

**RES-004** <sup>GB</sup>

## Operating Instructions



### Important features

- Microprocessor technology
- LED display (red), 3 characters
- Automatic zero calibration (AUTOCAL)
- Automatic frequency adjustment
- Primary control with burst firing control
- Time control (settable heatsealing time and cooling temperature)
- 115/230VAC switching output, e.g. "Sealing active" or "Close jaws"
- START signal via contact input
- Built-in current transformer

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# 1 Safety and warning notes

This RESISTRON temperature controller is manufactured according to DIN EN 61010-1. In the course of its manufacture it passed through quality assurance, whereby it was subjected to extensive inspections and tests.


It left the factory in perfect condition.

The recommendations and warning notes contained in these operating instructions must be complied with, in order to guarantee safe operation.

The device can be operated within the limits indicated in the "Technical Data" without impairing its operational safety. Installation and maintenance may only be performed by technically trained, skilled persons who are familiar with the associated risks and warranty provisions.


## 1.1 Use

RESISTRON temperature controllers may only be used for heating and temperature control of heatsealing bands which are expressly suitable for them, and providing the regulations, notes and warnings contained in these instructions are complied with.

 **In case of non-compliance or use contrary to the intended purpose, there is a risk that safety will be impaired or that the heatsealing band, electrical wiring, transformer etc. will overheat. Ensuring such compliance is the personal responsibility of the user.**

## 1.2 Heatsealing band

A basic prerequisite for reliable and safe operation of the system is the use of suitable heatsealing bands.


 **The resistance of the heatsealing band which is used must have a positive minimum temperature coefficient in order to guarantee trouble-free operation of the RESISTRON temperature controller.**

The temperature coefficient must be specified as follows:

$$TCR \geq 10 \times 10^{-4} \text{ K}^{-1}$$

e.g. Alloy-L:  $TCR = 780 \text{ ppm/K}$

The RESISTRON temperature controller must be set and coded according to the temperature coefficient of the heatsealing band.

 **The use of incorrect alloys with a too low temperature coefficient and incorrect coding of the RESISTRON temperature controller lead to uncontrolled heating and ultimately to burn-out of the heatsealing band!**

The heatsealing bands that were originally supplied must be identified by detail specification, part number or some other means that will assure that replacement bands are identical.

## 1.3 Impulse transformer

A suitable impulse transformer is necessary to ensure that the control loop functions perfectly. This transformer must be designed according to VDE 0570/EN 61558 (isolating transformer with reinforced insulation) and have a one section bobbin. When the impulse transformer is installed, suitable shock protection must be provided in accordance with the national installation regulations for electrical equipment. In addition, water, cleaning solutions and conductive fluids must be prevented from seeping into the transformer.

 **Incorrect installation of the impulse transformer impairs electrical safety.**

## 1.4 Line filter

The use of an original ROPEX line filter is mandatory in order to comply with the standards and provisions mentioned in section 1.5 "Standards / CE marking" on page 4. This device must be installed and connected according to the instructions contained in section 8.3, "Power supply" as well as the separate documentation enclosed with the line filter.

## 1.5 Standards / CE marking

The controller described here complies with the following standards, provisions and directives:

DIN EN 61010-1:2001 (2006/95/EG)	Safety requirements for electrical equipment for measurement, control and laboratory use (low-voltage directive): pollution degree 2, protection class II, measurement category I (for $U_R$ and $I_R$ terminals)
DIN EN 60204-1 (2006/42/EG)	Electrical equipment of machines (machinery directive)
EN 55011:1998 + A1:1999 + A2:2002 EN 61000-3-2:2006-04 EN 61000-3-3:1995-01 + A1:2001 + A2:2005-11 (2004/108/EG)	EMC genery emissions: Group 1, Class A
EN 61000-6-2:2005 (2004/108/EG)	EMC generic immunity: Class A (ESDs, RF radiation, bursts, surges) <u>Exception:</u> Line voltage interruption acc. EN 61000-4-11 is not fulfilled (This leads to a designated error message of the controller)

Compliance with these standards and provisions is only guaranteed if original accessories and/or peripheral components approved by ROPEX are used. If not, then the equipment is operated on the user's own responsibility.

## 2 Application

This RESISTRON temperature controller is an integral part of the "Series 00x", the outstanding feature of which is its microprocessor technology. All RESISTRON temperature controllers are used to control the temperature of heating elements (heatsealing bands, beaded bands, cutting wires, heatsealing blades, solder elements etc.), as required in a variety of heatsealing processes.

The controller is most commonly used for impulse-heatsealing PE and PP films in:

- Pouch, filling, and sealing machines
- Film wrapping machines
- Pouch-making machines

The CE marking on the controller confirms that the device itself complies with the above-mentioned standards.

It does not imply, however, that the overall system also fulfils these standards.

It is the responsibility of the machine manufacturer and of the user to verify the completely installed, wired and operationally ready system in the machine with regard to its conformity with the safety provisions and the EMC directive (see also section 8.3, "Power supply"). If peripheral components (e.g. the transformer or the line filter) from other manufacturers are used, no functional guarantee can be provided by ROPEX.

## 1.6 Warranty provisions

The statutory provisions for warranties apply for a period of 12 months following the delivery date.

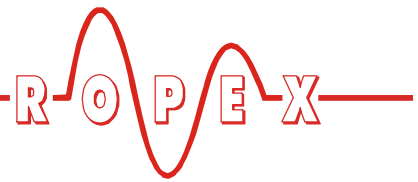
All devices are tested and calibrated in the factory. Devices that have been damaged due to faulty connections, dropping, electrical overloading, natural wear, incorrect or negligent handling, chemical influences or mechanical overloading as well as devices that have been modified, relabeled or otherwise altered by the customer, for example in an attempt to repair them or install additional components, are excluded from the warranty.

Warranty claims must be examined in the factory and approved by ROPEX.

- Group packaging machines
- L-sealers
- etc.

The use of RESISTRON temperature controllers results in:

- Repeatable quality of the heatseals under any conditions
- Increased machine capacity
- Extended life of the heatsealing bands and teflon coatings
- Simple operation and control of the sealing process



### 3 Principle of operation

The resistance of the heatsealing band, which is temperature-sensitive, is monitored up to 50x per second (up to 60x at 60Hz) by measuring the current and voltage. The temperature calculated with the help of these measurements is displayed and compared with the set point.

The primary voltage of the impulse transformer is adjusted according to the burst firing principle if the measured values deviate from the set point. The resulting change in the current through the heatsealing band leads to a change in the band temperature and thus also its resistance. This change is measured and evaluated by the RESISTRON temperature controller. The control loop is closed: ACTUAL temperature = SET temperature. Even minute thermal loads on the heatsealing band are detected and can be corrected quickly and precisely.

The thermoelectric control loop which is formed has a highly dynamic response because purely electrical variables are measured at a high sampling rate. A very wide secondary current range can be controlled with only minimal power dissipation – a considerable advantage – because power is controlled on the


primary side of the transformer. This allows optimum adaptation to the load and to the required dynamic range despite the exceptionally compact dimensions of the controller.

