Operating manual

ETR98C

Rev. 2.6, 15.05.2004

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Chapter 1

General information and instructions

1.1 ... About these installation and operating instructions

These instructions apply to temperature controller ETR98C

1.1.1 Reserved right to changes

These instructions have been issued with the claim to actuality, completeness and correctness. Further technical developments can, however, lead to changes to the equipment or software, which would no longer agree with these instructions..

Attention

For these reasons and under those conditions we are not liable for faults or failure and subsequent damage

These instructions are amended after every modification and include the latest information. After every change to these instructions the version number is also amended. The version number can be found on the front sheet of these instructions. If you do not hold the actual instructions we would be pleased to supply them on request.

1.2 Dispatch / Scope of delivery / Storage

The controller is supplied completely assembled in a box which is padded with cellular/foamed impact resistant material. This normally provides adequate protection.

Note

If external damage is noted at the time of opening of the carton, the equipment must be checked for signs of damage. In order to evaluate the damage, **do n o t operate the controller** and contact PSG Plastic Service GmbH without delay.

Scope of delivery:

Apart from the controller itself, the scope of delivery includes

- **the with drawable housing, including terminals/clamps to connect the controller in the cut-out of an operator panel,**
- **these installation and operating instructions..**

Storage

If the unpacked controller is not used immediately, it must be stored with sufficient protection against dirt and moisture. the permissible temperature range is -10 - 60°C.

1.3 Clear identification of the controller by means of identification plate

An identification plate is glued on the controller housing. The information on this identification plate enables you to determine the delivery condition from the factory as well as the date of manufacture of the controller.

type description

Part-number

The part number (PNo.) consists of a combination of numbers (12 figures). Apart from the information regarding the type of the controller, they offer further information regarding the-pre-configuration of the controller parameters (see also chapter 4). Controllers with a certain factory part number are always supplied with the hardware fittings as well as pre-parametrization.

Seriel-number

The serial number (SN) of the controller consists of a number configuration (16 figures).

Type-description

Underneath the controller manufacturer's details listed on the nameplate (PSG Mannheim), the type description of the controller is again provided in clear text.

Note

In order that we can provide you with a quick response to your enquiries, please always state the part and serial numbers.

1.4 ... CE marking of the controller

The ETR98C temperature controller carries the CE logo, which means that it satisfies the requirements of the EU guidelines 89/336/EEC (electromagnetic compatibility) as well as the standards listed therein and those of directive 73/23/EEC (low voltage guide line).

The temperature controller has been designed for use in an industrial environment and satisfies the following requirements:

Emitted interference	EN 50081/1
Noise immunity	EN 50082/2

as well as

Electrical safety for MSR (Measurement and control equipment)	DIN EN 61010

1.5 Safety precautions

Warning

- These installation and operating instructions must be read through carefully prior to the installation, commissioning and operation of the equipment
- Wiring up of the controller must be carried out by authorised personnel and in accordance with the details provided in these instructions
- Commissioning (start-up) of the controller may only be carried out by authorised personnel!
- The installation instructions for EMC correct installation of the controller must be strictly adhered to!
- The specified max. voltages must not be exceeded!
- The controller, together with the operating and display unit, offers the possibility of complete parametrization. Re-configuration may only be carried out by authorised personnel in line with the conditions of the plant.
- The controller must not be used in an explosive environment!.
- In the event of a fault the equipment should always be returned to PSG, Mannheim, for repair. Should you nevertheless carry out a fault-finding exercise on site, ensure the power supply is disconnected!

Note

Failure to adhere to these safety precautions or the instructions listed in chapter 3 under "Installation and Commissioning" can lead to failure of the controller or the plant. Subsequent damage will therefore not be covered by the manufacturer's guarantee.

Chapter 2

The technical specifications of the controller

INPUTS

MEASUREMENT INPUTS

Thermal elements (according to DIN 43710, DIN IEC 584)

reversible: Fe-CuNi (L) (0...500°C), Fe-CuNi (J) (0...500°C), Ni-CrNi(K) (0...900°C)
Temperature compensation for the whole ambient temperature range

Conduct the sensor and/or compensation line up to the controller
Input resistance >100kΩ
Resolution 0,1°C

Sensor fracture, polarity and sensor short-circuit monitoring available

PT100 (0...500°C)

Resistance thermometer

With two-wire connections, internal actual value compensation is possible
Solution 0,1 °C

DC current

4-20mA (configurable 0...999°C)
Input resistance approx. 50Ω
Solution 0,1°C

Direct voltage

0-10V (cinfigurable 0...999°C)
Input resistance >10kΩ
Solution 0,1°C

Accuracy error *(based on upper range value)*

Calibration accuracy <0,4%
Temperature drift <0,2%/10K
No mains voltage influence over specified voltage range

Measurement inputs (also changeable to °F)

SIGNAL INPUT

Deflection input

Optical coupler
Type of current input 5mA, max. 30VDC

HEATING CURRENT MONITORING

via current interface ST198 (part No. 039005, specification sheet 1.2.1-1), single or three-phase application per heater circuit, as required connection of the current transformer cards VSW41 (part No. 039000, specification sheet 1.2.1-2) direct to the current interface.

OUTPUTS

CONTROL OUTPUTS

Heating / Cooling

HO/KO - Optical coupler
Max. load 30VDC, 60mA
HTS/KTS
Open Collector for control of solid state relays
HSR/KSR
Internal solid state relay for the control of contactors, max. loading of the internal solid state relay 240VAC, min. 10mA, max. 100mA
The common inputs for the solid state relays must always be fused externally to 1.6A/T.

ALARM OUTPUTS

Alarm outputs 1...2

Optical coupler, negative switching, with external auxiliary voltage, max. 30VDC,60mA
Alarm outputs freely configurable

VOLTAGE SUPPLY

230VAC ±10%, 50...60Hz
115VAC ±10%, 50...60Hz
24VAC ±10%, 50...60Hz

Power input approx. 10VA
Extermal fusing to provided
Elektrical safety
DIN EN 61010 (VDE 0411)
Overvoltage categorie III
Pollution severity 2

		Protection II When connecting terminal 2 the max. permissible rated breaking voltage must not exceed 24 VDC; exception: interface terminal 20 mA (max. 50 VDC).
DIGITAL INTERFACES	**SERIAL DATA INTERFACE**	Electrical isolation Optionally RS485 (2-/4-wires) oder 20mA (2-/4-wires) Baud rate: 1200...19200 Baud, stop and parity bit freely configurable Log: PSGI, PSGII Addressable via external resistance (max. 24 items of equipment) or with software via address parameter address (32 controllers, adjustable 0 ...31)
DISPLAYS AND OPERATION		Zone indication: each has one triple role LED multifunction display, display range 000...999 I Information display: triple role LED multifunctional display 4 LED status display Membrane keyboard with 6 keys
GENERAL DATA	**Mechanical construction**	
	Type of construction	Insertable type controller
	Type of protection	Operating part IP40 Housing IP20
	Dimensions	Frontal dimensions 96x192mm, Insertion depth 192mm
	Weight	approx. 1200 g
	Electrical connections	Connecting terminals must be protected with a plug fuse.Unsupported connections of the power supply must be insulated by means of a heat shrinkable sleeve.
	Ambient conditions	Permissible temperatures Max. operating temperature: 60°C Storage: 25°C...60°C Climatic utilization classification: Relative humidity: < 75% in middle of year
CE ***- IDENTIFICATION***		The controller satisfies the requirements of Directive 89/336/EWG (EMC-guideline, EMVG) according to Standard DIN EN 50081/1 (Emitted interference) and Standard DIN EN 50082/2 (Noise immunity) as well as Directive 73/23/EEC (low voltage guideline, GSG) according Standard DIN EN 61010

Chapter

Installation and commissioning

This chapter contains, among others, instructions and information pertaining to the mechanical and electrical installation as well as to commissioning of the controller.

In addition, tips for installation with regard to the electromagnetic compatibility (including complete connecting diagrams) are also included.

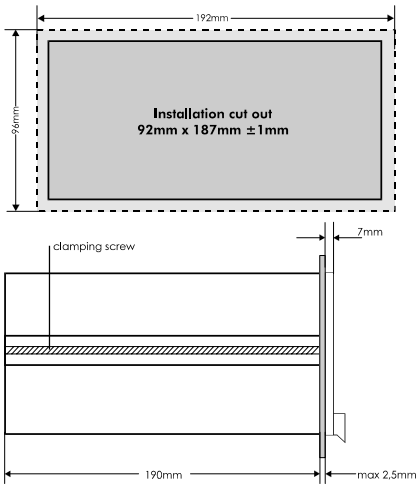
3.1 Installation

Note

Ensure that the ventilating slots of the plastic housing of the controller are not completely covered, so that the temperature inside the controller can be maintained within the permissible limits.

During installation of several items of equipment it is important to ensure that a certain clearance is provided between the units.

The controller is intended for installation in a front panel cut-out with standard dimensions of 92 x 187 mm, which requires a front panel cut-out to be prepared within the specified tolerances..



Ensure that there is sufficient clearance behind the controller to accommodate the wiring .

- **Loosen the screws in the controller front handle and remove the controller drawer from the housing.**
- **Insert the housing in the front panel and tighten.**
- **Insert the controller drawer and tighten the securing screws in the handle.**

The front panel thickness must not be more than 2.5 mm.

3.2 Electrical connections

The installation and commissioning of the controller must only be carried out by qualified personnel. These are persons who are authorised to commission the controller in accordance with the latest safety regulations.

This chapter contains marked instructions which must be strictly complied with to ensure personal and material safety.

Depending on the type of controller, not all terminals are always assigned. You can determine the type from the identification plate.

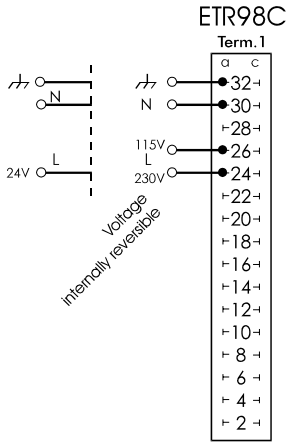
3.2.1 Terminal assignment

It is essential that the instructions contained in the chapter "General instructions and safety precautions" are observed when wiring up the controller..

3.2.1.1 Terminal1 (Voltage supply, control outputs for heating and cooling, HF earth terminal)

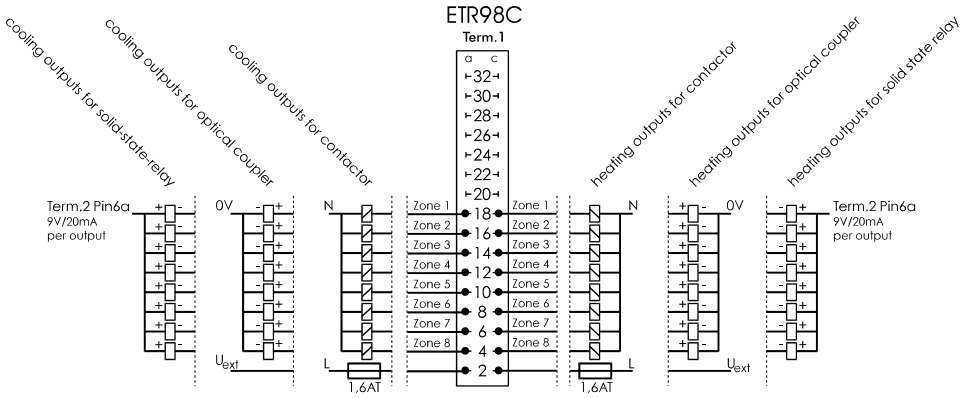
Voltage supply

Only the specified mains voltage applicable to the controller can be connected to the controller. Operation of the controller with 230 VAC or 115 VAC can be re-configured internally by means of a soldering jumper.



Fusing for the controller must be fitted externally.

Control outputs



- **Optical coupler outputs max. load = 30 VDC, 60 mA**
- **Common inputs for solid state relay must in each case be fused with 1.6a/T**
- **The potential differences of terminal 1, pins 2a and 2c, must be less than 250 VAC**

HF-earth terminal

An HF earth terminal is provided on the controller on terminal 1, pin 32a. The HF earth terminal helps in that the function of the controller is guaranteed even in the vicinity of strong electrical interference. The terminal should be connected as broadly based as possible and over the shortest possible distance with the control cabinet mass.

Note

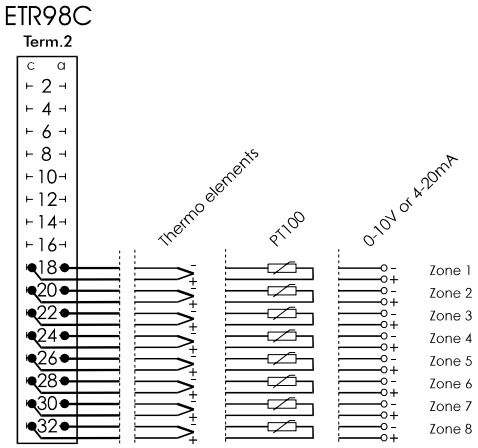
Further instructions to be observed with regard to earthing of the controller (especially the HF earth terminal) can be found under "Instructions for EMC compatible installation of the controller" at the end of this chapter.

3.2.1.2 Terminal 2 (Measurement, current monitoring, alarm outputs, signal depression)

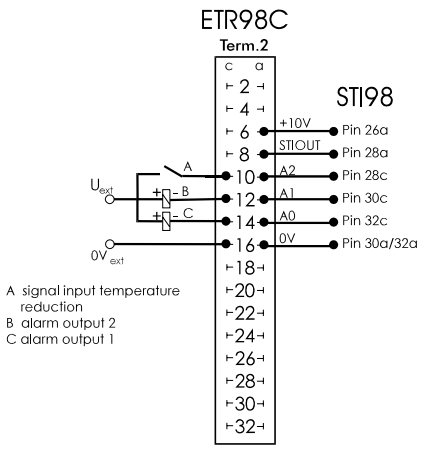
Measurement

Depending on the equipping of the controller, it is possible to connect thermal elements (configurable), resistance thermometer or standard signals to the measuring inputs.

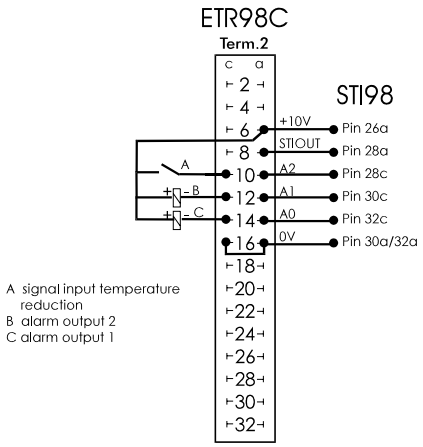
Connection of different types of sensors to a controller is not possible..



