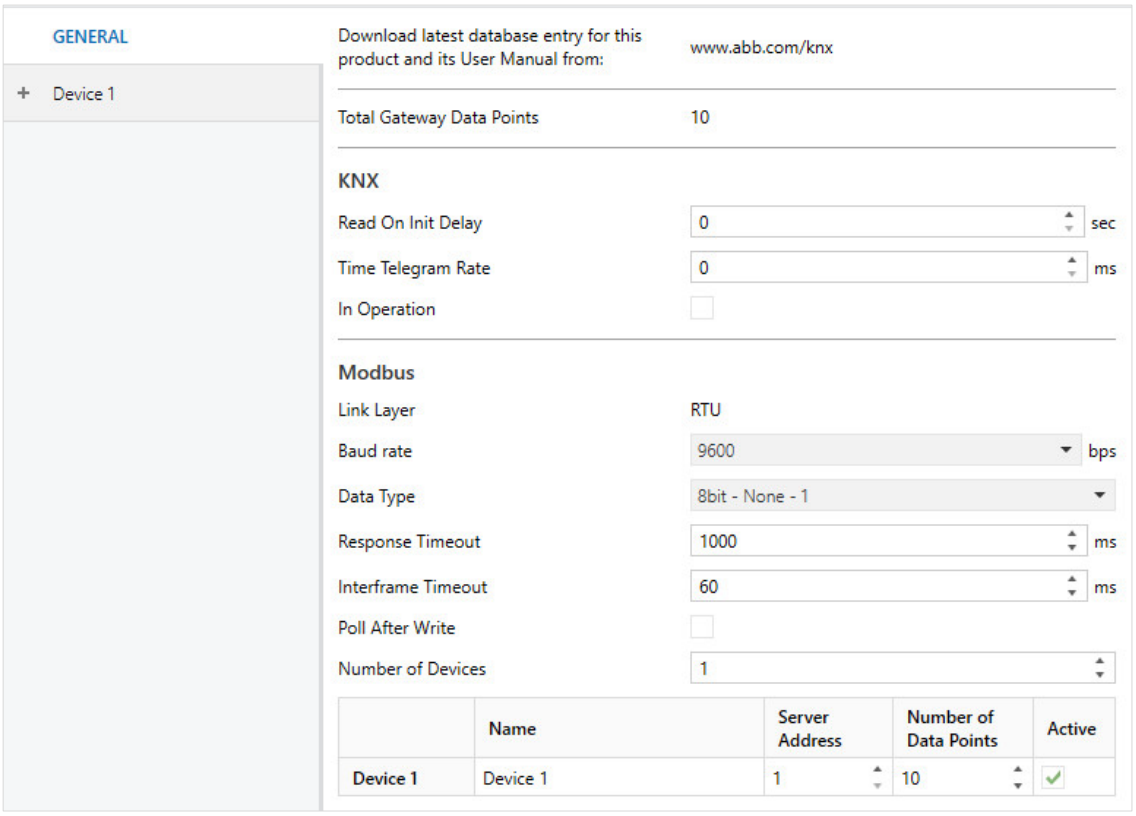


Fig. 5: General parameter window

Prerequisites for visibility

- The parameter window is always visible.

Note

The parameter *Total Gateway Data Points* indicates how many of the 100 available data points are already in use.

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7.2.1.1 Read On Init Delay

This parameter is used to define the sending delay of the GroupValueRead telegram for Group Objects with an initialization flag "I".

Note

I flag:
If the device is reset, a new GroupValueRead telegram is sent after the device restarts. The purpose of this is to call the object value via a GroupValueResponse. Reasons for a device reset are a power failure and subsequent bus voltage recovery, an explicit device reset, or an ETS download.
Explanation on knx.org -> KNX flags

Option
0…255 s

Note

The flag “T” (Transmit) must be activated so that the GroupValueRead telegram can be sent.

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.1.2 Time Telegram Rate

This parameter is used to define the waiting time between two telegrams before they are sent on the bus (ABB i-bus® KNX). The bus load generated by the device can be limited using the *Time Telegram Rate* parameter. This limit relates to all telegrams sent by the device.

Option
0…5000 ms

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.1.3 In Operation

This parameter is used to enable the Group Object *In Operation*. Readiness can be monitored by another KNX device using this Group Object. If a telegram is not received, the sending device could be faulty or the bus cable to the transmitting device could be interrupted.

