

# NL 3070 THD-14 Temperature-controller plug-in unit



## Operating instructions

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**REGLER**

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Dear customer,

thank you for purchasing this high-quality NOLDEN-temperature-controller.

All of our products are manufactured according to ISO9000.2000-standards, so constant quality is guaranteed.

- Unpack**            Check for damages caused by shipment!  
Never connect damaged devices!  
Complaints must be made immediately!
- Read**                this instruction-manual before installing and  
turning-on the device
- Installation**        should be done by your electrician,  
observing all instructions written in this  
manual.
- Warranty**            is provided for the duration of 2 years and  
includes all deficiencies, which are provable  
due to lacks of material, processing or  
construction. In this case, repair or  
replacement of faulty parts is free of charge,  
besides to shipment and customs.  
Further claims as complete change,  
reduction or substitution of direct or indirect  
harms are excluded.

**Maintenance**

Our support is fast and affordable. Please send us the device well packed-up, and do not forget to include your repair-order with a detailed description of the device's failure. Repairs below EUR50,-- are carried out without previous quotation. Otherwise you will be informed immediately.

The following pictograms will guide you through this manual:

*Security advice*






*Common information*



*Installational- and operational advice*



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## 1. Features



19"-3HE-10TE-H11 temperature-controller plug-in unit,  
pin-compatible with types 3060 TMD and 3080 TPS,  
for operating in basic-units of the series 4000  
(2 ... 30 heating zones)

- with integrated load-switching unit 230V~ / 12,5A
- with integrated load-current transformer
- Bargraphs additionally indicate control-deviation and load-current
- Microprocessor-controller with multiple monitoring features
- „Boost“-function establishes controlled elimination of „frozen“ product-relics
- automatic adaption to the controlled system
- extremely easy 3-button-operation

## 2. Important safeguards



1. Read these notes completely
2. Keep these operating instructions for later use
3. This unit is operated electrically with mains voltage. Make sure to note the relevant regulations for safety and those laid down by your national electrician's association.  
Mains voltage as well as any voltage from 42V up are highly dangerous.
4. Before cleaning the unit, please do always disconnect it from the mains by pulling the power plug.
5. Do not place unit on hot machine parts or in the range of radiation of hot parts.
6. Keep power cord away from hot or sharp-edged parts.



7. Pull power plug immediately, if
  - a) power supply cable got damaged,
  - b) a liquid or an object got in,
  - c) the unit got damaged by falling or any other mechanic influence.
8. Operating staff must be thoroughly instructed by a qualified employee.
9. Maintenance on this unit must only be carried out by persons especially qualified for this job.

For repairs the unit should be sent to the manufacturer, if possible.

If replacement parts are needed, please do only use those which are designed for it by the manufacturer.

The use of other parts can result in faulty functions or endangering of operating staff.

10. Please follow further notes and warnings of these operating instructions.



### 3. Features

**Mains voltage:**

230V  $\pm$  10%, 48...63Hz

**Nominal power-output / current of heating load:**

2,85kW / 12,5A

**Fuses:**

16A FF, 6,3x32mm (heating load)

1,6A MT, 5x20mm (optional cooling-exit)

0,1A MT, 5x20mm (controller)

**Power control:**

0...100% proportional

zero voltage switching

**Power limitation:**

60%

**Automatic soft-start:**

temperature sensitive, 20s - 9min. power & temperature limited ( $\vartheta_{\max} = 80^{\circ}\text{C}$ )

**Boost-Function:**

Single-time, controlled overheating after soft-start, free selectable 0...9K

**Standby-input:**

9V, 15mA

**LED-Display:**

Displays actual value, desired value, load-current, alarms, incorrect polarity of thermocouple, triac failure

**LED-Bargraphs:**

10-elements for load-current  
10-elements control-deviation

**Mode-LEDs:**

Normal operation, manual power control, display in load-current mode, 60%-limitation active

**Alarm-/info-LEDs:**

load broken, sensor broken, process high, process low, cooling-exit active (optional)

**Safety load-cutoff:**

contactor switches load off when process is high

**Limit-comparators:**

+3 ... 99K  
-3 ... 99K  
1 relay each, „N“ switched

**Sensor-input:**

thermocouples according to DIN IEC 584  
Fe-CuNi type J: 0 ... 450°C  
automatic zero-point-correction und  
reverse-sensor protection (thermocouple),  
sensor-breaking protection

**Cooling-exit:** (optional)  
230V~/120VA

**Type of control:**  
adaptive control, DPID-characteristics

**Accuracy:**  
0,5% f.s.

**Insulation voltage:**  
2,5kV mains / sensor circuit

**Dimensions:**  
50,5 x 128,5 x 195mm (w x h x d)

**Size:**  
19" / 3HE / 10TE  
transfer-plug H11 DIN 41612

**Weight:**  
0,8kg



#### 4. Application and installation

Temperature-controller plug-in unit complying with the 19"-rack-standard to establish multiple-zone controls. The control-units NL 3070 THD-14 are fully compatible with types NL3060TMD-14 and NL 3080 TPS-14. They are inserted in the same basic-units of series 4000 which are deliverable fully wired for 2, 4, 6, 12, 18, 24 and 30 zones.

