

**Climatix™**

## **Modbus communication, slave mode** Integration guide

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# Table of contents

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<b>1</b>	<b>About this document</b> .....	<b>5</b>
1.1	Revision history.....	5
1.2	Before you start.....	5
1.3	Reference documents.....	5
1.4	Document conventions.....	6
1.5	Important information on safety.....	7
1.6	Trademarks and copyrights.....	8
1.7	Quality assurance.....	8
1.8	Document use/ request to the reader.....	8
<b>2</b>	<b>Modbus networks</b> .....	<b>9</b>
2.1	Modbus protocol.....	9
2.2	RS485 networks.....	10
2.3	RS485, cable installation.....	10
2.4	Bus termination.....	11
2.5	TCP/IP networks.....	11
2.6	Tools.....	11
<b>3</b>	<b>Commission instructions</b> .....	<b>13</b>
3.1	General.....	13
3.2	Commission internal Modbus RTU.....	14
3.3	Commission internal Modbus TCP.....	16
3.4	The Modbus module.....	17
3.5	Commission Modbus modules.....	18
<b>4</b>	<b>Integration</b> .....	<b>21</b>
4.1	Map registers.....	21
4.2	Function codes.....	21
4.3	Reference Modbus addresses.....	22
<b>5</b>	<b>Other information</b> .....	<b>23</b>
5.1	Troubleshooting, tips.....	23
5.2	FAQ on TCP/IP.....	24
5.3	Upgrade application or BSP via SD card.....	25
5.4	Override I/Os via communication.....	26
<b>Index</b>	.....	<b>27</b>



# 1 About this document

## 1.1 Revision history

Version	Date	Changes	Section	Pages
1.0	01.03.2010	First edition		

## 1.2 Before you start

### Validity

This document applies to the following products:

Name	Type (ASN)	Short name
Modbus communication module	POL902.00/STD	Modbus module
Controller with onboard modbus	POL63x.00/STD	Basic controller
Controller with onboard TCP/IP	POL638.00/STD	TCP/IP controller

### Product versions

Description and functional scope of the products are based on the Climatix Valid Version Set 8.0 or higher and application based on standard AHU.

### Target audience

This document is intended for the following audience:

- Modbus system integrators
- Measuring and control engineering staff
- Sales and commissioning staff

### Prerequisites

The above target audience:

- Has general professional knowledge on planning and commissioning HVAC technology measuring and control solutions.
- Has basic knowledge of Modbus.
- Has the additional reference addresses documentation for the specific product.

## 1.3 Reference documents

### Further information

The following documents contain additional information on the products described in this manual:

Document	Order no.
Data sheet "Communication module Modbus"	CB1Q3934en
Basic documentation "Modbus communication module"	CB1P3934en
Reference addresses "Modbus communication, slave mode" Note! Unique documentation for each application.	CB1Y3961en
Basic documentation "Standard Application AHU"	CB1P3977en

## 1.4 Document conventions

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### Symbols used

Below is an overview of all symbols used in this document denoting risks or important information:



This symbol draws your attention to special safety notes and warnings. Failing to observe these notes may result in injury and/or serious damages.



This symbol denotes special information that, when failed to observe, may result in faulty functionality *or loss of data*.



Notes with this symbol provide important information that requires appropriate attention.



This symbol marks passages containing tips and tricks.




### Abbreviations

The following abbreviations are used in text and illustrations:

Abbreviation	Meaning
BACS	<b>B</b> uilding <b>A</b> utomation and <b>C</b> ontrol <b>S</b> ystem
BSP	<b>B</b> oard <b>S</b> upport <b>P</b> ackage (operating system)
Climatix	Controller family with common tools
Gateway	A device for transfer data between different kind of networks
HMI	<b>H</b> uman <b>M</b> achine <b>I</b> nterface, e.g. Operator unit
HMI-DM	Climatix <b>D</b> ot <b>M</b> atrix HMI, POL895.51
HVAC	<b>H</b> eating, <b>V</b> entilating, <b>A</b> ir <b>C</b> onditioning
LSB	<b>L</b> east <b>S</b> ignificant <b>B</b> it
MSB	<b>M</b> ost <b>S</b> ignificant <b>B</b> it
RTU	<b>R</b> emote <b>T</b> erminal <b>U</b> nit
SELV	<b>S</b> afety <b>E</b> xtra- <b>L</b> ow <b>V</b> oltage
TCP/IP	<b>T</b> ransmission <b>C</b> ontrol <b>P</b> rotocol, e.g. Ethernet/Internet