Current monitoring, alarm outputs, signal input depression



External power supply voltage for alarm outputs and depression input



Use of controller internal power supply voltage

for alarm outputs and depression input

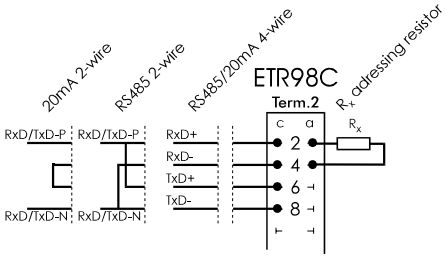
Max. loading for alarm outputs: 30 VDC, 60 mA

Connect pins 16a and 16c

The power interface card STI98 must be connected to the temperature controller over as short a path as possible. Use screened cable to connect the controller and the ST198 unit. The current transformers from PSG can be connected directly to the terminals of the current interface.

3.2.1.3 Serial Inferface

As preferred, the serial interface is provided with either a 20mA or a RS485 interface. Both interface units can be used in 2 or 4 core mode. The 20mA interface is of passive construction.



Adresse	Widerstand
0	offen
1	88,7k
2	49,9k
3	32,5k
4	23,3k
5	16,9k
6	13,3k
7	10,0k
8	7,87k
9	6,04k
10	4,53k
11	3,32k
12	2,32k
13	1,43k
14	665
15	0
16	11,5k
17	8,87k
18	6,81k
19	5,23k
20	3,92k
21	2,80k
22	1,87k
23	1,02k

Addressing Addressing of the controller can, if desired, be carried out via an addressing resistance (max. 24 controllers) or via input of the parameter Adr. (max. 31 controllers). An already fitted addressing resistance has greater priority than software addressing.

Parametrization of the interface (Pro, Par, Sto, Bd) can be carried out via the keyboard.

Logs To communicate with the controller it is possible to select two logs, either ASCII logs PSG-I or PSG-II.

We will be pleased to send you a description of the logs on request..

Note

If, after switching on the controller, the address resistance for addresses 23 is available (1.02kOhm), the following standard interface parameters are set up::

PSGII0 Log, baud rate 9600 bauds, no parity, 1 stopbit

In the event of a faulty data transfer it is possible to use this fixed setting to create a connection with definite and specified interfaces.

3.2.2 Instructions for EMC-compatible installation of the temperature controllers

The temperature controller has been designed for use in an industrial environment and it satisfies the requirements with regard to emitted interference and immunity to interference as long as the installation guidelines have been adhered to. The following text lists the most important points.

3.2.2.1 Wiring arrangement

Apart from the mains power supply cables, which carry 115VAC and 230VAC, all cables to and from the controller conduct a direct voltage of less than 30 VDC.

- Ensure that these power cables are routed inside and outside the control cabinet in separate bundles or cable ducts.
- Ensure that sufficient space is maintained between the signal cables and possible sources of interference such as, for instance, motors, frequency converters or transformers.
- All cables should be routed close to earthed surfaces
- Always use screened cables
- If at all possible avoid the use of clamps/terminals to extend cables
- Use the shortest possible route for the cables
- Connect the equipotential bonding cables as close as possible
- Fit the cable screens as flat as possible.

3.2.2.2 Screening

Screening is a counter measure against electrical or magnetic interference fields.

An HF earth terminal is provided on the controller. This earthing should be connected to the machine reference potential over as short a distance and as large an area as possible. The machine reference potential can be either the mounting plate of the control cabinet, the control cabinet itself or the machine frame.

Always use braided screened cable when installing the controller. Interference on the screening is then conducted to earth via the earth connector. The most resistance-free connection is required for this, so that the interference flow itself does not become an interference in its own right. Use, for instance, metal cable clamps on which the cable screen can cover a large area.

The screens for al cables must be fitted on both sides, as only this will ensure the best possible interference suppression.

By earthing different plant components it is possible to create a potential difference. These differences can be reduced by fitting an equipotential bonding cable in parallel to the screen

Equipotential bonding cable

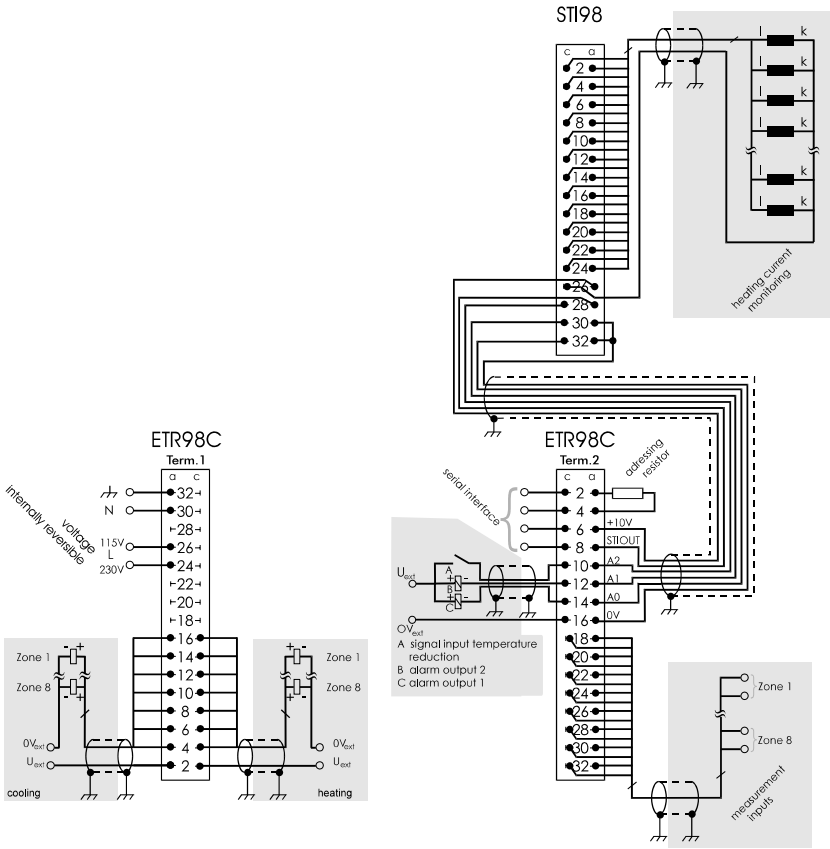
- The impedance of the equipotential bonding lead may only be max. 10% of the screening impedance.
- A copper cable of 16 mm^2 cross-section will normally suffice
- Connect the equipotential bonding lead to a large earthing surface
- Route the potential lead in such a way, that the smallest possible clearance is covered between the signal cable and the equipotential bonding lead

I If equipotential bonding is not possible, earth the screen on one side direct and on the other side via a capacitor (100 nF).

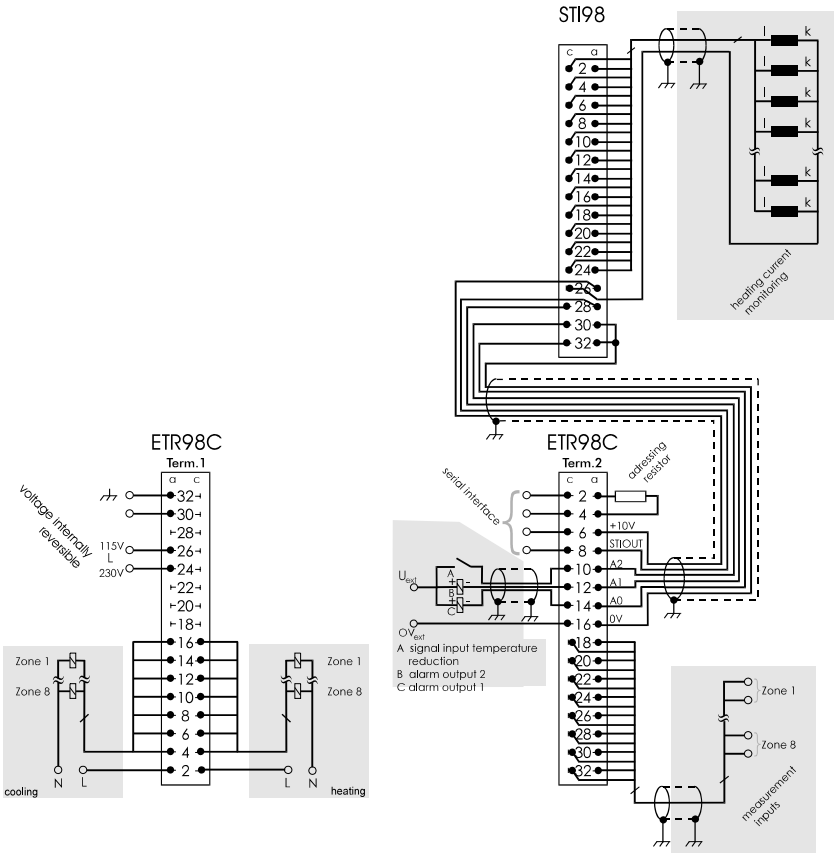
3.2.2.3 Complete connecting diagram for the temperature controller

All instructions for electromagnetic compatible installation were observed in the controller connecting diagram..

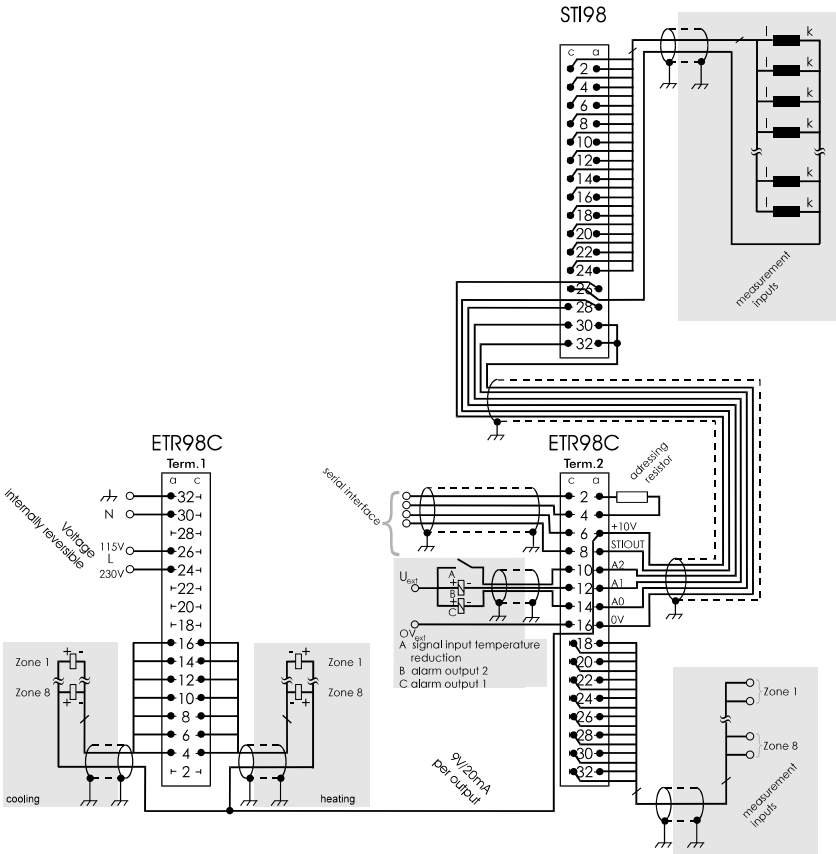
Control outputs - optical coupler (O)



Control outputs Contactor (SR)



Control outputs solid state relay (TS)



① The common reference point for current sensing must not be connected to overlap the control function

② For reasons of electromagnetic compatibility, the external power supply must be earthed on the OV side to the HF reference potential

③ The HF earth connection must be made over a large area with good conductivity and be connected to the control cabinet reference potential with as short a lead as possible

3.3 Checking the configuration parameters

After completing the wiring up of the controller and connecting to the voltage supply the configuration parameters must first be checked. The most important parameters for the function are listed below:

Tip

It is recommended that the controller is first checked with heating output plugs removed or setpoint value setting set to 0°C/32°F, so that the possibility of damaging the plant through, for instance, overheating, is excluded.

- **First set the setpoint value to 0°C or 32°F (SoL)**
- **Set type of sensor (FEL) at the thermal element measuring input**
- **Check temperature unit (0°C/32°F) (CEL)**
- **If all zones are not used passivate unused zones**
- **Check to see if automatic optimization has been switched on**
- **Check limits GAu and GAo**
- **Check the two-three point zone setting**
- **If necessary, set the depression value as well as the setpoint, irrespective of whether it is an absolute or relative value**
- **With controllers fitted with heating current monitoring, carry out current transfer**

Note

After careful checks of all parameters the setpoint values can be increased.

On controllers fitted with operating and display units the checking can be carried out via the membrane keyboard; on controllers without the operating and display unit this can be done by visual means via the serial data interface. Here, for instance, the configuration and visualization program **KonVis** from PSG Mannheim can be used (see chapter 8 "Annex - Accessories")..

Chapter 4

The configuration parameters

The following chapter describes in detail all configuration parameters of the controller and their method of operation.

4.1 Pre-configuration at the factory

Apart from hardware type determination, clear identification marking of the controller is also provided by the pre-configuration carried out at the factory. More detailed information for clear identification can be found in chapter 1.3 "General Information - Clear identification through part numbers".

4.1.1 Pre-configuration of all parameter values

Before delivery of all temperature controllers from PSG all parameters are allocated a value..

With stock controllers the configuration was determined by PSG, whilst with customer-specific controllers the determination was arrived at after discussions between the customer and PSG.

4.1.2 Additional pre-configuration of controllers fitted with an operating and display unit

Every controller fitted with an operating and display unit is, on top of its parameter, provided with an attribute for both the operating and display unit parameter levels. These attributes determine whether or not a parameter is not visible on a plane, is only displayed or whether it can be altered.

With stock controllers the configuration was determined by PSG, whilst with customer-specific controllers the attribute determination was arrived at after discussions between the customer and PSG.

Note

The consequence of pre-configuration is that on controllers fitted with an operating and display unit on an operating or parameter level not all possible parameters appear on the operator or parameter level when called up.

For details of help by call-up of the system level see chapter "Operation - the system level".

Pre-configuration of all temperature controllers carried out at the factory has the following advantages:

- **Minimal parametrization work at the time of commissioning**
- **Greatest possible operating safety through shielding of parameters on the operating and parameter level (on controllers fitted with an operating and display unit).**

4.2 All configuration parameters and their method of operation

4.2.1 General instructions

Information regarding all parameters of the controller is listed in the order in which they appear when called up.

