



131/132
TECON AG
Werkstrasse 1
CH-9242 Oberuzwil

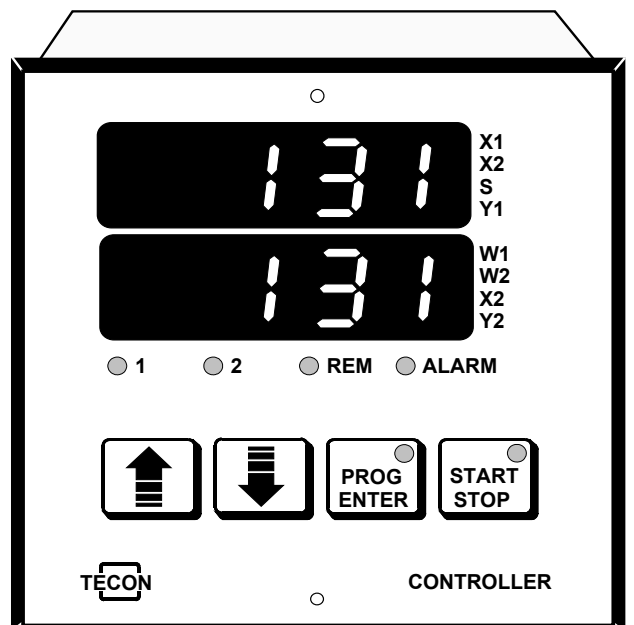
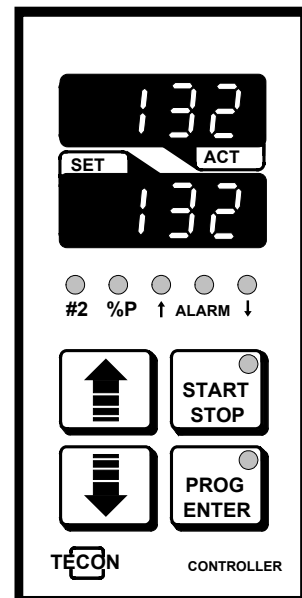
Telefon 071 951 23 33
Fax 071 951 15 77
e-mail headoffice@tecon.ch
internet <http://www.tecon.ch>

Instruction manual

**UNIVERSAL - DIGITAL
CONTROLLER**

TECON 131/132

Version 131 – 011.4
Version 132 – 011.4



TEMPERATURE CONTROLLER TECON 131/132

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1. Safety Precautions

1.1 Purpose of the unit

The controllers TECON 131 and 132 are used for controlling heating and/or cooling systems. For the control process the unit has to be equipped with a temperature sensor. Two electrically isolated and connected relay contacts are integrated as well as an output which can alternatively deliver an analogous or digital signal in a low voltage range, separated from the mains. With a signal transducer instead of a temperature sensor, the device can be used to control other physical values than temperature as well.

1.2 Operating range

Never use the unit in an environment exposed to explosion risk. Never expose the unit to rain or wetness.

The unit is assigned for an application at temperatures between 0 and 50C and humidities between 10% and 90%. The mains voltage has to correspond with the type description and may not deviate from this value more than 10%. In any case, connect protection earthing (PE).

Depending on used sensor, the unit can control temperatures up to 2000C. The user is solely responsible for any danger due to high temperatures.

1.3 Control range

The control range has to be set (see adaptation of the sensor on page 25). Setpoint can only be set within this range.

1.4 Temperature max./min

The maximum temperature (above there is no more heating) and the minimum temperature (below there is no more cooling) has to be set (see adaptation of the alarm data on page 21).

1.5 Safety of the control system

Wrong manipulations are avoided by the control range (section 1.3) and the temperature max./min. setting (section 1.4), if correctly adjusted and if the system is working properly.

If damage can occur due to a faulty unit, install an independent safety shut-down.

Consult TECON AG.

1.6 Instruction/manipulation at the unit

The user is responsible for the correct understanding of the manual and that no manipulations which affect the safety are executed on the unit. Especially, the unit may not be opened.

2. Technical Data and Functions

2.1. Overview

Temp. sensors	Thermocouples:	measuring range:
	NiCr-Ni (K)	-200 to 1200°C
	Fe-Ko (J)	-200 to 750°C
	Pt10Rh-Pt (S)	0 to 1600°C
	Pt13Rh-Pt (R)	200 to 1600°C
	PtRh18 (B)	200 to 1800°C
	Nicrosil-Nisil (N)	-200 to 1200°C
	measuring resistor:	
	Pt 100	-200 to 750°C
	Pt 100 with Zener barrier 84 Ohm	-200 to 400°C
	standard signal :	
4- 20 mA	-200 to 2000 units	
0- 20 mA	-200 to 2000 units	
0 - 10 V	-200 to 2000 units	
Temperature measurement.	accuracy :	0.3% of the range
	resolution :	16000 points
	number of measurements per second	10
Actual value indication.	indication :	4 digit, LED 14/7 mm high
	resolution :	programmable 0.1°C or 1°C
	range :	acc. to selected sensor
Setpoint	indication :	4 digit, LED 14/7 mm high
	resolution :	programmable 0.1°C or 1°C
	range :	can be adjusted and limited
	Input :	with 2 keys or with ext. analogue signal or via serial interface
Limit	The following values can be programmed, displayed and supplied to an output alternatively:	
	- max. temperature	
	- min. temperature	
	- deviation from setpoint, upwards	
	- deviation from setpoint, downwards	
	- mains break	
Control	Integrated into the unit, there are two controllers with PID action, which can be programmed for heating or cooling.	
	ranges for control - parameters :	
	proportional band	0 to 999°C
	lead time	0 to 999 s
	lag time	0 to 9999 s
	relay interval time	1 to 999 s
	dead-band between heating/cooling	0.1 to 99.9°C

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Outputs	Two relay contacts (normally open) alternative - signal output for thyristors etc. - current output (max. Load 500 Ohm) - voltage output (min 10 k Ohm) accuracy of analogue outputs resolution of D/A converter	230V, 2A max. 20 mA 0/4 20 mA -2 to 10 V 0.5 % 8000 points
Input	It can be used as analogue or digital input. Range (see configuration of input)	0 - 15 V
Serial interface	For interconnecting controllers to a master-slave system or for connection to other control units (RS 485): - Baud rate - Parity - Data bits - Stop bit - Handshake	9600 odd 7 1 none
Special designs	TECON also programs the controller to suit customer's requirements.	
Power supply	alternatively 230/115 V , 50/60 Hz, 10 VA	
Ambient temperature		0 to 50°C
Ambient humidity		10 to 90% rh
Dimensions	front frame Tecon 131 front frame Tecon 132 controller with casing, replaceable from the front mounting position optional mounting depth	96 x 96 mm , 5 mm high 48 x 96 mm, 5 mm high 125 mm
Weight		approx. 0.5 kg
Type of protection	Panel: Enclosure:	IP64 IP20
Safety	safety class I tested on	EN 60065
EMV protection	Immunity Emission	prEN 50 082-2 EN 50 081-1

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2.2. Function

Integrated into the TECON 131/132 there are two controllers with PID action, which can be used as heating or cooling controller, as required.

The controller can directly switch on and off heating via thyristors or contactors and can control the heating power by changing the pulse interval ratio. Additionally, with the two outputs a servomotor can be driven. Via current output final control elements like control valves or phase-shifting controls can be activated.

If the controller should operate in a superior control system, it is possible to interconnect it in different ways. The setpoint can be fed as an analogous signal. Optionally, they are available as analogue values: setpoint and actual value, difference between setpoint and actual value and the control variable (output). A digital input can be used for external control and a digital output signals the condition of the controller. Via serial interface the values setpoint and actual temperature, control variable, condition of controller, alarm data and control parameters can be requested and entered.

The control range can be programmed. It is possible to program a relay contact as an output for different monitoring tasks. It can be adjusted to a fixed temperature threshold, to a specified temperature deviation from setpoint or to the message of switching on the mains. Because the alarm indications can be suppressed it is eligible if the function is used as alarm or only as signal for controlling other units.

If a deviation from setpoint (upwards/downwards) is programmed a band around the setpoint will be monitored. However, the temperature has to be within this band, in order that an alarm is triggered when exceeding.

