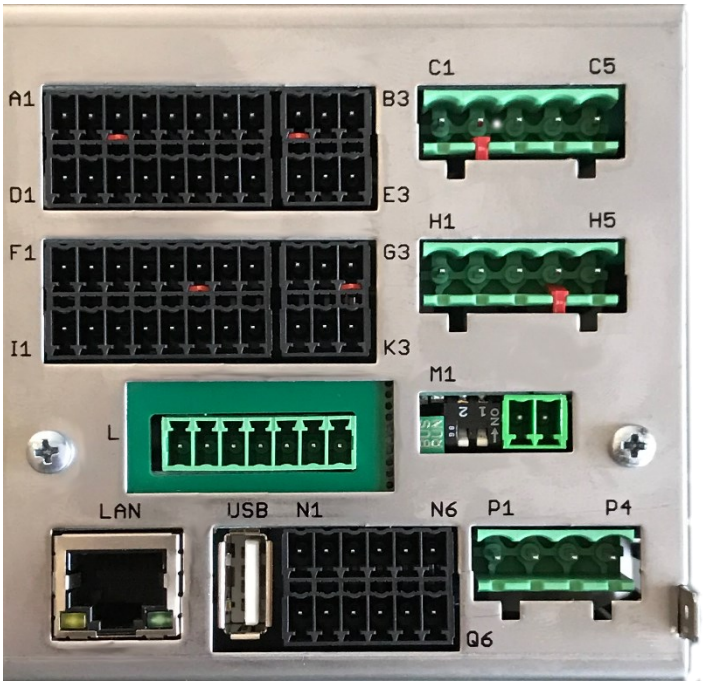
R4020

DIN Rail Temperature Controller With

1, 2, 4, 6, 8, 12* or 16* zones Heating/Cooling

* With the extension module R4010 up to 16 zones can be connected.



Depth: 120mm
Format: 116mm x 93mm

DESCRIPTION AND OPERATING MANUAL

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Contents

1 General Information

Symbols used:

www.elotech.de	Messages shown by the controller are written in this font.
MRS / MRE	**M**easuring **R**ange **S**tart / **M**easuring **R**ange **E**nd
<§>	Symbolizes the factory adjustment of the respective parameters.

2 Installation Instructions

Make sure the device is used for the intended purpose only.

R4020 controllers are designed for installation in control panels.
Protect the device against impermissible humidity and contamination.

The permitted ambient temperature range may not be exceeded.
Electrical connections must be made according to valid regulations and by properly qualified personnel.

If using thermocouple sensors, compensation lines have to be connected directly to the controller terminals. Sensors may be connected only in compliance with the programmed range.

Sensor cables and signal lines (e.g. logic or linear voltage outputs) must be laid separately from control lines and mains voltage supply cables (power cables).
In order to maintain CE-Compliance screened detectors - and signal lines have to be used.
It is not permitted to connect the grounds of the sensor-inputs and logic-outputs with each other.

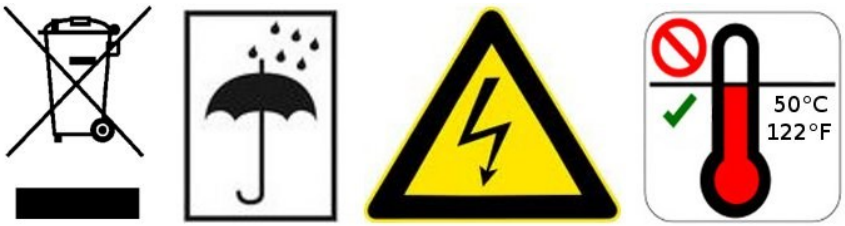
Separate installation of controller and inductive loads is recommended.
Interference from contactor coils must be suppressed by connecting adapted RC-combinations parallel to the coils.
Control circuits (e.g. for contactors) should not be connected to the mains power supply terminals of the controller.

The configuration parameters are generally to be selected first.

Disclaimer of Liability

The contents of this document is checked for the conformity with the hardware and software described. Nevertheless, we are unable to preclude the possibility of deviations so that we are unable to assume warranty for full compliance. However, the information given in the publication is reviewed regularly. Necessary amendments are incorporated in the following editions.
We would be pleased to receive any improvement proposals which you may have.
The information contained herein is subject to change without notice.

Electronic scrap and components are subject to special treatment and must be disposed of by authorised companies.



3 Type Code

R4020 - X - Z - Y - 000 - DD - 5

Power Supply	
5	24 VDC

Fieldbus Interface	
00	No
03	RS 232-C + RS 485 + 0/20mA TTY (incl. E-Bus)
09	Profibus-DP (incl. E-Bus)
90	E-Bus to connect the extension module R4010

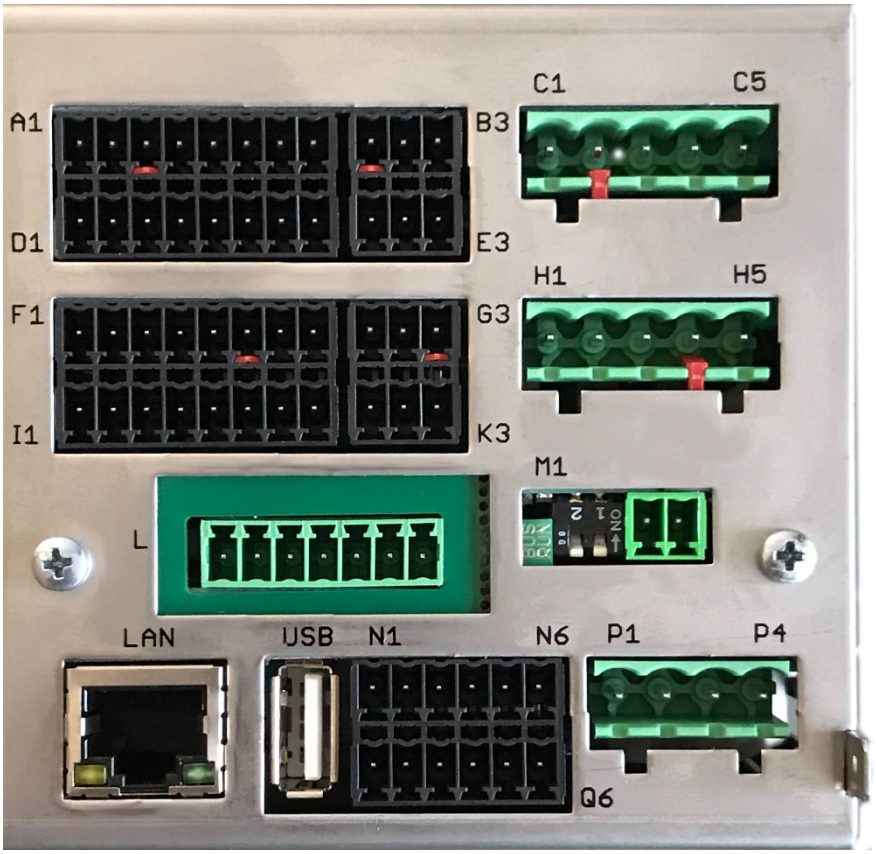
Heater Current Monitoring	
0	No
5	Yes (Logic outputs only)

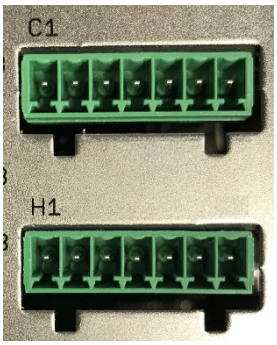
Zones	
1	zone
2	2 zones
4	4 zones
6	6 zones
8	8-zones
12 and 16 zones: see note below	

Versions	
0	Output each zone: 1x Logic & 1x Relay (standard)
1	Output each zone: 1x Logic & 1x 0-10V o. 0/4-20mA

DD If 12 or 16 zones are required, an 8-zone controller and an expansion module R4010 (4 or 8 zones) must be ordered.
The E-bus on the R4020 is required for communication with the R4010.
If the required controller already has a fieldbus interface, then the E-bus interface is already available.
If no fieldbus interface is required, key 90 (E-bus) must be selected for the fieldbus.

4 Connection Diagram



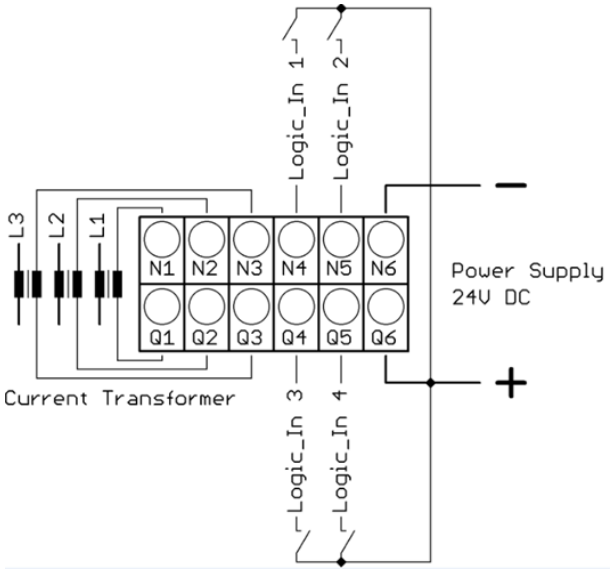


Option continuous

Ground connection

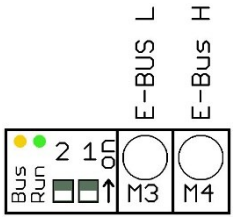
The Ground connection (flat plug 6,3mm) must be connected to an earth rail via a thick cable (>=4qmm) in the shortest possible way (<20cm)!