Option	
No	The function is deactivated.
Yes	The following dependent parameters are shown: • *Sending cycle*

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.1.4 Sending cycle

This parameter is used to define the cycle in which the *In Operation* Group Object sends a telegram.

Option
1 … 5 … 255 min

Prerequisites for visibility

- Parameter window *General* \ parameter *In Operation* \ Option *Yes*.
- This parameter is in the *General* parameter window.

7.2.1.5 Baud rate

This parameter is used to define the transmission speed of the Modbus RTU interface. The baud rate specifies the symbol rate of the data transmission.

The baud rate must be the same for all devices in the Modbus system (client and server).

Option
1200 bps
2400 bps
4800 bps
9600 bps
19200 bps
38400 bps
57600 bps
115200 bps

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.1.6 Data Type

This parameter is used to define the data format of the Modbus RTU interface. The parity and number of stop bits must be the same for all devices in the Modbus system (client and server).

Option
8bit - None - 1
8bit - Even - 1
8bit - Odd - 1
8bit - None - 2

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.1.7 Response Timeout

This parameter defines how many milliseconds the gateway waits between sending a request to a server and receiving a response.

If the gateway receives a response before this time elapses, it resets the timer and continues polling.

If the gateway does not receive a response, it re-sends the request. The gateway repeats the request three times before reporting the error via the corresponding Error Status Group Objects.

Option
100 … 1000 … 2000 ms

Note

Some servers have long processing times. This information is usually provided in the server manual. Take this into account when setting the *Response Timeout* parameter.

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.1.8 Interframe Timeout

This parameter defines how many milliseconds the gateway waits between receiving and sending a Modbus telegram. The Modbus load generated by the device can be limited using the *Interframe Timeout* parameter. This limit relates to all Modbus telegrams sent by the device.

Option
0 … 60 … 10000 ms

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.1.9 Poll After Write

This parameter is used to activate the function *Poll after write*. Activating this allows the gateway to update the new status of the corresponding KNX Group Object immediately after a write command to a server.

This parameter affects all Modbus telegrams sent by the device.

Note

After updating the KNX Group Object, the gateway goes on continuously polling the data points in ascending order (from data point 1 to 100).

Option	
No	The function is deactivated.
Yes	The function is activated.

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.1.10 Number of Devices

This parameter is used to define the number of integrated Modbus servers.

Option
0 … 1 … 100

Note

Each server has its own parameter window. The parameter windows are shown or hidden depending on the number of Modbus servers.

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.1.11 Device x Name

This parameter is used to specify an individual description for a device.

Option	
Free text entry	Maximum 64 ASCII characters; the maximum number of characters may vary for other character formats.

Note

This parameter appears in two places:

- The *General* parameter window
- The device parameter window

Changing it in one parameter window also changes it in the other.

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.1.12 Device x Server Address

This parameter is used to define the server address.

Each Modbus server must be given a unique server address. The setting must be made on the server itself and must match this parameter.

Note

Address duplication can cause conflicts.

Option
1 … 254

Note

This parameter appears in two places:

- The *General* parameter window
- The device parameter window

Changing it in one parameter window also changes it in the other.

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.1.13 Device x Number of Data Points

This parameter is used to define the number of data points on the Modbus device concerned.

Option
0 … 10 … 100

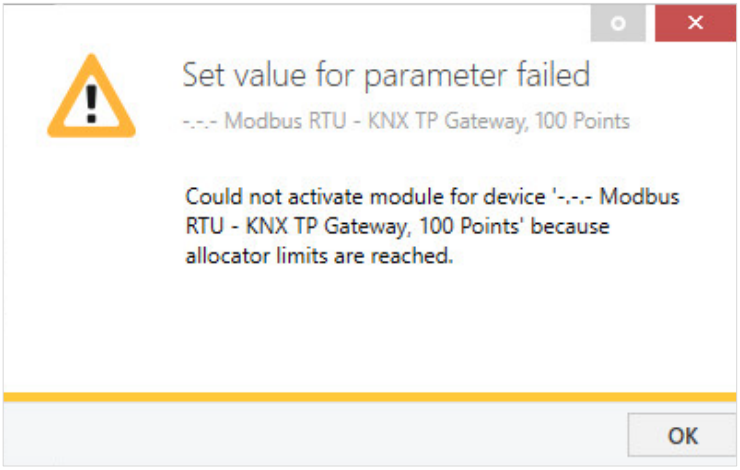
Note

This parameter appears in two places:

- The *General* parameter window
- The device parameter window

Changing it in one parameter window also changes it in the other.