## 1.5 Important information on safety

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<b>Field of application</b>		Use Modbus communication only for control and monitoring.
<b>Intended use</b>		Trouble-free and safe product operation of the above products presupposes transport, storage, mounting, installation, and commissioning as intended as well as careful operation.
<b>Electrical installation</b>		Fuses, switches, wiring and grounding must comply with local safety regulations for electrical installations.
<b>Wiring</b>		When wiring, strictly separate AC 230 V mains voltage from AC 24 V safety extra-low voltage (SELV) to protect against electrical shock!
<b>Commissioning and maintenance</b>		Only qualified staff trained accordingly may prepare for use, commission, and maintain Modbus communication modules.
<b>Maintenance</b>		Maintenance of Climatix Controller and Modbus communication modules generally only means regular cleaning. We recommend removing dust and dirt from system components installed in the control panels during standard service.
<b>Faults</b>		Only authorized staff may diagnose and correct faults and recommission the plant. This applies to working within the panel as well (e.g. testing or changing fuses).
<b>Storage and transport</b>		Refer to the environmental conditions specified in the respective data sheets for storage and transport. If in doubt, contact your supplier.
<b>Disposal</b>		Devices contain electrical and electronic components; do not dispose of them in household garbage. <b>Observe all local and applicable laws.</b>

## 1.6 Trademarks and copyrights

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### Trademarks, legal owners

The table below lists the third-party trademarks used in this document and their legal owners. The use of trademarks is subject to international and domestic provisions of the law.

Trademarks	Legal owner
Modbus®	The Modbus Organization, Hopkinton, MA, USA

All product names listed in the table are registered (®) or not registered (™) trademarks of the owner listed in the table. We forgo the labeling (e.g. using the symbols ® and ™) of trademarks for the purposes of legibility based on the reference in this section.

### Copyright

This document may be duplicated and distributed only with the express permission of Siemens, and may be passed on only to authorized persons or companies with the required technical knowledge.

## 1.7 Quality assurance

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### Document contents

These documents were prepared with great care.

- The contents of all documents are checked at regular intervals.
- All necessary corrections are included in subsequent versions.
- Documents are automatically amended as a consequence of modifications and corrections to the products described.

Please make sure that you are aware of the latest document revision date.

## 1.8 Document use/ request to the reader

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### Request to the reader

Before using our products, it is important that you read the documents supplied with or ordered at the same time as the products (equipment, applications, tools etc.) carefully and in full.

We assume that persons using our products and documents are authorized and trained appropriately and have the technical knowledge required to use our products as intended.

### Exemption from liability

Siemens assumes no liability to the extent allowed under the law for any losses resulting from a failure to comply with the aforementioned points or for the improper compliance of the same.



## 2 Modbus networks

### 2.1 Modbus protocol

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#### Modbus, general information

The following section provides only a brief overview of the Modbus protocol. For the full specification, see: "Modicon Modbus Protocol Reference Guide PI MBUS 300 Rev. J".

#### Master/slave protocol

The Modbus is a master/slave protocol. This, by definition, means that a Modbus network contains only one master and at least one slave.

#### Transactions on Modbus

The Modbus master uses a slave query to start transactions on the network. The slave either responds positively with the requested service (response) or transmits an "exception message".

#### Function codes

The type of transaction is defined by the function code transmitted in the Modbus telegrams. A function code defines the following:

- Structure of the telegram, query and response.
- Direction of data transmission (master → slave or slave → master).
- Data format of data point.

#### Transmission modes

The Modbus protocol defines two alternative serial transmission modes: These modes have the following characteristics:

##### RTU (Remote Terminal Unit) mode

- Binary-coded data.
- Start and end of telegrams marked by timed pauses (a "silent interval") between the characters transmitted.
- Check sum algorithm: CRC (cyclical redundancy check).

##### ASCII mode

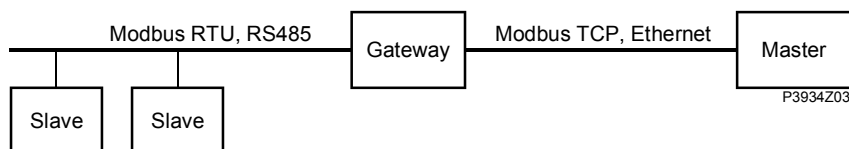
- Data in hexadecimal notation.
- Beginning and end of telegrams marked by start and end characters.
- Check sum algorithm: LRC (longitudinal redundancy check).

