

MCS[®]e

OPERATOR MANUAL

Inhaltsverzeichnis

| | |
|--|-----------|
| Abbildungsverzeichnis | 4 |
| 1 Introduction | 5 |
| 1.1 Symbols used: | 5 |
| 1.2 Notations | 5 |
| 2 Safety instructions | 5 |
| 2.1 Intended use | 5 |
| 2.2 Information for operators and users | 5 |
| 3 Structure and functionality | 6 |
| 3.1 General information | 6 |
| 3.2 Structure | 6 |
| 3.2.1 MCSe front panel | 7 |
| 3.2.2 Operating front | 7 |
| 3.2.3 LED-strip | 7 |
| 3.2.4 Power card | 7 |
| 3.2.5 Fuses | 7 |
| 3.2.6 Notification contact / Digital input | 8 |
| 3.2.7 Identification on the controller | 8 |
| 3.2.8 Wiring of the plug systems | 8 |
| 4 Commissioning | 9 |
| 4.1 Electrical connection | 9 |
| 4.1.1 Mains power supply | 9 |
| 4.1.2 Mains connection | 9 |
| 4.1.3 Mold connection | 9 |
| 4.2 Operating and display elements | 10 |
| 4.2.1 Display elements | 11 |
| 4.2.1.1 Status display | 11 |
| 4.2.1.2 Zone display | 11 |
| 4.2.2 Operating elements | 12 |
| 4.2.2.1 Main switch | 12 |
| 4.2.2.2 Soft keys | 12 |
| 5 Operation | 14 |
| 5.1 Zone selection | 14 |
| 5.1.1 Selecting a zone | 14 |
| 5.1.2 Selecting multiple zones | 14 |
| 5.1.3 Selecting several consecutive zones | 14 |
| 5.1.4 Selection of all zones | 15 |
| 5.2 Operating mode | 15 |
| 5.3 Setpoints | 16 |
| 5.4 Output rate | 17 |
| 5.5 Controller outputs | 17 |
| 5.6 Parameter | 18 |
| 5.6.1 Zone parameter | 18 |
| 5.6.2 System parameter | 19 |
| 5.7 Boost | 20 |
| 5.8 Standby | 20 |
| 6 Warning and error messages | 21 |



| | | |
|-------------|---|-----------|
| 6.1 | Warnings | 21 |
| 6.2 | Alarms | 22 |
| 7 | Functions and parameterization | 25 |
| 7.1 | Basic settings | 25 |
| 7.1.1 | Access authorizations | 25 |
| 7.1.2 | Fahrenheit display | 26 |
| 7.1.3 | Thermocouple type | 26 |
| 7.2 | Control behaviour | 27 |
| 7.2.1 | Control parameters P I D | 27 |
| 7.2.2 | Output level | 27 |
| 7.2.3 | Maximal output level | 27 |
| 7.3 | Heating | 28 |
| 7.3.1 | Softstart (Gentle heating) | 28 |
| 7.3.2 | Compound heating | 28 |
| 7.4 | Hot runner monitoring | 29 |
| 7.4.1 | Temperature monitoring | 29 |
| 7.4.2 | Average output level | 31 |
| 7.4.3 | Broken sensor | 31 |
| 7.4.4 | Heating current monitoring | 31 |
| 7.4.5 | Triac monitoring | 32 |
| 7.5 | Special functions | 32 |
| 7.5.1 | BOOST | 32 |
| 7.5.2 | STANDBY | 33 |
| 7.5.3 | Load detection | 33 |
| 7.5.4 | Default parameter | 33 |
| 8 | Parameter overview..... | 34 |
| 8.1 | Zone parameter | 34 |
| 8.2 | System parameter | 35 |
| 9 | Technical data..... | 36 |
| 10 | Spare parts + accessories..... | 37 |
| 11 | Appendix | 38 |
| 11.1 | Terminal bridges of the star-delta supply | 38 |
| 11.1.1 | Terminal jumpers in star network (state at delivery!) | 38 |
| 11.1.2 | 11.1.2 Terminal bridges in delta network | 38 |
| 11.2 | Notification contact / Digital input | 39 |

Abbildungsverzeichnis

| | |
|---|----|
| Figure 1 - MCSe front panel | 7 |
| Figure 2 – Type label | 8 |
| Figure 3 – Wiring of plug systems | 8 |
| Figure 4 – Operating and display elements | 10 |
| Figure 4 – Zone display | 11 |
| Figure 5 – Temperature monitoring | 30 |
| Figure 6 - Star-network | 38 |
| Figure 7 - Delta-network | 38 |


1 Introduction

1.1 Symbols used:


| | | |
|---|-----------------|---|
|  | Caution/Warning | Information on possible damage to property or personal injury |
|  | Information | Important information |

1.2 Notations

Menu structures between words are indicated by the > symbol and depicted in the same way on the device.

Interaction with the operator is denoted by the finger symbol. 

2 Safety instructions

| | |
|---|--|
|  | Please read this document completely and carefully before commissioning or operating the device. |
|---|--|

2.1 Intended use

The hot runner controller is used to control the temperature of heating circuits and is designed for use under precisely defined conditions, such as supply voltage and temperature. The operator must therefore ensure that the controller is only used under operating conditions that comply with the technical data. The manufacturer is not liable for damage resulting from non-compliance with the intended use.

The hot runner controller is not suitable for use beyond the limits defined in the technical data and during its design. In addition, the use of spare parts from third parties and the implementation of non-described maintenance activities constitute failure to comply with the intended use.

Alterations, conversions and other modifications are made exclusively at the operator's own risk and could pose safety hazards. The manufacturer and distributor of this device cannot be held liable for direct and indirect damage resulting from improper handling or treatment.

2.2 Information for operators and users

The controllers are operated on the low-voltage network. The relevant safety regulations must be observed when connecting up the controller and performing maintenance on it. In addition, the local and general safety regulations must be observed for its installation and operation. The operator is responsible for compliance with these regulations. The operator must additionally make this documentation available to the user and provide instruction in the correct operation of the device. The user must be familiar with this documentation. In order to ensure reliable and safe operation, the individual user is required to observe the information and warnings.

The controllers may only be brought into operation by authorized specialist personnel. Under the terms of these operating instructions, specialist personnel are persons who can recognise and assess the dangers associated with the work entrusted to them on the basis of their specialist training, their experience and their knowledge of standards.

The device is checked carefully prior to delivery and has passed the tests specified in the test plan for its production, in conformity with the manufacturer's valid quality guidelines. To prevent any damage to the controller, it must be transported and stored in the correct manner. Further safety-related notices are marked in the individual sections of this documentation.

3 Structure and functionality

3.1 General information

MCSe hot runner controllers are especially suited to the temperature control of hot runner molds on injection molding machines. In use, the controllers are connected directly to the mold via cables.

During operation, the hot runner controllers deliver electric current to the heating units for an injection mold. The so-called heating current leads to an adjustable temperature increase in the heating units and hence in the mold. Continuous temperature monitoring takes place in parallel via connected thermocouples. In the event of deviations between the actual temperature recorded and the temperature set on the hot runner controller, the heating current is automatically adjusted until the two temperatures are identical.