The functional equipment of the temperature-controller unit and its special control mode are particularly suitable for temperature-control of hot-runner injection-moulds, plastics and rubber machinery, extruders, presses and tools.

High temperature stability by using a precision control-unit with adaptive DPID-characteristics.

Careful handling of the connected heating-elements by use of automatic startup-routine with reduced power-output, feasibility of permanent power-output limitation as well as using nearly continuous proportional zero-voltage switching.

Very easy and concise 3-button-operation.

All operational parameters at a glance:

3-digit 7-segment LED-display indicates actual value, control-deviation is additionally indicated on the coloured 10-segment bargraph.

## 5. Assembly



Small units of 2, 4 or 6 control zones are ready equipped with temperature-controller plug-in units when delivered. Bigger mainframes with 12 or more control-zones are delivered separately from the controller plug-in units. For assembly just insert the plug-in units into the spaces provided in the mainframe.



### **Warning:**

The mainframe must not be connected to the mains during assembly. Please pull the power-cord!

Please turn both quick-seal coupling locks in horizontal position and insert PC boards of the plug-in units into lower and upper guide rail.

The front panel must engage fairly with gentle pressure. Please press quick-seal coupling locks gently through against spring with a screwdriver and lock with a 90° rotation.

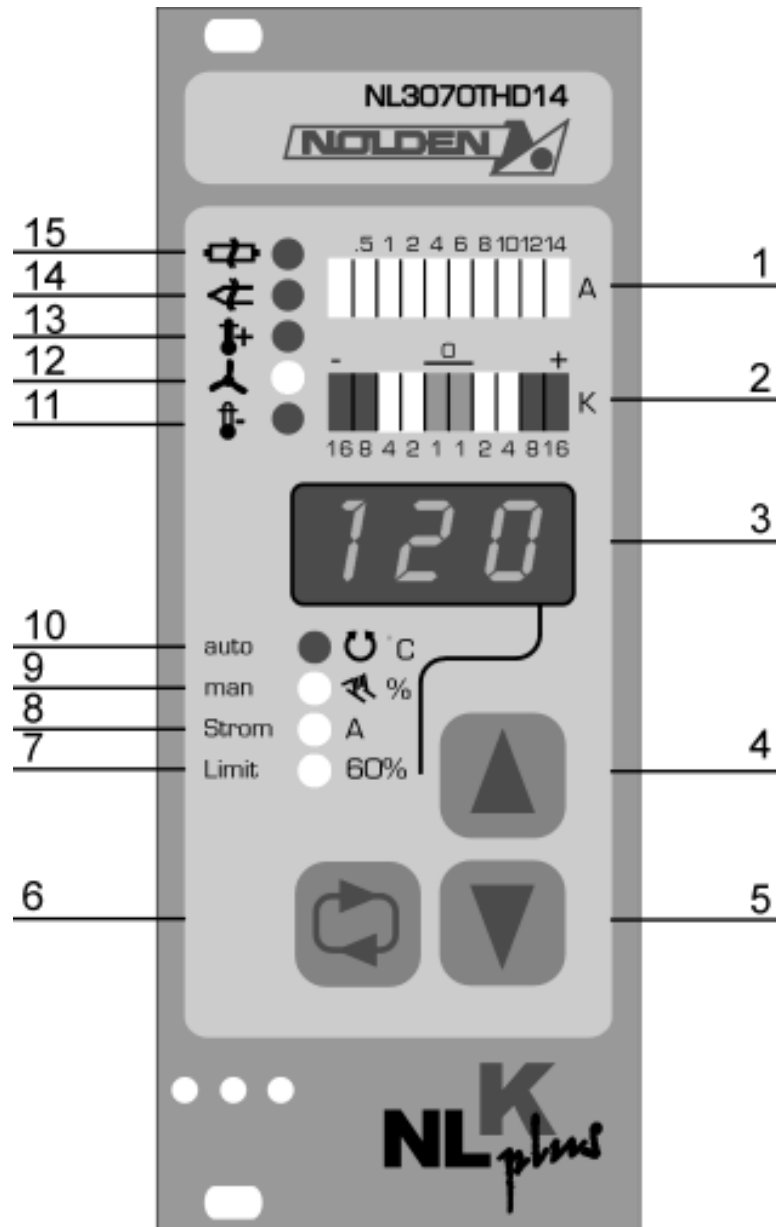
Do not fit the spaces designed for alarm plug-in units with temperature controller plug-in units, there will be no function here.