If the *Total Gateway Data Points* value exceeds the maximum number of data points, the following error message appears:



Prerequisites for visibility

- This parameter is in the *General* parameter window.

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7.2.1.14 Device x Active

This parameter is used to define whether the device is activated.

If the device is deactivated, all of its data points are automatically deactivated.

Deactivated data points are taken into account in the *Total Gateway Data Points* parameter.

Option	
No	The device is deactivated.
Yes	The device is activated.

Note

This parameter appears in two places:

- The *General* parameter window
- The device parameter window

Changing it in one parameter window also changes it in the other.

Example

You can use this parameter to preconfigure a server but not activate it until it is connected to the gateway.

Prerequisites for visibility

- This parameter is in the *General* parameter window.

7.2.2 Config Device x parameter window

Settings for the device are made in this parameter window.

The visibility of the parameter window is dependent on the setting in the *Number of Devices* parameter.

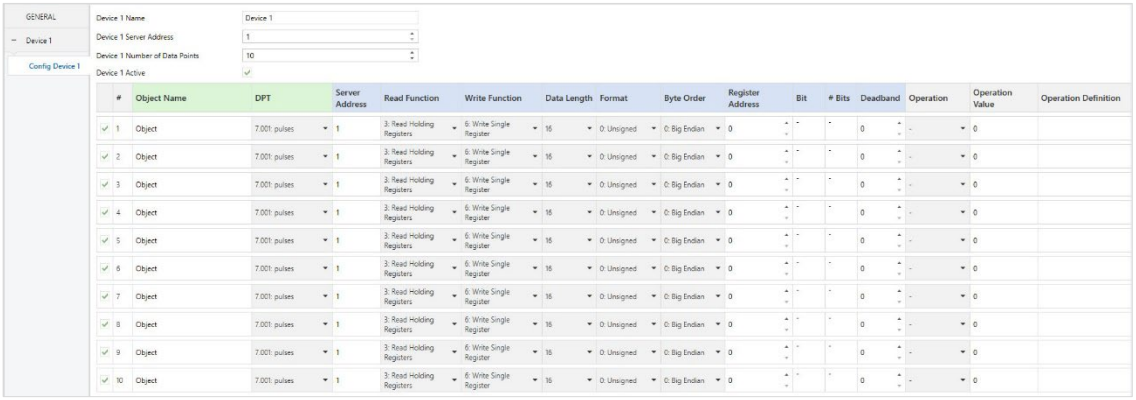


Fig. 6: Config Device x parameter window

Note

For information on how to correctly parameterize the Modbus device concerned, refer to its documentation (mapping tables).

7.2.2.1 Device x Name

This parameter is used to specify an individual description for a device.

Option	
Free text entry	Maximum 64 ASCII characters; the maximum number of characters may vary for other character formats.

Note

This parameter appears in two places:

- The *General* parameter window
- The device parameter window

Changing it in one parameter window also changes it in the other.

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.2 Device x Server Address

This parameter defines the server addresses.

Each Modbus server must be given a unique server address. The setting must be made on the server itself and must match this parameter.

Note

Address duplication can cause conflicts.

Option
1 … 254

Note

This parameter appears in two places:

- The *General* parameter window
- The device parameter window

Changing it in one parameter window also changes it in the other.

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.3 Device x Number of Data Points

This parameter is used to define the number of data points on the Modbus device concerned.