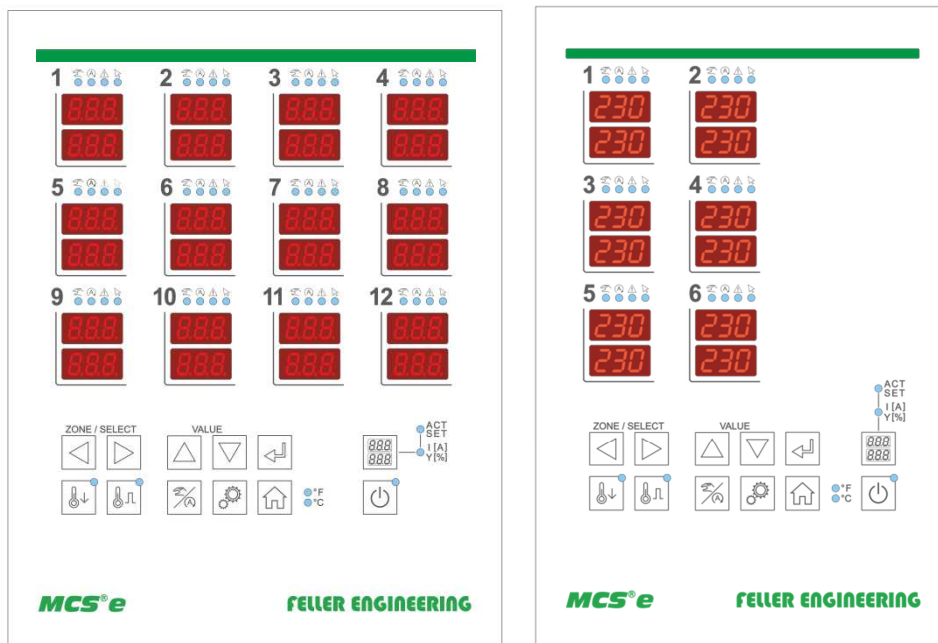
The controllers are available in different variants. These differ solely in terms of the number of control circuits that are possible – which are also referred to as heating zones. Depending on the variant, hot runner controllers are available with 2 to 12 heating zones (in steps of 2).

3.2 Structure

Housing front: MCSe hot runner controller is operated from the housing front. In addition to the main switch for switching on and off, the controllers have 12 keys for convenient operation. Furthermore, the front contains all visualization elements. The setpoint and actual values of the individual zones are displayed via 7-segment displays. If required, the display can be switched over to heating current and output rate. In addition, status LEDs provide information about operating modes and messages of the individual zones. The controller status is visualized in color via a led strip visible from afar. In control mode, without a current error or warning message, this display lights up green. In case of a warning or alarm, the display changes to yellow or red (traffic light status). This allows a quick assessment of the controller status even from a distance. A detailed description of the display and operating functions can be found in chapters 4.2 and 5.

Back of housing: All connections are located on the back of the housing. In addition to the connecting cable, which is used for connection to the supply voltage, the controllers offer a further connection for a potential-free alarm contact and a 24V digital input for external control of the set-back operation. The connection to the hot-runner mold is established via plug-in systems.

3.2.1 MCSe front panel



3.2.2

Figure 1 - MCSe front panel

3.2.3 Operating front

The convenient operation of the MCSe hot runner controller is carried out on the front panel (Figure 1 - MCSe front panel) via 12 keys. The front also contains all visualization elements. The setpoints and actual values of the individual zones are displayed via 7-segment displays. If required, the display can be switched over to heating current and output level.

3.2.4 LED-strip

The status of the controller is displayed in color via a strip of LEDs visible from afar. This enables a quick assessment of the current controller or tool status.

3.2.5 Power card

Inside the housing there are power cards which control connected heaters and record measured temperatures of the thermocouples. Each zone is switched individually via relays on the power cards, so that individual zones can be switched off separately and a seamless production process is always guaranteed.

3.2.6 Fuses

The controllers have three different types of fuses inside the housing. Each zone has two fuses on the power card. One fuse is used to protect the load output (fuse in the fuse holder below the heat sink). The second fuse, on the other hand, is required for use in delta networks. In addition, another control fuse is located in a terminal on the bottom of the housing.

3.2.7 Notification contact / Digital input

MCSe hot runner controllers have a potential-free message contact and a digital control input, which are brought out via a 7-pin plug on the rear of the unit. A contact diagram of the built-in plug is given in chapter **Fehler! Verweisquelle konnte nicht gefunden werden..**

The control input is PLC-compatible, i.e. it operates over a voltage range of 13...30 VDC with a typical current consumption of approx. 8.5 mA. The controller can be switched to standby mode via the input. The controller remains in this mode as long as the signal is present. Deactivation via the standby button on the device is not possible.

The potential-free notification contact is used to transmit the controller status to an injection molding machine. When warnings or alarms occur, the contact opens. Accordingly, the contact is normally closed (NC) and opens as soon as an alarm or warning is present. Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.** provides an overview of the behavior when messages occur.

3.2.8 Identification on the controller

The type label is mounted on the side of the controller housing. It contains the type designation with the number of zones, the electrical connection data and the manufacturer's data.

| Typ / Type | | MCSe 6 | |
|------------------------------|--|------------------------------------|-----------|
| S/N | 20091 | Prod. KW / CW | 03 / 2020 |
| Code | E7H1-AKB4-C1Z6-87A | | |
| Versorgung / Supply | <ul style="list-style-type: none"> ● Y 230/400 VAC 50/60 Hz ○ Δ 230 VAC 50/60 Hz | | |
| Belastung / Load | 3x 16 A | | |
| Schutzart / IP Class | IP20 | | |
| Temp. Fühler / Sensor | Fe-CuNi Type J | | |
| FELLER ENGINEERING GmbH | | Made in Germany | CE |
| Meldebuchse / Message Socket | | | |
| Pin 1+3 | Relay | Sammelmeldung / collective message | |
| Pin 2+6 | | Steuereingang / Digital input | |

Figure 2 – Type label

3.2.9 Wiring of the plug systems

The plugs for connecting the temperature sensors and heating elements to a hot runner are available on the rear of the controller. The customer-specific wiring plan for the plug systems is located on the side of the controller housing (see Figure 3 for an example).


| Zone | Sensor X1 | | Load X1 | |
|------|-----------|----|---------|------|
| | + | - | N | 230V |
| 1 | 13 | 14 | 2 | 1 |
| 2 | 15 | 16 | 4 | 3 |
| 3 | 17 | 18 | 6 | 5 |
| 4 | 19 | 20 | 8 | 7 |
| 5 | 21 | 22 | 10 | 9 |
| 6 | 23 | 24 | 12 | 11 |

| Zone | Sensor X2 | | Load X2 | |
|------|-----------|----|---------|------|
| | + | - | N | 230V |
| 7 | 13 | 14 | 2 | 1 |
| 8 | 15 | 16 | 4 | 3 |
| 9 | 17 | 18 | 6 | 5 |
| 10 | 19 | 20 | 8 | 7 |
| 11 | 21 | 22 | 10 | 9 |
| 12 | 23 | 24 | 12 | 11 |

Figure 3 – Wiring of plug systems

4 Commissioning

4.1 Electrical connection

| | |
|---|---|
|  | Important! Before the device is connected to the supply voltage, a check must first be performed to ensure that the mains electricity conditions comply with the specifications on the type plate. |
| | The electrical connections must be performed by a qualified electrician. Commissioning and operation while the controller is running are only to be carried out by authorized qualified personnel! |
| | Switching off all the outputs or individual zones will not protect any of the outputs against hazardous voltages. Before working on the connected heating elements, the associated connections must be unplugged, or the entire device disconnected from the mains power. Before the device is opened, it must be disconnected from the mains power! |

4.1.1 Mains power supply



Before connecting the device to the supply voltage, a check must be conducted to ensure that the mains electricity system is correct. The hot runner controllers are prepared by default for operation in a star network (3x400VAC + N + PE) but can also be operated in a triangular network (3x230VAC + PE). For operation in a triangular network without a neutral conductor, it is essential to follow the local regulations for the installation of electrical systems. The terminals in the controller must be bridged accordingly for use in a star or triangular network. Annex **Fehler! Verweisquelle konnte nicht gefunden werden.** contains a clear terminal connection diagram.

4.1.2 Mains connection

To ensure correct operation, the hot-runner controller is connected to the low-voltage mains by using the connecting cable connected to the unit.

