

EWIKON



HPS-C-TS Hotrunner Controllers

Operating manual for multi-zone controllers with Touch-Screen-Control

Valid for all controllers with PC-control,
item number 68010.120,
from software version 1.8.0

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Safety instructions:

Before working on the plant, ensure it is off-circuit. Unit switch OFF and disconnect mains plug. Connection, repair and maintenance work may only be carried out by qualified skilled personnel.

Before putting into service the system is to be inspected in accordance with DIN EN 60204 – 1 (11/1998 - Safety of machinery - electrical equipment) and the generally recognised rules of sound engineering practice. The connected components can become very hot. Appropriate precautionary measures are to taken when putting into service and during operation.

Scope:

This EWIKON control system can be used to operate EWIKON hotrunner systems in dry rooms in industry.

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Features

HPS controllers

- **Adaptive PID control** with **self-optimization**, facility for manual fine tuning
- **Heating current monitoring** in 230V operation, **current control** in 5V operation
- **Setpoint ramps** with freely selectable increase
- Intelligent drying mode with **leakage current measurement**
- **Increase function** (time-limited) for heating the control zones after starting up, manually or via external contact
- **Decrease function**, manually or via external contact
- **Load error detection** for short circuit, interruption and partial load failure
- **Thermocouple-error detection** for short circuit, interruption or reverse polarity
- **Multilingual display**

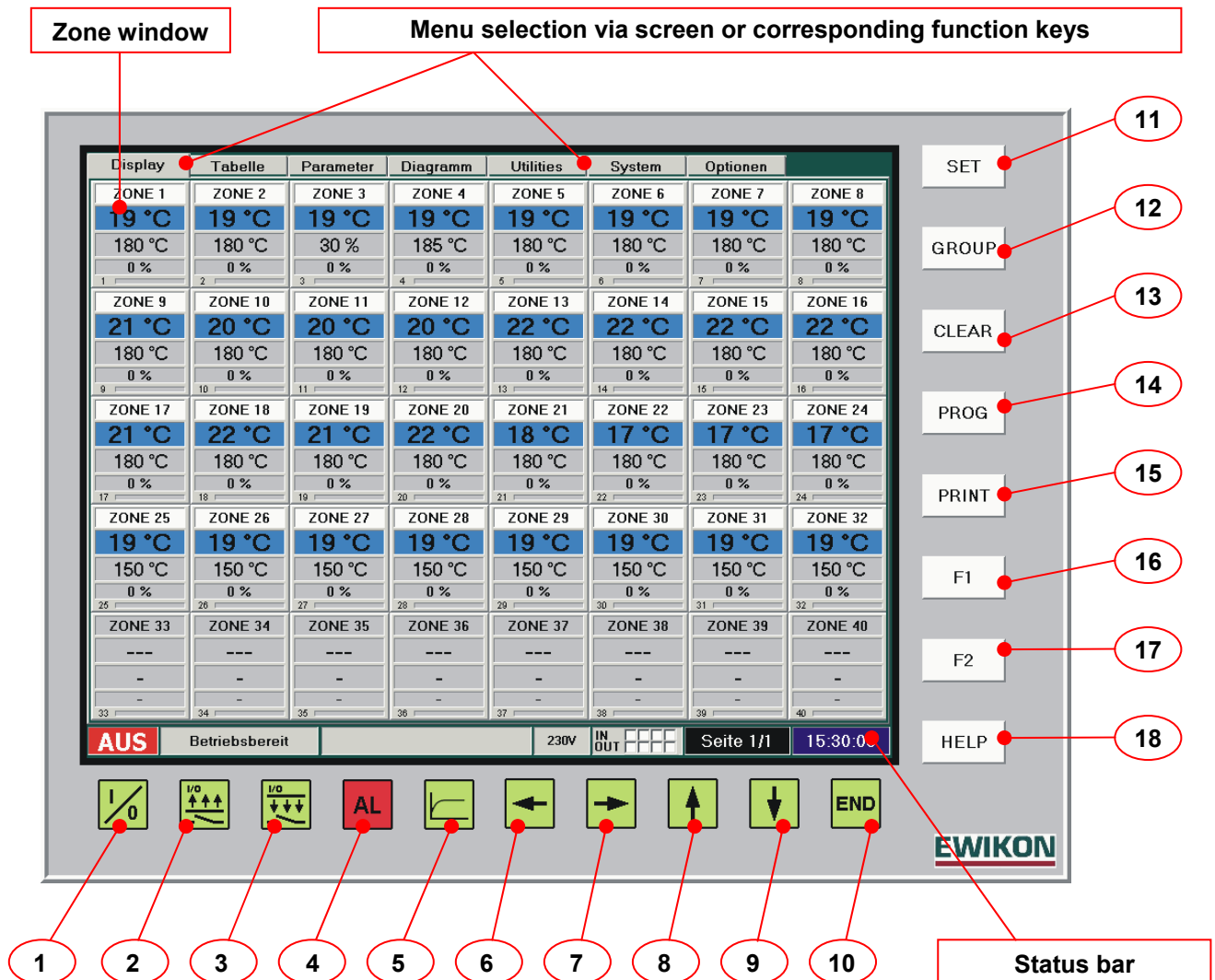


HPS-C - TS touchscreen control

- Easy control of up to **160 control zones**
- **Grouping of** related control zones
- **Data storage facility** for various mould settings
- **Image viewer**, e.g. for assignment and connection plans
- **Error and event logging**
- **Protection of the critical settings and data** through various access levels
- **Data recording** for overview and comparison (reference) diagrams
- **Even heat up function** for the whole hotrunner system
- **Diagnosis function** for mould start-up and checking

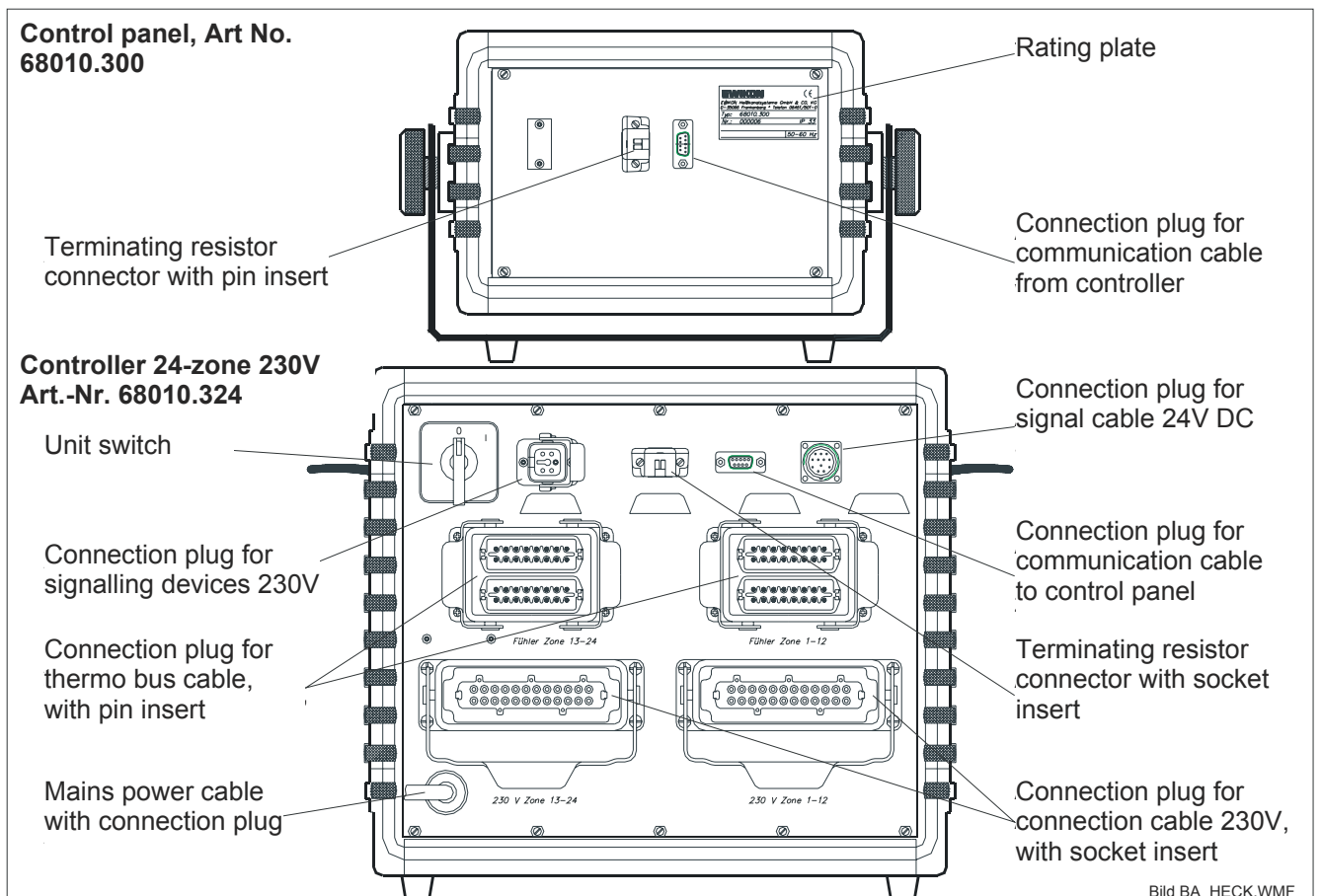
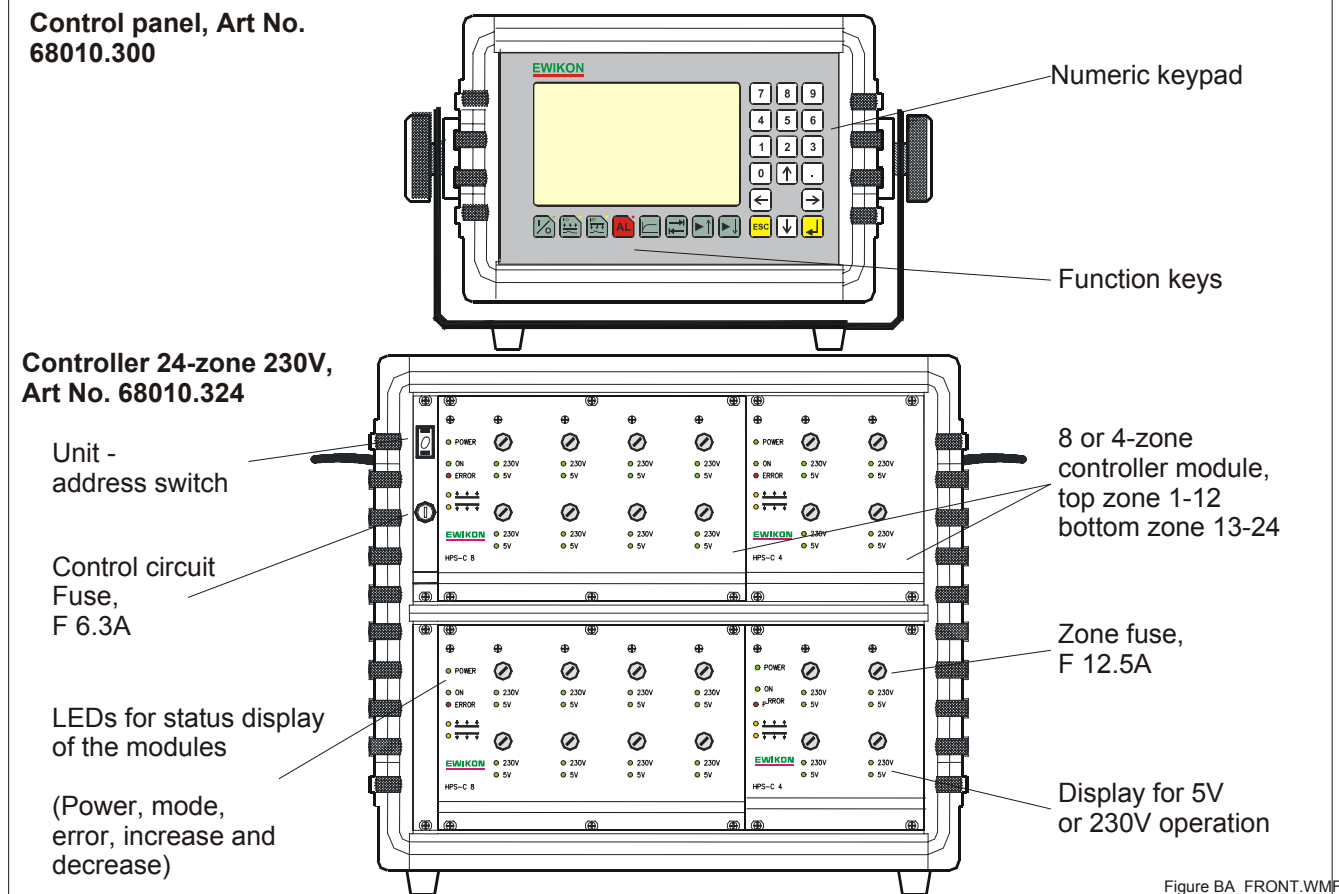
Display elements and controls

The PC version is controlled via 26 membrane keys arranged around the display and varying dialog boxes on the touch sensitive screen surface.



