SmartMold V1.58.0

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User Manual

Version: V1.58.0

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SmartMold V1.58.0

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All the people who contributed to this document, all the people who contributed in developping SmartMold software and hardware, all pilot customers for their valuable feedback.

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Foreword

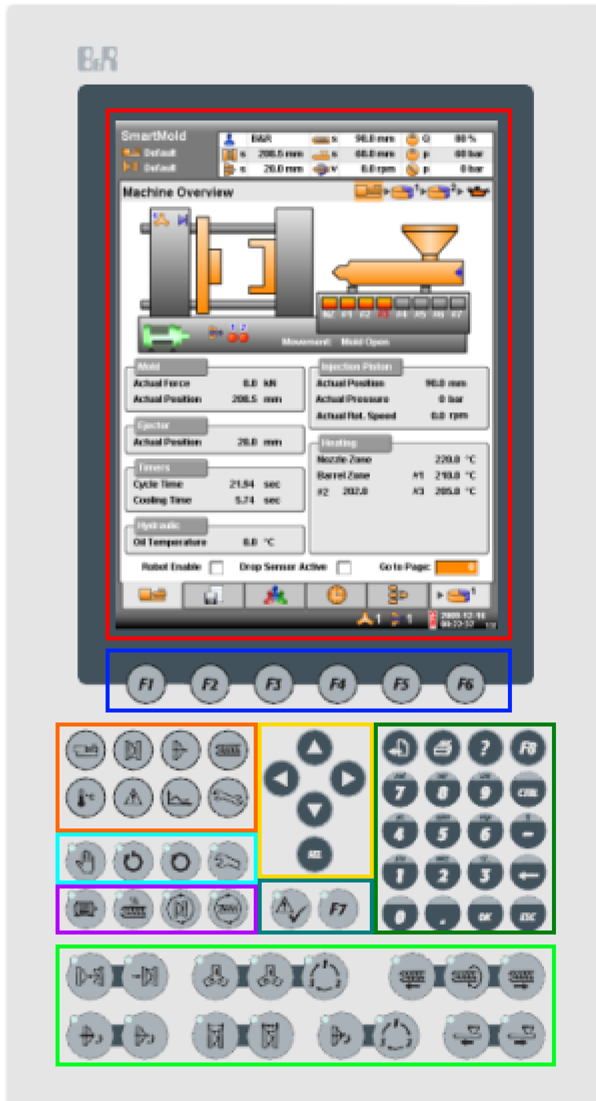
SmartMold is the complete injection molding solution of the worldwide leader in plastic machine automation.

B&R - Perfection in Automation

Part I

1 01_Operation

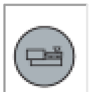
1.1 Control Unit

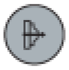


10.4 inch vertical VGA display.

F1-F6. These keys are used for page changing by switching between tabs. On some pages they are also used as special function keys. See the document Operation >> Screen Layout for details.

Keys for changing directly to the main page groups (see Also Pages >> Accessing Pages):

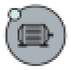
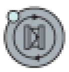
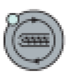
	Press this key to enter the page Pages >> Overview >> Machine Overview (100), containing machine overview, recipe management, user management, production, delay times, lubrication, hydraulic oil settings, automatic sequence editor.

	Press this key to enter the page Pages >> Mold >> Mold Open (200), containing the settings for mold, mold height and cores.
	Press this key to enter the page Pages >> Ejector >> Ejector (300), containing the settings for ejector and airblows.
	Press this key to enter the page Pages >> Injection >> Injection (400), containing the settings for injection, switchover, plastification, decompression, injection unit, injection unit rotation, purge, intrusion.
	Press this key to enter the page Pages >> Heating >> Cylinder Temperature (500), containing the settings for cylinder temperature, mold temperature, heating calendar.
	Press this key to enter the page Pages >> Alarms >> Alarms (600), containing actual alarm list, alarm history, audit trail and Acopos servo pump diagnosis.
	Press this key to enter the page Pages >> Advanced >> Trace Setup (700), containing axes trace, Acopos servo pump trace, SPC and SmartWizard.
	Press this key to enter the page Pages >> Settings >> Settings1 (800), containing general settings, IO browser, free programmable outputs and inputs, calibration and access to the machine setup wizard.

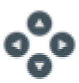
Keys for changing the operation mode. For a detailed explanation of all operation modes see the document Operation >> Machine Startup. Every key has a LED indicating the mode which is currently active:

	Press this key to change to manual mode. In manual mode all movements can be started by pressing the manual movement keys (see detailed description of the manual movement keys below). The movement is carried out with the normal settings (speed, pressure, ...) made on the respective page. The same settings are applied in the automatic mode. The movement lasts until the manual movement key is released or the target position is reached.
	Press this key to change to semi automatic mode. In semi-auto mode a full molding cycle is carried out after closing the safety gate or pressing the cycles-start button (depending on configuration). The cycle repeats after opening and closing the safety gate or pressing the cycle-start button again.
	Press this key to change to full automatic mode. In auto mode full molding cycles are carried out repeatedly after once pressing the **Mold Close** or cycle start key (alternatively also by opening and closing the safety gate - depending on machine configuration).
	Press this key to change to setting mode. In setting mode all movements can be started by pressing the manual movement keys (details see below). The movement is carried out with reduced speed and pressure. The movement lasts until the manual movement key is released. The movement does not stop at target position. Certain interlocks are bypassed in setting mode. When changing to page Pages >> Settings >> Calibration (830), the LED of this key starts blinking. This should be a hint that calibration mode is active.

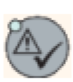
Keys for activating the hydraulic motor, heating, automatic mold height adjustment and purge:

	Press this key to switch on or off the hydraulic motor or Acopos servo pump. The LED is indicating the status of the motor: **Off:** Motor is off or a motor error occurred. **On:** Motor is running. **Blinking fast:** Motor is starting up. **Blinking slow:** Hydraulic oil preheating is active.
	Press this key to switch on or off the cylinder heating. The LED is indicating the status of the cylinder heating: **Off:** Heating is switched off. **On:** Heating is switched on. **Blinking fast:** Heating is in error state or the temperatures are above the maximum temperature. **Blinking slow:** Autotuning or lowering is active.
	Press this key to start automatic mold height adjustment procedure. During automatic mold height adjustment, the moldheight searches the touching point and then decreases for a certain distance to reach the tonnage that is set on the page Pages >> Mold >> Mold Height (230). This function can only be started in setting mode. For details see the documentation of the page Pages >> Mold >> Mold Height (230).
	Press this key to start automatic purging. During purge, injection and plastisizing repeat until no further material remains in the barrel. This function can only be started in manual mode. For details see the documentation of the page Pages >> Injection >> Purge (430).

Keys for navigating between input fields and selecting input options. For detailed information how to use all type of input controls on the pages see the document Operation >> Inputting Data:

	Press the arrow keys to navigate on a page between the input fields. After entering data, it can be confirmed by navigating with the arrow keys to another input field. It is not necessary to press the **OK** key explicitly. When a treeview is open the arrow keys can be used to navigate in the tree. On certain pages, the arrow keys have special functions, for example: In the automatic sequence editor the arrow keys are used to navigate between the steps of the automatic sequence. For the free programmable outputs the arrow keys are used to navigate in the ladder network.
	Depending on the input control which is currently focussed on the page, the select key has different functions: Dropdown: navigate through the available selections in wrap around mode. Button: press the button. Checkbox: toggle selection. Treeview: choose the selected item. For details see the document Operation >> Inputting Data.

Alarm acknowledge key and free programmable F7 key:

	When an alarm is active, the LED of this key is blinking fast. By pressing the button all currently active alarms are acknowledged. Before pressing this button, you should switch to page Pages >> Alarms >> Alarms (600) to check which alarms are active and take the according measures.