4.1.3 Mold connection

To connect the individual control zones to the corresponding injection mold, use must be made of appropriate leads for the sensor and heating unit connection.

| | |
|---|---|
|  | Please note: it must always be ensured that the internal wiring, the wiring of the cable set and the wiring in the mold are suitably coordinated with each other. |
|  | Important! To exclude any effects of potential shifts, the injection molds that are connected up must be properly earthed in all cases. |

4.2 Operating and display elements

The operation as well as all display elements of the hot runner controllers is carried out via the soft keys on the front of the housing. The following illustration shows the front view of a 6-zone controller, from which all operating and display elements are shown.

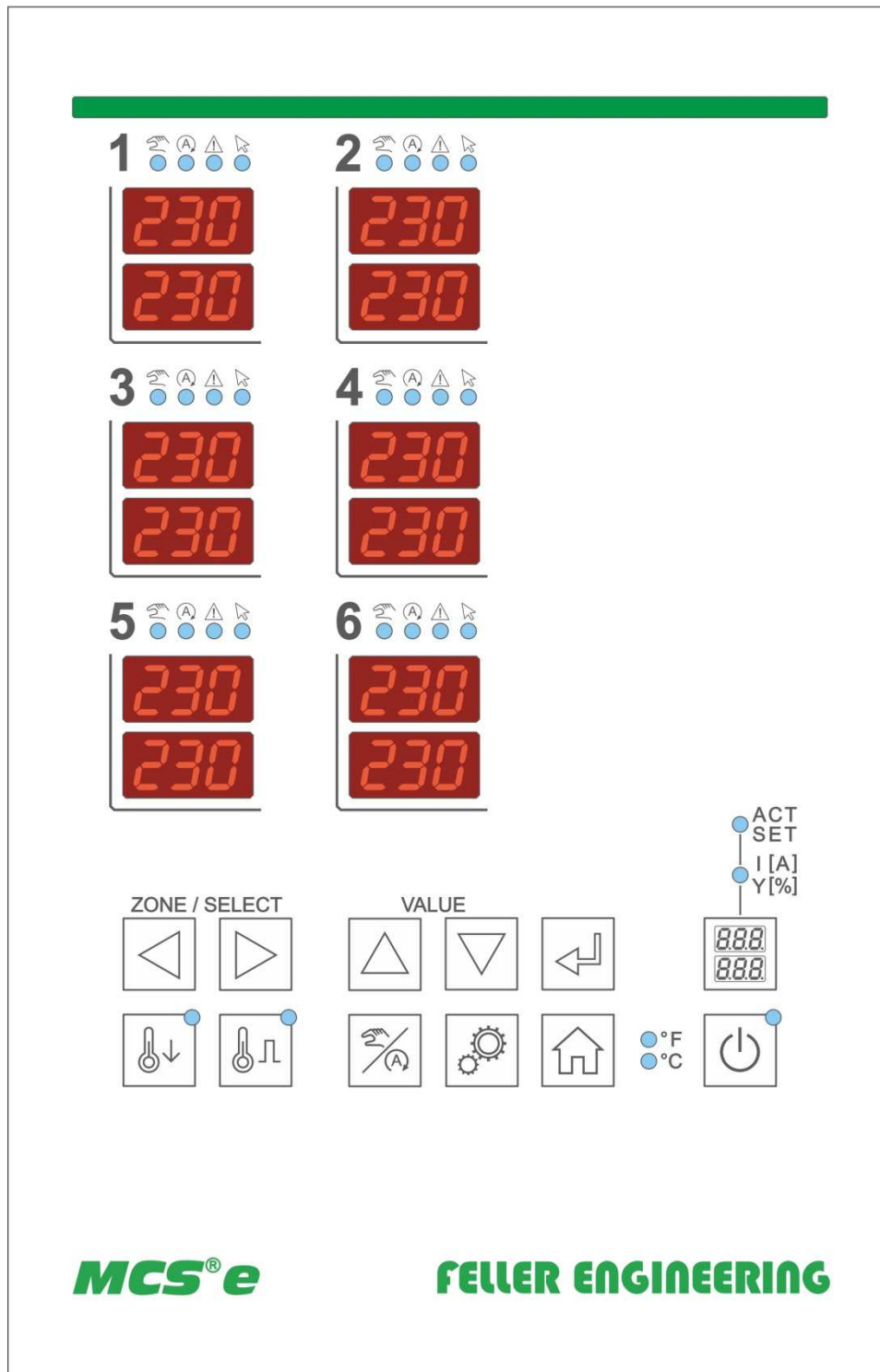





Figure 4 – Operating and display elements

4.2.1 Display elements

4.2.1.1 Status display

The status of the controller is indicated by a LED strip in the front. In control mode, this indicator lights up green. In case of a warning or alarm, the display changes to yellow or red (traffic light status).

| | |
|---|--|
|  | Green signals all is well. The controller operates in normal mode. |
|  | Yellow indicates warning messages that indicate a deviation from the normal state. |
|  | Red indicates alarms. Depending on the fault, outputs of corresponding zones are also deactivated. |

4.2.1.2 Zone display

Each heating zone has two 7-segment displays and four LEDs for status indication. The 7-segment displays show either the setpoint and actual value or the heating current and degree of operation. In addition, the four LEDs can also be used to display the states shown below.

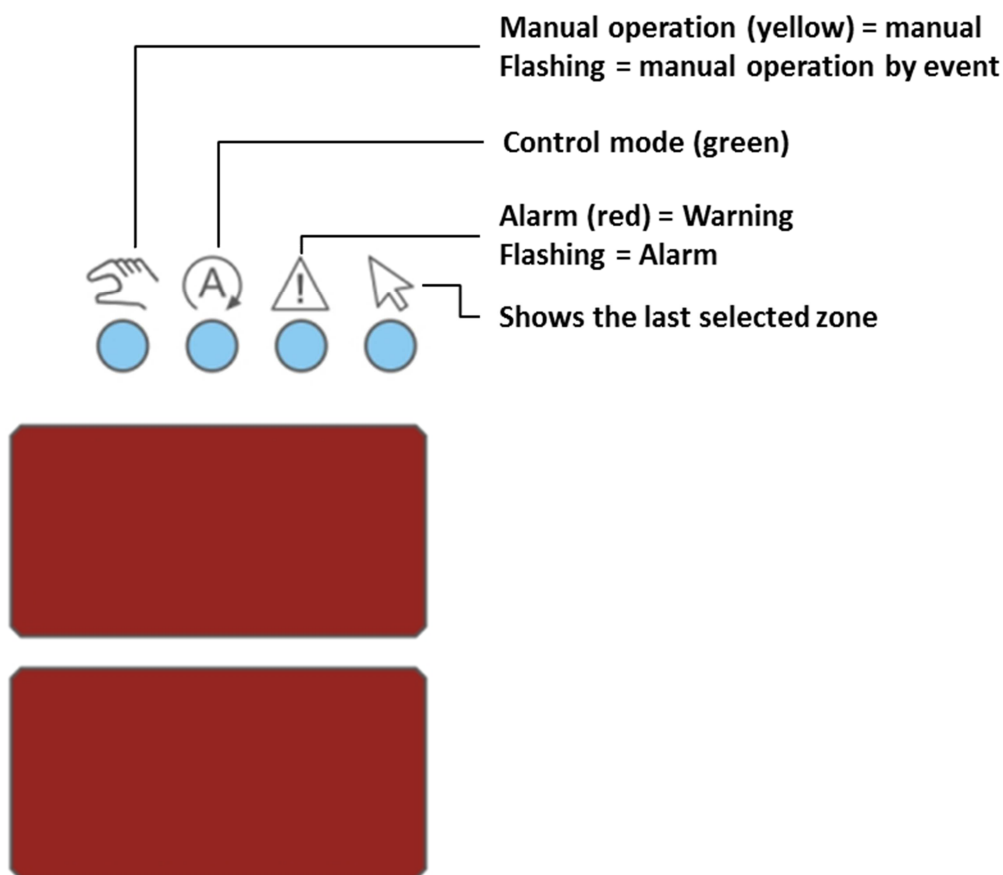


Figure 5 – Zone display









4.2.2 Operating elements

4.2.2.1 Main switch



The main switch is located on the back of the housing. The switch must be operated to switch the controller on and off.

