Technical Information
HCX8

Heat Control

Endress+Hauser
People for Process Automation

Described product
Product name: Heat Control

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Legal information

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Introduction

This documents provides instructions for:

- Mounting and electrical installation
- Start-up and shut-down
- Operation, configuration and parameter setting
- Retrofitting and troubleshooting

This document contains information on:

- Safety warnings and recommendations that must be followed to ensure safe operation and to maintain the control unit in a safe condition.
- Contact partners and intended use
- Environment and compliance
- Method of operation and design of the control unit

The HC8X heat control is referred to as "HC8X" in the following.

Target groups:

The target groups of this document are persons with electro-technical training.

Mounting, electrical installation, servicing and replacement:

Electricians and service technicians

Start-up, operation and configuration:

Technicians and engineers

Information depth:

This document contains all information required for mounting, electrical installation and start-up of the HC8X with the **basic factory settings**.

All these activities are explained step by step.

The configuration of the HC8X for the **specific application usage** is performed with the DOS 6.22-oriented HC8XINIT.EXE utility program or with the Windows-oriented SETHC8X.EXE utility program.

The warnings and safety notices summarized on the following pages are intended to supplement, not supersede, the safety regulations valid in the individual countries.

Before start-up of the control unit:

Carefully read and observe the safety notices and warnings contained in this manual as well as the relevant chapters on installation, start-up and operation of the control unit.

Before starting to work, inform yourself about the relevant regulations for preventing accidents issued by the professional associations, the legal stipulations (safety regulations concerning hazardous substances) and the standards.

Always observe all warnings and safety notices in the Manual!

Used Symbols

Some information in this documentation is specially highlighted for faster access to this information.

Warning!

A warning protects from bodily injuries or the HC8X heat control from serious damage.

➢ Always read and follow the warnings carefully.

Electrical hazard!

Warning of the danger of death by electrical shock when not complying with the relevant VDE and safety and control unit directives.

➢ Always read and follow the warnings carefully.

Note A note provides information on special characteristics.

Explanation An explanation provides background knowledge on technical interdependencies.

Recommendation A recommendation is an aid to the optimum performance of an activity.

Tip A tip explains setting options for the SETHC8X.EXE user interface.

Basic setting Marks a section in which the values of the basic factory setting are listed.

This symbol marks a section in which operating steps with the user interface of HC8XINIT.EXE or SETHC8X.EXE are described.

This symbol refers to supplemental technical documentation.

➢ Here, you have to do something. This symbol marks single-step action instructions. Multi-step action instructions are marked by successive numbers.

⇨ Here, you select a function of the interface of SETHC8X.EXE.

Inputs in MS-DOS mode, e.g."hc8xinit" are represented in this style.

Intended Use

The HC8X is an 8-channel heat control. It serves to regulate single and multi-phase heating circuits.

The control unit is an extension of the modular MODIOS I/O system and can be installed in an existing I/O module box system.

This control unit has been designed and produced in accordance with a variety of international safety standards. There is no potential danger from the control unit when used for its intended purpose.

To maintain the control unit in a safe condition, it is sufficient to observe some simple, widely known rules of behavior.

To ensure optimal operation of the control unit, only appropriately trained and skilled personnel should be allowed to operate the control unit.

Unauthorized Adjustments and Servicing!

- Only a Endress+Hauser service engineer or a similarly trained and authorized person should be per-mitted to perform service work or adjustments on the control unit.

Please observe the following safety recommendations:

- Do not attempt to make internal adjustments or replacements except as directed in this User's Handbook.
- Do not operate the control unit with any covers or parts removed.
- To the extent possible, disconnect the control unit from all voltage sources before opening it. If the opened control unit must be operated for further adjustment, maintenance or repair, this must be done only by a trained person who is aware of the hazard involved and knows how to protect himself with appropriate measures.

Safety Information

Electrical hazard!

Dangerous voltage in the control unit.

Even with the power switched OFF, voltage may still be applied to some parts of the control unit when the control unit is connected to the mains.

- ➢ For operation, the control unit must always be grounded.
- ➢ Never disconnect or remove the protective conductors in the control unit or in the supply line.

Electrical hazard!

- ➢ To avoid a potential hazard of injury by electric voltage and to prevent the control units from damage, switch OFF the control unit and disconnect it from the mains at all poles before performing or modifying any electrical connections.
- ➢ Verify whether the control unit is voltage-free.
- ➢ Secure the switched OFF control unit against any unauthorized or unintentional switching on.

Electrical hazard!

- ➢ This control unit may be connected to the mains only by authorized/qualified personnel.

- Only a Endress+Hauser service engineer or similarly trained and authorized person should be per-mitted to service or repair the control unit.
- The control unit operates with high voltages. Even with the power switched OFF, high voltages can be present inside the control unit.
- When the control unit is switched on, the electrical connections are live. Opening covers or removing parts is likely to expose live parts.
- Capacitors inside the control unit may still be charged even if the control unit has been switched off and disconnected from all voltage sources.
- Do not attempt to make internal adjustments or replacements except as directed in this User's Handbook.
- Do not operate the control unit with any covers or parts removed.

- ➢ Disconnect the control unit from all voltage sources before opening it. If the opened control unit must be operated for further adjustment, maintenance or repair, this must be done only by a trained person who is aware of the hazard involved and knows how to protect himself with appropriate measures.

➢ Use only fuses with the required current rating and of the specified type for replacement.

Do not use makeshift fuses or short-circuit the fuse holders.

➢ In case of inadequate grounding or damaged protective conductor (earth/ground terminal), place the control unit out of operation and secure it against any unauthorized or unintentional operation.

The earth/ground connection can be inadequate if the control unit:

- Shows visible damage or has been subjected to prolonged storage under unfavorable conditions (e.g. humidity).
- Has not been correctly handled during transport.


WARNING

Damaged control unit!

➢ Do not put a damaged control unit into operation.

➢ Whenever it is likely that the control unit is no longer electrically safe for use, place the control unit out of operation and secure it against any unauthorized or unintentional operation.

The control unit is likely to be electrically unsafe when it:

- Shows visible damage
- No longer operates correctly
- Has been subjected to prolonged storage or operation under unfavorable or inadmissible conditions
- Has been subjected to inadmissible transport stresses.

Electronic Components

Electrostatic discharges can damage the components. Special precautions are required when handling electronic components:

- Wear a special ESD safety wrist strap and work on a grounded, antistatic surface. If this is not possible, touch an adjacent grounded conductor (e.g. heating or water pipe) before handling the components.
- Leave the components in their original packaging until you are ready to use them.
- Handle electronic components only by their case - strictly avoid touching the contacts.
- Keep the components and printed circuit boards away from static-generating material as e.g. PVC materials, plastic bags, etc.

Environment

Storage Conditions

You can store the control unit safely under the following conditions:

- Ambient temperature –10 °C to + 80 °C.
- Relative humidity max. 80%, without condensation.

Operating Conditions

The control unit will operate correctly under the following conditions:

- Indoors
- Ambient temperature + 5 °C to + 50 °C.
- Relative humidity max. 80%, without condensation.
- Operation outdoors prohibited
- Keep dry.

Protect control unit from shocks and vibrations!

Note When you remove the control unit from storage and before you put it into operation, allow it to stand for at least one day under the permitted ambient conditions.

Explosion

Explosive atmosphere!

➢ The control unit must not be operated in explosive atmospheres.

Control units designed for use in an explosive atmosphere are available upon request.

Compliances

The technical design of this control unit complies with the following EC directives and EN standards:

- EC Directive NSP
- EC Directive EMV

Applied EN standards:

- EN 61010-1, Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 61326, Electrical equipment for measurement, control and laboratory use - EMC requirements

Electrical protection

Insulation: Class of protection 1 according to EN 61010-1.

Insulation coordination: Measuring category II according to EN61010-1.

Soiling: The control unit operates safely in an environment up to degree of soiling 2 according to EN 61010-1 (usual, not conductive soiling and temporary conductivity by occasional moisture condensation).

Electrical energy: The wiring system to the voltage supply of the system must be installed and fused according to the relevant regulations.

1 Product Description

The HC8X is an 8-channel heat control. It serves to regulate single and multi-phase heating circuits.

The control unit is an extension of the modular MODIOS I/O system and is installed in an existing I/O module box system.

1.1 Method of Operation of the Control Unit

The HC8X controls the temperatures of up to eight heating circuits in a two-point procedure. When the control circuits are configured and parameters set accordingly, the actuators of the heating circuits can be operated in a multi-phase follower mode. All control circuits can be enabled and disabled independently. The communication to a parent PC measuring system is performed via two bidirectional plastic optical fibers in master/slave procedure (for the control process of the HC8X see Chapter 5.4 Control Process, page 5-34).

1.2 Control Unit Design

The control unit consists of a microprocessor-controlled regulator part with LED indication and power section for heating circuits with a 3680 VA maximum nominal rating per heating circuit.

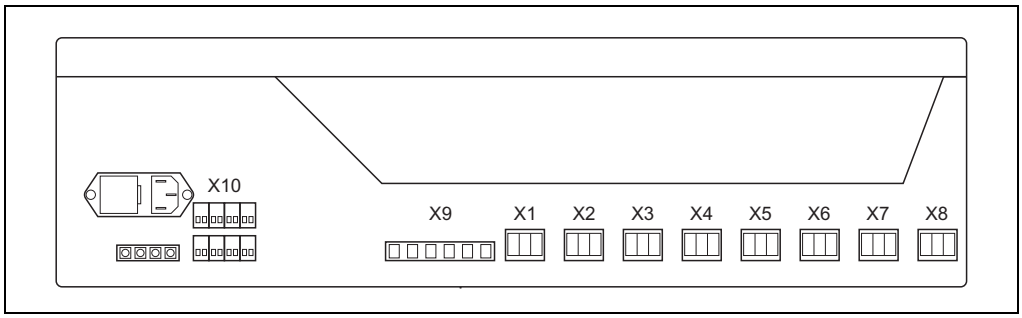

Fig. 1-1: HC8X Overview

1.2.1 Special Control Unit Configuration

In the full version, the HC8X heat control is equipped with eight power outputs. When only some of the control unit outputs are used, the respective terminal blocks of the power outputs are blank and the drillings of the thermal overcurrent trips are closed with plastic caps.