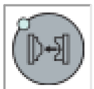
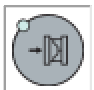
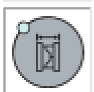
F7	Free programmable F7 key. The following functions can be assigned to this key in the Setup Wizard (see Setup >> Miscellenous): Start Manual Lubrication, Robot On/Off, Drop Sensor On/Off, Logout User, Cylinder Temperature Lowering On/Off, Mold Heating On/Off, Mold Temperature Lowering On/Off, Cycle Start, Go To Page, Change Language, Axis Jog, Axis Toggle, Airblow Activation.

Numerical input block and special functions:

	Press this key to go back one page, similar to the page back functionality of a web browser. The page history contains 10 pages.
	Press this key to generate a screenshot of the current page on the USB stick. The screenshot is saved as .bmp file, the filename is generated consecutively, for example SCS0004.BMP. During USB stick access an icon is displayed in the bottom bar of every page. The USB stick should not be removed during access. For details about screenshot status go to the page Pages >> Settings >> Settings (800).
?	Press this key to access online help or switch back from online help to the previously shown page.
F8	Press this key to move the focus to the next input field on the page. The focus is always moving in a fixed order. This key can be used if it is difficult to reach an input field with the arrow keys.
CTRL	Press this key to toggle the function of the keys F1-F6. F1-F6 can have either page changing functionality or can be used for special functions depending on the shown page, for example cursor movement on the Pages >> Advanced >> Trace Graphics (701). For details see the document Operation >> Screen Layout.
–	Depending on the type of input field which is currently focussed on the page, this key has a different function: Numeric input: Negative sign. Alphanumeric input: Toggle between lower case and upper case characters.
	Depending on the type of input control which is currently focussed on the page, this key has a different function: Numeric and alphanumeric input: Backspace functionality (delete the last number/ character). Treeview: Close all branches of the tree.
OK	Depending on the type of input control which is currently focussed on the page, this key has a different function: Dropdown: choose the selected item. Button: press the button. Checkbox: toggle selection. Treeview: choose the selected item. Numeric input: confirm the new number entered in the input field. Alphanumeric input: confirm the text entered in the input field. Dialog: confirm the action. For details see the document Operation >> Inputting Data.

	Depending on the type of input control which is currently focussed on the page, this key has a different function: Dropdown: cancel selection, close dropdown. Treeview: cancel selection, close treeview. Numeric input: cancel the new number entered in the input field. Alphanumeric input: cancel the new text entered in the input field. Dialog: cancel the action. For details see the document Operation >> Inputting Data.
	Press this key to enter a decimal point in a numeric input field.
	The numeric keypad is used to enter numbers 0-9 in numeric input fields and letters in alphanumeric input fields. For example key 1 can be used to enter the number 1 and the letters S, T and U. These letters are printed on every numpad key above the number.

Manual movement keys. In manual or setting mode, axes movements can be controlled by the manual movement keys. Manual movement keys can be configured as keys with momentary or toggle function. Momentary function means that the axis keeps moving as long as the key is kept pressed. Toggle function means that the axis starts moving when the key is pressed for the first time and stops moving when the key is pressed for the second time. Per default, all keys have momentary function.

	Press this key to open the mold.
	Press this key to close the mold. In automatic mode by pressing this key automatic molding cycles can be started.
	Press this key to move the ejector backward.
	Press this key to move the ejector forward.
	Press this key to increase the moldheight. Moldheight movement is only allowed in setting mode.

	Press this key to decrease the moldheight. Moldheight movement is only allowed in setting mode.
	Press this key to move the currently selected core in. In the bottom line on every page the currently selected core is shown.
	Press this key to move the currently selected core out. In the bottom line on every page the currently selected core is shown.
	Press this key to select a core for manual movement. In the bottom line on every page the currently selected core is shown. This core can be moved then with the **CoreIn** and **CoreOut** buttons. Only those cores can be selected for manual movement, that are programmed for the automatic cycle either on a Pages >> Mold >> Core1 (220) or on the page Pages >> Overview >> Sequence Editor (141).
	Press this key to activate an airblow. In the bottom line on every page the currently selected airblow is shown.
	Press this key to select an airblow for manual activation. In the bottom line on every page the currently selected airblow is shown. This airblow can be activated then with the **Airblow** button. Only those airblows can be selected for manual activation, that are programmed for the automatic cycle either on the page Pages >> Ejector >> Airblows (310) or in the page Pages >> Overview >> Sequence Editor (141).
	Press this key to move the injection piston forward and keep holdon pressure.
	Press this key to plastizise. If the injection piston position is smaller than the front decompression position, front decompression is carried out first.
	Press this key to do front decompression or rear suckback (depending on the actual position of the injection piston).
	Press this key to move the injection unit (nozzle) forward.
	Press this key to move the injection unit (nozzle) backward.

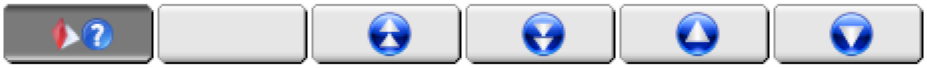
Back-Side:

USB1	Can be used to connect mass storage devices (USB-sticks). Content can be accessed from the recipe-page (under "USB/").
USB2	Can be used to connect a USB-Keyboard (see Operation >> USB Keyboard).

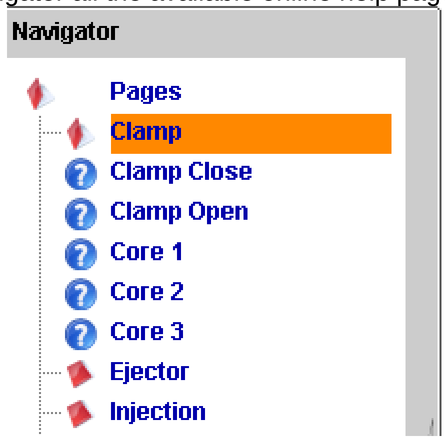
1.2 Online Help

When pressing the help button on any page, the corresponding online help document is opening automatically. If no context sensitive help is available, you are automatically forwarded to this page.

Press then the navigator button to open the navigator (a treeview of all available help pages):



Now you can access via the navigator all the available online help pages:



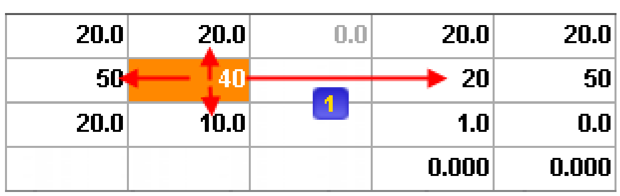
Simply use the cursor keys to move the focus in the navigator up and down. Use the cursor-left key to close a menu or the cursor-right key to open a menu or go to a help page (navigator is closed then). Also the "Select"- or "Enter"-key can be used to open the selected help-page.

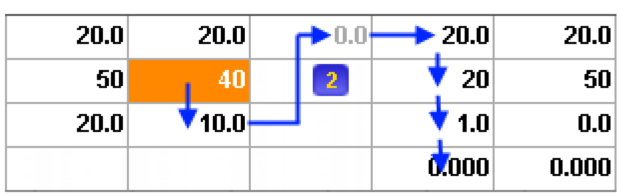
 Press the help button again to leave the online help system.

1.3 Inputting Data

1. Moving the Focus

Before entering data, the focus must be moved to the desired input field. The field which is currently focussed is highlighted orange.





1	Press the **Arrow** keys to move the focus in the desired direction.
2	Press the **F8** key to move the focus in a fixed tab order to the next input field.

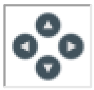
	Press this key to move the focus to the next input field to the left of the currently focussed input field.
	Press this key to move the focus to the next input field to the right of the currently focussed input field.
	Press this key to move the focus to the next input field above the currently focussed input field.
	Press this key to move the focus to the next input field below the currently focussed input field.
F8	Press this key to move the focus to the next input according the fixed tab order on the page.

2. Numeric Input

Numbers like pressure and speed settings can be entered in numeric input fields.