An alarm plug-in unit can, however, be inserted into a vacant temperature controller space.

Please do always seal vacant spaces with blind plates!

## 6. Operation

### 6.1 Operating element (s. a. flip-sheet at the last page):



- 1 Bargraph *load current / heating-pulse*
- 2 Bargraph *Control deviation*
- 3 Multi-purpose display
- 4 UP-button (increase value)
- 5 DOWN-button(decrease value)
- 6 Mode-button
- 7 Power limitation 60% active
- 8 Multi-purpose display in load-current mode
- 9 Manual power-control active
- 10 Closed-loop control active
- 11 Process low
- 12 Cooling-exit active
- 13 Process high
- 14 Sensor failure (broken)
- 15 Load broken

## Keyboard

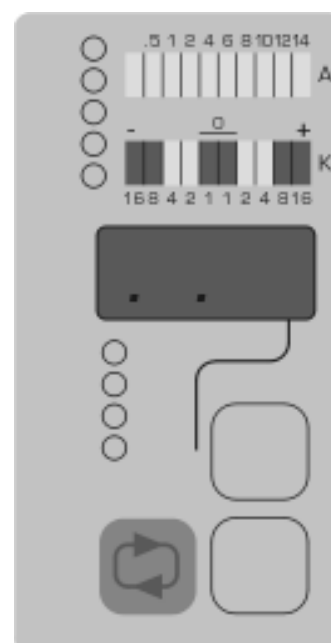
### Mode-button (6)

- starting from *closed-loop control-mode*, actuating the mode-button enters the following operation-modes:

DISPLAY IN „SET VALUE“-MODE / MANUAL POWER-CONTROL:  
tapping once, the multi-purpose-display (3) indicates the actual set-value; indicator-LED 9 (manual power-control) and 10 (auto) flash alternately. Actuating the UP/DOWN-buttons (4 / 5) switches to manual power-control; indicator 10 goes out, 9 lights constantly.

- SLEEP-MODE:

Pressing mode-button (6) longer than 4 secs will switch the controller into SLEEP-MODE. All outputs will be switched-off, the multipurpose-display indicates two decimal points. To reconnect press mode-button (4) longer than 4secs, the controller will restart.





**LOAD-CURRENT:**

Tapping the Mode-button twice switches over to LOAD-CURRENT-CONTROL-MODE. The multipurpose-display (3) now shows the actual load-current (resolution: 0,1A).

LOAD-CURRENT-CONTROL-MODE is also the first step towards entering SETUP-MODE (s. appendix).

The next acutation of mode-button returns to *closed-loop control-mode*.

**UP/DOWN-buttons**

- tapping in-/decreases the concerned value about one digit
- continuous actuation causes fast forward/reverse-count



## 6.2 Getting started:

To put the control-unit into operation turn-on the mains-switch of the mainframe.  
 If the controller-unit was in SLEEP-MODE, press mode-button (6) longer than 4 secs.

Factory-default control-values:

Temperature-desired value: 120°C

Limits

- Process low: -20K
- process high: +20K

Softstart (time): 5 min.

Boost-function: 0K (off)

The desired temperature-value may be changed immediately (also while softstart is active).  
 All other parameters are locked during softstart.

When re-starting the control-unit all last operated parameters will be used.

The control-unit always starts-up in CLOSED-LOOP CONTROL-MODE (normal operational mode).

The multi-purpose-display (3) indicates the actual temperature. According to the difference between actual and desired temperature and according to the



programmed process-low limit the corresponding LED (11) lights up. At starting tool-temperatures below 50°C the complete star tup-sequence is run.

During soft-start the decimal points slowly flash from left to right of the multipurpose-display.

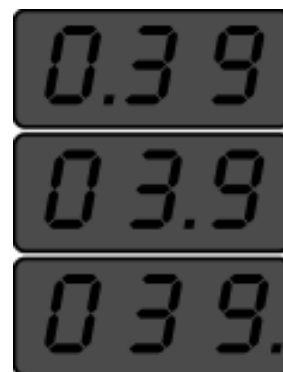
The initial power-output amounts to 5% and is increased continuously up to 60% within the time-period programmed in setup-mode.

Softstart-temperature is limited to 80°C.

Within this routine low-mass, fast acting heating-cardridges are gently preheated, and moisture, which may possibly be present, is expelled.

At starting-temperatures above 50°C the softstar t-sequence is abbreviated to 1 min.

Afterwards the control-unit analyses the controlled system and starts the complete control-sequence.



During the analysis of the controlled system the decimal points quickly flash from left to right of the multipurpose-display.