4.1 Connection Diagram: Power supply, Logic Inputs and Heater Current



Function of logic inputs		
*In_1:	0 =	(*) Setpoint 1 active for all zones.
	1 =	(*) Setpoint 2 active for all zones
*In_1:	0 =	Stop program controller
	1=	Start program controller *Depending on config. Logic input 1↗ 7.2.3
In_2:	No function	
In_3:	No function	
In_4:	No function	

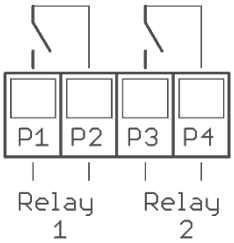
4.2 Connection diagram LEDs, DIP-Switches and E-Bus



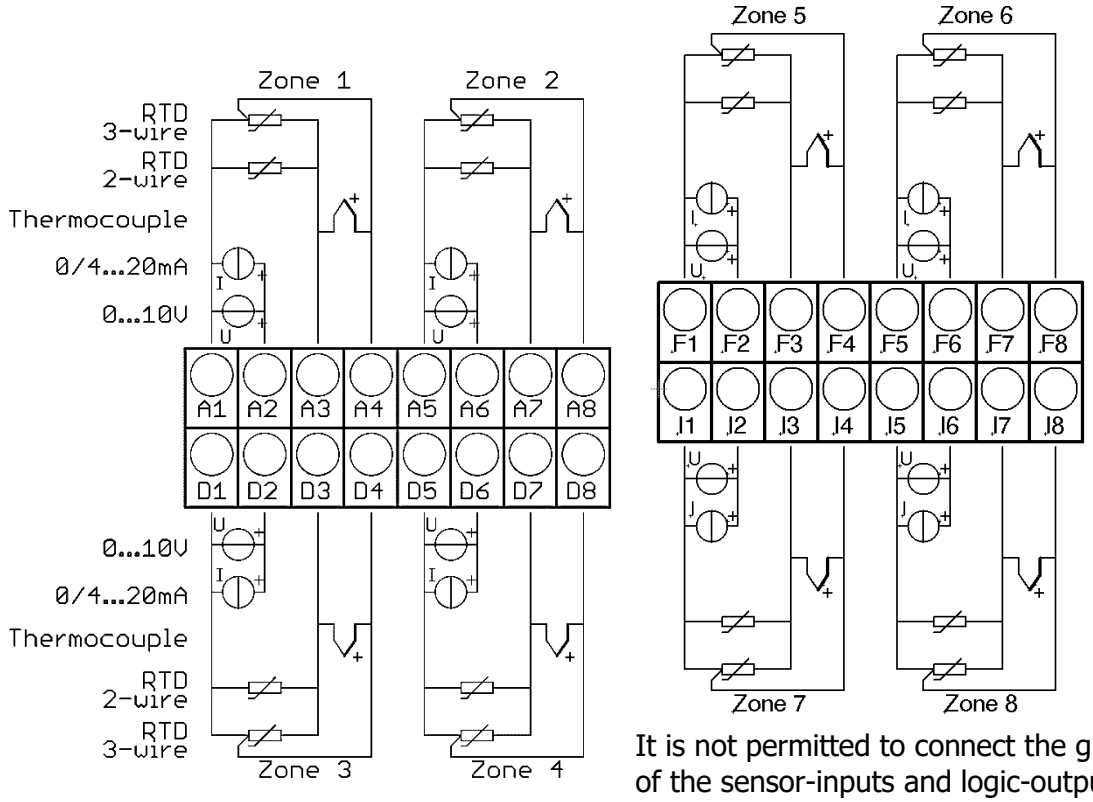
The LEDs are used to show operating states. E.g. LED Run is glowing green for normal operation.
Functions can be controlled with the dip switches. Such as resetting the IP address and initiating the firmware update.

The extension module R4010, for exptension to 12 or 16 zones, is connected to the R4020 via the E-bus.
The lines „E-Bus L" and E-Bus H" must be connected to the corrosponding terminals of the R4010.
The connection must be designed as a shielded cable. The shield has to be conneted the earth (housing) at the R4010 side.

4.3 Connection Diagram: Monitoring Relay



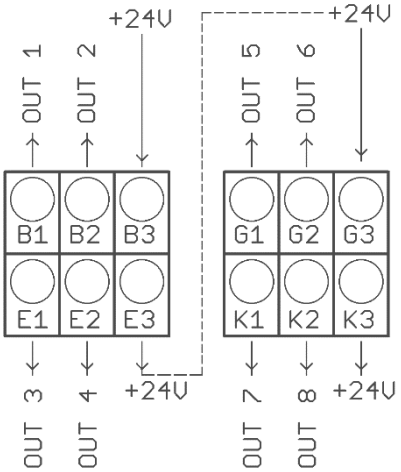
4.4 Connection Diagram: Sensor Inputs



It is not permitted to connect the grounds of the sensor-inputs and logic-outputs with each other!

RTD/Ni120: The parameter "Sensor Settings / Sensor" has to be set accordingly to the connection diagram (2-wire/3-wire)

4.5 Connection Diagram: Logic Outputs

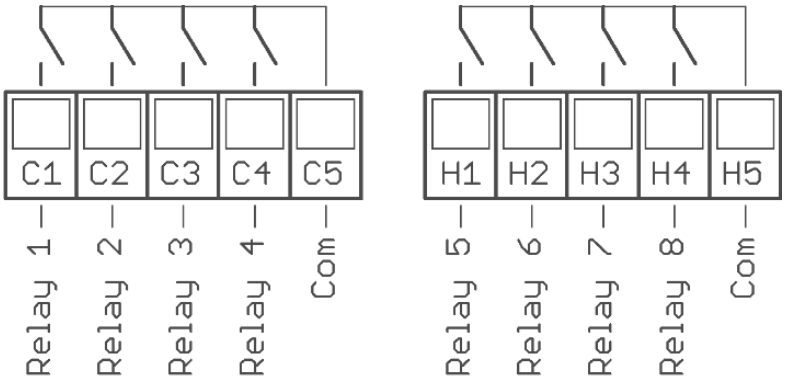


The power supply for the logic outputs has to be wired externally:
+24V must be applied to the terminals B3 and G3.

B3 is connected internally to E3 and G3 is connected to K3. So the terminals E3 and K3 can be used to loop the +24V.

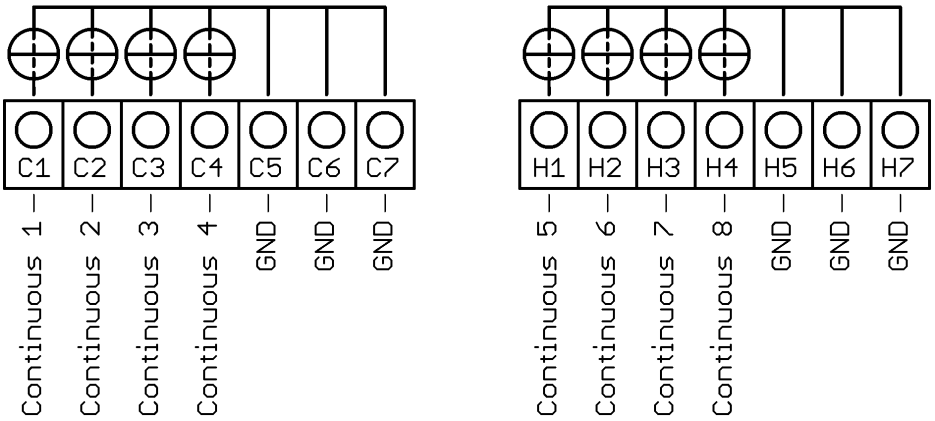
The 24V are switched to the outputs out x and thus control the SSRs. Reference potential is the ground of the supply voltage.

4.6 Connection Diagram: Relay Outputs



4.7 Connection diagram Continuous outputs (option)

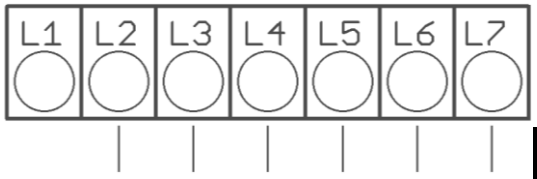
If continuous outputs are existed, the relay outputs are not available.



The GND connection terminals C5 - C7 and H5 - H7 are bridged. The output automatically switches to current or voltage, depending on the connected load.

4.8 Connection Diagram: Fieldbus Interfaces

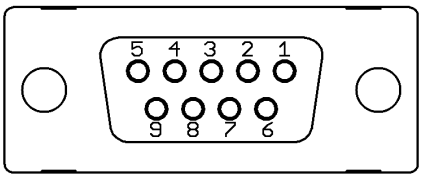
Type 03 / 07 : Serial Interface / CAN



							Bus	Type	Remark
	A	B					RS485	03	Parameter HW-config = RS232 / RS485
			RxD	TxD	GND		RS232	03	Parameter HW-config = RS232 / RS485
					-	+	TTY	03	Parameter HW-config = TTY (current loop)
	H	L					CAN	07	Not available at the moment

The serial fieldbus module (Type: 03) contains the three interfaces RS232, RS485 und TTY. By choosing the connection and setting the parameter ”HW-config“ the desired bus is selected.

Typ 09: Profibus



Pin 3	Data RxD / TxD - P
Pin 5	GND
Pin 6	+5V
Pin 8	Data RxD / TxD - N

The 5V-Supply is designed for the supply of the termination resistors. Further loads are not allowed.

4.9 Connection Diagram: LAN and USB

USB: Make a firmware update. (Please use FAT formatted USB flash drives.)

LAN: Connection to configuration tool **EloVision 3**.
Read and write parameters by MODBUS-TCP protocol.

5 Establishing a Modbus-TCP connection

5.1 Changing the IP address for the LAN interface

Normally, the address 192.168.100.100 will not correspond to the network in which the controller is to be used.

To change the address, the controller must be connected to a PC via its delivery address. For example, a Windows laptop with an Ethernet interface can be used for this.

1. Connect the R4020 controller directly to the PC using a LAN cable. (or via a switch).
2. Set a fixed network address on the PC for the network port used.

