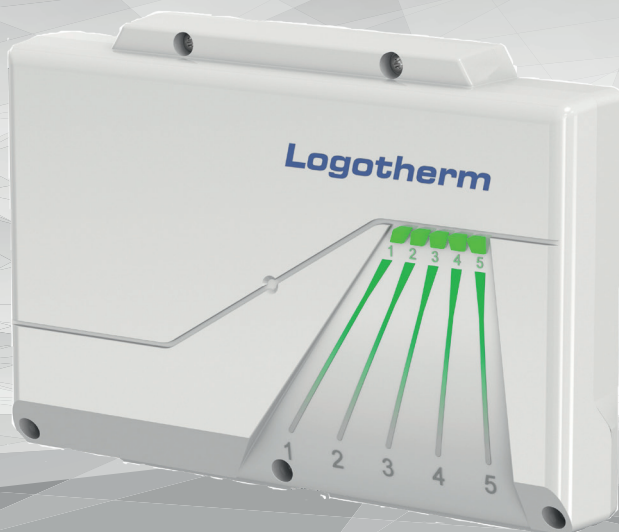# *Logotherm* LogoTronic Hub OTC

for communication with LogoTronic controllers
for electronically controlled interface stations (HIU)

ENG Operating instructions

Acronyms

HIU	Heat Interface Unit (interface station)
RL	Heating circuit return line
FL	Heating circuit flow line
FLA	Flashing
BT	Wireless data transmission
FW	Firmware
CW	Domestic water, cold
RTU	Remote Terminal Unit
GND	Ground
AT	External temperature sensor

Table of contents

We reserve the right to change designs and technical specifications of our products.

3

1. Safety instructions

Read the instructions carefully before installation and operation.

The LogoTronic Hub OTC only works in conjunction with corresponding electronically controlled Flamco/Meibes interface stations.

1.1 EU declaration of conformity

By affixing the CE mark to the equipment, the manufacturer declares that the LogoTronic Hub OTC is compliant with the relevant provisions:
• Radio Equipment Directive (RED) 2014/53/EU
• Low Voltage Directive (LVD) 2014/35/EU
• Electromagnetic Compatibility Directive (EMCD) 2014/30/EU
• Restriction of hazardous substances (ROHS) 2011/65/EU.

1.1.1 General instructions

Please read!

These installation and operating instructions contain basic instructions and important information concerning the safety, installation, commissioning, maintenance and optimal use of the equipment. For this reason, the installer / specialist and operator of the system must thoroughly read and observe them prior to installation, commissioning and operation of the equipment. The device is an electric automatic control unit. This device may only be installed in dry spaces and under the ambient conditions described in the "Technical data" section.

You must also observe the relevant accident prevention regulations, the regulations of the electrical engineering association and your local energy supply company, the relevant DIN-EN standards and the installation and operating instructions of any additional system components.

This device is in no way intended to replace any safety equipment that you may be required to install!

Installation, connection to the electricity supply, commissioning and maintenance of the equipment may be carried out only by an appropriately qualified specialist.

For the operator: You must ask the specialist to offer comprehensive training in the function and operation of the equipment. Always keep these instructions close to the equipment.

The manufacturer will not be liable for any damage that may arise through the improper use of the equipment or failure to follow these instructions!

1.1.2 Alterations to the equipment
• Alterations and additions to, and conversions of, the equipment require the written consent of the manufacturer.
• The installation of components which have not been tested with the equipment is not permitted.
• If it should become apparent, for example through damage to the housing, that it is no longer possible to operate the equipment without risk, the equipment must immediately be taken out of service.

- Any equipment parts and accessory parts which are not in perfect condition must be replaced immediately.
- Use only original replacement parts and accessories of the manufacturer.
- You must not alter, remove or render illegible any labels on the equipment which have been affixed by the manufacturer.
- Undertake only those adjustments to the equipment's settings that are described in these instructions.

1.2   Intended use

The components listed in the following instructions are intended for use in heating systems according to DIN EN 12828.

The LogoTronic Hub OTC is an automatic regulation and control unit within the meaning of IEC60730-1. It is used as a client for forwarding an outside temperature sensor value via Modbus to several LogoTronic controllers (servers for electronically controlled interface stations).