If the BOOST-function is active, the programmed desired temperature will be overstepped once to the normal desired temperature *plus* the programmed BOOST-temperature. After that the tool is heated to the exact desired temperature. Depending on limit-values there might be „process-high“-alarm during boost-process, whereas the cooling-exit (if established) is definitely deactivated during boost.

## **7. Setting parameters**

### **7.1 Temperature-desired value:**

Changing temperature desired-value in CLOSED-LOOP CONTROL-MODE is done by pressing UP/DOWN buttons (4/5).

Multipurpose-display (3) changes over from actual- to desired value at the first keystroke at any of both buttons, the green closed-loop control-LED (10) flashes.

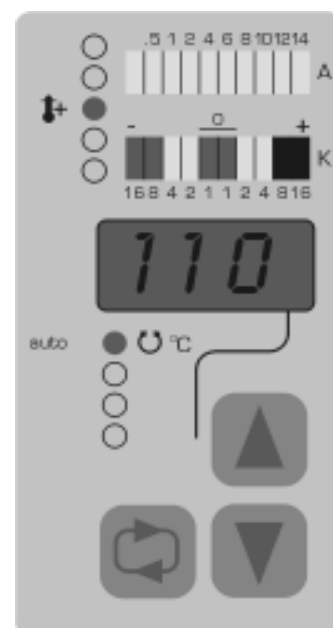
Each more tapping of 'UP' increases the desired value about 1°C, tapping 'DOWN' decreases about 1°C.  
 Continuous actuation causes fast forward / reverse change.  
 New desired values can be confirmed by pressing the mode-button, after about 20secs the new value will be automaticly acceptet, the multipurpose-display now returns to actual temperature-value.



## 7.2 Temperature-limits:

Both process-high and -low temperature-limits have a following relation to the set temperature, adjustable between 3 ... 99K, hysteresis 2K:

Example:  
 desired temperature      100°C  
 process-high-limit            +10K  
 process-low-limit            -15K



result:

operating value process-high

$$100 + 10 = 110^{\circ}\text{C}$$

release value process-high

$$100 + 10 - 2 = 108^{\circ}\text{C}$$

operating value process-low

$$100 - 15 = 85^{\circ}\text{C}$$

release value process-low

$$100 - 15 + 2 = 87^{\circ}\text{C}$$

Setting temperature-limits::

(see SETUP-MODE)



### 7.3 Cooling function: (optional)

The cooling-exit of the temperature-controller-unit is designed to the direct-driving of fan-motors 230V~/max.120VA. It works narrow-band proportional within an area of 5K, cycle-time is 10sec. The proportional-band has a running relation of 2K to the process-high-limit. Cooling exit only works if process-high limit is > 10K.



Settings (example):

process-high limit +12K  
results in proportional cooling-  
function within +5K to +10K  
at cooling-power 20% to 100%

+5K => 20% cooling-power  
+6K => 40% cooling-power  
+7K => 60% cooling-power  
+8K => 80% cooling-power  
+9K => 100% cooling-power

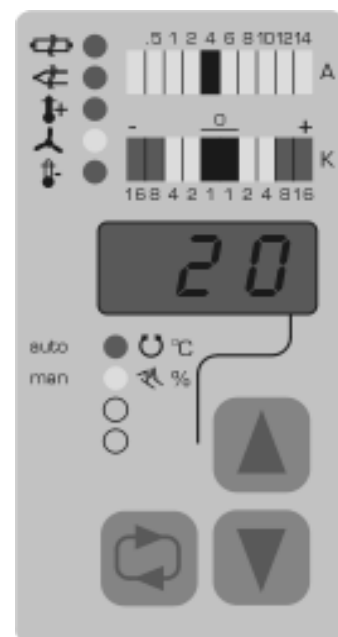
#### 7.4 Power-limitation:

(see SETUP-MODE)

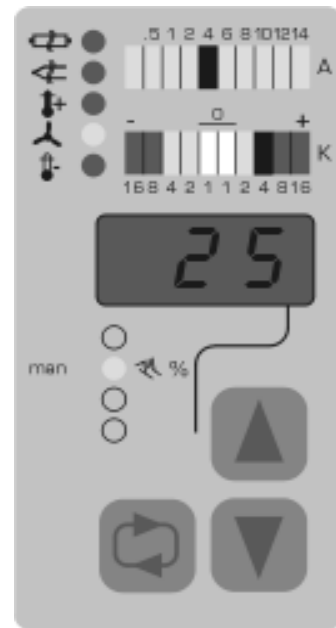
#### 7.5 Manual power-control

##### Manual power-control - selected

In closed-loop control mode tapping mode-button once switches the multipurpose-display to actual power-output (%), UP/DOWN-buttons (4/5) can be used to change the manipulated variable. LEDs „Auto“ (10) and „Man“ (9) blink alternately. Actuating 'UP/DOWN'-buttons switches over to manual power-control, continuous light at LED (9) as well as going out of „Auto“-LED (10) indicates manual chosen manipulated variable.