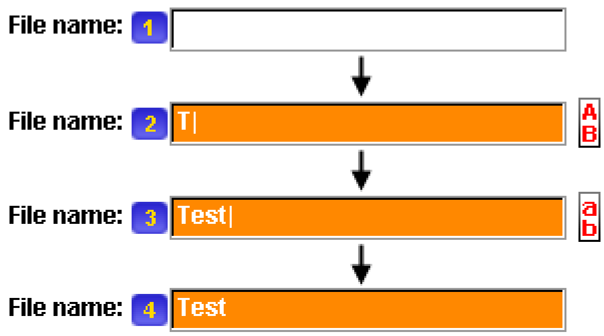
1	Move the focus to the desired input field.
2	Start to enter a number using the **numeric** keys. While the input is edited, the cursor is blinking in the field. Press the **OK** key or simply move the focus to another input field to confirm the new value. Press the **Escape** key to cancel and discard the input.
3	If the new value lies outside the valid range, the input cannot be confirmed, but is automatically corrected to the maximal or minimal possible value. The cursor keeps blinking to indicate that the field is still being edited. Press the **OK** key again or simply move the focus to another input field to confirm the (corrected) new value.
4	The blinking cursor is not shown any more after the new value was accepted.

1	Use the numerical keypad to enter a number in an input field.
–	Press this key to toggle the negative sign of the currently edited value.
←	Press this key to delete the number before the cursor.
OK	Press this key to confirm the new value and replace the old value with it.

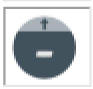
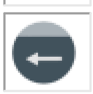
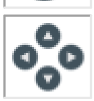
	Press this key to cancel and discard the new value and keep the old value.
	Press these keys to move the focus to the next input and at the same time confirm the new value.

3. Alphanumeric Input

Texts can be entered in alphanumeric input fields.

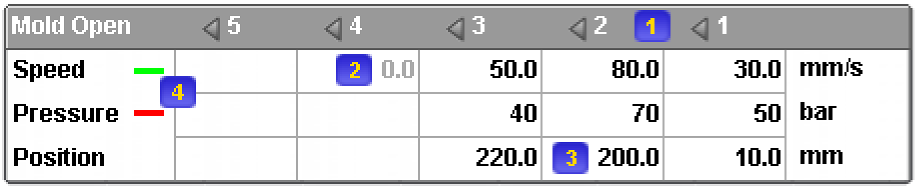


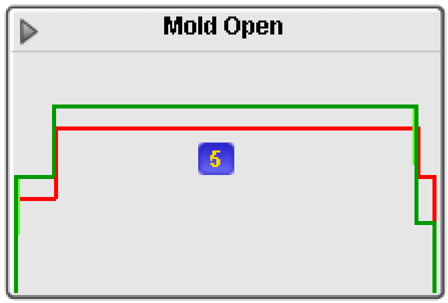
1	Move the focus to the desired input field.
2	Start to enter a text using the **numeric** keys. While the input is edited, the cursor is blinking in the field. On every numeric key some letters are printed in its upper section. By pressing the key fast and repeatedly, one of the letters can be chosen, similar to entering short messages on mobile phones. Press the **Shift** key to toggle between upper and lower case. The current shift status is shown in the bottom area of the page.
3	Press the **OK** key or simply move the focus to another input field to confirm the new text. Press the **Escape** key to cancel and discard the input.
4	The blinking cursor is not shown any more after the new text was accepted.

	Use the numerical keypad to enter a text in an alphanumeric input field. Inputting text works similar to entering short messages on a mobile phone.
	Press this key to toggle between upper and lower case while editing the text.
	Press this key to delete the character before the cursor.
	Press this key to confirm the new text and replace the old text with it.
	Press this key to cancel and discard the new text and keep the old text.
	Press these keys to move the focus to the next input and at the same time confirm the new text.

4. Movement Profiles

For most axes a movement profile can be entered on the respective page. The movement profile consists of several steps, every step with individual settings for speed and pressure. When reaching the target position of every step, speed and pressure change to the next step, considering the acceleration and deceleration rates that can be specified in the setup wizard.

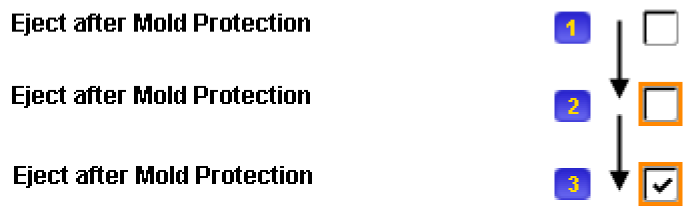




1	A profile consists of several steps with individual settings for speed and pressure. In the example, the mold open profile is made up of 3 steps.
2	A profile has a maximum number of steps (for example 5 steps for mold open), that can be activated by entering a speed higher than 0 or deactivated by entering 0 speed. Inactive profile steps are hidden.
3	The positions are interpreted as target positions. In this example it means that the mold opens with speed 80 mm/s and pressure 70 bar until reaching the position 200.0 mm. Then it switches over to step 3 in the profile. Positions are always checked for plausibility and limited by their neighboring position values. In this example it means that for the second movement step only a position can be entered that lies between 10.0 and 220.0 mm.
4	Speed and pressure profile characteristics are visualized in set value graphics. The color of the set value graph is indicated here.
5	Speed and pressure profile characteristics are visualized in set value graphics. For the speed always 2 curves are shown: the curve of the entered profile steps and additionally a curve where the internal acceleration and deceleration rates are taken into account.

See chapter **2. Numeric input** for details on key usage.

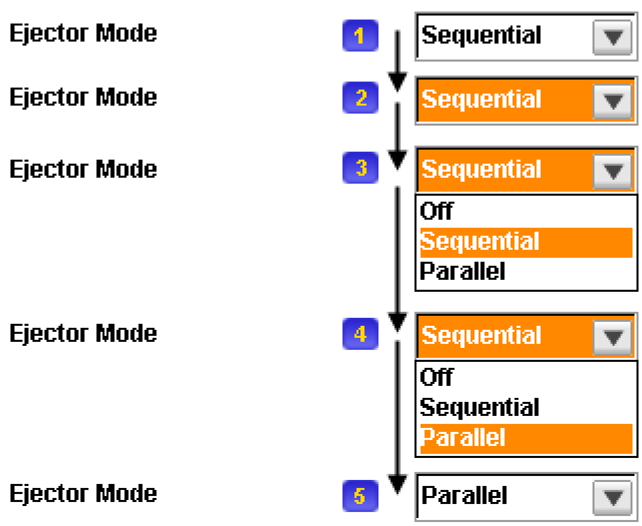
Yes/No, On/Off or Enable/Disable options can be made via checkboxes.



1	Move the focus to the desired checkbox.
2	Option is currently switched off. Press the **Select** or **OK** key to toggle the selection. The new selection is getting into effect immediately.
3	Option is currently switched on. Press the **Select** or **OK** key to toggle the selection. The new selection is getting into effect immediately.

	Press this key to toggle the selection of the focussed checkbox. Same function as **OK** key.
	Press this key to toggle the selection of the focussed checkbox. Same function as **Select** key.

A dropdown contains a list of several items, out of which one item can be chosen. It has the same functionality as a listbox (see chapter **7. Listbox**), but only shows the active item, whereas the listbox shows always the whole list of available items.

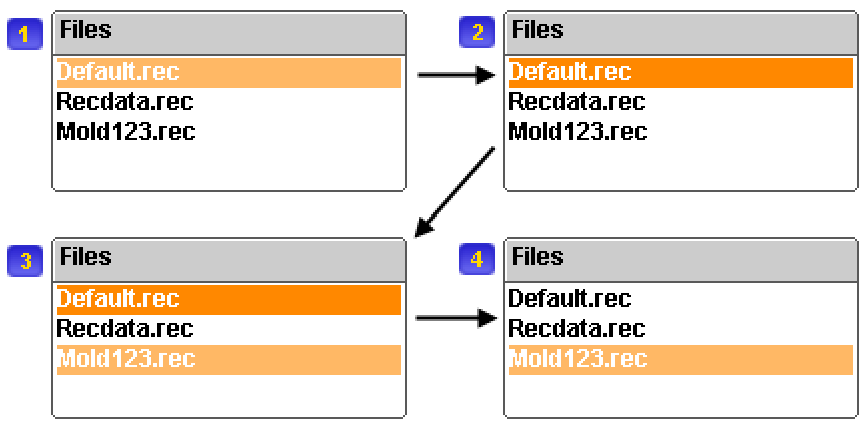


1	The active item is always shown in the dropdown.
2	Move the focus to the desired dropdown.
3	Press the **Select** or **OK** key to open the dropdown.