The LogoTronic Hub OTC and associated peripherals may be used only for the control of thermal systems. All the specifications described must be adhered to in its use. The LogoTronic Hub OTC may be installed and set up only by a specialist. The installer must first have read and understood the instructions. The installer must explain all the relevant functions to the operator. The housing must be intact and sealed prior to operation.

1.3   Warranty and liability

The equipment has been produced and tested in compliance with high quality and safety requirements. Excluded from warranty and liability are personal injury and damage to property which may, for example, be attributed to one or more of the following causes:
- Failure to observe these installation and operating instructions
- Improper installation, commissioning, maintenance and operation
- Improperly executed repair work
- Any actions in contravention of the "Alterations to the equipment" section
- Improper use of the equipment
- Situations in which values below or in excess of the tolerances listed in the technical data occur
- Force majeure

1.4   Disposal and hazardous substances

The equipment complies with European RoHS Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

The equipment must not be disposed of with household waste. You may dispose of the equipment only at approved collection facilities or by returning it to the seller or the manufacturer.

The battery must be correctly and professionally disposed of. The battery must not be disposed of with household waste (local legislation applies).

2. Description

2.1 Technical data

Model	LogoTronic Hub OTC
Power supply	200 - 240VAC, 50 - 60Hz
Power consumption	5W (power supply unit with electronics)
Internal fuse	2A delayed
Theory of operation	Type I
Degree of contamination	II
Overvoltage category	II

Permissible ambient conditions:

in operation	0^{0}C – 40^{0}C, maximum 85% relative air humidity at 25 ^{0}C
in transport/storage	0°C – 70°C, no condensation permitted
Housing	3-part, plastic polycarbonate / ABS
Dimensions	250 mm x 175 mm x 48 mm
Display	5 LEDs
Operation	2 buttons for service personnel

2.2 About the LogoTronic Hub OTC
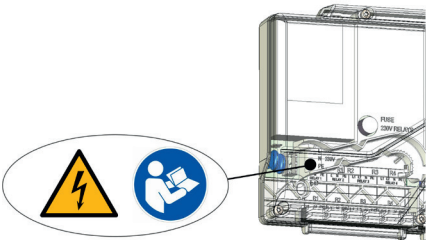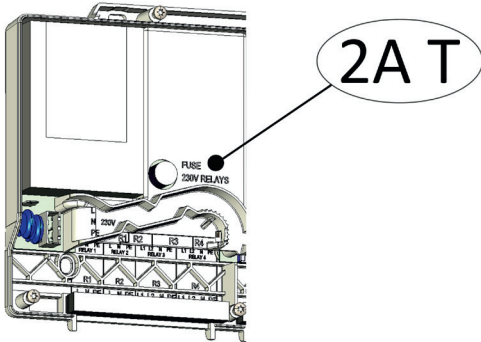
The LogoTronic Hub OTC is designed to transmit the outside temperature sensor value via Modbus to electronically controlled heat interface units (HIU) in heating networks. The LogoTronic Hub OTC is an end product and must be installed and connected professionally by the customer.

When connecting the LogoTronic Hub OTC, appropriate tensile loads must be provided for the cables.

2.3 Safety symbols and stickers

The LogoTronic Hub OTC is marked with the following symbols:

1. in the lower left corner of the transparent cover, the "High voltage" symbol and the "Read manual" symbol, see figure	
2. on the inner cover plate to the right of the fuse holder and the word "FUSE": a sticker with the inscription "2A T", see figure	

3. Installation

The LogoTronic Hub OTC is supplied with a mains power cable which is connected to the LogoTronic Hub OTC by a plug. The end of the cable to be attached to the mains is open and must be hard-wired.

The mains connection device is the three-pole connector, see Chapter 3.1 Item (A).

The mains connection device must be hard-wired. We recommend the use of a 3A fuse.

We reserve the right to change designs and technical specifications of our products.