#### Telegrams with multiple data points

Certain types of Modbus transactions allow for transmission of a variable number of Modbus data points in a single telegram.

#### Modbus TCP Ethernet

A Modbus TCP/RTU gateway helps connect a Modbus/TCP master to one or several Climatix controllers (slaves) if not a Climatix controller with internal TCP/IP onboard is available:



The Modbus TCP/RTU gateway acts as a Modbus/TCP slave on an Ethernet network, and transforms the queries to the serial Modbus network and back.

#### For more information on Modbus

See [www.modbus.org](http://www.modbus.org)

## 2.2 RS485 networks

### RS485 definition

RS485 is a balanced line, half-duplex transmission system that meets the requirements for a truly multi-point communications network. The standard specifies up to 32 drivers and 32 receivers on a single (2-wire) bus. Half-duplex data transmission means that data can be transmitted in both directions on a signal carrier, but not at the same time.

More than 32 devices on one RS485 trunk?

Yes, a repeater makes this possible.

However, in reality a repeater is not always necessary because:

Although the RS485 standard is based on just 32 devices, most RS485 chips need less than the specified unit load since initial development. Today, some devices on the market require only half or a quarter of the load units.

Read the associated data sheets and count the required load to determine how many devices you can install. This data is located in "UL" ("Unit Load").

## 2.3 RS485, cable installation

### Task of the third wire

Handle the RS485 bus in practice as 3-wire network even though RS485 as per EIA 485 only specifies a two-wire line for differential signals. Reason: Devices with RS485 interface have third connection named "Common", "Ground" or "REF" (e.g. in Climatix).

This connection is not used to connect to ground, but rather for a common reference signal. Voltage on lines Tx/Rx (or +/-) are measured relative to the voltage level on the reference signal.

### Screening not required

You do not need screens. The twisted cable for Tx and Rx suppresses interference more effectively than a screen.



Screening as third wire?

You can use the third wire as screen for emergencies. It is better, however, to use a wire of the second wire pair of a CAT5 cable; see "Cable selection" below.

Cat5 cables?

Yes, these cables are good. Use a pair for Tx/Rx and a wire of the other pair for the reference signal (ground).

We recommend the following cables:

Manufacture / Type	Specifications
Belden 3106A  Bild02	Multi-Conductor - EIA Industrial RS-485 PLTC/CM 22 AWG stranded (7×30) tinned copper conductors, Datalene® insulation, twisted pairs, overall Beldfoil® shield (100% coverage) plus a tinned copper braid (90% coverage), drain wire, UV resistant PVC jacket.
Belden 3107A  Bild03	Multi-Conductor - EIA Industrial RS-485 PLTC/CM 22 AWG stranded (7×30) tinned copper conductors, Datalene® insulation, twisted pairs, overall Beldfoil® shield (100% coverage) plus a tinned copper braid (90% coverage), drain wire, UV resistant PVC jacket.

## RS485, cable installation, *continued*

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### Cable length and baud rates

RS485 does not specify max cable length. It depends largely on transmission rates:

The greater the transmission rate, the shorter the possible cable length.

Rule of thumb for AWG cable:

$$\text{Cable length [m]} \times \text{data rate [bps]} < 10^8.$$

The following guide values result:

Baud rate	Cable length [m]
9,600	10,400
19,200	5,200
38,400	2,600

Additionally, note the following:

The higher the baud rate, the more important the cable installation quality. Issues such as twisted pair cable unfolded at each resistor gain importance.

## 2.4 Bus termination

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### Termination resistance

As Modbus RTU is based on an RS485 bus, both bus ends require terminating resistances.



In Climatix, the resistances can be enabled or disabled via operator unit. No external resistance is needed.

## 2.5 TCP/IP networks

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### Modbus TCP port

Modbus TCP in Climatix uses the TCP port 502. This port number is not changeable.

### IP address

The IP address is assigned either dynamically via the DHCP server or set manually via HMI. Normally is to use fixed IP address.



If the controller is Server (Slave) he is able to serve 3 Modbus IP Clients, so it is possible to connect for example 3 touch panels to one controller at the same time.

The onboard Ethernet port used for Modbus can be used for remote service or internal web HMI at the same time as Modbus TCP.

## 2.6 Tools

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### Modbus master simulation tools

Modbus slave devices e.g. Climatix controllers can be tested with several Modbus master simulation tools such as "Modbus Poll" or "ModScan" from a computer. "Modbus Poll" can be downloaded from [www.modbustools.com](http://www.modbustools.com).