Option
0 … 10 … 100

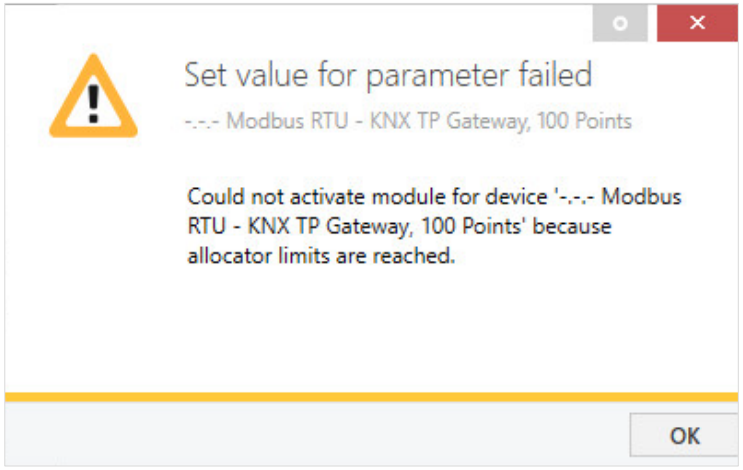
Note

This parameter appears in two places:

- The *General* parameter window
- The device parameter window

Changing it in one parameter window also changes it in the other.

If the *Total Gateway Data Points* value exceeds the maximum number of data points, the following error message appears:



Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.4 Device x Active

This parameter is used to define whether the device is activated.

If the device is deactivated, all of its data points are automatically deactivated.

Deactivated data points are taken into account in the *Total Gateway Data Points* parameter.

Option	
No	The device is deactivated.
Yes	The device is activated.

Note

This parameter appears in two places:

- The *General* parameter window
- The device parameter window

Changing it in one parameter window also changes it in the other.

Example

You can use this parameter to preconfigure a server but not activate it until it is connected to the gateway.

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.5 "Device x Active" checkbox

This parameter is used to define whether the individual data point is activated.

Deactivated data points are taken into account in the *Total Gateway Data Points* parameter.

Option	
No	The data point is deactivated.
Yes	The data point is activated.

Prerequisites for visibility

- Parameter window *Config Device x* \ parameter *Device x Active* \ option *Yes*.
- This parameter is in the *Config Device x* parameter window.

Note

The # indicates the data point number from 1 to 100.
The # is shown in the name of the corresponding Group Object.
The gateway continuously polls the data points in ascending order (from data point 1 to 100).

7.2.2.6 Group Object name

This parameter is used to specify an individual description for a Group Object. The description is shown in the name of the corresponding Group Object.

Option	
Free text entry	Maximum 64 ASCII characters; the maximum number of characters may vary for other character formats.

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.7 DPT

This parameter defines the KNX data point types (DPT). For a description of all the data point types available in the ETS application, click here.

The selected DPT is shown in the name of the corresponding Group Object.

Option	
7.001: pulses	DPT 7.001
x	Variable for the listed data point type

Note

Be sure to select the correct DPT based on the associated Modbus data point.

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.8 Read Function

This parameter is used to define which Modbus function codes are selected.

The function code tells the server which memory type (i.e. register, coils, etc.) to access and read.

Option
1: Read Coils
2: Read Discrete Inputs
3: Read Holding Registers
4: Read Input Registers
-

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.9 Write Function

This parameter is used to define which Modbus function codes are selected.

The function code tells the server which memory type (i.e. register, coils, etc.) to access and write.

Option
5: Write Single Coil
6: Write Single Register
15: Write Multiple Coils
16: Write Multiple Registers
-

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.10 Data Length

This parameter is used to define the size of the Modbus register in bits.

If the function code (Read or Write) refers to coils or discrete inputs, the data length is automatically set to 1. The parameter can no longer be adjusted. The only situation where all options are available is for function codes referring to registers.

Option
1
16
32
64

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.11 Format

This parameter is used to define the format of the Modbus register data.

If the function code (Read or Write) refers to coils or discrete inputs, the format is automatically set to "–". The parameter can no longer be adjusted. The only situation where all options are available is for function codes referring to registers.

Option
0: Unsigned
1: Signed (C2)
2: Signed (C1)
3: Float
4: BitFields
-

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.12 Byte Order

This parameter is used to define the order in which the bytes are shown.

If the function code (Read or Write) refers to coils or discrete inputs, the byte order is automatically set to "–". The parameter can no longer be adjusted. The only situation where all options are available is for function codes referring to registers.

Option	
0: Big Endian	High byte first
1: Little Endian	Low byte first
2: Word Inv BE	High word first
3: Word Inv LE	Low word first
-	

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.13 Register Address

This parameter is used to define the address of the register (DEC) in the server's memory range.