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3.1 Electrical connections for the LogoTronic Hub OTC

Example representations
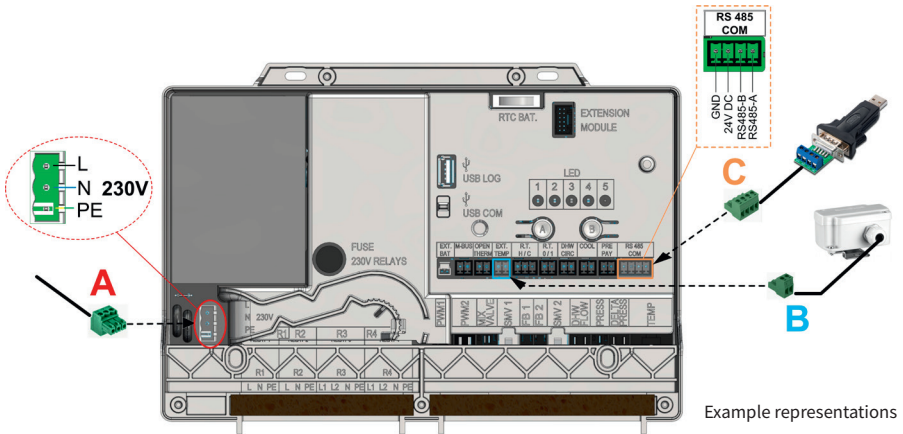
Legend:

Pos.	Identification	Connection	Comment	Pin assignments			
				4	3	2	1
A	L, N, PE, 230V	Power supply	Mains connection device: AC 230V, 50Hz	-	PE	N	L
B	EXT. TEMP	Outside temperature sensor (AT)	NTC, 10K resistor, for type see Chapter 7.2.6		-	GND	Temp in
C	RS 485 COM	Modbus connection*	or for e.g. adapters for flashing and configuring	GND	24V DC	RS485-B	RS485-A

Note:
The connectors are labelled on the cover plate.
The connection cables for this must be assembled on site!
*for connecting the RS-485 interface: see also Chapter 7.2.1

4. Commissioning

The LogoTronic Hub OTC is tested during production. All settings are preset to ensure safe and efficient operation.

If you want to change certain settings, then these changes will be made ex works.

The connections (see Chapter 3.1) to items (A), (B) and (C) must be made professionally by the customer!

5. Servicing

The equipment must be disconnected from mains power before any servicing is carried out!

5.1 Fuse

A safety fuse is installed. The fuse installed is a 2A delayed fuse. The fuse type is: Glass fuse 5x 20 mm. Fuses may be changed only by specialist personnel once the equipment has been disconnected from mains power.

6. LogoTronic Hub OTC – operation

6.1 Configuration
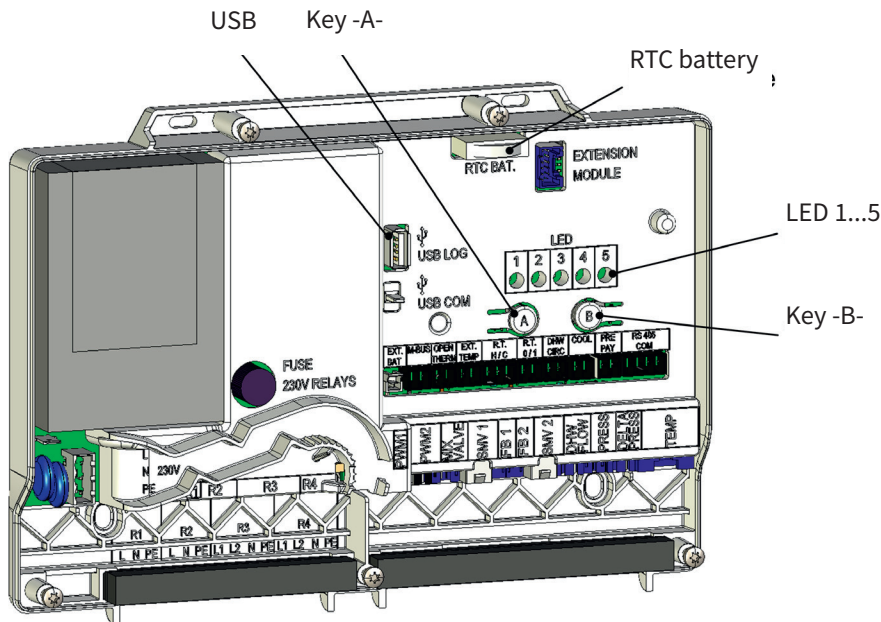
(shown without front cover)

Mains connection device (L, N, PE): see also Chapter 3.1 Item (A)
The module has a built-in power supply unit and is supplied by it. The mains connection device must therefore be 230V / 50Hz. This voltage is also switched through the output relays.