A RS485/RS232 converter or a Modbus RTU/TCP gateway may be needed to connect to a computer.

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# 3 Commission instructions

## 3.1 General

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### Connection ways

There are up to 3 ways to communicate with Modbus on a Climatix controller:

- Internal RTU (POL63x)
- Internal TCP (POL638)
- External communication module POL902

### Internal RTU (POL63x)

A Modbus RTU, via RS485, interface is always available on the basic controller POL63x.00/STD. It can be defined as the master or slave or switched off.

The internal Modbus interface is automatically set to master if any master function is enabled in the controller.

### Internal TCP (POL638)

A Modbus TCP interface is available on the POL638.00/STD controller via the standard Ethernet port. The internal Modbus TCP interface is normally only used for slave mode and can be used for slave mode even if the RS485 port is used as master.

### External communication module POL902

An extra slave interface, with two separate channels, is always provided with the external Modbus communication module POL902. The internal interface cannot be used if the external module is used and the internal interface is no longer required as the master.



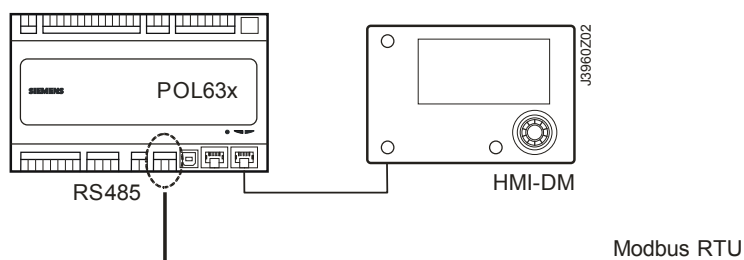
Prerequisite for commissioning any of the above mentioned ways:

**Working application** loaded and started in the Climatix controller.

## 3.2 Commission internal Modbus RTU

### Involved devices

The picture shows the devices and connections involved in commissioning:



### Connection

Proceed as follows to connect the Climatix controller to the Modbus bus:

Step	Action
1	Controller <b>OFF</b> .
2	Connect Modbus bus cable to the RS485 interface (pins A+ and B-, Ref for GND).
3	Controller <b>ON</b> .

### Configuration via operator unit

Proceed as follows to configure the controller for internal Modbus RTU:

Step	Action
1	Log in to HMI using the password for level 4 (Service), default 2000.
2	Select <b>Main Index &gt; System overview &gt; Communication &gt; Modbus &gt;</b>
3	Select <b>Internal mode</b> : Select the integrated Modbus interface RS485 to be used as slave. <i>Caution!</i> The integrated RS485 cannot be used as slave if already used as master. This selection is blocked when a function require master.
4	Select <b>Internal slave Address</b> : Enter the corresponding Modbus slave address (1...247). <i>Caution!</i> This is true for Modbus TCP as well.
5	Select <b>Internal settings for RS485 &gt;</b>
6	Select <b>Baudrate</b> : Enter the transmission rate as per the Modbus (2400, 4800, 9600, 19200 and 38400). All participants must have the same setting.
7	Select <b>Stop bits</b> : One or two stop bits All participants must have the same setting.
8	Select <b>Parity</b> : None, even or odd parity. All participants must have the same setting
9	Select <b>Delay time</b> : Delays the response by n milliseconds.
-	<b>Response timeout</b> : Setting access time if used as master. The master must undertake read access within this period, otherwise an alarm is triggered. This has no influence for Modbus slave mode.
10	Select <b>Termination</b> : The RS485 topology must always be ended using wave resistors. They can be enabled or disabled as described in Section, 2.4.
11	Select <b>Reset required !!</b> : When done, restart controller using this command.
Extra	MB communication is the alarm object and settings like alarm class etc for Modbus faults can be changed here.

## Commission internal Modbus RTU, *cont.*

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### Configuration via operator unit, *cont.*

After restart, the internal Modbus RTU is configured and ready to use.



As a matter of principle, the controller must be restarted with "Reset required !!" or power off/on the controller after changing any settings to assume the data.

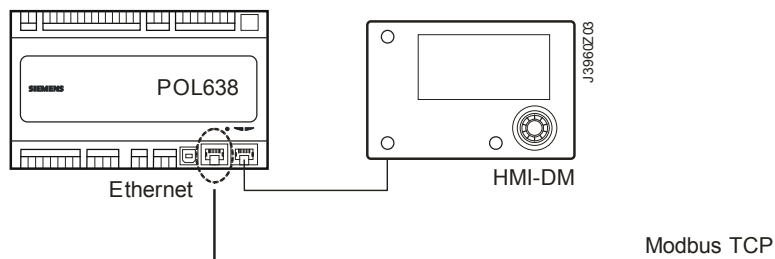


Other setting than described above has nothing to do with Modbus RTU slave mode and should not be changed.