4	Press the **Select** key repeatedly to select an item. The dropdown is working in wrap around mode. This means, when reaching the end of the list, the cursor moves automatically again to first item of the list.
5	Press the **OK** key or simply move the focus to another input field to confirm the new selection. Press the **Escape** key to cancel and discard the new selection.

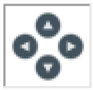
SEL	Press this key to open the dropdown and select an item.
OK	Press this key to confirm the new selection and replace the old one with it.
ESC	Press this key to cancel and discard the new selection and keep the old one.
	Press these keys to move the focus to the next input field and at the same time confirm the new selection.

A listbox contains a list of several items, out of which one item can be chosen. It has the same functionality as a dropdown (see chapter **6. Dropdown**), but shows always the whole list of available items, whereas the dropdown only shows the currently active item.

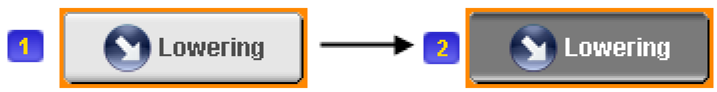


1	The active item is always highlighted light orange in the listbox.
2	Move the focus to the desired listbox. The active item's highlighting changes to dark orange.
3	Press the **Select** key repeatedly to select an item. The listbox is working in wrap around mode. This means, when reaching the end of the list, the cursor moves automatically again to first item of the list.
4	Press the **OK** key or simply move the focus to another input field to confirm the new selection. Press the **Escape** key to cancel and discard the new selection.

SEL	Press this key to select an item in the listbox.

	Press this key to confirm the new selection and replace the old one with it.
	Press this key to cancel and discard the new selection and keep the old one.
	Press these keys to move the focus to the next input field and at the same time confirm the new selection.

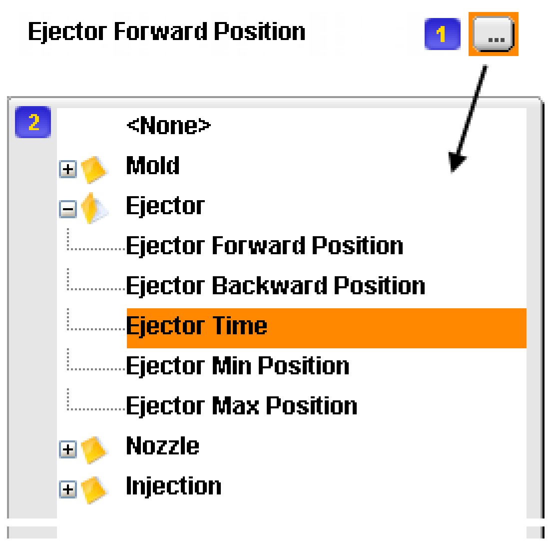
Actions can be triggered by pressing buttons.



1	Move the focus to the desired button and press the **OK** or **Select** key.
2	A pressed button is shown in different color.

	Press this key to press the button that is currently focussed. Same function as **OK** key.
	Press this key to press the button that is currently focussed. Same function as **Select** key.

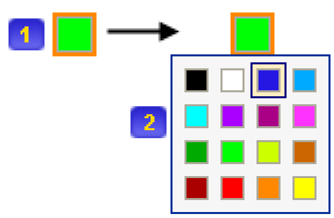
A treeview contains a list of several items, out of which one item can be chosen. It has similar functionality as a dropdown, but the items are not shown as a list, but in a hierarchical treeview, where branches can be closed or opened to access the items behind.



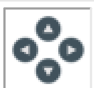
1	Move the focus to the button right to the current selection and press the **OK** or **Select** key to open the treeview.
2	Use the **Arrow** keys to navigate in the treeview and to open and close branches. Press the **OK** key or **Select** key to confirm the new selection. Press the **Escape** key to cancel and discard the new selection.

	Press this key to collapse a folder item in the treeview.
	Press this key to expand a folder item in the treeview.
	Press this key to move one line up in the treeview.
	Press this key to move one line down in the treeview.
	Press this key to collapse all folder items in the treeview.
	When the cursor is on a folder item, the folder will be expanded by pressing this key. When the cursor is over a valid selection, press this key to confirm the new selection and replace the old one with it.
	Press this key to confirm the new selection and replace the old one with it.
	Press this key to cancel and discard the new selection and keep the old one.

Colors can be chosen using the color picker control.

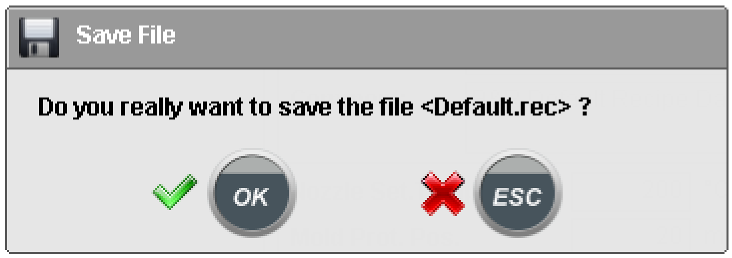


1	Move the focus to the desired color and press the **OK** key.
2	Use the arrow keys to navigate in the available colors, press the **OK** key to confirm the new color and replace the old one with it. Press the **Escape** key to cancel and discard the new color selection.

	Press these keys to navigate in an open color picker.

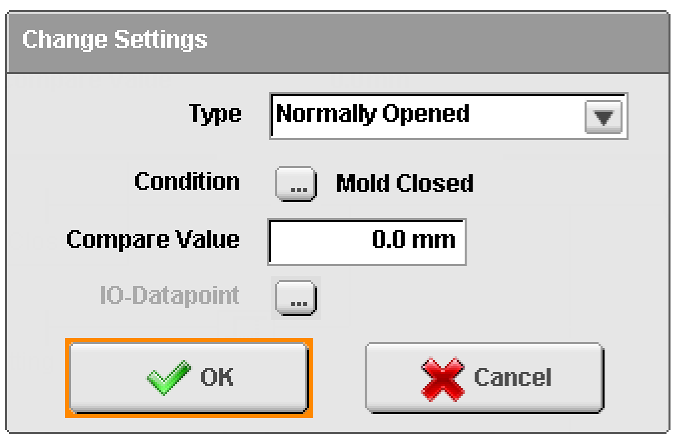
	Press this key to open the color picker for the color that is currently focussed. Press it again to confirm the new color and replace the old one with it.
	Press this key to cancel and discard the new color and keep the old one.

When the user is asked to simply confirm or cancel an action, a dialog window appears:



For dialogs that require only a confirmation, this can be done by pressing the **OK** or **Escape** key. These keys are also shown on the dialog.

On some pages the user is asked to enter data on a dialog:



On dialogs where inputs can be made, the inputs must be confirmed or canceled by pressing the corresponding button on the dialog. The **OK** and **Escape** key are not working like on dialogs type A.

1.4 Screen Layout

Every page of the SmartMold controller follows the same screen layout. The top and bottom areas are common on all pages.