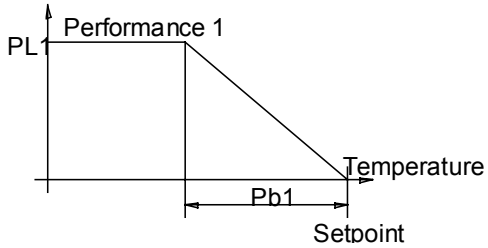
In case of a sensor break the control will be switched off. The following conditions can result in sensor break:

type of sensor	sensor break if
thermal converter	open circuit
measuring resistance (Pt100)	open circuit or short circuit at sensor
current input 4 - 20 mA	current > 24 mA or current < 3.2 mA
current input 0 - 20 mA	current > 24 mA
voltage input	voltage >12 V

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2.2.1. Controller-code 0 "PID heating / alarm"

Relay 1: Heating with PID-controller:

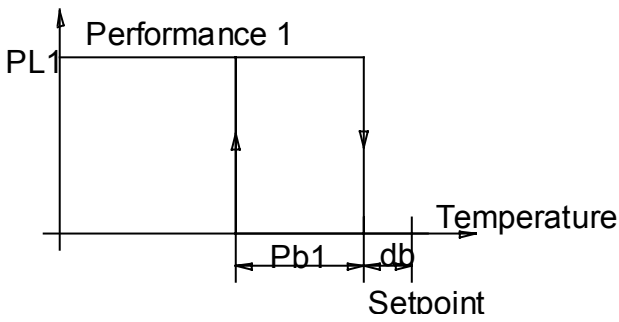


PL1: max. output performance
Pb1: proportional band

Relay 2 : Alarm report according to alarm configuration

2.2.2. Controller-code 16 "two-point heating / alarm"

Relay 1: heating with two-point controller:

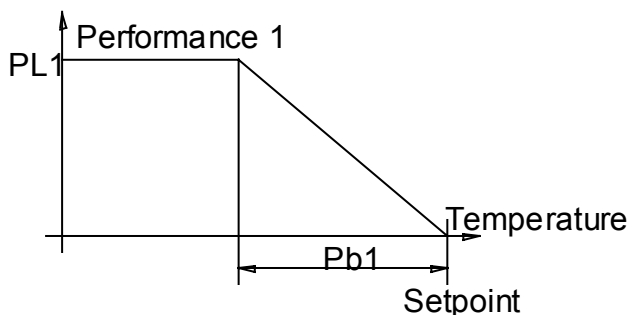


PL1: max. output performance 100 %
Pb1: hysteresis 1
db: dead band

Relay 2 : Alarm report according to alarm configuration

2.2.3. Controller-code 1 "PID heating / temperature level"

Relay 1: heating with PID-controller:



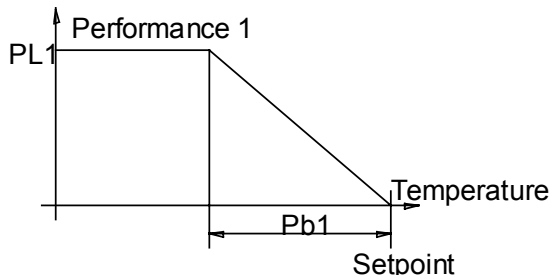
PL1: max. output performance
Pb1: proportional band 1

Relay 2 : Relay switches at a adjustable actual-value (temperature level)

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2.2.4. Controller-code 2 "PID heating / controller status"

Relay 1: Heating with PID-controller

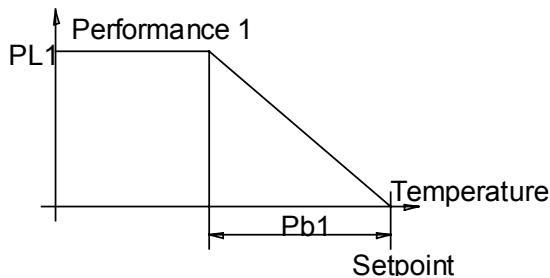


PL1: max. output performance
Pb1: proportional band 1

Relay 2 : Relay on when controlling is switched on

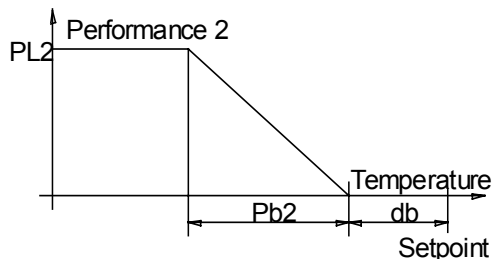
2.2.5. Controller-code 3 "PID heating / PID heating"

Relay 1: Heating with PID-controller



PL1: max. output performance
Pb1: proportional band 1

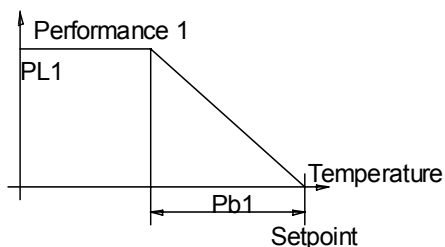
Relay 2: Heating with PID-controller



PL2: max. output performance
Pb2: proportional band 2
db: dead band

2.2.6. Controller-code 4 "PID heating / two-point heating"

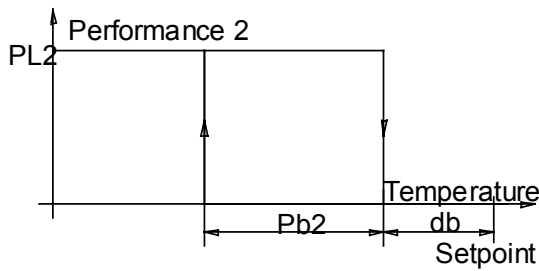
Relay 1: Heating with PID-controller



PL1: max. output performance
Pb1: proportional band 1

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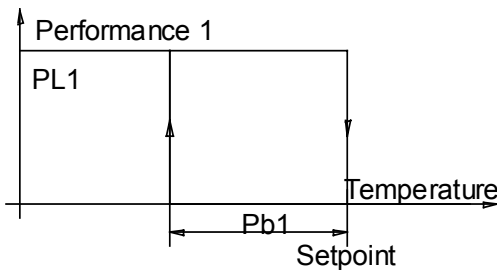
Relay 2: Heating with two-point-controller



PL2: max. output performance 100 %
 Pb2: hysteresis 2
 db: dead band

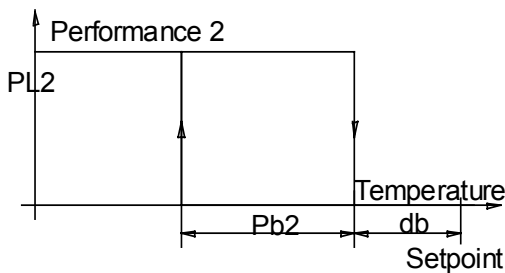
2.2.7. Controller-code 5 "two-point heating / two-point heating"

Relay 1: Heating with two-point-controller



PL1: max. output performance 100 %
 PB1: hysteresis 1

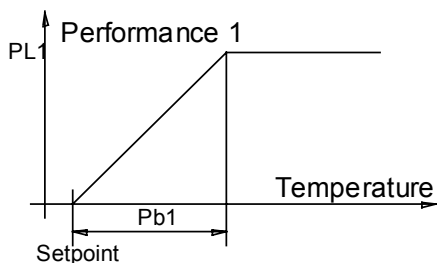
Relay 2: Heat with two-point-controller



PL2: max. output performance 100 %
 Pb2: hysteresis 2
 db: dead band

2.2.8. Controller-code 6 "PID cooling / alarm"

Relay 1: Cooling with PID-controller



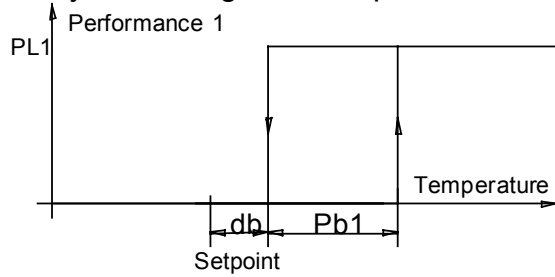
PL1: max. output performance
 Pb1: proportional band 1

Relay 2 : Alarm report according to alarm configuration

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2.2.9. Controller-code 17 "two-point cooling / alarm"

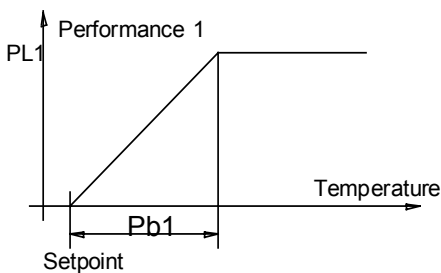
Relay 1: Cooling with two-point-controller



PL1: maximum output performance 100%
 Pb1: hysteresis 1
 db : dead band

Relay 2 : Alarm report according to alarm configuration

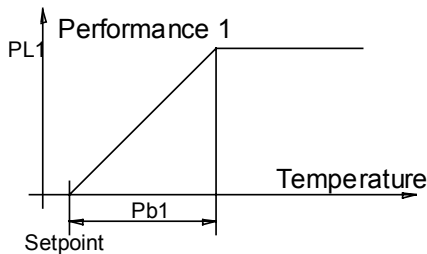
2.2.10. Controller-code 7 "PID cooling / temperature contact"



Relay 1: Cool with PID-controller
 PL1: max. output performance
 Pb1: proportional band 1

Relay 2: Relay switches at an adjustable actual value (temperature level)