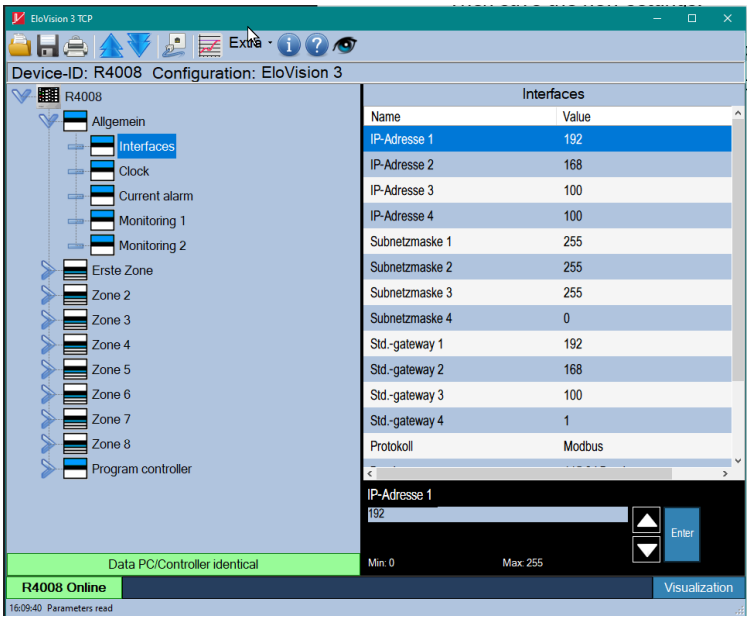
Windows 10: Open 'System' **settings**. Select **Network and Internet**. Click on the **Ethernet** line. Select the connector you are using. Then click the Edit button in the **IP Settings** section. See image. Make the following settings:

Setting: Manual
IPv4: On
IP address 192.168.100.101
Subnet length: 24 bits
Alternative subnet mask: 255.255.255.0
Gateway: 192.168.100.1
IPv6: Off

Then save the new settings.

3. With the help of EloVision 3 or another Modbus-TCP tool, the controller can now be accessed, and a suitable IP configuration can be made.
4. Please set the pre-set controller address 192.168.100.100 in EloVision 3. Please refer to the EloVision 3 operating instructions.

In menu General/Interfaces, the parameters can be changed in EloVision. They only become active after the controller has been restarted or after DIP switch 1 has been switched off.



If the address of the controller has already been set to an unknown address, the IP address can be set to factory setting via DIP switch 1. See 7.3.4 Switching the IP address to the factory default setting.

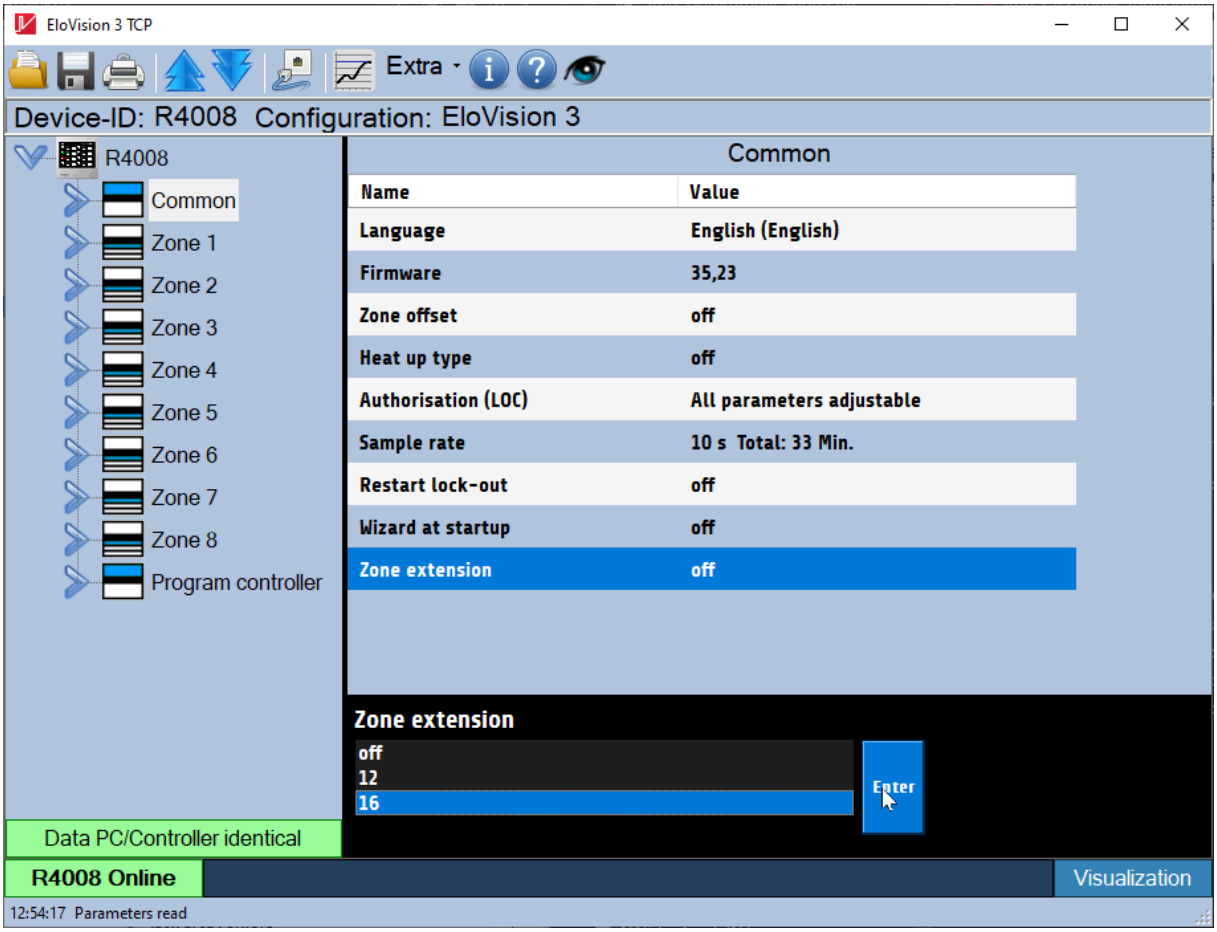
5.2 Running the controller via the Modbus TCP interface

With the network configuration correctly set, the controller can run in the intended target network.

6 Zone extension (R4010) configuration

The R4020 can be extended with a R4010 to up to 8 zones. Configuration and connection of a R4010 are shown in a separate manual.

To activate the additional zones in the R4020 the parameter *Zone extension* must be switched on. The parameter is in the menu *Common*.
The parameter *Zone extension* hast to be set (depending on the number of zones of the R4010) to the number of zones of the whole system.
After setting the zone extension the R4020 must be rebooted.



7 Parameters

The **Modbus** parameter codes are located below the parameter name. For example, 0x2000 for setpoint act..
Zone parameters end with 0x ## 00. The zone is selected with the low byte. Here zone 1 = 00; Zone 2 = 01. Please also read the associated Modbus description.

7.1 Zone – Parameter list

Setpoint act. 0x2000	**Setpoint min … Setpoint max.**	Current setpoint used for control. Read only parameter
Act. value 0x1000		Actual temperature value RO-Parameter
Current act. Value 0x1100		Actual heating current value RO-Parameter
Output ratio 0x6000	**0 … 100%**	Current output level RO-Parameter

Conf. Indicator/Contr. 0x8C00	**Off (0)**	Measuring- or controlling zone switched off
	Controller (1)	Controlling zone active **<§>**
	Indicator (2)	Measuring zone active

Config. Setpoint/ Cascade 0x2700	**Internal (0)**	The setpoint is generated from the setpoint 1 or setpoint 2 parameter. **<§>**
	External setpoint (1)	The setpoint is generated from the measured value of the zone set in the "Source zone ext. setpoint" parameter.
	Cascade controller (2)	This zone is the slave controller of the master controller set via the "Master zone cascade contr." parameter. The Start and End setpoint normalization parameters must be set in the Cascade scaling menu.

Only with external setpoint configuration	
Source zone ext. setpoint 0x7400	The zone for generating the external setpoint is selected here. ➔ Only zones that do not use an ext. setpoint themselves can be selected. ➔ If necessary, zones that are not designed as control zones can also be selected to generate the ext. setpoint. For example, with a 2-zone controller, zone 3 or 4 can also be used as external setpoint sources.

Only with cascade controller configuration	
Master zone cascade contr. 0x7500	Selection of the control zone for the master controller. This is connected to the current zone via the cascade control. The current zone is switched as the slave controller.
Start setpoint-scaling 0x2800	Setpoint temperature value of the slave zone with an actuating output value of the master zone of 0%
	Setting range: **MBA … 0(*) … MBE °C**
End setpoint-scaling 0x2900	Setpoint temperature value of the slave zone with a control output value of the leading zone of 100%
	Setting range: **MBA … 100(*) … MBE °C**

Only with internal setpoint configuration		
Setpoint 1 0x2100	**Setpoint min … Setpoint max**	Setpoint 1 **<§> =** 0
Setpoint 2 0x2200	**OFF(Setpoint min) … Setpoint max**	Setpoint 2 **<§> =** OFF As soon as the logic input In_1 is on level 1, setpoint 2 will become active on all zones in which the adjusted value is unlike "Off".

Configuration Heating-Cooling 0x8000	**Heating (0)**	Two-point controller: "Heating" **<§>**
	Cooling (1)	Two-point controller: "Cooling"
	Non-lin. Cooling (2)	Two-point controller: "Cooling" , with non-linear characteristic curve for evaporation cooling
	Heating-Cooling (3)	Three-point controller: "Heating-Off-Cooling"
	Heating – non-lin. Cool. (4)	Three-point controller: "Heating-Off-Cooling", with non-linear characteristic curve for eva. cooling

Hints for adjusting the control parameters:

As standard the controller operates in PD/I control mode, i.e. controlling without deviation and with practically no overshoot during start-up.

The control action can be altered in its structure by adjusting the following parameters:

a. no control action (on-off)	Setting P = off Continuing with the parameter "switching difference"
b. P-action	Setting D and I = off
c. PD-action	Setting I = off
d. PI-action	Setting D = off
e. PD/I	Modified PID-mode (set: P,D,I)

Autotune 0x8800	**off (0)**	Switches off autotune **<§>**
	On (1)	Activates autotune
	All zones (2)	Starts self-optimization on all activated zones.
	Automatically (3)	After a power restart auto-tuning starts automatically. If necessary after the soft start.

The tuning algorithm determines the characteristic values within the controlled process and calculates the valid feedback parameters (P, D, I) and the cycle time. (= 0.3 x D) of a PD/I- controller for a wide section of the range.

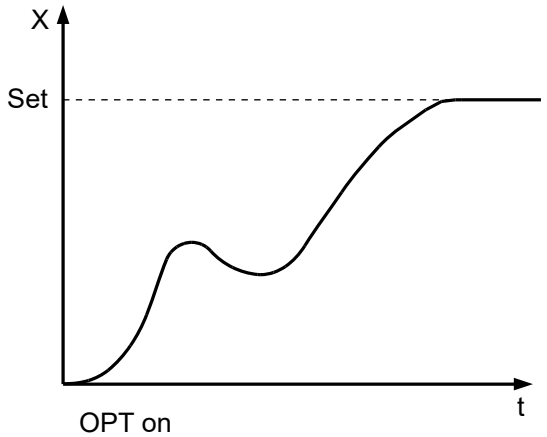
The autotune mode works during start-up shortly before the setpoint is reached. If activated after the setpoint has already been reached, the temperature will first drop by approx. 7% of the measuring range.