6.1.1 Keys A and B components

Each key can be operated by pressing and letting go, pressing and holding, and pressing and holding for a sustained period.

Incident table

Category	Key -A-	Key -B-	Application mode	Incident
USB	Press and let go		All states (not booting)	Prevents saving of the transfer log onto a USB stick (flush buffer)
		Press and let go	All states (not booting)	Launches saving of the transfer log onto a USB stick
State	Press and hold for a sustained period		Run/Test	Activates test/run mode
		Press and hold	Test	Launches with standard configurations New
	Press and hold for a sustained period	Press and hold for a sustained period	Run	Restart
	Press and hold for a sustained period	Press and hold for a sustained period	Restart/start (by switching on the supply voltage)	Start firmware update

Notes:

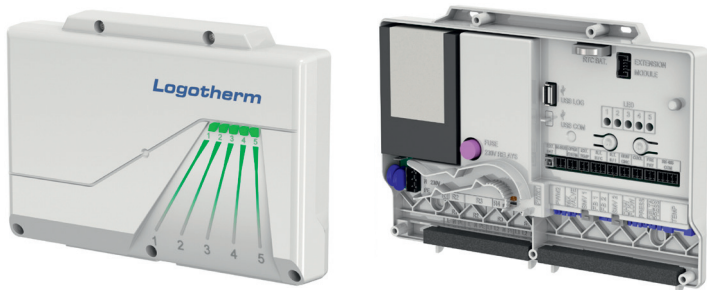|	
Short-press means:	Hold < 1s
Long-press means:	Hold < 4s
Hold long-press means:	Hold > 4s

6.1.2 LED displays 1…5

The LEDs display the status.

Each LED can be either "OFF", "ON", "Flashing slowly" (FLS) or "Flashing fast" (FLF):
- Flashing slowly (FLS) means that the LED alternates between ON for 1 s and OFF for 1 s (flashing frequency of 0.5 Hz).
- Flashing fast (FLF) means that the LED alternates between ON for 0.25s, OFF for 0.25s (flashing frequency of 2 Hz).

LEDs 1 to 4 show the corresponding status of the LogoTronic controller in normal operating mode.

Status changes and LED indicators:

LEDs	1	2	3	4	5
Possible display	🟢 Green On/Off/Flashing (FLS/FLF)	🟢 Green On/Off/Flashing (FLS/FLF)	🟢 Green On/Off/Flashing (FLS/FLF)	🟢 Green On/Off/Flashing (FLS/FLF)	Corresponding to RGB colour or Off
Function					Status
Switched on (Run mode)					🟢 Green
Switched on (Test mode)					🟣 Magenta
Switched on (battery)					🟢 Green FLF
BT connected					🔵 Blue for 10s
USB transfer started					🟡 Yellow FLS 3s
USB transfer ended					🟡 Yellow for 3s
USB transfer error					🔴 Red FLF 3s

An update procedure runs sequentially as follows:

Update started				ON	
Copy update			FL 200ms	ON	
Unpack update		FL 200ms	ON	ON	
Validate update	FL 200ms	ON	ON	ON	
Update error				🔴 Red	