2.2.11. Controller-code 8 "PID cooling / controller condition"

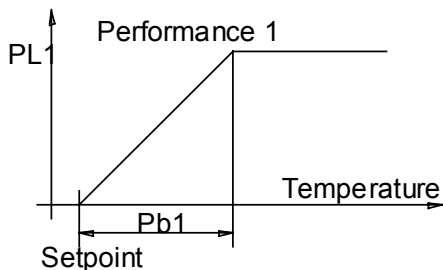


Relay 1: Cooling with PID-controller

PL1: max. output performance
 Pb1: proportional band 1

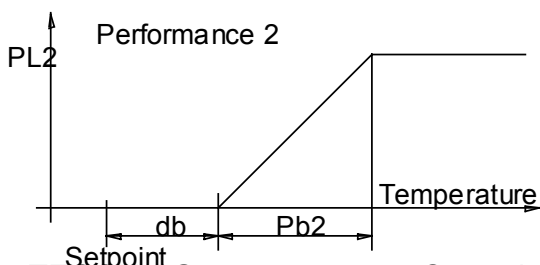
Relay 2 : Relay on when controlling is on

2.2.12. Controller-code 9 "PID cooling / PID cooling"



Relay 1: Cooling with PID-controller

PL1: max. output performance
 Pb1: proportional band 1



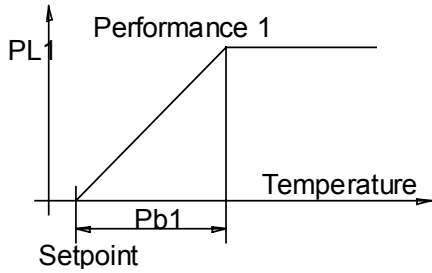
Relay 2: Cooling with PID-controller

PL2: max. output performance
 Pb2: proportional band 2

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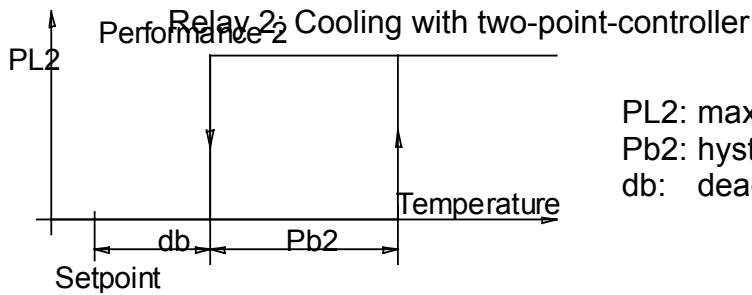
db: dead band

2.2.13. Controller-code 10 "PID cooling/two-point cooling"



Relay 1: Cooling with PID-controller

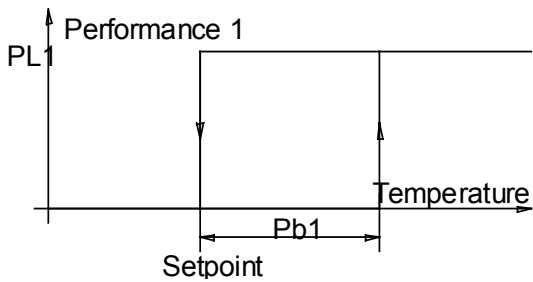
PL1: max. output performance
Pb1: proportional band 1



Relay 2: Cooling with two-point-controller

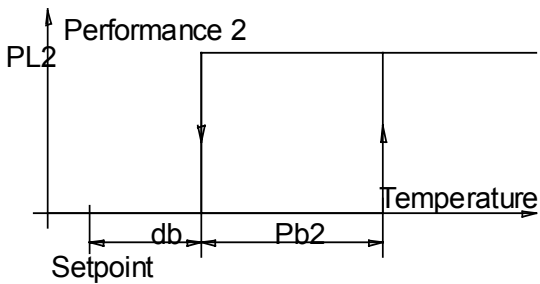
PL2: max. output performance 100 %
Pb2: hysteresis 2
db: dead band

2.2.14. Controller-code 11 "two-point cooling/ two-point cooling"



Relay 1: Cooling with two-point-controller

PL1: max. output performance 100 %
Pb1: hysteresis 1

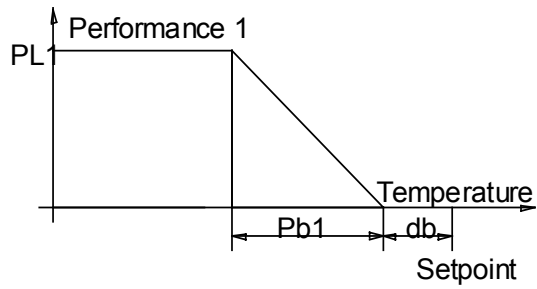


Relay 2: Cooling with two-point-controller

PL2: max. output performance 100 %
Pb2: hysteresis 2
db: deadband

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2.2.15. Controller-code 12 "PID heating/PID cooling"

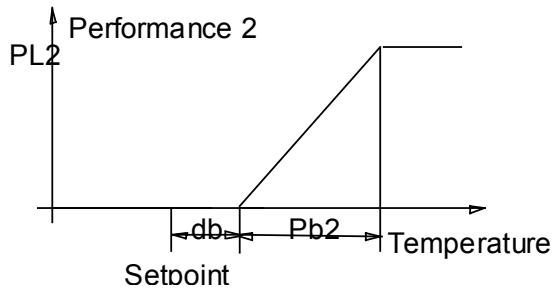


Relay 1: heating with PID-controller

PL1: max. output performance

Pb1: proportional band 1

db: dead band



Relay 2: Cooling with PID-controller

PL2: max. output performance

Pb2: proportional band 2

db: dead band

The different controller-codes are programmable under menu "system configuration".

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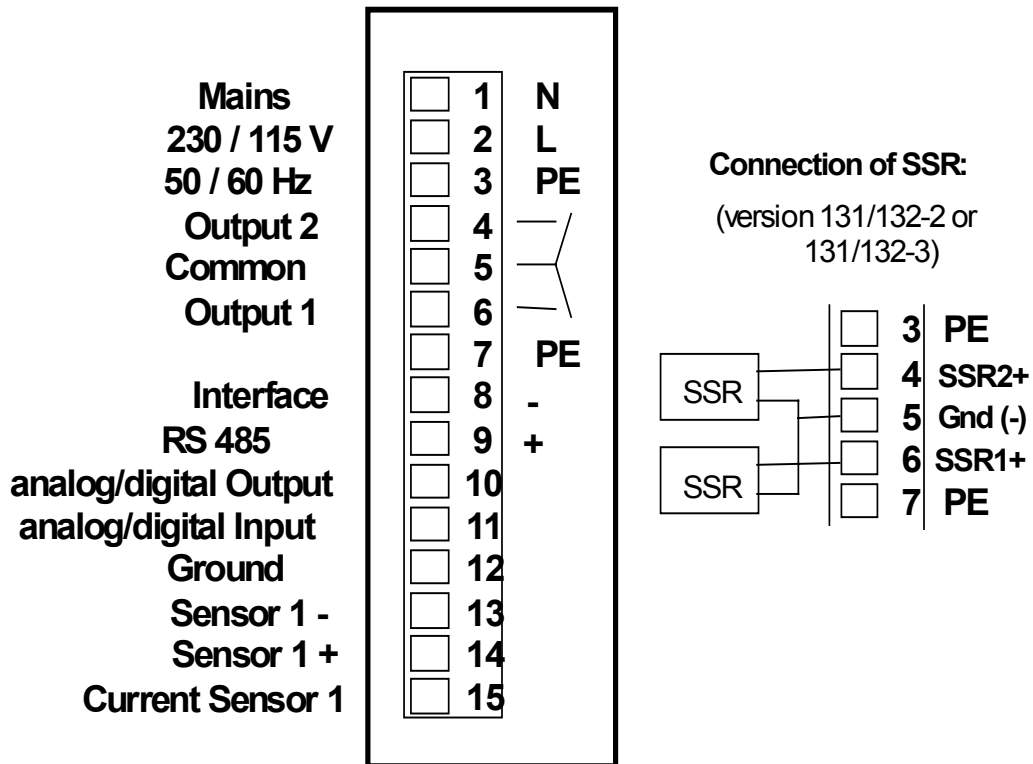
3. Installation

3.1. Connections

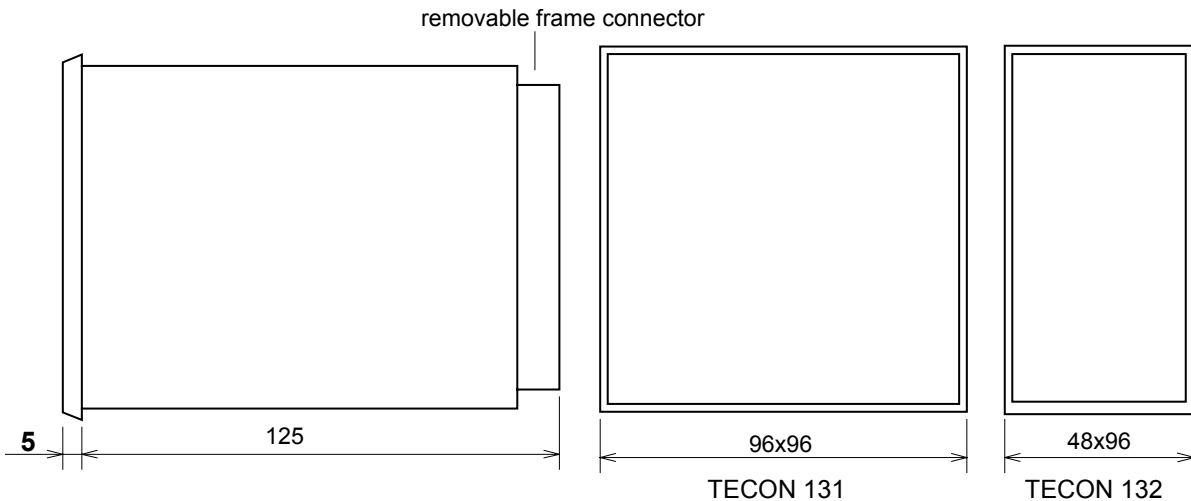
On the rear of the unit a screwed-plug terminal block with 15 connections is situated. Cross-section of the connection wires are max. 1.5 mm².