The information for each parameter comprises

- **the description of the parameter**
- **the abbreviation of the parameter for the information display (for controllers with an operating and display unit)**
- **range of values and unit**
- **the relationship system/channel data**
- **information for interface operation: offset and length of parameter data**
- **the method of operation of the parameter**

In order to keep the list as compact as possible, some of the functions will refer to chapter 7 for a more detailed description.

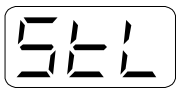
Note

For operating the controller via the serial interface please request the detailed log description direct from **PSG Mannheim.**

4.2.2 Listing of all configuration parameters

SoL - Setpoint value

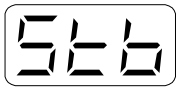
☐ Systemdata	☒ Channel data	Offset SIO(hex) Data length(Bytes)	00 2
Range of value	000...999	Unit	°C / °F



StL - Degree of control

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	02 2
Range of value	-100...100	Unit	%

Actual output in %.
Range of value is restricted by limiting degree of control (Sb, Sb-) if so required



Stb - Actuator operation

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	08,Bit 6
Range of value	on / off	Unit	

Changing over control operation / actuator operation.
constant output of the degree of control set to StL to control output .

Attention

During change-over from control operation in actuator operation mode it is important that the degree of control is checked, so that too great a degree of control does not result in damage caused by overheating connected zones.

GAu - Limit value -

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	23 2
Range of value	000...999	Unit	°C / °F

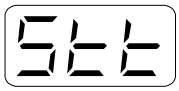
Lower temperature limit

For more detailed information regarding the alarm configuration see chapter "Alarm and Safety functions"

GAo - Limit value +

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	21 2
Range of value	000...999	Unit	°C / °F

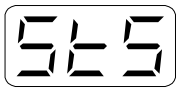
Upper temperature limit
For more detailed information regarding the alarm configuration see chapter "Alarm and Safety functions"



Stt - Current tolerance

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	18 2
Range of value	00.0...99.9	Unit	A

Tolerance band in % for measured actual current based on specified current setpoint



StS - Specified current setpoint

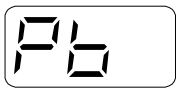
☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	29 2
Range of value	00.0...99.9	Unit	A

Input possibility of current setpoint by means of
- direct input or
- acceptance by automatic current transfer (see chapter "Operation")

2So- 2nd setpoint/depression value

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	2B 2
Wertebereich	000...999	Unit	°C / °F

Setpoint, when depression input is activated
Selection - 2nd setpoint (absolute) or depression value (relative), in parameter S-A
If depression input is activated in zone display, alternating actual temperature value / 2So or AbS



Pb - Proportional band Heating

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	0B 1
Range of value	00.0 09.9	Unit	%

Control parameter of the PID controller - heating

td

td - Rate time Heating

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	0D 1
Range of value	000...999	Unit	Seconds

Control parameter of the PID controller - heating

ti

ti - Reset time Heating

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	0F 2
Range of value	000...999	Unit	Seconds

Control parameter of the PID controller - heating

tA

tA - Switching time duration Heating

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	13 1
Range of value	000...999	Unit	Seconds

Sampling interval of the PID controller - heating

Pb-

Pb- - Proportional band Cooling

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	0C 1
Range of value	00.0 09.9	Unit	%

Control parameter of the PID controller - cooling

td-

td- - Rate time Cooling

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	0E 1
Range of value	000...999	Unit	Seconds

Control parameter of the PID controller - cooling

ti-

ti- - Reset time Cooling

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	11 2
Range of value	000...999	Unit	Seconds

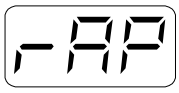
Control parameter of the PID controller - cooling

tA-

tA- - Switching time duration Cooling

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	14 1
Range of value	000...999	Unit	Seconds

Sampling interval of the PID controller - cooling



rAP - Temperature ramp

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	1C 2
Range of value	000...999	Unit	°C / minute °F / minute

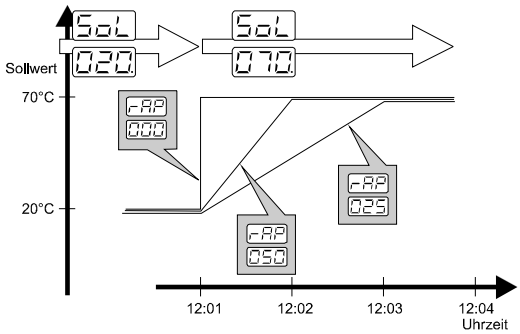
Setting the rate of the setpoint change by increasing or reducing the setpoint. The setpoint does not change suddenly, but with selected setpoint rate from the old to the new setpoint.
Deactivation effected by entering 000.

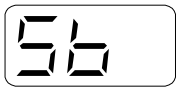
Application

e.g. avoidance of thermal voltages between control zones with different rate of speed by adaptation of the fast control zone to the slowest control zone by means of rAP

Example

Setpoint increase from 20°C to 70°C with
rAP = 0°C/minute, rAP = 50°C/minute, rAP = 25°C/minute



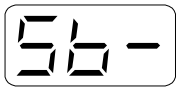


Sb - Degree of control limitation Heating

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	25 1
Range of value	000...099	Unit	%

Basis for calculation :
displayed degree of control with degree of control limitation =
actually calculated degree of control without StL limitation x (degree of control limitation/100) %

Example :
Sb = 70%; actually calculated degree of control without limitation = 56%
displayed degree of control with StL limitation = 56 x (70/100) % = 39%



Sb- - Degree of control limitation Cooling

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	26 1
Range of value	000...099	Unit	%

Basis for calculation:

displayed degree of control with degree of control limitation =
actually calculated degree of control without StL limitation x (degree of control limitation/100) %

Example

Sb- = 70%; actually calculated degree of control without limitation = -75%
displayed degree of control with StL limitation = -75 x (70/100) % = -52%

Sou - Lower setpoint limit

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	2F 2
Range of value	000...Soo	Unit	°C / °F

Soo - Upper setpoint limit

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	31 1
Range of value **depending on selected type of sensor**	Fe-J: 000...500 FE-L: 000...500 NiCr-Ni:000...900 4-20mA:000...999 0-10V: 000...999 PT100: 000...999	Unit	°C / °F

Please check detailed instructions in chapter "Alarms and safety functions".

Afb - Starting function

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	08, Bit 3
Range of value	on / off	Unit	

If the starting function is switched on, a fixed and unchangeable setpoint of 100°C is set after the controller has been switched on and a set temperature of less than 100°C and a setpoint greater than 100°C has been recognized. This applies for the duration of the starting time tAF. At the end of the starting time the set setpoint will again be the control point.

With switched off starting function, the zone is controlled immediately to the specified setpoint.

Application

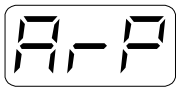
e.g. hot channel - drying out of the moisture during the starting phase prevents faults in the heating elements.

tAF - Starting time

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	16 1
Range of value	000...099	Unit	minutes

Length of time, how long the starting operation is to be active

If tAF is called up while the starting operation is active, the residual time of the starting time is terminated.



ArP - Software starting function - starting ramp

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	17 1
Range of value	000...100	Unit	% per minute

Input of max. degree of control per minute during the starting operation permits careful heating up by incremental increase of the energy directed to the control zone.

After reaching the degree of control from 100% the starting ramp is automatically deactivated.

ArP = 000 means software starting function "starting ramp deactivated".

OFF - Offset

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	1A 1
Range of value	-09,9...09,9	Unit	°C / °F

Correction value for the actual temperature value - the offset value is added to the actual temperature value .

Application

e.g. deviations of the actual temperature values during measurement input "resistance thermometer" due to long lead lengths can be compensated with OFF

Example

Actually measured temperature value = 56°C; OFF = 2,5°C
Corrected actual temperature value = 56°C + 2,5°C = 58,5°C

OPt - Automatic optimization

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	09, Bit 0
Range of value	on / off	Unit	

Automatic adaptation of the control parameter with optimization facility switched on.

Condition:

- Setpoint advance of at least 50°C
- During existing current alarm the automatic optimization will not take place

The control parameters "heating" will be calculated from the heating up process.

The control parameters "cooling" calculations will be obtained from the figures for the control parameter "heating". For this the "cooling parameter fixed" must be switched off (PF. = off). If it is not possible to calculate the "cooling" control parameters automatically from the "heating" control parameters, parameter PF must be switched on (PF = on).

A more detailed description of the function "Automatic optimization" can be found in chapter 7.

AA - Automatic starting adaption "heating"

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	09, Bit 1
Range of value	on / off	Unit	

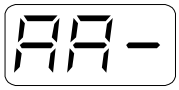
Automatic adaptation of the control parameter "heating"

With "Automatic optimization" (OPt = on) the "Automatic starting function - heating" is inoperative.

Condition:

- Setpoint advance of at least 40°C
- During existing current alarm the automatic optimization will not take place

For a more detailed description of the "Automatic starting adaptation - heating" see chapter 7.



AA- - Automatic starting adaption "cooling"

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	09, Bit 2
Range of va-	on / off	Unit	

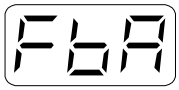
lue			

Automatic adaptation of the control parameter "cooling".

Condition:

- Setpoint advance of at least -40°C

For a more detailed description of the "Automatic starting adaptation - heating" see chapter 7.



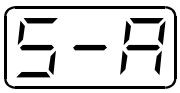
FbA - Automatic sensor failure detection system

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	08, Bit 5
Range of value	on / off	Unit	

With this system switched on recognition of a sensor failure will automatically switch over from control function to actuator function, which will then continue with a degree of control determined by the last sensor reading.

If, during the heating up process, sensor failure occurs and the automatic sensor failure detecting system is switched on, the operation will continue automatically with actuator operation with maximum degree of control.

Should a sensor fail and if the automatic system is already switched on, the degree of control for the relevant zone must be checked.



S-A - Selection of 2nd setpoint value/depression

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	08, Bit 7
Range of value	on / off	Unit	

Choose whether the set temperature value set with 2So should be a 2nd setpoint value (depression to absolute value) or a depression value (depression by one value point).

S-A = on 2nd setpoint value
S-A = off Depression value

3P - Change-over - two-three-point control

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	08, Bit 1
Range of value	on / off	Unit	

3P = on Three-point control (heating and cooling)
3P = off Two-point control (heating)

3P can also be switched on when the connected control is only controlling a two-point control path.

The best possible control is, however, possible when 3P is set for the connected control.

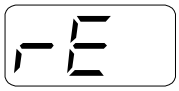
Lin - Linearization - cooling

☐☒ System data	☐☒ Channel data	Offset SIO(hex) Data length(Bytes)	08, Bit 4
Range of value		Unit	

If Lin is switched on, linearization of the degree of control for cooling takes place. This will improve the control quality.

Application

e.g. over paths with extremely strong cooling effect (e.g. cooling of water)



rE - Relay output - heating

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	08, Bit 2
Range of value	on / off	Unit	

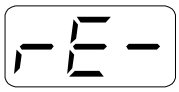
Setting of the degree of control output for heating.

With the rE parameter switched on (rE = on) the actuator is switched on and off only once during one sensing period +A. The min. sensing period is restricted to 10 seconds.

With the rE parameter switched off (rE = off), a pulsed degree of control will take place..

Application

e.g. paths with contactors acting as power controller, rE = on ensures a long life of the contactor, as the number of switching actions is minimised.



rE- - Relay output - cooling

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	09, Bit 3
Range of value	on / off	Unit	

Setting of the degree of control output for cooling.

With the rE- parameter switched on (rE- = on) the actuator is switched on and off only once during one sensing period +A-. The min. sensing period is restricted to 10 seconds.

With the rE- parameter switched off (rE- = off), a pulsed degree of control will take place.

Application

e.g. paths with contactors acting as power controller, rE- = on ensures a long life of the contactor, as the number of switching actions is minimised.

FAL - Supervising the thermoelement

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	on / off	Unit	

FAL = on Supervising function on
FAL = off Supervising function off

You find a detailed description of the function in chapter 7.

PAS - Change-over zone switched on/off

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	08, Bit 0
Range of value	on / off	Unit	

PAS = on Zone switched off
PAS = off Zone switched on

The degree of zone control is 0%.

With switched off zone no alarms will be initiated.

If the dIS switched off (dIS=off), the display will switched to be dark. With the diS switched on (dIS=on), the actual value is displayed in the zone display.

AS- - Definition of zonespecific alarm output

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	0L...40L 0H...40H	Unit	

If you have a controller with cooling outputs and use only the heating output, then you are able to use the cooling output for a zone specific output.

You find a detailed description of the function in chapter 6.

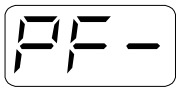
Etn - Extrusion

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	09, Bit 7
Range of value	on / off	Unit	

Monitoring function for control parameter "heating" after automatic optimization for a possible case of extrusion.

If the control parameters calculated by automatic optimization deviate from the characteristic values for averagely slow to slow zones, the calculated parameter are discarded and replaced by fixed parameters typical for the extrusion zones.

You find a detailed description of the function in chapter 7.

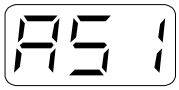


PF- - Fixed cooling parameters

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	09, Bit 6
Range of value		Unit	

With use of the automatic optimization feature, the control parameters for cooling are derived from the control parameter for heating if Pf- is switched off (Pf- = off).

If the parameter Pf- is switched on (Pf- = on), the control parameter for cooling are not overwritten after automatic optimization (per OPt or AA).



AS1 - Alarm mode- alarm output 1

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	0L...40L 0H...40H	Unit	

Selection of alarm to alarm output 1.

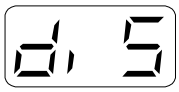
For definition of the alarm see chapter 6.

AS2 - Alarm mode - alarm output 2

☒ System data	☐ Channel data	Offset SIO(hex)	
Range of value	0L...40L 0H...40H	Unit	

Selection of alarm to alarm output 2.

For definition of the alarm see chapter 6.



diS - Display

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	on / off	Unit	

Choose whether with switched off zone (PAS = on) the background of the zone display should be dark (diS=off) or whether the actual temperature value will continue to be displayed (diS = on)..

Adr - Control address

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	000...032	Unit	

Parameter for serial interface.

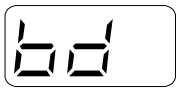
Addressing via the address resistance has greater priority than software addressing via Adr., which means that when moving the controller up with connected address resistance the control address is directed address belonging to the resistance value and the software is ignored.

Pro - Interface log

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	PSG / bin	Unit	

Parameter for serial interface

Selection of the interface log.