### 3.3 Commission internal Modbus TCP

#### Involved devices

The picture shows the devices and connections involved in commissioning:



#### Connection

Connect the Climatix controller to the Ethernet (Modbus TCP) with a standard network cable.

#### Configuration via operator unit

Proceed as follows to configure the controller for internal Modbus TCP:

Step	Action
1	Log in to HMI using the password for level 4 (Service), default 2000.
2	Select <b>Main Index &gt; System overview &gt; Communication &gt; Modbus &gt;</b>
-	<b>Internal mode:</b> Selects if the integrated Modbus interface RS485 should be used as master or slave. This has no influence for Modbus TCP.
3	Select <b>Internal slave Address:</b> Enter the corresponding Modbus slave address (1...247). <i>Caution!</i> This is true for Modbus RTU as well.
4	Select <b>Internal settings for TCP/IP &gt;</b> <i>Note!</i> Settings for TCP/IP can also be displayed and changed in: <b>Main Index &gt; System overview &gt; Communication &gt; TCP/IP &gt;</b>
-	Take care to change TCP/IP setting if the controller is already connected to Ethernet for other purpose.
5	Select <b>DHCP</b> (Normally Passive): Active, DHCP server issues addresses. Passive, IP address is fixed.
6	Select <b>IP:</b> Enter controller IP address if DHCP is set to passive.
7	Select <b>Mask:</b> Enter subnet mask if DHCP is set to passive.
8	Select <b>Gateway:</b> Enter gateway address if DHCP is set to passive.
9	Select <b>Reset required !!:</b> When done, restart controller using this command.

After restart, the internal Modbus TCP is configured and ready to use.



As a matter of principle, the controller must be restarted with "Reset required !!" or power off/on the controller after changing any settings to assume the data.



Other setting than described above has nothing to do with Modbus RTU slave mode and should not be changed.

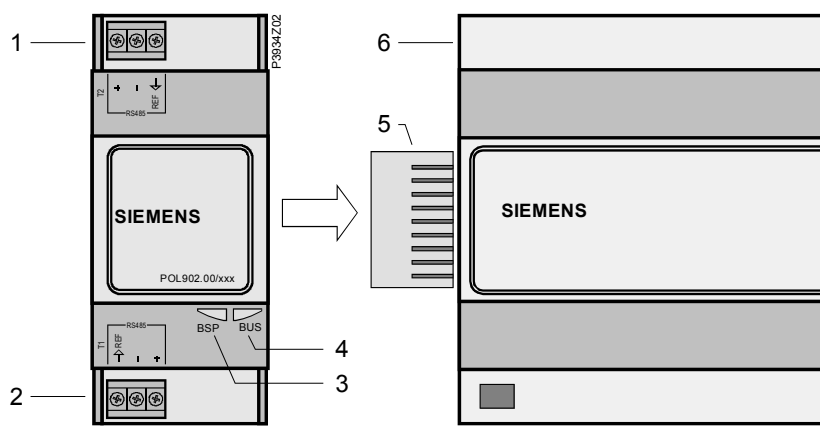


### 3.4 The Modbus module

#### Design

The figure shows the Modbus module. Properties:

- Two galvanically separated RS485 interfaces.
- Connection to the Climatix controller via internal communications extension bus using the plug on the controller's left.



#### Elements and connections

The elements and connections in the figure are:

Pos.	Element / Connection
1	Modbus RS485 interface T1 (slave, channel 0).
2	Modbus RS485 interface T2 (slave, channel 1).
3	Status display "BSP" (Board Support Package).
4	Status display "BUS" (bus connections o.k. / bus traffic).
5	Plug connection "Communication extension bus".
6	Climatix controller POL6XX.

#### Status LEDs

The status LEDs "BSP" and "BUS" can light red, green and yellow during operation.

#### "BSP" LED

This LED informs on the status of the "Board Support Package" (BSP). Color and flashing frequency of the LED:

Color	Flashing frequency	Meaning / Mode
Red / yellow	1 s "on" / 1 s "off"	Upgrade mode.
Green	Steady "on"	BSP operating and communication with controller working.
Yellow	Steady "on"	BSP operating, but no communication with controller.
Red	Flashing at 2Hz	BSP error (software error).
Red	Steady "on"	Hardware fault.