In any case, connect protection earthing (PE).

3.2. Rear view of the unit



3.3. Dimensional drawing

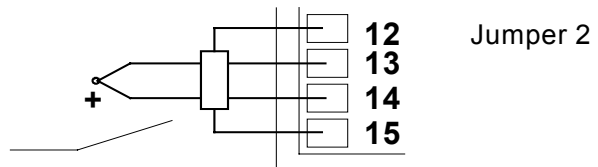


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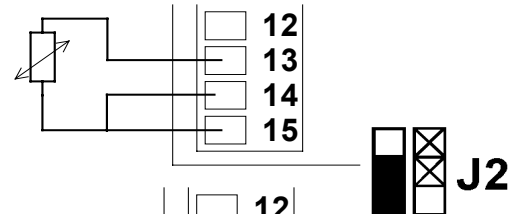
3.4. Connecting the sensor

Thermocouple:

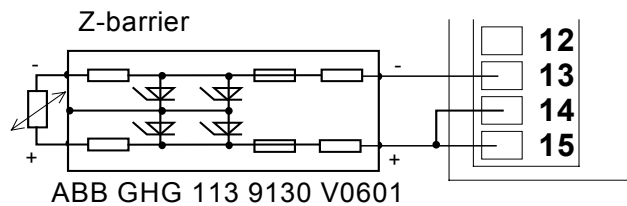
Temperature sensor for compensation. Art-Nr.:047002



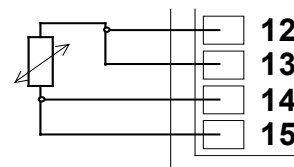
PT100 3-wire:



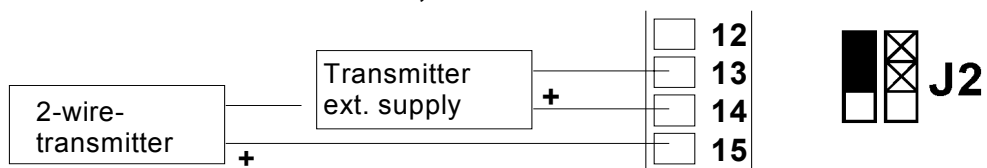
PT100 with Z-barrier



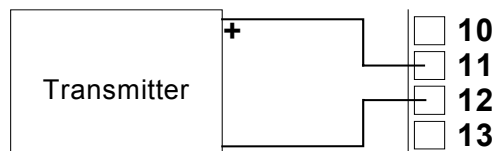
PT100 4-wire:



Transmitter: 4-20mA, 0-20mA



**Transmitter:
0 - 10 V**

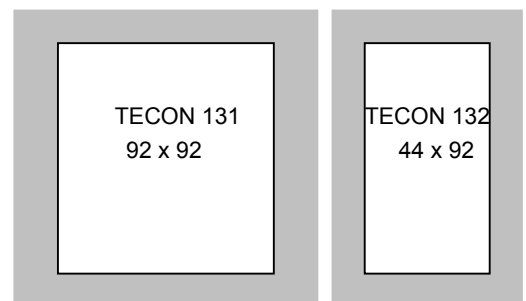


2-wire transmitter on demand only (see connecting diagram on the device).

3.5. Mounting

Opening in panel: 92 x 92 mm (131)
or 44 x 92 mm (132)
Panel thickness: 1 - 4 mm

Pull frame connector through the panel opening and plug in.
The controller is slid into the panel opening from the front and attached on the front panel with the 2 screws.



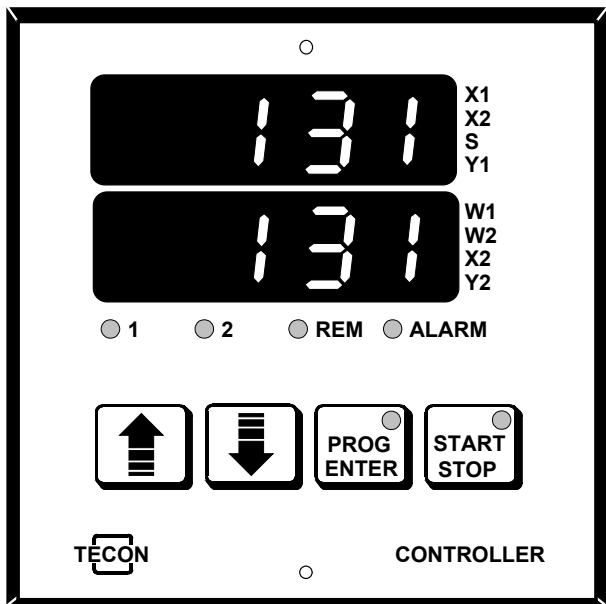
3.6. Removing

Loosen the two screws in the front panel until the controller can be pulled out.
Remove frame connector.

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4. Operating the Controller

4.1. Indication and operation elements TECON 131



Upper display: LED acc. to selection of indication

X1 : actual value
 X2: unused
 S: system data (configuration)
 Y1 : performance

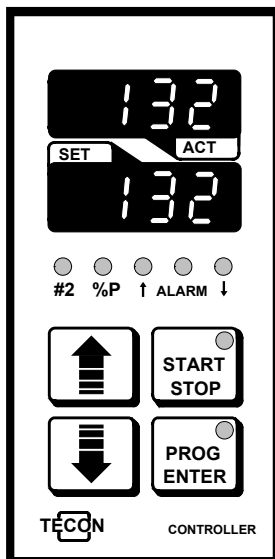
Lower display :

W1 : setpoint
 W2 : ramp nominal value
 X2 : unused
 Y2: unused

4 LED for functional monitoring :

1 : condition of relay 1
 2 : condition of relay 2
 REM : interface active
 ALARM : state of alarm
 4 keys for operation

4.2. Indication and operation elements TECON 132



2 4-digit displays

(acc. to selection of indication)

Upper display : actual value

Lower display : setpoint

7 LED for functional monitoring

LED #2 not used
 LED %P = performance
 LED ↑ = condition of relay 1
 LED ALARM = alarm
 LED ↓ = condition of relay 2

4 keys for operation

4.3. Adjusting setpoint with keys

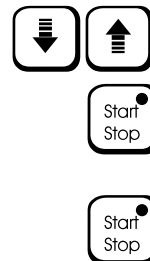
4.4. Starting the unit with key

LED 'start/stop' indicates control is operating.

4.5. Stopping the control with key

When the control system is switched off the LED in the key 'start/stop' is not lit.

When a turnoff ramp has been programmed (see system data, page 27), the nominal value first runs over this ramp towards room temperature and the control system does not switch off before this has been reached within $\pm 10^{\circ}\text{C}$. During this time the LED 'start/stop' flashes at short intervals.



4.6. Alarm

The red LED which is designated with 'Alarm', lights up when an alarm is triggered. Simultaneously, the alarm indication in the upper display is flashing if programmed with the alarm code (see page 22). The alarm is acknowledged with key



4.7. What to do in case of mains failure

After switching on mains supply again the controller continues in the condition as before mains break. According to configuration (see alarm code 2) an alarm is triggered. If alarm Code 2 is programmed on a value >1 , the controlling will be switched off after mains break.

4.8. Functional test

When control is operating, LED '1' indicates, that the first output is switched on. LED '2' indicates the condition of the 2nd output. The actual performance (upper) and the actual ramp nominal value (lower) can be requested with key



4.9. Control accuracy

If the control accuracy is inadequate it is permissible to adapt the parameters. For this purpose, see section 5 'Control parameters' on page 25.

If the following conditions are fulfilled the controller can also make the adaptation by itself :

- At start no ramp may be executed.
- Difference between start temperature and setpoint must exceed 5% of the set control range and must be more than 10 °C.
- During the adaptation the setpoint may not be changed.
- The controller works without external setpoint.
- Adaptation is only possible for heating parameters and only if controller 1 is configured as heating controller.

If these conditions are fulfilled, the controller carries out the adaptation, if at start of the control key 'START/STOP' is pressed for a minimum of 3 seconds. Adaptation is indicated by flashing of the LED 'ON'.

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4.10. Indication of software version, alarms and system errors

On power on, the software version is shown for a few seconds



131-
010.0

If an alarm comes up, for which the indication is programmed, it is shown blinking in the upper display.