#### PLEASE NOTE!

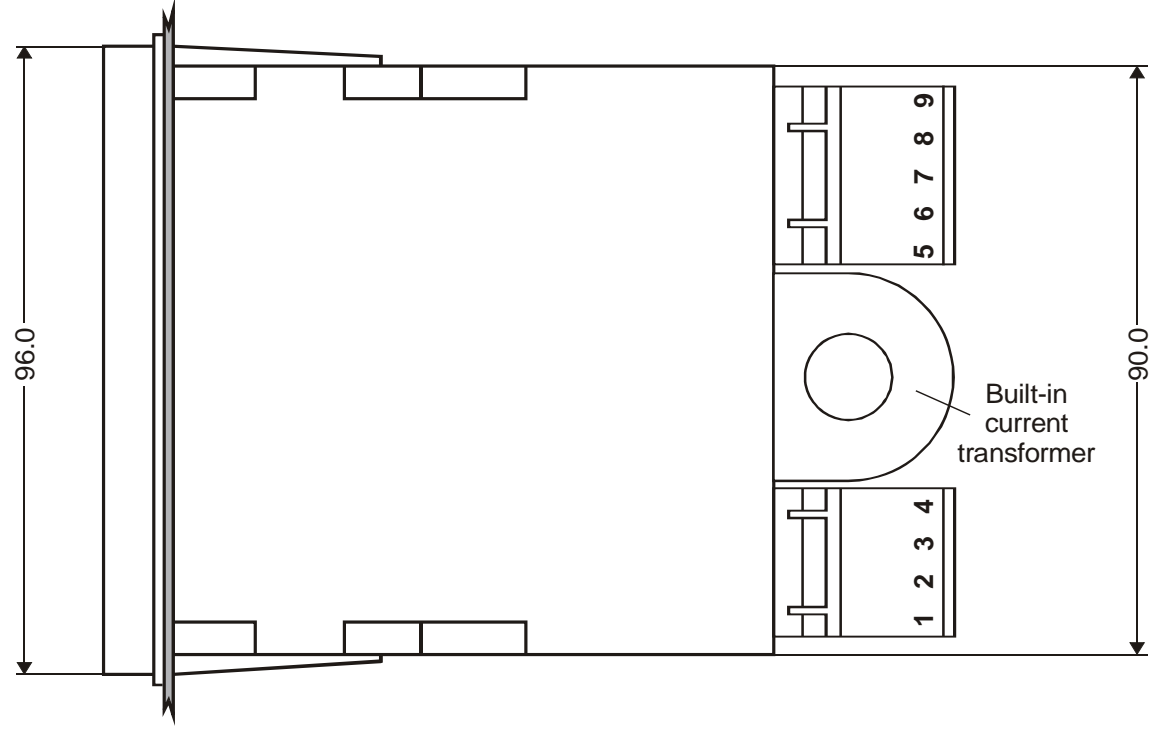
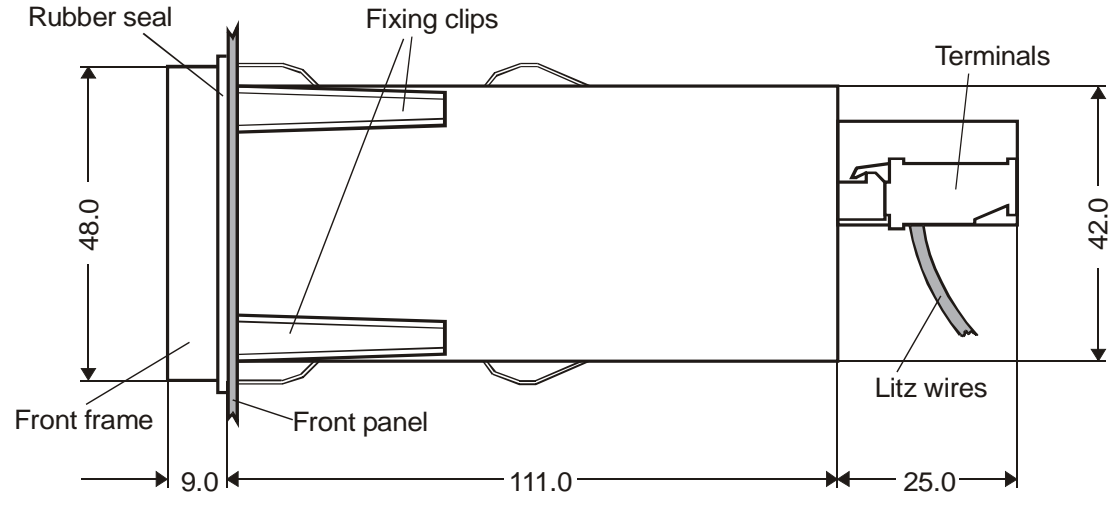
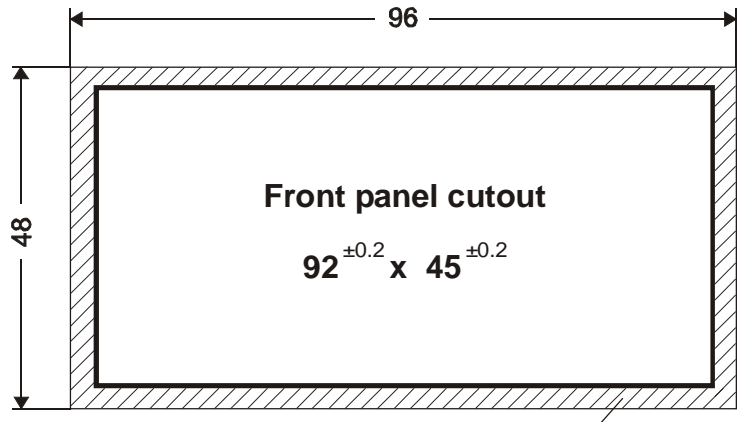
RESISTRON temperature controllers play a significant role in enhancing the performance of modern machines. However, the full benefit can only be obtained from the advanced technology offered by this control system if all the system components, in other words the heatsealing band, the impulse transformer, the wiring, the timing signals, and the controller itself, are compatible with one another.

We will be pleased to contribute our many years of experience towards optimizing *your* heatsealing system.

## 4 Technical data

<b>Type of construction</b>	Housing for installation in the electrical cabinet Dimensions (W x H): 96 x 48mm; depth: 111 mm (excl. connector plug-in parts)
<b>Line voltage</b>	Wide range power supply unit, operates at 115VAC and 230VAC Range: 110VAC -15%...240VAC +10% (equivalent to 94...264VAC)
<b>Line frequency</b>	47...63Hz, automatic adjustment to frequencies in this range
<b>Heatsealing band type and temperature range</b>	RES-004/230VAC (Art. No. 700432): approx. 40...250°C, Alloy L RES-004/230VAC-03 (Art. No. 700436): approx. 100...300°C, Alloy L
<b>Heatsealing band voltage</b> (secondary voltage of impulse transformer)	12...42VAC
<b>Limit values for heatsealing band specifications</b>	R = 135...1500mOhm $I_{max} \leq 90A$ (↳ see section 6 "Heatsealing band specification / application calculation" on page 8)
<b>Cycle rate</b>	Max. 6cycles / min (Consider the details described in the ROPEX Application Report)
<b>START via contact</b> Terminals 1, 2	Switching threshold: 3.5VDC, $U_{max} = 5VDC$ , $I_{max} = 5mA$
<b>Switching output</b> Terminal 5	Semiconductor output, switches the line voltage, $U_{max} = 240VAC$ , $I_{max} = 0.1A$
<b>Display</b>	LED display (red), 3 characters
<b>Power dissipation</b>	max. 15W
<b>Ambient temperature</b>	+5...+45°C
<b>Degree of protection</b>	Front: IP42 (IP65 with transparent front cover, Art No. 887002) Back: IP20
<b>Installation</b>	Installed in front panel cutout with (W x H) $92^{(+0.2)} \times 45^{(+0.2)}$ mm
<b>Weight</b>	Controller: Approx. 0.4kg (incl. connector plug-in parts)
<b>Housing material</b>	Black plastic, type Noryl SE1 GFN2
<b>Controller connecting cables</b> Type / cross-sections	Rigid or flexible; 0.2...2.5mm <sup>2</sup> (AWG 24...12) with plug-in connectors   <b>If ferrules are used, they must be crimped in accordance with DIN 46228 and IEC/EN 60947-1.</b> <b>This is essential for proper electrical contact in the terminals.</b>

# 5 Dimensions



## 6 Heatsealing band specification / application calculation

The RES-004 controller has only limited functionality compared to the controllers in the "Series 4xx". The possible heatsealing applications for the RES-004 are summarized in the table below.

**!** The information provided in the ROPEX Application Report (e.g. the specification for the impulse transformer) should be heeded in order to avoid malfunctions.

### 6.1 Possible heatsealing band geometries

Tapered, flat, or beaded band

### 6.2 Cycle rate

Max. 6 cycles / min

### 6.3 Heatsealing band dimensions

#### Line voltage 115VAC:

##### Heating on one side

Thickness [mm]	Length (active zone) [mm]	Max. width [mm] (*)
0.10	150...585	10
0.15	180...830	8
0.20	210...960	8
0.25	235...920	6
0.30	250...1150	6

##### Heating on both sides

Thickness [mm]	Length (active zone) [mm]	Max. width [mm] (*)
0.10	180...580	6
0.15	215...550	5
0.20	245...630	4
0.25	275...700	4
0.30	285...750	3.5

#### Line voltage 230VAC:

##### Heating on one side

Thickness [mm]	Length (active zone) [mm]	Max. width [mm] (*)
0.10	150...700	10
0.15	180...830	8
0.20	210...960	8
0.25	235...1080	6
0.30	250...1150	6

##### Heating on both sides

Thickness [mm]	Length (active zone) [mm]	Max. width [mm] (*)
0.10	180...810	6
0.15	215...1000	5
0.20	245...1120	4
0.25	275...1250	4
0.30	285...1140	3.5

(\*) Not possible for each length (active zone).



## 7 Installation

↳ See also section 1 "Safety and warning notes" on page 3.

**⚠ Installation and startup may only be performed by technically trained, skilled persons who are familiar with the associated risks and warranty provisions.**

### 7.1 Installation procedure

Proceed as follows to install the RES-004 RESISTRON temperature controller:

1. Switch off the line voltage and verify that all circuits are deenergized.
2. The supply voltage specified on the nameplate of the RESISTRON temperature controller must be identical to the line voltage that is present in the plant or machine. The line frequency is automatically detected by the temperature controller in the range from 47Hz to 63Hz.
3. Install the RESISTRON temperature controller in the front panel cutout. It is fastened by means of four fixing clips that snap onto the side of the controller housing.
4. Wire the system in accordance with the instructions in section 7.3 "Power supply" on page 10 and the ROPEX Application Report. The information provided in section 7.2 "Installation steps" on page 9 must be additionally heeded.
5. Electrical contact protection must be provided for the secondary circuit (sealing bar incl. wiring). If it is not possible to provide this protection on the machine side, the secondary side of the impulse transformer must be grounded.