No.	Name	Function
1	ON / OFF	Switch the hotrunner system on and off
2	Increase	Manual increase mode ON / OFF
3	Decrease	Manual decrease mode ON / OFF
4	ALARM	Open the alarm window with the currently queued alarm messages
5	Diagram	Switch between display and setup in the chart menu
6	Cursor left	Page / move left
7	Cursor right	Page / move right
8	Cursor up	Page / move up
9	Cursor down	Page / move down
10	END	Quit the program, shutdown PC or switch to Windows
11	SET	Set value input via pop-up window
12	GROUP	Carry out or open zone grouping
13	CLEAR	Cancel zone grouping
14	PROG	Open mould management
15	PRINT	Open the print function (screen view or list)
16	F1	Special function, menu dependent
17	F2	Special function, menu dependent
18	HELP	Online help

Connection and putting into service



The figures on the page on the left show an example of a 24-fold controller 230V with external control panel. The PC control is connected analogous to the control panel, irrespective of whether it is realised as a controller rack or wall-mounted device.

To avoid problems, the following procedure should be followed to start up the control system:

- Before connecting the equipment to the electricity supply the touchscreen monitor (TS) must be fixed to the swivelling arm supplied. Depending on the model, this is mounted on the controller or must be installed in a suitable place on the injection moulding machine. The grounding stud on the TS housing must be connected to ground with the PE conductor cable on the unit's swivelling arm or via a separate PE conductor cable.
- Connect the communication cable at the TS and at the controller. Ensure that the connector at the second CAN interface of the controller is fitted with terminating resistance (Art. No. 18096 with socket insert).
- Connect signal cable 24V DC to the controller and the injection moulding machine controls, if unit group functions (decrease, fault messages, ...) are required.
- If necessary, connect addition signalling device 230V to the controller connector provided.
- Insert the controller's mains plug. Ensure that the power supply matches the data given on the controller's rating plate!
- Connect connection cable 230V to the rear of the unit and the mould or connection cable 5V to the front of the unit and the mould. For 5V operation, also connect the ground cable to the mould and the controller, the assignment is described in greater detail in the chapter "connector pin and terminal assignment".
- Connect thermo cable at the rear panel of the unit and the mould.
- Switch on the unit switch on the rear panel of the unit (in several models also on the side panel).
- After switching on the Windows operating system starts first on the TS. Then the application program for operating the HPS-C controllers is automatically loaded and run.
- After being switched on the TS checks the system configuration connected to the system bus and displays it. The last used settings are then loaded. This process can take 1 to 2 minutes, depending on the number of control zones. After the system has successfully started up the TS starts in the "Display" menu, depending on the system configuration, the display is roughly as shown on page 5.

If problems occur while importing the system configuration, the following measures should be taken:

- If several controllers are connected to a touchscreen, the address switch of the controllers must be set (from 0 to 3). The zones are consecutively assigned in the TS starting with unit "0". Maximum 4 controllers can be connected to a TS; up to 160 zones are supported.
- Check whether the terminating resistor connector is fitted at the end of the communication cable (last unit).
- Check for secure fit of the interface cable at all connections and the condition of the cable (pinching along cable layout, damage ...).

Further operation of the system and value inputs as described on the following pages.

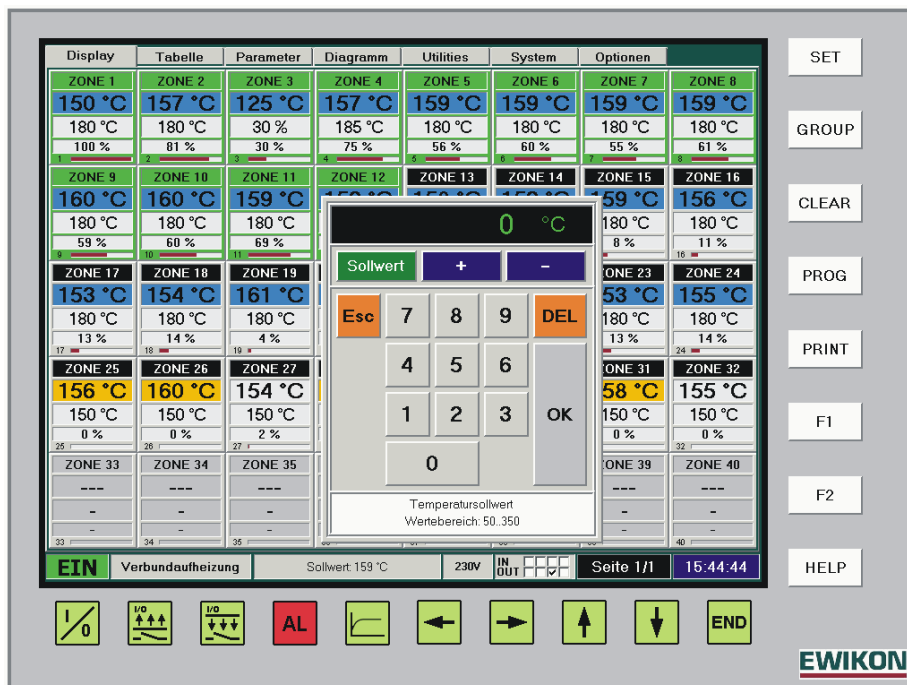
Operating the system

Introduction

The HPS-C control system with control monitor is controlled using 26 surrounding keys and the corresponding buttons on the touchscreen surface. All the settings for the control system can be entered in the various menus described in detail in the following text. The buttons represented as tabs or the keys arranged directly above these (not shown in the figures) are used to switch between the menus. After starting up the system the "Display" menu is displayed in which, if the basic configuration is correct, all controller operations (switch on, switch off, set value changes, increase, ...) can take place.

The following settings can be set or adjusted in the various menus; detailed explanations are given in the following chapters:

- **"Display"** Operating the system, set value changes, display up to 40 zones per page as zone window
- **"Table"** Operating the system, set value changes, display up to 20 zones per page in tabular form
- **"Parameters"** Basic mould setting (activate zones, operating mode, setpoint, increase and decrease values, ...)
- **"Chart"** Graphic display of the process values (temperature, output power, output current)
- **"Utilities"** Image viewer for connection and wiring plans or mould drawings
- **"System"** Setting/Adjusting the system parameters, system status overview, mould management
- **"Options"** Password entry, special function selection, error log book, permanent data recording



To change set values, the relevant zones are selected in the "Display" and "Table" menus, after pressing the "SET" key the input window appears on the screen. In the other menus, immediately after "touching" the value to be changed the respective input window appears. Most values are entered using the number keypad and are accepted with "OK" or quit with "ESC". Information about which value is being changed and in which range the entry can be made appears in the lower information window.

Above the number keypad there are three buttons which can be used to choose whether:

- **"Set value"** the entered value is adopted as the new value
- **"+"** the entered value is added to the old value
- **"-"** the entered value is deducted from the old value

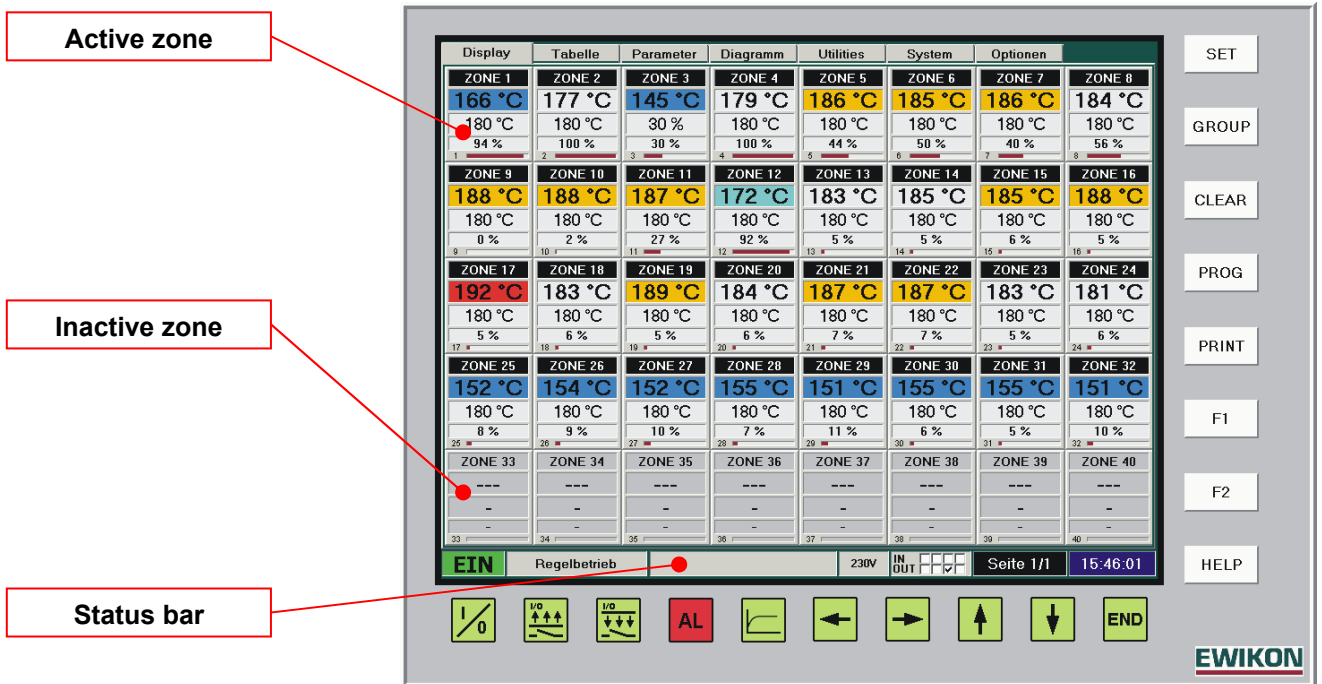
The system status and other information are displayed in the bottom part of the screen:

- Hotrunner ON or OFF
- Status display
- Information display (e.g. ALARM)
- Operating voltage of the hotrunner system (5V, 230V or mixed operation)
- Status of each of the 4 digital signal inputs and outputs (assignment - see chapter: connector pin and terminal assignment)
- Information about current and total available pages per menu, page using arrow keys
- Time or date, switchover by touching the display surface

"Display" menu

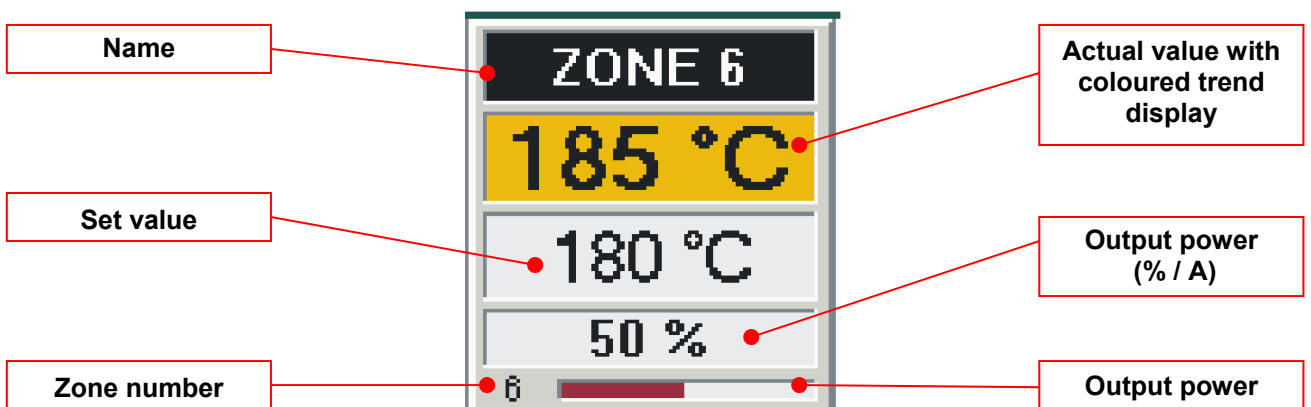
Display

After switching on and starting up the control system the program starts in the Display menu. Up to 40 zones per page are displayed as single windows with the most important process information. If there are a larger number of zones (max. 160) the other pages can be opened using the cursor keys. The number of available pages is shown in the pages information display of the status bar. Active zones have white backgrounds; the set values can be seen. Inactive zones have a grey background and are shown without display of the process values (exception: If a temperature sensor is connected the measured temperature is displayed).