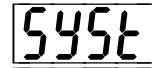
-0E

(Alarm programming see page 21).



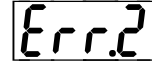
nnnnn

On power on, the device executes several self-tests. An error is shown in the following way: ('n' indicates error number)



595E

The code of error numbers is given in 'error messages, faults'.



Err.2

5. Adaptation of the Controller

5.1. Possibilities

This temperature controller can be adapted to the respective application in a wide range. The adaptation happens in ranges, protected by codes for:

- alarm data
- serial interface
- sensor
- control parameters
- system data
- offsets

5.1.1. Alarm data

Under which circumstances the alarm relay should switch and when an alarm indication should occur can be programmed with alarm codes for the sensor input and a code for the general alarm processing. Because the alarm indication and the request can be switched off, the different alarm values are also useable for temperature dependent releases and interlockings.

5.1.2. Serial interface

For interconnections with other controllers or with superior systems, the transferred data, the unit address and the alarm time for stopping the control when the connection breaks, are adjustable .

5.1.3. Sensor

Type of used sensor and the setpoint range can be specified.

5.1.4. Parameter for the control

Here the values determinant for the control, like

- proportional band
- lead time
- lag time
- relay cycle time
- max. permissible performance
- dead-band

are entered for both controllers acc. to the system to be controlled.

5.1.5. System data



Here the type of indication, the slope of the ramp and the function of inputs and outputs are determined.


5.1.6. Offset


To compensate for possible sensor displacement, it is possible to specify an offset for each input which corrects the measurement over the whole range by this constant value.


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5.2. Adaptation in the protected range




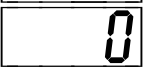








To reach the configuration level, keys  and  have to be pressed simultaneously for a min. of 3 seconds. To execute changes the code has to be known. Without this knowledge the values can only be checked but not altered. Code = 0 is factory-set, but it can be specified optionally by the user. With the arrow keys (forwards/backwards) the 6 data ranges are selected.

At any time it is possible to return to the operating level by pressing key  during 3 seconds. If no key is actuated during more than 60 seconds the unit switches back into the operating level automatically.

When briefly pressing key  indication and input switch forward one step within one data range.




If the key  is actuated between 1 and 2 seconds indication and input switch back one step.




5.2.1. Access to configuration


Step	Key	Indication	Function
1	  during 3 sec. simult	 	By entering user specified code (new unit = 0) programming is possible. Without valid code data can only be checked. This step is only necessary if data should be altered.
2			Code is acknowledged and can now be set newly if it was correct before. In case the code was wrong these two steps are ignored.
3	 		
4		 	The code, possibly set newly at step 3, is now valid. Now the desired data range can be selected.

5.2.2. Selecting the data range

























With the arrow keys (forwards/backwards) the data range is selected.

 = alarm data
 = serial interface
 = sensors

 = control parameters
 = system configuration
 = offsets (correction of actual value measurement and of the ext. setpoint)

By using key  data in the selected range are accessed. The data are stored in the controller. It is highly recommended to record these data. For this purpose see list of setting data on page 37.

5.3. Alarm data

Step	Key	Indication	Function										
1	 	ALA 	Range of alarm data										
2		-LI n	The maximum temperature for the sensor is set. If this temperature is exceeded the heating is switched off by the controller. Monitoring when controller is on or off. An alarm is only triggered if it is programmed.										
3	 	nnnn	range: acc. to set sensor.										
4		LI n	The minimum temperature for the sensor is set. If this temperature has fallen below, the cooling is switched off by the controller. Monitoring when controller is on or off. An alarm is only triggered if it is programmed.										
5	 	nnnn	range: acc. to set sensor.										
6		-LI n	The limit for overtemperature is set. If the actual value is exceeding the setpoint by this value, an alarm is triggered. Monitoring only when controller is on.										
7	 	nn	range: 0-99°C (0 = overtemp. alarm is switched off)										
8		=LI n	The limit for low temperature is set. If the actual value is below the setpoint by this value, an alarm is triggered.										
9	 	nn	range: 0-99°C (0 = low temperature alarm is switched off)										
10		ALC 1	Alarm code 1 (for sensor) is set. Meaning see following table.										
11	 	n	range : 0 – 9										
12		ALC 2	Alarm code 2 is set.										
13	 	n	<table border="1"> <thead> <tr> <th>code</th> <th>power switch on</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>no alarm</td> </tr> <tr> <td>1</td> <td>alarm</td> </tr> <tr> <td>2</td> <td>no alarm control is turned off</td> </tr> <tr> <td>3</td> <td>alarm control is turned off</td> </tr> </tbody> </table>	code	power switch on	0	no alarm	1	alarm	2	no alarm control is turned off	3	alarm control is turned off
code	power switch on												
0	no alarm												
1	alarm												
2	no alarm control is turned off												
3	alarm control is turned off												
14		tCon	The threshold temperature (temp. contact) for the sensor is set. Monitoring when controller is on or off.										
15	 	nnnn	range: acc. to sensor.										
16		ALA 	End of alarm data range. With the help of the arrow keys a new range can be selected.										

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5.3.1. Table alarm codes for code 1

Code	Function	Indication
0 , 5	Alarm is switched off	none
1 , 6	Alarm relay is activated as long as the alarm condition is fulfilled. Acknowledging isn't possible.	none
2 , 7	Same as 1, but: the alarm indication can be acknowledged, when the alarm condition disappears.	yes
3 , 8	Alarm relay is activated if the alarm condition takes place and remains activated until acknowledgement, even if the alarm condition leaves.	yes
4 , 9	Same as 3, but: If the acknowledgement happens during fulfilled alarm condition, then the alarm relay remains activated until the alarm condition disappears. The alarm condition is deleted according to the acknowledgement in any case.	yes

codes 0 - 4 : activated relay is operated (i.e. in normal state the relay is released).
 codes 5 - 9 : activated relay is released.

An alarm is acknowledged by pressing START/STOP key, as long as an alarm is indicated.

5.3.2. Band alarm

If at overtemperature and low temperature alarm a value >0 is entered, then a band is monitored. An alarm can be activated if the temperature has been within the band. If the setpoint is altered then the condition has to be fulfilled again.

5.3.3. Sensor break



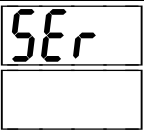

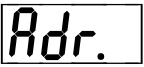


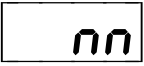

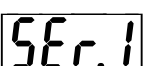


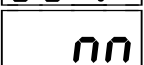

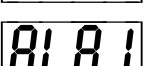




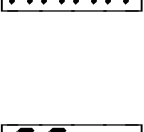
Sensor break causes an alarm which can not be acknowledged. If an alarm code below 2 is set, then for sensor break alarm code 2 applies.

5.3.4. Types of alarm and alarm indications - Sequence of priority:

Type of alarm	Indication	Alarm condition
1. Power switch on		Mains break
2. Sensor break		the resp. sensor does not deliver a valid signal
3. Max. value		value sensor > programmed alarm value
4. Min. value		value sensor < min. alarm
5. Overtemperature		value of sensor more than the programmed value above setpoint
6. Low temperature		value of sensor more than the programmed value below setpoint
7. Serial interface		time-out on the serial interface

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5.4. Serial interface

Step	Key	Indication	Function
1	 		Range of serial interface.
2			The address of the unit is set.
3	 		range: 0 - 31
4			Code of 1. interface is set.
5	 		Meaning see following code table.
6			The monitoring time of the 1. interface is set in seconds. If after this period no message is recognised on the interface (e.g. by cable break) the control is switched off. The alarm relay releases and on the display 'Ser.1' is flashing.
7	 		range: 0 - 1000 seconds. 0 = switched off monitoring.
8			End of range of serial interface. With the help of the arrow keys a new range can be selected.






















5.4.1. Code table for serial interface

Val.	addr.	Function
0	--	off (no data received or transmitted)
1	99	Master, transmits setpoint 1
2	--	not used
3	99	Slave without respond, notes Start/Stop, setpoint
4	99	Slave without respond, notes Start/Stop, Setpoint = program setpoint + master setpoint
5-15	--	not used
16	0-31	Slave takes notice of all commands and responds. Intervention at controller possible.
17	0-31	Slave takes notice of all commands and responds. No intervention at controller possible.

If the controller with function code 16 or 17 is operated together with other than TECON units, it is recommendable to ask for specification 'Serial standard interface for TECON controllers'.