The tuning algorithm can be activated at any time by selecting the parameter **Autotune** = **"on"**. After having calculated the feedback parameters, the controller will lead the process value to the actual setpoint.

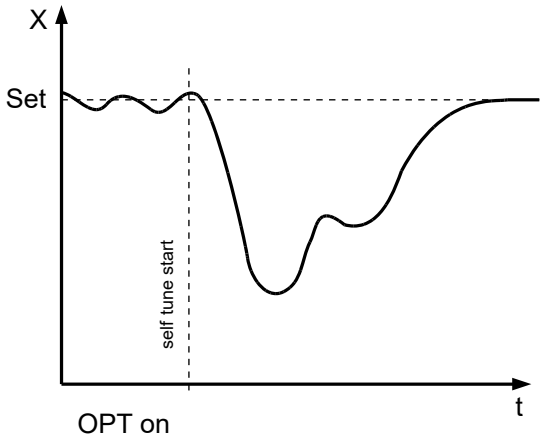
Selecting **Autotune** = **"off"** will stop the autotune function.

Autotune duration > 2 hours: autotune stops with an error message.

Conditions for starting the autotune algorithm:
- The setpoint must amount to at least 5% of the measurement range
- The sensor must not have a failure.
- The softstart function must not be active



OPT on
self tune during start-up

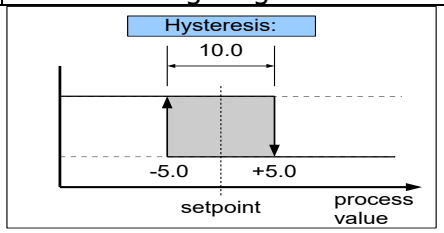


OPT on
self tune, after the setpoint has already been reached

Depending on the configuration, certain parameters are not visible.

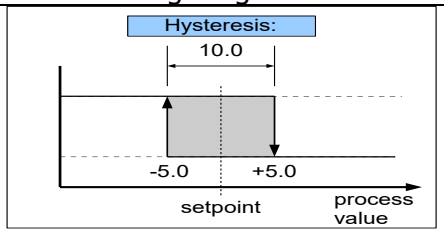
7.1.1 **Heating Control Parameter**

Only visible in operating modes heating or heating-cooling

P (Xp) 0x4000	**OFF(0), 0.1 ... 400.0K**	Proportional range **<§=10,0>** Unit: Kelvin
D (Tv) 0x4100	**OFF(0), 1 ... 200s**	Derivative time **<§=30s>**
I (Tn) 0x4200	**OFF(0), 1 ... 1000s**	Reset time **<§=150>**
Cycle-time 0x4300	**0.5 ... 240.0s**	**<§=10,0s>** The switching frequency of the actuator can be determined through the cycle time. In this time interval the controller switches on and off once. Voltage outputs for solid state relays (SSR): Cycle time: 0,5...10 s Preferred settings for rapid control processes: 0,8s Relay outputs: Cycle time: > 10 s The cycle time should be adjusted to a time as long as possible in order to minimize wear of the relay contacts.
Max. Output ratio 0x6400	**0 .. 100%**	**<§=100%>** The limitation of the output ratio is only necessary, if the heating energy supply is grossly oversized compared to the power required. Normally it should be switched off (Setting: 100 %). The limitation becomes effective when the controllers calculated output ratio is greater than the maximum permissible (limited) ratio. **Warning!** The output ratio limiting does not work during autotune.
Hysteresis 0x4700	Only adjustable if "(xp)" = off (on-off action, without feedback)	
	OFF(0), 0.1 ... 80.0	For measuring range without decimal point**<§=**0.1**>**
	OFF(0), 0.01 ... 8.00	For measuring range with decimal point **<§=**0.01**>**
		

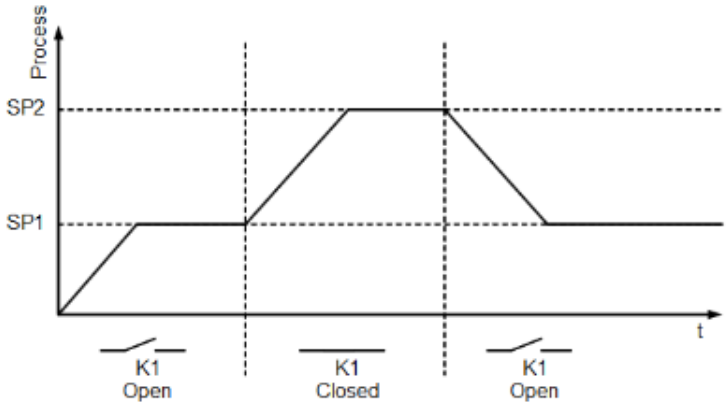
7.1.2 **Cooling Control Parameter**

Only visible in operating modes Cooling or Heating-Cooling

P (Xp) 0x5000	**OFF(0),0.1 ...400.0K**	Proportional band **<§=10,0>** Unit: Kelvin
D (Tv) 0x5100	**OFF(0), 1 ... 200s**	Rate time **<§=30s>**
I (Tn) 0x5200	**OFF(0), 1 ...1000s**	Reset time **<§=150>**
Cycle time 0x5300	**0.5 ... 240.0s**	**<§=10,0s>** The switching frequency of the actuator can be determined by adjusting the cycle time. In this time interval the controller switches on and off once. Voltage outputs for solid state relays (SSR): Cycle time: 0,5...10 s Optimal value for fast control loops: 0,8s Relay-Outputs: Cycle time: > 10 s In order to minimize the wear of the relay contacts the cycle time should be set as long as possible.
Max. Output ratio 0x6900	**0 ... 100%**	**<§=100%>** Limitation of the output ratio is only necessary, if the power supply of the control route is grossly overdimensioned. Normally it should be switched off (Setting: 100 %). Output ratio limiting interferes, if the calculated output ratio of the controller is higher than the max. output ratio that was set. **Caution!** Output ratio limiting does not work while auto-tune.
Hysteresis 0x5700	Only adjustable if "P (xp)" = off (on-off action, without feedback)	
	OFF(0), 0.1 ... 80.0	For measuring range without decimal point **<§=**0.1**>**
	OFF(0), 0.01 ... 8.00	For measuring range with decimal point **<§=**0.01**>**
		
Deadband 0x4600	Switching point distance "heating" and "cooling" This parameter is available for "heating and cooling" operations only. (Configuration Heating-Cooling = Heating-Cooling)	
	OFF(0), 0.1 ... 80.0	For measuring range without decimal point **<§=**0.1**>**
	OFF(0), 0.01 ... 8.00	For measuring range with decimal point **<§=**0.01**>**

7.1.3 **Ramps: Ramp rising / Ramp falling**

A programmed ramp is always activated when the setpoint is changed or when the mains supply is switched on. The ramp starts at the actual process value and ends at the preselected setpoint. The ramp can be activated for both setpoint 1 and setpoint 2. By programming the second setpoint a setpoint profile can be obtained, accordingly (see example with external contact In_1 (K1) below).



Ramp rising 0x2F00	**OFF(0), 0.1 ... 99,9**	°K/min for measurement range without decimal point **<§=Off>**
	OFF(0), 0.01 ... 9.99	°K/min for measurement range with decimal point
Ramp falling 0x2D00	**OFF(0), 0.1 ... 99,9**	°K/min for measurement range without decimal point **<§=Off>**
	OFF(0), 0.01 ... 9.99	°K/min for measurement range with decimal point

7.1.4 **Softstart**

Softstart-Function

For using the softstart function, make sure that the instrument is programmed to voltage (logic) outputs. This function is not allowed for relay outputs. Otherwise the relays will be damaged. During the softstart the controller's heating output response is limited to a pre-selected ratio, in order to achieve a slow drying of high performance heat cartridges. This results in a slower, more regular heating period.
Simultaneously the output clock frequency is quadrupled.
Once the process value reaches the softstart setpoint, it remains stable at this value for the preselected duration time. At the end of this period the process value rises to the valid setpoint. If the softstart is active, the controller's autotune function cannot operate.
If a setpoint ramp has been programmed, the softstart has priority, and the ramp will become active after the softstart has been completed.

The softstart only works:
- if the parameter P (xp) is programmed > 0,1%
- if the actual process value is lower than the softstart setpoint – 5% of the selected measuring range

It is possible to select this function for each zone individually.

Softstart On/Off 0x6D00	**Off (0)**	Softstart function not active. **<§>** The remaining softstart parameters are not displayed.
	On (1)	Softstart function is active.
Softstart Output ratio 0x6A00	**10 ... 100%**	**<§ = 30>**
Softstart Setpoint 0x6B00	**Range: Setpoint min...setpoint max.**	**<§ = 100°C>**
Duration time 0x6C00	**Off(0), 0.1...10.0min**	**<§ = 2.0 min>**
Output mode 0x8B00	**Controller mode (0)**	Controller mode
	Mode AUTOM. (1)	In the event of sensor break the last valid output ratio is maintained. Like the setpoint, the output ratio can be changed manually. Under the following circumstances, the output ratio will be 0%: - if the output ratio was at the time of sensor break 100% - if the controller is working along a setpoint-ramp - if the control deviation from the measuring range was at time of sensor break > 0,25% - if parameter is set P (xp) = 0 - if softstart was active at the time of sensor break.

		A few seconds after sensor break has been rectified, the controller returns to automatic operation and calculates the required output ratio.
	Mode MANUAL (2)	The controller now operates as an actuator only. The control function is inactive Process display: Actual process value. Setpoint display: Display of current output ratio in %. The output ratio can be changed manually.

Manual output ratio 0x6200	**0 ... 100 %**	Only effective if the controller is in "Manual" mode.