#### "BUS" LED

This LED shows the status of external communication with the bus, not to the controller. Color and flashing frequency of the LED:

Color	Flashing frequency	Meaning / Mode
Green	Steady "on"	Communication active.
Red	Steady "on"	Communication interrupted.

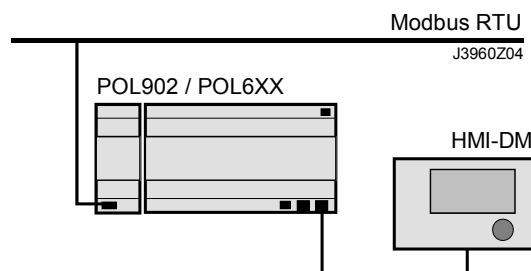


Power supply is outside the allowed range if both LEDs are dark.

## 3.5 Commission Modbus modules

### Involved devices

The picture shows the devices involved in commissioning:



### Connection

Proceed as follows to connect the Modbus module to the Modbus bus via RS485 (see also description in section for the Modbus module):

Step	Action
1	Controller <b>OFF</b> .
2	Connect Modbus module to controller using plug connection.
3	Connect Modbus bus cable to Modbus module (pins + and -, Ref for GND). Use the T1 interface if only one master/bus should be connected. Use the T2 interface if an additionally master/bus should be connected.
4	Controller <b>ON</b> : → The module starts / initialization begins. → As soon as the two LEDs "BSP" and "BUS" are steady green, communication with the controller and Modbus bus is active. <i>Caution!</i> HMI must be reset a second time to update; prior to parameterization.

### Configuration via operator unit

Proceed as follows to configure the Modbus module for Modbus RTU step by step:

Step	Action
1	Log in to HMI using the password for level 4 (Service), default 2000.
2	Select <b>Main Index &gt; System overview &gt; Communication &gt; Modbus &gt; Module[x] Modbus &gt;</b> or <b>Main Index &gt; System overview &gt; Communication &gt; Comm module overview &gt; Module[x] Modbus &gt;</b> <i>Note! [x] is the position of the connected communication module. This is only information used when more than one module is connected.</i>
3	Select <b>Settings channel [y] &gt;</b> Channel 0 / Channel 1. Displays as of this point the data for the first Modbus channel (channel 0, terminal T1) and the second Modbus channel (channel 1, terminal T2) of the module. These are the corresponding parameters, with the exception of enable:
-	Select <b>Enable</b> : Only for channel 1. Set to Active to enable channel 1 (T2).
4	Select <b>Slave address</b> : Enter the corresponding Modbus slave address (1...247).
5	Select <b>Baud rate</b> : Enter the transmission rate as per the Modbus (2400, 4800, 9600, 19200 and 38400). All participants must have the same setting.

## Commission Modbus modules, *cont.*

Configuration via  
operator unit, *cont.*

Step	Action
6	Select <b>Stop bits</b> : One or two stop bits All participants must have the same setting.
7	Select <b>Parity</b> : None, even or odd parity. All participants must have the same setting.
8	Select <b>Response timeout</b> : Settings access time for master. The master must undertake read access within this period, otherwise an alarm is triggered
9	Select <b>Termination</b> : The RS485 topology must always be ended using wave resistors. They can be enabled or disabled as described in Section,2.4
10	Select <b>Reset required !!</b> : When done, restart controller using this command.

After restart, the Modbus module is configured and ready to use.



As a matter of principle, the controller must be restarted with "Reset required !!" or power off/on the controller after changing any settings to assume the data.



Other setting than described above has nothing to do with Modbus RTU slave mode and should not be changed.

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# 4 Integration

## 4.1 Map registers

### Modbus data formats

Modbus registers are organized into reference types identified by the leading numeric character of the reference address:

The "x" following the leading character represents a four-digit reference address.

ModbusType	Reference	Description (refers to master device)
Coil Status	0xxxx	<u>Read/Write Discrete Outputs or Coils.</u> A 0x reference address is used to drive output data to a digital 1-bit output channel.
Input Status	1xxxx	<u>Read Discrete Inputs.</u> The 1-bit status of a 1x reference address is controlled by the corresponding digital input channel.
Input Register	3xxxx	<u>Read Input Registers.</u> A 3x reference register contains a 16-bit number.
Holding Register	4xxxx	<u>Read/Write Output or Holding Registers.</u> A 4x register is used to store 16-bits of numerical data (binary or decimal), or to send the data from the CPU to an output channel.