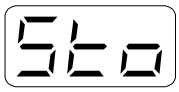


bd - Baud rate

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	12,24,48,96,192	Unit	

Parameter for serial interface

Selection of transfer rate of serial data.



Sto - Number Stopbits

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	1 / 2	Unit	

Parameter for serial interface

Selection of number of stopbits

PAr - Parity

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	off / E / odd	Unit	

Parameter for serial interface

Selection: Parity checks of the serial data transfer. Parity switched off (PAr = off), odd parity (PAR = odd) or even parity (PAr = E[ven]).

tSP - Interlocking keyboard

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	on / off	Unit	

If the keyboard interlock is switched on (tSP = on), it is no longer possible to operate via the keyboard after the first interface interrogation.

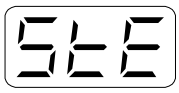
The controller can only be operated again after it has been reset

SEn - type of sensor

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	FEL/FEJ/niC/Pt/Str/	Unit	

Selection of the connected type of measuring value pickup.

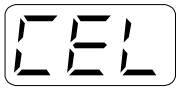
SEn=FEL/FEJ/niC	Selection of the thermal element
SEn=Pt	Selection of PT100 resistance pickup
SEn=Str	Selection of standard signal



StE - Current range transmitting value

☐ System data	☒ Channel data	Offset SIO(hex) Data length(Bytes)	1E 2
Range of value	000...999	Unit	A

Adaptation to the max. current value which can be captured by means of the current transformer card .



CEL - Temperature unit

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	on / off	Unit	

Selection of the temperature unit .

CEL=on	Measuring unit °C
CEL=off	Measuring unit °F

A conversion of the actual temperature value will take place.

All other temperature-dependent values such as limits or measuring range values must be changed manually.

EbE - Input range transmitting value

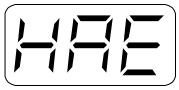
☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	°C / °F	Unit	

The parameter applies only with the standard signal measuring input (0...10V, 4...20mA).

Adaptation of the measuring range to the max. possible measuring input size.

Example :

EbE=200°C, measuring input 4...20mA
Measuring input value of 20mA corresponmds to 200°C



HAE - Release - manual adaptation

☒ System data	☐ Channel data	Offset SIO(hex) Data length(Bytes)	
Range of value	on / off	Unit	

Choose whether manual adaptation is possible (HAE = on) or not possible (HAE=off).

Chapter 5

Operation

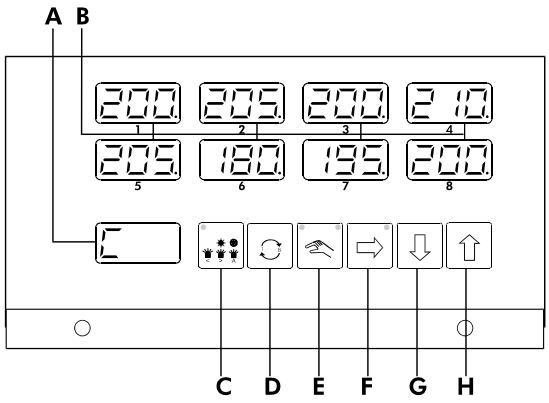
This chapter contains all information required for the operation as well as the display of the controller

The beginning of the chapter lists all LED displays in the keys as well as the controller LED displays.
Apart from explaining the operating diagram of the controller together with its two access levels all operating stages are explained in detail. Where operating examples are used the complete operating sequence is illustrated.
Operating functions deviating from the operating diagram are also explained by means of comprehensive operating examples.
At the end of the chapter there are instructions directed to the system level of the controller, in which the complete configuration of the controller is accessible by means of access to all parameters of the controller.

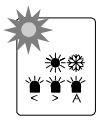
5.1 Display instructions

5.1.1 Overview

A Information display
B Zone display
C Status / acknowledge key
D Zone selection key
E manual key
F Parameter selection key
G "Reduce value" key
H "Increase value" key



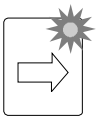
5.1.2 LEDs in the keys



If the LED in the operating condition" key flashes, it indicates that at least one alarm in one of the eight control zones exists (collecting zones). How the alarm can be located is described in detail in chapter 6.

If the left-hand LED key in the "manual" key flashes, the depression input has been activated.

If the right-hand LED in the "manual" key flashes, at least one zone is in the "degree of control" operation.



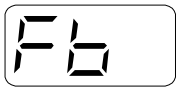
If the operating, parameter or system levels were selected, the LED in the "Continue" key will flash.

5.1.3 LED zone display

Alternatively an abbreviation can be displayed with the zone display, which provides additional information regarding the condition of the control zone. This could be either a

- **faulty message or**
- **a display of a certain operating condition.**

The zone is in the degree of control condition if Stb appears alternately with the zone value.

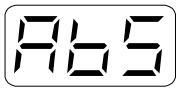


If Fb appears alternately with 999, a sensor failure has been detected in this zone. In this case the sensor including the sensor leads must be checked and changed if necessary.

If FP appears alternately together with the sensor values, it indicates pole reversal of the sensor connection on the controller.

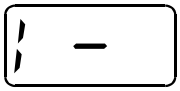
If FAL appears alternately with the actual values, it indicates a sensor short-circuit. The alarm must be acknowledged.

A more detailed description of the cause and action necessary to rectify the fault is provided in chapter 7.



If the depression input has been activated, Abs will appear alternately with the actual values in all zone displays. It is then depressed by the setpoint value set under 2So (depression setpoint value = SoL - 2So, also refer to parameter S-A).

If the depression input has been activated, 2So will appear alternately with the actual values in all zone displays. It is then depressed by the setpoint value set under 2So (depression setpoint value = SoL - 2So, also refer to parameter S-A).



If, for an alarm output, the configuration value 19 (current alarm with heating switched off, alarm must be acknowledged) and the alarm is active, 1- will appear alternately with the actual temperature value in the zone display.

A more detailed description of the cause and action necessary to rectify the fault is provided at the end of this chapter.

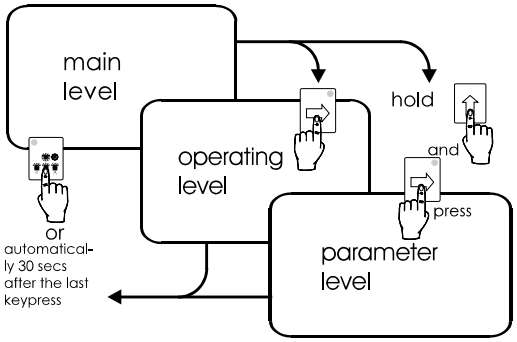
5.2 Operation - structure in 2 access levels

After being switched on the controller is on the basic level. The zone displays will show the actual temperature values.

From the basic level, the parameters of the controller can be selected in two levels.

Operating On the operating level the parameters for the **level** normal, everyday operation of the controller can be called up. This includes, for instance, the process parameters such as setpoint values, current setpoint values or limits.

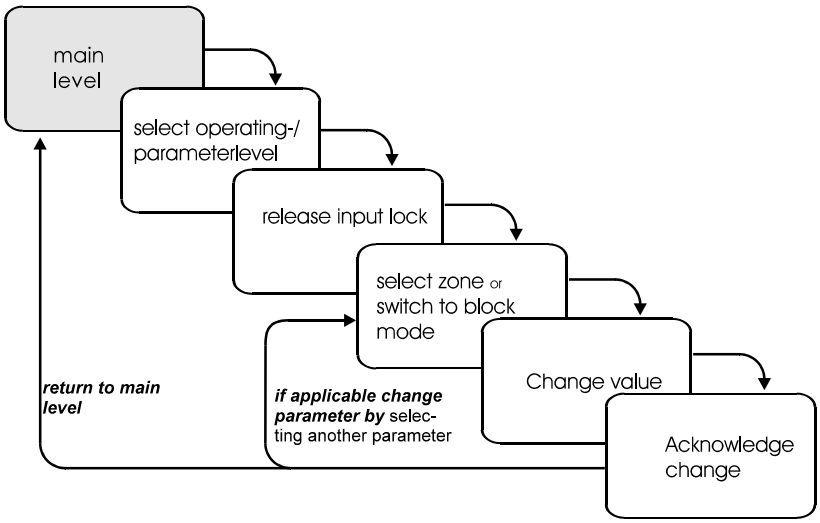
Parameter level On the parameter level it is possible to select those functions which will assist in the adaptation of the controller to the specific use. These values are generally set only once during commissioning of the controller.



Return to basic level The return to the basic level is achieved by pressing the "Return" key or automatically 30 seconds after the last use of the key. During automatic return the non-confirmed parameter changes will not be accepted.

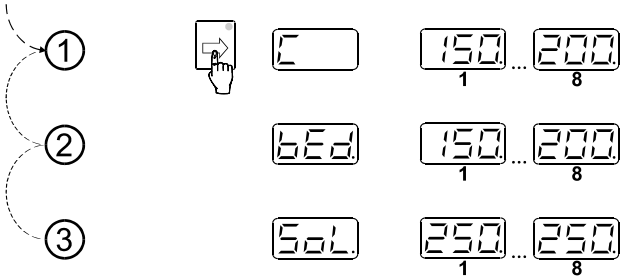
5.3 The operating diagram - change parameter values

Parameter values can be changed according to the following diagram. It is not necessary to clear the input lock just to view the parameters.

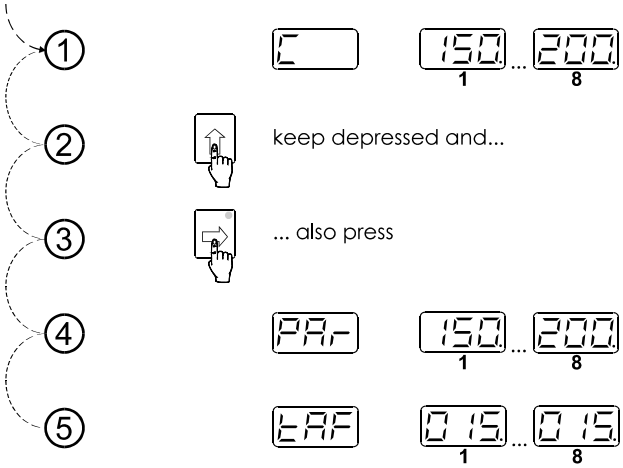


5.3.1 Select operating / parameter level

Selecting the operating level

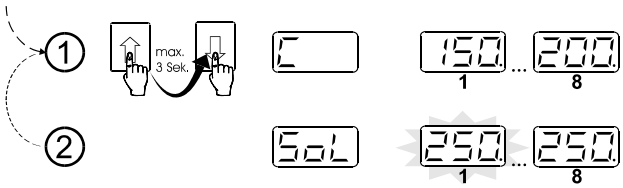


Selecting the parameter level



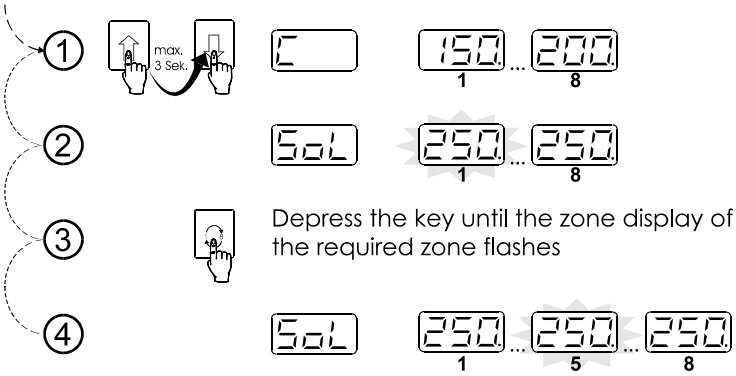
Call-up of the operating or parameter level does not result in a move to the start of the parameter list. The parameter which appears is the one with which the last level was called up and which was used to return to the basic level.

5.3.2 Releasing the input lock



5.3.3 Select the zone or switch on the block mode

Selecting the zone for individual input



Switching on the block mode

5.3.4 Changing the value

Numerical Values

Numerical values can be changed in individual steps, continuously slow and continuously fast .

- **To change values in individual steps press key to "Increase value / Decrease value"**
- **Keep the "Increase value / Decrease value" key depressed to change the values continuously slow**
- **Keep the "Increase value / Decrease value" key depressed and also press the respective arrow key.**

on/off values

on/off values can be changed by pressing either the "Increase value" or the "Decrease value" key.

5.3.5 Acknowledge the change

5.3.6 Return to the basic level

The return to the basic level also occurs automatically 30 seconds after the last use of the key. In automatic return the non-confirmed parameter changes will not be accepted.

5.4 Operating examples

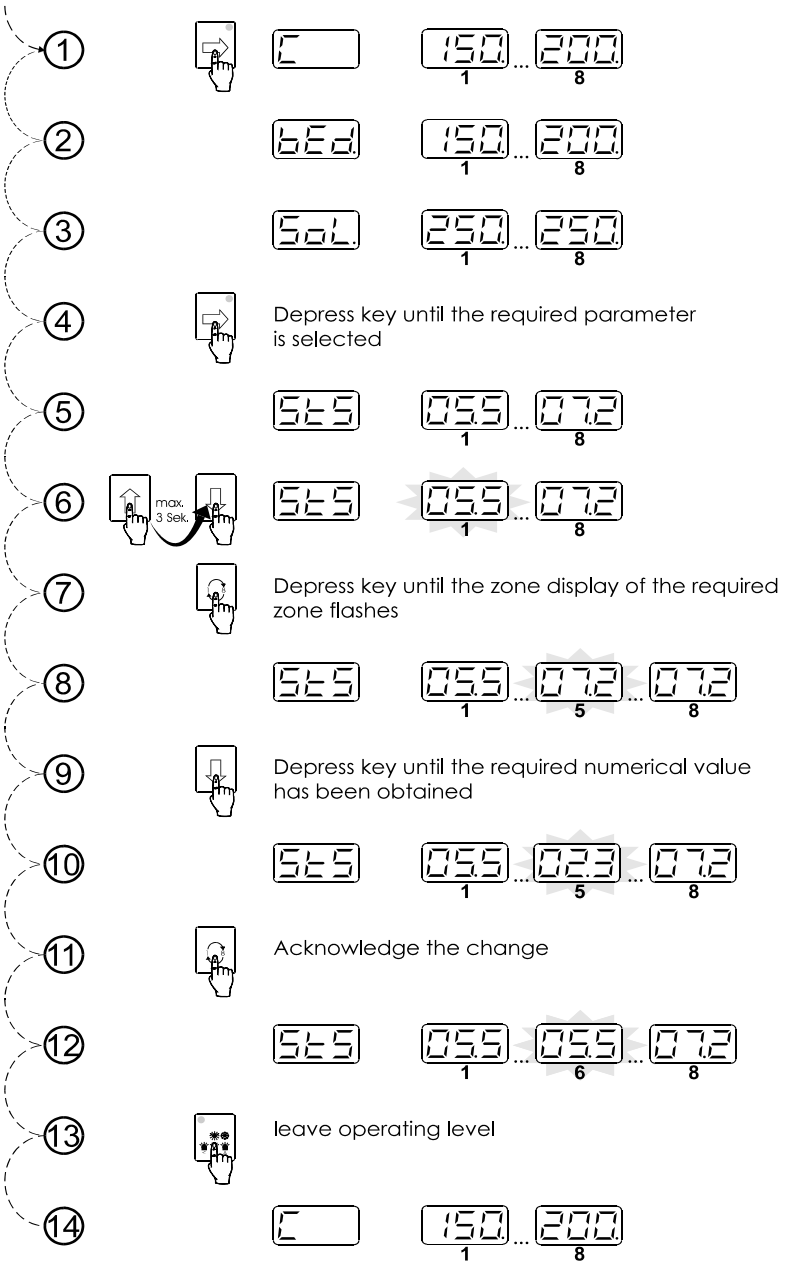
5.4.1 Operating example - operating level

An operating example is illustrated below for changing a single zone and another one for changing all zones in block mode.