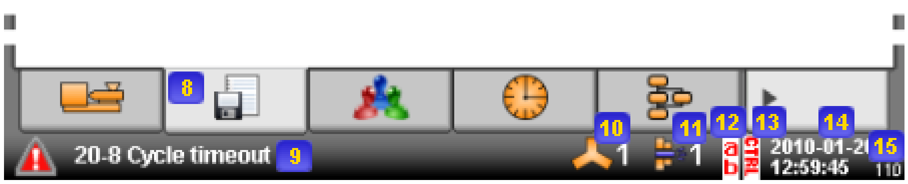
Top area:

1	Name of the machine manufacturer. This name can be defined in **sw.ini**.
2	Machine type or machine name.
3	Mold name. This is the name of the currently loaded and active recipe (mold data). Recipes (mold data) can be loaded and saved on page Pages >> Overview >> Recipe (110).
4	Actual value display. The most important actual values are displayed here. See the table below for a detailed explanation of the values shown.
5	Page title.
6	Subpage browser. Every page can consist of up to 6 subpages. The subpage which is currently displayed is highlighted. The subpages can be accessed by pressing the F6 key repeatedly. For details about page selection see the document Pages >> Accessing Pages.
7	Page content.

The following actual data is displayed in the top area.

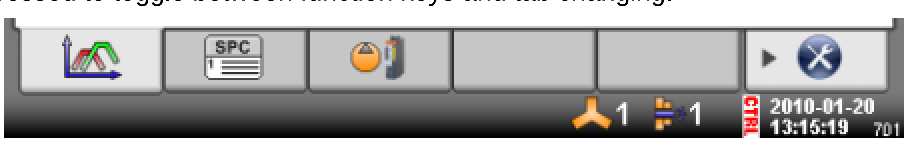
	Access level of the user currently logged in
	s: Actual ejector position
	s: Actual mold position
	s: Actual injection piston position
	s: Actual injection unit (nozzle) position
	v: Actual screw rotation speed
	p: Actual main pump pressure (pressure sensor)
	p: Actual pressure output to main pump
	Q: Actual flow output to main pump

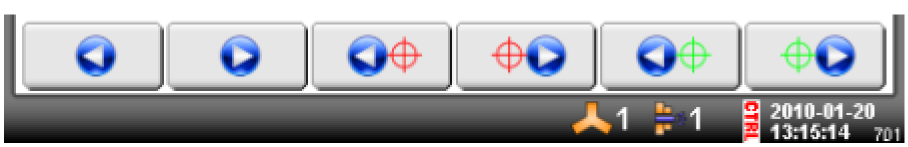
Bottom area:



8	Tabs to switch between pages. For details about page selection see the document Pages >> Accessing Pages.
9	If one or more alarms are active, the most recent active alarm is displayed in the bottom line of the screen. The alarm line contains a unique alarm ID (in this example 20-8) and the corresponding alarm text.
10	The core selection shows the core which can currently be moved with the **Core In** and **Core Out** keys. By pressing the **Core Select** key the core for manual movement can be chosen. For details about core selection for manual movement see the document Operation >> Control Unit.
11	The airblow selection shows the airblow which can currently be activated with the **Airblow** key. By pressing the **Airblow Select** key the airblow for manual activation can be chosen. For details about airblow selection for manual activation see the document Operation >> Control Unit.
12	Shift indicator showing the actual shift status for alphanumerical input fields. The shift indicator is only shown when the focus is placed on an alphanumerical input field. By pressing the **Shift** key you can toggle between upper and lower case characters.
13	CTRL indicator showing whether function buttons are available for this page or not. By pressing the **Ctrl** key you can toggle between function buttons and page tabs, for details see the explanation below.
14	Current date and time. The current date is shown in the format YYYY-MM-DD, the current time is shown in the format HH:MM:SS. Date and time can be ajdusted on page Pages >> Settings >> Settings1 (800).
15	On every page in the bottom right corner of the screen its actual page number is displayed. This number can be entered on page Pages >> Overview >> Machine Overview (100) to jump directly to the page.

Usually the keys F1-F6 are used for page changing by switching between tabs. On some pages however, they are used also as special function keys. If special key functions are available on a certain page, the CTRL indicator [13] is shown. In this case, the **Ctrl** key can be pressed to toggle between function keys and tab changing.





For example on the page Pages >> Advanced >> Trace Graphics (701) the keys F1-F6 are used alternatively to move the cursor within the trace graphic or to change between the tabs.

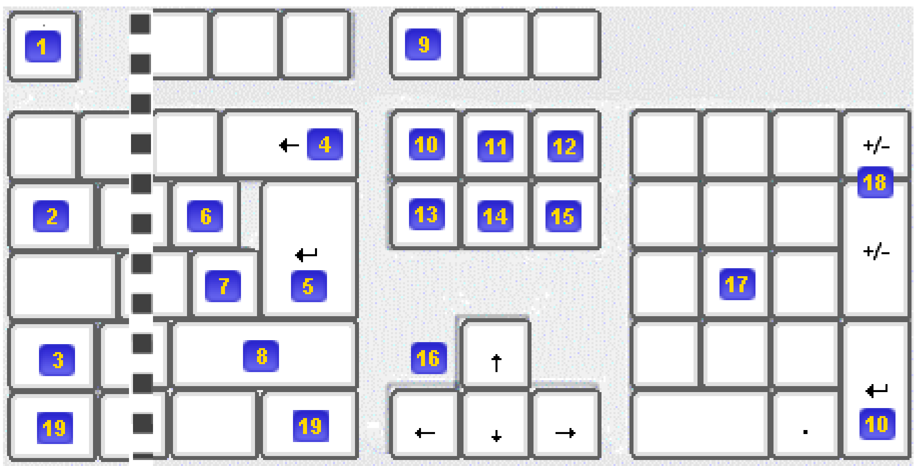
1.5 USB Keyboard

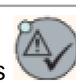
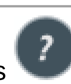
This document describes how the controller can be operated with a USB-Keyboard or with the PC-keyboard when connected via VNC. The Keyboard can replace all keys on the panel and makes inputting texts easier.

Some specials:

- Numeric inputs and dropdowns cannot be confirmed with the normal ENTER-key. Either use the "Insert"-key or move the focus further to confirm the numeric input.
- Numeric inputs and dropdowns cannot be canceled with the ESC-key. Use the "End"-key to cancel the numeric input.
- For moving the selection up and down in a dropdown or listbox use the keys directly left of the ENTER-key.
- For browsing through the main page-groups (see Pages >> Accessing Pages) use the "Page Up"- and "Page Down"-key.
- To go to the main overview page (Pages >> Overview >> Machine Overview) press the "Home"-key

List of usable keys:



1	**Esc**	Escape / Cancel Key. Cancel Dialogs, "Escape" for string inputs. This key has no function for numeric inputs, otherwise identical to  on panel
	F1 .. F6	Same function as F1 to F6 on panel. Change pages, function keys.
	F7	Free programmable key. Same function as  on panel (see Setup >> Miscellenous)
	F8	Acknowledge / Quit alarms. Same function as  on panel.
	F9	Opens Jog-Page (see below).
	F10	Page Back. Goto last opened page, same functions as  on panel.
	F11	Open/Close Help. Opens the online-help, same function as  on panel.

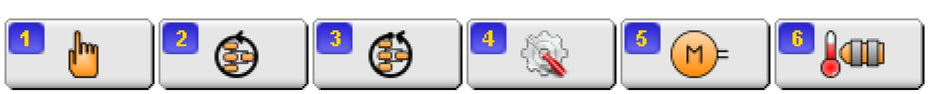
2	**Tab**	Goto next input. Same functionality as F8 on panel
3	**Shift (Left)**	Scroll-Key. Can be used to scroll through lists and dropdown-selections (same functionality as 7)
4	**Backspace**	Backspace for numeric inputs. Does not work for string inputs (use "Delete"-keys for string inputs)
5	**Enter**	Confirm Dialogs and string inputs. Toggle checkboxes. No function for numeric inputs. For numeric inputs the keys 10 can be used.
6	**Sel. Up**	Move selection up (dropdowns, listboxes)
7	**Sel. Down**	Move selection down (dropdowns, listboxes). If this key does not work on your keyboard (due to different country layout) you can use the key 3 to scroll through the lists.
8	**Shift (Right)**	Shift key to toggle between upper and lower case input for string input fields
9	**Print Screen**	Make a screenshot. Same function as  on panel.
10	**Insert**	ENTER for numeric inputs.
11	**Home**	Change to main overview page (Pages >> Overview >> Machine Overview)
12	**Page Up**	Goto next main page group (see Pages >> Accessing Pages)
13	**Delete**	Backspace for string inputs
14	**End**	ESCAPE for numeric inputs.
15	**Page Down**	Goto previous main page group (see Pages >> Accessing Pages)
16	**Cursor**	With this keys you can move the focus on the screen and also control treeview-inputs.
17	**0 .. 9**	Numeric input values for numeric and string inputs. While the keys on the main keyboard can only input numeric values the keys on the num-block can also be used for the mobile phone style input like it is done on the panel.
18	**Sign**	Toggle sign (+/-) for numeric inputs.
19	**Ctrl**	Control key. Same functionality as CTRL on panel (toggle between page and function buttons).
	A .. Z (. ,) Space	Input letters for string inputs. This keys are not available on the controller only with a keyboard a direct string input is possible.