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5.5. Sensor

Step	Key	Indication	Function																																																
1	 	SEn	Range of sensors																																																
2		TYPE	Type of sensor is set.																																																
3	 	nnnn	<table border="1"> <thead> <tr> <th>sensor</th> <th>range</th> <th>lower indication</th> </tr> </thead> <tbody> <tr> <td>NiCr-Ni (K)</td> <td>-200 - 1200°C</td> <td>CA</td> </tr> <tr> <td>Fe-Co (J)</td> <td>-200 - 750°C</td> <td>FECo</td> </tr> <tr> <td>PtRh10% (S)</td> <td>0 - 1600°C</td> <td>PT10</td> </tr> <tr> <td>PtRh13% (R)</td> <td>200 - 1600°C</td> <td>PT13</td> </tr> <tr> <td>Pt100 3-wire conn.</td> <td>-200 - 750°C</td> <td>P100</td> </tr> <tr> <td>Pt100 4-wire conn.</td> <td>-200 - 750°C</td> <td>P.1.0.0.</td> </tr> <tr> <td>Pt100 at 84-Ohm</td> <td>-200 - 400°C</td> <td>P184</td> </tr> <tr> <td>Z-barrier</td> <td></td> <td></td> </tr> <tr> <td>4-20 mA</td> <td>-200 -2000 units</td> <td>4-20</td> </tr> <tr> <td>0-20 mA</td> <td>-200 -2000 units</td> <td>0-20</td> </tr> <tr> <td>PtRh18% (B)</td> <td>200 - 1800°C</td> <td>PT18</td> </tr> <tr> <td>Nicrosil-Nisil (N)</td> <td>-200 - 1200°C</td> <td>NISI</td> </tr> <tr> <td>0 - 10 V</td> <td>-200 -2000 units</td> <td>0-10</td> </tr> <tr> <td>Pt100 at 84-Ohm</td> <td>-200 - 400°C</td> <td>P.184</td> </tr> <tr> <td>Z-barrier, 4-wire</td> <td></td> <td></td> </tr> </tbody> </table> <p>Attention: Sensor type 0 - 10 V must be connected between IN and Ground (pin 11 and 12).</p>	sensor	range	lower indication	NiCr-Ni (K)	-200 - 1200°C	CA	Fe-Co (J)	-200 - 750°C	FECo	PtRh10% (S)	0 - 1600°C	PT10	PtRh13% (R)	200 - 1600°C	PT13	Pt100 3-wire conn.	-200 - 750°C	P100	Pt100 4-wire conn.	-200 - 750°C	P.1.0.0.	Pt100 at 84-Ohm	-200 - 400°C	P184	Z-barrier			4-20 mA	-200 -2000 units	4-20	0-20 mA	-200 -2000 units	0-20	PtRh18% (B)	200 - 1800°C	PT18	Nicrosil-Nisil (N)	-200 - 1200°C	NISI	0 - 10 V	-200 -2000 units	0-10	Pt100 at 84-Ohm	-200 - 400°C	P.184	Z-barrier, 4-wire		
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Z-barrier, 4-wire																																																			
4		uuuü	This indication appears only, if sensor is selected as current- or voltage input. The lower limit of the input is set. range : -200 to 2000 units																																																
5	 	nnnn																																																	
6		nnny	This indication appears only, if sensor is selected as current- or voltage input. The upper limit of the input is set. range : -200 to 2000 units																																																
7	 	nnnn	Attention: Trespassing does not switch off regulation.																																																
8		---	The lower limit of the control range is set.																																																
9	 	nnnn	This range limits input of the setpoint.																																																
10		---	The upper limit of the control range is set.																																																
11	 	nnnn	This range limits input of the setpoint.																																																
12		FLt	Adjusting the filter code of the sensor. Function see table below.																																																
13	 	n.n	range: 0- 99. (0 = filter switched off)																																																
14		SEn	End of sensor range. With the help of the arrow keys a new range can be selected.																																																

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Filter code:

X X

	Spike suppression	Low-pass filter
1	50 units, time delay 0.9s	time constant 1s
2	20 units, time delay 0.8s	time constant 2s
3	10 units, time delay 0.7s	time constant 5s
4	5 units, time delay 0.6s	time constant 10s
5	2 units, time delay 0.5s	time constant 20s
6	1 unit, time delay 0.4s	time constant 50s
7	0.5 units, time delay 0.3s	time constant 100s
8	0.2 units, time delay 0.2s	time constant 200s
9	0.1 units, time delay 0.1s	time constant 500s


















Spike suppression: If the measured value between two measurements differs more than the spike suppression value, it will not be accepted. After the delay time, it will be accepted in any case.

Low-pass filter: After a step function of the measured value, it reaches 63 % of the step after 1 time constant and 99 % after 7 time constants. The amplitude of a periodic signal with the period of 1 time constant is reduced to nearly 50 %. Is the period 1/10 of the time constant, the amplitude is reduced to 1 %.

5.6. Control parameter

Step	Key	Indication	Function
1		PAr	Range of parameter.
2		Pb1	The proportional band for controller 1 is set. Within the proportional band the performance is controlled proportionally to the deviation between setpoint and actual value.
3		nnn	
4		J1	The lag time 1 (integral) is set. The lag time is responsible for compensating the deviation caused by the proportional control.
5		nnnn	
6		d1	The lead time 1 (differential) is set. The lead time is responsible for switching off before setpoint is reached. Thus, overshooting is prevented.
7		nnn	
8		r1	Relay cycle time 1 is set. With quasi-proportional control the performance at constant cycle time is influenced by altering the impulse interval ratio.
9		nnn	

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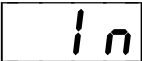



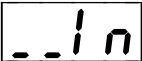



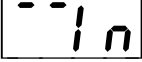


Step	Key	Indication	Function
10		PL 1	The max. performance 1 (in %) is set.
11		nnn	Performance can be limited to get a smoother control. range: 10 - 100%
12		Pb2	The proportional band for controller 2 is set.
13		nnn	Within the proportional band the performance is controlled proportionally to the deviation between setpoint and actual value. range: 0 - 999 units (0 = On/Off controller).
14		J2	The lag time 2 (integral) is set.
15		nnnn	The lag time is responsible for compensating the deviation caused by the proportional control. range: 0 - 9999 seconds (0 = no integral characteristic).
16		d2	The lead time 2 (differential) is set.
17		nnn	The lead time is responsible for switching off before setpoint is reached. Thus, overshooting is prevented. range: 0 - 999 seconds (0 = no differential characteristic).
18		r2	Relay cycle time 2 is set.
19		nnn	With quasi-proportional control the performance at constant cycle time is influenced by altering the impulse interval ratio. range: 1 - 999 seconds
20		PL2	The max. performance 2 (in %) is set.
21		nnn	Performance can be limited to get a smoother control. Range: 1 – 100 %
22		db	The dead-band is set.
23		nn.n	Within this band, symmetric to the setpoint, no heating nor cooling occurs (controller type 12). Otherwise, it is an offset for the 2nd controller. range: 0 - 99.9 units
24		t. n t	The regulating time is set.
25		nnn	With controller type 13, 14, 15 the regulating time of the servomotor must be entered. This time influences the period of the regulating pulses. range: 1 - 999 seconds
26		PAR	End of parameter range.
		<input type="text"/>	With the help of the arrow keys a new range can be selected.

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5.7. System configuration

Step	Key	Indication	Function																				
1		<div style="border: 1px solid black; padding: 2px; display: inline-block;">545</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> </div>	Range of system data.																				
2		<div style="border: 1px solid black; padding: 2px; display: inline-block;">dl SP</div>	Display code is set.																				
3		<div style="border: 1px solid black; padding: 2px; display: inline-block;">n</div>	Display-code for the following sensor types: NiCr-Ni, Fe-Co, PtRh10%, PtRh13%, Pt100																				
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">code</th> <th style="width: 15%;">resolution</th> <th style="width: 20%;">upper display</th> <th style="width: 55%;">lower display</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1°C</td> <td style="text-align: center;">actual value</td> <td style="text-align: center;">setpoint</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0.1°C</td> <td style="text-align: center;">actual value</td> <td style="text-align: center;">setpoint</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">1°C</td> <td style="text-align: center;">actual value</td> <td style="text-align: center;">setpoint</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">0.1°C</td> <td style="text-align: center;">actual value</td> <td style="text-align: center;">setpoint</td> </tr> </tbody> </table>				code	resolution	upper display	lower display	0	1°C	actual value	setpoint	1	0.1°C	actual value	setpoint	2	1°C	actual value	setpoint	3	0.1°C	actual value	setpoint
code	resolution	upper display	lower display																				
0	1°C	actual value	setpoint																				
1	0.1°C	actual value	setpoint																				
2	1°C	actual value	setpoint																				
3	0.1°C	actual value	setpoint																				
Display-code for the following sensor types: 0 - 2 mA, 4- -20 mA, 0 - 10V																							
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">code</th> <th style="width: 15%;">indication</th> <th style="width: 20%;">upper display</th> <th style="width: 55%;">lower display</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">xxxx</td> <td style="text-align: center;">actual value</td> <td style="text-align: center;">setpoint</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">xxx.x</td> <td style="text-align: center;">actual value</td> <td style="text-align: center;">setpoint</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">xx.xx</td> <td style="text-align: center;">actual value</td> <td style="text-align: center;">setpoint</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">x.xxx</td> <td style="text-align: center;">actual value</td> <td style="text-align: center;">setpoint</td> </tr> </tbody> </table>				code	indication	upper display	lower display	0	xxxx	actual value	setpoint	1	xxx.x	actual value	setpoint	2	xx.xx	actual value	setpoint	3	x.xxx	actual value	setpoint
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4		<div style="border: 1px solid black; padding: 2px; display: inline-block;">0C/h</div>	Setting of the ramp inclination for starting the nominal value.																				
5		<div style="border: 1px solid black; padding: 2px; display: inline-block;">nnnn.n</div>	Range : 0.0 - 999.9 units /h When 0 is set the controller directly goes to the set nominal value.																				
6		<div style="border: 1px solid black; padding: 2px; display: inline-block;">4C/h</div>	Setting the ramp inclination for switching off the controlling function.																				
7		<div style="border: 1px solid black; padding: 2px; display: inline-block;">nnnn.n</div>	Range : 0.0 - 999.9 units /h When 0 is set the control system immediately switches off, otherwise the nominal value first goes towards the range of 10 to 30 units with this gradient. As soon as this is reached, the control system switches off completely.																				
8		<div style="border: 1px solid black; padding: 2px; display: inline-block;">P/</div>	The gradient to change the output signal is set.																				
9		<div style="border: 1px solid black; padding: 2px; display: inline-block;">nnnn.n</div>	Range: 0.0 to 100.0 sec/% When 0.0 is set, the output signal goes directly to the new value.																				