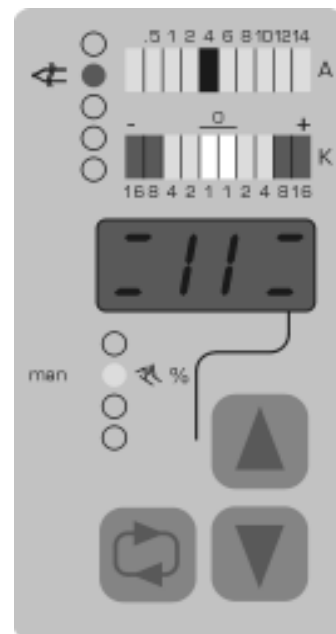


This way any heating zone can be tested in manual power-control mode. Control-deviation-bargraph (2) reacts according to set temperature-value. Any exceed of temperature-limits will be signalled its corresponding limit-exits. If temperature rises more than +5K above the process-high limit, the additional load-relay will open the load-circuit.



### **Manual power-control-mode - emergency operation in case of sensor breakage**

The sensor-breakage LED (14) flashes, the sensor-breakage-symbol appears on the multipurpose-display (3) alternating with the average manipulated variable in % (calculated by the control-unit). The calculated percentage for the manipulated variable depends on the manipulated system and therefore takes a certain time to be calculated; premature sensor-breakage may cause an incorrect manipulated variable. The calculated %-value can be changed any time by pressing UP/DOWN-buttons (4/5).

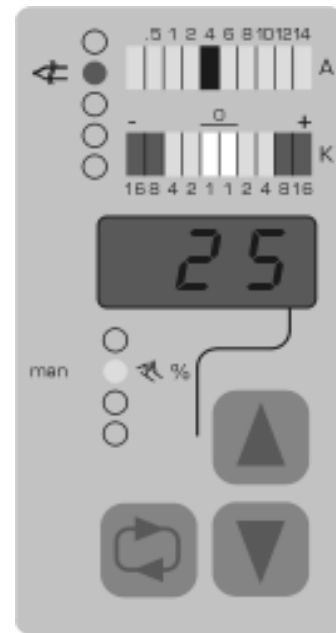




In contrast to the *selected* manual power-control-mode (with functional sensor) the deviation-bargraph now does not show any digits, process-high and -low is not available

In case of mains-failure the actual manipulated variable is stored.

After replacement of the defective sensor the unit returns to normal closed-loop-control-mode.



#### **7.6 Boost-funktion:** (see SETUP-MODE)

#### **7.7 Standby-funktion:** (see SETUP-MODE)

### **8. Monitoring of limit values**

The signal exits in the basic unit (mainframe) are wired parallel and run on a 5-pole Amphenol socket at the rear of the unit. Process-high/low-alarm devices can be driven directly, operating voltage is 230VAC, max. 150W, e.g. rotating mirror lamps. At the same time, the alarm plug-in unit NL 3053 SX can be operated.

### 8.1 Message „process high“

When the preset limit is reached, the corresponding LED (13) flashes.

Simultaneously a relay will switch the corresponding signal exit to N.

If temperature exceeds the preset process-high value above +5K, an additional load relay -serially wired with the triac- will reversibly open the load circuit mechanically.

This avoids e.g. an overheat by a melted triac.



### 8.2 Message „process low“

When the preset limit is reached, the corresponding LED (11) flashes.

Simultaneously a relay will switch the corresponding signal exit to N.



### 8.3 Monitoring of load-current

The actual load-current can be read-off any time at bargraph (1). All segments below the actual current-value blink synchronized to the heating pulses.

For the exact current press mode-button (6) twice (starting from normal closed-loop control-mode). The multipurpose-display now indicates the exact load-current with 0,1A-resolution.

Press mode-button (6) once more to return to closed-loop control-mode.

Missing load current with manipulated variable above 10% will be interpreted as load-breakage.

The corresponding LED (15) lights up.

Operating low-power heating-cardridges may lead to misinterpretations, which have no influence to control-routine.



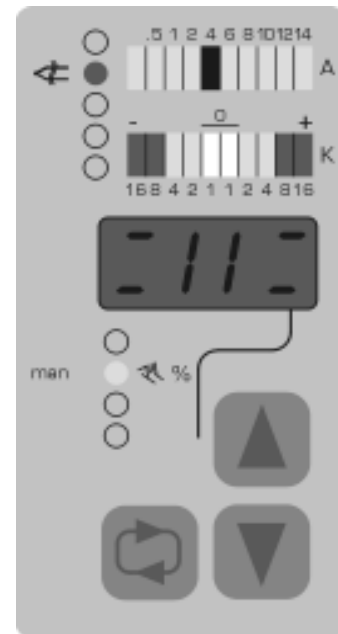
## 9 Sensor monitoring

### 9.1 Sensor breakage-guard

(s.a. „7.5 manual power-control“)

If sensor is broken or sensor wire is damaged or no sensor is connected, the unit automatically switches over to manual power-control using the latest average power-output value.