7.1.5 **Sensor settings**	All parameters for sensor configuration

Sensor 0x1A00	**Linear 0...10 V (0)**	Voltage 0 to 10 V
	Linear 0...20 mA (1)	Current 0...20mA
	Linear 4...20 mA (2)	Current Live Zero 4...20mA
	PT100 2-wire (3)	Pt 100 (RTD) 2-wire connection -100...800°C
	PT100 3-wire (4)	Pt 100 (RTD) 3-wire connection -100...800°C
	Ni120 2-wire (5)	Nickel 120 2-wire connection 0...250°C
	Ni120 3-wire (6)	Nickel 120 3-wire connection 0...250°C
	(TC) Fe-CuNi (J) (7)	Thermocouple Type J 0...800°C
	(TC) NiCr-Ni (K) (8)	Thermocouple Type K 0...1200°C
	(TC) Fe-CuNi (L) (9)	Thermocouple Type L 0...800°C
	NiCrSi-NiSi (N) (10)	Thermocouple Type N 0...1200°C
	(TC) PtRh-Pt (S) (11)	Thermocouple Type S 0...1600°C

	Please NOTE : If the sensor selection is changed and the value is out of the new measuring range, the following parameters will be reset.	
	Setpoint 1, Setpoint 2:	Setpoint limitation min.
	Setpoint min.:	Measuring range bottom
	Setpoint max:	Measuring range top
	Setpoint ramp rising/falling:	off
	Limit values:	off
	Actual process value offset:	off
	Setpoint softstart:	setpoint min.
	softstart:	off

Process offset 0x1800	**-999..0..1000°C**	**<§= 0°C>** This parameter serves to correct the input signal: - the correction of a gradient between the measuring point and the sensor tip - line resistance balancing at 2-wire-RTD - Correction of the control deviation when using P or PD action. If for example the offset value is set to +5°C, then the real temperature measured by the sensor is 5°C less than the displayed actual process value. Make sure that the adjusted actual temperature value should not fall below or exceed the measuring range limits.
Setpoint min. 0x2B00	**MR-Start ... Setpoint max.**	Lowest adjustable setpoint value. **<§ = 0>** MR-Start: Start of measurement range
Setpoint max. 0x2C00	**Setpoint min ... MR-End**	Highest adjustable setpoint value. **<§= 400>** MR-End: End of measurement range
The minimal span of linear value min. and max. is 100, the maximal span is 2000.		
Linear value min. For linear measurement range only 0x1E00	**-900 ... (Linear value max. -100)**	Measuring range starting value of the linear scale. **<§= 0,0>**

Linear value max. For linear measurement range only 0x1F00	**(Linear value min. +100) ... 10.000**	Measuring range final value of the linear scale. **<§= 100,0>**
Decimal For linear measurement range only 0x1D00	**0 ... 2**	Decimal of the linear measuring range. **<§= 1>**
Unit zone 0x7000	**°C(0) ... °F(1)**	For **control** zones, you can choose between ° C and ° F. **<§=°C>** The temperature values of the selected zone are set to the specified unit with this parameter. Please check all temperature values after adjustment. (Limit values, setpoints, setpoint limits, actual value offset and, if applicable, the linear limits.)

7.1.6 **Control outputs**

Possible settings for the logic outputs and relay or continuous outputs.
This is used to determine which signal is sent to the output.

Conf. digital out 0x8100	**Off (0)**	No function
	Heating (1)	Output of the heating signal at digital output x. **<§>**
	Cooling (2)	Output of the cooling signal at digital output x.
	Limit 1 (3)	Output of limit violation 1 to digital output x.
	Limit 2 (4)	Output of limit violation 2 to digital output x.

When using the relay as the actuating output, the switching cycle time must be set as long as possible in order to minimize the contact wear of the relay.

Conf. relay out 0x8200	**Off (0)**	No function
	Heating (1)	Output of the heating signal at relay x. **<§>**
	Cooling (2)	Output of the cooling signal at relay x.
	Limit 1 (3)	Output of limit violation 1 to relay x.
	Limit 2 (4)	Output of limit violation 2 to relay x.

Continuous out configuration (Option) 0x8300	**Off (0)**	No function
	Heating (1) output ratio	Output of the heating output ratio at continuous output x **<§>** (0..20mA or 0..10V)
	Cooling (2) Output ratio	Output of the cooling output ratio at continuous output x (0..20mA or 0..10V)
	Current value (3)	Output of the current value to the continuous output x (0..20mA or 0..10V)
	Heating output ratio live zero (4)	Output of the heating output ratio at continuous output x with offset zero. (4..20mA or 2..10V)
	Cooling output ratio live zero (5)	Output of the heating output ratio at continuous output x with offset zero. (4..20mA or 2..10V)
	Current value live zero (6)	Output of the current value to the continuous output x with offset zero. (4..20mA or 2..10V)

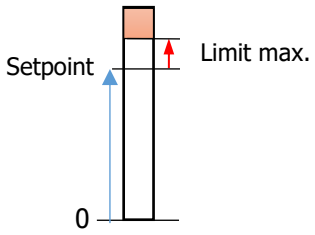
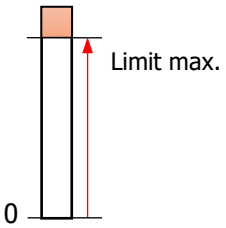
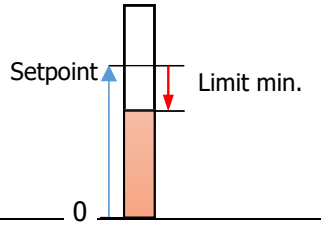
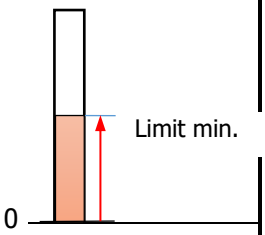
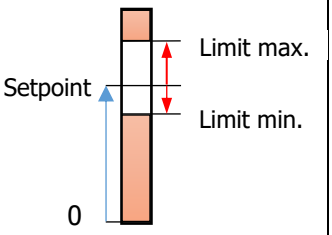
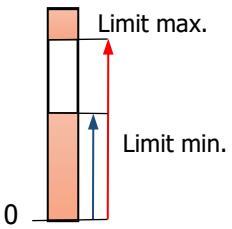
The minimal span of Continuous out min. and max. is 10.

Cont. out min. 0x8600 For "continuous out configuration" = "Current value" only	**MR-Start … (Cont. out max. -10)**	Starting value of the linear output. **<§= 0>** Corresponds to 0/4mA or 0/2V.
Cont. out max. 0x8700 For "continuous out configuration" = "Current value" only	**(Cont. out min. +10) … MR-End**	Final value of the linear output. **<§= 800>** Corresponds to 20mA or 10V.

7.1.7 **Configuration Limit 1+2**

Settings for limit values min./max. and configuration of limit monitoring 1/2

The controller features two independent limit monitors. The limit value monitoring can be configured zone by zone.
These limit values can be output to the monitoring relays via the monitoring function (0). Irrespective of this, the limit value overruns can be output on the zone relays or logic outputs.
With a programmed setpoint ramp, the relative limit values are tracked to the current ramp setpoints. In the case of sensor and line errors, the limit value violations react in the same way as range override.

Desired function	Setpoint based limit alarm	Absolute limit alarm
Limit exceeded. The actual value must be greater than the sum of the max. and setpoint or as the absolute limit for the limit monitor to become active.		
Falling below the limit. The actual value must be smaller than the difference of (setpoint – limit min.) or smaller than the absolute limit min., so that the limit value monitoring becomes active.		
Double-sided limit monitoring. The actual value must be outside the range for the limit value monitoring to become active.		

Limit values 0x3600/0x3700	**Limit value 1 / 2 (min.)**	Relative to setpoint: -200...0;OFF (+1 ≙ OFF**<§>**) Absolute: MB-Start**<§>** ... MB-End
0x3800/0x3900	**Limit value 1 / 2 (max.)**	Relative to setpoint: OFF;0...200 (-1 ≙ OFF**<§>**) Absolute: MB-Start**<§>** ... MB-End

Type limit 0x3400 0x3500	**Absolute (0)**	Absolute limits. Not dependent on setpoint. **<§>**
	Based on setpoint (1)	Limits relative to setpoint.

Delay 0xB900 0xBA00	**OFF (0)**	🌡-Alarm delay switched off. **<§>**
	1 ... 8000 s	🌡-Alarm is delayed by selected time.

Self-retaining 0xB700 0xB800	**Off (0)**	No self-holding of the temperature alarm. **<§>**
	On (1)	An activation of the 🌡-alarm will be stored. The 🌡-alarm can be acknowledged in the window "Monitoring".

Start suppression 0xB300 0xB400	**OFF (0)** **Without start up**	Start-up 🌡-alarm suppression switched off **<§>**
	Start up (1) **Suppression Active**	Start-up 🌡-alarm suppression active: Temperature must be within the limits once. Only then the 🌡-alarm is activated when reaching the alarm value.
Display colour 0xB500 0xB600	**Red (0)**	The monitoring displays the 🌡-alarm in red colour. **<§>**
	Green (1)	Intended for enabling signals: Display colour is green.
	Orange (2)	
Switching Behaviour 0xBB00 0xBC00	**Direct (0)**	The monitoring output is activated when the max. limit value has been exceeded or if the min. limit value has been undercut.
	Inverse (1)	The signal is inverted and output to the monitoring. If the min. limit value has been exceeded or if the max. limit value has been undercut the output is set.

7.1.8 **Configuration Current alarm (option)**

The heater current monitoring function is valid for all connected zones. Only zones with logic output for the heating signal will take part in current monitoring. Ensure that the limit value is set correctly to avoid false alarms in case of supply voltage changes. The alarm can be delayed by selecting a delay time to avoid false alarms caused by single disturbances. The heater current measuring is designed for a current transformer 1:1000. (Accessory type: M2000 1:1000 max. 60A) When using other transformers the ratio can be modified.		
Current alarm limits / Undercurrent alarm value 0x3A00	**OFF(0), 0.1 ... 99.9 A**	Zone parameter: Absolute value **<§=OFF>** Currents below this value will cause an alarm.
Current alarm limits / Overcurrent alarm value 0x3F00	**OFF(0), 0.1 ... 99.9 A**	Zone parameter: Absolute value **<§=OFF>** Currents above this value will cause an alarm.