**⚠ Check the tightness of all system connections, including the terminals for the impulse transformer winding wires.**

6. Make sure the wiring conforms to all relevant national and international installation regulations.

### 7.2 Installation steps

The following points should be heeded when the RES-004 is installed in addition to the information provided in the ROPEX Application Report:

#### Wiring / cable cross-sections:

- Use the cable cross-sections indicated in the ROPEX Application Report. The cables between the RES-004 and the heatsealing band must not be longer than 2m.
- Connect the heatsealing band direct to the RES-004. Additional clamping points can cause contact resistances, leading to temperature control errors.

**⚠ The connecting cables between the RES-004 and the heatsealing band must not be laid through closed steel sheets or tubes, in order to avoid temperature control errors. The permissible pipe and tube materials are aluminum or plastic.**

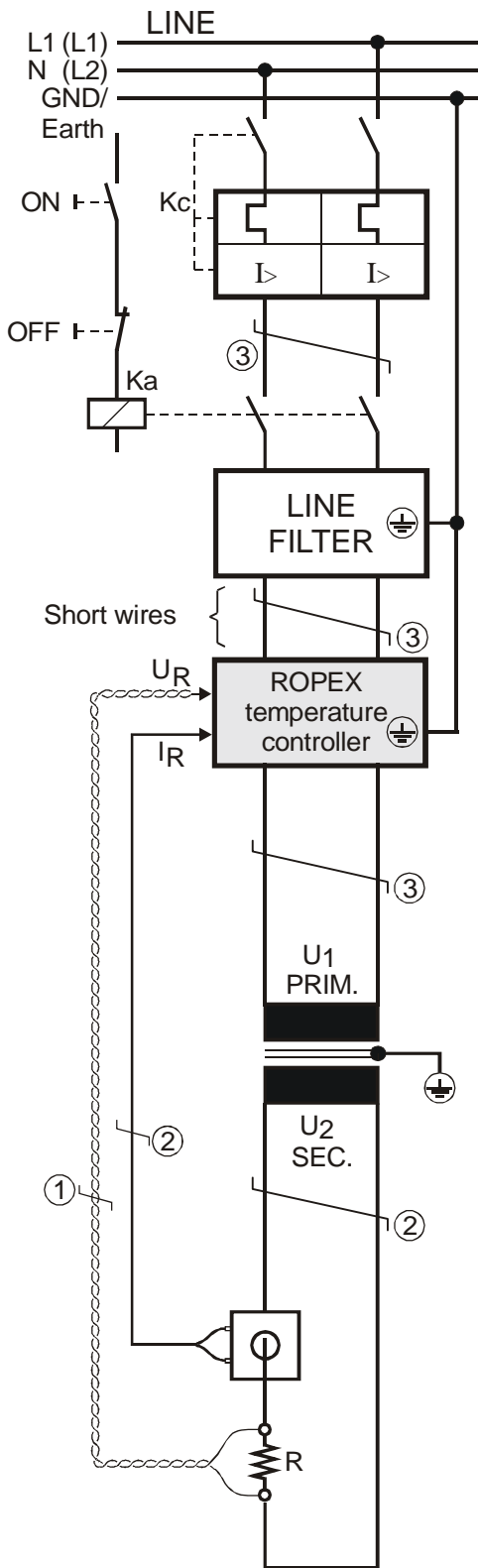
#### Impulse transformer:

- Refer to the ROPEX Application Report for the specification.

#### Heatsealing band / sealing bar:

- Use a heatsealing band with a suitable (positive) temperature coefficient.
- Copper the ends of the heatsealing band to prevent them from overheating.
- Push-on connectors on the sealing bar can lead to loose contacts. Use cables with screw connections.

## 7.3 Power supply



### Line

115VAC, 230VAC  
50/60Hz

### Over-current protection

Microfuse 5x20mm with melting integral 200A<sup>2</sup>s max.  
(E.g. ESKA 522.725: 6,3A T, Littelfuse 218 series 06.3: 6,3A T) (☞ ROPEX Application Report)

⚠ Short-circuit protection only.  
RESISTRON temperature controller not protected.

### Relay Ka

For "HEAT ON - OFF" function (all-pole) or "EMERGENCY STOP".

### Line filter

Type LF-06240, Art. No. #885508 (240VAC, 6A)

⚠ Do not run the filter supply wires (line side) parallel to the filter output wires (load side).

RESISTRON temperature controller RES-004.

### Electrical contact protection

Electrical contact protection must be provided for the secondary circuit (sealing bar incl. wiring). If it is not possible to provide this protection on the machine side, the secondary side of the impulse transformer must be grounded.

### Impulse Transformer

Designed according to VDE 0570/EN 61558 (isolating transformer with reinforced insulation). Connect core to ground.

⚠ Use transformers with a one section bobbin. The power, duty cycle and voltage values must be determined individually according to the application (☞ ROPEX Application Report and "Accessories" leaflet for impulse transformers).

### Wiring

The wire cross-sections depend on the application (☞ ROPEX Application Report).

Guide values:

Primary circuit: min. 1.5mm<sup>2</sup>, max. 2.5mm<sup>2</sup>

Secondary circuit: min. 4.0mm<sup>2</sup>, max. 10mm<sup>2</sup>

- ① These wires must always be twisted (>20turns/meter).
- ② These wires must be twisted (>20turns/meter) if several control loops are laid together ("crosstalk").
- ③ Twisting (>20turns/meter) is recommended to improve EMC.

### 7.4 Line filter

To comply with EMC directives – corresponding to EN 50081-1 and EN 50082-2 – RESISTRON control loops must be operated with line filters.

These filters damp the reaction of the phase-angle control on the line and protect the controller against line disturbances.

**! The use of a suitable line filter is part of the standards conformity and a prerequisite of the CE mark.**

installed and wired correctly, they guarantee compliance with the EMC limit values.

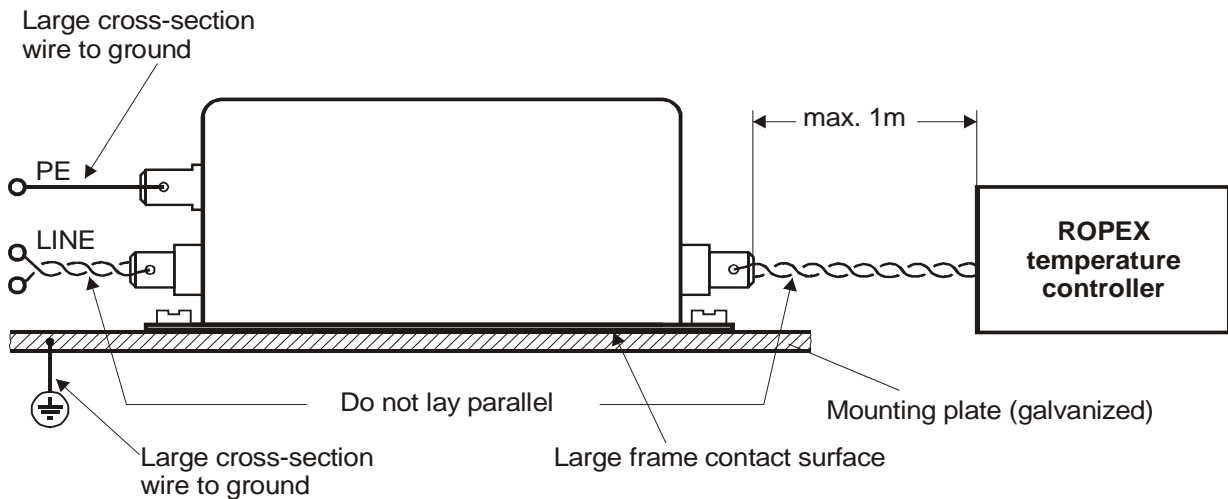
You can find the exact specification of the line filter in the ROPEX Application Report calculated for your particular heatsealing application.

For more technical information: ↪ "Line filter" documentation.