To control also the movement (movement jogs) with the keyboard a special page was created that can only be accessed via the F9-key on the keyboard.
On this page a machine overview is shown and all necessary movement buttons. This buttons can actuated like all other soft-buttons on the controller (move the focus to the button and use the ENTER-key to control the button). If you are connected via VNC you can also use the mouse to actuate the

buttons.
The buttons have the same function as the corresponding keys on the panel (see Operation >> Control Unit).

1	Start / Stop Automatic mold height adjustment
2	Start / Stop Purge
3	Movement Jog: Mold Open
4	Movement Jog: Mold Close
5	Movement Jog: Core In
6	Movement Jog: Core Out
7	Selection key: Change index of core to move
8	Movement Jog: Injection
9	Movement Jog: Plastification
10	Movement Jog: Decompression
11	Movement Jog: Ejector Back
12	Movement Jog: Ejector Forward
13	Jog: Activate AirBlow
14	Selection Key: Change air-blow index to actuate
15	Movement Jog: Increase mold height
16	Movement Jog: Decrease mold height
17	Movement Jog: Inj. Unit forward
18	Movement Jog: Inj. Unit backward

Some functions have to be controlled with the function keys (F1-F6) on this page.



1	**F1**: Change to manual mode
2	**F2**: Change to full automatic mode
3	**F3**: Change to semi-automatic mode
4	**F4**: Change to setting mode
5	**F5**: Turn on/off motor
6	**F6**: Turn on/off cylinder heating

Part II

2 02_General

2.1 Feature List

1 Hardware

1.1 Control Unit

The hardware used for the SmartMold is a B&R PowerPanel (4PP065.1043-K01):

Memory	128MB DRAM, 64KB SRAM, Compact Flash Slot (Default: 256 MB)
Interfaces	Ethernet 10/100, X2X Link, 2 x USB 2.0, optional CAN-interface (via Screw-In Card "4PP65.IF23-1"
Display	10.4" VGA color TFT display (portrait format), no touch!
Keys	65 Keys (26 with LED). See Operation >> Control Unit

On the first USB-slot mass-storage device can be connected to save recipes and other data (see Pages >> Overview >> Recipe (110)).
On the second USB-slot a USB-Keyboard can be connected to input data and replace all keys on the panel (see Operation >> USB-Keyboard).

The CAN-interface can be used to connect Acopos-ServoDrives for the integrated SmartPump-function.

1.2 IO-modules

The standard IO-module for the SmartMold is the compact IO-module XX419. It is especially designed for injection molding and supports the fast switch-over from injection to holdon pressure.
Technical Data:

Digital Inputs	48 digital inputs, 24 VDC, sink or source wiring. 2 of them with counting functionality for screw rotation and mold height pulses.
Digital Outputs	48 digital outputs 24VDC/2A(50%) + 6 relay-outputs (normally open) 230V/1A.
PWM Outputs	2 PWM outputs (3 A) for directly actuating analog valves
Analog inputs	4 analog inputs for potentiometers or general inputs (0..10V or 0..20mA or 0..100%), 2 analog inputs for standard signals (-10V..10V, 0..20mA)
Analog outputs	4 analog outputs: -10..10V

Additionally to this compact IO-Box various other standard X20-modules can be used as expansion (including additional PWM-outputs). For a detailed list of supported modules please see Setup >> IO Configurator.

2 Supported Modes

- **Automatic**: Continuous production. Machine runs without stop
- **Semi-Automatic**: Machine executed one cycle and has to be started by operator again

- **Manual**: Movements can be done manually with the keys on the panel (same movement as in automatic mode)
- **Setting**: Movements are executed with low speed and pressure to adjust machine

3 Supported Machine features

3.1 Injection

Injection	Control of a singly hydraulic axis for injection. Injection profile with up to 5 profile points (velocity, pressure-limit) either position- or time-based. Velocity control can be done open or closed loop. A output for servo-valve is supported. See Pages >> Injection >> Injection (400)
Holding Pressure	Up to 5 profile-points for holding pressure are possible (Pressure, velocity-limit). Control of pressure can happen open or closed loop. Pressure control can be done with PQ-system or servo-valve. See Pages >> Injection >> Injection (400)
Switchover (Injection >> Holding)	Fast switchover is supported by IO-module XX419. Different switchover-criterias are possible (Stroke, Time, Pressure, External). See Pages >> Injection >> Switchover (410)
Decompression	Decompression movements before and after plastification are possible. The decompression strokes can be relative or absolute. See Pages >> Injection >> Plastification (420).
Plastification	Up to 3 profile-points for plastification are possible (Rotation Speed, Backpressure, Pressure). The screw rotation can be controlled hydraulically (open or closed loop) by the PQ-system or with an external (electric) actuator (a analog output for the set rotation is supplied). The actual rotation speed is measured by incoming rotation-pulses. The back-pressure can be controlled by a servo-valve, by a separate pressure-proportional valve or by the pressure-proportional valve of the PQ-system. Backpressure-control is possible open or closed loop. See Pages >> Injection >> Plastification (420)
Purge	Two purge-programs for cleaning the barrel of changing the material-color are supported (see Pages >> Injection >> Purge (430))
Intrusion	Intrusion (Plastification "into" the mold before injection for a certain time) is possible (see Pages >> Injection >> Intrusion (431))
Pre-Injection	A time-based pre-injection step (injection before injection unit forward) is supported (see Pages >> Injection >> Pre-Injection/Accu (401))
Nozzle Closure	The control of a nozzle-closure (hydraulic or non-hydraulic) is possible. Various type of sensors and nozzles are supported the operator can decide when to open/close the nozzle (see Pages >> Injection >> Nozzle Closure (402))
Mold shut-off-valves	The control of up to 10 mold shut-off valves (hydraulic or non-hydraulic) is possible. The valves are operated without sensor-feedback and can be opened and closed during injection or plastification (see Pages >> Injection >> Mold Shut-Off Valves (403))

Inj. Accumulator	Operation of a hydraulic injection accumulator is possible. A pressure sensor or pressure switch can be used for detecting the load-status. The loading can happen with a external pump or one of the PQ-systems. The accumulator can be activated by the operator and it will unload during injection (see Pages >> Injection >> Pre-Injection/Accu(401))
Molding Wizard	A molding wizard is available to help the operator find the ideal injection parameters. It assists the operator in finding the basic parameters but also to correct molding defects (see Pages >> Advanced >> Molding Wizard (730))

3.2 Injection Unit

Injection Unit	Control of a singly hydraulic axis to move the injection unit (nozzle). The axes supports different types of sensors (position, limit-switch, time, pressure...) and can have up to 2 velocity- and pressure-stages for forward- and backward-movement (see Pages >> Injection >> Injection unit (440).
Injection Unit Rotate	The injection unit rotate axis is optional and is a simple axis to rotate the injection unit out and in setting mode (see Pages >> Injection >> Injection Unit Rotate (441))

3.3 Mold

Toggle Clamps as well as direct clamps are supported by the software. For Toggle clamps a linearization of the toggle position is possible if the geometry data of the toggle is known (a linearization table can also be entered manually).