The most important process information per zone is displayed in the "single zone windows":

- Name of the zone within the hotrunner system, in order to enable faster assignment (e.g. "nozzle 1"). When delivered corresponds to the zone number, changes can be made in the "Parameters" menu.
- Actual value display with coloured background, to ensure quicker overview. The marking is dark blue, light blue, orange or red depending on the difference between the actual and set value. The limits are deduced from the tolerance band settings ("System / System parameters" menu).
- Set value with display of the units (°C, % or A), changes can be made using the "SET" key.
- Current output power, depending on 5V or 230V operation in "A" (amperes) or "%" (percent).
- Zone number as consecutive numbering in the whole control system.
- Output power as analog display (bar chart) in % of maximum output.



Zone selection / grouping

The set value can only be adjusted in the Display menu if the relevant zones have been selected beforehand. The selected zones are marked with a green frame, in order to enable them to be more quickly identified. Both single and several or all zones can be selected or grouped.

The selection or grouping can be carried out in several ways:

- Selection of a single zone by touching the zone window.
- Selection of any combination of several zones by touching the corresponding zone windows. Only zones set in the same operating mode ("°C" / "%" / "A") can be selected together.
- Grouping of several consecutive zones. The first and last zones required are selected; all zones between these are then also selected by pressing the "GROUP" key. This enables e.g. set value changes to be made for a whole nozzle group.
- Grouping of all available control zones. The first and last zones of the control system are selected; the complete selection can then be made using the "GROUP" key.

After all the required zones have been selected and grouped, the "SET" key can be used to open the input window and to make the required set value change.

The zone selection / grouping is then individually cleared by touching the screen or is completely cancelled using the "CLEAR" key.

If necessary the grouping can be retained. It is useful if e.g. to open single nozzles in a high cavity system with a higher set value (" + " function in the input window) and must be removed again after starting up (" - " function in the input window). Any differing set values of the zones are then reset to the basic setting.

Alarm messages

If errors occur and are detected by the control system the affected zones are displayed with a red frame to enable them to be immediately recognised. In addition, an "ALARM" message is output in the status bar, so that errors in zones on any other pages can also be recognised. After pressing the "Alarm" key or touching the alarm message the alarm window is opened, in which all currently queued error messages are displayed in plain text. The alarm window can also be opened from all other menus.

The screenshot shows the Ewikon control interface. At the top, there are several menu tabs: Display, Tabelle, Parameter, Graf, Utilities, System, and Optionen. Below these is a grid of zone data for ZONE 1 through ZONE 18. Each zone displays a current temperature and a setpoint. Zone 16 is highlighted with a red border, indicating an error. Below the grid, there is a table with columns for 'Nr', 'Zone', 'Temperatur', 'Sensor', and 'Leistungsteil'. The table shows '16 ZONE 16' with a temperature of '-' and a sensor status of 'offen'. A pop-up window titled 'Alarm quittieren' and 'Fenster schliessen' is open over the table. At the bottom of the screen, there is a status bar with 'AN', 'Regelbetrieb', 'ALARM', '230V', 'IN', 'OUT', 'Seite 1/1', and '11:55:04'. Below the status bar is a control panel with various function keys, including 'AL', 'END', and directional arrows. On the right side of the screen, there are several buttons: SET, GROUP, CLEAR, PROG, PRINT, F1, F2, and HELP. Red callout boxes point to the 'Zone with error display' (Zone 16), the 'Alarm window' (pop-up), and the 'Alarm message' (AL button and status bar).

Corrected errors are acknowledged here in order to reset the alarm message. If sufficient information is available the window is closed using the corresponding button.

All errors that have occurred since the control system was switched on are saved in the error log book of the control monitor and can be opened under the "Options" menu.

"Table" menu

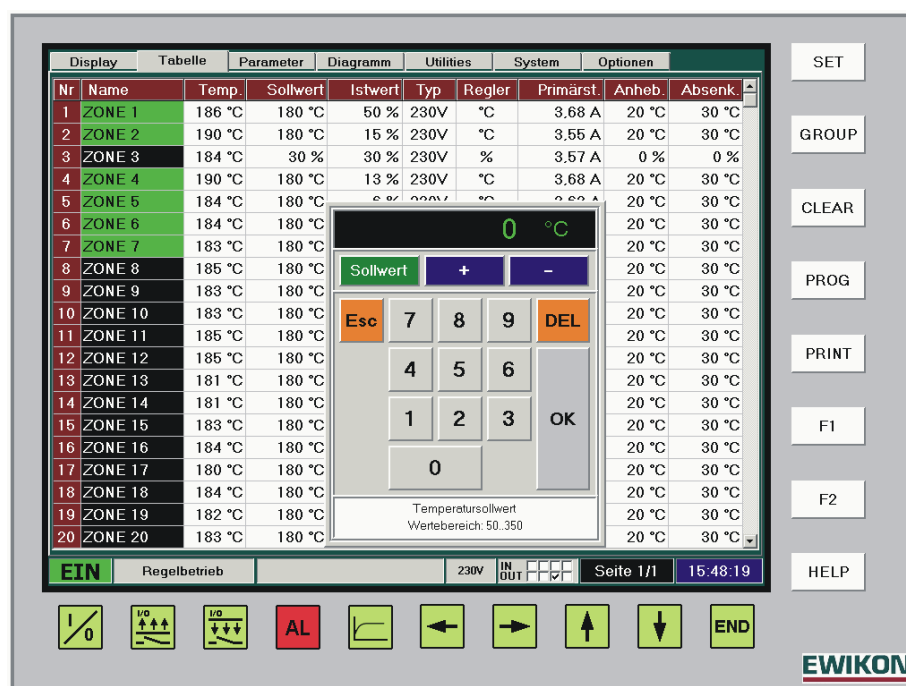
Display

Unlike the "Display" menu, all zones are displayed row by row in tabular form. Apart from the most important process data; actual temperature, set value and output power, other values are also available. The display is intended as an alternative to single window display and if the operator wishes can be equally used.

The following information per zone is displayed in the "Table" menu:

- **"No"** Zone number within the overall system
- **"Name"** Name of the zone
- **"Temp."** Current actual temperature value
- **"Set value"** Set value
- **"Actual value"** Current output power in % (230V operation) or A (5V operation)
- **"Type"** Operating voltage of the hotrunner: 230V or 5V
- **"Controller"** Operating mode of the zone: Temperature controlled (°C) or manually specified control variable (% or A)
- **"Current 230V"** Maximum current through the heating conductor or input current of the 5V transformer
- **"Increase"** Set value for increase mode (setting in the "Parameters" menu)
- **"Decrease"** Set value for decrease mode (setting in the "Parameters" menu)

After selecting the required zones, however, only the set value can be changed in this menu.



Unlike the window display, in the tabular display of the progression of the process only 20 zones per page are displayed; the scroll bar on the right-hand edge of the screen is used to page down.

Further, the actual value is not highlighted in colour if it differs from the set value.

Zone selection / grouping

Selection and grouping of zones and adjusting set values is carried out analogous to the "Display" menu. However, instead of the zone window the corresponding row must be selected.

Alarm messages

The display of alarm messages and opening of the alarm window is analogous to the "Display" menu. However, instead of a red frame faulty rows are completely highlighted in red.

"Parameters" menu

Display

The basic configuration of the controller for the respective application is set in the "Parameters" menu; information about the zone status is also available here. The zone number, zone name, position within the control system and the operating mode setting are displayed in the upper part of the screen. Below this there are two other separate areas. The basic settings for temperature controlled or manual mode are entered in the left-hand side as well as setting the values for increase and decrease mode. Further, the current actual values of the temperature and output power are displayed. The zone status information is displayed in the right-hand area.

Zone number

Zone name

Position of the zone within the control system:
 - Device number
 - Module in the unit
 - Zone number on the module

Gerät	HPS-C	Kanal	aktiv	Kanaltyp	Regelung
1	1	1	ja	nein	230 V °C %

Grundeinstellungen

	Temperatur	Ansteuerung
Istwert	186,4 °C	45,4 %
Sollwert	180,0 °C	40,0 %
Anhebung	20 °C	20 %
Absenkung	30 °C	10 %

Kanal-Status

Temperatur	kein Fehler
Temp.-Sensor	kein Fehler
Leistungsteil	kein Fehler
Laststrom 230V	3,68 A

EIN Regelbetrieb 230V IN OUT ffff Seite 1/1 15:49:03

Buttons: SET, GROUP, CLEAR, PROG, PRINT, F1, F2, HELP

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IMPORTANT: When entering and changing values, ensure that the required zone or group has been selected.

Zone selection

The zones to be changed are selected in the "zone number" field and this might be done in various ways:

- Select single zones for adjustment. These can be selected using the cursor keys or by pressing the button and setting the then available slide control. Also, after touching the display field an input window appears, in which the zone number can be entered directly.
- Adjusting a group of zones. The zones are grouped in the "Display" or "Table" menu using the method described; the information "Group" appears in the display. The values of the first zone selected are displayed; all changes made are applied to all the selected group members. This enables fast adjustment of specific zone groups, e.g. nozzles or manifolds.
- Adjusting all zones. The selection is made using the slide control by moving it to the "all" position or by directly entering the zone number "0". However, this is only possible if there is no more grouping ("CLEAR" key). This function is used for quickly entering the basic settings of new moulds; however it is also useful for making changes which affect all zones while the plant is running. The changed values are also applied to inactive zones. Therefore, this function should only be used to activate zones in certain cases, as it activates ALL the zones in the control system.

Zone labelling

After touching the display field for the zone name the input window shown below appears. The zones are given explanatory names (nozzle 1-n, manifolds 1-n ...) for faster orientation in a high cavity system. These names can be approx 10 characters long and are used in all the menus.



To automatically number several zones (select "Group" or "all"), the number of the first zone is entered followed by two dots, as shown in the above display. The system then automatically labels the selected zones, e.g. from "manifold 1" to "manifold 8".

Activate / deactivate zones

The zones required for the connected hotrunner mould are activated using the corresponding button, whereby "yes = active" and "no = inactive". The selected setting is shown "pressed down" (lighter).

Hotrunner operating voltage selection 5V / 230V

Selection of the hotrunner's operating voltage is zone-specific using the corresponding "runner type" button. For safety reasons, this selection can only be made if heating mode is switched off.

Operating mode

The operating mode of each zone is set using the "controller" button. Depending on the selection made; "°C" = temperature control or "%" = manual mode (in 5V operation correspondingly, "A" = current control) the basic settings values set apply.

Set value input

Depending on the operating mode, the input window is opened by touching the corresponding set value field. The required set value is mostly dependent on the injection temperature of the material used.

Increase mode, value input

The increase value is a 2nd set value for the zone, in order e.g. to briefly set a short-term higher temperature level after starting up to make it easier to open the nozzles. If the increase function is switched on the value entered is added to the set value. The increase function can be switched on and off using the monitor's function key or the digital signal input.