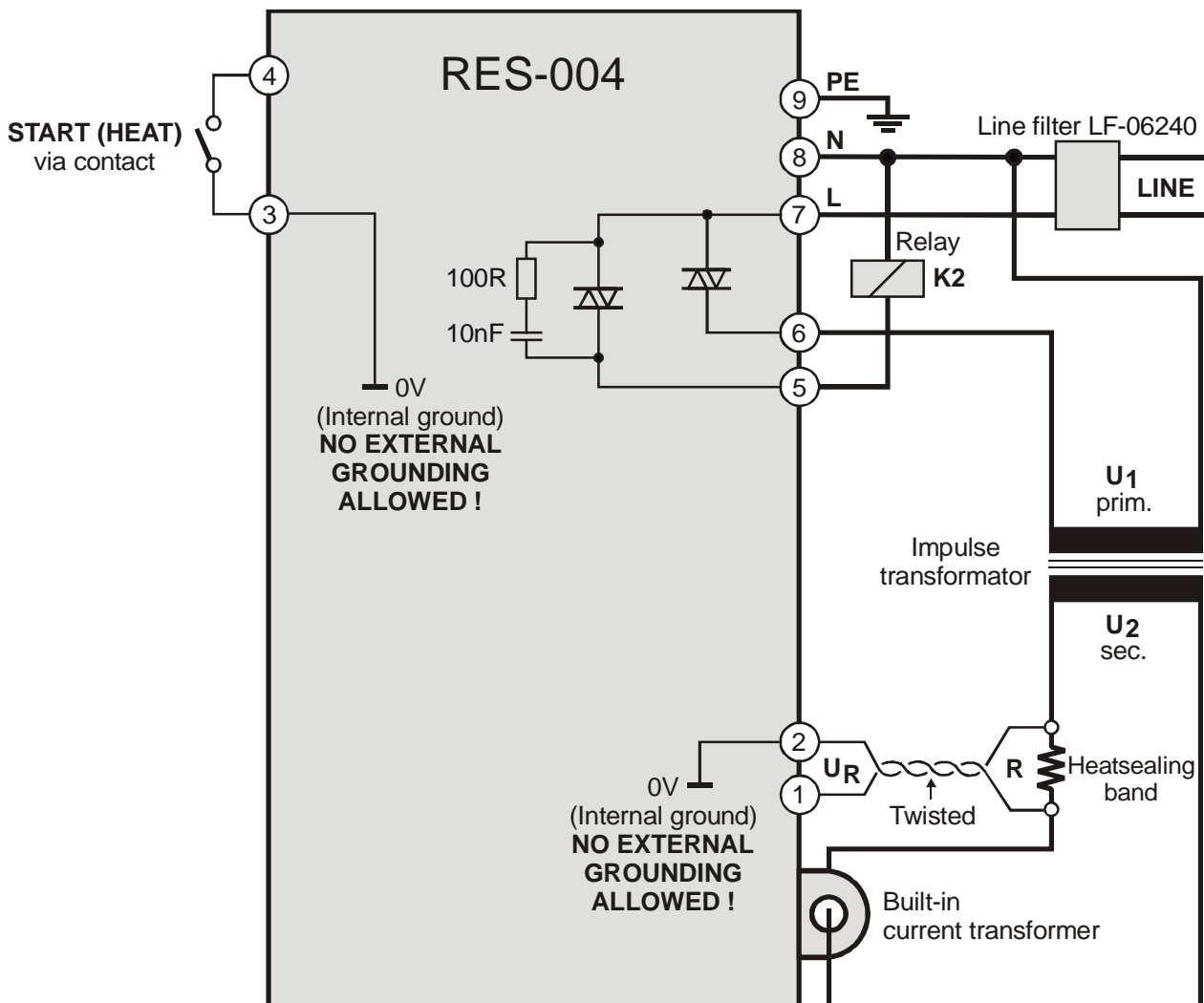
**! It is permissible to supply several RESISTRON control loops with a single line filter, providing the total current does not exceed the maximum current of the filter.**

ROPEX line filters are specially optimized for use in RESISTRON control loops. Providing that they are

The wiring instructions contained in section 7.3 "Power supply" on page 10 must be observed.



## 7.5 Wiring diagram



## 8 Startup and operation

### 8.1 View of the controller



### 8.2 Controller configuration

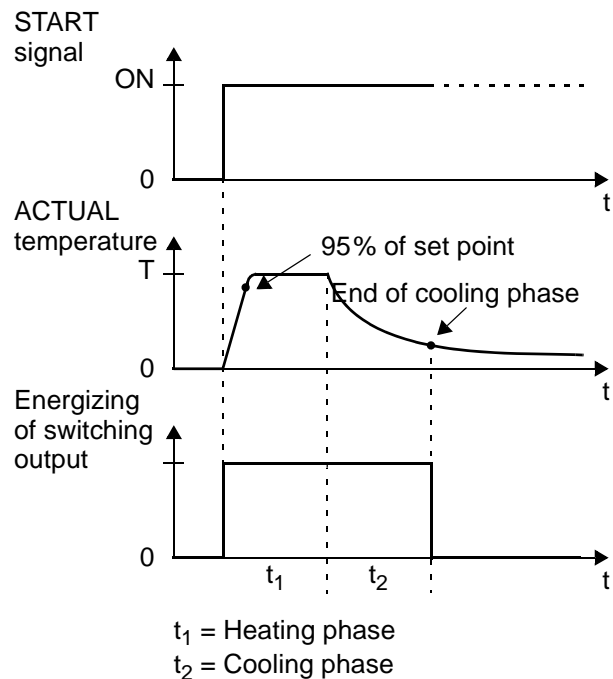
The secondary voltage and current ranges are automatically configured by the automatic calibration function (AUTOCAL). The voltage is configured in the range from 12VAC to 42VAC and the resistance (of the heatsealing band) in the range from approx. 100mohm to 1500mohm (↪ see section 6 "Heatsealing band specification / application calculation" on page 8). If the voltage and/or resistance are outside the permissible range, a detailed error message appears on the controller (↪ see section 9.2.4 "Error messages" on page 18).

### 8.3 Time control (timer function)

The timer function is always active and cannot be switched off. If time control is on, activating the "START" signal starts the internally parameterized timeout. This timeout comprises:

- Heating phase (heating and control process)
- Cooling phase

- Energizing of the switching output (e.g. for the external K2 relay)



### START signal monitoring:

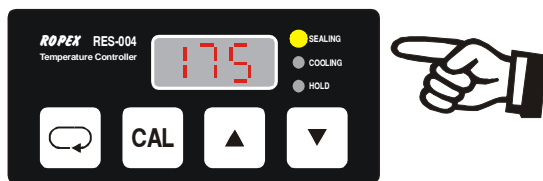
The "START" signal of the RES-004/230VAC (Art. No. 700432) must remain activated until the end of the parameterized cooling phase. If the "START" signal is deactivated before the end of the cooling phase, the timeout is interrupted.

The "START" signal of the RES-004/230VAC-03 (Art. No. 700436) is not monitored. The timeout is not interrupted if the "START" signal is deactivated.

**! The timeout of the internal timer function can only be interrupted by switching off the controller or deactivating the "START" signal (only RES-004/230VAC, Art. No. 700432).**

If the display is in the home position, the individual timeouts can be checked there.

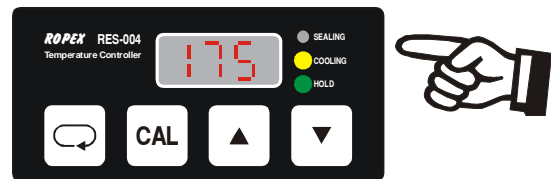
The "Sealing" LED lights up at the end of the heating phase.



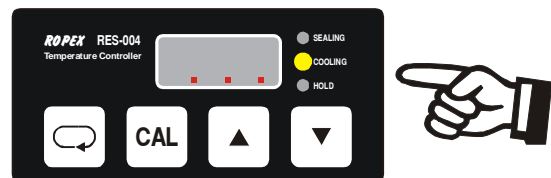
**! The heating phase comprises the heating time and the heatsealing time. The heatsealing time starts when the ACTUAL temperature reaches 95% of the SET temperature.**

At the end of the heating phase (i.e. at the end of the heatsealing time), the last ACTUAL temperature measured by the controller is displayed for 2seconds (Hold function) to make sure the correct heatsealing

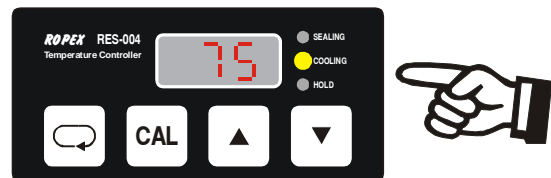
temperature was reached. The "Hold" LED also lights up.



The "Cooling" LED lights up to indicate the cooling phase (after the end of the heatsealing time). The controller does not measure the ACTUAL temperature regularly during the cooling phase. The three decimal points on the display blink during the intervals between measurements.



The ACTUAL cooling temperature is displayed for 1s while the controller is measuring the temperature.