7.2 Common Parameters

Measure current 0xCF53	**Off (0) / on (1)**	Enable or disable current measuring and monitoring.
Leakage limit 0xCF09 Monitoring an impermissible continuous current	Limit value: OFF, 0,0...99,9 A **<§>=0,3A** SSRs (especially if they are combined with RC-combinations) normally have small leakage currents. These currents add up and the sum can lead to a permanent leakage current. A leakage current limit value is programmable. All values below this limit will not be considered in the alarm monitoring. The field "act. Leakage current" displays the leakage current that has just been measured. If a permanent current (SSR short circuit) is detected the alarm will be activated. The zone with a permanent current can be detected by observing the actual process values (proves value too high).	
act. Leakage curr. 0xCF0A	Display of the actual leakage current	
Current transformer Turns ratio 0xCF16	**1:100 ... 1:9999**	**<§ = 1:1000** for M2000**>**
Cycle time 0xCF08	**1...60s**	Time interval between the current measurements of two successive zones. **<§ = 2s>**
Delay 0xCF2F	Settings in 5 steps, unit: seconds The values depend on the cycle time and the number of active controller zones. **Off(0)** = no delay time active **<§=off>**	

7.2.1 **Configuration Monitoring 1+2**

Settings for messages of monitoring 1. The same applies to monitoring (2).		
The controller has two independent monitoring relays. With the help of the monitoring several events of the controller can be routed (wired OR) to the relays.		
Limit 1 M1:0xCF23 M2:0xCF29	**--- (0)**	Not selected **<§** for Monitoring2**>**
	One zone (1) => Message	Once Limit 1 is active in one zone, monitoring 1(2) is set. **<§** for Monitoring1**>**
	All zones (2) => Message	Monitoring 1(2) is not set until Limit 1 is active in all zones.
Limit 2 M1:0xCF24 M2:0xCF2A	**--- (0)**	Not selected **<§** for Monitoring1**>**
	One zone (1) => Message	Once Limit 2 is active in one zone, monitoring 1(2) is set. **<§** for Monitoring2**>**
	All zones (2) => Message	Monitoring 1(2) is not set until Limit 2 is active in all zones.
Sensor error M1:0xCF25 M2:0xCF2B	**--- (0)**	Not selected **<§** for Monitoring2**>**
	Active (1)	In the case of sensor break monitoring 1(2) is set. **<§** for Monitoring1**>**
Restart lock-out M1:0xCF26 M2:0xCF2C	**--- (0)**	Not selected**<§>**
	generate Signal (1)	Monitoring 1(2) is set, if a restarting-incident triggered.
System error M1:0xCF27 M2:0xCF2D	**--- (0)**	Not selected **<§>**
	Active (1)	Monitoring 1(2) is set, if system error occurred.
End of Program controller M1:0xCF31 M2:0xCF32	**--- (0)**	Not selected**<§>**
	generate Signal (1)	Monitoring 1(2) is set, when the program controller has finished.
Moni 1(2) Relay M1:0xCF03 M2:0xCF05	**Direct (0)**	Relay switches on, if monitoring 1(2) is active. **<§>**
	Indirect (1)	Relay switches off, if monitoring 1(2) is active.
Current alarm 0xCF28 0xCF2E	**--- (0)**	Not selected **<§** for Monitoring1**>**
	Active (1)	Monitoring 1(2) is set, if current alarm occurred. **<§** for Monitoring2**>**

7.2.2 **Field Bus / USB / LAN**

Menu: Fieldbus		It depends on the installed field bus module what parameters will be visible.
Protocol 0xCF14	**Off (0)**	No protocol selected
	Elotech (1)	<SERIAL> ELOTECH-Standard-protocol **<§>**
	Modbus (2)	<SERIAL> Modbus-RTU-protocol
	Arburg 1 (3)	<SERIAL> Hot runner: One device address for all zones.
	Arburg 2 (4)	<SERIAL> Hot runner: Every zone has its own address.
	Arburg 3 (5)	<SERIAL> Protocol for temperature control systems
	Profibus DP (6)	<PROFIBUS> Profibus DP
Baudrate <SERIAL> 0xCF12	**1.2 kBaud (0)**	1.200 Bit/s
	2.4 kBaud (1)	2.400 Bit/s
	4.8 kBaud (2)	4.800 Bit/s
	9.6 kBaud (3)	9.600 Bit/s **<§>**
	19.2 kBaud (4)	19.200 Bit/s
	38.4 kBaud (5)	38.400 Bit/s
Address 0xCF11	**1 … 255**	**1<§>** . . . **255** (ELOTECH-Standard) **1<§>** . . . **247** (Modbus-RTU-Protocol) **1<§>** . . . **32** (Arburg-Protocols) **2<§>** . . . **125** (Profibus) At this address a master communicates with the controller. Each controller needs a unique address.
Format 0xCF13 <SERIAL>	**7 E 1 (0)**	7 Data bits, 1 Stop bit, Parity Even **<§>**
	7 O 1 (1)	7 Data bits, 1 Stop bit, Parity Odd
	7 E 2 (2)	7 Data bits, 2 Stop bits, Parity Even
	7 O 2 (3)	7 Data bits, 2 Stop bits, Parity Odd
	7 N 2 (4)	7 Data bits, 2 Stop bits, Parity None
	8 E 1 (5)	8 Data bits, 1 Stop bit, Parity Even
	8 O 1 (6)	8 Data bits, 1 Stop bit, Parity Odd
	8 N 1 (7)	8 Data bits, 1 Stop bit, Parity None
	8 N 2 (8)	8 Data bits, 2 Stop bits, Parity None
HW-config 0xCF36 <SERIAL>	The serial fieldbus module has three integrated interfaces. Select here the desired interface:	
	RS232/RS485 (0)	Signals see connection diagram.
	TTY (1)	Signals see connection diagram.

Menu: LAN		Ethernet interface for connection to the configuration tool Elo-Vision 3 or for a MODBUS-TCP communication.
IP-address 1	0xCF37	IP-Address **192** . 168 . 100 . 100 Part 1 **<§>**
IP-address 2	0xCF38	IP-Address 192 . **168** . 100 . 100 Part 2
IP-address 3	0xCF39	IP-Address 192 . 168 . **100** . 100 Part 3
IP-address 4	0xCF3A	IP-Address 192 . 168 . 100 . **100** Part 4
Subnet mask		
Subnet mask 1	0xCF3B	Subnet mask **255**. 255 . 255 . 0 Part 1 **<§>**
Subnet mask 2	0xCF3C	Subnet mask 255 . **255**. 255 . 0 Part 2 **<§>**
Subnet mask 3	0xCF3D	Subnet mask 255 . 255 . **255**. 0 Part 3 **<§>**
Subnet mask 4	0xCF3E	Subnet mask 255 . 255 . 255 . **0** Part 4 **<§>**
Default gateway		
def.-gateway 1	0xCF3F	Default gateway **192**. 168 . 100 . 1 Part 1 **<§>**
def.-gateway 2	0xCF40	Default gateway 192 . **168**. 100 . 1 Part 2 **<§>**
def.-gateway 3	0xCF41	Default gateway 192 . 168 . **100**. 1 Part 3 **<§>**
def.-gateway 4	0xCF42	Default gateway 192 . 168 . 100 . **1** Part 4 **<§>**

7.2.3 **Settings**

Language 0xCF0F	**Deutsch (German)**	German (0) **<§>**
	English (English)	English (1)
Clock, Time, Date		
Time	**Hours** 0xCF43	Number value 0 … 23
	Minutes 0xCF44	Number value 0 … 59
Day / Month	**Day** 0xCF45	Number value 1 … 31
	Month 0xCF46	Number value 1 … 12
Year 0xCF47	**2000 … 2150**	Adjustment of calendar year
The function of the first logic input can be configured here.		
Logic input 1 configuration 0xCF50	**Setpoint 2:** (0)	Closing the logic input switches to setpoint 2 if setpoint 2 is not switched off for the respective zone.
	Program controller: (1)	Closing the logic input starts the program controller. Provided a program controller has been configured. Opening the contact stops the program controller.
Start delay 0xCF51	**off** (*) (0)	No delay in the output of the output level for heating or cooling after restart.
	Time (1)	The output level output is blocked for the **Delay time** set below.
	Communication (2)	The output level output is stopped until the first interface communication has taken place. (data exchange)
Delay time 0xCF52	**10s**(*) **… 1000s**	Only visible if **Start delay** is set to **Time**. A time can be specified here. After the device is restarted, the output level is blocked for this time.
Zone offset 0xCF0C	**OFF (0)**	**<§>**
	1 … 91	The adjusted offset value is added to the displayed zone numbers in the windows. Therefore a continuous numbering of the zones can be achieved if more than one device is used. Examples: Offset= OFF: Zone numbering: 1-8 Offset= 4: Zone numbering: 5-12

Heat up type 0xCF18	**Off (0)**	Compound and energy opt. heating switched off **<§>**
	Even heat up (1)	Compound heating is switched on. The switched-on zones are heated up in a network. This makes sense for controlled systems of different speeds, the temperatures of which should not differ greatly from one another. Faster zones are aimed at the slower zones.
	Energy opt. (2) heat up	This function has the aim of reducing the energy required by time-shifted switching of the control zones.

Training 0xCF4A	**off (0)**	Normal state. After switching on the function **Energy opt. heating** will be performed.
	on (1)	The next time the system is switched on, the heat up times of the individual zones are determined. After heating up, the parameter is automatically set to **off**.
Participating zones 0xCF4B	**zone 1=BIT_0** **zone 2=BIT_1** **etc.**	Selection of the zones that should take part in the respective type of heating. Factory setting: **All zones activated** (Bit parameters)
Heat up times 0xBD00	**0**(*)... **30000 s**	Display of the zone-assigned times that were determined during the **training phase**. The values can also be entered manually.

7.3 Program control: Selection/Setting

Program number 0xC302	**1 … 8**	Selection of the active Program.
Program parameters		
Zone assignment	**0x000 … 0xffff**	Bit-by-bit specification of the zone that takes part in the program. From bit 0 (0x0001) for zone 1 to bit 15 (0x8000) for zone 16.
Display **Continue if**	**Time expired**	All steps are executed according to the predefined time grid.
	Temp. reached	After the ramp time has elapsed, the current step temperature is controlled until all the relevant zones have reached this setpoint. * The setpoint must be reached up to + - 2K.
Program end	**setpoint 1**	After completion of the last step, the control setpoint is further regulated. Normally setpoint 1.
	Last setpoint	After the last step has been completed, the temperature of the last step is further regulated.
	Repeat	After the last step has been completed, step 1 is started again.
Number of steps	**1 … 8**	Count of steps.