Option
0 … 65535

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.14 Bit

This parameter is used to define the start bit within the data point in the assigned register.

The options in the *Bit* parameter are only adjustable when the *Format:4: BitFields* option is selected.

Option
1 …x … 15… -

Note

The *# Bits* parameter defines the number of specific bits in the assigned register.

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.15 # Bits

This parameter is used to define the number of specific bits in the assigned register.

The options in the *# Bits* parameter are only adjustable when the *Format:4: BitFields* option is selected.

Option
1 …x … 15… -

Note

The *Bit* parameter defines the start bit within the data point in the assigned register.

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.16 Deadband

This parameter defines the minimum (absolute) value change of the Modbus data before the new value is written to the associated Status Group Object. This avoids excessive sending when making minimal value changes.

Option
0 … 100

Note

When calculating the *Device x Deadband* parameter, always take account of the type and resolution of the Modbus data points.

Example

The Modbus server stores the voltage value of 230 V as 2300 in the Modbus register. For a minimum change in value (absolute value) of 0.5 V, the deadband should be set to 5.

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.17 Operation

This parameter is used to define the mathematical operation.

The options *Multiply by* and *Divide by* are arithmetical connections that are always available.

For unidirectional data points (either the *Read Function* or the *Write Function*), there are also logical connections available.

These are:

- equals (=)
- is not equal to (≠)
- is less than (<)
- is greater than (>)

These logical connections return "1" if the result corresponds to the condition and "0" if not.

Option	
-	The function is deactivated.
Multiply by (x)	Multiplies the value.
Divide by (-)	Divides the value.
Equals (=)	The value is the same.
Is not equal to (≠)	The value is different.
Less than (<)	The value is less than.
Greater than (>)	The value is greater than.

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

7.2.2.18 Operation Value

This parameter is used to define the value for the operation.

Option
-32768 … 0 … 32767

Prerequisites for visibility

- This parameter is in the *Config Device x* parameter window.

8 Group Objects

8.1 Overview of Group Objects

Either one or two Group Objects are enabled per data point, depending on the option selected in the *Read Function* and *Write Function* parameters.

Note

If both the *Read Function* and *Write Function* are selected, ETS creates 2 Group Objects (one Status Group Object and one Control Group Object). However, if only the *Read Function* or the *Write Function* is selected, ETS creates a single Group Object (a Status Group Object for the *Read Function* or a Control Group Object for the *Write Function*).

Function	Group Object name	Data point type	Length	Flags				
KNX -> Modbus	D1.1 Control Group Object [DPT_7.001]	7.001	2 bytes	C	R	W	-	U
Modbus -> KNX	D1.1 Status Group Object [DPT_7.001]	7.001	2 bytes	C	R	-	T	-
KNX -> Modbus	D1.2 Control Group Object [DPT_7.001]	7.001	2 bytes	C	R	W	-	U
Modbus -> KNX	D1.2 Status Group Object [DPT_7.001]	7.001	2 bytes	C	R	-	T	-
KNX -> Modbus	D1.3 Control Group Object [DPT_7.001]	7.001	2 bytes	C	R	W	-	U
Modbus -> KNX	D1.3 Status Group Object [DPT_7.001]	7.001	2 bytes	C	R	-	T	-
KNX -> Modbus	D1.4 Control Group Object [DPT_7.001]	7.001	2 bytes	C	R	W	-	U
Modbus -> KNX	D1.4 Status Group Object [DPT_7.001]	7.001	2 bytes	C	R	-	T	-
KNX -> Modbus	D1.5 Control Group Object [DPT_7.001]	7.001	2 bytes	C	R	W	-	U
Modbus -> KNX	D1.5 Status Group Object [DPT_7.001]	7.001	2 bytes	C	R	-	T	-
KNX -> Modbus	D1.6 Control Group Object [DPT_7.001]	7.001	2 bytes	C	R	W	-	U
Modbus -> KNX	D1.6 Status Group Object [DPT_7.001]	7.001	2 bytes	C	R	-	T	-
KNX -> Modbus	D1.7 Control Group Object [DPT_7.001]	7.001	2 bytes	C	R	W	-	U
Modbus -> KNX	D1.7 Status Group Object [DPT_7.001]	7.001	2 bytes	C	R	-	T	-
KNX -> Modbus	D1.8 Control Group Object [DPT_7.001]	7.001	2 bytes	C	R	W	-	U
Modbus -> KNX	D1.8 Status Group Object [DPT_7.001]	7.001	2 bytes	C	R	-	T	-
KNX -> Modbus	D1.9 Control Group Object [DPT_7.001]	7.001	2 bytes	C	R	W	-	U
Modbus -> KNX	D1.9 Status Group Object [DPT_7.001]	7.001	2 bytes	C	R	-	T	-
KNX -> Modbus	D1.10 Control Group Object [DPT_7.001]	7.001	2 bytes	C	R	W	-	U
Modbus -> KNX	D1.10 Status Group Object [DPT_7.001]	7.001	2 bytes	C	R	-	T	-
0-no alarm; 1-alarm	Status Error alarm [DPT_1.005]	1.005	1 bit	C	R	-	T	-
Server Address	Status Modbus device error [DPT_8.xxx]	8.xxx	2 bytes	C	R	-	T	-
Register Address	Status Modbus register error [DPT_12.xxx]	12.xxx	4 bytes	C	R	-	T	-
Error text	Status Error text [DPT_16.001]	16.001	14 bytes	C	R	-	T	-