Decrease mode, value input

The decrease value is a 3rd set value for the zone in order e.g. in the event of faults, to briefly set a short-term lower temperature in the system to avoid damaging the material. If the decrease function is switched on, the value entered is subtracted from the set value. The decrease function can be switched on and off using the monitor's function key or via the digital signal input.

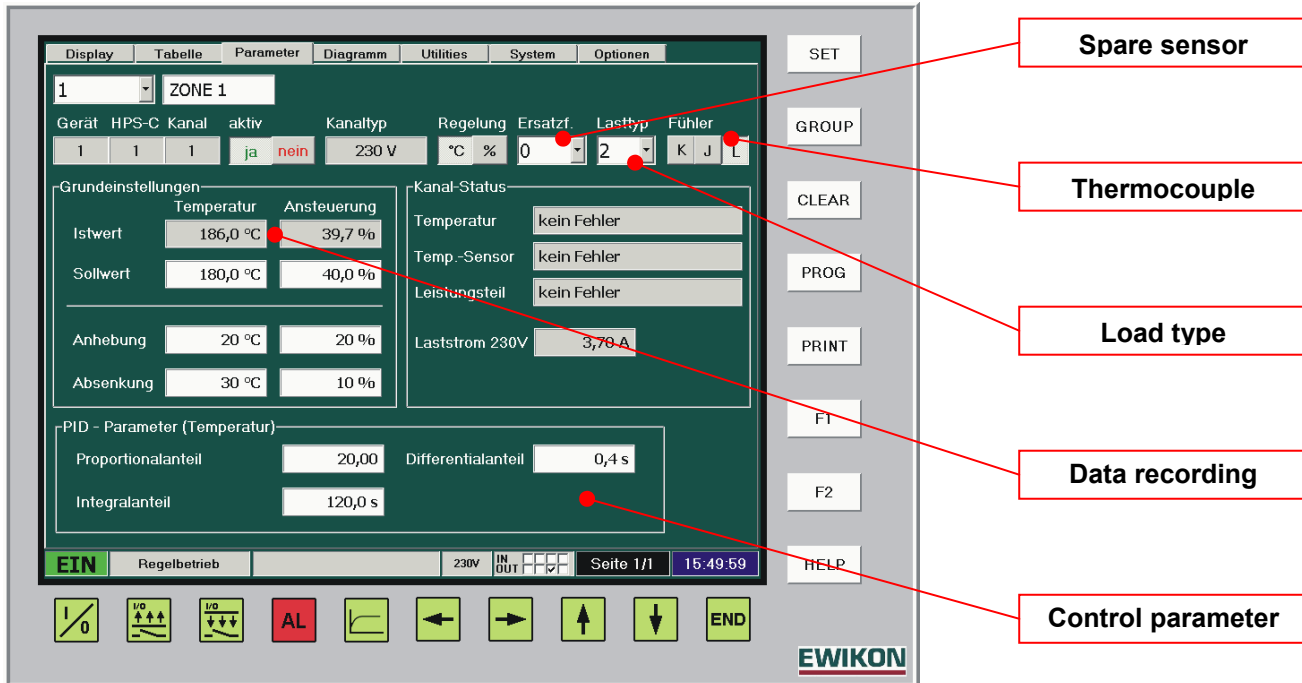
Zone status / error messages

Any zone errors that occur are reported in the "zone status" and are shown in plain text. Further, the zone's maximum current measured by the controller is displayed, which makes it relatively easy to calculate the installed heating output:

Heating power P = voltage U * current I (whereby U equals the mains voltage, e.g. 230V)

Extended functions after password entry

After entering the correct password, experienced operators can also make further adjustments. The password is entered in the "Options" menu and is described in the chapter with the same name. The additional functions displayed below are available on the next higher access level (Level 1).



IMPORTANT: As the following settings may have serious effects on the operating and control behaviour, changes should only be made by skilled personnel.

Access level "Level 1":

Data recording

If permanent data backup of the process values on the hard disk has been switched on in "Options", the required recording data can be set here. To do this, the required zones are selected or grouped, after touching the actual value display field an input window appears in which data recording can be switched on or off. This procedure must be separately carried out for the temperature and control values. Further information about the "data backup" function is given in the "Options" chapter.

Spare sensor

No effect or function at present, reserved for subsequent extensions.

Thermocouple

The temperature measurement of the HPS-C controllers is designed for the connection of a thermocouple; in total 3 different thermocouple types can be connected. When the units are delivered the type Fe-CuNi "L" according to DIN 43710 is set; the types Fe-CuNi "J" and NiCr-Ni "K" according to DIN IEC 584 can also be used.

The setting and thermocouple type assignment is listed in the following table:

Selection	Thermocouple	Type	Sleeve colour*)	Plus leg*)	Minus leg*)
"K"	NiCr-Ni	K	Green	Green	White
"J"	Fe-CuNi	J	Black	Black	White
"L"	Fe-CuNi	L	Blue	Red	blue

*) Colour code of the thermocouple connection cable; deviations are possible.

Load type / control parameters

The HPS-C control system is equipped with a PID control algorithm, which ensures optimum control performance and small deviations between the actual and set value during operation. During the system's heating phase other additional supporting special functions act (ramp, compound operation ...), as the connected controlled system (hotrunner) mostly behaves differently to the subsequent operation.

The controller usually determines the load type for each zone itself (see chapter: "Options - Load type recognition"), and depends on the type of heating connected. In total, they are divided into 10 different types, for which respective specific controller default systems are stored in the system. The following table gives typical values for the various settings, however may contain different values in the controller:

Load type	Hotrunner type	P (amplification)	I (Reset time) / s	D (Rate time) / s
1 (230V)	230V, very sluggish performance	25.00	150.0	0.5
2 (230V)	230V, sluggish performance	20.00	120.0	0.4
3 (230V)	230V, average performance	15.00	90.0	0.3
4 (230V)	230V, fast performance	10.00	60.0	0.2
5 (230V)	230V, very fast performance	5.00	30.0	0.1
1 (5V)	5V, very sluggish performance	0.80	15.0	6.4
2 (5V)	5V, sluggish performance	0.80	15.0	6.4
3 (5V)	5V, medium performance	0.80	15.0	6.4
4 (5V)	5V, fast performance	0.80	15.0	6.4
5 (5V)	5V, very fast performance	0.80	15.0	6.4

If required the control characteristics can also be adjusted manually, if good control results are not achieved with the automatic recognition. Either the load type can be changed, whereby the settings stored in the system are automatically adopted. Optionally, the 3 control parameters can also be individually adjusted.

Proportional component P (amplification):

The amplification determines size of the set power depending on the control difference. Higher values mean a higher output with the same deviation; lower values correspond to a smaller output. The proportional component mainly acts during the start-up of new set values (large control deviation) and faults during operation, and corrects deviations as quickly as possible.

Integral component I (reset time):

The reset time depends on the connected heaters and the speed with which the temperature can follow the changes in output power. Sluggish heaters require a larger reset time, fast nozzles a correspondingly smaller time frame. The integral component keeps the control circuit at the required set temperature via a summed (integral) output power, if there are no longer any control deviations (control offsets).

Differential component D (rate time):

The rate time (derivative action time) counteracts changes and depends on how fast the actual value of the connected heaters changes within a specific unit of time. A more or less large attenuation must be set depending on the speed of the actual value change, in order to avoid control circuit oscillation. The differential component mainly acts in the event of fast changes, e.g. cycle-induced faults due to frictional heat input, and determines (differentiates) its output power from the change per unit of time.

The total output power for the control circuit is calculated from the three single components P, I and D.

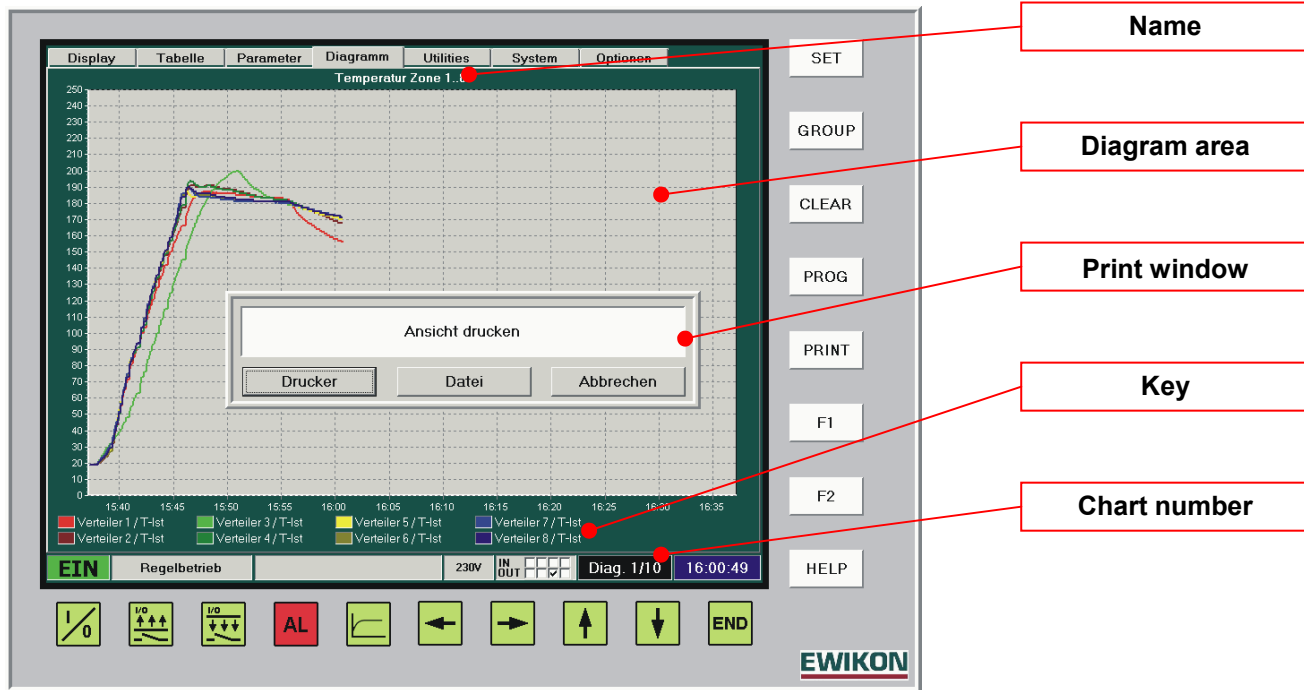
IMPORTANT: The following points must be noted in case of manual intervention in the controls:

- The values should be changed individually and in small steps in order to enable differentiated evaluation of the results. After each change the controller requires a certain amount of time (approx 5 – 10 minutes) to adapt to the new settings.
- Manual settings are only permanently retained if load type recognition is switched off in the "Options" menu. If not the controller default setting is loaded each time the hotrunner system is switched on again.

"Chart" menu

Display

Apart from permanent data recording on the hard disk, 10 diagrams are available with touchscreen control, on which the important process data and their curves can be shown. These can then be used to query the trend or peak values of the last time interval. It is possible to plot up to 10 different values in each diagram. Therefore, in total 100 process values are available. Each diagram can be given an easily understood name; the recorded (plotted) data is given in the key with the corresponding colour. The diagram area scaling is shown on the left and bottom edge and depends on the settings entered in the diagram setup.



The current diagram number is displayed in the status line instead of the page information. The cursor keys are used to page backwards and forwards between the different diagrams. The "Diagram" key is used to switch between diagram view and setup.

Data printout

If important diagram curves or settings are to be documented, it is possible to printout the current screen display. After pressing the "PRINT" key the print window appears for selecting whether to print directly to an installed default printer or into a print file.

A printer with a USB connection can be set up as the default printer using the Windows interface; this printer is then also used by the operating program for the HPS-C controllers.

If a file printout is selected a bitmap file is saved in a subdirectory of the program path, this can then be transferred to another PC via the USB port.

The windows interface is accessed in the "Options" menu and this is described in the chapter with the same name.

The procedure for printing out data is the same in all the menus; however, in the "Table" and "System" menus the output is in list form instead of the screen view.

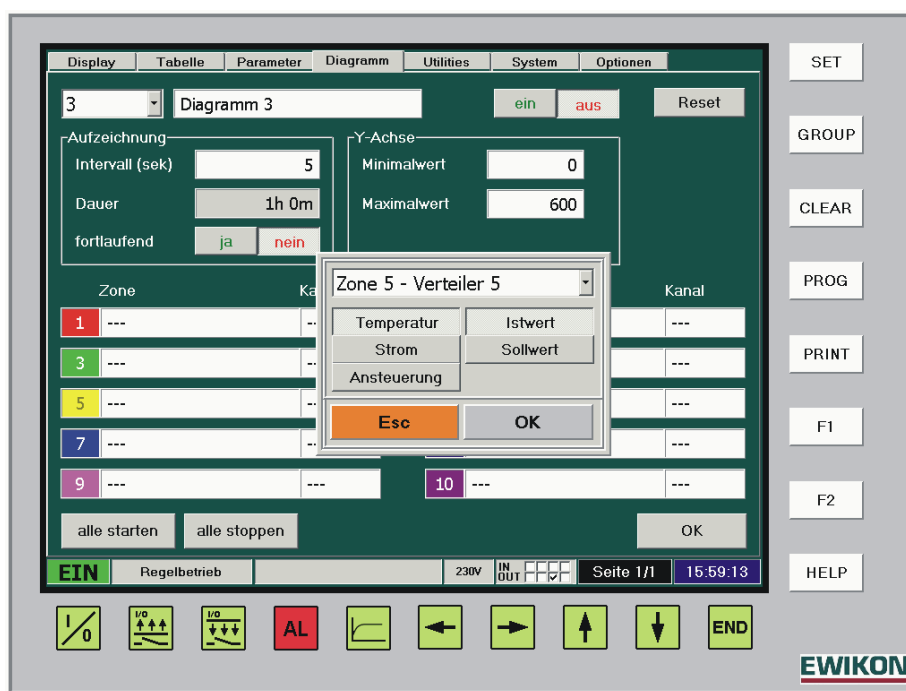
Setting up the diagrams

Before using a diagram it must be set up for the respective requirements. The setup page is opened by pressing the "Diagram" key or by pressing the surface of the diagram. In setup the required diagram number is selected first from the top left-hand side and if necessary an explanatory name is entered (e.g. "temperature zone 1 - 10").

Diagrams which have been set up can be reset to their original condition by pressing the "Reset" button (all settings reset to default values and recording function switched off).

The settings for the time axis (X-axis) of the diagram are specified in the "recording" field. The interval specifies the cycle in seconds over which the data is recorded. The whole recorded duration of the diagram changes depending on the interval time, e.g. "Interval = 5 sec → duration = 1 h", "interval = 10 sec → duration = 2 h". The interval time can be set between 1 second and 1 hour (3600 seconds); the total duration varies accordingly between 12 minutes and 30 days. The "continuous" button is used to specify whether the data is to be recorded once ("no") or continuously ("yes"). In the case of continuous recording the diagram is "shifted on" accordingly at the end and the x-axis is relabelled, the oldest data is lost. In the event of once-off recording a certain period is recorded after the unit is switched on then the diagram function ends.

The minimum and maximum value of the y-axis scaling is specified in the "Y-axis" area, changes can also be made during the current recording.



The required process values for the diagram are set in the lower area; a maximum of 10 different values are available for each diagram. First the input window is opened by pressing the corresponding button, then the required zone or zone number is either entered directly or selected by opening the sliding bar. Then the appropriate buttons are pressed to set the required process value, to be recorded for this zone (e.g. "temperature - actual value" or "output power - set value"). The settings are accepted with "OK" or discarded with "ESC".

After all the required zones to be recorded have been set for the diagram, data recording is switched on. After this only the Y-axis scaling of the selected diagram can be changed, all other fields which can no longer be changed have a grey background.

If necessary, other diagrams can be set up. The "Start all" and "Stop all" buttons can be used to switch recording on or off for all the diagrams set up.

If the program is quit using the "END" key, the most recently recorded data of all active diagrams is backed up as a bitmap, this bitmap is then available for viewing in the "Utilities" menu when the program is restarted. To save memory space, this data is overwritten with the current values each time the program is quit.

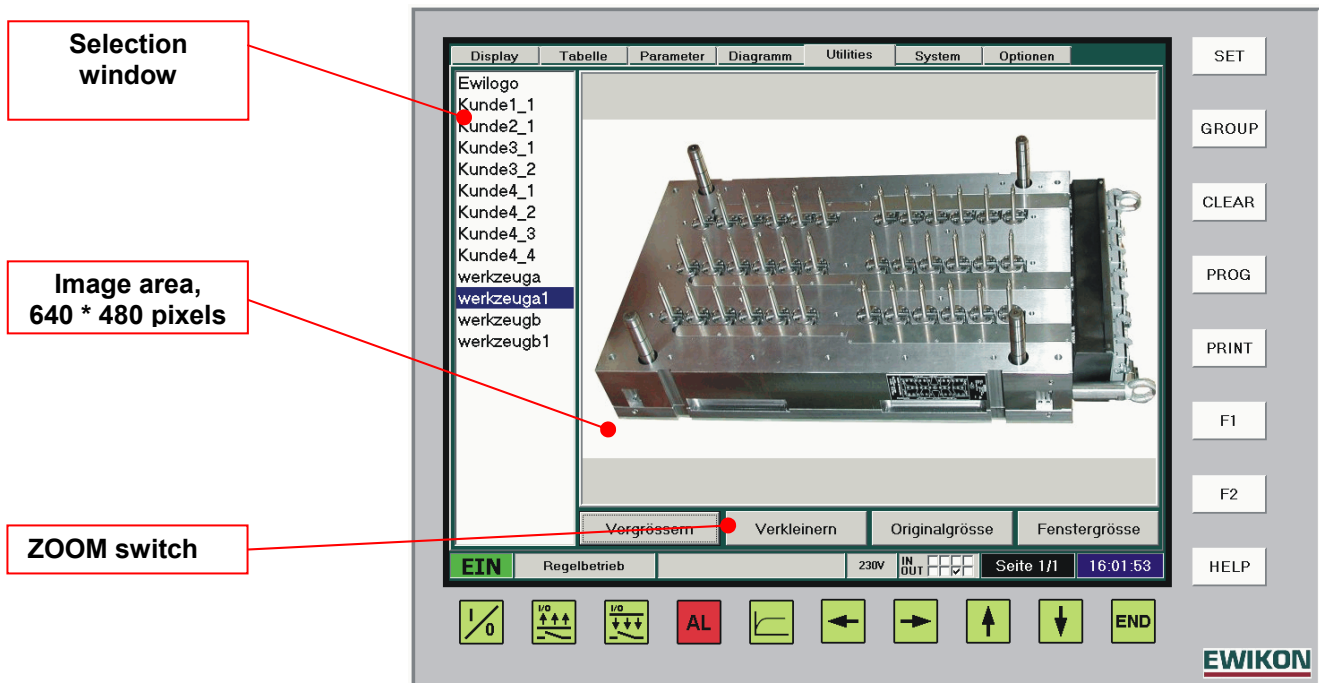
Use the "Diagram" key or the "OK" button to return to the diagram view.

"Utilities" menu

Display

A simple image viewing function is provided in this menu with which the graphic diagrams can be displayed in BMP or JPG file format. This enables mould views, wiring plans or other mould data to be directly saved on the PC. If necessary this information is then available to the user "online". The graphic files must be stored in the "Images" subdirectory of the program directory so that they appear in the file selection window after the program is started. Further information on access to the Windows interface is given in the "Options" chapter. Further, if diagram recording (plotting) is active the most recent process data is stored as graphic diagrams: "Diagram1" to "Diagram..." when the program is quit. When the program is restarted this information can then be evaluated or printed out as required.

A window section of 640 * 480 pixels (VGA format) is available for the image area, if the graphic images are larger or magnified only a part of them are displayed.



The "Zoom in", "Zoom out", "Original size" and "Window size" buttons can be used to adjust the graphic display to the respective needs. If the display or graphic is enlarged (zoomed in) with more than 640*480 pixels the window section can be moved in the corresponding direction using the cursor keys.

"System" menu

In the "System" window the menu is divided into 3 further submenus, in which all general settings applicable to all zones can be entered or adjusted for the whole control system. The required menu in which the values are to be changed or information queried is selected using the corresponding buttons in the bottom part of the screen.

The following options are available to choose from:

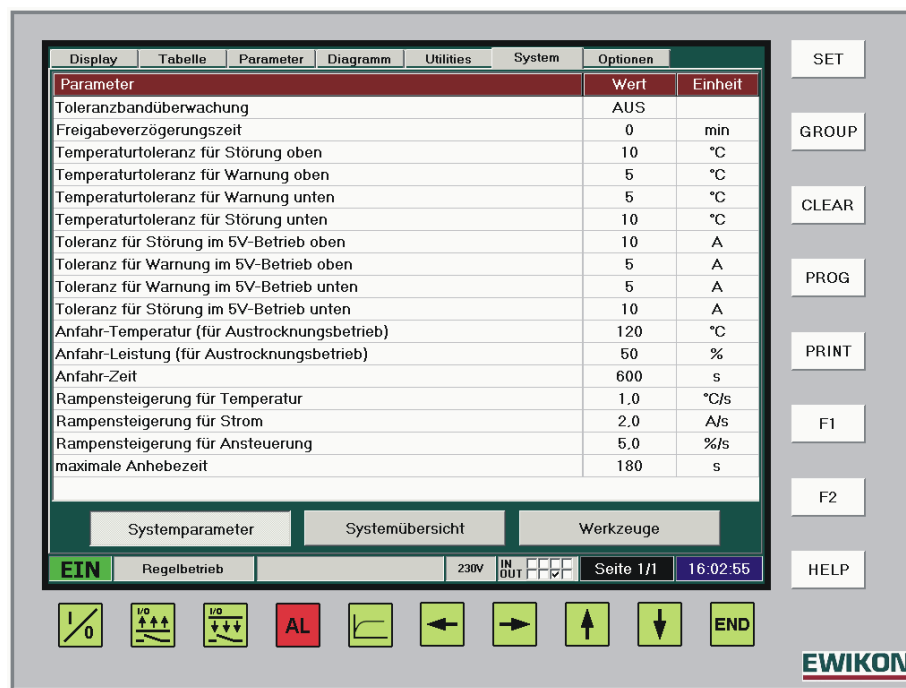
- **"System parameters"** Set parameters and limit values or switch functions on and off
- **"System survey"** Display the connected units and modules, information about the respective operating status
- **"Moulds"** Save or load mould settings

A more detailed description of the individual submenus is given in the following sections.

Parameter settings

Values and functions which apply across the zones to all the controller modules can be changed or switched on and off in this submenu. Access is also divided into different authorisation levels, which are protected by a password. Password entry and access management are described in greater detail in the "Options" chapter.

The following screenshot shows the values, which can be changed in access levels "Level 0" and "Level 1".



Tolerance band monitoring

The tolerance band function enables automatic monitoring of the injection moulding process for compliance with the entered set values. Tolerance band windows can be entered for the temperature and current control; these then apply to all connected control zones. The monitoring function can be used in the data network with the injection moulding machine to trigger various reciprocal actions, e.g. decreasing the hotrunner in the event of a machine fault or interruption of injection operation if faults occur in the hotrunner system. However, this requires a connection between the controller and the machine, e.g. via the signal cable 24V, Art No. 60070.019. Alternatively, or in addition, an optical or acoustic signalling device can be connected to the connector 230V. The pin assignment is described in the "connector pin and terminal assignment" chapter.

Release delay time

This is used for delayed switching off an error message in case of tolerance band deviations, in order to allow the hotrunner system sufficient time to develop an adequately stable thermal condition after the heating up phase.

Limit values for tolerance band monitoring

In the tolerance band function there are two pairs of values available for the temperature and current monitoring. The inner pair of values is intended for setting a warning limit if the process data only slightly differs from the set value specifications. This enables problems to be detected early. The outer pair of values is used to generate fault messages if the current process data deviates a lot from the specified set value. The warning and fault messages can be picked off via separate outputs at the controller.

The settings act relative to the set value, i.e. if e.g. "Upper warning limit = 5°C" and "Lower warning limit = 5°C" a warning message is issued for deviations of $> \pm 5^\circ\text{C}$ from the set value. The advantage here is that if the set temperature or various settings of the different zones change the limit values do not have to be adjusted.

Drying mode (Level 1)

The starting operation of 230V heaters is always followed by a drying phase in order to remove any residual moisture in the hotrunner system. The HPS-C control system operates in phase-fired mode, in order to avoid damage to the connected heating loads. Compared to the pulse packet mode used in normal operation, in phase-fired mode smaller peak voltage values are connected to the heating conductor so that arcing due to moisture can be avoided. During the drying phase, all 230V heaters are controlled with an adjustable maximum power (max. output power) for a minimum period (time for drying out)

and at a maximum temperature (start-up temperature), after this the system starts with the set set-point value.

The drying phase is prematurely aborted if:

- The leakage current measurement detects there is no moisture in the hotrunner system.
- All temperature values in the hotrunner system were over 120°C when the system was switched on.

Startup ramp / heating-up speed (Level 1)

When the hotrunner system is switched on or in case of set value changes, the set gradient determines the speed (change per second), with which the system is to change to the new set value. Therefore it is possible to influence the heating-up speed of the hotrunner system. However, when setting this value it is necessary to consider that by virtue of their physical properties sluggish heating loads, e.g. manifolds, cannot achieve fast changes e.g. to the temperature.

Maximum increase time (Level 1)

Increase mode has a maximum time limit in order to avoid material damage in the hotrunner system due to a continuously too high temperature level. After the set time has expired, increase mode is automatically discontinued, if it was not previously quit manually or via the external signal input. The setting "0 seconds" switches off the maximum time limit function for increase mode.

System survey

The system survey provides a tabular display of all controllers and modules connected to the operator's control unit with the corresponding zone assignments in the whole system. Further, the installed software versions of the individual modules are displayed as well as their status display. If system errors have occurred, the relevant column is marked red so that the module concerned can be immediately localised. The "System status" button in the status bar also has a red background if an error occurs.

The "System overview" menu can also be opened by touching the system status button on the screen.

Gerät	HPS-C	Kanal	FW Vers.	ON	AH	AS	LS	NS	AC	EE	CH	Systemstatus
1	1	1-8	V 1.64b	1	0	0	0	0	0	0	0	Regelbetrieb
1	2	9-12	V 1.64b	1	0	0	0	0	0	0	0	Regelbetrieb
1	3	13-20	V 1.64b	1	0	0	0	0	0	0	0	Regelbetrieb
1	4	21-24	V 1.64b	1	0	0	0	0	0	0	0	Regelbetrieb
2	33	25-32	V 1.64b	1	0	0	0	0	0	0	0	Regelbetrieb
2	34	33-40	V 1.64b	1	0	0	0	0	0	0	0	Betriebsbereit

The screenshot also shows a control panel with buttons for SET, GROUP, CLEAR, PROG, PRINT, F1, F2, and HELP. At the bottom, there are status indicators for 'EIN', 'Regelbetrieb', '230V', 'IN', 'OUT', 'Seite 1/1', and '16:11:28'. Navigation icons for I/O, AL, and movement are also present.

System information

- **"Device"** Unit (device) number of the controller within the whole system
- **"HPS-C"** The module's address on the CAN bus
- **"Channel"** Arrangement of the control zones, zone numbers of the module
- **"FW Vers"** Software version of the module

System status / error messages

- **"ON"** Hotrunner is ON (1 = heating mode) or OFF (0 = Standby)
- **"IN"** Increase mode is switched on (1) or switched off (0)
- **"DE"** Decrease mode is switched on (1) or switched off (0)
- **"LC"** Leakage current in the system exceeds the set limit value
(Residual moisture in the hotrunner system due to long storage; water entry)
- **"NS"** Network synchronisation measurement of the module is disrupted
(Fuse for the first zone of the module concerned is defective; faults in the power supply)
- **"AC"** Internal error in the controller module (communication fault)
(Data transfer between the two controllers in the module is disrupted; follow-up error of "NS")
- **"EE"** Internal error in the controller module (EEPROM fault)
(Write or read error during access to the EEPROM memory)
- **"CH"** Error in one or several zones
(Precise description in the zone error display in the "Parameters" menu)
- **"Status"** Information about the module' current operating status
(Ready for operation - Load type recognition - Drying phase – Even heat up mode - Manual mode)

Mould management

In the "Moulds" menu it is possible to deposit complete settings for various hotrunner systems. All set values, increase and decrease values, operating mode settings and the remaining specific parameters of the mould should be stored. The data is then available at a later date, e.g. in the event of alternating mould assignment or for basic settings of test moulds.

The "Mould management" menu can also be opened directly using the "PROG" key.



A new file is created using the "Save as" button. The input window shown above appears for entry of the file name, after "OK" is pressed the current settings are saved. The respective data is displayed in the "Devices", "Zones" and "Created on" columns.

An existing file can be overwritten with the current settings using the "Save" button and subsequent confirmation. This is documented with date and time in the "Last change" column.

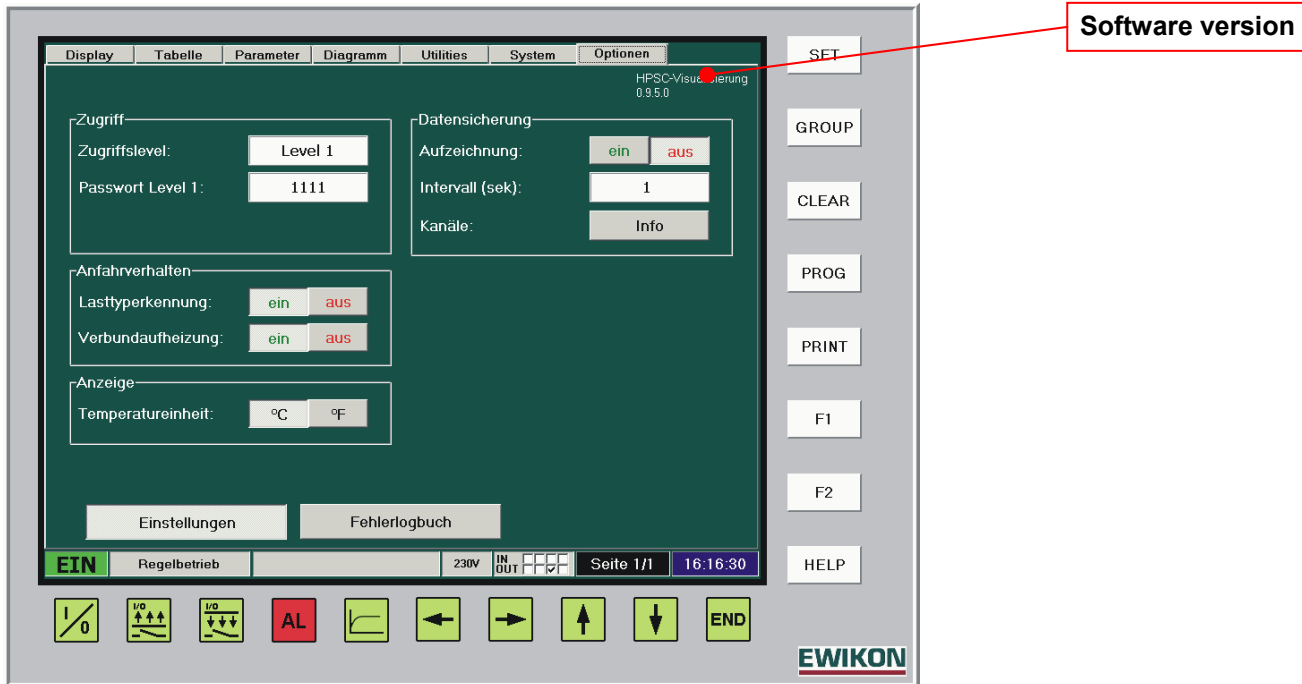
An existing file can be read in as the current setting using the "Load" button and subsequent confirmation. For safety reasons, this can only be carried out if heating mode is switched off.

If a saved setting is no longer required, it can be removed from the memory with the "Delete" button and subsequent confirmation. This is only possible from access "Level 1".

"Options" menu

Access authorisation and the display layout of the PC controls is managed in the "Options" menu, several special functions can also be set here. Access through various password levels is also controlled here; with authorisation "Level 0" information only can be opened, changes can only be made from "Level 1". Diverse setting and adjustment options appear on the interface depending on the access levels set. The program version for operating the HPS-C controllers is given in the display on the top right-hand side.

The following display applies to access authorisation with "Level 1"; the display differs for other levels.



Password entry

A password can be entered in the "Access" area in order to reach the various access levels. The currently valid access level is displayed; if no keys are pressed or no entries are made for 10 minutes the authorisation is automatically reset to "Level 0". Password entry provides extended input features in the "Parameter", "System - Parameters" and "Options" menus. Details are given in the individual chapters.

After entering a valid password a further input field appears in which the password itself can be changed. For example, this can be used to change the access code if it is too well known or known to too many people.

IMPORTANT: In the other access levels settings can be made, some of which have serious effects on the operating performance of the control system. The values should therefore only be changed by skilled personnel!

Load type recognition / self-optimization

The HPS-C control system is equipped with a self-optimization function for optimally adjusting the control performance to the connected heating load. This enables both extremely fast nozzles and sluggish manifolds to be precisely controlled. The necessary settings for the various types are stored in the controller (PID parameters, see "Parameters" chapter), classification takes place after switching on of the hotrunner system using the "I/O" key. In this process a defined output power is applied to the heating load for a specific period, the control parameters are then adjusted to the controlled system depending on the heating behaviour.

The optimization process is however only executed if all temperatures of the hotrunner system are less than 100°C when it is switched on. If this prerequisite does not exist the system is controlled with the last set values. Automatic adaptation is only possible for the whole hotrunner system when it is switched on; individual adaptation is only possible manually.

The self-optimization function can only be switched on or off from "Level 1".

Even heat up mode

When this function is switched on, after the automatic "self-optimization" and "drying" start functions have been completed all zones are heated with uniform temperature level. During this phase the corresponding display appears in the system status field, further the current temperature set value for all zones is displayed. This is calculated from the actual temperature of the coldest zone plus a supplement of 10°C. The even heat up mode ensures uniform heating of the system, so that the normally faster nozzle heaters do not reach their set values long before the manifold zones.

The even heat up mode can only be switched on and off from "Level 1".

Temperature units

Setting for the temperature display units of the PC controls, whereby the choice is between "°C" and "°F".

This setting can also only be changed from "Level 1".

Data backup

The setting for permanent storage of the process data on the hard disk can be made in the "Data backup" area. The "Recording" button is used to switch the log functions on and off. These settings are kept even after a new program start. The interval defines the time interval in seconds at which the data is saved. The "Information" button is used to open a table from which all the logged process values can be read or deleted. The process values required for the recording are selected in the "Parameters" menu.

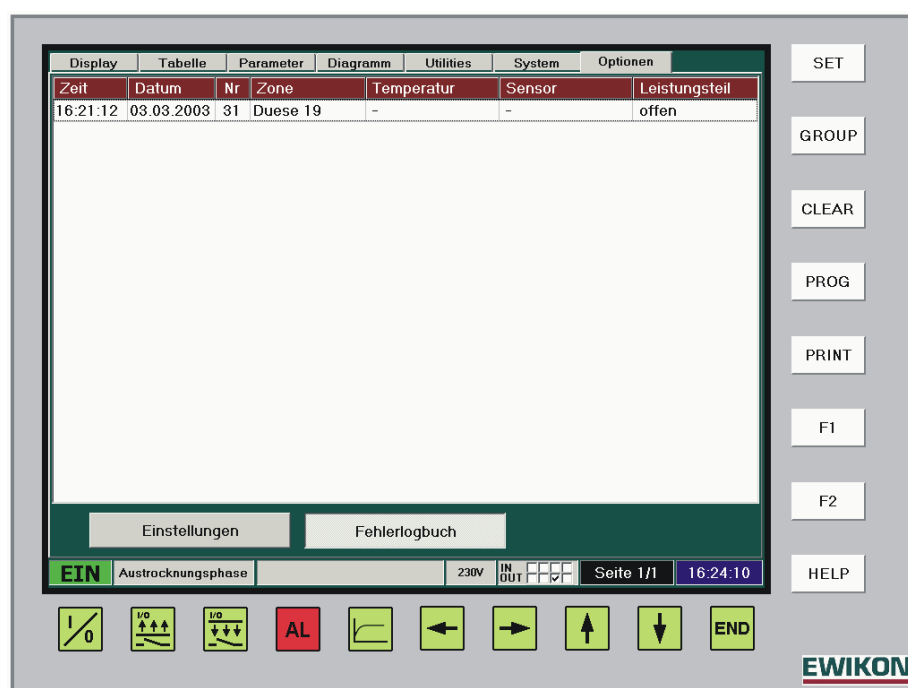
The data is stored in the "Data" subdirectory of the program directory and from there can be transferred to other computers via the USB port. Access to the Windows interface and the exchange of data with other PCs is explained in the "Windows interface" of this chapter. The process data is stored in CSV format (comma separated values), so that it can easily be further processed by standard application programs, e.g. MS Excel.

The "Data backup" function settings can only be changed from "Level 1".

Error log book

The "Error log" button is used to generate a tabular list of all errors which have occurred in the hotrunner system since the program start. When the program is quit this information is stored as a file in the "ErrLog" subdirectory of the program directory from where it can be exported for subsequent evaluations.

The error log can be accessed in every access level.



Log (Level 2)

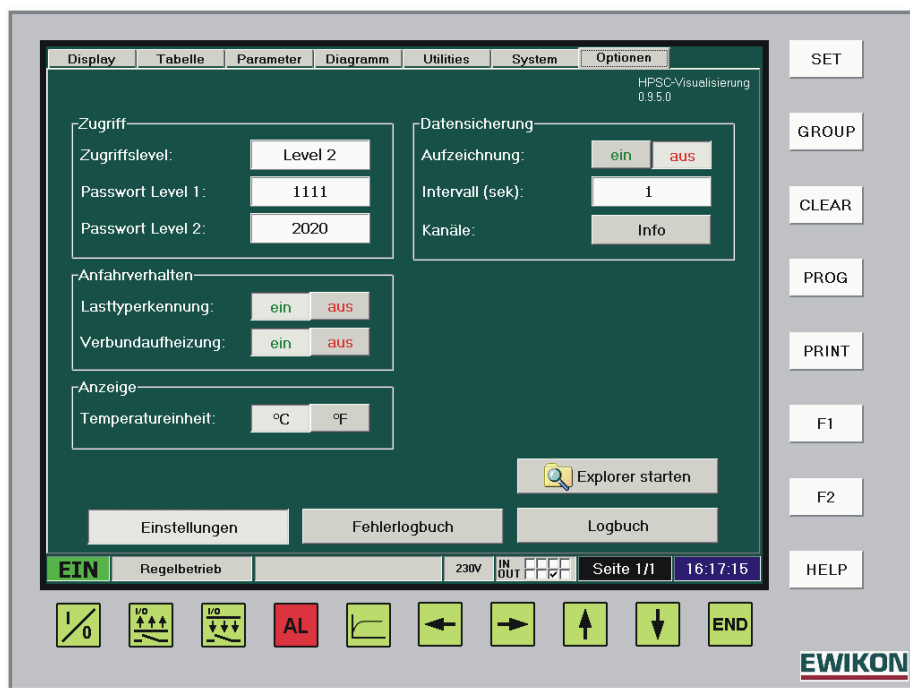
The "Log" button is used to generate a tabular list of all manual changes and inputs made to the controls since the program start. When the program is quit this information is saved as a file in the "Log" subdirectory of the program directory from where it can be exported for subsequent evaluations.

The log book is not available until access "Level 2".

Windows interface (Level 1 or Level 2)

The Windows user interface can only be accessed on the control PC for the HPS-C control system in two ways:

- After entering the password for access "Level 1" and when the program is quit using the "END" key, a third "Windows" window becomes accessible. If actuated the program is quit and the Windows operating system interface (Desktop) appears on the PC's screen.
- After the password for access "Level 2" is entered a new button appears: "Start Explorer". This can be used to access the Windows interface for file operations directly from the program.



IMPORTANT: This manual cannot provide an introduction to Microsoft "Windows 98". However, in the activities described in the following it is assumed that the reader is knowledgeable about this operating system.

The control PC can only be used in the Windows interface via the touchscreen, therefore the options and possible actions are somewhat limited. If necessary a standard PC keyboard can be connected, the connection for this is located on the left-hand cover plate on the underside of the computer.

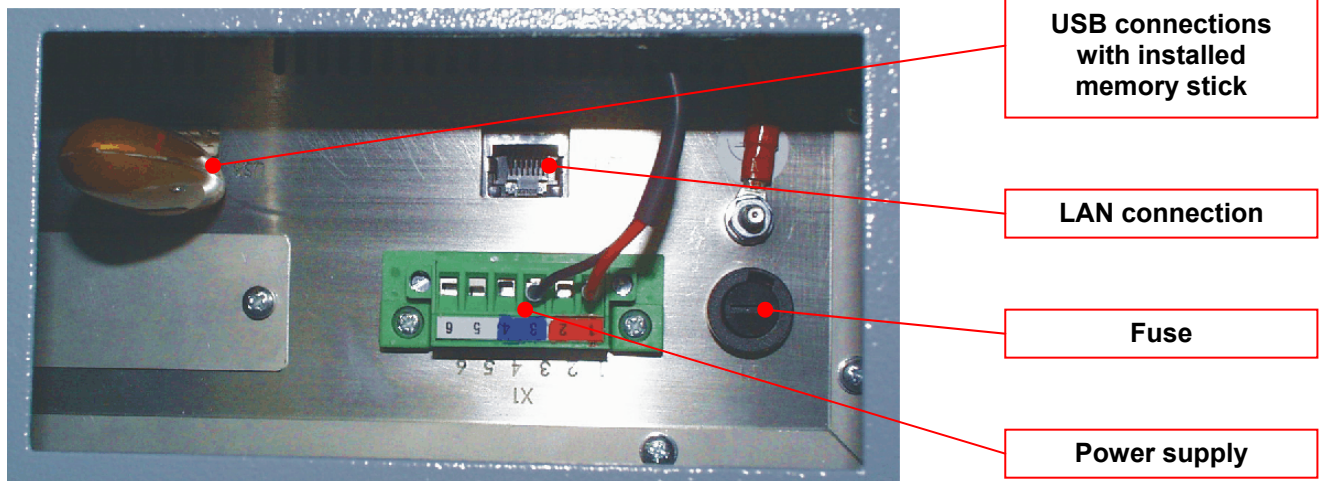
The connections required for data exchange with another PC can be reached behind the right-hand cover plate. These are the two USB ports for connecting a printer or a memory stick. This is displayed in the file manager as a "Removable data carrier" and is accessed as with a disk drive.

The memory stick can be used to exchange data, e.g. log files or graphic diagrams, between two PCs. The driver files for the memory stick supplied (32 MByte) are included in the Windows2000 operating system, a disk is supplied for installation under Windows98.

If a printer is installed and connected at one of the two USB ports it is possible to printout directly from the control PC.

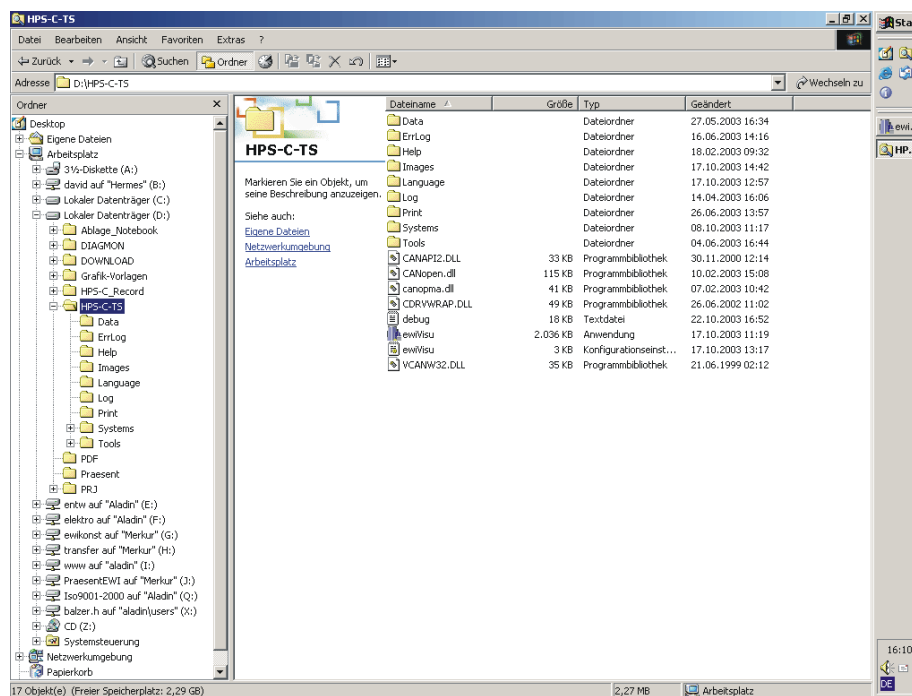
Apart from the USB connections there is also an LAN connection with which a direct computer link or a connection to a network can be set up.

Further, the connection plug for the power supply (24 V DC) and the fuse for the control PC are also accessible.



The directory with the control program for the HPS-C controller is located on the computer's "D" drive under the name "HPS-C-TS". Under this are the program and driver files and further subdirectories in which the various files are saved by the program or have to be imported by the operator.

The display on the touchscreen control PC differs from the figure shown below as this computer does not have so many available drives. However the program directory structure is the same.



The various subdirectories contain the following data:

- **"Data"** Log files with the saved process values, if permanent data backup is active
- **"ErrLog"** Error files with the detected problems
- **"Help"** Help files, which are opened when the "HELP" key is pressed
- **"Images"** Graphic diagrams for accessing via the image viewing function
- **"Language"** Language files, selection is made in the INI file
- **"Log"** Log files with the changes and inputs made
- **"Print"** Program printouts, if the "File" selection has been used
- **"Systems"** information about the control systems connected to the control PC
- **"Tools"** Files with information about the saved mould settings

The exchange of data between the control PC and another computer via the memory stick is carried out using the file manager of the Windows operating system.

Specifications

HPS-C controllers

Operating voltage:	230V / 400V +6/-10%; 50 / 60 Hz
Degree of protection:	IP 33
Output power:	230V: $P_{Max} = 2500VA$ per zone or $P_{Max} = 3500VA$ per zone 5V: $P_{Max} = 625VA$ per zone (transformer dependent)
Output signal:	230V: Phase-fired in drying, pulse packet in normal operation 5V: Phase-fired
Fuse:	- Load circuit: G fuse insert 6.3 x 32 mm; Type A 12 BK (Schurter) - F 12.5 A (in modules with normal output power) - F 16 A (in modules with output power 3.5 kW) - Control circuit: G fuse insert 6.3 x 32 mm, F 6.3 A
Thermocouple input:	Fe-CuNi Type L or J; NiCr-Ni Type K
Signal input 24V:	External decrease, external increase, 2 free inputs
Signal output 24V:	Fault message, warning message, hotrunner ON, 1 free output
Data storage:	EEPROM, data retained at least 10 years
Interface:	CANopen
Ambient conditions:	Working temperature range 0 – 50 °C
Control behaviour:	PID temperature control with adaptive parameter determination and manual optimization facility PID current control with manual optimization facility (5V operation)
Control accuracy:	- Temperature control: ± 1 °C - Current control: ± 1 A
Startup functions:	- Intelligent drying mode for 230V hotrunners - Setpoint ramps with freely selectable increase
Measurement and working ranges:	- Temperature range: 0 – 500 °C Sensitivity: 0.1 °C - Current 5V: range: 0 – 125 A Sensitivity: 0.1 A - Current 230V: range: 0 – 16 A Sensitivity: 0.01 A
Measured value accuracy:	- Temperature: ± 3 °C (at 300 °C) - Current 5V: ± 3 A (at 100 A)
Further functions:	- Load error detection interruption, short circuit and partial load-failure - Thermocouple-error detection interruption, short circuit and reverse polarity - Set value monitoring with 2 tolerance bands for fault and warning messages - Decrease function - Increase function with maximum time limit

The series HPS-C controllers conform to the standards DIN EN 60204-1 (11/1998), DIN EN 55011 (05/2000), DIN EN 61000-6-2 (03/2000) and DIN EN 61558-1 (07/1998).

HPS-C - TS touchscreen control

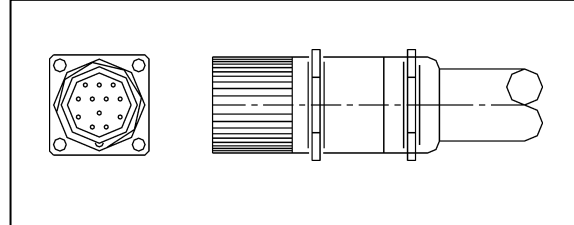
- 10.4“-SVGA – LCD with touch surface, resolution 800 * 600 pixels
- 26 surrounding membrane keys for often used functions
- CPU 266MHz with 64 MB RAM
- 10 GByte hard disk
- 2 * CANopen interface
- 2 * USB ports for data exchange / printer connection
- Ethernet connection 10/100
- Windows 98 SE operating system
- Supply voltage 24V DC , 1A (fan free operation)
- Dimensions (W/H/D) 400/330/100 mm
- Weight approx 7.5 kg
- Swivelling arm available for unit or wall-mounted assembly
- Conforms to the currently valid CE requirements



Connector pin and terminal assignment

24 V DC signal socket

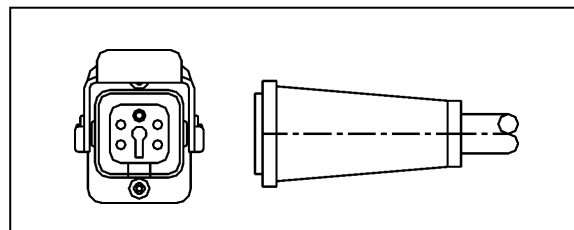
Contact / Wire	Name	Use
1	Input 1	Decrease
2	Input 2	Increase
3	Input 3	Not used
4	Input 4	Not used
5	Output 1	Fault message
6	Output 2	Warning message
7	Output 3	Hotrunner ON
8	Output 4	Not used
9	+ 24 V DC	Power supply
10	GND	for the inputs
11	-	-
12	PE	Protective conductor



Each output can be loaded with max. 200 mA, the total load of the connection plug however must not exceed 0.5 A. All inputs and outputs operate on the 24V DC voltage level.

230 V AC signal socket

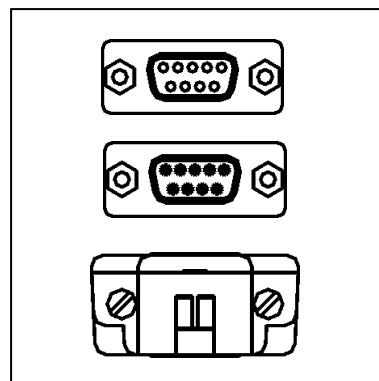
Contact	Use
1	230 V (via unit switch)
2	Fault message 230 V
3	Warning message 230 V
4	Neutral conductor N
PE	Protective conductor



Each output can be loaded with max. 0.5 A, total load max. 1 A. The signals are directly available with voltage level 230 V AC.

Communication interface CAN (connector and socket)

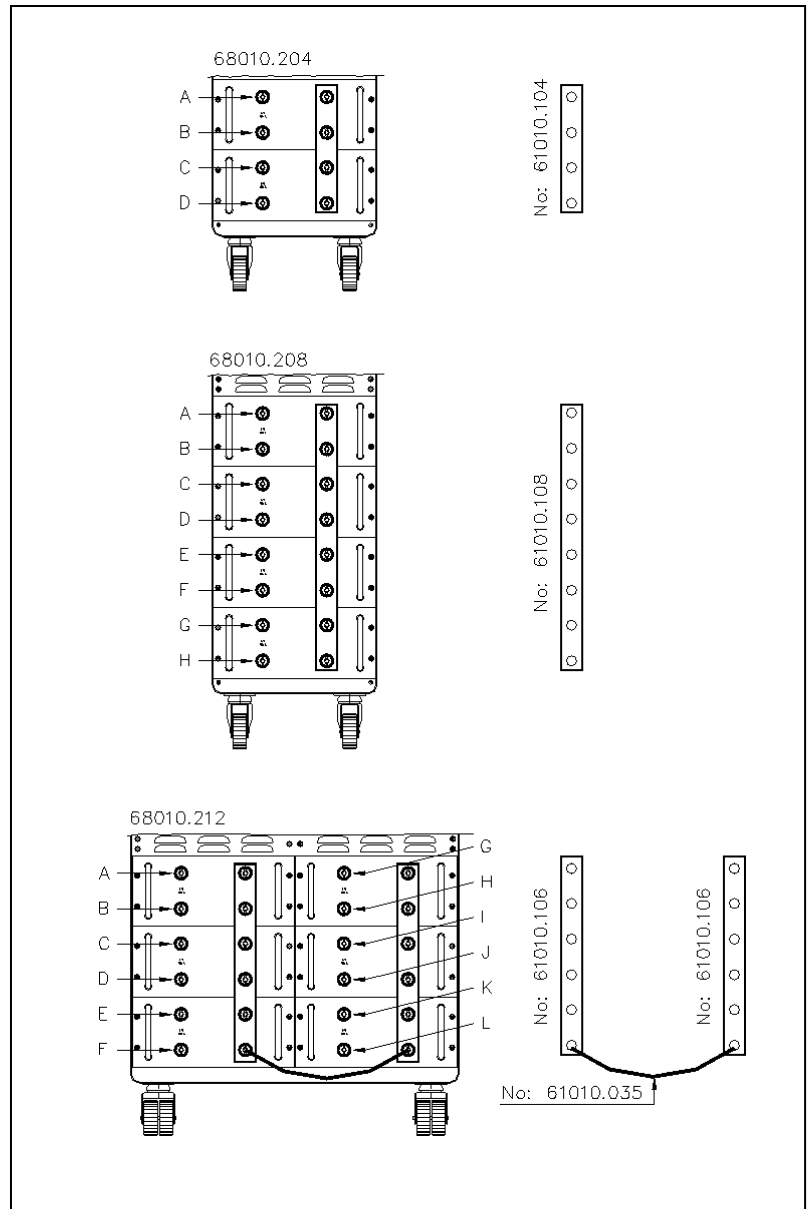
	Use
1	-
2	CAN_L
3	CAN_GND
4	-
5	-
6	GND (24 V) *)
7	CAN_H
8	-
9	+ 24 V DC *)



*) For power supply of the control panel or the touchscreen monitor, applied only in the direct connection.

5V power circuits

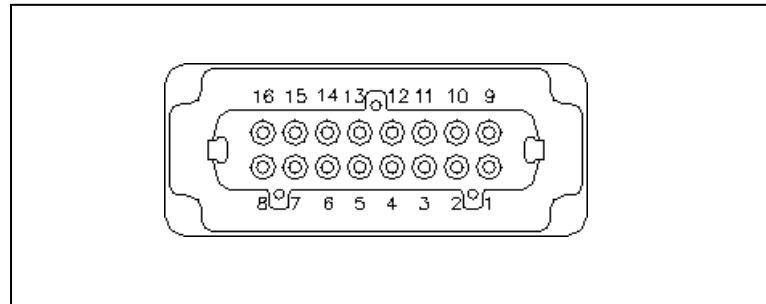
Zone	Connection
1	A
2	B
3	C
4	D
5	E
6	F
7	G
8	H
9	I
10	J
11	K
12	L



230V load connection

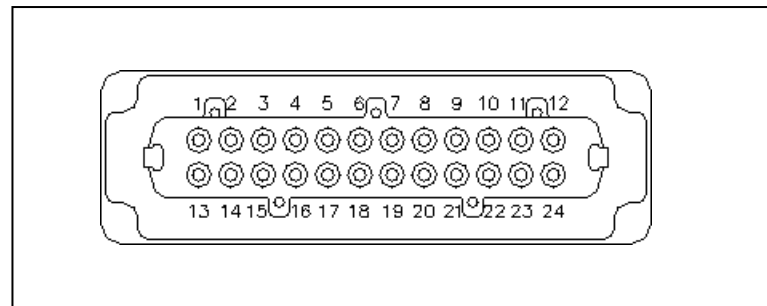
16-pin socket insert for up to 8 heaters

Zone	Contact
1	1 + 9
2	2 + 10
3	3 + 11
4	4 + 12
5	5 + 13
6	6 + 14
7	7 + 15
8	8 + 16



24-pin socket insert for up to 12 heaters

Zone	Contact
1	1 + 13
2	2 + 14
3	3 + 15
4	4 + 16
5	5 + 17
6	6 + 18
7	7 + 19
8	8 + 20
9	9 + 21
10	10 + 22
11	11 + 23
12	12 + 24



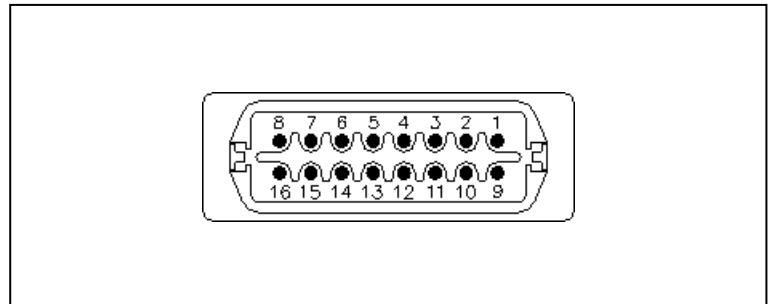
In controllers with a larger number of zones the other connector plugs are assigned according to the first connector plugs.

E.g.: For controller 68010.240 (36 zones) Zone 13 is applied to contacts 1 + 13 of the second connector plug, Zone 25 to contacts 1 + 13 of the third connector plug.

Temperature sensor connection

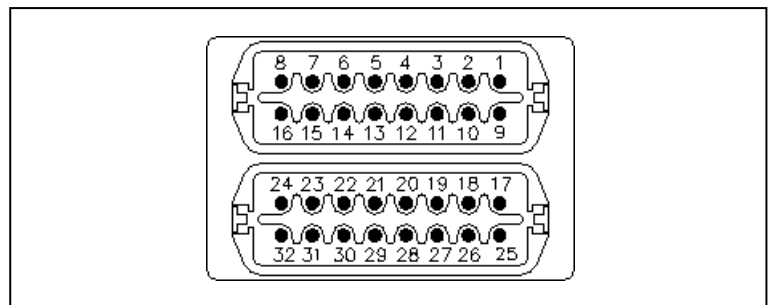
16-pin insert for up to 8 temperature sensors

Zone	Contact	
	+red	-blue
1	1 +	9
2	2 +	10
3	3 +	11
4	4 +	12
5	5 +	13
6	6 +	14
7	7 +	15
8	8 +	16



32-pin insert for up to 16 temperature sensors

Zone	contact	
	+red	-blue
1	1 +	9
2	2 +	10
3	3 +	11
4	4 +	12
5	5 +	13
6	6 +	14
7	7 +	15
8	8 +	16
9	17 +	25
10	18 +	26
11	19 +	27
12	20 +	28
13	21 +	29 ^{*)}
14	22 +	30 ^{*)}
15	23 +	31 ^{*)}
16	24 +	32 ^{*)}



*) In controllers 68010.316 and 68010.364 the connector plug is completely assigned with 16 zones.

In controllers with a larger number of zones the other connector plugs are assigned according to the first connector plugs.

E.g.: For controller 68010.240 (36 zones) Zone 13 is applied to contacts 1 + 9 of the second connector plug, Zone 25 to contacts 1 + 9 of the third connector plug.

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Item no.: 13805 Technical information subject to changes. EWIKON 03/2010