Program step parameters

Ramp duration	**0:00 … 99:59h**	Time setting in which the setpoint is to go up from the previous step temperature to the temperature of the current step. In the first step, the actual value is set as the start setpoint. * If no ramp is desired, set this time to 0: 00h.
Temperature	**-100 … 1600°C**	Temperature for this step.
Dwell time	**0:00 … 99:59h**	Time for the hold time of the current step temperature. The dwell time starts after the end of the ramp duration. When configuration is switched to "temp. reached", this time does not start until all the zones involved have the current step temperature. * Disabled zones are ignored. * For functional reasons, a "**Dwell time**" of at least one minute is used when the "**Continue if**" setting is set to "**Temperature reached**", even if the dwell time is set to "0:00h".

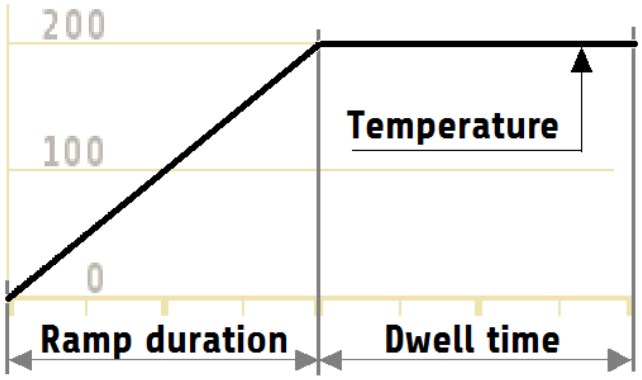
7.3.1 **Procedure of the program control:**

The first step is to determine whether the program controller should run after a fixed time grid, or whether the respective step temperature must first be reached in order to reach the respective holding phase. (See parameter "Continue if")
You should also consider how the program controller should control the temperature after the end of the program. Three options are available: Setpoint 1, Last setpoint and Repeat. For more details, see "Program End".

The number of steps [1 ... 8] must also be defined.

Now the time and temperature values for the desired steps must be entered in the "Setting the program steps" screen.

One step always involves ramp duration and dwell time. The ramp duration determines the time in which the setpoint is steadily increased from the previous temperature to the temperature of the current step. The dwell time is the duration of the current step temperature.



An exception is the ramp for the first step. Since the first step does not have a preliminary temperature, the ramp for all zones starts here with the current actual value of the first activated zone and ends at the temperature of step 1.
The ramp duration can be switched off by setting it to zero.

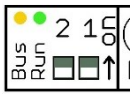
The dwell time is the duration of the current step temperature. If the parameter "Switch on" is set to "Temp. reached", the dwell time does not start until all zones have reached the step temperature.

After a network interruption with the program controller running, the program controller reactivates in the step at which the interruption took place.

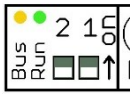
7.3.2 **Parameter list program controller**

Sio-	inde	Dec.	Parameters	Prg.	Step	Sio-index		Dec.	Parame	P	S	Sio-index		Dec.	Parame	P	S	Sio-index		Dec.	Paramet	P	S
0xC3	00	0	Count of Programs	all																			
0xC3	01	1	Count of steps	all																			
0xC3	02	2	act. programnr.	all																			
0xC3	03	3	Reserve	all																			
0xC3	04	4	For zone	**1**		0xC3	22	34	For zon	**2**		0xC3	40	64	For zon	**3**		0xC3	5E	94	For zone	**4**	
0xC3	05	5	Continue if	1		0xC3	23	35	Continu	2		0xC3	41	65	Continu	3		0xC3	5F	95	Continu	4	
0xC3	06	6	Program end	1		0xC3	24	36	Progran	2		0xC3	42	66	Progran	3		0xC3	60	96	Program	4	
0xC3	07	7	Number of steps	1		0xC3	25	37	Numbe	2		0xC3	43	67	Numbe	3		0xC3	61	97	Number	4	
0xC3	08	8	Res 1	1		0xC3	26	38	Res 1	2		0xC3	44	68	Res 1	3		0xC3	62	98	Res 1	4	
0xC3	09	9	Res 2	1		0xC3	27	39	Res 2	2		0xC3	45	69	Res 2	3		0xC3	63	99	Res 2	4	
0xC3	0A	10	Ramp duration	1	1	0xC3	28	40	Ramp d	2	1	0xC3	46	70	Ramp d	3	1	0xC3	64	100	Ramp du	4	1
0xC3	0B	11	Temperature	1	1	0xC3	29	41	Temper	2	1	0xC3	47	71	Temper	3	1	0xC3	65	101	Tempera	4	1
0xC3	0C	12	Dwell time	1	1	0xC3	2A	42	Dwell ti	2	1	0xC3	48	72	Dwell ti	3	1	0xC3	66	102	Dwell tir	4	1
0xC3	0D	13	Ramp duration	1	2	0xC3	2B	43	Ramp d	2	2	0xC3	49	73	Ramp d	3	2	0xC3	67	103	Ramp du	4	2
0xC3	0E	14	Temperature	1	2	0xC3	2C	44	Temper	2	2	0xC3	4A	74	Temper	3	2	0xC3	68	104	Tempera	4	2
0xC3	0F	15	Dwell time	1	2	0xC3	2D	45	Dwell ti	2	2	0xC3	4B	75	Dwell ti	3	2	0xC3	69	105	Dwell tir	4	2
0xC3	10	16	Ramp duration	1	3	0xC3	2E	46	Ramp d	2	3	0xC3	4C	76	Ramp d	3	3	0xC3	6A	106	Ramp du	4	3
0xC3	11	17	Temperature	1	3	0xC3	2F	47	Temper	2	3	0xC3	4D	77	Temper	3	3	0xC3	6B	107	Tempera	4	3
0xC3	12	18	Dwell time	1	3	0xC3	30	48	Dwell ti	2	3	0xC3	4E	78	Dwell ti	3	3	0xC3	6C	108	Dwell tir	4	3
0xC3	13	19	Ramp duration	1	4	0xC3	31	49	Ramp d	2	4	0xC3	4F	79	Ramp d	3	4	0xC3	6D	109	Ramp du	4	4
0xC3	14	20	Temperature	1	4	0xC3	32	50	Temper	2	4	0xC3	50	80	Temper	3	4	0xC3	6E	110	Tempera	4	4
0xC3	15	21	Dwell time	1	4	0xC3	33	51	Dwell ti	2	4	0xC3	51	81	Dwell ti	3	4	0xC3	6F	111	Dwell tir	4	4
0xC3	16	22	Ramp duration	1	5	0xC3	34	52	Ramp d	2	5	0xC3	52	82	Ramp d	3	5	0xC3	70	112	Ramp du	4	5
0xC3	17	23	Temperature	1	5	0xC3	35	53	Temper	2	5	0xC3	53	83	Temper	3	5	0xC3	71	113	Tempera	4	5
0xC3	18	24	Dwell time	1	5	0xC3	36	54	Dwell ti	2	5	0xC3	54	84	Dwell ti	3	5	0xC3	72	114	Dwell tir	4	5
0xC3	19	25	Ramp duration	1	6	0xC3	37	55	Ramp d	2	6	0xC3	55	85	Ramp d	3	6	0xC3	73	115	Ramp du	4	6
0xC3	1A	26	Temperature	1	6	0xC3	38	56	Temper	2	6	0xC3	56	86	Temper	3	6	0xC3	74	116	Tempera	4	6
0xC3	1B	27	Dwell time	1	6	0xC3	39	57	Dwell ti	2	6	0xC3	57	87	Dwell ti	3	6	0xC3	75	117	Dwell tir	4	6
0xC3	1C	28	Ramp duration	1	7	0xC3	3A	58	Ramp d	2	7	0xC3	58	88	Ramp d	3	7	0xC3	76	118	Ramp du	4	7
0xC3	1D	29	Temperature	1	7	0xC3	3B	59	Temper	2	7	0xC3	59	89	Temper	3	7	0xC3	77	119	Tempera	4	7
0xC3	1E	30	Dwell time	1	7	0xC3	3C	60	Dwell ti	2	7	0xC3	5A	90	Dwell ti	3	7	0xC3	78	120	Dwell tir	4	7
0xC3	1F	31	Ramp duration	1	8	0xC3	3D	61	Ramp d	2	8	0xC3	5B	91	Ramp d	3	8	0xC3	79	121	Ramp du	4	8
0xC3	20	32	Temperature	1	8	0xC3	3E	62	Temper	2	8	0xC3	5C	92	Temper	3	8	0xC3	7A	122	Tempera	4	8
0xC3	21	33	Dwell time	1	8	0xC3	3F	63	Dwell ti	2	8	0xC3	5D	93	Dwell ti	3	8	0xC3	7B	123	Dwell tir	4	8
Sio-	**inde**	**Dec.**	**Parameters**	**Prg.**	**Step**	**Sio-index**		**Dec.**	**Parame**	**P**	**S**	**Sio-index**		**Dec.**	**Parame**	**P**	**S**	**Sio-index**		**Dec.**	**Paramet**	**P**	**S**
0xC3	7C	124	For zone	**5**		0xC3	9A	154	For zon	**6**		0xC3	B8	184	For zon	**7**		0xC3	D6	214	For zone	**8**	
0xC3	7D	125	Continue if	5		0xC3	9B	155	Continu	6		0xC3	B9	185	Continu	7		0xC3	D7	215	Continu	8	
0xC3	7E	126	Program end	5		0xC3	9C	156	Progran	6		0xC3	BA	186	Progran	7		0xC3	D8	216	Program	8	
0xC3	7F	127	Number of steps	5		0xC3	9D	157	Numbe	6		0xC3	BB	187	Numbe	7		0xC3	D9	217	Number	8	
0xC3	80	128	Res 1	5		0xC3	9E	158	Res 1	6		0xC3	BC	188	Res 1	7		0xC3	DA	218	Res 1	8	
0xC3	81	129	Res 2	5		0xC3	9F	159	Res 2	6		0xC3	BD	189	Res 2	7		0xC3	DB	219	Res 2	8	
0xC3	82	130	Ramp duration	5	1	0xC3	A0	160	Ramp d	6	1	0xC3	BE	190	Ramp d	7	1	0xC3	DC	220	Ramp du	8	1
0xC3	83	131	Temperature	5	1	0xC3	A1	161	Temper	6	1	0xC3	BF	191	Temper	7	1	0xC3	DD	221	Tempera	8	1
0xC3	84	132	Dwell time	5	1	0xC3	A2	162	Dwell ti	6	1	0xC3	C0	192	Dwell ti	7	1	0xC3	DE	222	Dwell tir	8	1
0xC3	85	133	Ramp duration	5	2	0xC3	A3	163	Ramp d	6	2	0xC3	C1	193	Ramp d	7	2	0xC3	DF	223	Ramp du	8	2
0xC3	86	134	Temperature	5	2	0xC3	A4	164	Temper	6	2	0xC3	C2	194	Temper	7	2	0xC3	E0	224	Tempera	8	2
0xC3	87	135	Dwell time	5	2	0xC3	A5	165	Dwell ti	6	2	0xC3	C3	195	Dwell ti	7	2	0xC3	E1	225	Dwell tir	8	2
0xC3	88	136	Ramp duration	5	3	0xC3	A6	166	Ramp d	6	3	0xC3	C4	196	Ramp d	7	3	0xC3	E2	226	Ramp du	8	3
0xC3	89	137	Temperature	5	3	0xC3	A7	167	Temper	6	3	0xC3	C5	197	Temper	7	3	0xC3	E3	227	Tempera	8	3
0xC3	8A	138	Dwell time	5	3	0xC3	A8	168	Dwell ti	6	3	0xC3	C6	198	Dwell ti	7	3	0xC3	E4	228	Dwell tir	8	3
0xC3	8B	139	Ramp duration	5	4	0xC3	A9	169	Ramp d	6	4	0xC3	C7	199	Ramp d	7	4	0xC3	E5	229	Ramp du	8	4
0xC3	8C	140	Temperature	5	4	0xC3	AA	170	Temper	6	4	0xC3	C8	200	Temper	7	4	0xC3	E6	230	Tempera	8	4
0xC3	8D	141	Dwell time	5	4	0xC3	AB	171	Dwell ti	6	4	0xC3	C9	201	Dwell ti	7	4	0xC3	E7	231	Dwell tir	8	4
0xC3	8E	142	Ramp duration	5	5	0xC3	AC	172	Ramp d	6	5	0xC3	CA	202	Ramp d	7	5	0xC3	E8	232	Ramp du	8	5
0xC3	8F	143	Temperature	5	5	0xC3	AD	173	Temper	6	5	0xC3	CB	203	Temper	7	5	0xC3	E9	233	Tempera	8	5
0xC3	90	144	Dwell time	5	5	0xC3	AE	174	Dwell ti	6	5	0xC3	CC	204	Dwell ti	7	5	0xC3	EA	234	Dwell tir	8	5
0xC3	91	145	Ramp duration	5	6	0xC3	AF	175	Ramp d	6	6	0xC3	CD	205	Ramp d	7	6	0xC3	EB	235	Ramp du	8	6
0xC3	92	146	Temperature	5	6	0xC3	B0	176	Temper	6	6	0xC3	CE	206	Temper	7	6	0xC3	EC	236	Tempera	8	6
0xC3	93	147	Dwell time	5	6	0xC3	B1	177	Dwell ti	6	6	0xC3	CF	207	Dwell ti	7	6	0xC3	ED	237	Dwell tir	8	6
0xC3	94	148	Ramp duration	5	7	0xC3	B2	178	Ramp d	6	7	0xC3	D0	208	Ramp d	7	7	0xC3	EE	238	Ramp du	8	7
0xC3	95	149	Temperature	5	7	0xC3	B3	179	Temper	6	7	0xC3	D1	209	Temper	7	7	0xC3	EF	239	Tempera	8	7
0xC3	96	150	Dwell time	5	7	0xC3	B4	180	Dwell ti	6	7	0xC3	D2	210	Dwell ti	7	7	0xC3	F0	240	Dwell tir	8	7
0xC3	97	151	Ramp duration	5	8	0xC3	B5	181	Ramp d	6	8	0xC3	D3	211	Ramp d	7	8	0xC3	F1	241	Ramp du	8	8
0xC3	98	152	Temperature	5	8	0xC3	B6	182	Temper	6	8	0xC3	D4	212	Temper	7	8	0xC3	F2	242	Tempera	8	8
0xC3	99	153	Dwell time	5	8	0xC3	B7	183	Dwell ti	6	8	0xC3	D5	213	Dwell ti	7	8	0xC3	F3	243	Dwell tir	8	8