Example

Example: Input for single zone

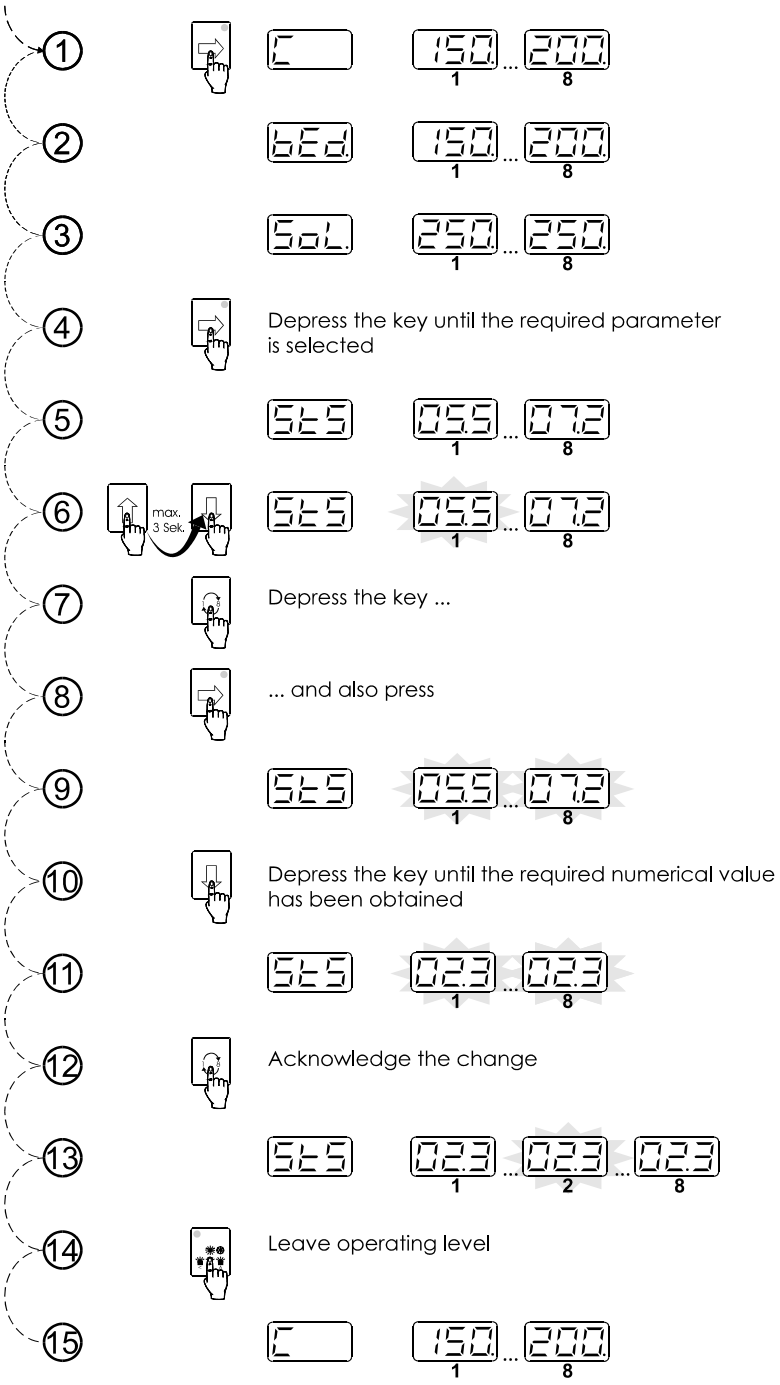
Current setpoint value of zone 5 to be reduced manually from 7.2A to 2.3A.



Example

Example: Input for block mode

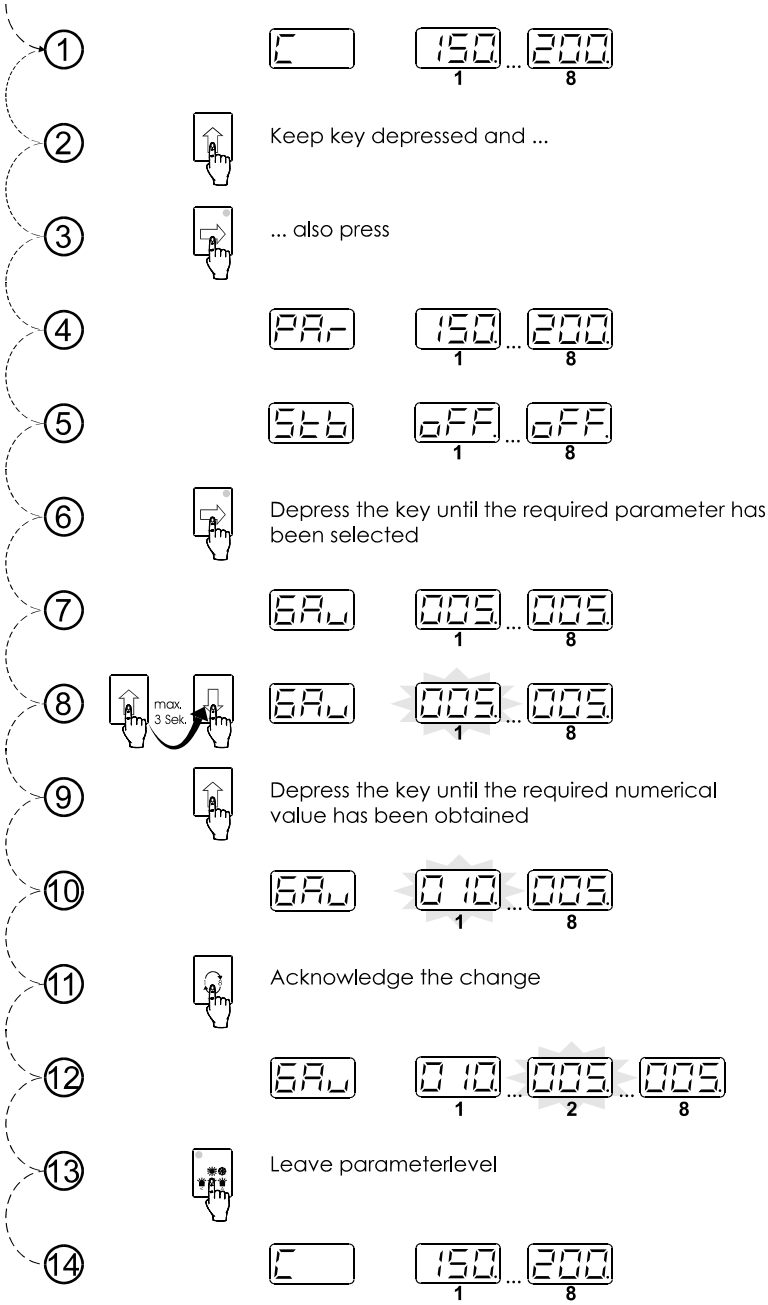
Set current setpoint value for all zones to 2.3 A



5.4.2 Operating example for parameter level

Example

Increase lower limit of zone 1 from 5°C to 10°C



5.5 Further operating functions

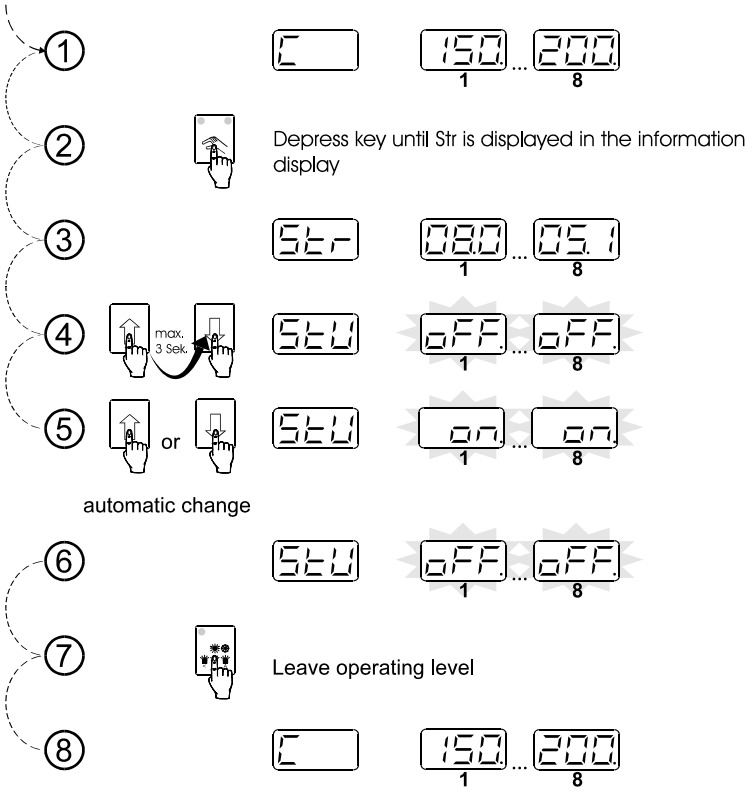
Those operating functions described in detail below are those which deviate from the operating diagram with regard to changing parameter values.

5.5.1 Automatic current transfer

With the help of the current transfer facility the actual current values are transferred as current setpoint values.

This function can also be carried out when no current monitoring is provided or is not connected. In this case the function of the controller is not impaired.

Example



5.5.2 Manual adaption

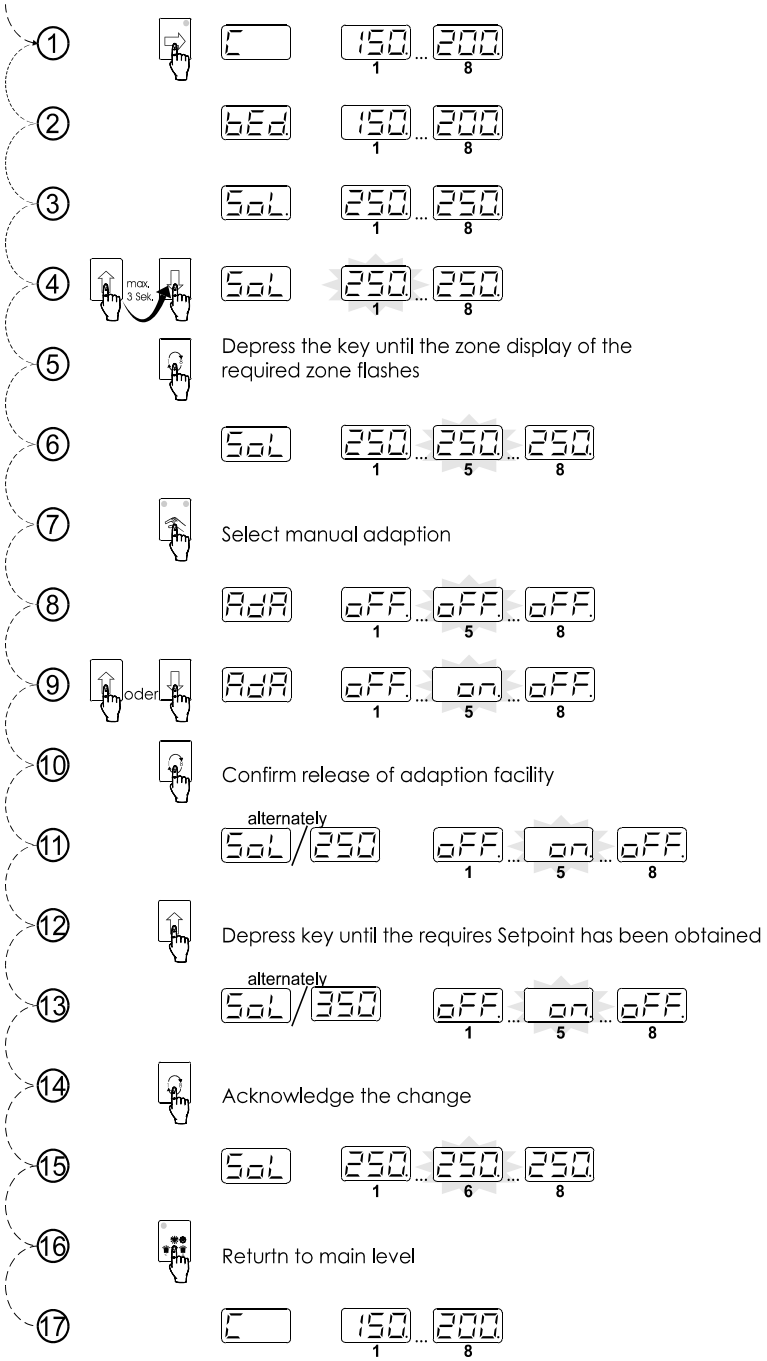
The manual adaptation facility can only be started when

- **OPt is switched off (Opt = off) and**
- **the manual adaption facility (HAE = on)**

is released.

Example

Manual adaptation zone 1 - setpoint value increase from 250°C to 350°C



5.5.3 Acknowledge sensor short circuit alarm (FAL)

A sensor short circuit alarm can only occur when the sensor short circuit monitoring facility FAL is switched on.