Mold Open/Close	For closing a 3 point velocity profile + mold protection phase is supported. In case of a mold-protection timeout the mold will automatically open again and do the adjusted retries. For opening a 5 point velocity profile is supported.
Graph. Mold Protection	Additional to the normal mold protection timeout the pressure trace during the mold protection phase can be compared to the pressure trace from the last cycle (+/- Tol) (see Pages >> Mold >> Graph. MoldProtect (202))
Mold Fast Valves	Fast Movement and Breaking valves can be freely programmed for open and close movement (see Setup >> MoldValves)
Cores	Up to 6 cores can be operated with the SmartMold. Each core can be actuated hydraulically or not and each core can be moved 2 times in each direction during a cycle (mixing time- and sensor-based movements is possible). Additionally to the normal limit-switch (in/out) also limit-switches for intermediate stop (intermediate in / intermediate out) are supported. Beside limit-switch-based and time-based movements also rotational movements (pulses) are possible.
Mold Height	The mold height can be actuated hydraulically or electrically and a pulse-input for measuring the move-distance is supported (absolute or relative position display possible). See Pages >> Mold >> Mold Height (230).
Mold Height Adjustment	Automatic mold-height adjustment is supported to adjust to the mounted mold. The tonnage can be set open-loop based on the machine characteristics. See Setup >> Mold Height Adjustment
Lock Pressure Adjustment	The pressure necessary for locking can be adjusted automatically (See Pages >> Mold >> Mold Height (230))

Tonnages sensor	A tonnage (locking force) sensor can be connected to monitor the max. locking force and to display it.

3.4 Ejector

Hydraulic Ejector	Control of a single hydraulic axes. For the normal movement (forward/ backward) a 2-stage-profile (velocity/pressure) can be adjusted. For the repetition (shaking) a separate parameter-set can be used. Repetition by time is supported. See Pages >> Mold >> Ejector (300).
AirBlows	Up to 6 air blows are supported which are operated during mold open. Optionally these outputs can be pulsed (on/off-time) (see Pages >> Ejector >> Airblows (310))
Delivery Flap	A simple delivery flap function is available that sorts the parts in "good" and "bad" parts (see Pages >> Ejector >> Delivery Flap (301))
Robot Interface	All signals from Euromap67 are available for the robot-interface. Additionally a cycle-start signal is supported (see Pages >> Ejector >> Robot Interface (320))

3.5 Automatic sequence

Graphical display	The automatic step sequence is always displayed graphically with the active steps highlighted (see Pages >> Overview >> Automatic Sequence (140))
Graphical sequence editing	Normally the automatic sequence is generated automatically from the operator-settings. For special programs it is also possible to edit the sequence grapically and thus create any possible sequence (see Pages >> Overview >> Sequence Editor (141))

3.6 Heating

All heating is done with a PID-control. The PID-parameters are evaluated by a autotuning-procedure (quick step-response method).

Cylinder Heating	Control of up to 8 temperature-zones (including nozzle). Each zone can be heated and/or cooled by a pulse-width-modulated digital output (one for heating and one for cooling). Additionally a cooling-output for the traverse is available. For details see Pages >> Heating >> Cylinder Temperature (500)
Temperature Trending	The set- and actual- temperature of the last 3 hours for every zone (cylinder- and mold-heating) are displayed graphically. (see Pages >> Heating >> Temperature Trend (510))
Calendar	A heating-calendar on a weekly base is available to turn the heating on or off before production starts (see Pages >> Heating >> Temperature Calendar (520))
Mold Heating	Control of up 32 temperature-zones. Each zone can be heated by a pulse-width modulated digital output. See Pages >> Heating >> Mold Temperature 1 (530).

3.7 Data acquisition

Tracing	A tracing (oscilloscope) function is available with which a single movement can be recorded (speed, pressure, position). See Pages >> Advanced >> Trace Setup (700).
SPC	With the SPC various datapoints can be selected and recorded for each machine cycle. The recorded value can be displayed numerically and graphically. Statistical values are evaluated for every datapoint and the distribution can also be seen graphically (6-sigma-plot). Parallel to the recording on the controller it also possible to write the result to a text-file on the USB-device (see Pages >> Advanced >> SPC Setup (710))
Hourly Production Data	The hourly production data is displayed as bar-graphs for the last 30 days (see Pages >> Advanced >> Production Data (740))

3.8 IO-Configuration

IO Browser	In a IO-Browser window all configured IO-modules can be monitored. The status of all IOs can be monitored and forced. Also module-information like serial-number, firmware, hardware-revision, module-configuration and diagnostic information (errors) can be read via the browser (see Pages >> Settings >> IO Browser(810))
IO Diagnosis	A diagnosis-dialog is available to see which modules are plugged correctly and which are missing or defective (see Pages >> Settings >> IO Browser (810))
IO Configurator	In the IO-Configurator a new IO-configuration can be created or the existing changed. It is possible to insert new IO-modules, change the IO-assignment and also the module configuration (channel-types, filter-times...)
Free Prog. Outputs	With the free programmable outputs it is possible to program a short ladder-style code on the panel directly. Available for operator (end-user) and OEM (see Pages >> Settings >> Free Prog. Outputs (820) for end-user and Setup >> Free Prog. IOs for OEM)
Free Prog. Inputs	With the free programmable inputs it is possible to react to a new input by settings a alarm or blocking a movement. Available for operator (end-user) and OEM (see Pages >> Settings >> Free Prog. Outputs (820) for end-user and Setup >> Free Prog. IOs for OEM)

3.9 Hydraulics

PQ-systems	The SmartMold supports up to 3 PQ-systems (hydraulic unit with analog pressure- and/or flow-actuator, see Setup >> Pumps >> PumpSys Setup). Each unit can consist of multiple physical pumps that are used according to the currently necessary flow and pressure (see Setup >> Pumps >> Static Pump-Selection and Setup >> Pump >> Dynamic Pump-Selection). The PQ-systems can also be combined to drive single axes (see Setup >> Pumps >> Pump Combination).
SmartPump	Each PQ-system can also be driven by a servo-pump. Acopos-drives can be controlled directly via the CAN-interface.
Oil	For the hydraulic a oil pre-heating- and cooling-function are integrated.

Motors	Up to 3 motors (to drive hydraulic pumps) can be controlled with the SmartMold (star-delta-startup).

3.10 General

Recipes	Recipes and other date can be saved/loaded on the local flash-drive or on a USB-stick. All data is stored in CSV-format and up to 100 files can be displayed in the recipe-handling (see Pages >> Overview >> Recipe (110))
Alarms	Critical machine conditions are displayed as alarms (see Pages >> Alarms >> Alarms (600)) and the last 2000 alarms can be seen in the alarm-history (see Pages >> Alarms >> Alarm History (610))
AuditTrail	In the AuditTrail each value-changed, operator log-on/off, IO force.... is recorded and the last 2000 events can be viewed and exported (see Pages >> Alarms >> Audit Trail (620))
Login	Login to the system can happen with default-passwords (for each login-level: operator, supervisor, OEM) or with user-name and password (see Pages >> Overview >> Login (120))
Languages	Different languages are available in the SmartMold. New languages can be added as soon as a translation is available.
Units	Units can be changed between metric and imperial (US) as well as between relative (injection parameters as distance) or absolute (injection parameters as volume).
Diagnostics	If an unknown error occurs a error-report can be dumped to the USB-stick. With this data offline-diagnostic is possible. On the SmartMold also the ServiceDiagnositManager (SDM) is active and can be accessed with any Internet-browser (http://panel-ip/sdm)
USB-Keyboard	A USB-Keyboard can be connected to the PP65 and with this keyboard the whole panel and machine can be operated (e.g. when a key on the panel is broken) (see Operation >> USB Keyboard)
Free programmable key	A free programmable key (F7) is available that can have various functions and replace other keys on the panel (if broken).