### Leading character

The leading character is generally implied by the function code and omitted from the address specified for a given function. The leading character also identifies the I/O data type.

## 4.2 Function codes

### Meaning

The functions below are used to access the registers outlined in the register map of the module for sending and receiving data.

Function Code	Modbus function	Modbus master application
01	Read CoilStatus-Register (ID-COIL)	Read coil registers (bit register) from slave: (0xAdr)
02	Read InputStatus-Register (ID-STATE)	Read state registers (bit register) from slave: (1xAdr)
03	Read Holding-Register (ID-HOLD)	Read holding registers (16 bit register) from slave : (4xAdr)
04	Read Input-Register (ID-INP)	Read input registers (16 bit register) from slave: (3xAdr)
05	Write Single Coil-Register	Write one single coil register (bit register) to slave: (0xAdr)
06	Write Single Holding-Register	Write one single holding register (16 bit register) to slave: (4xAdr)
15	Write multiple Coil-Register	Write multiple coil registers (bit registers) to slave: (0xAdr)
16	Write multiple Holding-Register	Write multiple holding registers (16 bit registers) to slave: (4xAdr)

## 4.3 Reference Modbus addresses

### Register restrictions

The internal Modbus onboard the controller has limited number of registers. Input and holding registers are limited to max 125 addresses. The Modbus communication module can handle up to 1000 addresses. In some applications are some of the reference addresses higher than 125 and it is then only possible to access them via the Modbus communication module.

### Addresses used

All reference addresses from 0001-0125 for on-board and -1000 for module are generated and can be accessed even if not listed. As a result, multiple coils/registers can be forced/reset even if there is a gap between two reference addresses.



Do not read/write any addresses above 0125/1000. Doing so causes an exception and communication fails.

All address types starts with 1, and due to that some Master devices starts with 0 it's in that case necessary to subtract all addresses in the reference list with 1.

### Use the right document for the actual application

The reference addresses are found in a separate document and are specific for the actual application. All different applications, and in some cases also application versions, have different reference addresses. The specific document for the actual application must be used to see what reference addresses that are used.



The actual application name and version can be found using the HMI. In some cases it is also good to check the controller BSP version.

### See actual application

Proceed as follows to see the actual application name and version:  
On the HMI select **Main Index > System overview > Application info >**

Parameter	Explanation / Example
Application manufacturer	e.g. Siemens
Application name and version	e.g. STD_AHU_vX.XX
Date	Application creation date; can be changed by application manufacturer
Name	e.g. plant name.
Street	e.g. plant address.
City	e.g. plant address.

### See actual BSP version

Proceed as follows to see the actual controller BSP version:  
Log in to HMI using the password for level 4 (Service), default 2000.  
Select **Main Index > System overview > Target >**

Parameter	Explanation / Example
BSP version	Controller operating system.

# 5 Other information

## 5.1 Troubleshooting, tips

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### General

General things to check:

- Check the actual application version and controller BSP version before call any support.
- As a matter of principle, the controller must be restarted with “Reset required !!” or power off/on the controller after changing any settings to assume the data.

### Modbus communication error

Non-adherence to the following rules may result in communication errors:

- The slave address must be unique in the network, valid addresses are from 1-247.
- Only reference addresses that are generated can be read/write, see chapter about reference addresses for more information about the specific application.
- All address types starts with 1, and due to that some Master devices starts with 0 it's in that case necessary to subtract all addresses in reference manual with 1.

### RS485 network

Observe the following for RS485 network design and structure:

- Baud rate, parity and stop bits must match network and master.
- The 2-wire bus is NOT interchangeable and must be connected correctly.
- In case of long distance and/or high baud rate, consider end-of-line resistors like 120 Ohms on both sides (according to RS485 rules). In Climatix this can be done via HMI.

### TCP/IP network

Observe the following for TCP/IP network design and structure:

- Check that the DHCP parameter is set to “Passive” if fixed IP address should be used.
- Try to ping the controller if the communication is not working. If the ping fails something is wrong in the network or the IP settings.
- Check that the defined TCP/UDP port is open in the firewall. For Modbus the TCP port 502 is used.