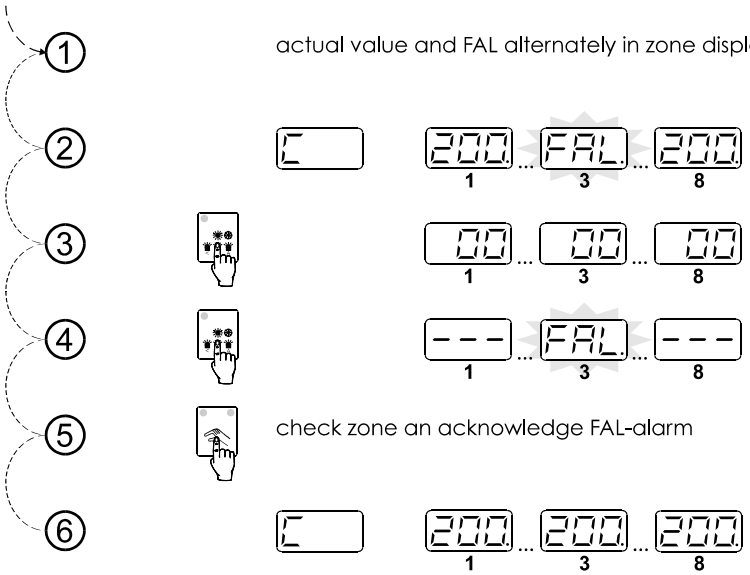
If the alarm is triggered, it is stored until it is acknowledged by the operator, because

Note

The cause of the alarm is a defect or failure on the heater and/or sensor. The respective zones must be checked.

Example

Acknowledge FAL alarm zone 3



5.5.4 Acknowledge current alarm with heating switched off

The alarm can only occur if the value 19 has been set in one of the two alarm configurations AS1 or AS2 (corresponds to "current alarm with heating switched off, can be acknowledged").

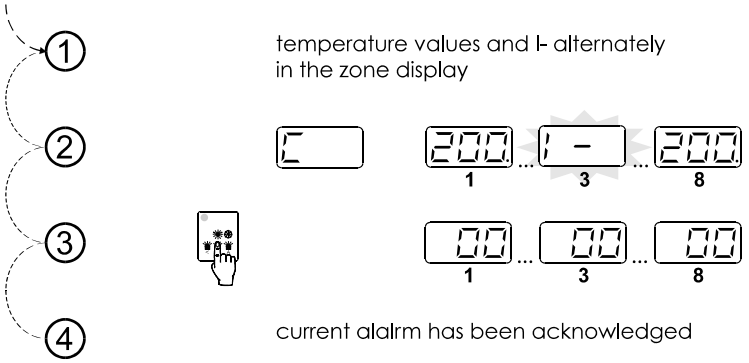
If the alarm is triggered, it is stored until it is acknowledged by the operator.

Note

The cause for the alarm is a defect or failure on the heater itself or at the solid state relay in the control cabinet. The respective zones must be checked.

Example

Acknowledge stored current alarm



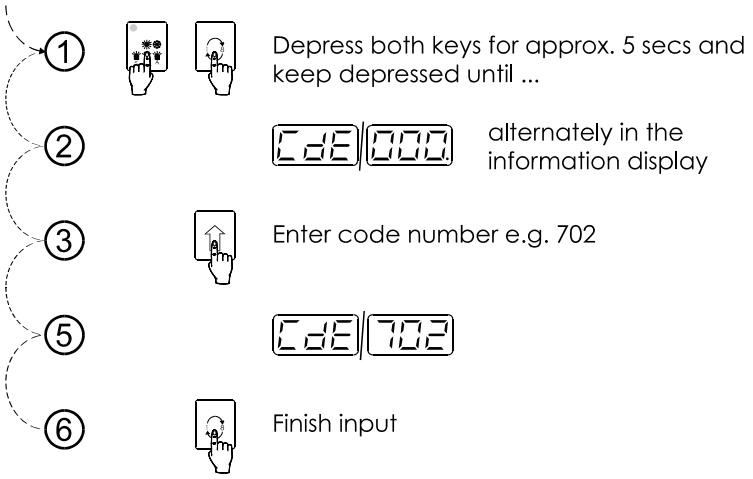
5.5.5 Input of code number

It is essential that a code number is entered to acknowledge any alarm messages if a change of the configuration data in the EPROM of the controller has not been called up by the operator.

A more detailed description of the monitoring function can be found in chapter 6.

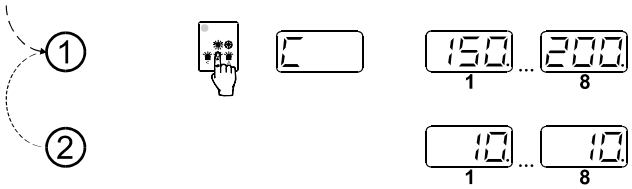
Example

Entering code number 702



5.6 Operating status display - detailed information regarding the condition of all zones at any one time

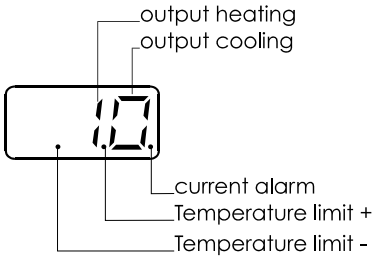
The status of all zones can be called up at a glance by pressing a key. After pressing the acknowledge key in the basic condition, the information display is switched to dark and the complete status of all zones is displayed in the zone display.



The status display contains information for

- **Heating and cooling output status and**
- **the alarm status (limit+, limit-, current alarm)**

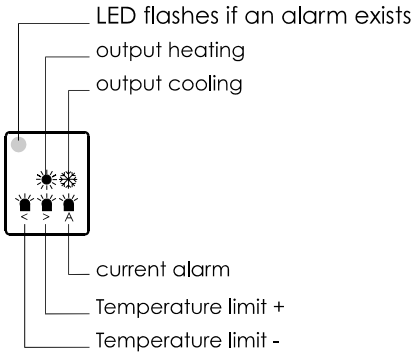
Status-display



0 'output not switched'

1 'output switched'.

Allocation of the status in the zone display can easily be derived from the allocation of the symbols in the acknowledge key.



The LED in the acknowledge key will only flash if at least one alarm in a zone exists.

5.7 The system level - total configuration of the controller

The pre-configuration and parameter shielding of each temperature controller with operating and display unit supplied requires only minimal parametrization effort and time during installation and guarantees the greatest possible operating safety.

Locking of the parameters also means, however, that on controllers with an operating and display unit not all parameters can be changed or viewed by the user.

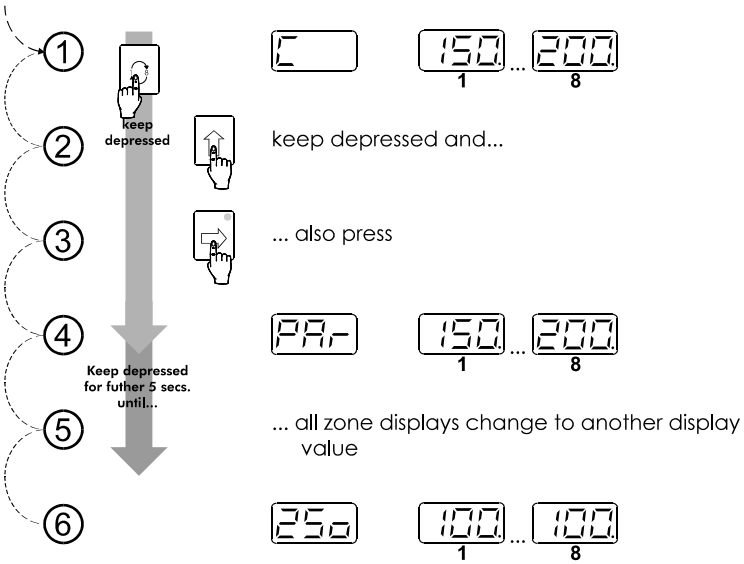
However, the system level provides unrestricted access to all configuration parameters.

Attention

- **Changes to the non-released parameter of the controller as supplied at the responsibility of the controller operator.**
- **The system level should only be selected by authorised personnel, who can evaluate the possible effect of the respective parameter change.**
- **Upon return of the controller to PSG Mannheim for repair, for instance, the controller will again be configured to the condition as it was at the time of supply.**

5.7.1 Selecting the system level

After selection of the system level all parameters of the controller are displayed and can be changed.



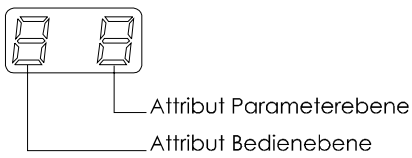
Functioning is irrespective of operation on the operating or parameter levels.

5.7.2 Change attribute for release in operating and parameter level

Every parameter of the controller has also been allocated an additional attribute for operating and parameter level.

These attributes can only be viewed or changed by call-up on the system level and they are displayed by depressing the "manual" key in the information display.

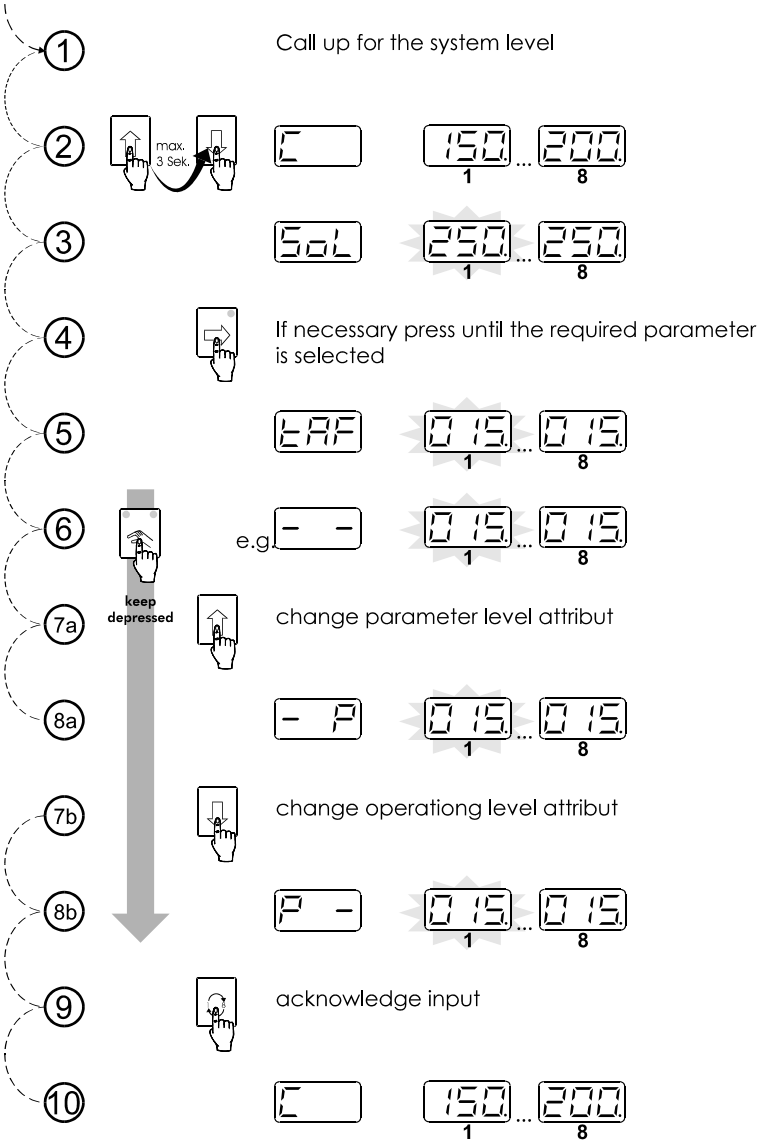
Informations-display



The attributes can represent three values for both levels.

Attribute display	–	A	P
Bedeutung	**Parameter is invisible**	**Parameter can be viewed but no changed**	**Parameter is displayed and can be changed**

By depressing the "manual" key and simultaneous pressing of the arrow key "below", the attribute of the operating level is changed and with the key "up" that of the parameter level.



Example of attribute set-ups

– –	In the control condition the parameter is not displayed on either the operating or the parameter level
P –	In the control condition the parameter is displayed onthe operating level and can be changed. The parameter is not visible on the parameter level.

– A	In the control condition the parameter is not displayed on the operating level and can be viewed but not changed on the parameter level.
– P	In the control condition the parameter is not displayed on the operation level and can be viewed and changed on the parameter level.

Chapter 6

Alarm and safety functions

The alarm functions will help you to recognise errors in your application and to remove them speedily.

Apart from the description of the alarm outputs and the alarm configurations this chapter will also list causes for the triggered alarms as well as possibilities for rectifying the source of the alarm.

In addition to the two alarm outputs provided on the controller the controller also has additional monitoring functions built-in which will help to avoid spurious functions.

How the alarms can be interrogated via the serial interface can be found in the log descriptions.

1.1 General information for the alarm

The controller is provided with two optical coupler alarm outputs which can be configured. They can be selected as a relative measurement value alarms for the monitoring of control deviations, absolute measurement value alarms for monitoring of limits independent of setpoint value inputs, sensor failure messages and current alarm messages with the heating either switched on or off. It is also possible to set combinations of various alarms.

The alarms of the two alarm outputs are interlinked as collective alarm messages for all zones. An alarm will be triggered if an alarm condition exists at at least one of the zones.

If one zone is passivated (PAS = on), all alarm monitoring functions for this zone are switched off, which means the zone will not supply any alarm value for the collective alarm message.

Setpoint value 0°C/32°F also represents passivation of the zone. In this case, however, monitoring of the current alarms will continue.

1.1.1 Alarm outputs

Two configurable optical coupler alarm outputs are provided on the controller.

For installation of the alarm outputs, please read the information provided in the chapter "Installation and commissioning....Alarm outputs 1...2".

1.1.2 Configuration of the alarm outputs

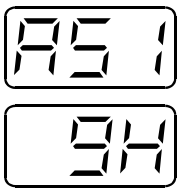
The following alarm messages can be determined and displayed by the controller:

Alarm function	Alarm occurs on ...
Max. value / absolute measurement value alarm	Exceeding an absolute limit, irrespective of the setpoint value
Min. value / absolute measurement value alarm deviation	Undercutting an absolute limit, irrespective of the set-point value
Upper limit / relative measurement value alarm deviation	Exceeding a relative limit for monitoring of the control
Lower limit / relative measurement value alarm deviation	Undercutting a relative limit for monitoring of the control
Current alarm with heating switched off	A current is measured, although no degree of control is provided
Current alarm with heating switched on	Exceeding / undercutting tolerance band set through the current tolerance and current setpoint value
Sensor failure	Defective sensor

1.1.3 Possible alarm configurations for AS1 and AS2

The function for both alarm outputs is set with the configuration parameters AS1 and AS2. This specifies that AS1 determines the function of alarm output 1 and AS2 the function for alarm output 2.

e.g.



the value of alarm parameters AS1 and AS2 consists of a number from 0 to 40 and, with letters, of one of the two letters L or H.

the number represents a certain alarm definition while the letter explains whether the output has switched through in the case of an alarm (H) or whether the output is passive in the case of an alarm (L).