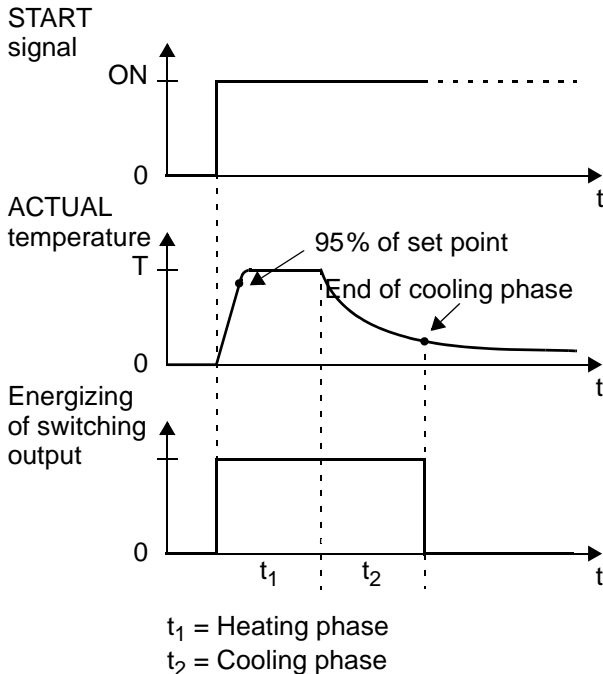


At the end of the cooling phase (i.e. when the temperature falls below the SET cooling temperature), the "Cooling" LED goes out again.

### 8.3.1 Energizing of the switching output

The switching output (e.g. for the external K2 relay) is energized as soon as the "START" signal is activated. It is deenergized at the end of the cooling phase (i.e. when the ACTUAL temperature is less than the cooling temperature).

**⚠ Relay K2 cannot be reenergized for 200ms after the end of the cooling phase, in order to prevent bouncing or oscillation of the driven closing movement.**



## 8.4 Heatsealing band

### 8.4.1 General

The heatsealing band is a key component in the control loop, since it is both a heating element and a sensor. The geometry of the heatsealing band is too complex to be discussed at length here. We shall therefore only refer to a few of the most important physical and electrical properties.

The measuring principle applied for this system necessitates a heatsealing band alloy with a suitable temperature coefficient TCR, i.e. one whose resistance increases as the temperature rises.

Too low a TCR leads to oscillation or uncontrolled heating.

If a heatsealing band with a higher TCR is used, the controller must be specially calibrated.

The first time the heatsealing band is heated to approximately 200...250°C, the standard alloy

undergoes a once-only resistance change (burn-in effect). The cold resistance of the heatsealing band is reduced by approximately 2...3%. However, this at first glance slight resistance change results in a zero point error of 20...30°C. The zero point must therefore be corrected after a few heating cycles (↪ section 8.4.2 "Burning in the heatsealing band" on page 15).

One very important design feature is the copper or silver-plating of the heatsealing band ends. Cold ends allow the temperature to be controlled precisely and increase the life of the teflon coating and the heatsealing band.

**⚠ An overheated or burned-out heatsealing band must no longer be used because the TCR has been altered irreversibly.**

### 8.4.2 Burning in the heatsealing band

If a new heatsealing band has been used, the zero point is first of all calibrated while the band is still cold by activating the "AUTOCAL" function on the controller. When the "AUTOCAL" function has finished, adjust the set point to approximately 220°C and activate the "START" signal to heat for approximately 1s. Repeat the "AUTOCAL" function after cooling down again. The heatsealing band has now been burned in and the change in the alloying properties stabilized.

The burn-in effect described here does not occur if the heatsealing band has already been thermally pretreated by the manufacturer.

### 8.4.3 Replacing the heatsealing band

All power supply leads must be disconnected from the RESISTRON temperature controller in order to replace the heatsealing band.

**⚠ The heatsealing band must be replaced in accordance with the instructions provided by the manufacturer.**

Each time the heatsealing band is replaced, the zero point must be calibrated with the AUTOCAL function while the band is still cold, in order to compensate production-related resistance tolerances. The burn-in procedure described above must be performed for all new heatsealing bands.

## 8.5 Startup procedure

Please also refer to section 1 "Safety and warning notes" on page 3 and section 2 "Application" on page 4.

**⚠ Installation and startup may only be performed by technically trained, skilled persons who are familiar with the associated risks and warranty provisions.**

### 8.5.1 Initial startup

Prerequisites: The controller must be correctly installed and connected (↪ section 7 "Installation" on page 9). Proceed as follows to start up the controller for the first time:

1. Switch off the line voltage and verify that all circuits are deenergized.
2. The supply voltage specified on the nameplate of the controller must be identical to the line voltage that is present in the plant or machine. The line frequency is automatically detected by the temperature controller in the range from 47 to 63Hz.
3. Make sure no START signal is applied.
4. Switch on the line voltage.
5. The power-up message appears on the display.
6. One of the following states then appears:

DISPLAY	ACTION
No error message (SET temperature indicated)	Go to 7
Error message with error code 8	Activate the AUTOCAL function. Go to 7
Error message with error code 14	U <sub>R</sub> signal has wrong polarity; diagnose error (↪ section 9.16). Switch off line voltage, reconnect U <sub>R</sub> signal to terminals 1+2. Go to 3
Error message with error code 90	Temperature inside controller is too high (↪ section 9.15).

7. Specify the controller configuration as described in section 8.2 "Controller configuration" on page 13.
8. Activate the AUTOCAL function by pressing the "CAL" button for 2s while the heatsealing band is still cold. "CAL" blinks on the terminal display for the duration of the calibration process (approx. 20s). When the zero point has been calibrated, the terminal display returns to the home position. If the zero has not been calibrated successfully, an error message appears on the display. In this case, the heatsealing application was not designed according to the ROPEX Application Report. Repeat the calibration after reconfiguring the controller correctly.
9. When the zero point has been calibrated successfully, select a SET temperature and apply the "START" signal (HEAT). If an error message is displayed, proceed as described in section 9.17 "Error messages" on page 23.
10. Burn in the heatsealing band (↪ section 8.4.2 "Burning in the heatsealing band" on page 15) and repeat the AUTOCAL function.

The controller is now ready

### 8.5.2 Restart after replacing the heatsealing band

To replace the heatsealing band, proceed as described in section 8.4.2 "Burning in the heatsealing band" on page 15.

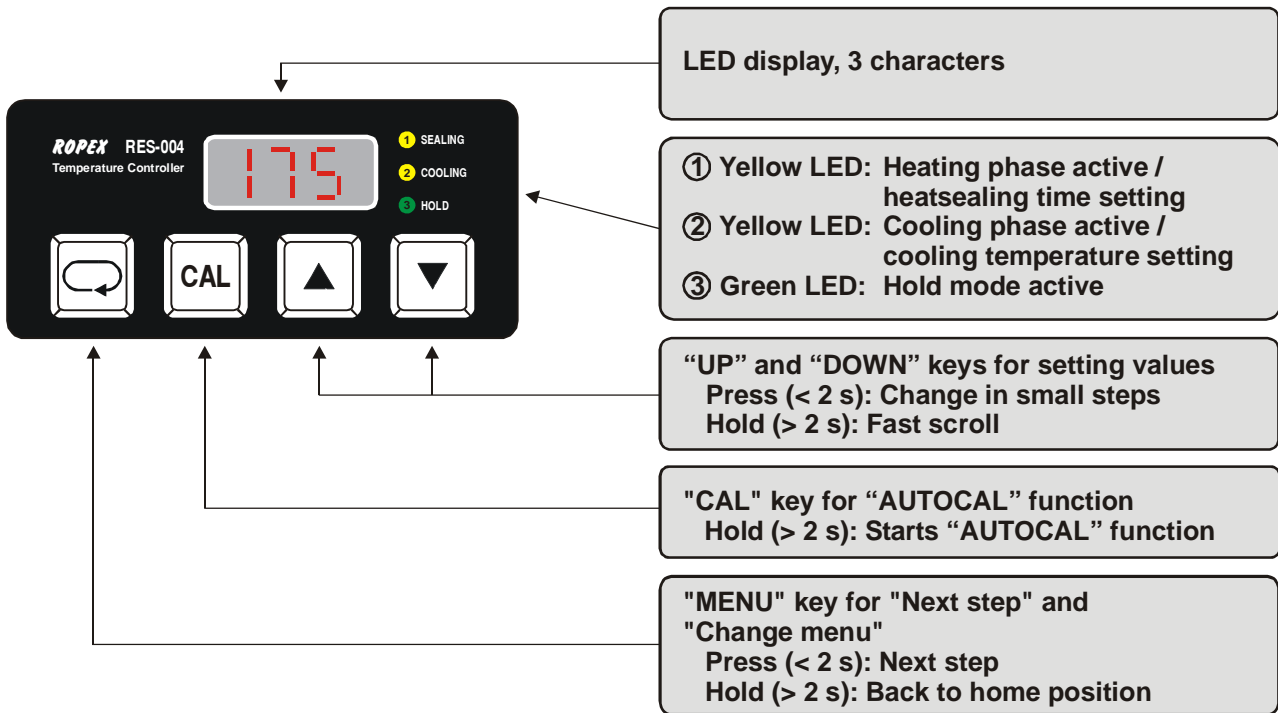
**⚠ Always use a heatsealing band with the correct alloy, dimensions and copper-plating in order to avoid malfunctions and overheating.**

Continue with section 8.5.1, steps 3 to 10.