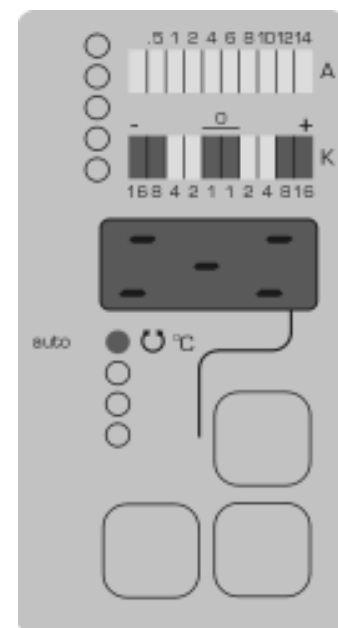
The sensor-breakage-symbol appears on the multipurpose-display (3) alternating with the average manipulated variable in % UP/DOWN-buttons (4/5) can be used to change the manipulated value (%).



### 9.2 Incorrect sensor polarity

If the sensor is connected with incorrect polarity, the unit displays the symbol stated beside. The connected load is irreversibly switched-off, no manual power-control allowed.

Reset the unit by correcting the sensor-polarity and switch-off the controller-unit (turn-off mains-switch of mainframe or pull plug-in unit; SLEEP-MODUS via mode-button (6) is not possible during failure).

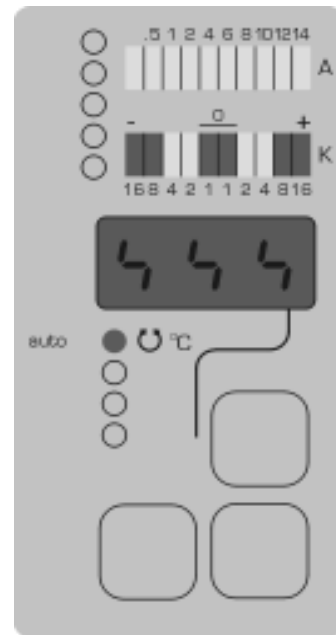


### 10. Triac monitoring

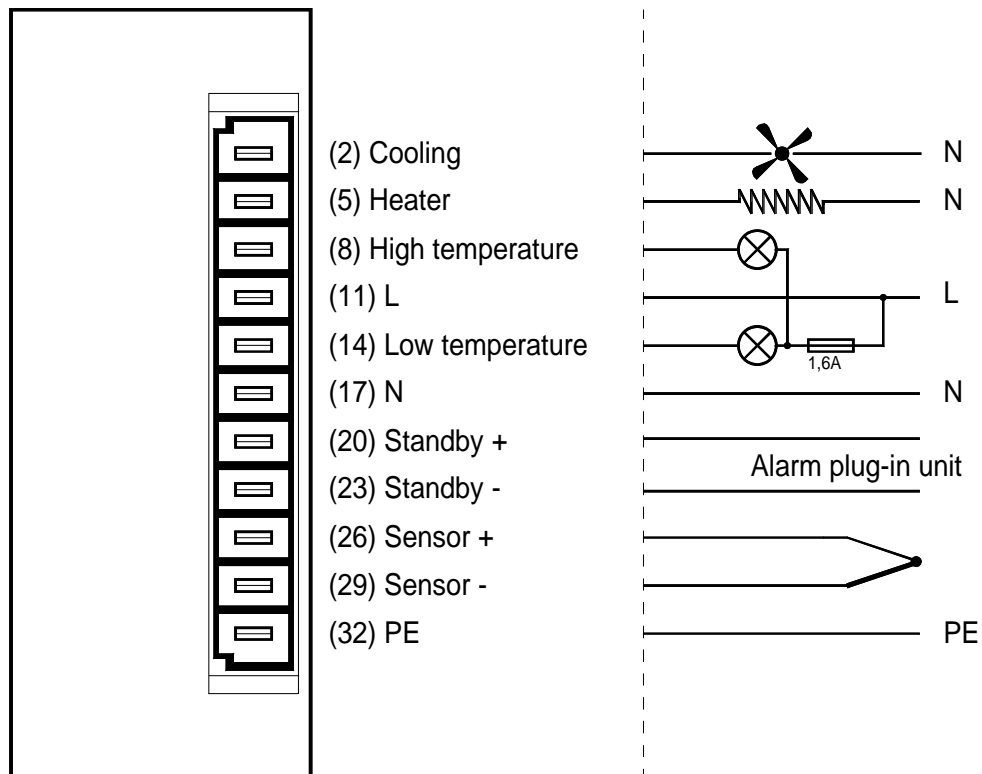
Running load-current without heating-pulses is recognized as triac failure.

The multipurpose-display (3) indicates the symbol stated beside.

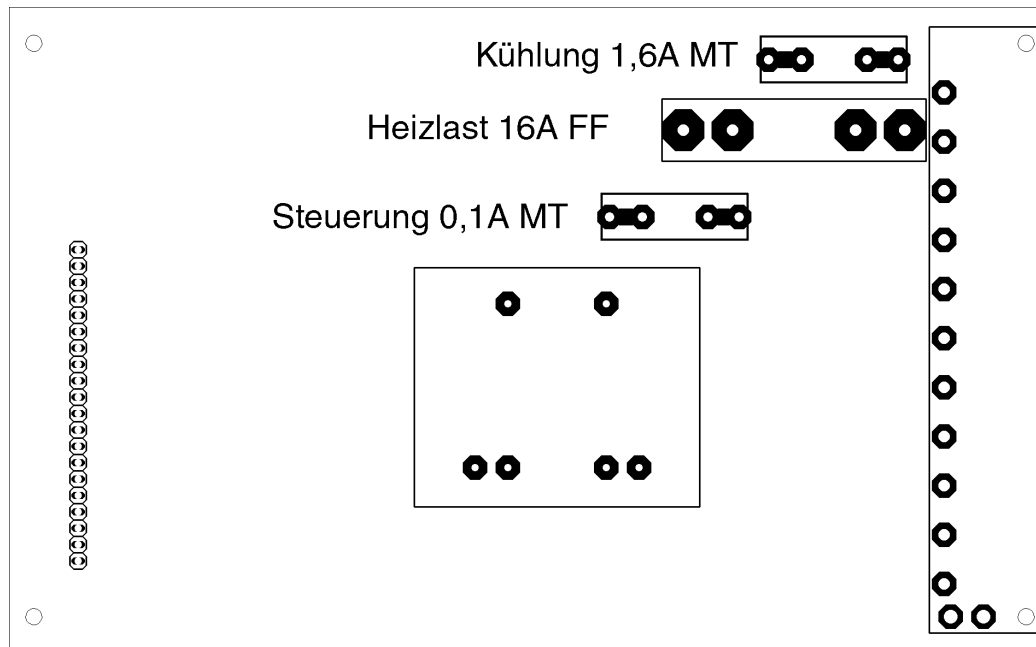
The additional load relay -serially wired with the triac- will irreversibly open the load circuit mechanically.



### 11. Pin assignment (Transfer plug)



## 12. Fuses (location):



## 13. Setup-Mode

After the softstart-routine has finished several parameters may be adapted in SETUP-MODE. SETUP-MODE is started from LOAD-CURRENT-CONTROL-MODE. In this mode press and hold the UP- button (4) and additionally tap the Mode-button (6). This is the first menu-item:



### 13.1 Process-high limit-value:

The multipurpose-display (3) shows the actual process-high limit. Process-high-LED (13) blinks slowly. The indicated value can be changed between +3 and +99K by tapping the UP/DOWN-buttons (4/5). Mode-button (6) confirms changes and continues to the next menu-item:



### 13.2 Process-low limit-value:

The multipurpose-display (3) shows the actual process-high limit. Process-high-LED (11) blinks slowly. The indicated value can be changed between -3 and -99K by tapping the UP/DOWN-buttons (4/5).

Mode-button (6) confirms changes and continues to the next menu-item:



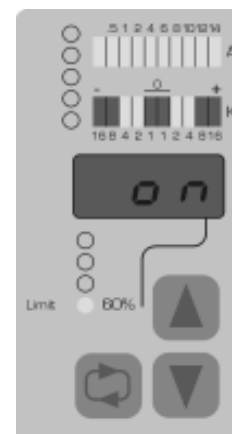
### 13.3 Limitation of power-output:

To save sensitive heating-elements during 24/7-operation, the maximum power-output can be limited to 60%.

Limit-LED (7) blinks, the multipurpose-display (3) shows the actual limit-status (ON - OFF). Use UP/DOWN-buttons (4/5) to switch between limit-ON (UP) or limit-OFF (DOWN).

Limit-ON is indicated by LED (7), even after returning to CLOSED-LOOP OPERATION-MODE.

Mode-button (6) confirms changes and continues to the next menu-item:





### 13.4 Softstart:

Softstart-time can be defined individually.

Select the desired duration via UP/DOWN-buttons (4/5) between 20secs („So.0“) and 9min („So.9“).