7.3.3 **Firmware update**

Firmware version 0xCF48	Displays the current firmware version.
Firmware update 	Start the firmware update by: 1. Switch off the supply voltage of the controller. 2. Switch on both DIP switches. 3. Insert the USB stick with the folder "EL4000.01_V20xx_xx.ELO" for the firmware update. 4. Switch on the mains. LEDs yellow, green and red light up briefly. 5. After approx. 2s the green LED flashes. Approx. 8s after mains on, the yellow and red LEDs light up. *Do not wait longer than approx. 22s. Then the green LED lights up. In this case, the unit must be switched off and on again to re-start the update process. 6. While the red and yellow LEDs are lit, switch off both DIP switches. Now the yellow LED flashes for approx. 15s 7. The green LED flashes for approx. 5 seconds. 8. The firmware update has been successfully completed when the green LED lights up. 9. Finally switch the unit off and on again. If the LED lights up red, repeat the procedure.

7.3.4 **Switching the IP address to the factory default setting**

Switching to the factory-set IP address 	To switch the IP address to the factory default setting, please follow the steps below: 1. initial position: both dip switches are switched off. Green LED lights up. 2. Switch on DIP switch 1. LED green flashes. -> IP address, standard gateway and subnet mask are set to factory default and are initialised. IP address = 192.168.100.100 Subnet mask = 255.255.255.0 Default gateway = 192.168.100.1 3. Now the controller can be accessed via this address, e.g. to set a new address for the controller. See also chapter 5.1 "Changing the IP address for the LAN interface". 4. Switch off DIP switch 1. -> The unit is initialised with the internal address. When DIP switch 1 is switched on, for example, a new address can be specified via EloVision, which is directly set and initialised when the DIP switch is switched off.

8 Error Messages

Error message	Cause	Possible remedy
ERR0	System error	Please send the controller back to the manufacturer.
ERR8	System error	Quit error message. Check the parameters. If the error is still there, send the controller back to the manufacturer.
ERR IO	Error I/O board See logbook: Error IO board 1 or 2 Error IO board 3 or 4	The connection to the input/output circuit board is broken. -> Internal card defective, please send the controller back to the manufacturer. -> If zone extension (0 menu About) is set to 12 or 16, the required additional module R4010 may not be connected. Switch off zone extension if necessary. *Info: All 4 sensors of the faulty card are set to sensor break.*

9 Technical Data

Input Pt100 (DIN)	2- or 3- wire connection possible Built-in protection against sensor breakage and short circuit Sensor current: … < 1 mA Accuracy: … < 0,2 % Linear error: … < 0,2 % Influence of the ambient temperature: … < 0,01 % / K
Input Thermocouple	Built-in internal compensation point and protection against sensor breakage and incorrect polarity. Accuracy: … < 0,25 % Linear error: … < 0,2 % Cold junction error: 0,5K Influence of the ambient temperature: … < 0,01 % /
Input voltage 0…10V	Internal resistance > 100 k-Ohm Accuracy: < 0,25 % Linearity error: < 0,2 % Ambient temperature influence: < 0,01 % / K
Input current 0…20mA	Internal resistance < 100 Ohm Accuracy: < 0,25 % Linearity error: < 0,2 % Ambient temperature influence: < 0,01 % / K **!** The input has high impedance when the controller is without supply voltage.
Logic input	Internal resistance > 22k-Ohm Level 0 < 2V Level 1 > 9V; max 30V
Heater current monitoring	Measuring input range: 0… 100mA corresponding 0,0…99,9A when using a current transformer 1: 1000. If the range is exceeded, the controller may be damaged.
Logic outputs	Bist. voltage, 0/24 V DC, max. 500 mA, short-circuit proof
Relay outputs/ Alarm outputs	Relay; max. 250V AC, max. 2A, resistive load
Continuous outputs	0…20 mA maximal load 300 Ohm; 0…10V minimal Load 5kOhm. Automatic switching, depending on connected load.
Fieldbus Interface:	Depends on the version of the device: - Serial: RS232, RS485, TTY (20mA) - Profibus DP, according to EN 50170 All with optical isolation.
Service-Interface	Ethernet: Modbus TCP
USB-Interface	Host for USB-Stick; max. 100mA
Supply voltage	24 V DC, +/-25 %, appr. 6W + Power of logic outputs
Data protection	EAROM, Semiconductor storage When using a Fieldbus interface please note: Permissible writing operations per parameter must not exceed 1 000 000.
Casing	Format, case: 96x96mm, acc. DIN 43700, Installation depth 122 mm

	Panel cut-out: Material: Protection mode:	Width=92 +0,5 mm x Height=90 +0,5 mm Sheet steel and Makrolon UL 94-V1 IP 20 (DIN 40050), Front side: IP 50
Connectors	Service-Interface: Ethernet RJ45 USB-Interface: Type A Profibus: SUB-D 9 Others: spring-loaded push terminals, Protection mode IP 20 (DIN 40050), Insulation class C Cross-sections: Terminal groups: A, B, D, E, F, G, I, K, M, N, Q + C, H (continuous) = 1,5 mm^2 (for end sleeves with plastic collar 0,75mm^2) Terminal groups: C, H, (Relay), P = 2,5mm^2	
Real time clock	Backup battery: Lithium CR2032	
Weight	Approx. 800g, depends on the version of the device	
E-Bus	Bus system for connecting the R4020 to the extension module R4010, to expand the number of zones to 12 or 16 zones. Serial bus. The connecting cable must be shielded.	
Permissible operating conditions	Operating: Temperature: Storage temperature: Climate class:	0...50°C / 32...122°F -30...70°C / -22...158°F KWF DIN 40040; equivalent to annual average max. 75% rel. humidity, no condensation
CE - mark	EN 61326-1:2013 / EN 61000-3-2:2006+A1:2009+A2:2009 EN 61000-3-3:1995+A1:2001+A2:2005 Electrical safety: EN 61010-1	

Subject to technical improvements.