## 9 Controller functions

### 9.1 Indicators and controls



In addition to the functions shown in the diagram above, various controller operating states are indicated

by the status LEDs. These states are described in detail in the table below:

Status LED	Blinks slowly (1 Hz)	Blinks fast (4 Hz)	Lit continuously
<b>SEALING</b> (yellow)	Selection of the heatsealing time (Settings menu, step 1)	Selection of the SET temperature offset (Configuration menu)	Heating phase active
<b>COOLING</b> (yellow)	Selection of the cooling temperature (Settings menu, step 2)		Cooling phase active
<b>HOLD</b> (green)	---	--	Indicates the ACTUAL temperature for 2s at the end of the heatsealing time

### 9.2 Display

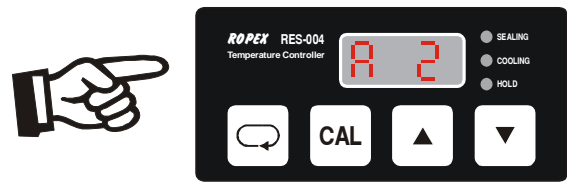
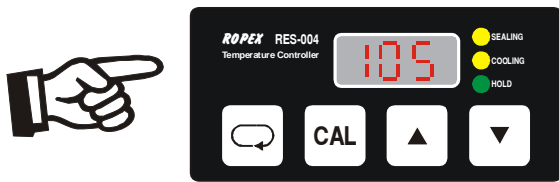
switched on. The display initially shows the controller version for 1.5s, followed by the SW revision (e.g. 105)

#### 9.2.1 Power-up message

A power-up message appears on the display for approximately 3seconds when the controller is

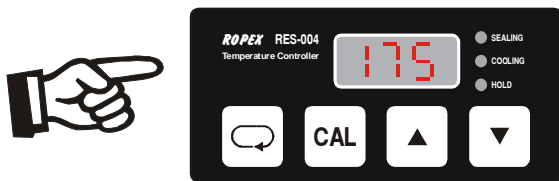
for another 1.5s. All three status LEDs are lit as long as the power-up message is displayed.

(↪ section 9.16 "System monitoring / fault output" on page 23).



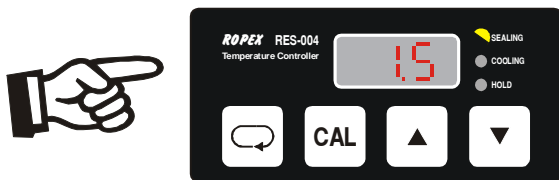
### 9.2.2 Display in home position

If no settings are being specified on the controller and no error messages are visible, the display is in the home position, in other words it shows the SET temperature.



### 9.2.3 Settings / Configuration menus

The required parameters are specified in the Settings menu and the Configuration menu (↪ section 9.4 "Menu structure" on page 19)



### 9.2.4 Error messages

The controller's error diagnostics function is always active. If an error is detected, it is immediately indicated on the display in the form of an error message

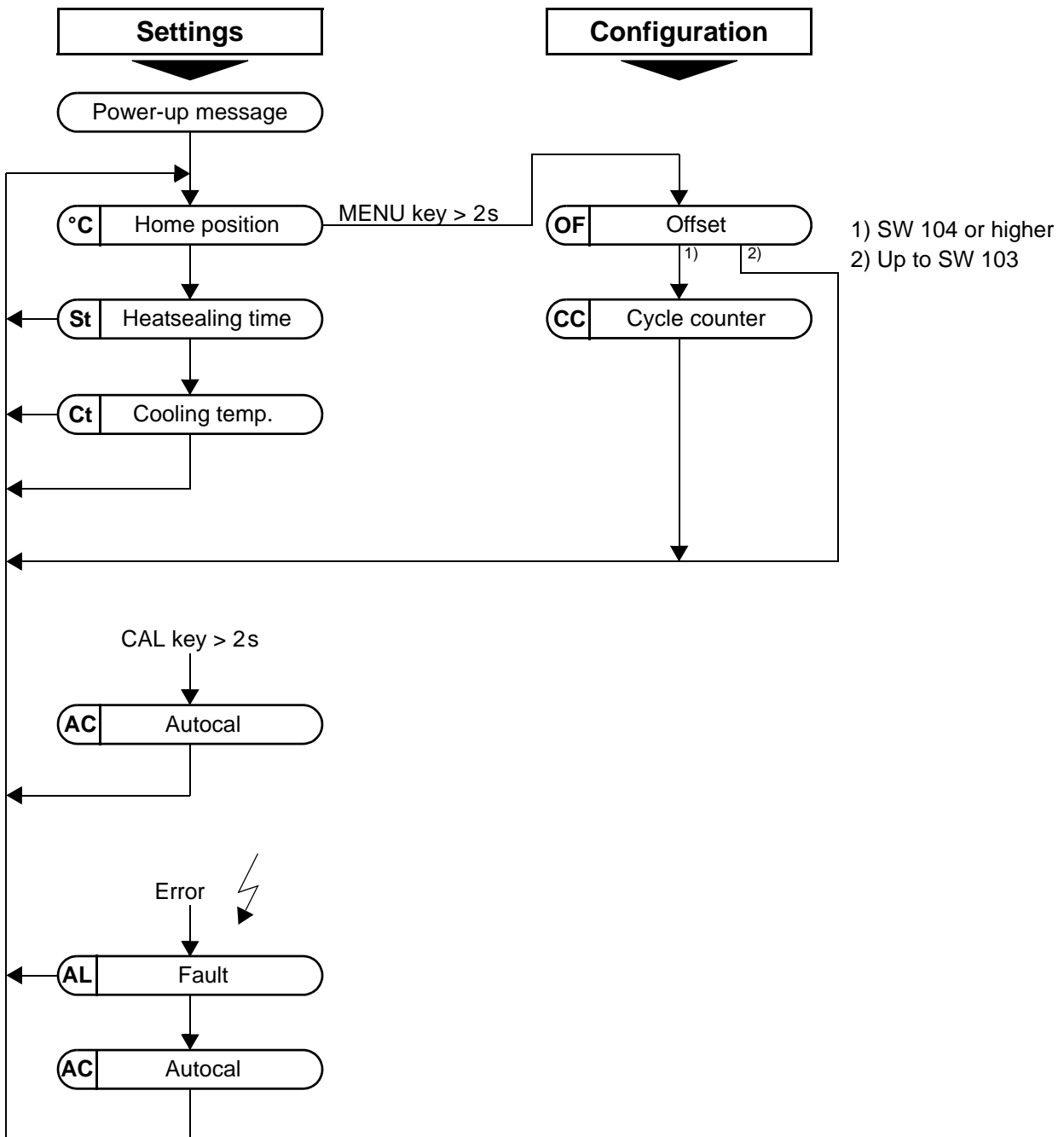
### 9.3 Navigation in the menus

A "MENU" key is provided for navigating through the various menu steps. By pressing this key briefly (<2s) at any time, you jump to the next menu step. By pressing the key for longer (>2s), you can return to the home position from anywhere in the menu structure.

If the display is in the home position and you press the "MENU" key for longer than 2s, the Configuration menu opens directly.

In addition, you always return to the home position if no keys are pressed for a period of 30s.

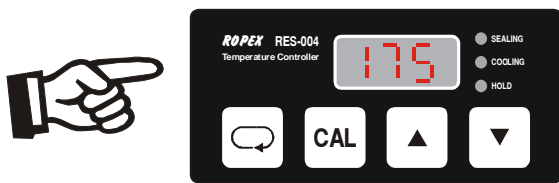
### 9.4 Menu structure



## 9.5 Temperature setting (set point selection)

The heatsealing temperature is set directly in the home position of the RES-004 controller ("Sealing" and "Cooling" LEDs not lit). The heatsealing temperature can be changed with the "UP" and "DOWN" keys. The new input value takes effect immediately, i.e. it does not need to be confirmed.

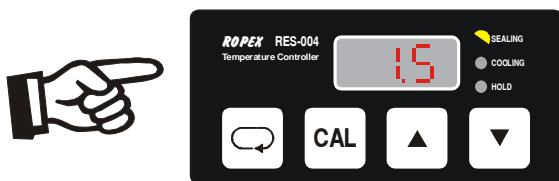
The set point selected for the heatsealing temperature must be at least 40°C (RES-004/230VAC-03: at least 100°C). If not, the heatsealing band is not heated when the "START" signal is activated.