Note

The Group Objects listed in the overview are the standard Group Objects when the gateway is not configured. Once configuration/mapping is done, the Group Objects change.

8.2 KNX Status Group Objects

Function	Group Object name	Data point type	Length	Flags				
1-active	Status In Operation [1.011]	1.011	1 bit	C	R	-	T	-
This Group Object cyclically sends an In operation telegram on the bus (ABB i-bus® KNX). The sending cycle is set in parameter *Sending cycle*. Telegram value: • 1 = Active • 0 = Inactive Prerequisite for visibility: • Parameter window *General* \ parameter *In Operation*								
0-No alarm; 1-Alarm	Status Error alarm [DPT_1.005]	1.005	1 bit	C	R	-	T	-
This Group Object indicates whether there is a communication problem with the server, Telegram value: • 0 = No alarm • 1 = Alarm Prerequisite for visibility: This Group Object is always visible.								
Server Address	Status Modbus device error [DPT_8.xxx]	8.xxx	2 bytes	C	R	-	T	-
This Group Object indicates the server address of the last Modbus server with an error. Telegram value: • Server Address Prerequisite for visibility: This Group Object is always visible.								
Register Address	Status Modbus register error [DPT_12.xxx]	12.xxx	4 bytes	C	R	-	T	-
This Group Object indicates the register address of the last Modbus server with an error. Telegram value: • Register Address Prerequisite for visibility: This Group Object is always visible.								
Error text	Status Error text [DPT_16.001]	16.001	14 bytes	C	R	-	T	-
This Group Object is used to set the error text: Error text: Reports a string signal containing information about the error or alarm. The format of the string is ss:ff:aaaa:ee, where: • ss: Server ID (00 .. 3F) • ff: Function code (00 .. 10) • aaaa: Address (0000 .. FFFF) • ee: Error code (00 .. 0F) **The following Modbus error codes may occur:** See https://www.simplymodbus.ca/exceptions.htm **The following gateway error codes may occur:** • ER0: Unknown error: The error type cannot be specified. • ER1: CRC error: The cyclic redundancy test has identified an error in the response structure. • ER2: Reception length error: The length of the response is incorrect. • ER3: Reception time out: No response after timeout. Prerequisite for visibility: This Group Object is always visible.								

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8.3 Dx.x Control Group Objects

The Group Objects are shown in accordance with the specifications in the device settings table.

Function	Group Object name	Data point type	Length	Flags				
KNX -> Modbus	Dx.x Control Group Object [DPT_x.xxx]	x.xxx	x bit/ x bytes	x	x	x	x	x

Abbreviation	Description
D	Device
x	Device number
x	Data point number. As shown in the "#" column of the device table
Group Object	Specified Group Object name
x.xxx	DPT. Specified DPT
x	Specified length (bit/bytes) and flags

8.4 Dx.x Status Group Objects

The Group Objects are shown in accordance with the specifications in the device settings table.