7. LogoTronic Hub OTC – functions

7.1 Modbus – General overview

Modbus is a serial communication protocol used to transport data via serial channels between electronic devices. Modbus is an open protocol that can be used free of charge for commercial applications. One client and up to 247 servers are possible in a Modbus network. The protocol uses, for example, the RS-485 interface for data transmission. The protocol is based on a client-server architecture.
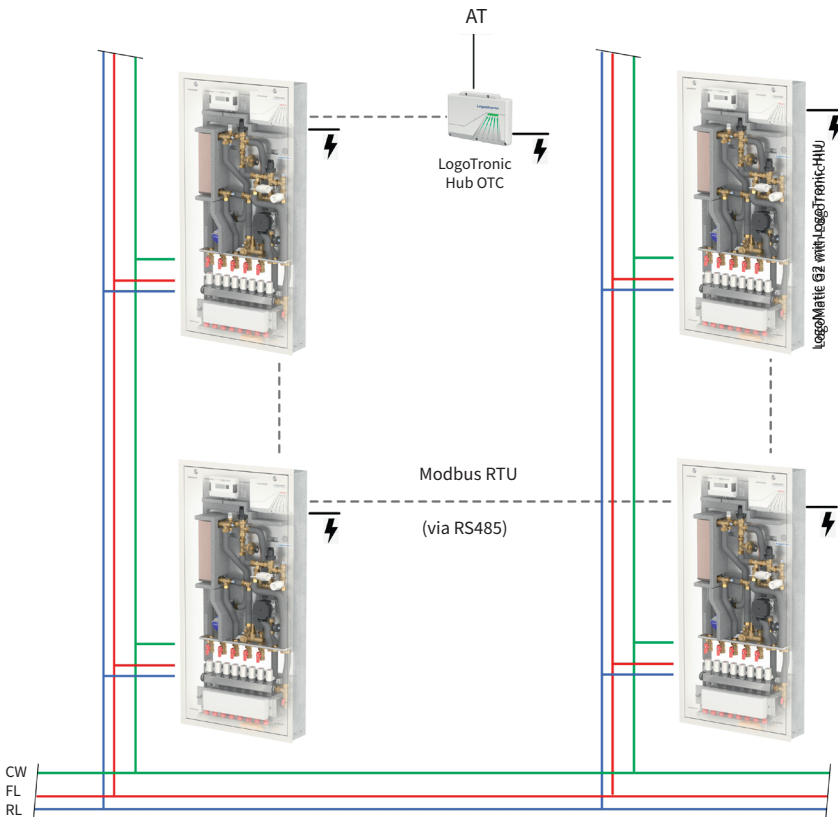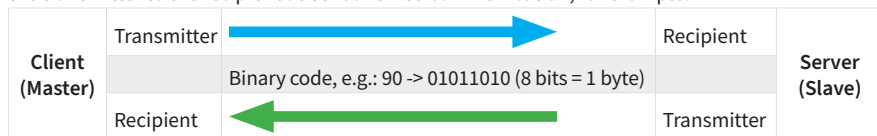

Figure 7-1 Example: LogoMatic G2 stations and LogoTronic Hub OTC

7.1.1 Remote Terminal Unit (RTU) mode

Modbus protocol messages in Remote Terminal Unit (RTU) mode are transmitted in binary form from the transmitter to the recipient as serial RS-485 communication, for example.

Client (Master)	Transmitter		Recipient	Server (Slave)
		Binary code, e.g.: 90 -> 01011010 (8 bits = 1 byte)		
	Recipient		Transmitter	

Note:
The maximum length of a message must not exceed 256 bytes.

7.1.2 Protocol configuration

A Modbus protocol message has defined start and end points. The receiving device recognises the beginning of the message and reads out the server address. This allows a server to recognise whether it has been addressed by the client and whether the message has been sent completely. If it has arrived complete, the server uses error check bytes and parity bits to check the completeness of the message. If the error check or parity fails, the message is discarded.

In RTU mode, the message starts with a silent interval of at least 3.5 characters. The first byte contains the device address. Client and server devices continuously monitor the network, even during a silent interval.
After the last transmitted byte, a silent interval of at least 3.5 characters indicates the end of the message. After this silent interval, a new message can begin.

Protocol configuration

Start	Application data unit				End
	Address	Protocol data unit		CRC Error Check	
		Function code	Dates		
Waiting time min. 3.5 characters	1 byte	1 byte	n byte (0...252 byte)	2 byte (16 bits)	Waiting time min. 3.5 characters
	1 to 247* devices; 0 as broadcast message	1…17		Checksum	

* please note: up to 32 devices are possible without a Modbus repeater!

The entire message must be transmitted in one continuous flow. If a silence interval of more than 1.5 characters occurs before the completion of the message, the receiving device will discard the incomplete message. Subsequently, the device assumes that the next byte contains the device address of a new message.

Similarly, if a new message starts earlier than 3.5 characters after the previous message. In this case, the receiving device considers the message as a continuation of the previous message. Consequently, an error occurs because the value of the combined message in the final CRC field (check field) is invalid!

7.1.2.1 Uni-/Broadcast transmission principles

In **unicast mode**, the client addresses an individual device which, after receiving the message, processes it and generates a response. The device address can vary from 1 to 247. A message always consists of a request and a response. If no response is received within a specified time, timeout is detected.