4.2.2.2 Soft keys

| Operating element | Description |
|--|--|
| <p>ZONE / SELECT</p>  | <p>Selection of zones</p> <p>Each time the arrow keys are pressed, the display jumps one zone further.</p> |
| <p>VALUE</p>  | <p>Change in value</p> |
|  | <p>Confirm button / Acknowledge error</p> |
|  | <p>Boost</p> |
|  | <p>Standby</p> |
|  | <p>Change operating mode</p> |
|  | <p>Parameterization / System information</p> |
|  | <p>Basic view: Display of all zones / Reject input</p> |

Shift key for the zone display

Display: actual value (ACT) and setpoint (SET)



Display: Current (I[A]) and output level (Y[%])



Activating / deactivating the controller outputs




Temperature unit of the display



5 Operation

5.1 Zone selection




5.1.1 Selecting a zone


| Step | Operation | Description |
|------|---|---|
| 1. |  | <p>Each time the arrow keys are pressed, the display jumps one zone further.</p> <p>All other zones that are not selected are hidden.</p> |

5.1.2 Selecting multiple zones


| Step | Operation | Description |
|----------------------|---|------------------------|
| 1. |  | Select zone |
| 2. |  | Press confirmation key |
| ... repeat 1. and 2. | | To select any zones |

5.1.3 Selecting several consecutive zones






| Step | Operation | Description |
|------|---|--|
| 1. |  | Selection of the 1st zone to be selected |
| 2. |  | Keep confirmation key pressed |
| 3. |  | With each keystroke a zone is added to the selection |

4.  Release the confirmation key







5.1.4 Selection of all zones

| Step | Operation | Description |
|------|---|--|
| 1. |  | <p>The basic rule is:</p> <p>In the basic view, all zones can be operated and are virtually already selected for a value change.</p> <p>"The Zones that you see can also be operated."</p> |










5.2 Operating mode

| Step | Operation | Description |
|------|--|---|
| 1. | <div style="text-align: center;"> <small>ZONE / SELECT</small>   </div> | <p>Select the zone(s) as described in 5.1</p> |
| 2. |  | <p>Selection of the operating mode</p> <p>The display switches between</p> <p>Manual mode <i>Hand</i></p> <p>Control mode <i>on</i></p> <p>Zone off <i>off</i></p> <p>Note: The display flashes and must be confirmed within 5 seconds.</p> |
| 3. |  | <p>Confirm the entry</p> <p>The display stops flashing</p> |
| 4. |  | <p>Press the Home button to return to the overall display of all zones.</p> |


5.3 Setpoints

| Step | Operation | Description |
|------|--|---|
| 1. | <p>ZONE / SELECT</p>   | Select the zone(s) as described in 5.1 |
| 2. | <p>VALUE</p>   | <p>Use the buttons to set the setpoint to the desired value.</p> <p>The display flashes, indicating that the value has not yet been accepted.</p> |
| 3. |  | <p>Confirm the entry</p> <p>The display stops flashing</p> |
| 4. |  | <p>Press the Home button to return to the overall display of all zones.</p> |

5.4 Output rate










| Step | Operation | Description |
|------|--|--|
| 1. | <div> <div>ZONE / SELECT</div> <div>   </div> </div> | Select the zone(s) as described in 5.1 |
| 2. |  | Selection of the operating mode. Operate until manual mode <i>Hand</i> is displayed. |
| 3. |  | Confirm selection |
| 4. |  | Switching the zone display to Current (I) and output rate (Y) |
| 5. | <div> <div>VALUE</div> <div>   </div> </div> | Use the buttons to set the output level to the desired value. The display flashes, indicating that the value has not yet been accepted. |
| 6. |  | Confirm the entry. The display stops flashing. |
| 7. |  | Press the Home button to return to the overall display of all zones. |

5.5 Controller outputs










| Step | Operation | Description |
|------|---|---|
| 1. |  | Activating / deactivating the controller outputs either switches on all heating zones in control mode and manual operation or switches off all zones. |

5.6 Parameter



5.6.1 Zone parameter

| Step | Operation | Description |
|------|--|---|
| 1. | <div> <div>ZONE / SELECT</div> <div>   </div> </div> | Select the zone(s) as described in 5.1 |
| 2. | <div>  </div> | Press key to change to the parameterization level |
| 3. | <div> <div>ZONE / SELECT</div> <div>   </div> </div> | <p>Select parameter.</p> <p>Each time the arrow keys are pressed, the parameter is incremented or decremented.</p> <div> <div>PO1</div> <div>PO2</div> <div>PO3</div> </div> <div> <div>0</div> <div>400</div> <div>25</div> </div> |
| 4. | <div> <div>VALUE</div> <div>   </div> </div> | <p>Use the buttons to set the value of the selected parameter to the desired value.</p> <p>Note! Password entry required before parameterization (default "22"). Set the current password with the keys and confirm. The parameter can then be changed</p> <p>The display flashes. This means that the value has not yet been accepted.</p> |
| 5. | <div>  </div> | <p>Confirm the entry.</p> <p>The display stops flashing.</p> |
| 6. | <div>  </div> | Press the Home button to return to the overall display of all zones. |


5.6.2 System parameter

| Step | Operation | Description |
|------|--|---|
| 1. |  ... 2s | <p>Press and hold for 2s. The display changes to the system parameter level.</p> <p>This level contains system information that cannot be changed:</p> <div>  System Information </div> <p>However system parameters and system functions can be changed. The representation is made as <i>SYS PAR</i> or <i>SYS Fun</i>:</p> <div>  System Parameter  System Function </div> |
| 2. | <p>ZONE / SELECT</p>  | <p>Select system parameters.</p> |
| 3. | <p>VALUE</p>  | <p>Set the value of the selected parameter to the desired value using the arrow keys.</p> <p>Note! Password entry required before parameterization (default "22"). To do this, set the current password with the keys and confirm. The parameter can then be changed</p> <p>The display flashes, indicating that the value has not yet been accepted.</p> <p>Example: System parameter <i>HH</i> with value 500</p> <div>  </div> |
| 4. |  | <p>Confirm the entry. The display stops flashing.</p> |
| 5. |  | <p>Press the Home button to return to the overall display of all zones.</p> |

5.7 Boost

| Step | Operation | Description |
|------|---|--|
| 1. |  | Select the zone(s) as described in 5.1 |
| 2. |  | <p>Pressing the Boost button increases the setpoint value for the selected zones by the value stored in the zone parameters. The duration of the boost process is stored in parameters.</p> <p>If necessary, the standby mode is ended by the boost.</p> |

5.8 Standby




| Step | Operation | Description |
|------|--|---|
| 1. |  | <p>Pressing the standby button lowers the setpoint to the value stored in zone parameters.</p> <p>Confirming again deactivates the standby mode.</p> <p>The standby mode terminates the boosting if necessary.</p> <p>The standby mode can also be activated via the digital 24V control input.</p> |

6 Warning and error messages

MCSe controllers provide information about the current status via status and 7-segment display. Warnings and alarms are shown as abbreviations in the 7-segment display. In addition, the LED band indicates the controller status in green, yellow and red. In the standard state, the LED band lights up green. An existing warning is displayed in yellow. Warning messages alert the plant operator to possible problems. However, production operation is continued. A suddenly occurring alarm is displayed in red. If it occurs, the plant operator must intervene. For critical alarms, an error acknowledgement or a device restart may be necessary. The following subchapters contain a detailed list of all warnings and alarms.