Function	Group Object name	Data point type	Length	Flags				
Modbus -> KNX	Dx.x Status Group Object [DPT_x.xxx]	x.xxx	x bit/ x bytes	x	x	x	x	x

Abbreviation	Description
D	Device
x	Device number
x	Data point number. As shown in the "#" column of the device table
Group Object	Specified Group Object name
x.xxx	DPT. Specified DPT
x	Specified length (bit/bytes) and flags

9 Operation

9.1 Manual operation

This section is not relevant for this device.

10 Maintenance and cleaning

10.1 Maintenance

The device is maintenance-free if used properly. In the event of damage, e.g. during transport and/or storage, repairs are not allowed to be made.

10.2 Cleaning

1. Disconnect the device from the electrical power supply before cleaning.
2. Clean the dirty device using a dry cloth or a slightly damp cloth.

11 Removal and disposal

11.1 Removal

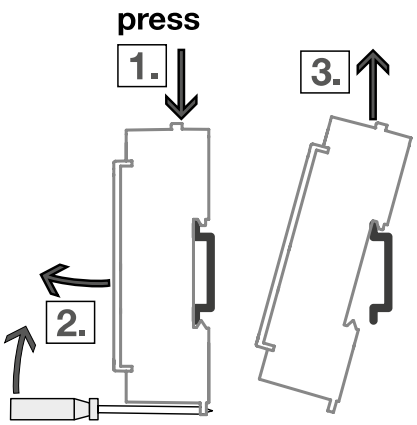

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Fig. 7: Removing from the mounting rail

1. Press on the top of the device.
2. To release the device, pull down the latching lever with the aid of a screwdriver.
3. Release the bottom of the device from the mounting rail.
4. Lift the device up and off the mounting rail.

11.2 Environment

Consider environmental protection.

Electrical and electronic devices must not be disposed of as domestic waste.

The device contains valuable resources that can be recycled. Therefore, please take the device to a suitable recycling center. All packaging materials and devices are provided with markings and test seals for proper disposal. Always dispose of packaging material and electrical devices or their components at collection points or disposal companies authorized for this purpose. The products comply with the statutory requirements, particularly the law on electrical and electronic equipment and the REACH regulation. (EU directive 2012/19/EU WEEE and 2011/65/EU RoHS) (EU REACH regulation and the law implementing the regulation (EC) no.1907/2006)

12 Planning and application

12.1 Priorities

This section is not relevant for this device.

12.2 Basic knowledge

12.2.1 General Modbus RTU/RS-485 information

This section describes the basics of planning and installing Modbus systems.

You will find further information in the Modbus documentation/specification: http://www.modbus.org

12.2.2 What is Modbus?

Modbus is a serial communication protocol that was developed and published for use with programmable logic controllers (PLC). It is a communication method for the transmission of information via serial cables between electronic devices. The device that requests the information is termed the client. The devices that send information are servers. In a standard Modbus network there is one client and up to 255 servers each with a unique server address from 1 to 255. Address 0 is reserved for the client.

12.2.3 Bus principle RS-485

The Modbus standard uses the RS-485 standard. This standard defines the physical layer of the Modbus interface. The data are transmitted in serial form via a 2-wire bus (RS-485). The RS-485 standard is based on the client-server method and defines the bus cable as a cable with a start and an end that are each terminated using an EOL resistor RT (T=Termination).

Client = Level Converter (e.g. MG/S 11.100.1.1 Modbus KNX Gateway)

Server = Modbus RTU device (e.g. ABB electricity meter from the A and B series, water meter, heat meter, gas meter, etc., with Modbus RTU interface).