In **broadcast mode**, the client sends a written command (request) to all participants on the bus, but they do not generate a response. Address 0 is reserved for broadcast messages.

7.1.2.2 Function codes

The function code in a Modbus protocol message defines the action to be performed by the server. The function codes are stored in an assignment table.

Assignment table:

The assignment table contains the function code, the data type, the register and information about the register. With the information, a client can read out a register of a server via an RTU telegram.

7.1.2.3 Data/parameter scaling

Due to the limitations for integer data in the Modbus protocol, it is necessary to convert the parameters before transmitting them. This is achieved by scaling, where a parameter containing a position after a decimal separator is multiplied by a factor so that a fractional value is no longer required. The scaling factor to be applied can be taken from a corresponding table.

7.1.2.4 CRC

The CRC is a 16-bit value that is appended to the message. It is used to determine whether the transmission of a message was detected without errors. Together with the parity check, all possible transmission errors should be detected. If a parity error is detected when a message is received, no reply message is generated by the device.

7.1.2.5 Start/end

The end identification of a message is specified as a rest situation on the Modbus with a length of 3.5 characters. After this time has elapsed, the earliest a server will begin its response or the earliest a client will send out a new message.

The evaluation of a message can already begin when it is detected that the rest condition on the Modbus has occurred for more than 1.5 characters. However, a response is started after 3.5 characters at the earliest.

7.1.3 Transmission parameters

Setting options for parity/stop bit*	The parity bit can be used to check whether a single error has occurred within a byte during transmission.	No parity and 1 stop bit, Same parity and 1 stop bit, Unequal parity and 1 stop bit
Setting options for baud rate*	The baud rate is a measure of the transmission speed.	e.g. 2400, 4800, 9600, 19200, 38400, 57600, 115200 bits/s

* Factory setting options

Note: The transmission parameters must be set the same for all devices participating in a bus.

7.1.4 Modbus – properties

Properties of Modbus RTU in the client-server network

Network topology	Linear bus with bus termination: Cable with 120 Ohm resistance at both ends
Transmission medium	For connecting the devices, bus cables suitable for the respective application must be used and laid professionally, the cross-section must be AWG 26 (0.129mm²) or more. To increase transmission reliability, it is recommended to use shielded bus cables twisted in pairs.
Cable lengths (without repeater)	A maximum cable length depends on the baud rate: -at a baud rate of 9600 bits/s (factory setting), up to 1000m
physical interface	RS-485 with bus connector; connection can be mounted by the customer, 2-wire and has a 2-screw terminal
Addressings	1 ... 247; the following must be observed: **32 devices in one segment, expandable to 247 with repeater, incl. client, where address 0 goes as broadcast message to all servers**.

Note:
The respective applicable regulations and standards must be taken into account for laying bus cables inside buildings (inside/outside cabinets), laying cables outside buildings, potential equalisation, minimum distances (such as measures against interference voltages), shielding of cables (e.g. shield connection after expected interference) as well as installation of terminating resistors!

When laying shielded cables, the shield may only be connected to ground at one point!

Work on electrical equipment and connection work is only permitted for authorised and qualified electricians. The VDE guidelines and the provisions of the responsible energy utility company must be observed.

The LogoTronic Hub OTC operates with mains voltage. Therefore, always ensure the system is disconnected from the mains supply when carrying out any maintenance or repair work and secure it against unauthorised activation

7.2 Modbus for LogoTronic Hub OTC and HIU controllers

These chapters describe the Modbus communication via RS-485 interface with the LogoTronic controller for electronically controlled interface stations (HIU) that are prepared for communication via the Modbus RTU client/server protocol.

The Modbus interface offers the following possibilities:
• User interface with restricted data access to registers
• Client-server communication between HIU controllers (passing on temperature values), whereby they form a closed BUS system!