TEMPERATURE CONTROLLER TECON 131/132

Key	Indication	Function
10		
Code for combined input is set.		
11		
This function is not available if sensor 0 - 10 V is selected.		
Code Function		
0 Control off if ext. contact closed.		
1 Control on if ext. contact closed.		
Control off if ext. contact open.		
2 Control starts and stops with ext. pulse.		
3 ext. setpoint in 1 mV/°C		
4 ext. setpoint in 10 mV/°C		
5 ext. setpoint 0-10 V		
6 ext. setpoint 4-20 mA		
7 ext. setpoint 0-20 mA		
8 collective alarm if contact closed		
9 see 8, control always on		
10 collective alarm if contact open		
11 see 10, control always on		
12		
The lower range limit for input is set.		
range : -200 to 2000 units		
13		
This indication appears only if the input code is 5-7.		
14		
The upper range limit for input is set.		
range : -200 to 2000 units		
15		
This indication appears only if the input code is 5-7.		

TEMPERATURE CONTROLLER TECON 131/132

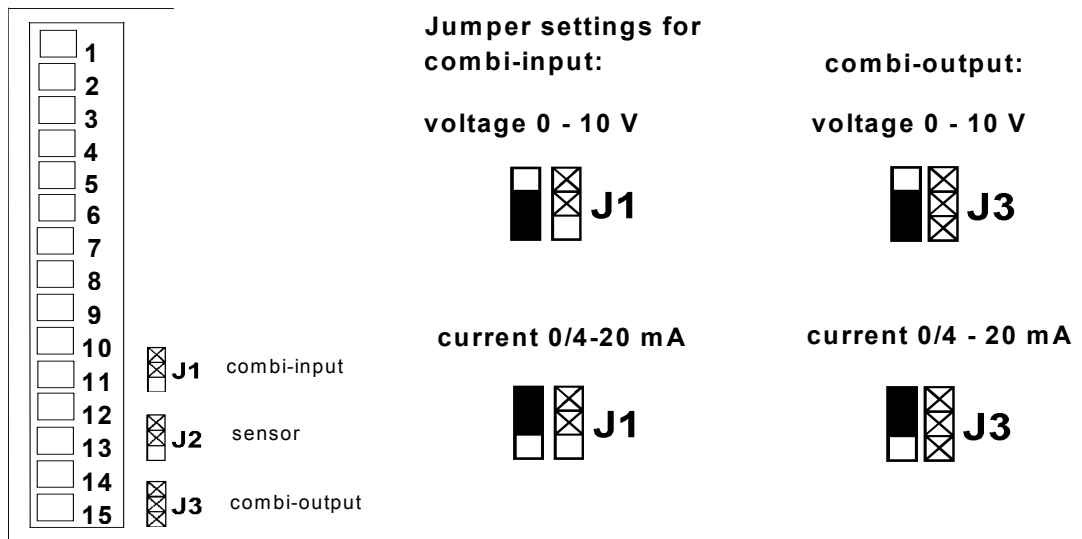
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17			<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Code table</th> <th style="text-align: left;">Polarity</th> <th style="text-align: left;">+</th> <th style="text-align: left;">-</th> </tr> </thead> <tbody> <tr> <td>control signal digital</td> <td></td> <td>0</td> <td>1</td> </tr> <tr> <td>control on</td> <td></td> <td>2</td> <td>3</td> </tr> <tr> <td>alarm</td> <td></td> <td>4</td> <td>5</td> </tr> <tr> <td>temperature contact</td> <td></td> <td>6</td> <td>7</td> </tr> <tr> <td>performance 0 - 10 V</td> <td></td> <td></td> <td>8</td> </tr> <tr> <td>performance 4 - 20 mA</td> <td></td> <td></td> <td>9</td> </tr> <tr> <td>performance 0 - 20 mA</td> <td></td> <td></td> <td>10</td> </tr> <tr> <td>actual value 1 mV/°C</td> <td></td> <td></td> <td>11</td> </tr> <tr> <td>actual value 10 mV/°C</td> <td></td> <td></td> <td>12</td> </tr> <tr> <td>actual value 0 - 10 V</td> <td></td> <td></td> <td>13</td> </tr> <tr> <td>actual value 4 - 20 mA</td> <td></td> <td></td> <td>14</td> </tr> <tr> <td>actual value 0 - 20 mA</td> <td></td> <td></td> <td>15</td> </tr> <tr> <td>setpoint 1 mV/°C</td> <td></td> <td></td> <td>16</td> </tr> <tr> <td>setpoint 10 mV/°C</td> <td></td> <td></td> <td>17</td> </tr> <tr> <td>setpoint 0 - 10 V</td> <td></td> <td></td> <td>18</td> </tr> <tr> <td>setpoint 4 - 20 mA</td> <td></td> <td></td> <td>19</td> </tr> <tr> <td>setpoint 0 - 20 mA</td> <td></td> <td></td> <td>20</td> </tr> </tbody> </table> <p>The swap between current/voltage-output needs according jumper setting, see 5.7.1 below.</p>	Code table	Polarity	+	-	control signal digital		0	1	control on		2	3	alarm		4	5	temperature contact		6	7	performance 0 - 10 V			8	performance 4 - 20 mA			9	performance 0 - 20 mA			10	actual value 1 mV/°C			11	actual value 10 mV/°C			12	actual value 0 - 10 V			13	actual value 4 - 20 mA			14	actual value 0 - 20 mA			15	setpoint 1 mV/°C			16	setpoint 10 mV/°C			17	setpoint 0 - 10 V			18	setpoint 4 - 20 mA			19	setpoint 0 - 20 mA			20
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TEMPERATURE CONTROLLER TECON 131/132



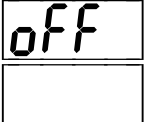

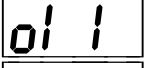


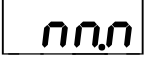

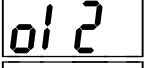




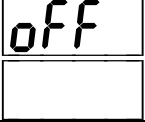
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24		 	<p>End of system data range. With the help of the arrow keys a new range can be selected.</p>																																																																		

TEMPERATURE CONTROLLER TECON 131/132

5.7.1 Jumper for combi-input and combi-output



5.8. Offsets

Step	Key	Indication	Function
1	 		Range of offsets.
2			Offset 1 is set.
3	 		(sensor 1) range: -99.9 to +99.9 units
4			Offset 2 is set.
5	 		(ext. setpoint input resp. analogue input) range: -99.9 to +99.9 units
6			End of offset range.

6. Serial Interface

6.1. General

In quantity the controllers of the TECON 100 series have a serial interface acc. to RS 485. With the help of this interface it is possible to interconnect several controllers. As a result operation is simplified. Then one controller is programmed as master and all others as slaves. All connected slaves are operating in the same manner as the master acc. to the pre-set. So only the master has to be manipulated. The performance of the controllers are determined with code 'SER1'. This code is explained under section 'Adaptation of controller, serial interface'.

One of the interconnected controllers becomes the master if its code is set to 1. This controller now is continuously transferring data to all other connected controllers. These controllers must have a code set between 3 and 4 so that they cannot answer. It is important that only one controller is transmitting as master and all the others are receiving only. Otherwise, transmitting units get mixed up on the shared line.

The slaves can be connected to the master by 2 different ways.

Code 3 means that the slaves are switched on and off together with the master and that its setpoint is accepted by the slaves. This is mainly practical with multi-zone heatings.

With code 4 the setpoint of the slave is added to the setpoint of the master. As a result, slaves are operating with an offset to the master.

Neither master nor slaves need an address. That is why it is irrelevant which value is indicated at the address (Adr.). Internally, master and slaves use address 99 for their data exchange. However, in case of a failure in the data exchange the alarm time can be used to switch off the slaves, which have now no connection to the master and to trigger an alarm.