The following table lists all possible settings for the number in the alarm parameters AS1 and AS2.

The two parameters are normally not released for changes on the operating and parameter levels. In this case select the system level and change the alarm configuration.

Setting	Meaning
0	Max. value / absolute measurement value alarm
1	Min. value / absolute measurement value alarm
2	Upper limit / relative measurement value alarm
3	Lower limit / relative measurement value alarm
4	Deviation band (upper limit) upper or lower limit below set-point value
5	Current alarm with heating switched on or alarm with heating switched off
6	Upper limit / relative measurement value alarm or current alarm with heatingswitched off
7	Lower limit / relative measurement value alarm or current alarm with heating switched on
8	Deviation band *or* current alarm with heating switched on *or* alarm with heating switched off
9	Upper limit / relative measurement value alarm *or* current alarm with heating switched on *or* current alarm with heating switched off
10	Lower limit / relative measurement value alarm *or* current alarm with heating switched on *or* current alarm with heating switched off
11	Max. value / absolute measurement value alarm *or* current alarm with heating switched on *or* current alarm with heating switched off
12	Min. value / absolute measurement value alarm *or* current alarm with heating switched on *or* current alarm with heating switched off
13	Lower limit / relative measurement value alarm if setpoint value has been reached. Alarm active if the lower limit is undercut after zone or control reset and the setpoint value having been obtained yet again.
14	Deviation band *or* current alarm with heating switched on
15	No alarm message
16	Current alarm with heating switched off
17	Deviation band "upper limit" (upper limit above and below the setpoint value)
18	Deviation band "lower limit" (lower limit above and below the setpoint value)
19	Stored current alarm with heating switched off

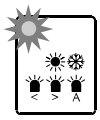
Sensor break

If the information of a possible sensor failure is to be issued through the alarm output, the figure 20 must be added to the number of the alarm setting.

Example

Output of the upper limit or a sensor failure through one of the alarm outputs will result in alarm setting 22 (2 + 20).

1.2 Alarms, their possible causes and how they can be rectified



The flashing LED in the status key signals an alarm.

By pressing the status key the zone status will appear in the zone display, with which the faulty zone(s) can be identified.

Alarm message & diagnosis in causes **zone status display**	possible **Ursachen**	**Rectification**
999 Fb 0.0 upper limit	• Sensor failure • Sensor not connected	• Check sensor and replace if necessary
999 FP .00 lower limit	• Sensor cable connected with reversed polarity	• Change over the sensor connections
heating on .10 upper limit	• Heater defective • Heater too small	• Check heater element and change if necessary • Fit heater with greater output
.00 lower limit	• Setpoint temperature • GAu parameter set too low	• Increase GAu reached
0.0 upper limit	• Temperature increase despite heating switched off • Influenced by higher-temperature of neighbouring zone	• if necessary, check neighbouring zones
0.0 upper limit	• Setpoint value reached • GAo parameter set too low	• Increase GAo
127 I- 00. Stromalarm	• Current alarm active with heating switched off	• Check heater or solid state relay!

A more detailed explanation of the FAL alarm fault message can be found in chapter 7 under "Detailed description of selected functions - sensor monitoring function".

In addition, more explicit instructions for messages relating to **safety and monitoring functions** can be found at the end of this chapter.

1.3 Zone-specific alarms

With the control of two-point zones the cooling outputs of the controller can be used as zone-specific alarm outputs.

Condition

- **Zone two-point (3P=off)**
- **Cooling outputs nevertheless available on controller**
- **Input of an alarm setting in parameter AS-**

In this case and analogously to the collective alarm messages AS1 and AS2, a zone-specific alarm is put out via the cooling outputs.

The alarm setting for the alarm of the zone using the cooling output is zone-specific.

Wiring of the zone-specific alarm outputs is analogous to that of the cooling output.

Example

Do not use all zones on your controller for three-point control and, if you would like to monitor the two-point zones of the controller in addition to the collective alarm messages, switch parameters 3P to off and use AS- to switch the required alarm function on. An alarm will now be put out through the cooling output of the respective zone.

1.4 Safety and monitoring functions for the configuration data

In addition to the alarm functions of the controller additional monitoring functions to safeguard the

- **matching data**
- **system data and**
- **Channel data**

have been implemented in the controller software. With the aid of these functions, a change to the parameter data stored in the EEPROM of the controller, which has not been initiated by the operator, is detected and followed by the output of an alarm, after which respective zones are brought into a defined condition.

With due consideration of the installation instructions it is almost impossible to cause a fault on the configuration data stored in the EEPROM.

1.5 Matching

The data for matching each controller are stored in the EEPROM and cannot be corrupted by a mains power failure.

1.5.1.1 Fault message "Fault in matching data"

Faults with matching data will result in a fault message Err 002 in the zone displays 1 and 5 of the controller.

- **A degree of control output of 0% is effected for all zones.**

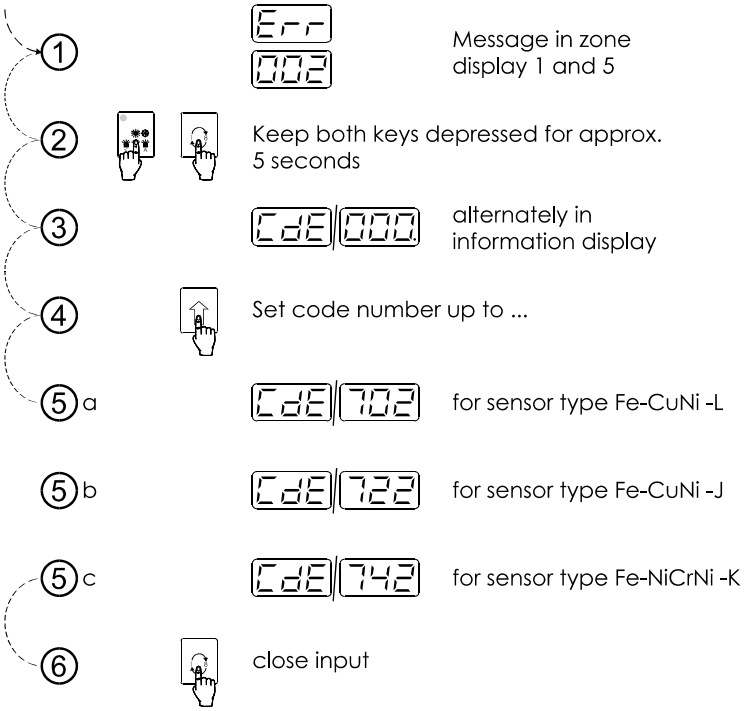
1.5.1.2 Resetting the fault message "Fault in matching data"

After destruction of the matching data, there is still the possibility of loading a standard match in the controller. This is effected by the input of a sensor-specific code number.

Standard match

Averaged characteristic curves were used for the standard match data for sensors type FE-CuNi-J, FE-CuNi-L and NiCrNi. Even in the case of faults in the controller-specific data they also guarantee temperatures with a max.deviation of 5°C from the actual temperature reading.

The standard matching data is set using the following operating procedure:



Standard system data

After resetting the matching data all system data is reset to standard values. If your controller configuration deviates from standard values, please reset your controller specification data.

Parameter	Standard value
AS1	16L
AS2	14L
diS	on
Pro	PSG
bd	9600
Sto	1
PAr	no
tsP	off
Sen	According to code number
CEL	on
EBE	300
HAE	on

Note

Changes should only be carried out by authorized personnel !

Resetting is only possible with thermal element sensors.

Matching with standard matching values can only be carried out after matching error Err 002.

In order to obtain the controller-specific matching data for the controller, please send the controller back to PSG Mannheim for checking at the earliest opportunity.

1.5.2 System data

The system data for matching the controller are stored in the EEPROM and cannot be corrupted by a mains power failure. The following parameters are stored within the system data:

Parameter
AS1
AS2
diS
Pro
bd
Sto
PAr
tsP
SEn
CEL
EBE
HAE

1.5.2.1 Error message "Error in system data

As soon as the values of the system data change without external influence e.g. manual change via the operating field or via an interface, the error message Err 005 is put out.

- **Output 0% degree of control is seen on all zones**
- **An alarm message is put out for limit+, limit-, current limit+ and current limit-.**

1.5.2.2 Resetting the error message "Error in system data"

Check all parameter values of the system data and correct them in accordance with your controller specification. In case of questions regarding your configuration please contact PSG Mannheim direct.

In case of any doubt you can also enter standard values instead of system data.

Parameter	Standard value
AS1	16L
AS2	14L
diS	on
Pro	PSG
bd	9600
Sto	1
PAr	no
tsP	off
SEn	FE-CuNi -J
CEL	on
EBE	300
HAE	on

Changes should only be carried out by authorized personnel !

1.5.3 Channel data

The channel data of the controller are stored in the EEPROM and cannot be corrupted by a mains power failure.

1.5.3.1 Error message "Error in channel data"

As soon as the values of the channel data change in the channel data range without external influence e.g. manual change via the operating field or via an interface, the error message Err is put out in the zone display of the respective zone

- **Output 0% degree of control is seen on the respective zone.**
- **An alarm message is put out for limit+, limit-, current limit+ and current limit-.**

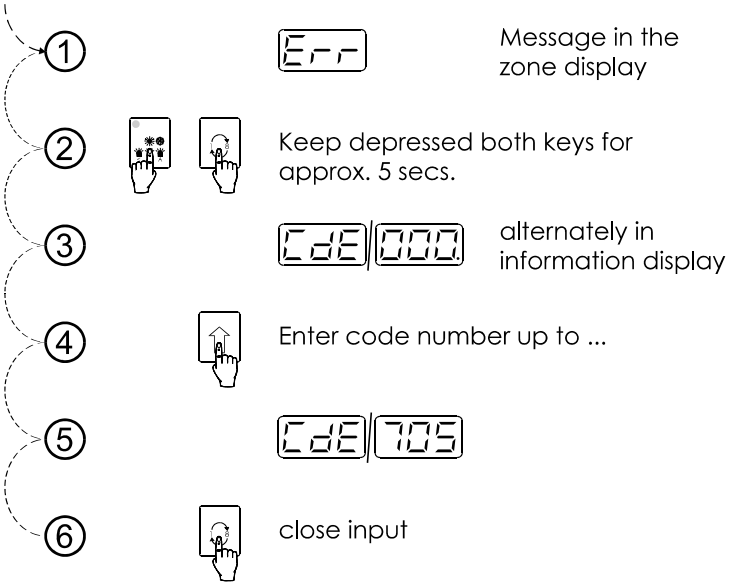
1.5.3.2 Resetting the error message "Error in channel data"

Changes should only be carried out by authorized personnel !

If necessary, check and alter all parameter values of the zone in accordance with the system level.

With the aid of the "Automatic zone configuration" facility set the original parameters as per the factory settings. Chapter 4 should be read carefully before carrying out this work !

Reset the error message by entering the code number 705.



Err will now extinguish in the zone display(s).

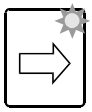
1.5.4 System error messages

The system will recognize faulty components and will put out an error/fault message in two zone displays. The other zone displays and the information display are switched to dark.

Error/fault message	Cause of error/fault
Err 001	EPROM error/fault
Err 003	RAM error/fault
Err 004	EEPROM hardware fault

In these cases the controller **must** be returned to PSG Mannheim for repair!

1.5.5 AUTOSAVE function after data transfer via the serial interface



For reasons of data security all data transferred to the controller via the serial interface is saved to EEPROM automatically every 10 minutes after the last "go" command and cannot be corrupted by a mains failure. During this time the LED in the right-hand arrow key will flash.

1.6 Monitoring of the safety limits "Upper setpoint value" and/or final measurement range value

If the upper setpoint value limit Soo is set to more than 150°C, a safety switch-off facility is used to check the max. permissible temperature of the control paths. If this temperature is exceeded by 5°C, the degree of control of the respective zone is set to 0% or 100%.

Temperatu-relimits of the safety switch-off facility

The safety switch off facility is activated when one

of the following limit temperatures is exceeded:

1. **Upper setpoint value limit**
2. **Measurement range of the sensor is exceeded**

If the actual value exceeds the upper setpoint value or measurement range limit by 5°C, the degree of control of the respective zone is set to

- **0% with a two-point zone or**
- **-100% with a three-point zone**

- **An error message occurs for limit+, limit-, current limit value and with the heating switched off.**
- **The error message AL appears alternately in the zone display together with the actual temperature value.**

Chapter 7

Detailed description of selected functions

In the following chapter the effective methods of selected functions implemented on the controller are described in detail

7.1 Technical control information

Two fully automatic adaptation strategies for determining the control parameters are at your disposal. Both differentiate basically in their method of operation.

The end result is that they both supply control parameters for optimum control quality of the connected control zones.

7.1.1 The automatic optimization by means of OPT

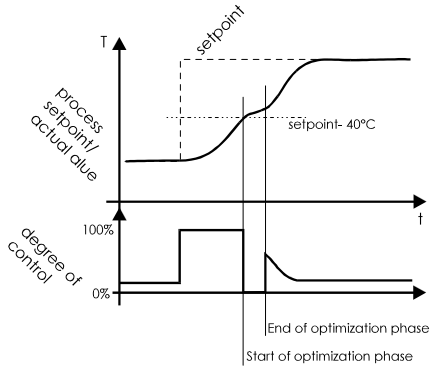
7.1.1.1 Parameters

The automatic optimization can be switched on or off via parameter OPt.

7.1.1.2 Function

Determination of the parameters by means of the automatic optimization is carried out 40°C before reaching the setpoint value.

At the start of the optimization phase the degree of control is set to 100%. The automatic optimization is finished when the slew rate has dropped to a part of the slew rate existing at the start of the optimization phase.



The heating control parameters are calculated from the dynamic behaviour of the actual value process and from that the cooling parameters are derived. The data is stored in the EEPROM and overwrite the control parameters previously used.

Condition

The only condition for use of the automatic optimization facility is that, apart from a setpoint value jump of at least 60°C, you ensure that the slew rate of the temperature at the start of the optimization phase is at max.

Gründe dafür, daß sie nicht größtmöglich ist, können sein:

- Switch on starting ramp ArP. To determine the correct control parameters they must de-activate at least once (ArP = 0).
- Actuators were not switched on just before the start of the optimization phase, as this reduces the max. slew rate. The control parameters would be calculated wrongly because of the "dampened" temperature process.

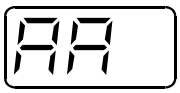
7.1.2 Automatic starting adaptation by means of AA

With regard to the automatic starting adaptation for heating and cooling, the parameters are calculated from the unit step response.