### 7.2.1 Connection of the RS-485 interface on the circuit board

Cable connection to RS-485:

The CON29 is marked in the controller as "RS-485 COM" and counts the pin numbers from right (pin 1) to left (pin 4), see also Chapter 3.1 Pin assignment

Pin description from right to left:
1) RS485-A
2) RS485-B
3) 24V DC supply output (to external devices)
4) GND (Ground)

The figure below shows the connection option, e.g. using a standard USB RS-485 cable connected to a LogoTronic controller for electronically controlled interface stations.
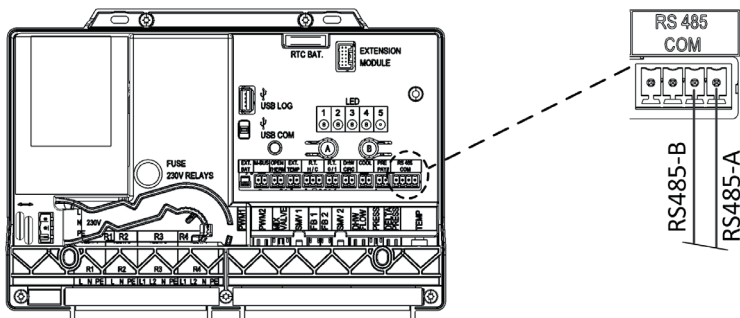
7.2.2 Setting the controller for the Modbus protocol

Various protocols are available on the RS-485 interface. Currently, the HFC protocol (manufacturer's own) and the open Modbus protocol are available. The protocol used on the RS-485 can be changed using the keys on the controller (also see Chapter 6 LogoTronic Hub OTC operation and configuration).

Interface mode (serial/Modbus):
In the factory setting, the controller operates in serial mode; this mode can be changed to Modbus mode with the A and B keys.

Modbus mode (client/server):
The controller can be operated in client or server mode for Modbus communication. In the factory setting, the controller operates in server mode; this mode can also be changed using the following key combinations.

Key combination:
To change the interface or the Modbus mode, you must activate the service mode with key "B" and select the interface with key "A".

Use the following key combination to activate the Modbus protocol or to change the interface (RS-485 <-> Modbus):

1) Long-press key "B" to enter the service mode, LED 5 lights up light blue
2) Now press key "A" briefly several times to select the interface:

    1 = RS-485

    2 = Modbus as server (default setting)

    3 = Modbus as client
    Then, for example, only LED 2 is still lit (of the 4 available LEDs 1-4).

3) Long-press key "B" (to enter run mode), this saves the setting
    and LED 5 lights up green again (or red if there is an error condition).

4) The controller must be switched off and on again to activate the Modbus protocol.

Note (for system integrators) on the Modbus client on PC:
The program Flamco used to test the Modbus functionality is ModbusClientX
https://sourceforge.net/projects/modbusclientx-modbus-tool/

7.2.3   RS-485 interface settings (notes for system integrators)

The **factory settings** of the Modbus interface are set to (8, N, 1, 9600Baud) by default:
- 8 data bits
- No parity bit
- 1 start bit/1 stop bit
- Baud rate = 9600 bits/s

It is possible to preset the settings ex works to suit interface requirements.

7.2.4   Example of a broadcast message (notes for system integrators)

The external (outside) temperature can be transmitted via Modbus from a client to any LogoTronic controller for electronically controlled interface stations (HIU) as a server. The easiest way is to send the broadcast command to register 45002. The outside temperature should be written at least every 10 minutes. The HIU controllers will invalidate the outside temperature value after 15 minutes without new data and reset it to the default value (-10°C).

The following example shows a complete telegram for a Modbus broadcast at address 0 for register 45002.

Send broadcast telegram: (Client -> server)

	Telegram Hex	RTU structure	Value	Description
1	0x00	Device address	0	Broadcast
2	0x10	Function code	16	Function code for writing multiple holding registers
3	0xAF	Dates	45002	Modbus register for outside temperature
	0xCA	Dates		
4	0x00	Dates	1	Number of registers to be read
	0x01	Dates		
5	0x02	Dates	2	Byte counter
6	0x08	Dates	2270	Value = 22.7C°
	0xDE	Dates		
7	0x62	CRC check	25320	Checksum
	0xE8	CRC check		

Received broadcast telegram: (Server)

	Telegram Hex	RTU structure	Value	Description
1	0x00	Device address	0	Broadcast
2	0x10	Function code	16	Function code for writing multiple holding registers
3	0xAF	Dates	45002	Register for outside temperature (via Modbus)
	0xCA	Dates		
4	0x00	Dates	1	Number of registers to be read
	0x01	Dates		
5	0x02	Dates	2	Byte counter
6	0x08	Dates	2270	Value = 22.7C°
	0xDE	Dates		
7	0x62	CRC check	25320	Checksum
	0xE8	CRC check		