6.2. Operation on superior control unit

However, if the controller is used as slave of a superior control system, e.g. a PC the code has to be set to 16 and each unit has to be given an other address. With code 16 the controllers respond to enquiries of the superior system. The responsibility of this system is the enquiry of always only one controller at the same time and that no further message happens, as long as the answer hasn't been received completely.

In contrast to the master-slave-mode only the addressed controller observes the commands from the master. That means, every connected controller must be individually operated except the master uses address 99. This is also considered with all connected controllers at code 16/17.

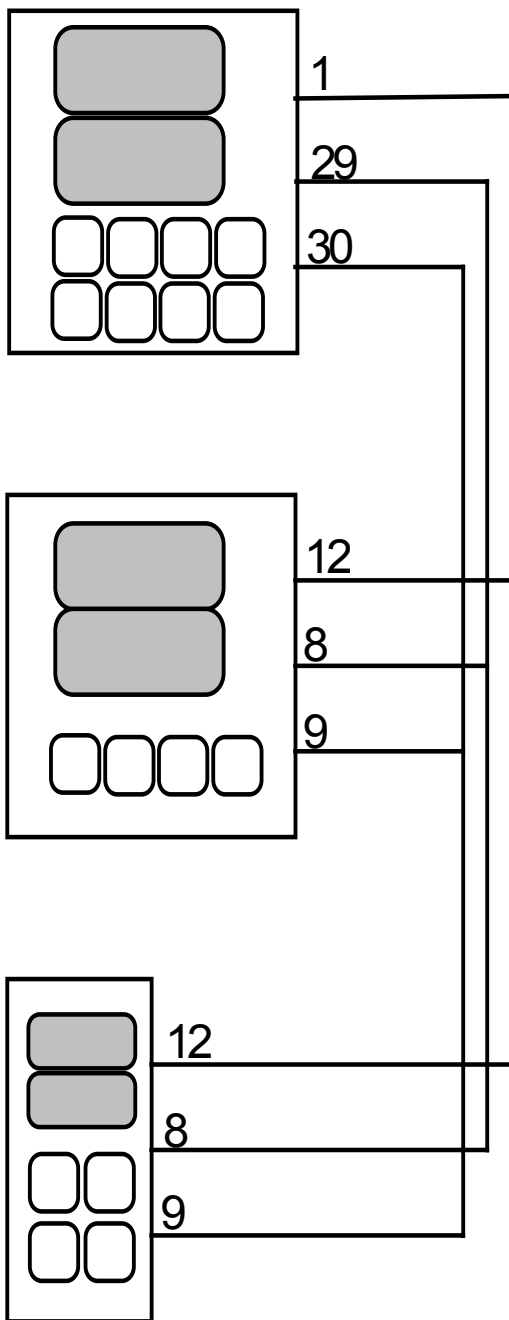
With code 16 interventions at the controller like Start/Stop or altering the setpoint are possible directly on the controller. With code 17 these functions are locked. Within this mode the LED 'REMOTE' on the front panel lights up.

With each valid message the controller receives and recognises via interface the LED 'SER' lights up during 2 seconds.

For PC operation TECON AG offers several programs, e.g. for optimisation, documentation and monitoring of control systems.

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Example: Master-Slave operation with 3 controllers



Master: TECON 230

Spec. of serial interface:

Adr.: 0

Ser.1: 1

Alarm: 0

Function:

Only this controller is operated by the user.

Slave 1: TECON 131 Heating/Cooling

Spec. of serial interface:

Adr.: 0

Ser.1: 3

Alarm: 10

Function:

This slave starts and stops together with the master. It controls to the same setpoint. 10 seconds after breaking-off the connection to the master it stops.

Slave 2: TECON 132, Heating/Cooling

Spec. of serial interface:

Adr.: 0

Ser.1: 5

Alarm: 0

Function:

This slave starts and stops together with the master. It is always in the same program section

as the master. After breaking-off the connection it operates with its own program.

Max. number of controllers:

32

Max. length of line:

1000 m

Line cross section:

0.5 - 1 mm²

(screen off longer lines, screen on PE)

7. Error Indications, Faults

7.1. Error indications of the controller

When switching on the controller carries out different system checks. If an error occurs, an error message is indicated.

On the upper display appears 'SYST' and on the lower display appears 'Err' and a number. This number has the following meaning:

Indicat.	Cause	Action
Err1	Lost data	Press Start/Stop key. The controller is initialised. Data entered by the user are erased and must be entered anew.
Err2	Storage fault int. RAM	Switch on and off controller again.
Err3	Faulty EEPROM	Switch on and off controller again.
Err4	Faulty program store	Switch on and off controller again.
Err5	Faulty A/D converter	Switch on and off controller again.
Err6	Program isn't compatible (Incorrect manipulation on controller)	Press START/STOP key. The controller is initialised. Data entered by the user are erased and must be entered anew.
Err7	Controller isn't calibrated	Press START/STOP key. Indeed the controller can operate, but the inputs and outputs are not sufficiently accurate. Return controller.

If the error message appears repeatedly, return unit to the manufacturer for repair.

7.2. Faults during operation

7.2.1. It is not possible to start controller

Controller is programmed for external Start/Stop. Ref. to 'Configuration system data combi input' on page 27.

Possibly, the controller is programmed with the interface code 17. This code prevents operating the unit.

7.2.2. Indication of actual value

The actual value indication flashes together with the indication of the set sensor:

Sensor is wrongly connected, faulty or it doesn't correspond with the programmed type.

Wrong indication of actual value: The connected sensor doesn't correspond with the programmed type.

Actions: Check sensor. Check programming of sensor (sensor levels, type of sensor on page 24)

7.2.3. Setpoint can not be adjusted

Cause: The limits of the control range are not correctly set (see page 24).

Or: Controller is programmed for external setpoint (see page 27).

Possibly, the controller is set to interface code 17 (LED 'REMOTE' on front of the unit lights up).

7.2.4. Control doesn't function properly

If the green LED '1' is illuminated permanently and the temperature still doesn't rise, then the heating isn't connected correctly or too weak.

If the green LED '2' is illuminated permanently and the cooling still doesn't operate, then the cooling system has to be checked (possibly controller code is wrong).

If the green LED '1' indicates no heating although the controller is switched on and the setpoint is above actual value, then the set max. temperature has to be checked (see page 21).

The exceeding of the max. temperature is indicated only if the alarm code 1 is set suitably (level alarm data, alarm code, page 21).

If the green LED '2' indicates no cooling although the controller is switched on and the setpoint is under actual value then the set min. temperature has to be checked (see page 21).

Remaining under the min. temperature is indicated only if the alarm code 1 is set suitably (alarm data level, alarm code, page 21).

7.2.5. Controller cannot be configured

Code at entry into the confide. level is wrong. The code can be entered by the user and consequently must be managed by the user. With new units the code is 0. Handling of the code is explained under sect. 5 'Adaptation'. If the code isn't known no longer, please contact the supplier.

7.3. Repair and warranty

If the user cannot remedy a failure, please send unit back to manufacturer for repair. For the user, it is forbidden to open the unit or to make any changes.

The manufacturer guarantees a proper function of the unit within one year from the date of buying it. During this period a faulty unit will be repaired or replaced free of charge at our manufacturing site in Oberuzwil. But only if the damage isn't the result of improper application or interventions of nonauthorised people. There are no additional claims.

8. Indication Code

TECON 131 - X - X X X . X
 TECON 132 - X - X X X . X

index of mod.

No.	controller-output	combi-output
0	relay	voltage
1	relay	current
2	signal (24V)	voltage
3	signal (24V)	current

No.	Software version
01x	standard

Ordering information

normal version:

feed voltage 230 V, 50/60 Hz

special version

please specify when ordering:

feed voltage 115 V, 50/60 Hz

or 24 V, 50/60 Hz

or DC (131 only)

Modifications without notice.

Art. Nr. 096035 Operating Manual

9. List of Setting Data

Alarm data	
Max. temperature	
Min. temperature	
Overtemperature threshold	
Low temperature threshold	
Alarm code 1	
Alarm code 2	
Threshold sensor	

Serial interface	
Unit address	
Code serial interface	
Alarm time serial interface	

Sensor	
Type of sensor	
Current input, lower limit	
Current input, upper limit	
Setpoint, lower limit	
Setpoint, upper limit	
Filter-constant	

System data	
Display code	
Ramp slope	
Turn-off ramp	
Output gradient	
Combi input	
Lower range limit, input	
Upper range limit, input	
Combi output	
Lower range limit, output	
Upper range limit, output	
Controller code	

Offsets	
Offset 1 (sensor)	
Offset 2 (setpoint)	

Control parameter	
Proportional band 1	
Integral-action time 1	
Diff.-action time 1	
Relay cycle time 1	
Max. performance 1	
Proportional band 2	
Integral-action time 2	
Diff.-action time 2	
Relay cycle time 2	
Max. performance 2	
Dead-band	
Regulating time of motor	

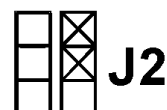
Code for adaptation : _____

Jumper Settings:

combi-input:



sensor:



combi-output:

