

# NR8000-v3



# Hotrunnertemperature controller for 4 - 32 zones

STS Version 3.0



# **Operations manual**

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Dear customer,

thank you for having chosen a NOLDEN temperature controller. This high quality device has been produced in our ISO 9001-certified factory and was shipped to you after a thourough quality test.

- **Unpack** Check the device for eventual shipping damage. Don't connect damaged equipment ! Claim the damage with your shipping agent.
- *Read* Please read carefully this operating manual before bringing the device into service !
- *Connect* Wiring the device should be done by your qualified electrician following the instructions given in this manual.
- *Warranty* period is 1 year and includes all malfunctions clearly caused by material, production or design failures. Repair or replacement in this case are free of charge, you only pay the shipping cost to our factory. No further claims or requirements can be accepted, especially for consequential losses or damages.
- **Service** We help you quickly and at resonable costs. Just send us the device with repair order and precise description of the malfunction.

Carefull packaging is essential for a safe shipment !

Small repairs up to the maximum amount mentionned in our commercial terms and conditions are done immediately without formal offer. In any other case, we contact you as soon as possible to determine the next steps.

To facilitate your orientation in this manual, you find the following symbols :

Imminent danger !Safety adviceGeneral informationWiring- and installing advice



#### Disclaimer

Compliance with the operating instructions is a prerequisite for the safe operation of the controller unit and for achieving the specified product and performance characteristics. NOLDEN Regelsysteme GmbH is not liable for personal injury, property damages or financial losses that arise from non-compliance with the operating instructions. Warranty for defects is excluded in such cases.

This controller unit has been designed and built safely by us and also left the plant in a safe and proper working condition. To maintain this condition and to ensure safe operation, the user must follow the instructions and warnings described in this manual and the safety instructions herein included.

Since the observance of safety is outside our sphere of influence, we cannot be held liable for damages resulting from failure to comply with one or more of these rules. The list of safety regulations can not be complete (mechanical and foreign regulations). Not mentioning or listing these rules does not mean that they have no validity.

Commissioning, maintenance and repair work may only be performed by persons which are recognized as professionals within the meaning of current legislation (VDE-rules, safety law for electrical equipment, accident prevention legislation of the employers liabilities insurance association).

#### Warranty limitations

The content of this documentation has been carefully established and thouroughly verified.

NOLDEN Regelsysteme GmbH assumes no responsibility for any damage that may arise from errors in the documentation. In particular, descriptions and technical specifications are not warranted characteristics in the legal sense.

NOLDEN Regelsysteme GmbH has the right to make changes to the product described or documentation without prior notice, if they are made for reasons of reliability and quality improvements, or by technical progress.

We always appreciate any advice for possible errors or potential improvements, that help us provide you with even better products and services in the future.

# Content

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Chapter						
1 Features	6					
2 Safety advice	7					
2.1 Environmental advice	8					
2.2 Qualification of personnel	9					
3 Specification	10					
4 Installation and wiring	12					
4.1 Installation	12					
4.2 Power connection	12					
4.3 Mould wiring	12					
4.4 Alarm connector / Signal contact	13					
4.5 Changing fuses	18					
5 Operation	20					
5.1 Main switch	20					
5.2 Operating elements and keys	21					
5.3 Safety load shedding	21					
5.4 Touchscreen	22					
6 NOLDEN STS Smart Touch System	23					
6.1 "Homescreen"	23					
6.2 Part "Heating" - view total situation	24					
6.2.1 Zones - view in groups	29					
6.2.2 Zones - details	30					
6.2.3 Settings - zones configuration	38					
6.3 Part "Mould diagnosis"	54					
6.4 Part "Analysis"	58					

4



# Content (cont.)

Chapter	Page
7 Part "Mould memory"	60
8 Part "Alarms"	64
9 Part "Settings"	66 🪺
9.1 Settings - User	66 IL
9.2 Settings - Language	69
9.3 Settings - System	70
9.4 Settings- Temperature control	76
9.5 Settings - further options	79
10 Appendix	81
11 Keyword index	83
12 CE-conformity certificate	86

#### 1. Features

Ready to use compact multizone temperature controller for all 230V hotrunner systems

- Compact unit for 4 up to 32 zones
- User friendly touchscreen operation with NOLDEN STS Smart Touch System
- Adaptive control NOLDEN evoControl<sup>©</sup> based on neural networks with automatic self-tuning for every zone
- Cloud connection with automatic intermediate data storage for internet line failures comes standard, suitable for NOLDEN Data portal NOAH for process data archiving and retrieving (option)
- Safety load-shedding for process-high temperature
- Synchronized heating for all zones possible
- Boosting for "frozen" nozzles possible
- Integrated heater current monitoring
- Intelligent, programmable soft start routine
- Programmable alarm settings for every zone and various self-monitoring functions
- Standard with mould diagnosis function
- Mould memory and real-time data analysis
- Smartphone- or tablet operation with integrated WIFI
- Number of zones can be increased afterwards (depending on the size of the casing) further process control and monitoring features as an option, e.g. valve gate control or coolant monitoring



# 2 Safety advice

- 1. Please read this advice carefully.
- 2. Keep this operations manual for use near the machine.
- This is an electrical device driven with high voltage, please respect the current CE- and safety regulations.
   Mains voltage and every voltage greater than 42 volts is dangerous !
- 4. Connect to a power source following the identification plate on the device.
- 5. Avoid contamination of the interior with debris, liquids or sprays. Risk of short-circuit, fire or electric shock !
- 6. Before cleaning the device, disconnect from the power source.
- 7. Place the device in a stable manner and prevent it from slipping away. Take care of the tension load created by the wiring, fix the cables separately from the controller.
- 8. Clean the surface of the touchscreen only with appropriate, soft cleaning material, never use solvants or abrasive detergents or material.
- 9. Don't place the device on hot machine surfaces or near radiation sources of hot parts.
- 10. Keep the power connection cable clear of hot parts or sharp edges.
- 11. Disconnect the power cable immediately, if
  - it was damaged,
  - liquid or parts penetrated the device,
  - the device was damaged by falling down or other mechanical impacts,
  - you have the suspicion of any malfunction.
- 12. Operation of the device and any other intervention must only carried out by qualified staff members following chapter 2.2.
- 13. For repair, the device should be send back to our factory. Attempted self-repair causes immediate termination of the warranty period !

# 2 Safety advice (cont.)

- 13. (Cont.) If spare parts are required, only parts recommended by the supplier must be used. The use of other parts may cause damage and/or hazard for operation personnel.
- 14. Please respect further recommandations and warnings described in this operations manual.

#### 2.1 Environmental advice

- 1. This device has been produced according to EU-directive 2002/95/EG(RoHS), this applies also to all of its components.
- 2. The approved range of climatic conditions may not be left during current operation.
- 3. The published degree of protection of the device must be taken into account when defining the operational and environmental conditions of use.
- 4. This device must not be used in areas exposed to explosion hazards.
- 5. Electronic scrap, electronical devices and their components are subject of specific regulation concerning treatment of special refuse and may only be disposed by certified bodies.



#### 2.2 Qualification of personnel

For the use and operation of this device, the following requirements regarding qualification and training of the personnel must be taken into account :

- 1. Operator
- 2. Tool setter / shift leader
- 3. Administrator
- 4. Maintenance and repair personnel
- 5. Manufacturer

Definition of the different qualification levels see next page.



#### To 1.) Operator

- Scope of activities :

Starting and stopping of current operation, reading of actual operational situation and current alarms, limited altering of heating parameters

- Qualification :

Trained for the operation of the actual device and its risks and hazards by a qualified person, at least of the level "Tool setter / shift leader"

#### To 2.) Tool setter / shift leader

- Scope of activities :

As 1.), additionally altering of more heating parameters in the zones configuration, loading and saving of mould data into or from the mould memory, performing of mould diagnosis program

- Qualification :

Professional training or equivalent experience, trained for the operation of the actual device and its riscs and hazards by a qualified person, at least of the level "Tool setter / shift leader"

#### To 3.) Administrator

- Scope of activities :

As 2.), additionally configuration of system parameters such such as memory settings or interface configuration

- Qualification :

Professional training or equivalent experience, trained for the operation of the actual device and its riscs and hazards by a qualified person, at least of the level "Administrator"

#### To 4.) Maintenance and repair personnel

- Scope of activities :

As 3.), additionally assembly of cables and wiring harnesses, default finding and replacement of components inside the device while using original parts

- Qualification :

**Electrically skilled person is imperative**, trained for the operation of the actual device and its riscs and hazards by a qualified person, at least of the level "Administrator"

#### To 5.) Manufacturer

- Scope of activities :

All activities exceeding 4.), especially modifications, upgrading of functions and updating of the devices software

## 2 Specification

#### Mains voltage :

230/240V +/- 10%, 48...63 Hz

#### Nominal rating/nominal current :

Max. 16A per zone Up to 16 zones : max. 17 kW / 3 x 25A total 24 and 32 zones : max. 22 kW / 3 x 32A total

#### Fuses :

16A FF, 6,3x32mm, heating-loads 5A mT, 5x20mm, controller

#### Standby / alarm-exit :

7-pin plug:
2 floating contacts (230VAC, max. 3A) for alarms.
One 24V DC input to activate the 2<sup>nd</sup> (standby-) temperature-value for all zones simultaneously, wired in parallel with the internal "stand-by" switch.

#### Safety load-shedding :

Disconnection of all heating loads in case of process-high alarm +50°C

#### Heating load alarm :

0,0 ... 19,9A adjustable Min. 0,5A factory default setting

#### Sensor inputs :

Thermocouple Fe-CuNi, type J, 0...400°C Internal zero point correction Sensor is monitored for cable breakage, short-circuit and polarity errors. Thermocouple Ni-CrNi, type K and temperature range 0...800°C can be set

#### Touchscreen

Capacitive 7" touchscreen with glass surface, non sensitive for dirt or contamination, shows actual values and setpoints, load current, alarms, configuration parameters and mould memory settings

#### Power control :

0...100% proportional, zero-voltage switching Triac rated up to 35A



# 3 Specification (cont.)

#### Automatic soft-start :

(factory defaults) Powersetting 50% / temperature 80°C / time 5 min

#### Sensor-/load-connectors :

16 or 24-pole standard-industry female plug 16A/400V Pin assignment NOLDEN-Norm, other norms available (see appendix)

#### Accuracy :

0,25% FS

## Insulation voltage :

2,5kV mains/sensor circuit

#### **Dimensions :**

325 x 342 x 180mm (WxDxH, 4 up to 8 zones) 410 x 370 x 190mm (WxDxH, 12 / 16 zones) 410 x 370 x 355mm (WxDxH, 24 / 32 zones)

#### Colour :

RAL7030 sanded structure : RAL9005 silk gloss : RAL7021 structured : Frontpanel Back side (from 12 zones on) other casing parts

#### Weight :

#### (depending on number of zones and installed options, e.g.)

e.g. NR8008 mini : ca. 13 kg e.g. NR8012 : ca. 15 kg NR8024 : ca. 22 kg

## 4 Installation and wiring

#### 4.1 Installation

The installation site must provide easy access for the operator without hazard. Sufficient mechanical stability must be guaranteed, also secure the device from slipping on the installation surface.

Protect from heat, radiation and allow free air circulation. Protect power cable from heat and mechanical stress. Do not place the device on hot surfaces.

Take care of the tension load created by the wiring, fix the cables separately from the controller.

#### 4.2 Connection to power supply

This device must only be operated at the voltage indicated on the name plate. Please check for a sufficient fuse protection of the CEE power outlet foreseen for the device. If neutral conductor is not wired properly, dangerous voltages can be created inside the device.

Protective earth conductor must be provided !

#### 4.3 Mould wiring

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Please compare the connecting diagram on the temperature controller (backside, near the outlet) with the diagram of the mould. Inappropriate connection can destroy controller, heater and TC !

Available mould connecting cables contain heater– and FeCu-Ni compensation wires for TC. **Never use compensation wires to connect a heater.** 



# Maximum load capacity for the heater when using mould connector VK24 (24 pol. + PE)

The maximum load capacity of the heater wires (1,5sqmm Cu) depends on the operating conditions (see also DIN VDE 0298 Part 2 and 4).

@ op. condition : Continuous
@ wire location : Individually, free installation on wall or floor
@ ambiant temperature : 30°C, free air circulation, no heat radiation

#### VK 24 :

1 heater	12,5 A	2 heaters	12,5 A
3 heaters	11,5 A	4 heaters	10,5 A
5 heaters	10,0 A	6 heaters	9,5 A

NR8000-v3



Load and TC-connection following NOLDEN-Norm NR24 :  $24 \underset{3}{10} \underset{3}{10} \underset{24}{10} \underset{24}{1$ 

Other pin assignment norms see appendix chapter 10 of this operations manual

#### 4.4 Alarm- / signal connector

For every heating zone, three alarm functions can be programmed individually. These alarms operate 2 common floating contacts as cumulative exits for all zones together, they are wired on a 7-pin connector on the back side. Default settings are one process-high temperature alarm (A1, pin 2 and 3) as well as one load-breakage and leakage alarm (A2, pin 4 and 5).

To activate the 2nd temperature set-point (stand-by function), a 24V DC switching contact is wired to pin 6 and 7. **No external power source may be connected to this input.** This function can also be activated manually with a button on the front panel or on the touchscreen.



If the unit is equipped with additional options, e.g. coolant monitoring, servo control, mould pressure measurement or others, a larger common alarm connector for the transfer of all signal contacts of the system is used. Type and pin assignment of this connector is described in the operation manual of the concerned option.





Back side NR 8000-v3 mini desktop casing 4 - 8 zones :



Fig.: Back side NR 8008 mini

- 1 Load– and TC-connector (6 zones each)
- 2 USB connector
- 3 Alarm output / external stand-by
- 4 Power cord



#### Back side NR 8000-v3 desktop casing 12 / 16 zones :

- 1 Load– and TC-connector (6 zones each)
- 2 Ethernet / OPC-UA port
- 3 USB connector
- 4 Alarm output / external stand-by
- 5 Power cord
- 6 Main switch



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#### Back side NR 8000-v3 high casing (24 / 32 zones)



Fig.: Back side NR 8032-v3

- 1 Load– and TC-connector (6 zones each)
- 2 Ethernet / OPC-UA port
- 3 USB connector
- 4 Alarm output / external stand-by
- 5 Power cord
- 6 Main switch



- 1 Touchscreen
- 2 Operation panel with main switch and phase control lights
- 3 Load fuses for every zone

Front view NR 8000-v3 desktop casing 12 / 16 zones



Fig.: Front NR 8016-v3

- 1 Touchscreen
- 2 Operation panel with main switch and phase control lights
- 3 Load fuses for every zone (on both sides)



#### Front view NR 8000-v3 high desktop casing 24 / 32 zones



Fig.: Front NR 8032-v3, left side with load fuses

- 1 Touchscreen
- 2 Operation panel with main switch and phase control lights
- 3 Load fuses for every zone (on both sides)

4.5 Changing fuses



Before exchanging whatever fuse, it is mandatory to disconnect the unit from mains voltage supply and protect against re-connecting!

#### Exchanging the <u>externally accessible</u> load fuses :

- 1. Remove the fuse holder cap with an appropriate (wide) screw driver
- 2. Exchange the blown fuse by a new one of the same type 16A FF
- 3. Reassemble the fuse cap holder and turn it tight (only reasonable force)

#### Example front side NR 8000-v3 desktop casing 12 - 16 zones :



Fig.: Front NR8016, left side with load fuses (right side identical)

In case of a blown load fuse, those can be exchanged easily from the outside without opening the casing.

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## Attention :

#### Only superfast fuses 16A FF may be used !

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- Exchanging the internally accessible <u>controller</u> fuse (picture see next page) :
- 1. Remove the casing cover (pay attention to internal earth wiring!)
- 2. Pull out the fuseholder on the electrical terminal block on C-rail (unit floor)
- 3. Open the fuse holder, exchange the blown fuse by using the same type **5A MT**, close the fuse holder
- 4. Insert again the fuse holder into the electrical terminal clock
- 5. Re-install the casing cover and tighten all fixing screws



Opening of the device for damage research and repair is only allowed for electrically qualified personnel, see also chap. 2.2.



## Exchanging the internally accessible <u>controller</u> fuse (cont.) :







Fuseholder pulled out



Fuseholder opened

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# 5 Operation

5.1 Main switch

Before wiring the device, make sure that the **master switch on the back side (from 12 zones on) or both master switches on the front panel (4 to 8 zones) are in position OFF "0".** Herewith, all poles are disconnected from the mains voltage. The master switch on the back side can be locked according to EN 81-80.

#### Before working on the device itself or on a tool connected to it, the system must be locked to prevent the device against unintentional restart. This can be done by retracting the power cable and securing it against re-connecting

After having finished the wiring completely, switch the device on with main switch "touchscreen" in position "ON". After start-up of the touchscreen and appearing of the start-up menu screen, switch then the heating on by pressing the second main switch "Heating" in position "ON". Both switches are lighted when in "ON" position.



Before start-up of the control software, self-test and enabling of controller operation, power supply to the heating elements is locked and cannot be started (switch dark, even when switched on).



In addition to the masterswitch itself, all **3 phase-controllights must now be lighted**. Is this not the case, one phase of the mains voltage is not active. The most likely origin of this problem is a blown fuse in the electrical cabinet. Even if the touch screen seems to work correctly, a part of the heating zones may not work in this case.

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Before continuing the start-up of the controller, you have to fix the problem with the mains voltage first.



5.2 Keys and operation elements



- 1 Phase control lights (one for each phase)
- 2 ON / OFF-switch heating
- 3 Main switch electronics and touchscreen

The control panel of all units with desktop casing is similar. The USB-socket is on the back side of the casing. The stand-by function can also be activated from an external signal source, e.g. an injection moulding machine, see also chapter 4.4.

5.3 Safety loadshedding :

In addition to both alarms A1 and A2, a safety loadshedding function ("alarm A0") is wired to the heating masterrelay of the system. This functions cuts automatically the total heating power of the mould, when a process-high temperature **in access of 50°C** is measured somewhere in the mould.

The alarm limit value A0 can only be altered by an operator with the user rights level "Administrator".

This setting cannot be switched off, it helps preserving the hotrunner and the mould from damages caused by excessive heating. Activation of the safety loadshedding can easily be detected by all 3 phase control lights being dark with the heating main switch being "ON" (and lighted) at the same time.

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Before trying to switch ON again the heating main switch, first check the whole system and remove the origin of the excess temperature. Before this excess temperature is not removed, swiching on the heating again is not possible. On the touchscreen, you can easily find the zone(s), where excess temperature is present.

#### 5.4 Touchscreen

Beside the above mentionned direct-access-keys for all zones, operation of the controller is made mainly by the touchscreen. Therefore, a glass touchscreen with newest technology, called "projected capacitive", is used. In opposition to older touchscreens (with switching film on it), **this very sensitive technology requires only a light touch of the screen without any pressure.** If there is no reaction of the system after a light touch input, there must be another reason (e.g. no right of the user for this specific function), pressing more firmly on the screen does not change the situation. Operation with gloves may be erroneous depending on the type of glove, in doubt, take the gloves out.

To enlarge the screen representation, you can stretch the image with two fingers as you know it from your mobile phone or tablet computer (,, pinch-to-zoom"-function).

Finally, to facilitate reading and operating the touchscreen, the front panel (or the upper part of it on higher casing types) is inclined.



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# 6 NOLDEN STS Smart Touch System

#### 6.1 Homescreen

The "Homescreen" is the start-up operation screen for all functions and programs of the NOLDEN STS, comparable to the desktop of a PC, smart-phone or tablet computer. From every screen, the "Home"-button will lead you directly to the homescreen, this button is always on the upper right corner of the screen.



The "Arrow" or "Back"-button will lead you to the last visited screen (this can also be the homescreen, if you just were there).



On the Homescreen, the 6 main functions of the NOLDEN STS can be chosen :

Alarms Real time analysis Mould memory Hotrunner heating Mould diagnosis function Settings

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Depending on other options eventually installed, more buttons may appear on the homescreen. Those programs are then described in a separate manual for every option.



**Hotrunner** is the most frequently used screen, all actual values and conditions are shown here. Also, the most common inputs and settings are done here. **Thus, this is the most common screen for current operation of the system.** 

6.2 Part "Heating" - Overview all zones



This button on the homescreen leads you first to the overview of all zones. Here, the actual situation of all zones is displayed, which gives you a quick impression of the situation in the mould. So, we strongly recommend you to use this screen during the current operation of the controller. All possible situations are shown by different **colours**, this permits a quick glance even from greater distance. Zones normally working within their defined limits without any alarm are **shown in green**, **this should be the current situation during any operation**.

zo	ZONEN / ÜBERSICHT															
E																
L	Во	ost		Stand-by				O,	Zo	om		4	Те	mp + /	/ -	
1	83	2	¢	3	¢	4	А	5	83	6	e	7	В	8	С	
ZONE	NNAME	ZONE	NAME	ZONE	ZONENNAME ZONENNAME		ZONENNAME ZONENNAME		NAME	ZONENNAME		ZONE	NNAME			
zu	KALT	ZU I	KALT	Ŀ	ZU KALT		KALT	ZU F	ZU KALT ZU KALT		ALARM!		BETRIEB			
14	-7°C	147	7°C	14	7°C	147	7°C	147°C		147°C		147	147°C		147°C	
1	0%	10	)%	10	10% 10%		)%	10% 10%		)%,	10%		10	)%		
9	¢	10	А	11	₫	12	£3	13	-	14	-	15	-	16	-	
ZONE	NNAME	ZONE	NAME	ZONE	NAME	ZONENNAME		ZONENNAME -							-	
AL	ARM!	BET	RIEB	BET	RIEB					INA	KTIV	INA	<b>KTIV</b>	INA	KTIV	
14	7°C	147	7°C	14	7°C	147	147°C (		C	0	°C	0°	С	0	°C	
1	0%	10	)%	10	)%	10	)%	0	%	0	%	0	%	0	%	



In the upper part of the screen, functions to operate all heating zones together are shown :

Quic	cklink to mould me (see chapter	emory Display a 6.6)	actual mould name	ON / OFF all active zones
Z	ONEN / ÜBEF	RSICHT		← ♠
E	WERKZEUG: N	IR 800 BACKUP		EIN
Ц	Boost	Stand-by	🔍 Zoom	<b>Temp + / -</b>
	Boosting all zones	Standby all zones	Zoom view	Temp +/- function to change all set- points at once

Colours are the same in all screens an indicate the following operational state :

Green : undisturbed operation
Red : Alarm
Grey : not active
Orange : Softstart
Blue : Setpoint not yet reached during first heating
Puple : Zone coupled, manual (%-operation) or measuring zone

The colours green ("Active"), grey ("De- activated") and red ("Alarm") indicated on top are even the same throughout all options of the STS, e.g valvegate operation, cooling or pressure monitoring.

In addition to the colour of the actual zone, the operational state is also shown by symbols or short description.

The **display field of the actual mould name** is also a button to access directly the mould memory without passing trough the homescreen (see chapter 6.6).

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#### - Boost :

For all zones, the boost-setpointaddition is activated for a limited period of time. This Boost holding time is hold after the boost-setpoint temperature is reached, then, every zone goes back to the last operation setpoint.

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Boost is being activated for all zones together, and <u>if synchronized heating is acti-</u> <u>ve</u>, also hold until all zones have finished their boost holding time. Slow zones such as e.g. manifolds may thus delay the whole boost-process in this case, this may be avoided by choosing boost parameters accordingly.

Boost function can be ceased by pressing the boost-button again.

#### - Stand-By :

For all zones, the second setpoint (stand-by temperature) is activated as long as until the operator switches it off again

Activation of Boost– and Stand-By-function is indicated by green colouring of the respective button. **If one of both functions is active, the other one is locked,** this is shown by a lighter display of this button.

#### Alternative :

"Stand-By" function can also be activated with an external switching contact (see chapter 4.4).

#### - Zoom-view :

With the **"Zoom" button**, you can enlarge the overview of all zones, so that more parameters per zone can be displayed (see chapter 6.2.1). By pressing the **"Zoom"** button again, you get back to the full view of all zones. As for the other buttons, activation is indicated by green colour of it.

Examples for the display of one single zone :





#### Examples for the display of one single zone (cont.) :



#### - "Temp +/- "- function :

With the "Temp +/-" -Function, the temperature setpoint of several or all zones can be increased or decreased by the same amount. To do so, press the "Temp +/-" - button and the following dialogue menu apears :

Temp +	- / -			← 🕅
1 150°C	2 150°C	3 ⊈ 150°C	4 ⊄ <b>〕</b> 150°C	
5 ᢏ∰ 150°C	6 <b>⊂∏</b> 150°C	7 ᢏ∰ 150°C	8 <b>⊂[]</b> 150°C	
9	10	11	12	Gruppe: Keine Gruppe
13	14	15	16	$\leftrightarrow \rightarrow$
17	18	19	20	Alle
21	22	23	24	auswanien

In this dialogue you can select the zones, whose setpoint shall be increased or lowered. Selection of a zone is confirmed by green colour of the associated field. Alternatively, all zones of one group (see also chapter 6.3.2) can be selected with the arrow buttons on the right side of the dialogue. This selection can then be modified by selecting or de-selecting of certain zones, Finally, you may select "All zones" by pressing the associated button, also this choice can be modified afterwards.



When all required zones are selected, you can increase or decrease the setpoint of each individual zone by the indicated amount. **Setpoints previously different will stay different, they just get increased or decreased as described.** 

The amount, by which each setpoint shall be changed, can be modified. To do so, press the field where the temperature step is indicated, this will open the known numpad where you can enter the desired temperature step value.

#### - Zones ON / OFF :



The heating of all active zones is being switched on or off. When switching on, only those zones will be switched on, <u>that were active before last switching off.</u> This function is software based and works only via the touchscreen. **If the whole heating must be switched off into a <u>safe position</u>, this must be done with the main switch "Heating" on the front panel. This switch is wired to the main heating power relay of the system and cannot be influenced by the software.** 



## 6.2.1 Zones - view in groups

Zoom Ansicht								
Werkzeug :								
← Zonen 1 - 8 →								
1 🕃	2 ⊂])	3 🗇	_ <b>4</b> A	5 🗱	6 👘	7 B	8 C	
ZONENNAME	ZONENNAME	ZONENNAME	ZONENNAME ZONENNAME		ZONENNAME ZONENNAME		ZONENNAME	
ZU KALT	ZU KALT	ヒ	ZU KALT	ZU KALT	ZU KALT	ALARM!	BETRIEB	
zu kalt Ist 147°C	zu kalt Ist <sub>147°C</sub>	<mark>∠</mark> Ist <sub>147°C</sub>	zu kalt Ist <sub>147°</sub> C	zu kalt Ist 147°C	ZU KALT Ist 147°C	ALARM! Ist 147°C	betrieb Ist 147°C	
zu kalt Ist 147°C 10%	zu kalt Ist 147°C 10%	L Ist 147°C 10%	zu kalt Ist <sub>147°</sub> C 10%	zu kalt Ist 147°C 10%	zu kalt Ist 147°C 10% <sub>1</sub>	ALARM! Ist 147°C 10%	BETRIEB Ist 147°C 10%	
ZU KALT Ist 147°C 10% soll 150°C	ZU KALT Ist 147°C 10% soll 150°C	Ist 147°C 10% <sup>soll</sup> 150°C	ZU KALT Ist 147°C 10% Soll 150°C	ZU KALT Ist 147°C 10% Soll 150°C	ZU KALT Ist 147°C 10% <u>,</u> soll 150°C	ALARM! Ist 147°C 10% soll 150°C	BETRIEB Ist 147°C 10% Soll 150°C	

With the arrow keys, you can roll through all groups of zones. In this screen, all zones are shown in groups of 8 zones with indication for every zone of

- Zone number (consecutive)
- Group of zones (see chapter 6.2.3)
- Name of the zone as defined by the operator
- Operational state
- Actual temperature
- Setpoint temperature
- Powersetting in % and
- Heating load current .

The colours are the same as in the overview of all zones (see legend). **Operation is** made in the detail view (next page), touching of a zone guides you directly there.



## 6.2.2 Zones - detail view



- 1.) Arrow keys next / previous zone
- 2.) Display name and group of the actual zone
- 3.) Display alarms
- **4.)** ON-/OFF-switch heating actual zone
- 5.) Display and modification of parameters
- 6.) Entering zones configuration
- 7.) Copy function for changes
- 8.) Visualisation actual temperature, setpoint and alarm treshold values

With the arrow keys, you can roll through all groups of zones. Beside the overview of all zones, this screen is the next frequently used of all. Here, the most important details of one given zone are shown and can also be operated or modified.

# All inputs can be copied with the copy button to one other, several or all zones (see also page 35).



#### Ad 1.) and 2.) Display name and group of the actual zone, arrow keys

|--|

Here, the name of the selected zone is displayed, if a name is assigned. If no name is assigned, just the number of that zone is shown. Beside the name of the zone, the affiliation of a group of zones is displayed. This one can be assigned automatically or manually chosen, see chap. 6.2.3 zones configuration. The <u>display field for the</u> <u>zones name</u> serves also as a <u>button</u> to manually change the name (see below).

With the arrow keys, you can roll trough all zones.

#### - Manual entry of zone name :

When pressing the display field showing the zones name, a keypad opens, where you can enter an arbitrary name :



After having finished entry, quit by pressing "OK".

#### <u>Remark 1 :</u>

**Toggling between capitals and lower cases can be done with the "shift" key.** If lower case letters are activated, you can also enter numbers with the upper line of keys. After pressing the "%&#..."-key, you will find here specific signs.



#### Remark 2 :

To ease the entering of names, a "quick choice" menu with frequently used names (tip, manifold etc.) can be used. After having chosen the desired name, this name appears then in the entering field. To complete this generic name, just enter other letters or numbers with the keybord and close with "OK".

#### Ad 3.) Display alarms



In the display of alarms, 4 different alarms are being indicated :

- Temperature alarm
- Current alarm respectively heater breakage
- Leakage alarm
- Thermocouple alarm (polarity interchange or defect)

If one of these alarms is present, the respective zone is displayed **in red** in all screens. In addition to that, the alarm symbol below the alarm display in the zones detail view is lighted.

Pressing this symbol opens a window with a list of all actual alarms, see also chapter  ${\bf 8}$  .

Only the field **thermocouple alarm** is a mere display field with no switching function. The three other alarm fields open a numpad when pressed, which permits to enter or modify the associated alarm threshold value.

The threshold value entering choices for the **temperature alarm** are being defined in the **alarm configuration**, see chapter 6.2.3.



If a higher and a lower alarm limit value are defined, the entering menu looks as below :

	×
Grenze über Sollwert	
20°C	
	Grenze über Sollwert 20°C

If only one (or none) of both alarm limit values is activated, only the respective entry field can be operated.

The entry possibilities for current and leakage alarm are limited for the operator to the entry of a threshold value, see also the description of the **alarm configuration** chapter 6.2.3.

Ad 4.) ON-/OFF-switch heating actual zone



Zone on / off, sliding switch can be operated.
The actual state is being indicated by the colour :
Green = ON , Grey = OFF
This function can be copied to one, several or all zones (see page 35).



Ad 5.) Display and modification of parameters:

<u>Actual temperature</u>, background colour indicates the operational state (see chapter 6.2).



Actual heating current,

Entering new setpoint value :

Touching of this field opens the following keyboard :

	230°0	2	×	Enter the desired setpoint value with the keyboard and acknowledge with <b>"OK"</b> .
Min 0°C		Max, 400°C		
7	•		Rack	<b>Deels</b> " deletes the last digit
	0	9	Dack	"BACK deletes the last digit
4	5	6	Clear	"Clear" deletes the whole number
				"ESC" aborts the entering process
1	2	3	ESC	
0		,		



#### Attention:

The entered value must be in a range between the indicated "Min" and "Max" limit values, if not, the value will not be accepted.

These limit values are set in the zones configuration menu (see chapter 6.2.3). To modify them, the operator must at least have the user level "Shift leader".



#### Ad 6.) Button zones configuration (see chapter 6.2.3):



This button is normally blocked for the user, the key lock is indicated by a light colouring of the key. This is also true for key locks in all parts of the NOLDEN STS. **Locked keys** guide you directly into the **user management section** (see chapter 9.1), where you may adjust your user right level, if appropriate. With the arrow key, you can immediately get back to the previous screen.

In this case, the zones configuration button guides you directly to the zone configuration menu (from user right level tool fitter an, see chapter 6.2.3).

#### Ad 7.) Copy field for changes :



Newly entered parameters or the ON / OFF - switching of zones can subsequently be copied to one, several or all zones.

To do this, mark in the copy screen the zone(s), to which the values (or functions) must be copied (see example below).

Zone 1 kopieren auf :				←
1 🔊	2 🔊	3 Ф	<sup>4</sup> ⊄₿	
5 - C)	<sup>6</sup> C)	7 🗗	8 <b>-()</b>	
9	10	11	12	
13	14	15	16	Keine Gruppe
17	18	19	20	$\leftarrow \rightarrow$
21	22	23	24	auswählen
				OK

To remember the zone, from which the values are copied, it is marked light (see previous page, zone 1). Zones switched off are marked in grey (see below, zones 9 – 24).

Finally, name and group assignment of all zones (if any) are being shown.

- <u>Copy to one or several zones :</u> Mark the desired zones and acknowledge with "**OK**".

 <u>Copy to all zones</u>: Press the button "All zones" and acknowledge with "OK". You also can de-select zones by touching them.

- Copy to all zones of one group :

Choose first with the arrow buttons the desired group, then acknowledge with "**OK**". Here also, you can **select or de-select additional** zones by touching them.

#### Remark :

Due to the limited space available for the display of one zone, the groups name is always indicated by a symbol. In the legend of the copy window, the name of the group is being displayed in full length (example see previous page).

The copy function can be quit with the **"Back"- button** in the upper right corner of the copy window **without copying anything**.

Ad 8.) Display actual temperature, setpoint and alarm treshold-values

Beside the actual temperature (dark pointer), the instrument also shows the setpoint value (light triangle). The green scale shows the "good" operation area between the higher and the lower alarm treshold values (see next page).

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<u>Example shown :</u>	
Actual temperature	250°C
Setpoint value	250°C
Lower alarm limit	200°C
Higher alarm limit	300°C

If the actual temperature is outside these treshold limits, temperature alarm is then activated for this zone. In all screens, this zone is then marked in red.

### 6.2.3 Zones configuration

In the zones configuration, mould and/or production order specific parameters of the controller system can be set, that typically do not have to be changed during current operation. All parameters of all zones can be stored in the mould memory and easily reloaded during the next use of that same mould.

Furthermore, critical operation parameters as e.g. thermocouple coupling or switching to manual operation are accessible, which should normally not be changed by normal operators. Access to this menu is done from the "Zones detail view", see chapter 6.2.2)

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Access to the zones-configuration is only possible for user rights from level "Set-up / shift leader" and higher.



The entry of data described here is valid for the zone named on top of the screen. If those data must be valid for several zones, use the copy function as described in the detail view of one zone.

With the **arrow keys**, you can roll trough all zones (see above).



#### Dialogue menu "Setpoints" :

Soll-Werte

When selecting this function, the following dialogue menu opens :

Sc	ollwerte ×
Sollwert 1 Betrieb 150 °C	Stellgrad- Begrenzung 100
Sollwert 2 StandBy 100 °C	obere Sollwertbegrenzung 400 °C
Standby Timer 0 min	untere Sollwertbegrenzung 0 °C
Sollwert 3 Boost 5 °C	Messzone OFF
Boost- Haltezeit 10	

#### - <u>Setpoint 1 - Operation</u>:

This parameter is the setpoint for normal operation of every zone, it is the only one of all parameters shown here that can also be changed by a normal operator with the user rights "Operator" in the detail view of this zone.

- <u>Setpoint 2 - Stand-By</u>: This parameter is the setpoint for the stand-by operation of every zone.

#### <u>Attention :</u> Setpoint 2 must be entered as an absolute value

- Setpoint 3 - Boostaddition :

This parameter is the setpoint for the boost-operation of this zone (boost-function for a temporary temperature increase). The boostaddition is than **added by the system to setpoint 1 of this zone.** 

Example: Setpoint 1 = 200°C, Boostaddition = 10°C, gives a Boost-setpoint of 210°C

The boost-setpoint is activated by choosing the temporary boost via the screen or with the dedicated "Boost"-key on the front panel. Upon reaching of the boost-setpoint, **temperature is hold for a programmable time**, then automatically brought to the normal setpoint 1. The boost-function is only available during normal operation with setpoint 1, not in stand-by operation with setpoint 2.

De-activation of the boost is done by entering a boost-addition of "0°C"

- <u>"Boost-Holding time" :</u> Value in sec. See "Setpoint 3 - Boostaddition".

#### - "Higher" and "Lower setpoint limit" :

Max. allowable range for setpoint 1 to be entered by an operator. The actually active limits are shown on the numpad during the entering process. Setpoints outside this range are not accepted (see chapter. 6.2.2).

- "Stand-By-Timer" :

#### Value in min.

The Stand-By Timer delays the activation of the stand-by function by a time up to 99 minutes. As the stand-by-function is activated from the touchscreen or from an external signal contact (see chapter 4.4), first this timer starts to run for the set delay time and then, normal stand-by is activated. To set this delay time and to activate the timer, press the button "Stand-by timer" and the known numpad opens, where you can enter the desired delay time.

If the stand-by function is then activated from the zones overview screen (or via an external signal contact), the associated button on the screen is colored in green. Inside the button, the timer is displayed and the remaining delay time is count down :

Zonen-Übersicht	← ♠
Werkzeug :	OFF
Boost <u>Stand-by</u> Q Zoom	Select

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#### - Power setting limitation :

#### Value in %

Limitation of the power setting is only required for a too high heating power installed in this zone (e.g. heater with the desired dimensions only available with higher power). Nomally, power setting limitation is out of order (setting: 100 %).

The power setting limitation can also be used to limit the required mains power, eg. if only a power outlet of a lower wattage is available. In this case, it is normally sufficient to limit the power setting of the high output zones (eg. manifolds).

The required duration for heating up the mould increases linearly with limiting of the power setting, that's why using this method must only be done in particular cases.

#### - Measuring zone :

Any zone can be operated as a temperature measurement zone only, e.g. if a hot tip has a second thermocouple solely for process control purpose or if a leakage thermocouple is installed in the hotrunner. To do so, set the sliding switch "Measuring zone" in the dialogue menu "Setpoints" to "ON". Green colouring of the sliding switch confirms the activation (see page 39).

# Now, the powersetting of this zone is continuously set to "0%", no heating power is generated.

No electrical power is set on the related output on the connector of this zone, it can not be used for other purposes, but must be free. For other moulds, this choice can be deselected and this zone can then be used again as a normal heating zone.

Dialogue menu "Softstar	<b>t"</b> :	×
Soft-Start		Sollwert 230°C
Softstart-setpoint : Softstart-duration :	Value in °C Value in min	Dauer 5 min
Softstart-powersetting :	Value in %	Stellgrad 50 %
		Softstart vorgewählt: ON

Softstart can be preset for every zone individually. The entered softstart parameters are only active for the actual zone, if the sliding switch "Softstart preset" is ON, this is confirmed by a green colouring of the switch.

#### General remarks about softstart :

During the softstart, the controllers output response is limited to a preselected **softstart powersetting**, in order to achieve a slow baking out of high performance heating cartridges.

Once the process value reaches the **softstart setpoint**, it remains stable at this value for a preselected **softstart duration time**. At the end of this period, the process value rises to the assigned setpoint.

Softstart is only activated for the first heating after start-up of the device, **if the actual temperature is < 80°C**. If the actual temperature is > 80°C, no softstart is performed, **but the system starts heating only after 1min delay time**.



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#### Dialogue menu "Alarm-configuration" :



After choosing alarm configuration, a selection menu appears first to determine which alarm shall be configurated :



- Load shedding / Limit alarm :

When pressing the button "Limit value alarm", the numpad opens (see also chapter 6.2.2), where you can enter the desired limit alarm value. The actual value is displayed in the button and will be updated after being changed. The limit value is added to the actual setpoint 1 of this zone :

Example: Setpoint Zone 1 = 200°C , Limit value = 50°C , gives load shedding at 250°C

#### Attention :

The limit value is only valid for one zone, but the load shedding takes place by acting on the main relay, thus switching off the entire heating. The limit value can only be altered by an operator with user rights "Administrator", see also chapter 5.3.



For all other users, this button is locked.

#### - Temperature alarm :

After having chosen "Temperature alarm", the following window opens :

Temperaturalarm			
Grenze über Sollwert	20°C		
Grenze unter Sollwert	10°C		
Alarm Invertiert			
Signal Invertiert			

The upper and lower alarm threshold value can be **activated and set separately**. After having activated one or both alarms, the associated alarm scheme is shown on the right side.

# The red range on the diagram is the "Alarm"-range, the green one is the "Operation / No Alarm"-range. Alarm threshold values are always relative, that means associated to the active setpoint temperature.

When pressing one of the buttons "Upper limit" or "Lower limit", the numpad opens (see also chapter 6.2.2), where you can enter the desired limit alarm value. The actual value is displayed in the button and will be updated after being changed.

With the button "Alarm inverted" you can invert the alarm behavior. If the alarm is inverted, it is activated if no **temperature limit value exeeding** is being present.

With the button "Signal inverted" you can invert the switching behavior of the relay for the external alarm signal contact (see chapter 4.4). If the signal is <u>inverted</u>, the relay closes if <u>no alarm</u> signal is present. This form of signal is expected by some injection presees for the enabling of the injection cycle.

For both buttons, activation is confirmed by green colouring of the button.

After having selected the desired temperature –alarm configuration, the associated alarm diagram is shown also in the zone detail view of the resective zne (see chapter 6.2.2).





# All temperature alarms of all zones are operating the common alarm A1, which is wired to a floating contact on the alarm connector on the back of the device, see chapter 4.4.

Is the temperature alarm configurated as a range alarm or low temperature alarm, the common alarm A1 can be used for production release of an injection press. Depending on the type of switching contact of the press, the alarm might need to be inverted.

After having finished the desired modifications, close the dialogue menu with the red cross and get back to the menu "zones configuration".

#### - <u>Heater current alarm :</u>

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After having chosen "Heater current alarm", the following window opens :

Stroma	alarm	×
	Stromalarm 0,5 A	
	Signal Invertiert	

When pressing again the button "Heater current alarm", the known numpad opens (see also chapter 6.2.2), where you can enter the desired alarm limit value. The actual value is displayed in the button and will be updated after being changed.

The heater current alarm guards a <u>minimum</u> heating current level which can be set individually for each zone. If the actual heating current is lower than the set level, heater current alarm is activated.

All heater current alarms of all zones are operating the common alarm A2, which is also wired to a floating contact on the alarm connector on the back of the device, see chapter 4.4.

With the button "Signal inverted" you can invert the switching behavior of the relay for the external alarm signal contact (see chapter 4.4). If the signal is <u>inverted</u>, the relay closes if <u>no alarm</u> signal is present.

#### Leakage alarm :

To monitor the actual powersetting of all active zones, a **maximum alarm powersetting (in%)** can be defined. If this alarm threshold value is reached in one or more zone(s), leakage alarm is activated.

All leakage alarms of all zones are operating also the common alarm A2, which is wired to a floating contact on the alarm connector on the back of the device, see explanation above.

When pressing again the button "Leakage alarm", the known numpad opens (see also chapter 6.2.2), where you can enter the desired alarm limit value. The actual value is displayed in the button and will be updated after being changed.

#### General remarks on leakage alarm :

Setting a leakage alarm threshold value makes sense mostly on tip zones to detect a "drifting" of the heating powersetting above the average value on a longer operation period. Such a drift of the heating power setting can be caused by a leakage of molten plastic, e.g. on the junction of the nozzle and the mould cavity, that's why this alarm is called "Leakage alarm".

As operation conditions on the nozzle heating differ from case to case, automatic determination of the average powersetting is dangerous, it bears the risk to create false alarms or, on the other hand, to not detect leakage situations.

That's why the leakage alarm threshold value must be determined manually, e.g. by observing the average heating powersetting for a duration of about one hour under comparable operation circumstances.

#### Rule of thumb: Dubble the average powersetting

Example : Heating powersetting tip zones : 5...10% Recommended alarm threshold value : 20%

For detail observation of the heating powersetting, it may be wise to use the real-time analysis function (see chapter 6.4).



Short-term exeeding of the powerseting is not taken into account, as well as exeeding at first heating-up of the hotrunner or at setpoint changes.



The leakage alarm does not influence the actual control behaviour, that means the alarm threshold value does not limit actual heating power-setting. If this shall be done, a powersetting limitation can be set, see chapter "zones configuration - setpoints".

Dialogue menu "Coupling a zone to another one" :

$\cap$	Anhängen	
--------	----------	--

Touching the button "Zone coupling" opens the following menu :

Zone 1	anhänger	n an :		←
1 🔊	2	<sup>3</sup> ⊄‡	4 ¢	
5	<sup>6</sup> C)	7 🗗	8 <b>C</b> JI	
9	10	11	12	
13	14	15	16	Keine Gruppe
17	18	19	20	$_{\text{Alle}} \rightarrow$
21	22	23	24	auswählen
				OFF

To couple a zone to another one, press the field of the desired leading zone. Then, activate the sliding switch to position "ON".

#### Attention :

#### By doing so, this zone gets the same powersetting as the "leading zone"!

Thus coupling a zone is best done with a similar zone, e.g. the neighbour tip zone in the hotrunner.

Leave then the dialogue with the arrow, the actual temperature of the leading zone is then displayed for the coupled zone. Furthermore, the number of the leading zone is displayed near the number of the coupled zone and the operational state is shown as "Coupled".

To undo the coupling, re-open the dialogue en set the sliding switch to "OFF".

#### Dialogue menu "Manual powersetting" :



Touching the button "Manual powersetting" opens the following menu :



To switch over to manual powersetting, move the sliding switch to "ON". If the displayed powersetting is not suitable, press the display field, the known numpad then opens (see also chapter 6.2.2), where you can enter the desired powersetting value. The active value is displayed in the field and will be updated after being changed. Finally, leave the menu with the red cross.



#### Attention :

This setting deactivates the automatic temperature control, this zone is furthermore fed with constant (manual) powersetting.

Monitoring of the desired actual temperature must be provided by the operator !

To go back to automatic temperature control, re-open the menu en set the sliding switch to "OFF".



#### Dialogue menu "Synchronized heating":

Blockaufheizung

With the function "Synchronized heating", all zones are heated up together, this means that all zones reach the same temperature at approximately the same time. This avoids that quick zones (e.g. the hot tips) reach their setpoint temperature much earlier than slower ones (e.g. the manifolds), which could cause "baking" of the material in the tips or even a damage of the hotrunner system.

If there is a big difference in heating power between tips and manifold and / or a very temperature-sensitive material, use in doubt always this function.

The duration of the total heating process depends on the slowest zone, it can take up to 30min for some moulds.

This setting is valid for all zones together

Dialogue menu "Autonaming":



The "Autonaming"-function saves the time and effort needed to manually number a greater number of zones, whose names shall only differ by a consecutive number.

Example :

Manifold zones numbered continuously from "Manifold 1" up to "Manifold 6"

To do so, enter first a the name **without number**, as described in chapter 6.2.2. For common names, use the "quick choice" function.

The name, that all zones shall have in common, **must be given to the first zone** in the row, which then will be number 1.

Press then the Autonaming" button, which opens the copying field known from other copy procedures in the zone detail view. Mark all zones, which must be part of that numbered row (see below).



Here, you can select randomly all zones, that you want to be numbered. The zone, whose name shall be used for the autonaming of the whole row, is indicated on top of the screen window. Selecting or de-selecting zones takes place as for copying parameters from one zone to others, see also description on page 35. You also can skip zones, which are part of another group, eg. manifolds, headers, bushings etc. .

You can also select simply **all zones of an existing group, eg. all tips,** see "auto-grouping". The group can be selected with the arrow keys on the bottom of the copying window.

Acknowledge with the "OK"-button, then the autonaming of the row commences, starting with number "1". **The order of the numbering cannot be changed**.

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#### Dialogue menu "Grouping of zones" :

Gruppenbildung

Each zone can be assigned to one of 7 groups :

"Tip" = Nozzle "Man" = Manifold "A" = Group A "B" = Group B "C" = Group C "D" = Group D "E" = Group E

Pressing the **"Zone grouping"** button opens the following menu :

Gruppenbildung : 4 ์ก) 1 3 2 4 ⓓ ß X Ф ⊲⊅ Balk. 83 5 6 7 ¢ C]) ⊲⊅ ⊲⊅ 8 А В 9 10 11 12 С D 13 14 15 16 Е 17 18 19 20 Gruppen Aufheben 21 22 23 24 Autogruppenbildung Ok

Assignment to both groups "Tip" and "Man" is done **automatically depending on the load current of that zone.** The threshold value for this assignment can be modified by pressing the button "Treshold value = xx A", **factory default setting is 3,0 A**.

51

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When modifying this threshold value, press afterwards the button "Restart auto- grouping", this performs the process again according to the new threshold value.

The automatic group assignment can be changed at any time by the operator. Also, you can de-activate manually the assignment to a group.

Assigment to one of the 5 manual groups "A" up to "E" is arbitrary and shall persist until an operator changes it again. Assignment to one of the groups is part of the zones configuration and shall be saved into the mould memory. When loading a set of parameters from the mould memory, you don't have to redo the group assignment again.

#### Dialogue menu "Sequential heating":



If step-by-step heating-up of the hotrunner is needed instead of the synchronized start-up, you can define a **sequential heating up**. After pressing the associated key in the zones configuration menu, the following window opens :

Aufheizreihenfolge ×						
1.	2.	3.	4.	5.		
Haltetemperatur	Haltetemperatur	Haltetemperatur	Haltetemperatur	Haltetemperatur		
Verzögerungszeit	Verzögcrungszeit	Verzögcrungszeit	Verzögcrungszeit			
				ON		



**Up to 5 groups of zones** can be heated up one by one. Every group is heated until a predefined temperature is reached, then waits for a given delay time (if set), then the next group starts its heating in the same manner.

The desired groups for sequential heating-up must be defined prior to setting up the heating sequence, see "zones configuration - Grouping of zones". Typically, heating-up of manifolds and tips is separated. If more groups must be defined (e.g. spruces), use the free groups A up to E.

Setting up a heating sequence is done step-by-step from left to right :

- 1. Entering the holding temperature for the first group
- 2. Entering the holding delay time for the first group
- 3. up to 7. : Entering those parameters similarly for the 2. group. For the 5th. Group, only the holding temperature needs to be set.

To finish, activate the sequential heating up by setting the sliding switch (lower right side, see previous page) to ON-position and quit the window with the red cross

After having executed the sequential start-up, all zones are heated until their respective setpoint temperature is reached.

6.3 Mould diagnosis



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The mould diagnosis function performs a wiring check of all connected thermocouples and heating elements on good allocation to the same zone. Check of good functioning of every thermocouple and heater itself is done continuously during current operation and **does not require a mould diagnosis**.

The mould diagnosis is a separate function of the controller and can only be performed outside current operation.



# The continuous heating is switched off, no production can be run during mould diagnosis.

For this reason, a warning menu appears after selection of the mould diagnosis, which must be acknowledged :



After acknowledgment, the status-screen of the mould diagnosis is shown :





#### Attention :

During the mould diagnosis, a weak heating pulse is subsequently given on every zone, then the temperature increase on that zone is checked. This is done at low temperature (max. 120°C), so that normally, no cooling device is required (only for very delicate moulds).

With a standard mould configuration, the diagnosis can immediately be engaged with the "Start"-button. Progress of the diagnosis is shown by the progress bar and also by the coloured marking of every zone with the result (normally green). If there are still zones left in white, the diagnosis is not finished yet.

#### Attention :

As all zones are checked separately one by one in several steps, the whole diagnosis can take up to one hour for big moulds, in exceptional cases even longer.

After start-up of the diagnosis, no input is required, the presence of an operator is not necessary.



When the mould diagnosis is finished successfully, the result is shown as follows :

In the "Normal view", the result for each zone is depicted with a colour, a legend on the right side of the screen explains them.

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For more information about the analysis result in one particular zone, press the field of this zone, the following window then shows up :



This can also be done during the current analysis to follow its progress. The pre-set diagnosis time is count-up, as soon as the sensor is detected, diagnosis for this zone stops and the next zone is taken.

Alternatively, the result can also be shown as a table, press "Enhanced view" to do so (button see previous page) :





The "enhanced view" gives immediately the result for every zone with a symbol, but depending on the total number of zones, you must use the roll bars on the right side to see all zones. Also in the enhanced view, you can access the detail result by pressing the associated zone field (see previous page).

The diagnosis result of each heater can be shown altenatively as heating power (W), current (A) or resistance (Ohm). To switch from one unit to another, press the column title "W / A / W" and choose the desired unit (menu see below). Afterwards, quit the menu with the red cross.



In both views, you can download the result as a csv-file via USB-interface. **If no wor-king USB-memory device is detected, an error message appears.** 

The csv-file created this way can be opened, edited and saved on every office-pc with all current spreadsheet– or database software programs (example below shows zones 1 - 10) :

STS-Werkzeugdiagnose-05-10-2022									
Zo- ne	Name	Power [W]	Cur- rent [mA]	Resis- tance [Ohm]	Start- temp. [°C]	End- temp. [°C]	Diagn time [sec]	Status	Result
1	Tip 1	575						OK	
2	Tip 2	575						OK	
3	Tip 3	575						defekt	TC interchanged with Zone : 4
4	Tip 4	575						defekt	TC interchanged with Zone : 3
5	Bushing	575						ОК	
6	Manifold A	575						ОК	
7	Manifold B	0						defekt	тс
8	8	575						ОК	
9	9	575						OK	
10	10	575						OK	

The memory device is connected via the USB-port on the back side of the device.

#### Attention:

Given the USB interface definition, any USB-port is hasardous as well from the hardware- (EMV) as from the software standpoint. Please consider this when defining rules of access to the unit.

6.5 Analysis



With the real time analysis, the evolution of important control parameters with time can be shown and analysed as a diagram. Here, first the parameters

- Setpoint
- Proces value (actual temperature) and
- Powersetting (heating power)

are shown for all zones as bargraphs :





If the control behaviour of a given zone shall be analyzed in detail, pressing the "zone" button opens a curve showing that zone:



With the arrow keys (left and right of the zone number), you can scroll through all zones.

Toggle between process value, setpoint and powersetting by pressing the respective case underneath the zone number field.

By pressing the "Bargraph" button (lower right side), you get back to the overview of all zones.

7 Mould memory

	7
Speicher	

With the mould memory, all parameters of all zones can be stored to be reloaded if this mould is re-used for the next time in production.

The mould memory is used for all functions or options present in the actual device, that means, all settings of all functions are stored here. That's why a new set of mould data must only be loaded once, apart from temperature control, all other data e.g. coolant monitoring, pressure survey or others will be active too.

The first position in the mould memory is always "Factory default / RESET", this mould can not be altered or deleted. Here, all standard parameters are stored, a average mould should work at first instance with those settings (exept setpoint 1).

Wer	kzeugspeicher		←
	Aktuelles Werkzeug : NR8000 BACKUP		
1	Werkseinstellung Reset		Workzoug expertieren
2	NR8000 BACKUP	-	
3			
4			Neues werkzeug
5			
6			Werkzeug laden
7			
8			Werkzeug ersetzen
9			
10			Werkzeug löschen
11			
12		-	

The second position is taken by the actual BACK-UP. This is created automatically by the system and updated every 5 minutes without any intervention of the operator. Back-up is loaded, if no other mould is selected during start-up of the system.

)



#### Attention :

When a mould is loaded from the memory (also the default settings), all actual parameters are overwritten and so, lost. If you have found an actual set of parameters by trials, save them first as described below as a different mould (new name).

Storing a set of parameters :

With the button "Save new mould", a menu opens where a neutral name ("New Tool Nr. xxx") is proposed.



This name can be used to save the set of parameters, but also any other name. To change the name, hit the button with the name field. Enter the desired name for the new mould as already described for the zone name (see page 31) and **close the menu with "OK"**.





#### Loading a set of parameters :

1. Choose the desired mould (the name is then marked in GREEN)



#### 2. Press "Loading mould"

ß	Werkzeug exportieren
₿+	Neues Werkzeug
	Werkzeug laden
ß	Werkzeug ersetzen
×	Werkzeug löschen



#### Attention:

When loading a new mould or activating the factory default settings, all actual parameters and settings are overwritten and lost. The loading process starts immediately after the button is hit, no confirmation is asked.

Overwriting a set of parameters :

- 1. Choose the desired mould (the name is then marked in GREEN)
- 2. Press "Replacing mould"
- 3. Acknowledge with "OK"



This function must only be used, if the stored data saved under this name will certainly not be needed anymore. If they might be usefull at a later moment, you better store the actual version under a new name (eg. mould xxx version 2 or so).



#### Deleting a set of parameters :

1. Choose the desired mould (the name is then marked in GREEN )

#### 2. Press "Deleting mould"

3. Acknowledge with "OK"



#### Attention :

Deleting a mould from the memory removes all associated parameters and set-

The factory default / RESET values (first position) can't be removed or overwritten.

As for the result of the mould diagnosis previously described, also the most important parameters of the mould memory can be downloaded via an USB interface (see chapter 6.3).

#### Export a set of parameters :

- 1. Connect an USB-Device onto the USB-socket of the unit
- 2. Choose the desired mould (the name is then marked in GREEN)
- 3. Press "Export Mould"
- 4. Acknowledge with "OK"

8 Alarms



With the program "Alarms", all actual and previous alarms can be checked.

After having choosen the program, a list of **all actual alarms** appears first. If an alarm dissappears (problem solved), this alarm is also automatically deleted from the list.

Timestamp Message   0 21.06.2022 11:01:21   Lastbruch in Zone 1	
0 21.06.2022 11:01:21 Lastbruch in Zone 1	
1 21.06.2022 11:01:21 Stromalarm in Zone 1	
2 21.06.2022 11:01:21 Temp. Alarm in Zone 1	

History

#### To view all alarms, also the previous ones, press the button "History" below the list (see above and next page). This choice is confirmed by green colouring of the button.

Beside alarms, the list shows also all system event such as initialization / start-up as well as all USB-downloads.

Finally, <u>all alarms of the device are shown in the list</u>, also those of other functions such as eg. valve gate control, if the device is equipped with it.



A	arme	← ☆
	Timestamp 🗸	Message
0	21.06.2022 11:01:21	Lastbruch in Zone 1
1	21.06.2022 11:01:21	Stromalarm in Zone 1
2	21.06.2022 11:01:21	Temp. Alarm in Zone 1
3	21.06.2022 11:01:21	Lastbruch in Zone 2
4	21.06.2022 11:01:21	Stromalarm in Zone 2
5	21.06.2022 11:01:21	Temp. Alarm in Zone 2
6	21.06.2022 11:01:21	Stromalarm in Zone 3
7	21.06.2022 11:01:21	Temp. Alarm in Zone 3
	-	History

9 Settings



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This button on the Homescreen leads you to the functions "Settings" of the NOLDEN STS. The extent of the available functions depends on the rights of the actual user (see next page).

Functions which are not allowed with the actual rights are covered dark (see example below, "System")

Einstellungen	X X	←                  ←
	Benutzer	
	Sprache	
	System	
	Version : %s	
		)

*i* The actual software version is shown on the lower side of the screen, please always mention it when calling for questions.

9.1 Settings - User

This function leads you to the user management of the NOLDEN STS, tree levels of user rights are available :

- User (normal operator)
- Setup (shift leader)
- Admin (administrator)



Benutzerverwaltung	← ♠
Bediener	
Einrichter	
Administrator	

The active user at this very moment is indicated by a green colouring of the button (see red arrow).

After the choice of the desired type of user, a PIN-code must be entered, which can be specificly defined by an administrator. No specific code being defined, the standard PIN is "1" for User, "2" for Setup and "3" for Admin.

**During current operation, only the levels "User" and "Setup" must be used.** In the level "Admin", additional interface– and IT-parameters are accessible, which can stop the current operation when modified in a wrong way.

In lower user right levels, certain functions are locked, this is shown by a dark key (example see previous page). If this key is preseed nontheless, the user is guided automatically into the user management section of the settings, where another user rights level may be selcted, if appropriate.





With user rights as "Administrator", an enhanced view is shown:

Here, two other functions are accessible, that are not displayed to other users :

- Modification of password
- Change of the user level when starting the system

- Change of password :

When selecting this function, the following menu opens, where the password can by modified for every user right level :



- Change user rights at start-up :

When selecting this function, the following menu opens, where the user right level when starting-up the system can by modified (Factory default = "Operator")

## 9.2 Settings - Language

Sprache		← 🕅 7
	Dansk	Français
$\leftarrow$	Deutsch	
	English	Nederlands

The choice of the actual language is confirmed by a green colouring of the key. All words in all screens and menus are then adapted accordingly. The number of available languages covers several screens, you can toggle with the arrow keys between them. The active language is also shown on the lower left side of the homescreen (see chapter 6.1).

Adapting the active language is allowed in all user levels.

### 9.3 Settings - System

Settings in this menu are valid for one part on the whole system, that means all present options and functions together. The other part concerns every single option in the system with parameters that should not be accessible for normal users.



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#### This part is only accissible for users with the right level "Administrator".

In addition to the software version, which is displayed also in the part "Settings" on the lower side of the screen, we show here also the detail firmware version. When pressing the button "System", the following dialogue opens :

System		← ♠
Systemeinstellung	Backup	Temperaturregelung
Zeiteinstellung	Werkzeugspeicher >> USB	KNN - Konfiguration
Software Update	USB >> Werkzeugspeicher	Fühlertyp / Temperaturbereich
Wlan	Verbindung	
SSID:Nolden_WLAN PW:Nolden2023	Cloud Einstellung	
URL: nolden-regler.de/webvisu.htm	OPC-UA	
	Version : 2023_KW04_STS_v3.0	

The dialogue menu "System" is split in three parts :

- Left column : Central settings for the whole system such as WiFi, system time and software-Update
- Middle column: Memory back-up as well as OPC-UA activation, cloud settings, if present
- Right column : Specific funktional settings for all options present in the unit



- WIFI-operation of the device :

All devices are equipped with an own WiFi transmitter / receiver.

On the left side of the screen, the access data for the internal WiFi as well as the the webpage name (URL) of the touch system are shown :

Wlan	
SSID:Nolden_WLAN PW:Nolden2023	
URL: nolden-regler.de/webvisu.htm	

Operation of the system can be remote controlled from every WiFi-equipped external device (smartphone, tablet or so) with an internet browser. No applet or program download is required. The connection is not made via the internet, but by a safe **peer-to-peer WiFi connection between participating devices**. The number of devices is unlimited, you can operate from several devices at the same time. To connect to the system, proceed as follows :

#### 1. Log in at the systems own WiFi :

Switch your device to the "Settings / WiFi" page, check for available networks. Now, it must show the network name displayed on the left side of the NOLDEN screen, in the example shown here above, it is "NOLDEN\_WLAN". Then enter the password shown there as well, in this example "Nolden2023" and press "connect" on your device. A warning "No intenet connection on this network" or so may be shown. The range is appr. 15m depending on local conditions.

#### 2. Selecting HTML-page :

The easiest way to do so is to scan the QR-code shown on the NOLDEN screen and press "Activating link", "Connecting" or so on your device. With newer devices, a QR-code scanner is integrated into the camera. If not, download an appropriate QR-code app from your appstore.

If no QR-code scanner is present, you may also enter the URL directly on the webpage line of your internet browser. **Functions of several browsers may be different**, **in doubt**, **choose another browser**.



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#### - Date-/ Time setting :

The date-/time setting is an operating system function of the industrial computer used in this unit, all time relevant program functions use it. This is of particular significance for functions with date / time stamp such as e.g. the alarm history. If the system time is changed, e.g. as the unit is placed in another time zone of the world, all new system entries get then the new system time. Please take that fact into account when analysing time sensitive events.

When pressing the "Date-/timesetting"-key, the following dialogue appears :

Date-/ Timesetting	
Continent:	City: Berlin
time: 15 28 05	Date: 08 10 2022

Please select from the pull-down menues "Continent" and "City" the ones, that come most close to the actual location of the system. Then enter the actual values for date and time by pressing the relevant data field. By doing so, the already known numpad opens, enter the desired numbers and close the numpad with the red cross.

Finally, quit the dialogue with the red cross.


### - Software-Update :

With this function, the complete program software of the controller can be updated. This function is only accessible for users with the user right level "Administrator".

# The update is definitive, this operation cannot be withdrawn without additional actions.

If the update is not successfull or if the new software does not fullfill the expectations of the user, a previous software version must be installed by another software update.

### Attention :

It is highly recommended to perform a software update only in close collaboration with the manufacturer, e.g. during a conference call.

### Procedure :

To perform a software update, you need to prepare first a functional upgrade data file on an USB memory device. This data file is normally provided by the manufacturer of the device and needs to be adapted exactly to the actual control system, e.g. number of control zones, eventual options (e.g. valve gate control) and hardware-specific particularities (e.g. touchscreen drivers).

Updates with unappropriate data files, e.g. from similar but not identical devices or corrupt data files with later modifications, may cause total failure of the device !

The USB memory device must first be connected to the USB-data port on the back side of the device (see chapter 5.2). Then, press the key "Software update" in the system menu (see overview on chapter 9.3). When doing so, a confirmation menu appears, that needs to be acknowledged by pressing the "OK" key. To dis-continue the procedure at that moment, quit the menu now (red cross, upper right corner)



The "OK" key is only enabled, if a functioning USB memory device is recognized on the USB data port on the back side. Otherwise, the key is shown in light grey and cannot be operated.

If a functioning USB memory device is connected and recognized and the "OK" key is operated, but no appropriate program data file is found, another warning menu appears :



When all functional requirements are fulfilled, the complete software update process is now executed automatically, **afterwards**, **the system is operational without any further action by the operator / administrator**.

#### - Back-Up mould memory :

Beside a data export of a single set of mould parameters (see mould memory), you can also make a safety back-up of the total content of the mould memory on an USB memory device. We strongly recommend to perform a complete back-up by the system administrator on a regular basis and to store the USB-memory device away from the controller in a safe place or to perform another back-up routine also for this memory device.

# Not doing this means a total loss of mould data in the case of a damage of the controller (e.g. fire or damage of the internal memory device), so all mould data must then be re-entered manually.

For data saving on an external memory device as well as re-loading the mould memory from this device, the following menu is used (see also overview in chapter 9.3) :





### <u>- OPC-UA :</u>

If the control unit is connected to an injection molding machine with an OPC UA interface, the complete operation can take place via the operating screen of the processing machine. To activate the interface, press the "OPC-UA" button in the middle column of the System Settings screen (see chapter 9.3) and the following dialog box will open:

OPC-UA	×
400 400 0 407	
192.168.0.197	
ON	

If the slide switch is set to "ON / ON", the connection to the machine is made automatically. After exchanging data for the first time, the IP address of the connected system is displayed in the dialog box, see above. No further input is required. The supported operating options of the controller depend on the type of machine and the operating system selected there, for which the documentation of the processing machine must be consulted.

If the OPC-UA connection is active, this is indicated in all overview screens at the top of the screen by displaying the words "OPC-UA".

### Attention :

The protocol according to EUROMAP 82.2 is used to operate the control unit. Other OPC-UA interface types such as 82.1 (SAP etc.) as well as 82.3, 82.4 (temperature control units, robots) are not suitable.

If, in addition to the OPC UA interface, the controller is compatible with other interface types, e.g. the old TTY interface (Arburg / HB-Therm), only one of the two can be used. Since the TTY interface is always active and cannot be activated or switched off, the OPC-UA interface must be switched off.



- Cloud connection settings :



### 9.4 Settings temperature control

In this part of the settings menu, fundamental parameters of the part hotrunner temperature control can be defined, which normally only need to be set once for the device.

Temp	peraturregelung
KNN	- Konfiguration
	Fühlertyp

### - KNN-Configuration :

"KNN" is the abbreviation for "Künstliche Neuronale Netzwerke" (German) or "Artificial Neural Networks". Is designates the control algorithm, which is used by the NOLDEN STS, please see also the general explanation on next page.

Temperature control of your NOLDEN unit is fully automatic, that means with automatic adaptation to the characteristics of every connected heating zone. In rare cases of very unusual behaviour of an heating zone, this automatic adaptation can be switched off. You may then choose from three auxiliary control programs to ensure a stable production process.

# This manual override of the control configuration must only be used in particular cases and with previous consultation of the manufacturer of the unit.

When selecting this function, the following dialogue opens :

Control parameter X		
	Zone: 1	
Automatic		Delta-T: 10
Modus 1		
Modus 2		OK
Modus 3		



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For normal control operation, "Automatic" must be selected. Is this done, the auxiliary control program "Mode 1", Mode 2" or "Mode 3" actually selected by the system is displayed, both by a green colour of the key. If "Automatic" is disabled and one of the three auxiliary programs is manually activated, no automatic adaptation of the control to the heated zone takes place anymore. The manually selected mode stays active as long as it is changed manually, even if another tool was wired to the unit in the meantime.

# The number in the data field "Delta-T" must be "10" and must only be modified by the manufacturer of the unit.

The configuration data as described above are only valid for one single zone. They may be copied as all other data entries to one, several or all other zones as described on page 35.

### General informations about neural networks :

Artificial neural networks (ANN or German KNN) are an new algorithm now established in actual control technology. They adopt the function of bionic control in nature and reproduce it into mathematical models to solve complex control problems.

To do so, every arithmetic problem is fragmented into small discrete steps which are then computed by functional units build upon the image of bionic neurons.



In every neuron, several input signals ("stimuli") are provided with a weight factor, combined and finally computed with an overall transfer function.





Several neutrons are then combined to a network in such a way, that the output signals of one set or "layer" of neurons are used as input signals for the next layer of neurons. One or several layers of neurons are neither fed with external inputs, nor give the their output to external parts of the network, that's why they are called "hidden layers".



This control algorithm is used by the NOLDEN STS instead of the traditional PID control method used up to now by most systems. The most prominent disadvantages of PID control, the so called "overshoot" at the beginning of the control cycle and the need to determine automatically or manually the appropriate P-, I– and D-parameters, are thus avoided. Neural networks are self-adapting and can train themselfves to the prevailing circumstances without the need of any operator input.

No user action is needed to adapt the controller to the controlled system or mould.

- <u>Temperature control - Sensor type and temperature range :</u> When pressing the "Sensor type"-key, the following dialogue appears :

Sensor type	×
Typ J - 400°C	
Typ J - 800°C	
Тур К - 999°С	

(i)



Thermocouples type "J" (Fe-CuNi) or "K" (Ni-CrNi) can be selected. In case of thermocouples type "J", you may also choose between an upper limit of the measuring range of 400 or 800°C.

### Attention :

When changing the type of thermocouple  $(,J^{"} \text{ or },K^{"})$ , the internal wiring of the controller must be adapted to the right compensation wires. If this is not done, signal processing of the sensor data is false and will lead to an erroneous temperature control.



- Unit change °C / °F :

To change the unit of all temperature values, press the button "°C / °F". The following dialogue menu ones :



All temperature values, also setpoints in the mould memory, are automatically transformed into the respective other unit and displayed accordingly

### 9.5 Settings other options

In this part of the settings menu, fundamental parameters for other options as hotrunner temperature control can be defined, if the actual unit is fitted with them. Those settings are then described in the operating manual of the respective option .





### 10 Appendix

Other pin assignments for 24-pole connector



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### Appendix (cont.)

Other pin assignments for 16-pole connector



Serial interface TTY 20mA (ARBURG or others, OPTION)

llme CKF03 20 mA	
Pin	Function
1	+20mA
2	-20mA
3	NC
PE	PE





### 11 Key word index

Subject :		Page :
Α	Actual temperature zone Alarm configuration Alarm connector Alarm de-activate (Temperature) Alarm history Alarm limit values Alarm range ARBURG-interface - see serial interface Arrow keys Artificial neural networks (ANN) see neural networks Autonaming (automatical numbering of zones)	26 ff. 44 ff. 13 ff. 44 ff. 64 36, 44 ff. 36, 44 ff. 82 23, 31, 38, 59 76 49
в	Backup mould memory Boost function	74 25
С	Cloud connection Copying of parameters csv file Current alarm heater	70 35 57, 63 45
D	Data export Date / Time setting	57, 63 72
Е	Export result mould diagnosis	57
F	Fuses (heating)	10, 18
н	Heating current High temperature alarm Homescreen	29 - 30 44 ff. 23
κ	Key lock see user rights level	66
L	Leading zone - see coupling of a zone Leakage alarm Line diagram (temperature curve) see real-time analysis Low current alarm	47 46 58 46

### Key word index (cont.)

<u>Sub</u>	oject :	Page :
Μ	Mains connection. Manual powersetting. Measuring zone. Mould conncetion cable Mould data - loading. Mould data - deletin. Mould data - changing. Mould diagnosis.	10 - 14 48 41 12 - 14 62 63 62 54
Ν	Neural networks	76
0	OPC-UA-interface	14, 15, 75
Ρ	Password see user right leve Password change PIN-Code Powersetting heating zone Powersetting limitation	66 68 67 26 ff. 41
R	Real time analysis	58
S	Serial interface (e.g. ARBURG) Safety load shedding Sensor type setting Sequential heating Single zone view Softstart Softstart Software-Update Software-Version number Setpoint temperature zone Setpoint temperature zone Setpoint limitation Standby Synchronized heating - see zones synchronisation	82 21 78 52 30 42 73 ff. 70 29, 34 40 25 49
Т	Temperature alarm Temperature - change unit Celsius / Fahrenheit Touchscreen Touchscfreen - cleaning	44 ff. 79 22 7

## Key word index (cont.)

<u>Subj</u>	ect :	Page :
U	Update - see software-Update User right level User right level at system start USB-export USB-connector	73 ff. 66 68 57, 63 14 ff.
W	WiFi remote control of the unit	71
Z	Zone - configuration Zone - copiying parameters Zone - coupling to another Zone - enter name Zones - group (select participation) Zones - group view Zones - group view Zone - switching ON/OFF (single) Zones - switching ON/OFF (all) Zones - synchronisation - see synchronized heating	38 35 47 31 51 29 30 28 49