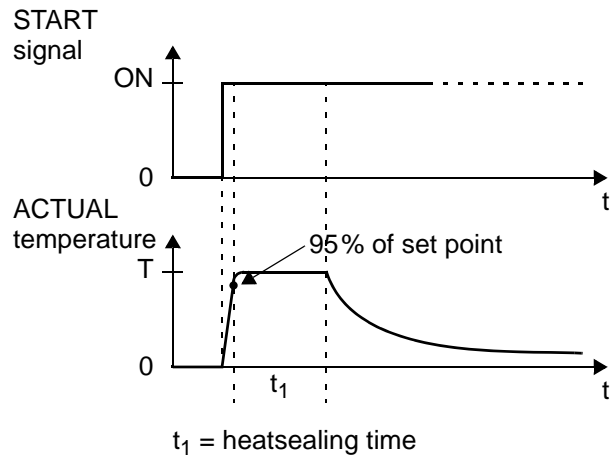
## 9.6 Setting the heatsealing time

The heatsealing time can be set in the range from 0...9.9s with step 1 in the Settings menu. The "Sealing" LED blinks slowly when you select this step. The factory setting is 1.0s.

The new input value takes effect immediately, i.e. it does not need to be confirmed.



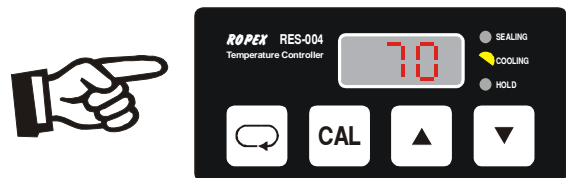
However, the heatsealing time does not start until the ACTUAL temperature reaches 95% of the SET temperature.



## 9.7 Setting the cooling temperature

The cooling phase ends when the ACTUAL temperature of the heatsealing band falls below the cooling temperature set with step 2 in the Settings menu. The "Cooling" LED blinks slowly when you select this step.

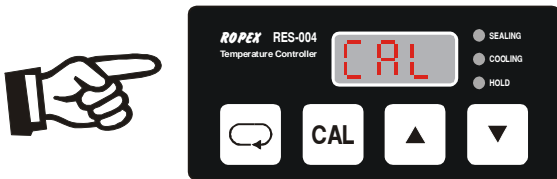
The minimum temperature setting is 20°C.



The new input value takes effect immediately, i.e. it does not need to be confirmed.

## 9.8 Automatic zero calibration (AUTOCAL)

Owing to the automatic zero calibration (AUTOCAL) function, there is no need to adjust the zero point manually on the controller. The "AUTOCAL" function matches the controller to the current and voltage signals that are present in the system. To activate this function, press the "CAL" key for 2s. The zero point is calibrated in the factory to 20°C.



The automatic calibration process takes around 20 seconds. The heatsealing band is heated slightly. "CAL" blinks on the display as long as the "AUTOCAL" function is active. If the temperature of the heatsealing band varies the "AUTOCAL" function is executed a maximum of three times. If the function still cannot be terminated successfully, an error message (no. 13) appears (↪ section 9.17 "Error messages" on page 23).

**⚠ You should always wait for the heatsealing band and the bar to cool down (to ambient temperature) before running the "AUTOCAL" function.**

### Reasons for locked AUTOCAL function:

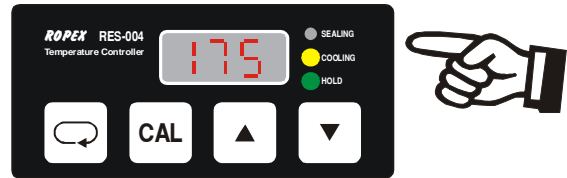
1. If the "START" signal is activated, the "AUTOCAL" function is not executed.

## 9.9 Temperature meter / Hold function

The measured ACTUAL temperature appears on the display during the heatsealing process (heating and cooling phases).



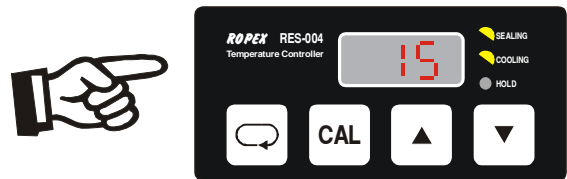
At the end of the heating phase (i.e. at the end of the heatsealing time), the ACTUAL temperature measured by the controller is displayed for 2s (Hold function), to make sure the correct heatsealing temperature was reached. The "Hold" LED also lights up.



At the end of the heatsealing process (end of the cooling phase, START signal no longer active), the display shows the SET temperature again. The ACTUAL temperature is no longer indicated.

## 9.10 SET temperature offset

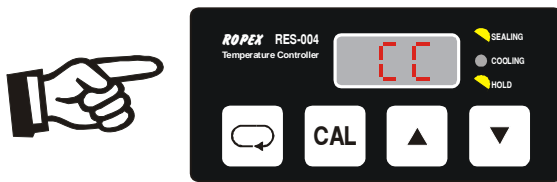
You can specify a SET temperature offset in the range from -40...+40°C in the Configuration menu by pressing the "MENU" key for > 2s. This function allows you to adapt the real heatsealing temperature – measured, for instance, with the ROPEX TS-1 temperature sensor – to the SET temperature. The specified offset is added to or subtracted from the SET temperature each time the heatsealing band is heated. The "Sealing" and "Cooling" LEDs blink fast as long as this step is selected.



## 9.11 Cycle counter (as of software revision 104)

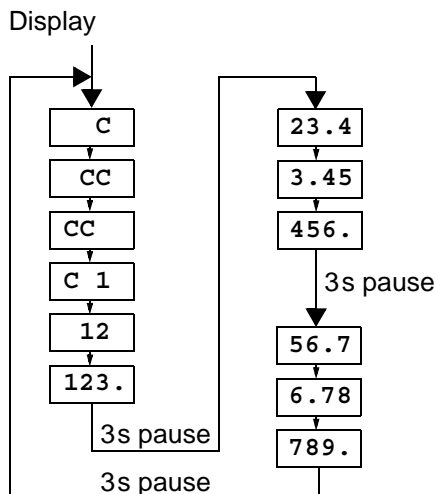
Each activation of the "START" signal while the controller is operating is detected by an integrated cycle counter. The counter reading can be displayed in the Configuration menu in the form "CC XXX.XXX.XXX" (thousands digits are separated by a period).

The "Sealing" and "Hold" LEDs blink fast as long as this step is selected.



The counter reading is scrolled until you exit the Configuration menu by pressing the "MENU" key. To stop the counter scrolling, press the "UP" or "DOWN" key (the display carries on scrolling if you press one of these keys again).

The display sequence is shown in the diagram below (example: cycle counter 123456789):



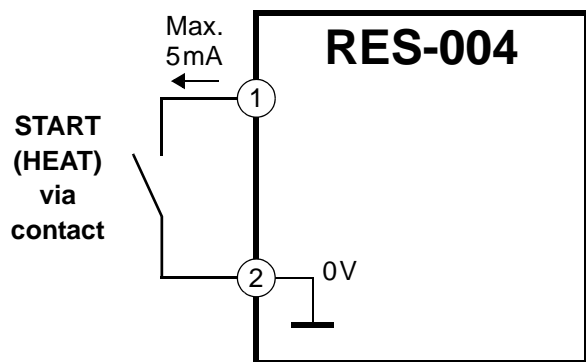
The cycle counter is reset to 0 if the maximum cycle count (999.999.999) is exceeded.

## 9.12 "START" signal (HEAT)

Activating the "START" signal starts the timeout of the internal time control (timer function) (see section 8.3 "Time control (timer function)" on page 13).

The "START" signal must be deactivated again before the next timeout is activated.

The "START" signal is activated by means of a control contact at terminals 1+2.



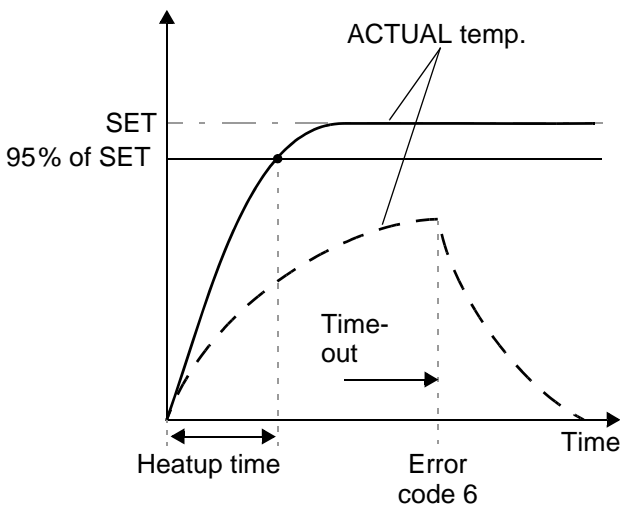
**!** "START" signal activations are rejected as long as the "AUTOCAL" function is active.

The set point selected for the heatsealing temperature must be at least 40°C (RES-004/230VAC-03: at least 100°C). If not, the heatsealing band is not heated.

**!** It is not possible to activate the "START" signal again (in other words, relay K2 cannot be reenergized) for 200ms after it is deactivated, in order to prevent bouncing or oscillation of the energized closing movement.