With the automatic optimization facility switched on, the automatic adaptation will not be executed.

7.1.3 Automatic starting adaptation (heating)

7.1.3.1 Parameters



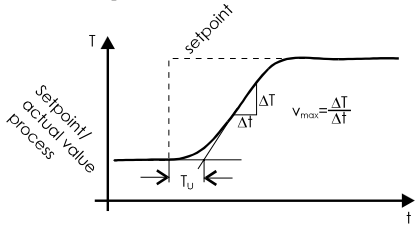
The automatic starting adaptation (heating) can be switched on or off via the parameter AA.

7.1.3.2 Function

After increasing the setpoint value by at least 40°C, the dwell time and slew rate are calculated from the temperature process and the heating control parameters are calculated.

Condition

- **Setpoint value of at least 40°C**
- **Current alarm is not active. This also means that the actuators must not, under any circumstances, be switched off.**

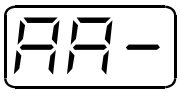


During automatic starting adaptation (heating) the zone display will show AA alternately with the actual temperature value.

The new control parameters are stored in the EEPROM and will overwrite the control parameters used up to now.

7.1.4 Automatic starting adaptation (cooling)

7.1.4.1 Parameters



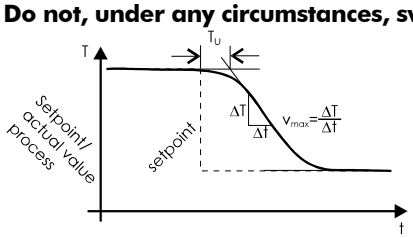
The automatic starting adaptation (cooling) can be switched on or off via the parameter AA.

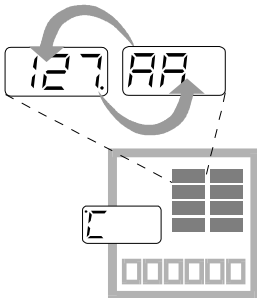
7.1.4.2 Function

After reducing the setpoint value, the dwell time and slew rate are calculated from the temperature process and the cooling control parameters are calculated.

Condition

- **Setpoint value of at least 40°C**
- **Do not, under any circumstances, switch off the actuators.**





During the automatic starting adaptation (cooling) the zone display will show AA- alternately with the actual temperature value.

The new control parameters are stored in the EEPROM and will overwrite the control parameters used up to now. They cannot be corrupted by failure of a mains power supply failure.

- **If you use the controller on different zones, you will, depending on the conditions, be able to make best use of the function of automatic parametrization.**
- **If you always use the controller on the same zones, there is the possibility of switching the automatic adaptation off after initial determination of the correct control parameters. With changes of the setpoint value the setpoint values will be started without delay caused by the determination of parameters.**

7.2 Sensor monitoring function FAL

Apart from sensor failure of the connected thermal element, a sensor short-circuit is a further source of problems during acceptance of the measurement value.

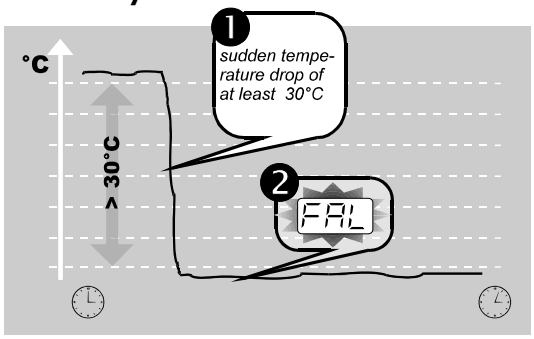
Contact between the two sensor balancing cables caused, for instance, by chafed cables, supplies a thermal voltage not belonging to the measurement point and, therefore, faulty temperature measurement. This fault occurs mostly on the feed cable of the thermal element. The ambient temperature usually corresponds to the room temperature, and that is why the actual temperature indication is close to the room temperature.

A further reason for a FAL alarm can also be that a sensor has slipped out of the sensor bore. Although this sensor is not defective, it nevertheless does not show the temperature at the actual measuring point.

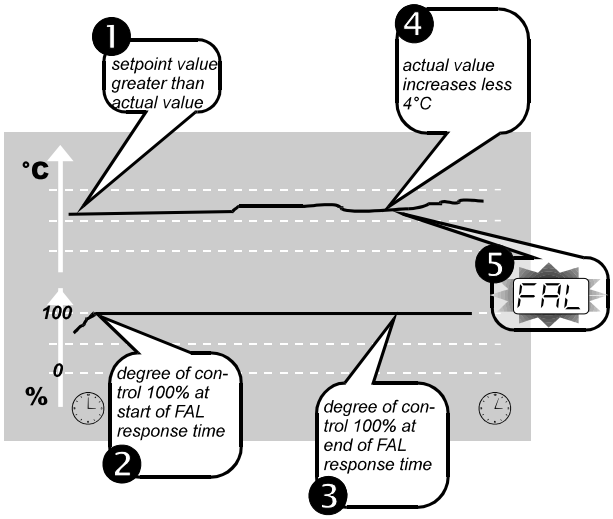
Two causes for an FAL

These are two causes which can lead to an FAL alarm:

- **If the difference between the actual value and the last indicated actual value is suddenly more than 30°C, a FAL alarm will be initiated after a certain number of control cycles. This is because, in this case, there is almost certainly a defect in the sensor lead or on the sensor itself.**



- **If the setpoint value > actual value during the FAL response time and with max. possible degree of control (observe possible degree of control limitation) does not lead to a temperature rise of at least 4°C, the FAL alarm will be initiated.**



With identification of one of the two operating conditions the alarm will be initiated and the respective zone made passive. Re-activation of the zone will only take place after acknowledgment of the alarm.

The sensor short-circuit monitoring facility is not active when

- **a current alarm (heating switched on or off) is active**
- **the starting adaptation is switched on**

- **sensor failure has been identified**
- **the setpoint value is being changed to a lower value**

7.2.1 FAL response time

The FAL response time helps to prevent a FAL alarm being wrongly initiated if, despite max. degree of control, there is no temperature increase.

The response time will start to operate when all pre-conditions for a FAL alarm have been satisfied. If the operating condition is still according to the pre-conditions for a FAL alarm at the end of the FAL response time, the alarm will only be initiated at this time.

A FAL alarm will not be initiated if any one of the pre-conditions is no longer satisfied during the FAL response time. In this case the response time will be started again when FAL pre-conditions exist.

Duration dependent *on working point*

Depending on the working point, different FAL response times will prevail. The response time depends on the dynamics of the connected control zone, which can be derived from the sensing time.

- Within the setpoint value band SWB: FAL response time = 30 x sensing time for heating
- Outside the setpoint value band SWB: FAL response time = 20 x sensing time for heating

The width of the setpoint value band SWB depends on the proportional band for heating Pb and is calculated as follows: SWB = Pb x 4°C. The setpoint value band lies above and below the setpoint value.

Example

Sensing time for heating tA = 10 secs., proportional band Pb = 2,5%

Width of the setpoint value band 10°C

Response time outside the setpoint value band: 20 x 10 secs. = 200 secs.

Response time within the setpoint value band: 300 secs.

Additional conditions *Etn = on*

With Etn = on the FAL response time after switching on of the controller is 20 minutes. On recognition of an increase in temperature of 4°C the FAL response time will be set to the above described respective operating conditions. The min. FAL response time is, however, limited to 300 secs. (= 20 x 15 secs, min. sensing time for heating = 15 secs.) in order to take account of the time characteristics of "slow paths" as well.

Example

Sensing time for heating tA = 10 secs., proportional band Pb = 2,5%

Width of the setpoint value band 10°C

As tA = < 15 secs., the response time is calculated as tA = 15 secs..

Response time outside the setpoint value band: 20 x 15 secs. = 300 secs.

Response time within the setpoint value band: 450 secs.

7.2.2 Response time within the setpoint value band: 450 secs.

From a pictorial point of view, two flags are reserved for every control channel, providing the sensor monitoring facility has been switched on. Both will indicate, whether the pre-conditions for an FAL alarm have been satisfied. In addition, a stop watch has been connected to one of the flags and this will be started, when the conditions for a FAL alarm have been satisfied, and it will be reset when at least one of the conditions is no longer met.

Flag1

The actual process is monitored and checked to see if thedifference between the actual value and the last sensed actual value is greater than 30°C.

The actual value is measured and then compared with the last measured value and, if the difference is greater than 30°C, a check is carried out over a number of cycles. If there is still a difference, a FAL alarm will be initiated.

Flag2 and stop watch

If, during the normal FAL response time and with max. degree of control, there is no increase in temperature of 4°C, a FAL alarm will be initiated.

Monitoring of the 2nd flag and the connected stop watch is carried out continuously during the process.

If the 2nd flag is set, the stop watch is either started or, if already started, permitted to continue to run. if the flag is extinguished, i.e. the pre-conditions for a FAL alarm no longer exist, the stop watch is stopped and reset.

FAL and setpoint value change

Flag 2 is automatically extinguished after a change in setpoint value.

When the following conditions have been satisfied within the FAL response time, a FAL alarm will be initiated

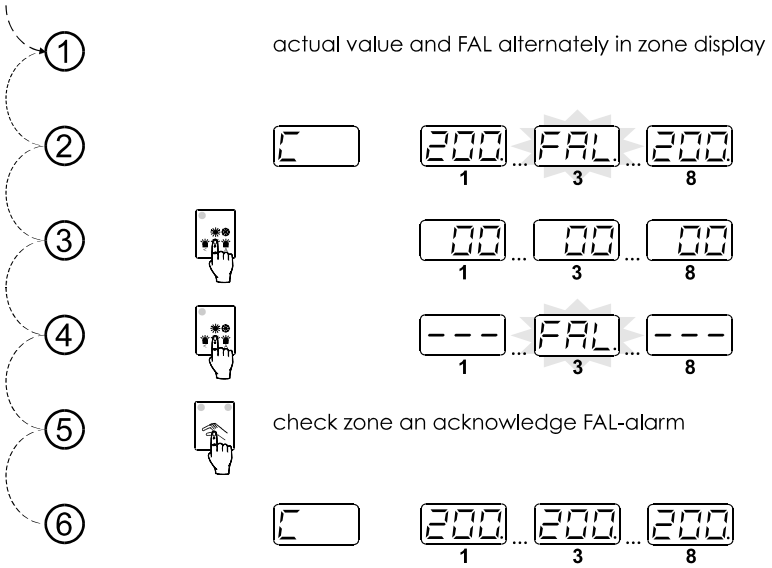
- **Degree of control = max. degree of control limitation**
- **No setpoint value change**
- **No current alarm**

If, at the time indicated by the stop watch (FAL - response time), flag 2 is still set out and no increase in actual value of 4°C is obtained, the FAL alarm will be initiated.

If, during the FAL slew time, the temperature rises by 4°C, flag 2 will be extinguished and monitoring of the sensor short-circuit facility is continued.

7.2.3 Acknowledgment of the FAL alarm

FAL alarms are acknowledged on a zone-specific basis.



7.3 Parameter 3P (Change-over two-/three-point control)

If the controller has been designed for three-point zones, the parameter 3P has been set at the factory on stored controllers, after which they are released for operation. It is possible with customer-specific controllers it is possible that the parameter is not visible to the user and cannot therefore be changed on the operating or parameter level. However, a change can be carried out on the system level.

Optimization of the control quality

It can happen, that the control quality with two-point zones (only heating) is not at its best. The reason for this is that the controller with positive control difference awaits the cooling zone and would therefore like to provide a negative degree of control, although cooling has not been connected.

Since the algorithm of the controller is a modified PID algorithm, the modified version will not switch abruptly over to a positive degree of control when a greater degree is requested, but will "integrates" itself, on the basis of the control parameters, from the negative to the positive degree of control range. This results in a delay in the degree of control reaction which can, but not necessarily, result in a fluctuating temperature behaviour.

This can, however, be rectified by switching the parameter 3P off, resulting in deactivation of the control range for cooling (min. degree of control = 0%). An increase in the degree of control will immediately show its effect by an increase in the emitted heat.

Note

Any change in the parameter should be recorded so that, at the time of changing of the controller, the same configuration can be set up.

7.4 Parameter Etn (extrusion)

The parameter Etn is a safety feature during calculation of the control parameters Pb, tI, td and tA. If parameter Etn is switched on, the control parameter calculation is monitored by the automatic optimization facility during adaptation.

If, for the extrusion applications, unusable path parameters were measured, resulting in "silly" control parameters, the extrusion-specific standard control parameters are used.

As, with extrusion application for heating zones, the paths are either rather or very slow or slow, it can be seen from parameter tA (sensing time for heating), whether the automatic optimization has calculated a sensible set of control parameters, Pb, ti and td.

Etn-criteria

If tA is less than 5 secs., the extrusion-specific standard control parameters

- **Pb = 5 % and Pb- = 5 %**
- **td = 100 secs. and td- = 50 secs.**
- **ti = 500 secs. and ti- = 250 secs.**
- **tA = 20 secs. and tA- = 20 secs.**

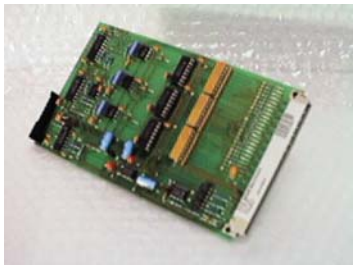
are set automatically and the calculated parameters are overwritten.

Chapter 8

Annex

8.1 Accessories

8.1.1 Current interface STI98 (part number 039005)



Current acquisition card in Euro card format for processing of up to 8 three-phase heating circuits.

Technical specifications

Input	0...2VAC per channel
Input resistance	2kΩ
Output	analog 0...6VDC digital BCD Code

Current consumption with 12V max 70mA

8.2 Current transformer VSW41 (part number 039000)

Current acquisition card for exact acquisition of up to 4 single-phase heating circuits.

Technical specifications

Input	0...40 A
Resolution	0,1 A
Output	Linear 42mVeff pro 1A (±10%)

8.2.1 Configuration set (part number 039006, 039007)

Part No.039006 Configuration set RS485

Part No.039007 Configuration set 20mA

The configuration set, consisting of

- **An interface transformer**
- **Connecting cable to the PC and controller and**
- **Configuration program KonVis**

enables

- **complete configuration of the controllers (read-out of parameter, writing and editing of parameters)**
- **off-line editing of the control parameters**
- **on-line operating of the controllers**
- **storing and printing out of the controller configuration**
- **graphic illustration of temperature processes in the graphic window**
- **storing and printing out of temperature processes**

to be carried out via the serial data interface.