7.2.5 Client-server interconnection options in the Modbus network

1.
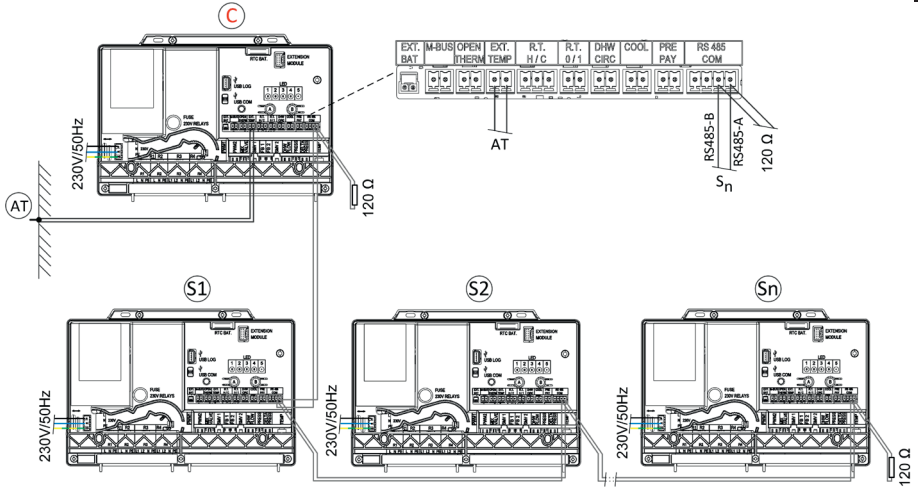
2.
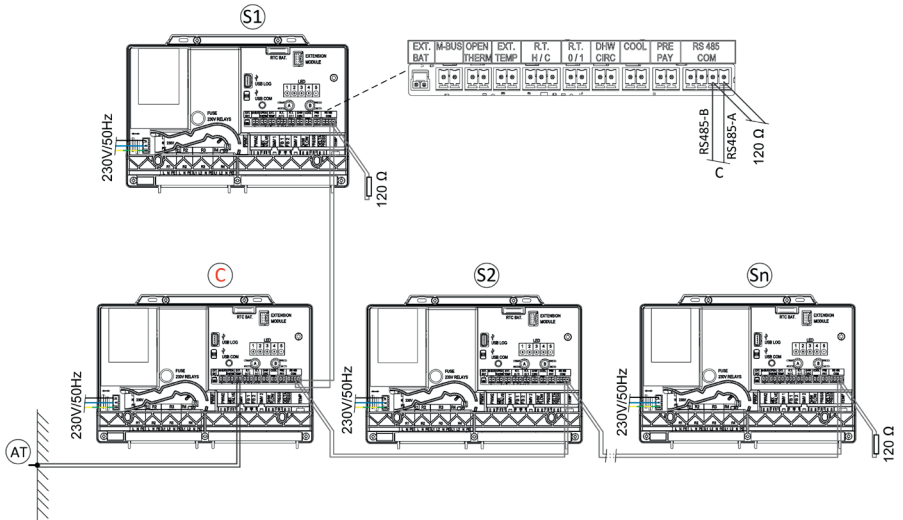
Legend:

C	Client, LogoTronic Hub OTC
S1…Sn	Server, LogoTronic controller for electronically controlled interface stations (HIU)
AT	Outside temperature sensor NTC 10K
120 Ohm – End resistors	
corresponding connection cables – provided by the customer	

7.2.6 Notes on components

Components	Example fig.
To the outside temperature sensor: • included in the scope of delivery of the LogoTronic Hub OTC • NTC 10k resistor, Honeywell AF10-B65 • Operating range -40...70°C, IP54 • Art. no.: M10560.53 (for a spare parts case) Warning! The use of outside temperature sensors with other temperature characteristics, such as PT1000, is not possible here.	
To terminating resistors 120 Ohm: 2 items are included in the scope of delivery of the LogoTronic Hub OTC. As terminating resistors, they can be directly connected to the ModBus cable.	

Meibes System-Technik GmbH
Ringstraße 18
D - 04827 Gerichshain
Germany
Tel: +49(0) 3 42 92 7 13-0
Fax:+49(0) 3 42 92 7 13-808
info@flamcogroup.com
www.flamcogroup.com

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