## 5.2 FAQ on TCP/IP

### TCPI/UDP ports

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Port number	Type	Used for ...
21		FTP
23	UDP	Telnet/Ping
80		Web
502	TCP	Modbus
4242	TCP	Scope, RemoteOPC TCP/IP

### Network: Disconnected

Ping the communication module using the IP address to test communications:

Step	Action
1	Select <b>Start &gt; Run</b> on the Windows start bar: → The "Run" dialog box opens.
2	Enter <b>CMD</b> and click <b>OK</b> : → The "CMD.exe" DOS window opens.
3	Enter <b>C:\&gt;ping XXX.XXX.XXX.XXX</b> and press <b>Enter</b> : → The ping result is displayed. <i>Note! (XXX.XXX.XXX.XXX is the set IP address)</i>

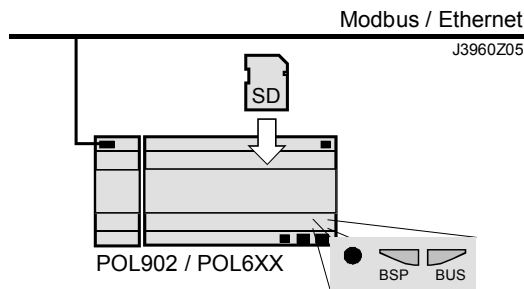
You are dealing with a network or IP settings error if pinging does not work.



## 5.3 Upgrade application or BSP via SD card

### Situation

The Climatix POL6XX controller and/or the Modbus communication module POL902 can in special cases be updated with new software.



### Prerequisite

To upgrade the following items are needed:

- SD card
- Application- and/or BSP files from the actual manufacturer

File	Used for...
POL8196.hex	Modbus Communication module, POL902, BSP
POL63x.hex	Controller, POL63x, BSP*
MBRTCode.bin	Controller, POL63x, Application*
OBH.bin	Controller, POL63x, Communication mappings
HMI/HMI4Web.bin	Controller, HMI structure



\* These files may set all settings in the controller to default!



All settings can be saved to the SD card before the upgrade and then loaded again after the upgrade.

### Upgrade procedure

The upgrade procedure and how to save/load all settings are not described in this manual. See basic documentation for the specific product depending of what upgrade is needed.

## 5.4 Override I/Os via communication

### Preamble

Some inputs can be overridden via Modbus, see reference addresses. However these inputs must first be setup for this before it works. Inputs can work, only via hardware, only via communication or as a combination.

### Prerequisite

Input must first be enabled and hardware place selected in configuration.

### Configuration via operator unit

Proceed as follows to select input handling:

Step	Action
1	Log in to HMI using the password for level 4 (Service), default 2000.
2	Select <b>Main Index &gt; Unit &gt; Inputs &gt; Element group &gt; Element &gt;</b> <i>Example Main Index &gt; Unit &gt; Inputs &gt; Temperatures &gt; Outside temp &gt;</i>
3	Select <b>Special settings &gt; Value selector</b> , see selections below

Parameter	Range	Function
Value selector (Digital inputs)	<ul style="list-style-type: none"> <li>– Hardware</li> <li>– Comm</li> <li>– And.</li> <li>– Or.</li> <li>– PreferredHW</li> <li>– PrefComm</li> </ul>	Select valid input value for the application: <ul style="list-style-type: none"> <li>– Value on hardware input.</li> <li>– Value from communications.</li> <li>– The input is 1, if the value on the hardware input and the value from communications = 1. Alarm triggers, if one of the two values is invalid.</li> <li>– The input is 1, if the value on the hardware input or the value from communications = 1. Alarm triggers, if one of the two values is invalid.</li> <li>– Value on hardware input has priority. The value from communications assumed if invalid. Alarm triggers, if both values are invalid.</li> <li>– Value from communications has priority. The value from hardware input assumed if invalid. Alarm triggers, if both values are invalid.</li> </ul>
Value selector (Analog inputs)	<ul style="list-style-type: none"> <li>– Hardware</li> <li>– Comm</li> <li>– Average</li> <li>– Minimum</li> <li>– Maximum.</li> <li>– PreferredHW</li> <li>– PrefComm</li> </ul>	Select valid input value for the application: <ul style="list-style-type: none"> <li>– Value on hardware input.</li> <li>– Value from communications.</li> <li>– Average from the values on hardware input and from communications. Alarm triggers, if one of the two values is invalid.</li> <li>– Lowest value from the values on hardware input and from communications. Alarm triggers, if one of the two values is invalid.</li> <li>– Highest value from the values on hardware input and from communications. Alarm triggers, if one of the two values is invalid.</li> <li>– Value on hardware input has priority. The value from communications assumed if invalid. Alarm triggers, if both values are invalid.</li> <li>– Value from communications has priority. The value from hardware input assumed if invalid. Alarm triggers, if both values are invalid.</li> </ul>



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