6.1 Warnings

Warnings are shown in yellow  by the status display (LED stripe).

| 7 segm. display | Description / Causes | Notification contact |
|---|---|--------------------------|
|  | Positive temperature deviation <ul style="list-style-type: none"> The actual value of the sensor is above the tolerance band set as zone parameter $P03$. | Warning is displayed |
| | <ul style="list-style-type: none"> Tolerance band (zone parameter $P03$) too small, if oscillation occurs due to the process. | |
|  | Negative temperature deviation <ul style="list-style-type: none"> The actual value of the sensor is below the tolerance band set as zone parameter $P03$. | Warning is displayed |
| | <ul style="list-style-type: none"> Controller is in the heat-up phase Tolerance band (zone parameter $P03$) too small Heat output may not be sufficient Heating could be defective Sensor not in contact with this zone | |
|  | Broken sensor <ul style="list-style-type: none"> No connection to the sensor. | Warning is not displayed |
| | <ul style="list-style-type: none"> No sensor connected Sensor cables / connecting cable defective Sensor plug connections defective Zone operates with the average output level in manual mode | |

6.2 Alarms

Alarmer werden durch die Störmeldeanzeige (LED-Band) in Rot ■■■■ dargestellt.

| 7 segm. display | Description / Causes | Notification contact |
|-----------------|---|----------------------|
| HH | Shut-off temperature <ul style="list-style-type: none"> - The actual value of the sensor is above the maximum permissible temperature (system parameter <i>HH</i>). - All outputs are switched off. The controller can only be restarted by restarting or acknowledging the error by . The actual value must also be below the parameter <i>HH</i>. | Alarm is displayed |
| | <ul style="list-style-type: none"> - Setpoint too close to <i>HH</i> value - Triac malfunction. This results in current flowing and heating without output level | |
| Hi | Over temperature <ul style="list-style-type: none"> - The measured actual value of the sensor is greater than the limit value set under Zone parameter <i>PQ2</i> (Hi-Alarm). - The corresponding zone is switched off until the actual value falls below the value of the parameter <i>PQ2</i> again. | Alarm is displayed |
| | <ul style="list-style-type: none"> - Alarm limit (zone parameter <i>PQ2</i>) is too close to the setpoint - Triac malfunction. This results in current flowing and heating without output level | |
| Lo | Under temperature <ul style="list-style-type: none"> - The actual value of the sensor is below the limit value set under zone parameter <i>PQ1</i> (Lo alarm). | Alarm is displayed |
| | <ul style="list-style-type: none"> - Alarm limit (zone parameter <i>PQ1</i>) is too close to the setpoint - Heat output may not be sufficient - Heating could be defective - Sensor not in contact with this zone - Sensor polarity reversal - Controller is heating up | |

| 7 segm. display | Description / Causes | Notification contact |
|-----------------|---|----------------------|
| -E- | Broken sensor <ul style="list-style-type: none"> No connection to the sensor, in addition the average output level could not yet be recorded. | Alarm is displayed |
| | <ul style="list-style-type: none"> No sensor connected Sensor cables / connecting cable defective Sensor plug connections defective | |
| Pol | Sensor polarity <ul style="list-style-type: none"> The polarity of the sensor is reversed Due to incorrect polarity, negative temperature values can be measured by the controller. Therefore the corresponding zone is switched off at -15°C and can only be switched on again after the polarity has been changed. | Alarm is displayed |
| | <ul style="list-style-type: none"> Sensor wrong polarity. This causes the measured temperature to show falling values during heating. | |
| IFU | Fuse <ul style="list-style-type: none"> Zone is not supplied with power | Alarm is displayed |
| | <ul style="list-style-type: none"> Fuse defective | |
| ltr | Triac <ul style="list-style-type: none"> Without control of the outputs a current flows | Alarm is displayed |
| | <ul style="list-style-type: none"> - Triac defective, switches through permanently <p>Note: The relevant zone is switched off and the alarm output opens. After exchanging the triac, the controller can be operated again.</p> | |
| Pot | Sensor voltage <ul style="list-style-type: none"> The voltage potential on the sensor cable is impermissibly high | Alarm is displayed |
| | <ul style="list-style-type: none"> Wiring error Cable or plug defective Cable pinching | |

| 7 segm. display | Description / Causes | Notification contact |
|-----------------|---|----------------------|
| noI | No current flow <ul style="list-style-type: none"> When controlling the outputs with a output level > 0% no current flows | Alarm is displayed |
| | <ul style="list-style-type: none"> Cable or plug defective Heating defective Triac defective, does not switch through No heating connected | |
| rEL | Relay <ul style="list-style-type: none"> Internal hardware error - Output relay of the zone defective Message must be acknowledged | Alarm is displayed |
| | <ul style="list-style-type: none"> Defect of the device hardware | |
| dI | Current deviation <ul style="list-style-type: none"> The rated current set in zone parameter P^{14} deviates from the current monitoring tolerance set in zone parameter P^{15}. | Alarm is displayed |
| | <ul style="list-style-type: none"> Heating defective or partially failed Correct rated current set under zone parameter P^{14}? Tolerance band (zone parameter P^{15}) too small | |
| IH1 | Load short circuit <ul style="list-style-type: none"> An impermissibly high current flows through a short circuit in the heating circuit Message must be acknowledged | Alarm is displayed |
| | <ul style="list-style-type: none"> Wiring error Cable or plug defective Line pinch | |
| CAN | CAN-Bus fault <ul style="list-style-type: none"> Communication error of the internal power card | Alarm is displayed |
| | <ul style="list-style-type: none"> Identical address assigned twice Cable not connected correctly Missing final resistance of the last participant | |

7 Functions and parameterization

7.1 Basic settings

(see chapter 5.6.2 System parameter)

7.1.1 Access authorizations

| | | |
|-------------|--|--------------------------------------|
| Description | System parameter $\mathcal{C}od$: Password The control unit is protected against unauthorized settings by a password = identification code $\mathcal{C}od$. The password can be individualized after it has been entered. <p style="text-align: center;">The release is done with code "22"</p> System parameter IdL: User level The IdL parameter determines the degree of locking, with which the device is locked against inputs. 0= No interlock 1= Only setpoints and operating modes free 2= All parameters locked IdL is always only accessible via the code System parameter P_{in}: Pin Code If the password $\mathcal{C}od$ has been changed and is subsequently unknown, the password can be reset via the parameter P_{in} . A master password must be generated by the manufacturer via the pin shown. | |
| Parameter | System parameter | Settings |
| | $\mathcal{C}od$ ID Code | 0...999, Default value = 22 |
| | IdL ID Level | 0...2, Default value =1 |
| | P_{in} ID Pin Code | (read only, value cannot be changed) |

7.1.2 Fahrenheit display

| | | |
|-------------|--|--|
| Description | <p>This parameter indicates the temperature unit in which the controller is displayed and operated. During operation, the setting can also be read off via LED indicators on the display.</p> <ul style="list-style-type: none"> 0: °C 1: °F | |
| Parameter | <p>System parameter</p> <p><i>FAH</i> Fahrenheit-display</p> | <p>Settings</p> <p>0 / 1, Default value = 0 → °C</p> |

7.1.3 Thermocouple type

| | | |
|-------------|---|--|
| Description | <p>The <i>TEC</i> parameter specifies the type of thermocouples used for the entire controller.</p> | |
| Parameter | <p>System parameter</p> <p><i>TEC</i> Thermocouple type</p> | <p>Settings</p> <p>0: Fe/CuNi Typ J</p> <p>1: Ni/CrNi Typ K with temperature range max. 800°C</p> <p>Default value = 0</p> |

7.2 Control behaviour

7.2.1 Control parameters P I D

| | | |
|-------------|---|--|
| Description | <p>The automatic determination of the control parameters P I D is called classification. It is performed automatically after the controller outputs are switched on and overwrites all previous settings of the control parameters.</p> <p>PID-Parameter</p> <p>When classifying the zones, the controller sends a defined heating impulse to each zone in order to automatically determine the heating behaviour of e.g. the nozzle or manifold. The controller determines the suitable control parameters for P, I and D and stores them in the parameters <i>P04</i>, <i>P05</i> and <i>P06</i>.</p> <p>The process can be recognized by the flashing green LED band and can take up to 60s for large, sluggish objects. The determined classification can be viewed for each zone under Parameter <i>02</i>.</p> <p>Activate and deactivate classification</p> <p>To obtain special settings of the P, I and D parameters in any case, the classification per zone can be switched off with the parameter <i>P07</i> = "0".</p> | |
|-------------|---|--|

| Parameter | Zone parameters | Settings |
|-----------|--------------------------------------|--|
| | <i>P04</i> P-Band | 0...100% |
| | <i>P05</i> Tn Reset time | 0...999s |
| | <i>P06</i> Tv Derivative time | 0...999s |
| | <i>P07</i> Activate classification | OFF = 0 ON = 1 Default value = 1 |
| | <i>02</i> Classification of the zone | Read only |

7.2.2 Output level

| | | |
|-------------|---|--|
| Description | <p>The parameter specifies the output level for manual operation. If the controller is already in manual mode, the setting of <i>P13</i> can also be made as described in section Fehler! Verweisquelle konnte nicht gefunden werden..</p> | |
|-------------|---|--|

| Parameter | Zone parameters | Settings |
|-----------|-------------------------|-------------------------------|
| | <i>P13</i> Output level | 0...100% Default value: 0% |

7.2.3 Maximal output level

| | | |
|-------------|--|--|
| Description | <p>This parameter limits the maximum output power of the heaters via the output level.</p> | |
|-------------|--|--|

| Parameter | Zone parameter | Settings |
|-----------|---------------------------------|---------------------------------|
| | <i>P12</i> Maximal output level | 0...100% Default value: 100% |

7.3 Heating

7.3.1 Softstart (Gentle heating)

| | | |
|-------------|--|--|
| Description | <p>All zones are gently heated separately to 100°C, independent of a higher set-point temperature. Up to a temperature of 50°C, each zone is heated with a maximum degree of operation of 50%.</p> <p>From 50 - 100°C the degree of operation is determined according to the existing temperature, i.e. from 60°C with a degree of operation of 60% etc.</p> <p>After reaching 100°C, the soft start is completed and the zone can heat at full power.</p> <p>Softstart is already set at the factory.</p> | |
| Parameter | Zone parameter <i>P08</i> Softstart | Settings 0: Without Softstart 1: With Softstart Default value: 1 |

7.3.2 Compound heating

| | | |
|-------------|--|---|
| Description | <p>Joint heating with respect to the slowest zone</p> <p>This is to prevent the complete mold, manifold and nozzles from heating up with thermal imbalances.</p> <p>All zones are heated in such a way that they may only have a certain temperature difference to each other (system parameter <i>CL</i>)</p> <p>The slowest zone (whose number can be read off as information in the system parameter <i>SL</i>) works with maximum output. The other zones are limited in the degree of operation in such a way that they may only advance by the set temperature difference. The parameter <i>P09</i> defines the assignment of a zone to the "compound".</p> | |
| Parameter | Zone parameter <i>P09</i> Compound heating | Settings 0: Zone without compound 1: Zone with compound |
| | System parameter <i>CL</i> Max temperature difference of the compound <i>SL</i> Slowest channel | Settings Adjustable from 1° ... 100° Default value: 10° Read only |
| Example | <p>Zones 1 to 6 should be heated together. The temperature difference during the heating process should not exceed 20° C. Zones 7 and 8 should not be part of the heating compound. The settings:</p> <p>Zone 1 to zone 6 : Parameter <i>P09</i> = 1</p> <p>Zone 7 and Zone 8: Parameter <i>P09</i> = 0</p> <p>System parameter <i>CL</i> = 20</p> | |

7.4 Hot runner monitoring

7.4.1 Temperature monitoring

| | | |
|-------------|--|--|
| Description | Monitoring of the zones for under- or overtemperature | |
| | <p>Limit value for undertemperature: Lo alarm If the process value is below this value, an alarm is given. The LED band lights up red and the alarm contact is switched.</p> <p>Limit value for overtemperature: Hi alarm: If the process value is above this value, the zone is switched off until the process value falls below the Hi-alarm again. The LED band lights up red and the alarm output is switched.</p> <p>Negative temperature deviation: dL tolerance band In case of a dL alarm, the process value deviates too much from the setpoint and is below the specified tolerance band. The LED band lights up yellow and the alarm output is switched. The zone is NOT switched off. The size of the tolerance band is set in parameter <i>P03</i>.</p> <p>Positive temperature deviation: dH- tolerance band In case of a dH alarm, the actual value deviates too much from the setpoint and is above the specified tolerance band. The LED band lights up yellow and the alarm output is switched. The zone is NOT switched off. The size of the tolerance band is set in parameter <i>P03</i>.</p> <p>Shut-off temperatur: HH-Alarm The <i>HH</i> parameter defines the shut-off temperature of the device. If the -value is exceeded, an alarm is generated and all zones are switched off. The LED band lights up red.</p> | |
| Parameter | Zone parameter | Settings |
| | <i>P01</i> Lo-Alarm | -15...600°C (800°C for NiCrNi as Thermocouple) Default value: 0°C |
| | <i>P02</i> Hi-Alarm | 1...600°C (800°C for NiCrNi as Thermocouple) Default value: 400°C |
| | <i>P03</i> dL / dH Tolerance band | 1...600°, Default value: 15°C |
| | System parameter | |
| | <i>HH</i> HH-Alarm | 0...600°C (800°C for NiCrNi as Thermocouple) Default value: 400°C |

Example

The set point is 200°C.

Above and below the setpoint, a limit value should be set at intervals of 15°C. A warning is to be issued when these limits are exceeded or undercut. The LED band lights up yellow and the alarm output switches.

If the temperature exceeds 250°C an alarm is to be triggered and the zone switched off.

The LED-band lights red and the alarm output switches.

If the temperature falls below 150°C an alarm should also be triggered.

The LED band is red and the alarm output switches.

A value of 400°C should be set as the maximum upper temperature limit for all zones. If this value is exceeded, all zones are switched off.

The following settings must be made:

| Parameter | Zone parameter | Settings |
|-----------|--------------------------------------|----------|
| | <i>P01</i> Lo-Alarm | 150°C |
| | <i>P02</i> Hi-Alarm | 250°C |
| | <i>P03</i> dL / dH Tolerance band | 15°C |
| | System parameter | |
| | <i>HH</i> HH-Alarm | 400°C |

The following figure illustrates the relationships:

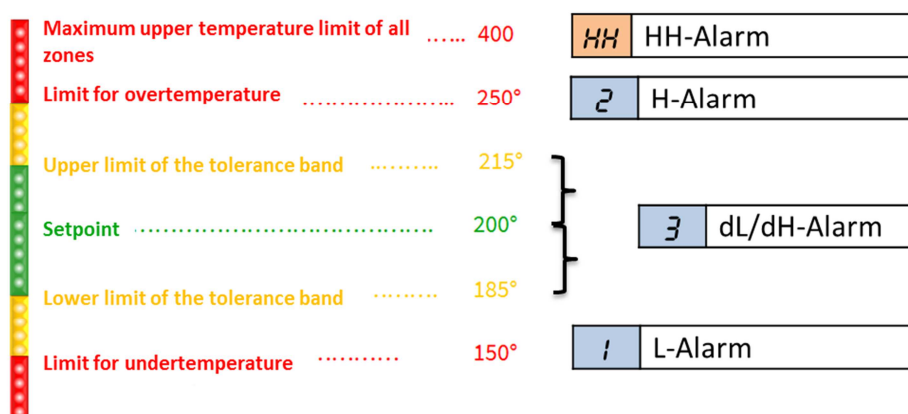





Figure 6 – Temperature monitoring

7.4.2 Average output level

| | | |
|-------------|--|--|
| Description | <p>This parameter is calculated during regular control operation.</p> <p>Note! After a set point change, the average output is temporarily deleted and recalculated. The output is also deleted if a zone is put into manual mode.</p> | |
| Parameter | Zone parameter  Average output level | Settings Is determined by the controller |
| Procedure | Start up the system. Let it work at the setpoint for approx. 10 minutes. Afterwards the determined value can be read in the zone parameter  . | |

7.4.3 Broken sensor

| | | |
|-------------|---|--|
| Description | <p>A sensor break is automatically detected by the controller.</p> <p>In the event of a sensor break, the controller automatically switches over to the average output level. This sets the zone to manual mode and accepts the parameter as the new output level. After the sensor break has been rectified, the zone automatically returns to control operation.</p> <p>The sensor break is shown as an alarm in the display.</p> <p>Note! If no average output was saved before the sensor break occurred, the zone switches off the corresponding output in case of an alarm.</p> | |
| Example | Zone 2 has a current setpoint of 110°C. According to parameter  , the average output of the zone is 35%. In the event of a sudden sensor break, zone 2 would now be put into manual operation and 35% would be specified as the degree of operation. | |

7.4.4 Heating current monitoring

| | | |
|-------------|--|---|
| Description | <p>The current flow to a heater can be continuously controlled by the heating current monitor.</p> <p>Current: Reference value To activate the heating current monitoring, the nominal current ("normal" current) of the heating element must be entered in Parameter <i>P14</i>. The current measurement monitors this value with the tolerance according to parameter <i>P15</i>.</p> <ul style="list-style-type: none"> • 0,0: no heating current monitoring • > 0: this value is monitored <p>Current: Tolerance Parameter <i>P15</i> defines the tolerance for heating current monitoring. The current measurement monitors the value of parameter <i>P14</i> with this tolerance.</p> | |
| Parameter | Zone parameter <i>P14</i> Current: Reference value <i>P15</i> Current: Tolerance | Settings 0,0...25,0A, Default value=0,0A 0,0...16,0A, Default value=0,5A |

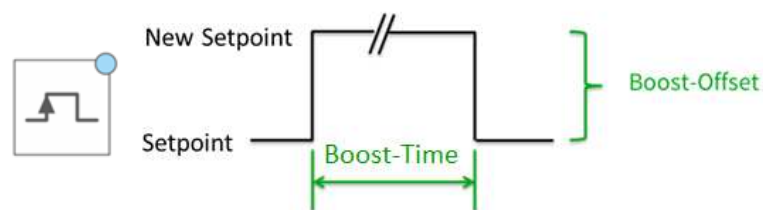
7.4.5 Triac monitoring

| | |
|-------------|---|
| Description | <p>Each zone has its own triac monitoring (triac = electronic power switch which directly controls the heating circuits), in order to be able to detect a possible control interruption of a zone, e.g. nozzle heating.</p> <p>A defective triac is detected if a current flows without controlling the outputs.</p> <p>If a current flows, this zone is switched off and an error message <i>!Er</i> is displayed.</p> |
|-------------|---|

7.5 Special functions

7.5.1 BOOST

| | |
|-------------|---|
| Description | <p>By executing the boost function, the temperature in selected zones is raised by a fixed value - the boost offset (parameter <i>Pi0</i>) - for a certain time (parameter <i>Pi1</i>).</p> <p>The control is carried out via the "Boost button".</p> |
|-------------|---|



| Parameter | Zone parameter | Settings |
|-----------|---------------------------|-----------------------------|
| | <i>Pi0</i> Boost-Offset | 0...50K, Default value=0K |
| | <i>Pi1</i> Boost-Duration | 0...900s, Default value=60s |

7.5.2 STANDBY

Description The use of the standby function is recommended in order to protect the tools and the raw material they contain as well as to reduce energy costs during downtimes. The standby temperature can be set according to the materials used.

It is controlled via the "Standby button". The standby function always applies to all zones.



| Parameter | Zone parameter | Settings |
|-----------|--------------------------------|---------------------------------|
| | <i>P16</i> Standby temperature | 0...300°C Default value=20°C |

7.5.3 Load detection

Description With this parameter the load detection of the controller can be deactivated. This allows error-free control of very small nozzles with heating currents < 100 mA.

1 = Deactivate load detection

| Parameter | Zone parameter | Settings |
|-----------|---------------------------|--------------------------|
| | <i>P17</i> Load detection | 0, 1 Default value: 0 |

7.5.4 Default parameter

Description **System parameter** *Std*
 With this parameter a reset of all settings to the factory setting can be initiated.
 1 = Load default parameters

| Parameter | System parameter | Settings |
|-----------|------------------------------|--------------------------|
| | <i>Std</i> Default parameter | 0, 1 Default value: 0 |

8 Parameter overview

8.1 Zone parameter

| | Zone parameter | Short description | Chapter |
|------------|-------------------------|---|---------|
| P01 | Lo-Alarm | Lower temperature limit value / under-temperature | 7.4.1 |
| P02 | Hi-Alarm | Upper temperature limit value / excess temperature | 7.4.1 |
| P03 | dL/dH-Tolerance band | Permitted deviation of actual temperature from setpoint | 7.4.1 |
| P04 | P-Band | Parameter of the PID-Controller | 7.2.1 |
| P05 | Tn Reset time | Parameter of the PID-Controller | 7.2.1 |
| P06 | Tv Derivative time | Parameter of the PID-Controller | 7.2.1 |
| P07 | Classification | Activate / deactivate classification | 7.2.1 |
| P08 | Softstart | Gentle heating due to limitation of output | 7.3.1 |
| P09 | Compound heating | Common, slow heating of zones | 7.3.2 |
| P10 | Boost-Offset | Brief increase of the target temperature | 7.5.1 |
| P11 | Boost-Duration | Time of temperature rise at BOOST | 7.5.1 |
| P12 | Maximal output level | Output level limitation to maximum value | 7.2.3 |
| P13 | Output level | Output presetting in manual operation | 7.2.2 |
| P14 | Current reference value | Nominal current of the zone to be monitored | 7.4.4 |
| P15 | Current tolerance | Tolerance of current monitoring | 7.4.4 |
| P16 | Standby temperature | Lowering the temperature to a new set point | 7.5.2 |
| P17 | Load detection | Switching off the load detection for error-free control of very small nozzles | 7.5.3 |
| 01 | Average output level | The average output level (Read Only) | 7.4.2 |
| 02 | Classification of zone | Found classification (Read Only) | 7.2.1 |

8.2 System parameter

| Display | | System parameter | Short description | Chapter |
|--------------------------|-------------|--|--|---------|
| <i>SYS</i> <i>Inf</i> | <i>SC</i> | Slowest channel | The slowest zone during heating is stored here | 7.3.2 |
| <i>SYS</i> <i>PAR</i> | <i>HH</i> | HH-Alarm | Shut-off temperature: Maximum upper temperature limit value for all zones | 7.4.1 |
| <i>SYS</i> <i>PAR</i> | <i>Δt</i> | Max temperature difference of the compound | Maximum temperature deviation of the compound heating | 7.3.2 |
| <i>SYS</i> <i>PAR</i> | <i>FAH</i> | Fahrenheit display | Presentation of the display | 7.1.2 |
| <i>SYS</i> <i>PAR</i> | <i>ΔTΔ</i> | Thermocouple type | Type of the connected thermocouples | 7.1.3 |
| <i>SYS</i> <i>PAR</i> | <i>IdL</i> | ID Level | User level | 7.1.1 |
| <i>SYS</i> <i>PAR</i> | <i>Code</i> | ID Code | Password | 7.1.1 |
| <i>SYS</i> <i>Inf</i> | <i>Pin</i> | Pin Code | The displayed value is required if the password has been forgotten. In this case contact the service | 7.1.1 |
| <i>SYS</i> <i>Fun</i> | <i>Std</i> | Default parameter | Reset to factory settings | 7.5.4 |
| <i>IOI</i> <i>Inf</i> | <i>VER</i> | Software Version | Shows the current software version of the power card | |
| <i>IOI</i> <i>Inf</i> | <i>ΔTΔr</i> | Temperature heat sink | Shows the current temperature of the heat sink of the power card inside the case | |
| <i>IOI</i> <i>Inf</i> | <i>ΔTΔc</i> | Temperature Thermo-Terminal | Shows the current temperature of the thermocouple terminal on the power card | |
| <i>SYS</i> <i>Inf</i> | <i>VER</i> | Software Version | Shows the current software version of the firmware | |

9 Technical data

| | | | |
|--|---|----------|----------------------------------|
| Feller Engineering GmbH | MCSe | | |
| Number of zones | 2 | 4 to 6 | 8 to 12 |
| Housing | | | |
| Dimensions W x H x D | 175 x 270 390 mm* ¹ | | 205 x 275 x 390 mm* ¹ |
| Weight | 13kg | | 15kg |
| Body material | Galvanized steel | | |
| Protection class | IP 20 | | |
| Environmental conditions | | | |
| Operating temperature | 0...50°C | | |
| Maximum housing surface temperature * ² | 55°C | | |
| Air humidity | 0...90% rel. Humidity, no condensation | | |
| Storage temperature | -25 ... +75°C | | |
| Operation and display | | | |
| Display per zone | 2x three-digit 7-segment | | |
| Control panel | 12 Soft keys | | |
| Electrical connection | | | |
| Connection cable with CEE plug | 1 x 16 A | 3 x 16 A | 3 x 32A |
| Supply voltage | 3 x 190 – 400 V AC, N, PE | | |
| Switchable to | 3 x 110 – 230 V AC, PE | | |
| Tolerance | + 5% / -15% | | |
| Main switch | 40 A 3-pole | | |
| Mains fuses | | | |
| Control voltage electronics | 1 x 2,5A mid-term contracts (5 x 20mm) | | |
| Internal heating outputs | per zone 16A gRL (6,3 x 32mm) | | |
| Additional fuses (delta) internal | per zone 16A slow (6,3 x 32mm) | | |
| Power consumption | max 30 W without load | | |
| Thermocouple inputs | | | |
| Thermocouple | Fe-CuNi Typ J - 0...700°C | | |
| convertible to | NiCr-Ni Typ K | | |
| Cold junction compensation | Internal | | |
| Measurement accuracy | ±0,25 K | | |
| Temperature query | 4x128 / second | | |
| Load outputs | Bistable, electrically insulated | | |
| per zone | 1x heating, 230VAC switchable | | |
| Shortest controller response | 10ms at 50Hz | | |
| Current per zone | max. 16A at 80% Duty cycle | | |
| Beware! Observe the total load capacity of the electrical connecting cable | | | |
| Minimum load | 100 W | | |
| Control behavior | PI, PD or PID separately adjustable for all zones | | |
| Message contact/ control input | | | |
| Notification contact (relay contact) - potential-free | | | |
| Maximum voltage | 250V AC | | |
| Maximum current | 4A at cosφ = 1; 2A at cosφ = 0,5 | | |
| Digital input - isol. potential free | 13 – 30V DC | | |

^{*1}: Depth gauge without mold connection

^{*2}: at an air temperature of 20°C

10 Spare parts + accessories

The following table contains a useful list of spare parts that can be replaced if necessary, taking into account the safety instructions:

| Spare parts | Order number |
|---------------------------------------|---------------------|
| Control fuse | 62-00012 |
| Control zone protection 16A gRL | 62-00087 |
| Power card incl. heat sink and triacs | BP-12231C |
| Message contact / digital input cable | AU-00209 |
| Triac 16A | 05-00019 |

11 Appendix

11.1 Terminal bridges of the star-delta supply

11.1.1 Terminal jumpers in star network (state at delivery!)

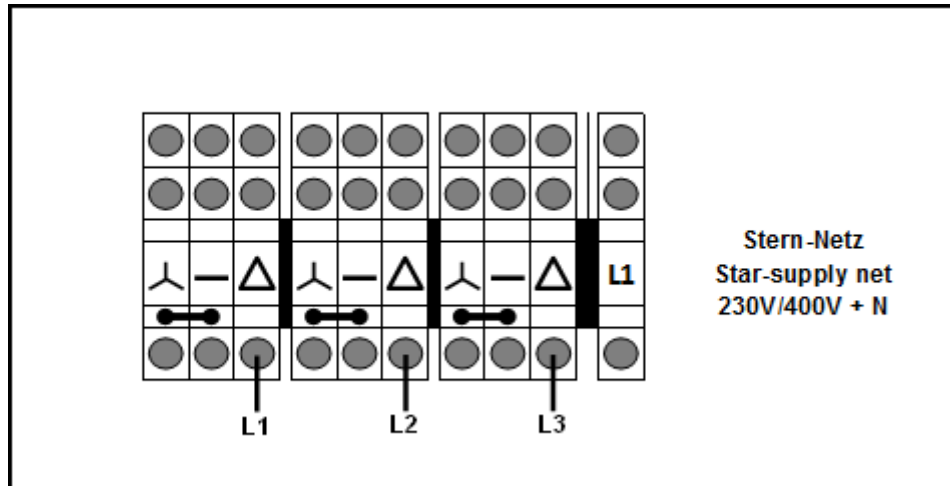


Figure 7 - Star-network

11.1.2 11.1.2 Terminal bridges in delta network

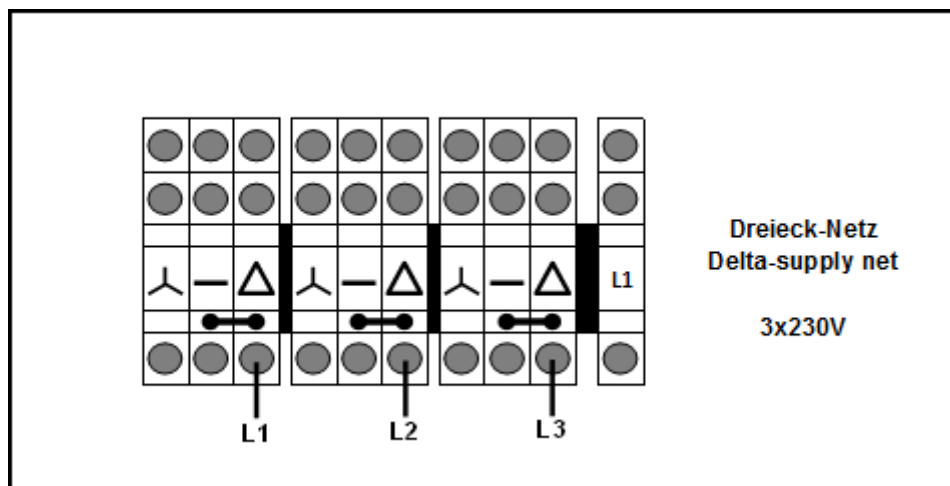


Figure 8 - Delta-network

11.2 Notification contact / Digital input

| Contact | Function | |
|---------|----------------------|-----------------|
| 1.+3. | Notification contact | Normally closed |
| 2. | Digital input | 0V Standby |
| 6. | Digital input | 24V Standby |



Access authorizations 25
Alarms 22
Average output level 31
Boost 32
Broken sensor 31
Compound heating 28
Default parameter 33
Delta 40
Digital input 8
Fuses 7
Heating current monitoring 31
LED-strip 7
Main switch 12
Maximal output level 27
Notification contact 8

Operating front 7
Output level 27
PID 27
Power card 7
Safety instructions 5
Standby 33
Star 40
Structure 6
System parameter 36
Temperature monitoring 29
Thermocouple type 26
Triac 32
Type label 8
Warnings 21
Zone parameter 34