### 9.13 Heatup timeout

The RES-004 has a heatup timeout as standard to protect it against incorrectly designed heatsealing applications (↪ ROPEX Application Report). This timeout starts as soon as the "START" signal is activated. The controller then monitors the time required for the ACTUAL temperature to reach 95% of the SET temperature. If this time is longer than 10.0s, error code 6 is indicated (↪ section 9.17 "Error messages" on page 23). If a heatsealing cycle is in progress, it is immediately interrupted.



### 9.14 Undervoltage detection

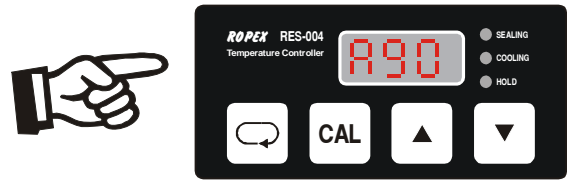
Trouble-free operation of the temperature controller is guaranteed within the line voltage tolerance range specified in section 4 "Technical data" on page 6. If the line voltage drops below the lower limit of the permissible range, the controller could cease to function correctly. It may even be completely switched off.

**! Trouble-free operation of the controller is only guaranteed within the specified input voltage tolerance range. An external voltage monitor must be connected to prevent defective heatseals as a result of low line voltage.**

### 9.15 Overheating protection

The RES-004 is fitted with an overheating protection device to prevent the internal electronics from overheating.

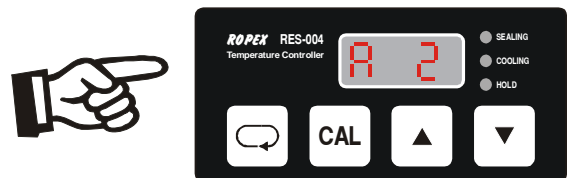
A warning message (error code A90) appears on the display if excessive heat develops inside the controller (↪ section 9.17 "Error messages" on page 23).



"START" signal activations are rejected until the temperature inside the controller has cooled down again.

### 9.16 System monitoring / fault output

To increase operating reliability and prevent faulty heatsealing, the controller incorporates special hardware and software features that facilitate error diagnostics. Both the external wiring and the internal system are monitored. These features crucially support the system owner in localizing the cause of an abnormal operating state. System faults are reported by means of an error message on the display.



"START" signal activations are rejected by the controller as long as an error message is displayed.

**! An error message can only be reset by switching the controller off and then on again (exceptions: A8, A90).**

### 9.17 Error messages

The table below describes all possible error messages as well as their most likely causes and the required corrective action.

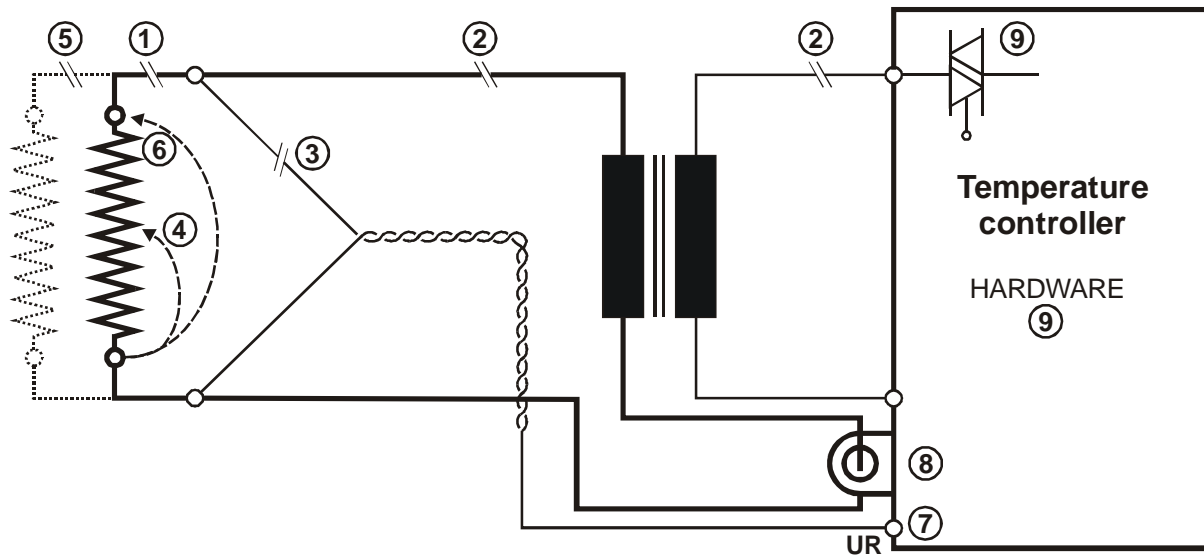
The block diagram in section 9.18 "Fault areas and causes" on page 26 permits each fault to be cleared quickly and efficiently.

Part 1 of 2: Error messages			
Error code	Cause	Action if machine started for first time	Action if machine already operating, HS band not changed
1	I <sub>R</sub> signal missing	Fault area ①	Fault area ①②
2	U <sub>R</sub> signal missing	Fault area ③	Fault area ③
3	U <sub>R</sub> and I <sub>R</sub> signals missing	Fault area ②	Fault areas ②③
4	Temperature step	Fault area ④⑤⑥ (loose contact)	Fault area ④⑤⑥ (loose contact)
5	Frequency fluctuation, inadmissible line frequency	Check power supply	Check power supply
6	Heatup time too long (↘ section 9.13)	Check configuration	Check configuration
7	Internal fault, controller defective	Replace controller	Replace controller
8	U <sub>R</sub> and/or I <sub>R</sub> signals incorrect	Run <b>AUTOCAL</b>	Fault area ④⑤⑥
9	Data error	Run <b>AUTOCAL</b>	---
10	I <sub>R</sub> signal incorrect, calibration not possible	Fault area ⑧, check configuration	---
11	U <sub>R</sub> signal incorrect, calibration not possible	Fault area ⑦, check configuration	---
12	U <sub>R</sub> and I <sub>R</sub> signals incorrect, calibration not possible	Fault area ⑦⑧, check configuration	---



<b>Part 2 of 2: Error messages</b>			
<b>Error code</b>	<b>Cause</b>	<b>Action if machine started for first time</b>	<b>Action if machine already operating, HS band not changed</b>
<b>13</b>	Temperature fluctuates, calibration not possible	---	---
<b>14</b>	U <sub>R</sub> signal has wrong polarity	Reverse U <sub>R</sub> measuring wires (terminals 1+2), fault area ③ (↘ section 8.5)	---
<b>90</b>	Temperature inside controller is too high (↘ section 9.15)	Allow controller to cool down	Allow controller to cool down

### 9.18 Fault areas and causes



The table below explains the possible error causes.

Fault area	Explanation	Possible causes
①	Load circuit interrupted after $U_R$ pickoff point	- Wire break, heatsealing band break - Contact to heatsealing band is defective
②	Primary circuit interrupted	- Wire break, triac in controller defective - Primary winding of impulse transformer interrupted
	Secondary circuit interrupted before $U_R$ pickoff point	- Wire break - Secondary winding of impulse transformer interrupted
③	$U_R$ signal missing	- Measuring wire interrupted
④	Partial short-circuit ( $\Delta R$ )	- Heatsealing band partially bypassed by conducting part (clamp, opposite heatsealing bar etc.)
⑤	Parallel circuit interrupted	- Wire break, heatsealing band break - Contact to heatsealing band is defective
⑥	Total short-circuit	- Heatsealing band installed incorrectly, insulation at heatsealing bar ends missing or incorrectly installed - Conducting part bypasses heatsealing band completely
⑦	$U_R$ signal incorrect	Heatsealing application not designed according to ROPEX Application Report. Check configuration
⑧	$I_R$ signal incorrect	Heatsealing application not designed according to ROPEX Application Report. Check configuration
⑨	Internal controller fault	- Hardware fault (replace controller)

## 10 Factory settings

The RES-004 RESISTRON temperature controller is configured in the factory as follows:

- SET temperature: 0°C
- Cooling temperature: 50°C
- Heatsealing time: 1.0s
- Offset: 0°C
- Cycle counter: 0

## 11 Maintenance

The controller requires no special maintenance. Regular inspection and/or tightening of the terminals – including the terminals for the winding connections on the impulse transformer – is recommended. Dust deposits on the controller can be removed with dry compressed air.

## 12 How to order

	<p><b>Controller RES-004/230VAC (standard unit)</b> Art. No. 700432</p> <p>Scope of supply: Controller includes connector plug-in parts</p> <p><b>Controller RES-004/230VAC-03 (300°C range, START signal not monitored)</b> Art. No. 700436</p> <p>Scope of supply: Controller includes connector plug-in parts</p>
	<p><b>Line filter LF-06240</b></p> <p>Continuous current 6A, 240VAC, Art. No. 885508</p>
	<p><b>Impulse transformer</b></p> <p>See ROPEX Application Report for design and ordering information</p>
	<p><b>Transport cover TFA-2</b></p> <p>For IP65 protection on front, Art. No. 887002</p>

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