Note The HC8X can be retrofitted by the installation of the retrofit kits HC 4A, 8A, 16A with / without load relay (see Chapter 7.1 Retrofitting the HC8X, page 7-36).

Possible Heating Modes

The HC8X can be operated in three heating modes (see Chapter 5.4 Control Process, page 5-34):

- Heating mode "H1" = standard control.

  If the temperature to be controlled exceeds the set temperature + limit, a safety relay which is connected in series with the working relay interrupts the supply voltage of the heating circuit. When the set temperature hysteresis is reached, the safety relay closes and the working relay takes over the control switching function.

- Heating mode "T1" = control with permanent safety temperature switch-off

  As standard control "H1", however the safety relay permanently interrupts the voltage supply of the heating circuit when the set temperature + limit is exceeded. A return to controlling is possible only by a control reset.

- Heating mode "B1" = temperature limiting without control function.

  Exceeding the set temperature + limit interrupts the supply voltage of the heating circuit. A return to monitoring is possible only by a control reset.
  The series connection of a controller with "T1" function and a controller with "B1" function makes possible the temperature control of components in explosion zones. For safety reasons, the two controllers of a heating circuit may not be located in the same HC8X heat control.

Note ➢ Check the respective heater mode after a control unit change. Readjust as required (see Chapter 4.5 Configuration and Parameter Setting with SETHC8X.EXE under Windows, page 4-29).

WARNING

Control unit damage caused by incorrect configuration!

➢ The control unit configuration may be changed only by Endress+Hauser.

The heat control is supplied configured. Changes to an existing configuration are normally not required. However, if a configuration needs changing, e.g. to create load symmetry, proceed according to Chapter 7.2 Configuring the Power Bars, page 7-39.

1.2.2 Schematic Block Diagram

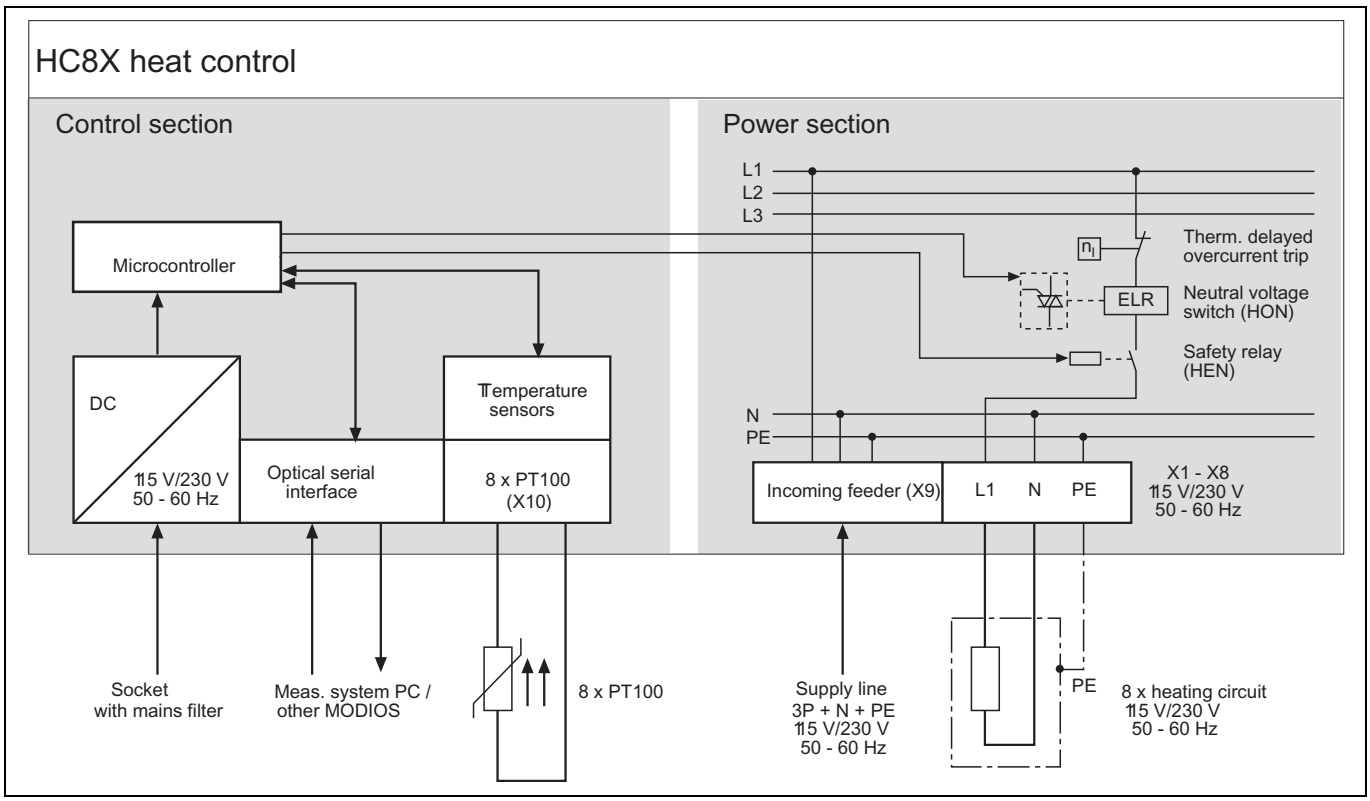

Fig. 1-2: HC8X Block Diagram

Note

- For the adaptation to the respective heating circuits, the thermally delayed overcurrent trips installed in the power section have been designed for 4 A, 8 A and 16 A, depending on the control unit configuration. The use of larger heating circuits is not allowed.
- When two- and three-phase heating circuits are connected, the temperature sensors (PT100) must be assigned to the respective controlling channel (see Chapter 4.5 Configuring the Control Channel as a Follower, page 4-30).

Recommendation

- ➢ For the external fusing of the power electronics supply voltage (X9), install a three-pole 35 A circuit-breaker (see Chapter 10.2 Electrical Data / Temperatures, page 10-45) near the HC8X or in the MCS 100 E measuring system cabinet.
- ➢ For the external fusing of the supply voltage of the control electronics (non-heating apparatus connection), install a single-pole 10 A circuit-breaker (see Chapter 10.2 Electrical Data / Temperatures, page 10-45) near the HC8X or in the MCS 100 E measuring system cabinet.

1.3 HC8X Process Connection

The process connection of the HC8X, e.g. to a MCS 100 E system, is shown in Fig. 3-1.

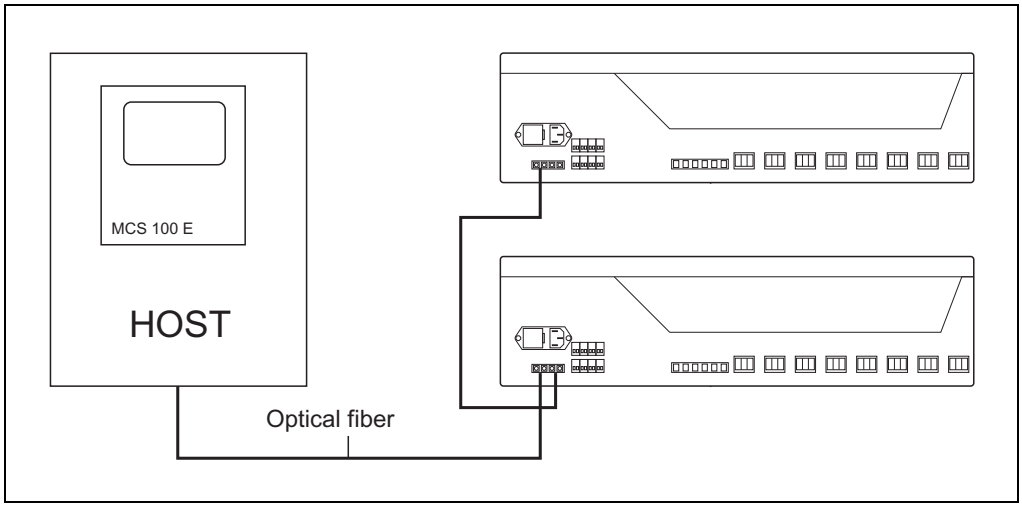

Fig. 1-3: HC8X Process Connection

1.4 Signaling

General LEDs

The LEDs (see Fig. 1-4) indicate the set mode and the states of the individual control channels.

- A green, separate LED (LED 25) signals the HC8X operational state "Idle", "Prog" or "Norm" and the control channel alarm .
- Eight green LEDs (LED 1 – LED 8) signal the states of the individual heating circuits.
- Eight red LEDs (LED 9 – LED 16) signal the state of the working relays (HON = Heating ON, see Chapter 5.4 Control Process, page 5-34).
- Eight red LEDs (LED 17 – LED 24) signal the state of the safety relays (HEN = Heating ENable, see Chapter 5.4 Control Process, page 5-34).

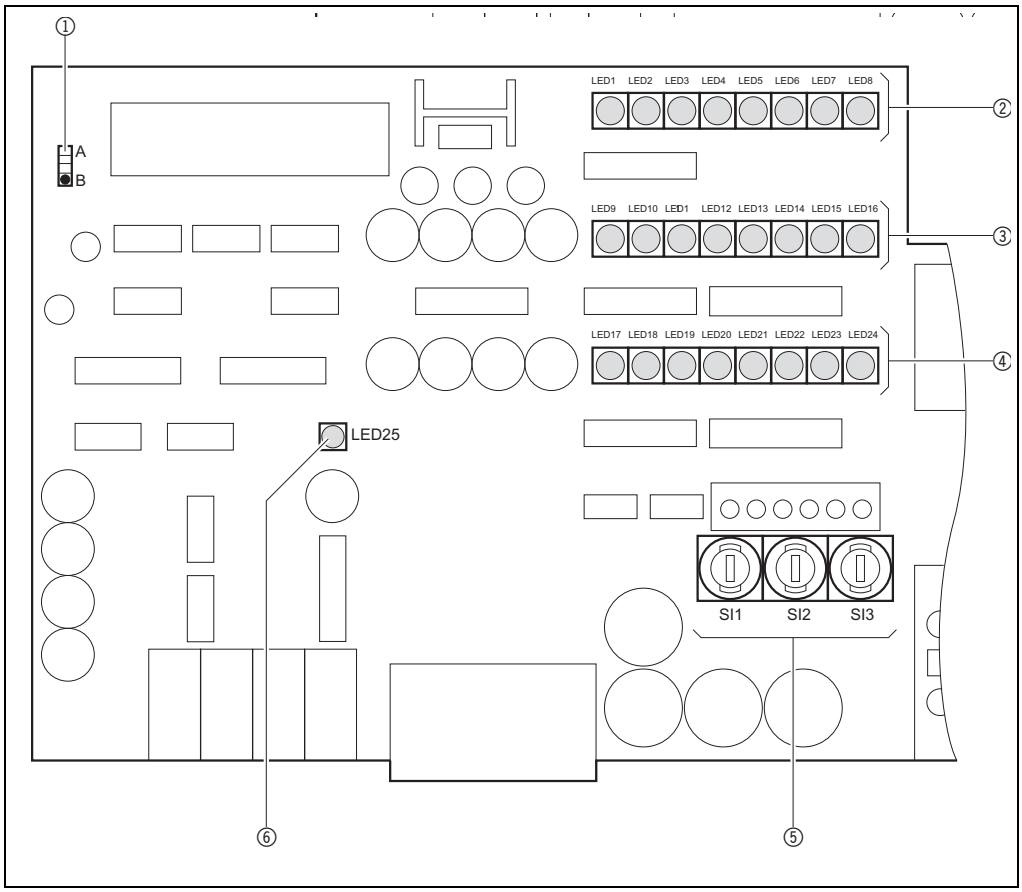

Fig. 1-4: Layout of LEDs and Slide Switches on the Printed Circuit Board

① Slide switch = setting of "Idle","Prog" or "Norm" modes and reset of HC8X (see Chapter 5.1.1 Setting the HC8X Mode, page 5-32)

② LED 1 – LED 8 = status signaling of the eight heating circuits

③ LED 9 – LED 16 = status signaling of the eight working relays

④ LED 17 – LED 24 = status signaling of the eight safety relays

⑤ Control fuses

⑥ LED 25 = signaling of HC8X "Idle", "Prog" or "Norm" modes and control channel alarm.

LED Signals	HC8X in Mode	Function
LED 25 (green) *Short blink once per second*	**Idle**	• EEPROM data invalid • HC8X inactive • Green channel LEDs (1–8) blink at the same rate
LED25 (green) *Short blink twice per second*	**Prog**	• The serial interface is set to 9600 baud • Control unit parameters can be modified in the processor dialog
LED 25 (green) *Blinks three times per second*	**Norm**	• At least one control channel is in the alarm state • The respective channel LED blinks at the same rate
LED 25 (green) *Steady light*	**Norm**	• All EEPROM data are valid • All channels are free from error
LED 1 – LED 8 (green) *Short blink once per second*	**Idle**	• LED 25 blinks at the same rate • HC8X inactive
LED 1 – LED 8 (green) *Short blink once per second*	**Norm**	• Associated channel was previously disabled in programming mode • Control function not available
LED 1 – LED 8 (green) *Short blink twice per second*	**Prog**	• LED 25 blinks at the same rate • HC8X in programming mode
LED 1 – LED 8 (green) *Short blink three times per second*	**Norm**	• LED 25 blinks at the same rate • Alarm on respective channel • Error acknowledgment with slide switch or with a software reset command via the serial interface
LED 1 – LED 8 (green) *Steady light*	**Norm**	• Correct state of the control of the respective channel
LED 1 – LED 8 (green) *Long blink once per second*	**Norm**	• The respective control channel was set to follower mode in the programming mode • The heating circuits follow the control function of the previous channel
LED 9 – LED 16 (red) *Steady light*	**Norm**	• Working relay of channels 1–8 is excited
LED 17 – LED 24 (red) *Steady light*	**Norm**	• Safety relay of channels 1–8 is excited

Table 1-1: Significance of General LEDs

2 Installation/Removal

2.1 Selecting the Installation Location

WARNING

Short-circuit caused by moisture or dust!

- Observe the degree of protection (IP 20) when selecting the installation location.
- Do not install the control unit in a humid or dusty environment.

Distance between HC8X and Measuring System PC

The length of the optical fiber between the HC8X or an I/O module box and the measuring system PC may not exceed 60 m.

2.2 Installing the HC8X

WARNING

Control unit damage by overheating!

- Install the HC8X horizontally, if possible.
- If required, install the HC8X vertically so that the ventilator on the side points downward
- Ensure adequate heat dissipation.
- Install the HC8X so that the internal control unit ventilator can draw in cool air unhindered.

1. Position the HC8X on the installation plate or a control unit carrier; observe a minimum distance of 5 cm between the heat sink and adjacent control units.
2. Ensure a firm base and good attachment of the control unit.

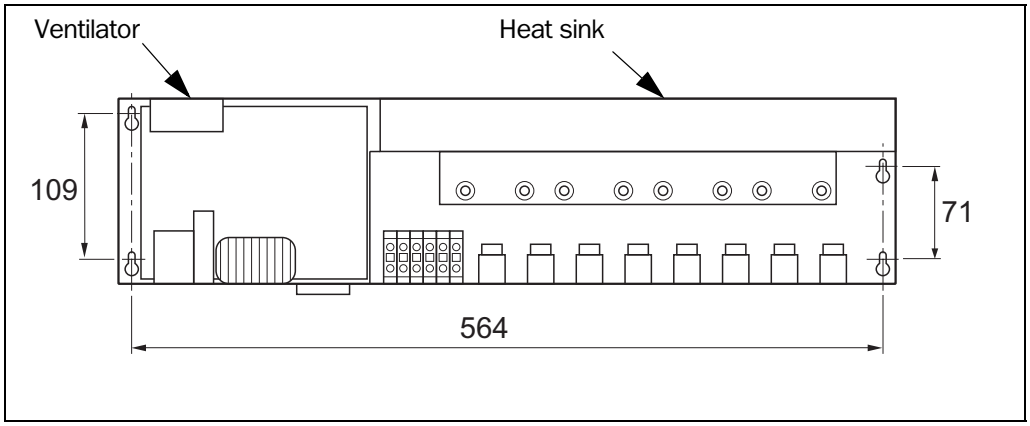

Fig. 2-1: HC8X Attachment

2.3 Removing the HC8X

1. Shut down the measuring system.
2. Switch off the supply voltage of the control electronics and pull the plug from the mains socket.
3. Switch off the supply voltage of the power electronics and secure against switching on again.
4. Pull all plugs of the external temperature sensors from terminal strip X10.
5. Unscrew two cross-slotted screws from the case cover, pull off the plug connection of the grounding line and remove the case cover.
6. Check whether the supply line on terminal strip X9 is free from voltage. When this is the case, disconnect the wires.
7. Pull all plugs from terminal strips X1 to X8.
8. Loosen the four attachment screws on the case base plate of the HC8X by a few turns and lift the HC8X from the attachment.
9. Change individual electrical or mechanical assemblies only after contacting Endress +Hauser. A fur-ther disassembly of the HC8X heat control is not intended.

For the environmentally compatible disposal during the final shut-down, proceed according to Chapter 9 Disposal, page 9-43.

3 Electrical Installation

3.1 Overview of Installation Steps

- Connect the power electronics supply voltage
- Connect the heating circuits
- Connect the temperature sensors (PT100)
- Connect the optical fibers
- Connect the control electronics supply voltage via the mains socket

WARNING

Short-circuit caused by frayed ends

➢ Provide all stranded individual wires with suitable connector sleeves before their connection to the respective terminal / terminal block.

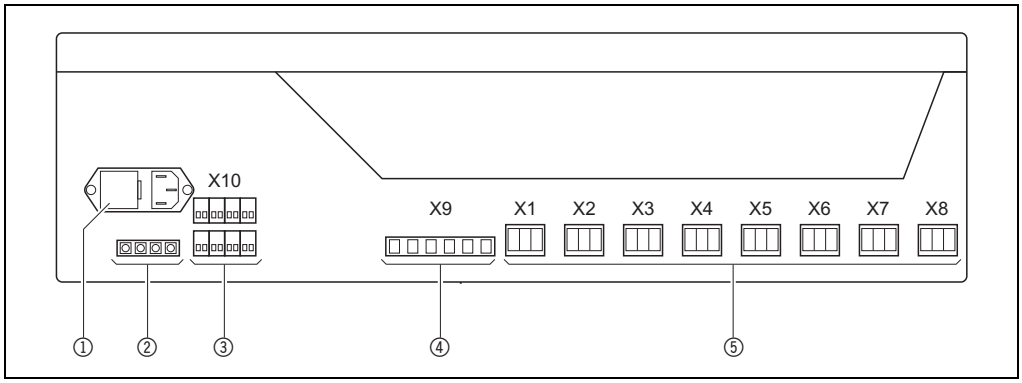

Fig. 3-1: Terminal-Side Overall View of the HC8X

① Socket for mains connection with fuse holder and system voltage switch-over 115 V/230 V, 50–60 Hz

② Optical fiber connection

③ X10 plug-type terminal strip for PT100 temperature sensors

④ X9 plug-type terminal strip for power electronics supply voltage

⑤ X1 – X8 plug-type terminal strip for heating circuits

3.2 Connecting the Power Electronics Supply Voltage

WARNING

Destruction of electrical components by overvoltage!

➢ Connect only a Y-connected supply line (3 P + N + PE).

➢ The supply voltage may be 230 V, 50–60 Hz maximum.

1. Unscrew two screws from the case cover.
2. Remove the case cover and pull off the ground conductor.
3. Select the wire cross-sections according to the current load and the circuit fuse.
4. Carefully connect the wires of the supply line to the terminals L1, L2, L3, N and PE of the plug-type terminal strip X9. Firmly tighten the clamping screws.

Pin/Term.	Signal	Function
L1	Phase-L1	115 V/230 V , 50–60 Hz
L2	Phase-L2	115 V/230 V , 50–60 Hz
L3	Phase-L3	115 V/230 V , 50–60 Hz
N	N	Neutral conductor
PE	PE	Protective conductor
PE	PE	Protective conductor

Table 3-1: Pin Assignment of the 5-Pole Power Electronics Supply Voltage

3.3 Connecting the Heating Circuits

Destruction of electrical conductors by overheating!

➢ Observe voltage drop for large conductor lengths.

3.3.1 Connecting Single-Phase Heating Circuits

Connect the heating circuits via the 3-pole terminal blocks to plug-type terminal strips X1 (channel 1) to X8 (channel 8):

1. Connect wires 1, 2 and PE of the respective actuator to the 3-pole terminal block.
2. Insert the terminal block into the respective plug-type terminal and check firm seating.

Wire No.	Term. Block	Pin/Term.	Signal	Function
1	X1–X8	1	L	Power output 115 V/230 V, 50–60 Hz
2	X1–X8	2	N	Neutral conductor
PE	X1–X8	3	PE	Protective conductor

Table 3-2: Pin Assignment of Single-Phase Heating Circuits

3.3.2 Connecting Two-Phase Heating Circuits

Connect the two-phase heating circuit to two adjacent terminal blocks, e.g. X1 (channel 1) and X2 (channel 2):

1. Connect wires according to Table 3-3.
2. Insert terminal blocks into the respective plug-type terminal strip and check firm seating.

Note

3. In this example, connect the temperature sensor (PT100) to plug-type terminal strip X10, terminals No. 1/2. Controlling channel = channel 1.

Wire No.	Term. Block	Pin/Term.	Signal	Function
1	X1	1	L1	1st power output 115 V/230 V, 50–60 Hz
2	X1	2	N	Neutral conductor
PE	X1	3	PE	Protective conductor
3	X2	1	L2	2nd power output 115 V/230 V, 50–60 Hz
–	X2	2	N	(Neutral conductor)
–	X2	3	PE	(Protective conductor)

Table 3-3: Pin Assignment of Two-Phase Heating Circuits

3.3.3 Connecting Three-Phase Heating Circuits

Connect the 3-phase heating circuit to three adjacent terminal blocks, e.g. X6 (channel 6), X7 (channel 7) and X8 (channel 8):

1. Connect wires according to Table 3-4.
2. Insert terminal block into the respective plug-type terminal and check firm seating.

Note

3. In this example, connect the temperature sensor (PT100) to plug-type terminal strip X10, terminal No. 11/12. Controlling channel = channel 6.

Wire No.	Term. Block	Pin/Term.	Signal	Function
1	X6	1	L1	6th power output 115 V/230 V, 50–60 Hz
2	X6	2	N	Neutral conductor
PE	X6	3	PE	Protective conductor
3	X7	1	L2	7th power output 115 V/230 V, 50–60 Hz
–	X7	2	N	(Neutral conductor)
–	X7	3	PE	(Protective conductor)
4	X8	1	L3	8th power output 115 V/230 V, 50–60 Hz
–	X8	2	N	(Neutral conductor)
–	X8	3	PE	(Protective conductor)

Table 3-4: Pin Assignment of Three-Phase Heating Circuits

3.4 Connecting the Temperature Sensors

Observe the assignment of the temperature sensors (PT100)!

When the assignment of the temperature sensor (PT100) to the controlling channel is wrong, the control function does not operate correctly.

- ➢ Determine the controlling channel when multi-phase heating circuits are connected.
- ➢ Always connect the temperature sensor (PT100) of the controlling channel.

1. Pull the terminal blocks out of the plug-type terminal strip, starting with No. 1/2 for channel 1.
2. Connect the wires of the temperature sensors to the terminal block of plug-type terminal strip X10.
3. Insert the terminal block in plug-type terminal strip X10 and check firm seating.

Pin/Terminal	Signal	Function
1	PT100 +	Sensor input (+), channel 1
2	PT100 –	Sensor input (–), channel 1
3	PT100 +	Sensor input (+), channel 2
4	PT100	Sensor input (–), channel 2
5	PT100 +	Sensor input (+), channel 3
6	PT100 –	Sensor input (–), channel 3
7	PT100 +	Sensor input (+), channel 4
8	PT100 –	Sensor input (–), channel 4
9	PT100 +	Sensor input (+), channel 5
10	PT100 –	Sensor input (–), channel 5
11	PT100 +	Sensor input (+), channel 6
12	PT100 –	Sensor input (–), channel 6
13	PT100 +	Sensor input (+), channel 7
14	PT100 –	Sensor input (–), channel 7
15	PT100 +	Sensor input (+), channel 8
16	PT100 –	Sensor input (–), channel 8

Table 3-5: Pin Assignment of the 2-Pole Temperature Sensor Connections

3.5 Connecting the Optical Fibers

1. Connect connection MA (E) of HC8X with connection (S) of measuring system PC.
2. Connect connection MA (S) of HC8X with connection (E) of measuring system PC.

When the HC8X is the last communications unit in the optical fiber group:

3. Close connection SL (E) of HC8X with a blank plug (see Fig. 3-2, HC8X 2).

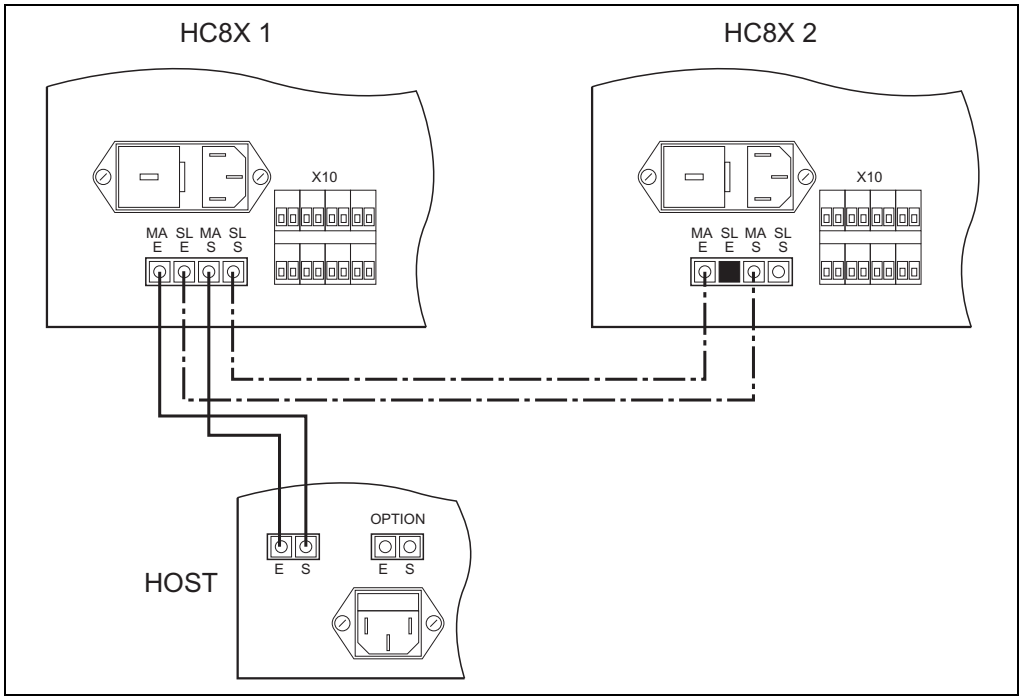

Fig. 3-2: HC8X Optical Fiber Connection

3.6 Connecting the Control Electronics Supply Voltage

3.6.1 Supply Voltage and Fuse Preselection, Primary Side

The supply voltage of the control electronics is connected via the mains socket with variable voltage preselection 115 V/230 V, 50–60 Hz (see Fig. 3-1).

1. Unlock the fuse holder with a screwdriver on the side tongue and pull it out.
2. Pull out contact bridge of supply voltage switch-over and turn so that the desired voltage rating is visible in the indicator window of the mains socket (e.g. 115).
3. Reinsert the contact bridge of the supply voltage switch-over.
4. Reinsert the required fuses in the fuse holder:
   – With 115 V preselected voltage: 2 x 0.4 AT (slow blow), size 5 x 20
   – With 230 V preselected voltage: 2 x 0.2 AT (slow blow), size 5 x 20
5. Firmly press in the fuse holder until you hear it click into place.

3.6.2 Connecting the Supply Voltage

Destruction of control unit by overvoltage!

The control electronics of the HC8X operate without additional mains switching immediately upon inserting the plug.

➢ Check the value of the preset supply voltage by visual inspection of the indicator window in the fuse holder.

➢ Correct the supply voltage selection as required.

1. Connect the plug (not included in items delivered) with the correct polarization to the supply line of the supply voltage for the control electronics.
2. Insert the plug into the socket.

4 Configuration and Addressing

4.1 Preparations

Danger of electrical shock!

➢ Disconnect all poles of the power from the supply voltage before opening the case.

1. Unscrew two screws from the case cover.
2. Remove the case cover and pull off the ground conductor.

Danger of electrical shock!

The supply voltage of the control electronics remains present during configuration and addressing.

➢ Operate the slide switch only with a totally insulated tool.

➢ When using the slide switch, make sure that the PC board is not damaged.

4.2 Overview for Parameter Settings

Note The "HC8XINIT.EXE" and "SETHC8X.EXE" programs serve for the configuration and parameter setting of the HC8X heat control. The software is not completely described and intended only for trained personnel.

Steps for configuration and addressing:

- Establish the communication between the measuring system PC and the HC8X.
- Configuration and parameter setting of the HC8X with the "HC8XINIT.EXE (MS-DOS)" and "SETHC8X.EXE (Windows)" utility programs

4.3 Parameter Setting with HC8XINIT.EXE under MS-DOS

Control unit damage!

Modifications of the factory configuration and parameter setting can damage the control unit.

➢ Determine all nominal values of the controlled system before all parameter modifications.

Parameter setting prerequisites:

- Connection between the measuring system PC and the HC8X
- The HC8X operates in "Prog" mode.

4.3.1 "HC8XINIT.EXE" DOS Option Window

Because of the interface administration, HC8XINIT.EXE works only on DOS-compatible PCs.

➢ Start the program by entering `hc8xinit` without any other parameters.

The HC8X replies with the DOS Options window.

The "HC8XINIT.EXE" DOS Options window contains information concerning configuration and parameter setting, for example, COM port, baud rate, etc. (see Fig. 4-1).

```
[w95] C:\WIN95>HC8Xinit
HC8XINIT utility by MMKrajka '99-'02, v. 1.40
Sets parameters of HC8X module via serial optical link in Prog mode.
Usage: HC8XINIT {/|-<options>}
Options:
 C<c> - COM port used, c=1..4, must be defined
 I<i> - IRQ number, i=0..15, default is 4 for COM1&3, 3 for COM2&4
 B<b> - Baud rate to be programmed, b=600,1200,..38400, default is 9600
 A<a> - base Address of HC8X, a=0..63 (dec) or a=$0..$3F (hex), default 48
 G<g> - common analog Gain, g=0..2.0, default 1.0
 O<o> - common analog Offset, o=-4096..4095 LSB, default 0
 R<r> - common analog coRrection, r=0..1, 0/1: correction off/on
 N<n> - channel Numbers (relative addresses) to be affected,
        0..7 in any combination allowed, default 01234567
 E<n> - channel numbers (relative addresses) to be Enabled,
        0..7 in any combination allowed, default 01234567
 F<n> - numbers of disabled channels to be set as Following channels,
        0..7 in any combination allowed, default: none
 T<t> - control Temperature, t=-50..359.5degC, default 40.0degC
 U<t> - Upper limit, t=0..409.5K, default 12.0K
 L<t> - Lower limit, t=0..409.5K, default 12.0K
 H<t> - Hystheresis, t=0..409.5K, default 5.0K
 M<m> - Mode of channel, m=H, T or B (for H1, T1 and B1 version), default H
 P<p> - Programmability of HC tempeatures, p=1: yes, p=0: no (default)
 S    - Save variable HC8XINIT (max 96 chars) as remark in the HC8X
Option C must be defined, the rest uses defaults if not specified.
The communication with HC8X in Prog mode runs always with 9600 Bd.
Example: HC8XINIT /c3 /b1200 -t120.3 -a49 /n6305 /e123
  uses the HC8X on COM3 at 9600 Bd, IRQ4, 8 data bits, 1 stop bit,
  no parity, sets HC8X address to 49 dec, control temperature to 120.3degC on
  channels 0,3,5 and 6, enables channels 1..3 only, sets 1200 Bd for normal
  (OptoBox) mode
```

Fig. 4-1: HC8XINIT.EXE after the Call-Up without Additional Parameters

4.3.2 Configuration Query of HC8X with HC8XINIT.EXE

Note The serial interface COM1 was enabled with IRQ4 in the following examples.

The following occurs after the start of the program with hc8xinit /c1:

- General parameters and data are queried
- The plausibility of the parameters is checked
- Implausible parameters are overwritten with default values

In case of plausibility, the parameters of the data sets "Found" and "Written" are identical.

The "Found" data set indicates the configuration found, the "Written" data set the new parameter configuration (see Fig. 4-2).

➢ When the communication is acknowledged with the message "HC8X doesn't respond", check possible error sources:

- Check the connection of the optical fibers to the measuring system PC and HC8X
- Operating mode of HC8X (desired status = "Prog")
- COM interface and associated interrupt (COM1 = 0x3F8h, IRQ 4, COM2 = 0x2F8h, IRQ 3)

```
[w95] C:\WIN95>HC8Xinit /c1
Querying the HC8X...
Found:
Check sum : 99FC hex
BaudRate  : 9600 Bd
Address   : 48 dec, 30 hex
Function  : HC
Correction: inactive
Programbl.: active
Gain      : 1.00000
Offset    :    0.00
Channel activity:
0:Enabled 1:Enabled 2:Enabled 3:Enabled 4:Enabled 5:Enabled 6:Enabled 7:Enabled
HC Mode   :
0:H1      1:H1      2:H1      3:H1      4:H1      5:H1      6:H1      7:H1
TCtrl:
0:185.0   1:185.0   2:185.0   3:185.0   4:185.0   5:185.0   6:185.0   7:185.0
TLLim:
0: 12.0   1: 12.0   2: 12.0   3: 12.0   4: 12.0   5: 12.0   6: 12.0   7: 12.0
TULim:
0: 12.0   1: 12.0   2: 12.0   3: 12.0   4: 12.0   5: 12.0   6: 12.0   7: 12.0
THyst:
0:  5.0   1:  5.0   2:  5.0   3:  5.0   4:  5.0   5:  5.0   6:  5.0   7:  5.0
Remark    :

Written:
BaudRate  : 9600 Bd
Address   : 48 dec, 30 hex
Function  : HC
Correction: inactive
Programbl.: active
Gain      : 1.00000
Offset    :    0.00
Channel activity:
0:Enabled 1:Enabled 2:Enabled 3:Enabled 4:Enabled 5:Enabled 6:Enabled 7:Enabled
HC Mode   :
0:H1      1:H1      2:H1      3:H1      4:H1      5:H1      6:H1      7:H1
TCtrl     :
0:185.0   1:185.0   2:185.0   3:185.0   4:185.0   5:185.0   6:185.0   7:185.0
TLLim     :
0: 12.0   1: 12.0   2: 12.0   3: 12.0   4: 12.0   5: 12.0   6: 12.0   7: 12.0
TULim     :
0: 12.0   1: 12.0   2: 12.0   3: 12.0   4: 12.0   5: 12.0   6: 12.0   7: 12.0
THyst     :
0:  5.0   1:  5.0   2:  5.0   3:  5.0   4:  5.0   5:  5.0   6:  5.0   7:  5.0
Remark    :
```

Fig. 4-2: Configuration Output of HC8XINIT.EXE

4.4 Parameter Setting Example with HC8XINIT.EXE under MS-DOS

In this example, the following parameters are to be transferred to the HC8X during the program execution of HC8XINIT.EXE:

- Enabling of channels 0, 1, 2, 3 and 5 (parameter: /E25013)
- Channels 6 and 7 become followers (parameter: /F67)
- Temperature values only for channels 1 and 2 (parameter: /N10)
- Set temperature value of channels 1 and 2 = 107.6 C (parameter: /T107.6)
- Upper limit temperature of channels 1 and 2 = 10 C (parameter: /U10)
- Lower limit temperature of channels 1 and 2 = 20 C (parameter: /L20)
- DOS environment variable "SET HC8XINIT= A little bit more complicated example" is to be programmed as identification line of the HC8X.

The correct parameter transfer must be entered as a sequential string (see Fig. 4-3).

➢ hc8xinit /c1 /e25013 /n10 /t107.6 /u10 /l20 /f67 /s

```
[w95] C:\WIN95>set HC8Xinit=A little bit more complicated example

[w95] C:\WIN95>HC8Xinit /c1 /e25013 /n10 /t107.6 /u10 /l20 /f67 /s
Querying the HC8X...
Found:
Check sum : 99FC hex
BaudRate  : 9600 Bd
Address   : 48 dec, 30 hex
Function  : HC
Correction: inactive
Programbl.: active
Gain      : 1.00000
Offset    :    0.00
Channel activity:
0:Enabled 1:Enabled 2:Enabled 3:Enabled 4:Enabled 5:Enabled 6:Enabled 7:Enabled
HC Mode   :
0:H1      1:H1      2:H1      3:H1      4:H1      5:H1      6:H1      7:H1
TCtrl:
0:185.0   1:185.0   2:185.0   3:185.0   4:185.0   5:185.0   6:185.0   7:185.0
TLLim:
0: 12.0   1: 12.0   2: 12.0   3: 12.0   4: 12.0   5: 12.0   6: 12.0   7: 12.0
TULim:
0: 12.0   1: 12.0   2: 12.0   3: 12.0   4: 12.0   5: 12.0   6: 12.0   7: 12.0
THyst:
0:  5.0   1:  5.0   2:  5.0   3:  5.0   4:  5.0   5:  5.0   6:  5.0   7:  5.0
Remark    :

Written:
BaudRate  : 9600 Bd
Address   : 48 dec, 30 hex
Function  : HC
Correction: inactive
Programbl.: active
Gain      : 1.00000
Offset    :    0.00
Channel activity:
0:Enabled 1:Enabled 2:Enabled 3:Enabled 4:Disabld 5:Enabled 6:Follows 7:Follows
HC Mode   :
0:H1      1:H1      2:H1      3:H1      4:H1      5:H1      6:H1      7:H1
TCtrl     :
0:107.6   1:107.6   2:185.0   3:185.0   4:185.0   5:185.0   6:185.0   7:185.0
TLLim     :
0: 20.0   1: 20.0   2: 12.0   3: 12.0   4: 12.0   5: 12.0   6: 12.0   7: 12.0
TULim     :
0: 10.0   1: 10.0   2: 12.0   3: 12.0   4: 12.0   5: 12.0   6: 12.0   7: 12.0
THyst     :
0:  5.0   1:  5.0   2:  5.0   3:  5.0   4:  5.0   5:  5.0   6:  5.0   7:  5.0
Remark    : A little bit more complicated example
```

Fig. 4-3: Parameter Setting Example with Output of the Environment Variable

4.5 Configuring the Control Channel as a Follower

The configuration of a control channel as a follower serves for the multi-phase activation of heating actuators.

In the "Prog" mode, every control channel is enabled, disabled or set as a follower.

An enabled control channel is shown in the address area of the HC8X and its control function is enabled.

A disabled control channel is not shown in the address area of the HC8X and its control function is disabled.

A control channel which is set as a follower is not shown in the address area of the HC8X, however, the power output is controlled by the previous control channel.

4.5.1 Example for "Channel Following"

1. Set the HC8X with the slide switch to the "Prog" mode (see Chapter 5.1.1 Setting the HC8X Mode, page 5-32).
2. Start the utility program "HC8XINIT.EXE" with parameter /c1 /FX (X = digit of respective control channel) on the measuring system PC.

The control channel set as a follower and the previous control channel (= controlling channel) have been prepared for the 2-phase controlling of a heating circuit.

3. Set the HC8X with the slide switch to the "Norm" mode again (see Chapter 5.1.1 Setting the HC8X Mode, page 5-32).

The control unit works in the preset operating mode with the previously transferred parameters in two-phase operation.

4.6 Final Steps

1. Connect the ground conductor with flat plug contact on the case cover and check correct seating.
2. Close and screw on the case cover.
3. Connect the supply voltage with all poles of the power section.

5 Start-up

5.1 Presetting the HC8X

Danger of electrical shock!

➢ Disconnect all poles of the power section from the supply voltage before opening the case.

➢ Remove the case cover and pull off the ground conductor.

Danger to life by electric current!

The supply voltage of the control electronics remains present when the operating mode is set.

➢ Do not touch live parts.

➢ Operate slide switch only with a totally insulated tool.

➢ When using the slide switch, make sure that the PC board is not damaged.

Basic Setting

Set the HC8X to the basic state:

1. Switch off the supply voltage of the HC8X control electronics.
2. Push the slide switch (see Fig. 1-4, page 1-17) to position "B".
3. Switch on the supply voltage of the HC8X control electronics.

LED25 acknowledges with a single short blink.

4. Push the slide switch to position "A" again.

After the successful transfer of the preset values to the EEPROM, the HC8X starts in the "Norm" operating mode with the parameters in *table 5-1*.

Parameter	**Value**
HC8X address	48 (30h)
Baud rate	9600
Gain	1
Offset	–7
Correction	Enabled
Programmability	Enabled
Type of heating	H1
Set temperature	40 °C
Upper temperature limit	12 K
Lower temperature limit	12 K
Temperature hysteresis	1 K

Table 5-1: Preset Values

5.1.1 Setting the HC8X Mode

The HCX8 operates in the three modes "Idle", "Prog" or "Norm". The mode is set with a slide switch on the PC board (see Fig. 1-4, page 1-17). When the control unit is delivered, the slide switch is in position "A".

➢ Set the mode according to table Table 5-2.

Switching Sequence	**Switch from → to**	**Blink Frequency LED 25**	**Function**	**Mode**
1	A → B	*Continuous signal*	• The reset is initiated when the slide switch is in position "B" for 1 s to 5 s min. • When the slide switch is set to position "B" for less than 5 s, the HC8X remains in the "Norm" mode • When the slide switch is in position "B" for more than 5 s, a switch-over to the "Idle" mode is made automatically.	Norm
2	B → A	*Short blink once per second*	HC8X is inactive	Idle
3	A → B → A	*Short blink twice per second*	HC8X expects parameters from the measuring system PC or sends data to the measuring system PC on request.	Prog
4	A → B → A	*Continuous signal or* *Short blink three times per second*	HC8X works as a two-position controller Alarm on at least one channel	Norm

Table 5-2: Setting the Mode with the Slide Switch

5.2 Start-up of the Control

5.2.1 Start-up of the Measuring System PC

1. Check the optical fiber connection to the measuring system PC (see Chapter 3.5 Connecting the Optical Fibers, page 3-24).
2. Configure the measuring system PC as ready for operation and start the respective utility program, e.g. "HC8XINIT.EXE".
3. Check the configuration data and required parameters according to the processor request at the measuring system PC. Change data as required (see Chapter 4.3 Parameter Setting with HC8XINIT.EXE under MS-DOS, page 4-26).

5.2.2 Start-up of the HC8X

1. Ensure that there is no supply voltage at the HC8X.
2. Unscrew two screws from the case cover.
3. Remove the case cover and pull off the ground conductor.
4. Set the HC8X to the "Norm" mode (see Chapter 5.1.1 Setting the HC8X Mode, page 5-32).
5. If one or several control channels were set as followers, check the correct assignment of the temperature sensors (PT100) to the controlling channel (see Chapter 4.5 Configuring the Control Channel as a Follower, page 4-30).
6. Check whether the correct poles of the PT100 temperature sensors are connected to the X10 terminal strip (see Chapter 3.4 Connecting the Temperature Sensors, page 3-23).
7. Check whether the correct poles of the heating circuits are connected to the clamping strips X2 to X8 (see Chapter 3.3 Connecting the Heating Circuits, page 3-22).
8. Check the connection of the supply voltage to the power electronics (terminal strip X9) (see Chapter 3.2 Connecting the Power Electronics Supply Voltage, page 3-21).
9. Check the preset value of the supply voltage to the control electronics in the indicator window of the socket.
10. If the set voltage differs from the required voltage: Preselect the supply voltage (see Chapter 3.6.1 Supply Voltage and Fuse Preselection, Primary Side, page 3-25).
11. Check the optical fiber connection of the HC8X (see Chapter 3.5 Connecting the Optical Fibers, page 3-24).
12. Connect the ground conductor with flat plug contact in the case cover and check correct seating.
13. Close and screw on the case cover.
14. Connect the supply voltage for the control electronics and insert the plug in the socket.
15. Connect the supply voltage for the power electronics.

5.3 Start-up of the Process

1. Perform the configuration query of the measuring system PC (see Chapter 4.3.2 Configuration Query of HC8X with HC8XINIT.EXE, page 4-27).
2. If the HC8X does not reply: Check the communication between the measuring system PC and the HC8X (see Chapter 1.3 HC8X Process Connection, page 1-16).
3. Check whether the control behavior is correct. For this purpose, read the actual values of the PT100 temperature sensors on the measuring system PC and observe the behavior of the respective actuator (see Chapter 5.4 Control Process, page 5-34).

5.4 Control Process

An exemplary control process is shown in Fig. 5-1 . The interactions of the individual control parameters in the heating types H1, T1 and B1 are shown in a time sequence.

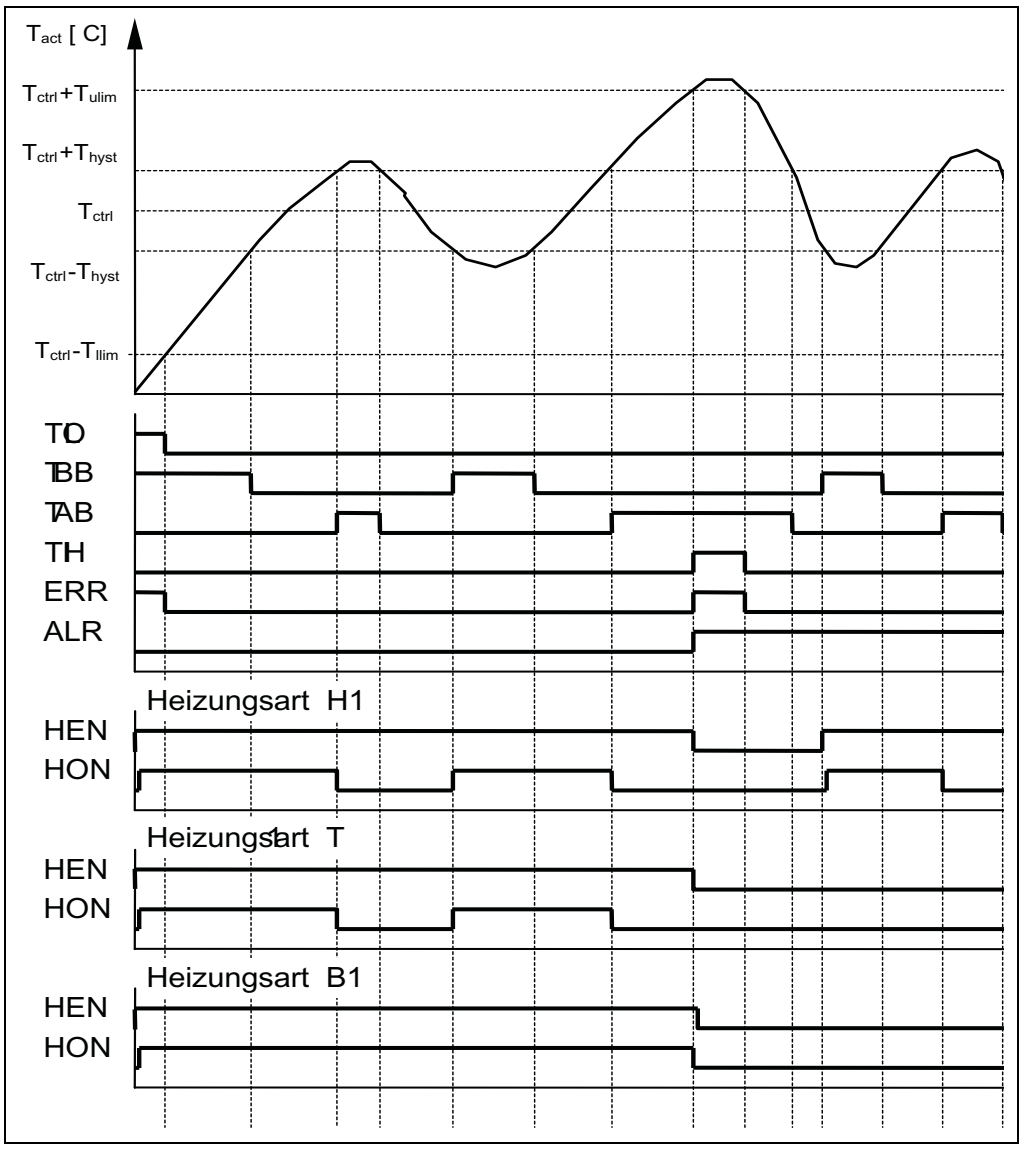

Fig. 5-1: Control Process

ALR	=	Alert	(Alarm)
ERR	=	Error	(Error)
HEN	=	Heating Enabled	(Heater safety relay)
HON	=	Heating On	(Heater working relay)
TAB	=	Temperature Above Hysteresis Band	(Temperature > req. temp.+hyst.)
TBB	=	Temperature Below Hysteresis Band	(Temperature < req. temp.– hyst.)
THI	=	Temperature High	(Temperature > req. temp.+upper limit)
TLO	=	Temperature Low	(Temperature < req. temp.– lower limit.)

If the temperature $T_{ctrl} + T_{ulim}$ (see Fig. 5-1) is exceeded:

➢ Acknowledge the error with the slide switch (see Chapter 5.1.1 Setting the HC8X Mode, page 5-32).

– or –

➢ Perform a software reset via the measuring system PC.

6 Temporary Shutdown

6.1 Switching off the HC8X


WARNING

Uncontrolled process due to status changes of the heaters!

➢ Inform the equipment operator before switching off the heat control.

Note All parameters and configuration data are maintained when the HC8X is switched off.

1. Switch off the supply voltage of the power electronics (terminal strip X9) and secure it against switching on again.
2. Switch off the supply voltage of the control electronics and pull the plug from the mains socket.

6.2 Switching the HC8X on Again

1. Insert the plug in the mains socket of the HC8X and switch on the supply voltage of the control electronics.
1. Switch on the supply voltage of the power electronics (terminal strip X9).

The HC8X starts operation with the parameter set which was **last permanently saved**.

7 Retrofitting / Conductor Bar Configuration

7.1 Retrofitting the HC8X

Note The basic configuration of the control unit determines which retrofit kit is selected. When the HC8X in the basic configuration is equipped with an even number of channels:

➢ Select the retrofit kit with a load relay.

When the HC8X in the basic configuration is equipped with an odd number of channels:

➢ Select the retrofit kit without a load relay.

Determine for the retrofitting of the control unit:

1. Required fuse value of the thermally delayed overcurrent trip with consideration of the required power and the wire cross-section.
2. Type of corresponding retrofit kit (4 A, 8 A, or 16 A with/without load relay).

7.1.1 Retrofitting the HC8X with an Even Number of Channels

➢ Make available the retrofit kit with load relay.

Danger of electrical shock!

➢ Do not touch live parts.

➢ Disconnect all poles of the power section and control section from the supply voltage before opening the control unit.

➢ Check whether the power section and the control section are free from voltage.

1. Unscrew two screws from the case cover.
2. Remove the case cover and pull off the ground conductor.
3. Find the next free installation area in the control unit.
4. Position the load relay on the heat sink and screw it on with the two attached cross-slotted screws.
5. Insert the four-pole control line plug into the load relay so that the latch points to the heat sink.
6. Insert the thermally delayed overcurrent trip from below into the next free drilling of the stainless steel bracket and secure it with a locking nut.
7. If required, insert another thermally delayed overcurrent trip from below into the next free drilling of the stainless steel angle and secure it with a locking nut.

Note Always plug all wires of the thermally delayed overcurrent trip on the left into the left connection side (OUTPUT B) of the load relay.

Always plug all wires of the thermally delayed overcurrent trip on the right into the right connection side (OUTPUT A) of the load relay.

8. Push the end of the wiring marked"P" onto the flat plug connection of the printed circuit board (see Fig. 7-1, page 7-37).
9. Push the end of the wiring marked "REL" onto the flat plug connection on the load relay.

Fig. 7-1: Wiring on the Flat Plug Connection of Printed Circuit Board and Load Relay

Note Observe mains symmetry!

10. Push the end of the wiring marked"BR" onto the flat plug connection of the conductor bar (see Fig. 7-2, page 7-37).
11. Push the end of the wiring marked "1" onto the flat plug connection of the thermally delayed overcurrent trip .

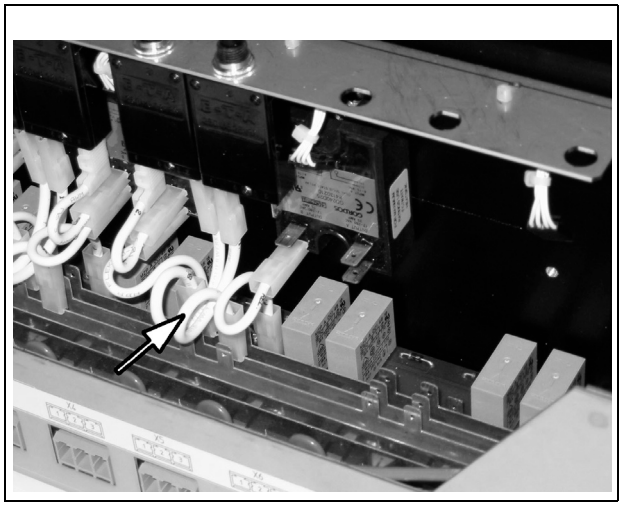

Fig. 7-2: Wiring on Conductor Bar and Overcurrent Trip

12. Push the end of the wiring marked "2" onto the flat plug connection of the thermally delayed overcurrent trip (see Fig. 7-3, page 7-38).
13. Push the end of the wiring marked "REL" onto the flat plug connection on the load relay.

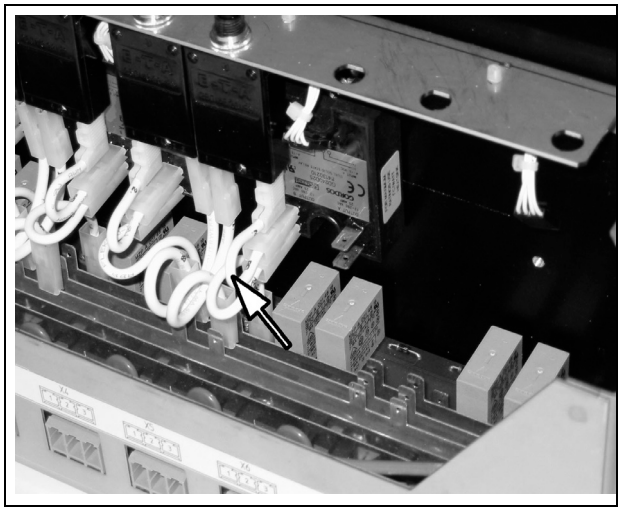

Fig. 7-3: Wiring on Overcurrent Trip and Load Relay

14. Check the correct assignment and firm seating of all connections.
15. Connect the respective PT100 temperature sensor to terminal strip X10 (see Chapter 3.4 Connecting the Temperature Sensors, page 3-23).
16. Connect the respective heating circuit to the plug-in block terminal (included in the retrofit kit) X1–X9 (see Chapter 3.3 Connecting the Heating Circuits, page 3-22).
17. Configure/address the respective power channel (see Chapter 4 Configuration and Addressing, page 4-26).
18. Connect the ground line with flat plug contact in the case cover and check correct seating.
19. Close and screw on the case cover.
20. Connect the supply voltage to all poles.
21. Put the HC8X in operation (see Chapter 5 Start-up, page 5-31).

7.1.2 Retrofitting the HC8X with an Odd Number of Channels

➢ Make available the retrofit kit without a load relay.

Danger of electrical shock!

➢ Do not touch live parts.

➢ Disconnect all poles of the power section and control section from the supply voltage before opening the case.

➢ Check whether the power section and the control section are free from voltage.

1. Unscrew two screws from the case cover.
2. Remove the case cover and pull off the ground conductor.
3. If required, insert another thermally delayed overcurrent trip from below into the next free drilling of the stainless steel bracket and secure it with a locking nut.

4. Plug in all wires, as shown in the example (Chapter 7.1.1 Retrofitting the HC8X with an Even Number of Channels, page 7-36).
5. Check the correct assignment and firm seating of all connections.
6. Connect the respective PT100 temperature sensor to the terminal strip X10 (see Chapter 3.4 Connecting the Temperature Sensors, page 3-23).
7. Connect the respective heating circuit to the plug-in block terminal (included in the retrofit kit) X1–X9 (see Chapter 3.3 Connecting the Heating Circuits, page 3-22).
8. Configure/address the respective power channel (see Chapter 4 Configuration and Addressing, page 4-26).
9. Connect the ground line with flat plug contact in the case cover and check correct seating.
10. Close and screw on the case cover.
11. Connect the supply voltage to all poles.
12. Put the HC8X in operation (see Chapter 5 Start-up, page 5-31).

7.2 Configuring the Power Bars

Danger of electrical shock!

- Do not touch live parts.
- Disconnect all poles of the power section and control section from the supply voltage before opening the case.
- Check whether the power section and the control section are free from voltage.
- Change the outer conductor connections only on the L1, L2 or L3 conductor bars.

Changing the outer conductor connections on the conductor bars (see Fig. 7-4, page 7-40) allows for a symmetrical load distribution on all three phases of the power supply.

Note Determine the values of the heating circuit current before changing the existing conductor bar configuration. The total of all individual currents of the heating circuit per phase may not exceed the maximum back-up fuse value of the power electronics.

1. Unscrew two screws from the case cover.
2. Remove the case cover and pull off the ground conductor.
3. Pull the respective wire (white) from one of the outer conductor bars and plug it onto the desired outer conductor bar.
4. If necessary, change other wires (white) in the same manner.
5. Connect the ground line with flat plug contact in the case cover and check correct seating.
6. Close and screw on the case cover.
7. Connect the supply voltage to all poles.

8. Put the HC8X in operation (see Chapter 5 Start-up, page 5-31).

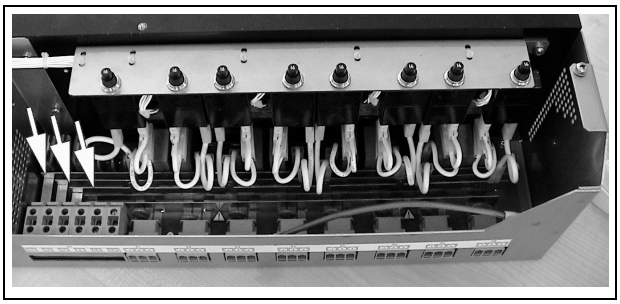

Fig. 7-4: Position of the Outer Conductor Bars

8 Troubleshooting

8.1 Power Electronics Overload Protection

To protect the power electronics, one thermally delayed overcurrent trip per power output is series connected with 4 A, 8 A or 16 A.

After the actuation of an overcurrent trip, it must be acknowledged after a waiting time of approx. 1 minute by pressing the button (see Fig. 8-1).

When an overcurrent trip responds:

1. Determine the cause of the error.
2. Acknowledge the overcurrent trip with a button.

Danger of electrical shock!

- ➢ Do not touch live parts.
- ➢ Disconnect all poles of the power section and control section from the supply voltage before opening the case.
- ➢ Check whether the power section and the control section are free from voltage.

8.2 Primary-Side Fuses of the Control Electronics

The supply voltage of the control electronics is connected via the mains socket with variable voltage preselection of 115 V/230 V, 50–60 Hz (see Fig. 3-1, page 3-21).

1. Unlock the fuse holder with a screwdriver on the side tongue and pull it out.
2. Pull out the contact bridge of the supply voltage switch-over and turn it so that the desired voltage rating is visible in the indicator window of the mains socket (e.g. 115).
3. Reinsert the contact bridge of the supply voltage switch-over.
4. Reinsert the required fuses in the fuse holder:
   – With 115 V preselected voltage: 2 x 0.4 AT (slow blow), size 5 x 20
   – With 230 V preselected voltage: 2 x 0.2 AT (slow blow), size 5 x 20
5. Firmly press in the fuse holder until you hear it click into place.
6. Check the value of the preset supply voltage by visual inspection of the indicator window in the fuse holder.

8.3 Secondary-Side Fuses of the Control Electronics

The secondary-side fusing is divided into three separate circuits (see Fig. 8-1).

- SI1 = fuse size 5 x 20, 1 AT (slow blow)
- SI2 = fuse size 5 x 20, 2 AT (slow blow)
- SI3 = fuse size 5 x 20, 0,2 AT (slow blow)

When a fuse is blown:

1. Unscrew two screws from the case cover.
2. Remove the case cover and pull off the ground conductor.
3. Pull the plug.
4. Determine the cause of the error.
5. Replace defective fuse.
6. Connect the ground line with flat plug contact and check correct seating.
7. Close and screw on the case cover.

8.4 Automatic Over-Temperature Protection of Control Electronics

A self-resetting safety temperature switch on the control side protects the control electronics from thermal damage (see Fig. 8-1).

When the inside temperature of the control unit is $T_{max} > 50$ °C, the safety temperature switch switches off the power section. The communication between the measuring system PC and the I/O units is maintained.

After the temperature has significantly cooled (by at least 10 K), the heat control is enabled again.

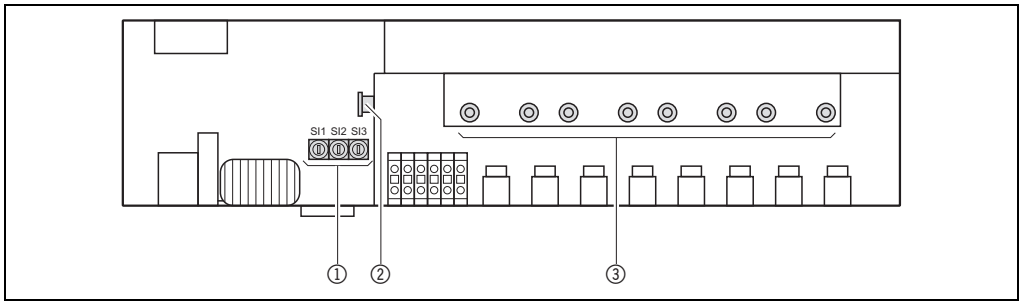

Fig. 8-1: Arrangement of the Fuses and the Over-Temperature Protection

① Secondary-side fuses of the control electronics

② Automatic over-temperature protection of control electronics

③ Power electronics overload protection

9 Disposal

9.1 Disposal after Final Shut-Down

Dispose of unusable or irreparable control units in an environmentally compatible manner and according to the specific waste disposal regulations of your country. The design of the HC8X allows for the separation into reusable secondary raw materials and special waste (electronics waste).

10 Technical Data / Annex

10.1 Dimensions / General Data

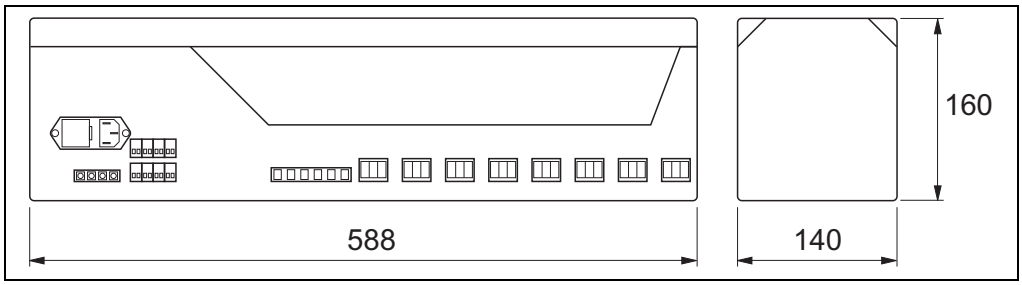

Fig. 10-1: HC8X Case Dimensions

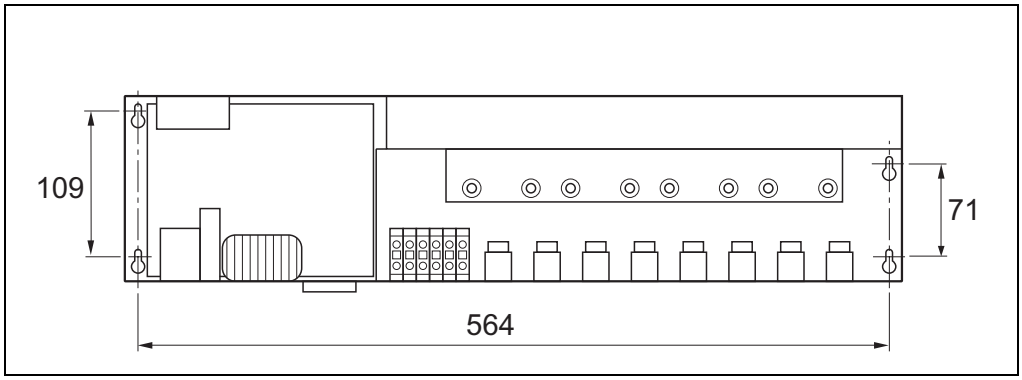

Fig. 10-2: Attachment Dimensions

Control unit	**Type**
Case version	Stainless steel, 1.4301
Weight	Approx. 10 kg

Table 10-1: General Data

10.2 Electrical Data / Temperatures

Connection / Control Unit	**Type**
Control electronics supply voltage, primary side	115 V, 50–60 Hz 230 V, 50–60 Hz
Control electronics supply voltage, secondary side	± 15 V, 5 V
Power electronics supply voltage	115 V / 230V, 50–60 Hz, 3 P + N + PE
Maximum power input of control electronics	*20* VA
Maximum nominal current per power output	16 A
Maximum nominal output per power output	3680 VA
Internal control unit fuse of control electronics, secondary side	SI1 = 1.0 A slow blow, 5 x 20mm SI2 = 0.2 A slow blow, 5 x 20mm SI3 = 0.2 A slow blow, 5 x 20 mm
Internal control unit fuse of control electronics, primary side	With 115 V AC: 2 x 0.4 A slow blow, 5 x 20 mm With 230 V AC: 2 x 0.2 A slow blow, 5 x 20 mm
External back-up fuse connection	10 A max.
External back-up fuse of power electronics	3 x 35 A max.
Temperature sensors	PT100
Power supply of temperature sensors	0.8 mA
Conductor cross-section of temperature sensors (X10)	0.2–2.5 mm^2 single- or multi-wire
Conductor cross-section of power electronics (X9) supply line	0.5–10.0 mm^2
Heating wire cross-section (X1...X8)	0.2–4 mm^2 single- or multi-wire
Data interface	Optical fiber
Class of protection	1
Measuring category	II
Degree of soiling	2
Set temperature range	–50 °C to 359.5 °C, resolution 0.1 K
Temperature hysteresis	0 to 409.5 K, resolution 0.1 K
Limit temperatures	0 to 409.5 K, resolution 0.1 K, upper and lower limit separately adjustable
Default temperature after reset	40 °C
Maximum ambient temperature	50 °C

Table 10-2: Electrical Data

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