Mode-button (6) confirms changes and continues to the next menu-item:



### 13.5 Boost-function:

The NL 3070 THD temperature-controller-unit features a facility to override the normal settemperature with 1 - 9K at the first heating-up.

This intended overshooting abbreviates the required time to „melt“ frozen injectors.

As soon as the increased boost- temperature has been reached, the unit immediately reduces the temperature to the normal set-temperature and hereby ends with the boost-routine.

The amount of temperature-increase is selected via UP/DOWN-buttons (4/5) between 0K („bo.0“) and 9K („bo.9“).

„bo.0“ means „boost OFF“.

During boost process-high LED (13) as well as control-deviation-bargraph (2) react according to their presets (see chapter 7.1, so they will probably indicate process-high.

Cooling-exit (see chapter 7.3) is disabled during boost-phase.



Mode-button (6) confirms changes and continues to the next menu-item:

### 13.6 Standby-function:

The control-unit is provided with a signal-port to activate the standby-routine by an external signal.

The standby-value effects the temperature-termination to a defined percentage of the desired temperature.

The standby-routine permits a reduction of the desired temperature of all heating-zones in a unit simultaneously. This way mass-variations in consequence of long-term high-temperature during machine-downtime is avoided.

The limit-LED (7) blinks with higher frequency, the multi-purpose-display (3) indicates the actual standby-percentage.

Changes may be applied via UP/DOWN-buttons (4/5) between 0% („S.00“) and 99% („S.99“).

Mode-button (6) confirms changes and continues to the next menu-item:

SOFTWARE-VERSION.



### Application of standby-routine:

Standby-function is activated by a switch at the frontpanel of a alarm-plug-in-unit (NL 3053SX), which must be installed inside the same mainframe.

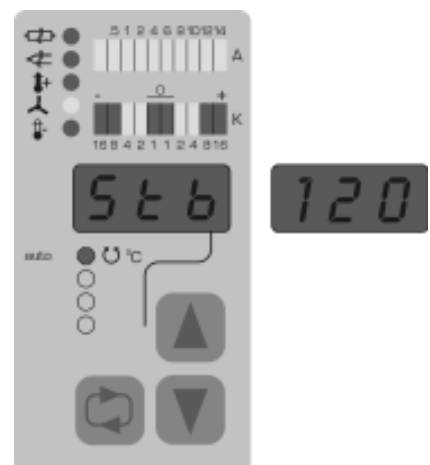
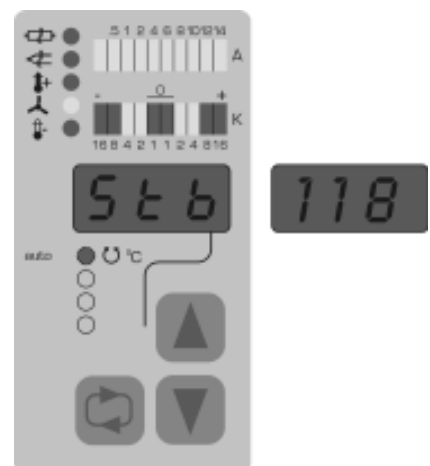
All temperature-controller-units will change-over to their individually set standby-percentage as described before.

The multipurpose-display (3) alternates between actual temperature and the abbreviation „Stb“.

One tap to the UP or DOWN - button (4/5) shows the calculated standby-temperature, also alternating with „Stb“.

LED „auto“ (10) blinks.

One further tap to UP or DOWN shows the original, not reduced 100%-desired temperature-value. It may be changed by pressing UP/DOWN-buttons (4/5) and must be confirmed by pressing modus-button (6).



When standby is activated, the control-deviation-bargraph reacts according to the (calculated) standby-temperature, whereas the process-high/-low-indicators (11/13) as well as their corresponding alarm-exits always react according to the 100% desired-temperature-value.



This ensures, that potentially dependent machine-functions (e.g. „machine stop“ when process low), that are controlled via alarm-exits (see chapter 8, „relay exits“), still react as demanded by their original product-parameters.

### 13.7 Software-Version:

The multipurpose-display indicates the actual software-revision.

Press mode-button (6) to return to CLOSED-LOOP CONTROL-MODE.





## Declaration of Conformity

We declare under our sole responsibility that this product is in conformity with the following standards or standardization documents:

EN 50081-2

EN 50082-2

EN 61010

according to the provisions of the directives

EC-Low-voltage directive (73/23/EEC)

EC-directive of electromagnetic compatibility (89/336/EEC)

NOLDEN REGELSYSTEME GMBH  
Am Tonschuppen 2 · Gewerbegebiet Volmershoven  
D-53347 Alfter · Germany

A handwritten signature in black ink, appearing to read 'H.W. Müller', is written over a light grey rectangular background.

Hans Werner Müller, General manager