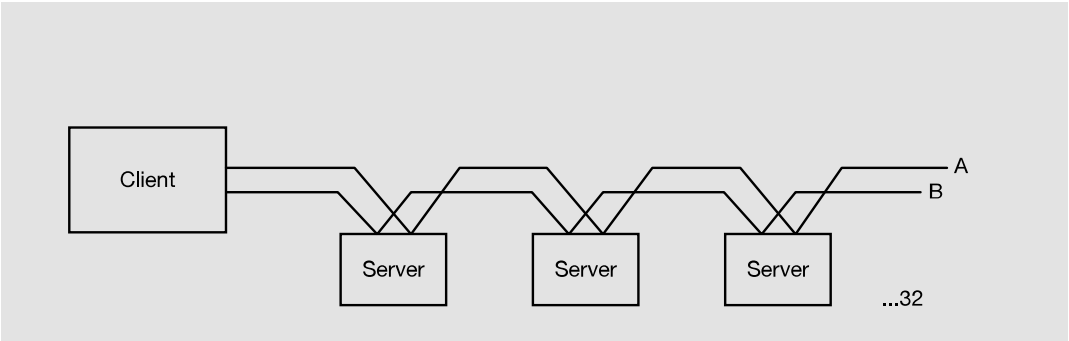

Fig. 8: Bus principle RS-485

12.2.4 Polarity

Attention must be paid to the correct polarity of the core pairs during installation because incorrect polarity will invert the data signals. Particularly if there are difficulties in relation to the installation of new devices, any troubleshooting should start with a check on the bus polarity.

12.2.5 Topology

The optimal cable topology for the Modbus RTU is a purely linear structure. Droplines to individual devices with a maximum length of 1 m are allowed. These droplines are not terminated.

12.2.6 Cable types

A twisted pair, screened cable is recommended as the bus cable. The cable type J-Y(St)Y n x 2 x 0.8 is suitable, for instance. The screen is to be connected to PE at one end. The bus cable must be terminated with resistors (120 Ω, 0.25 W) at both ends so that only minimal reflections are produced. The serial communication on the RS-485 interface operates most efficiently if the source and load impedance are matched at 120 Ohm. The termination resistors are connected in parallel with terminals A and B.

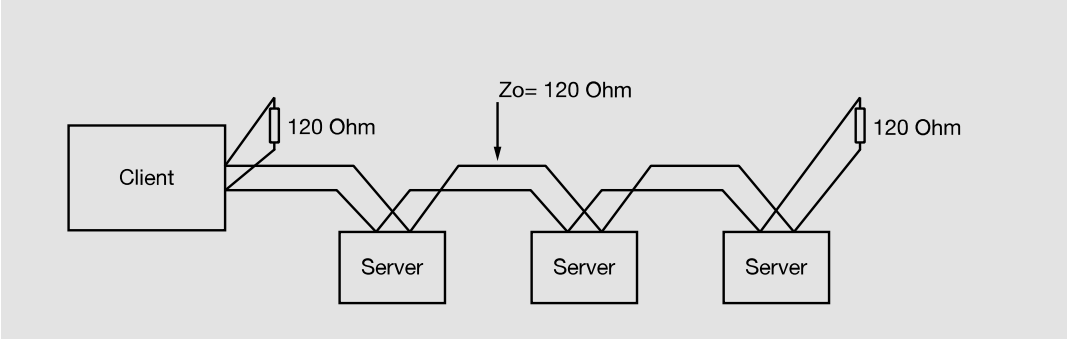

Fig. 9: Termination resistors

12.2.7 Cable length

The RS-485 specification limits the cable length to 1200 m, the number of devices in the bus to 32 and stipulates a linear topology (daisy chain).

12.2.8 Number of devices

The number of Modbus devices depends on the unit load (UL) of the RS-485 transceivers. In the worst case, a transceiver has 1 UL. An RS-485 segment is specified for 32 UL. If more devices are connected, a repeater must be used. Modern RS-485 transceivers have 1/4 or 1/8 UL. If only such devices are used, 128 or 256 devices are possible without repeaters.

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12.2.9 Troubleshooting

To minimize potential sources of error, there are certain principles you should follow:

Installation:

- Check cable length, polarity, termination resistors, etc.

Configuration:

- The server manual is available.
- The baud rate and parity must be the same for all the devices in the Modbus system.
- Each Modbus server is assigned a unique address.
- Server data points (function codes, register numbers, format, etc.) are correctly entered in the gateway in accordance with the server specification.
- General server information such as processing times were taken into account in the gateway configuration.

There are Modbus tools for simulating and testing the communication between client and server. Example: https://www.modbustools.com/index.html

Other support tools, e.g. Engineering Guides, FAQs, etc. are available on our website www.abb.com/knx.

13 Appendix

13.1 Scope of delivery

The device is supplied together with the following components:

- 1 x Modbus RTU – KNX TP Gateway, MG/S 11.100.1.1
- 1 x installation and operating instructions

13.2 Status byte Device

This section is not relevant for this device.

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