2.2 IO Datapoints

All available input and output datapoints are listed below:

Mold
Ejector
Injection
Injection Unit
Cores
Mold Height
Safety Gate
Motor/Hydraulics
Pumps
Lubrication
Robot
General
Heating
Mold Shut-Off Valves
AirBlows
Free Prog. Inputs/Outputs

These datapoints can be connected in the IO-Configurator (Setup >> IO-Configurator) to a hardware IO channel. Only those datapoints which are actually connected to the hardware are considered in the software. Unless noted otherwise in the detailed descriptions below, it is sufficient to connect the datapoint in the IO Configurator to activate a function, this means it is not necessary to modify any other setting on a screen. For example the ejector is waiting in automatic mode for the robot only, if the respective signals **Robot: Enable Ejector Back B3** or **Robot: Enable Ejector Forward B4** are connected in the IO Monitor.

🟢 Digital Input
🔴 Digital Output
AI Analog Input
AO Analog Output

Mold

🔴	DO#002	DV Mold Close	Mold close directional valve. The output is HIGH in all operation modes from beginning to the end of mold closing.
🔴	DO#003	DV Mold Open	Mold open directional valve. The output is HIGH in all operation modes from beginning to the end of mold opening.
🔴	DO#004	DV Mold Protection	Mold protection valve. The output is HIGH in manual, semi automatic and automatic mode from beginning to the end of the mold protection phase. The corresponding settings can be made on Pages >> Mold >> Mold Close (200).
🔴	DO#005	Mold Close Fast	Mold close fast valve. The output is HIGH in manual, semi automatic and automatic mode during a certain period while closing the mold. The conditions when the valve is set to HIGH and reset to LOW can be freely defined. These settings can be made either by the OEM (Setup >> Mold Valves) or are unlocked for the operator on page Pages >> Mold >> Mold Close Fast (201).
🔴	DO#006	Mold Open Fast	Mold open fast valve. The output is HIGH in manual, semi automatic and automatic mode during a certain period while opening the mold. The conditions when the valve is set to HIGH and reset to LOW can be freely defined. These settings can be made either by the OEM (Setup >> Mold Valves) or are unlocked for the operator on page Pages >> Mold >> Mold Open Fast (211).
🔴	DO#007	Mold Backpressure	Mold backpressure valve. The output is HIGH in manual, semi automatic and automatic mode during a certain period while opening the mold. The conditions when the valve is set to HIGH and reset to LOW can be freely defined. These settings can be made either by the OEM (Setup >> Mold Valves) or are unlocked for the operator on page Pages >> Mold >> Mold Open Fast (211).
🔴	DO#008	Direct Clamp Lock	Directional valve of the locking cylinder for tonnage build-up on direct clamps. For direct clamps this output signal is HIGH during the locking phase of the mold close movement.
🔴	DO#009	Direct Clamp Unlock	Directional valve of the locking cylinder for pressure release (unlocking) on direct clamps. For direct clamps this output signal is HIGH during the unlocking phase of the mold open movement.
🔴	DO#010	Direct Clamp Pre-Lock	Output that is on during the pre-lock stage (direct clamps only). The pre-lock stage is optional and is active before the locking starts.
🔴	DO#011	Direct Clamp Post-Lock	Output that is on during the post-lock stage (direct clamps only). The post-lock stage is optional and is active after the end of the unlocking (before mold open).
🔴	DO#012	Bumping (Open)	Output that is on during the opening of the bumping-movement (toggle clamp: Output is on from start of movement to end, direct clam: Output is on from end of unlocking to end of movement)

🟢	DI#002	Mold Lock End	Limit switch that is HIGH when the toggle is fully stretched and the mold is locked. The following mold movements consider this limit switch, if additionally the option **Mold Close: Locked LS Connected** is set in the fixdata (Setup >> Toggle Linearization): The Mold Close movement in manual, semi automatic and automatic mode stops when this limit switch is reached. The Mold Unlock movement (after unmanned timeout) stops when this limit switch is LOW and after that the **Mold Unlock Time** (on page Pages >> Mold >> Mold Open (210)) is over. For direct clamps the pressure switch that indicates that the locking phase is finished should be wired to this input.
🟢	DI#003	Start Mold Lock	Limit switch that is HIGH when the platen touches the mold. It indicates that the mold protection phase is over and mold locking can start. Mold locking starts either when the mold locking position (on page Pages >> Mold >> Mold Close (200)) is reached or this limit switch is HIGH.
🟢	DI#004	Mold Blocked Hyd.	This input signal indicates that the mold is locked hydraulically, because the safety gate was opened. If the input signal is HIGH, all movements on the mold side are locked. Injection piston and injection unit can be moved.
🟢	DI#005	Mold Blocked Mech.	This input signal indicates that the mold is locked mechanically, because the safety gate was opened. If the input signal is HIGH, all movements on the mold side are locked. Injection piston and injection unit can be moved.
🟢	DI#006	Jog: Mold Open	This input signal has the same function as the **Mold Open** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the mold open movement.
🟢	DI#007	Jog: Mold Close	This input signal has the same function as the **Mold Close** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the mold close movement.
🟢	DI#008	Mold Open Confirm	Limit switch that is HIGH when the mold is open, to additionally confirm that the mold is in open position besides the mold position transducer. The ejector forward movement is blocked if this signal is LOW. This function must be additionally enabled on Pages >> Mold >> Mold Open (210).
🟢	DI#009	Mold Unlock End	Limit or pressure switch that is HIGH when the unlocking of a direct clamp is finished.
🟢	DI#010	PreLock End	Limit or pressure switch that is HIGH when the pre-lock stage of the direct clamp is finished.
🟢	DI#011	PostLock End	Limit or pressure switch that is HIGH when the post-lock stage of the direct clamp is finished.
AI	AI#002	Mold Actual Stroke	Mold position transducer. It is necessary to specify in the Setup Wizard (Setup >> Toggle Linearization) whether it is mounted on the platen or on the piston.
AI	AI#003	Mold Actual Pressure	This input serves as mold locking force (tonnage) measurement for toggle clamps and as pressure sensor for direct clamps, where the mold locking force is generated with a hydraulic locking cylinder instead of a toggle mechanism.
AO	AO#002	Mold Servo Valve	Normally the mold movement is actuated by directional valves. If a proportional valve for the mold is used, connect this datapoint and specify the valve type in the Setup Wizard (Setup >> Mold).

Ejector

🔴	DO#021	DV Ejector Forward	Ejector forward directional valve.
🔴	DO#022	DV Ejector Backward	Ejector backward directional valve.

🔴	DO#023	Delivery Flap Back	Move the delivery flap to back position.
🔴	DO#024	Delivery Flap Front	Move the delivery flap to front position.
🟢	DI#021	Ejector Confirm Backward	Limit switch that is usually mounted in the mold and that is HIGH when the ejector is retracted, to additionally confirm that the ejector is in backward position besides the ejector position transducer. The mold close movement is blocked if this signal is LOW. This function must be additionally enabled on page Pages >> Ejector >> Ejector (300).
🟢	DI#022	Ejector Backward	Ejector backward limit switch. For an ejector movement based on limit switches, you must select **LimitSwitch** as ejector sensor type in the Setup Wizard (Setup >> Ejector).
🟢	DI#023	Ejector Backward (Pre, IStop)	Depending on the setting for the ejector sensor type (Setup >> Ejector), this input signal can have 2 functions: LimitSwitch (+Pre): Limit switch to indicate the change from first profile step to the second profile step during the normal backward movement. LimitSwitch (+IStp): Limit switch for the backward stop position during the repetition movement.
🟢	DI#024	Ejector Forward	Ejector forward limit switch. For an ejector movement based on limit switches, you must select **LimitSwitch** as ejector sensor type (Setup >> Ejector).
🟢	DI#025	Ejector Forward (Pre, IStop)	Depending on the setting for the ejector sensor type (Setup >> Ejector), this input signal can have 2 functions: LimitSwitch (+Pre): Limit switch to indicate the change from first profile step to the second profile step during the normal forward movement. LimitSwitch (+IStp): Limit switch for the forward stop position during the repetition movement.
🟢	DI#026	Jog: Ejector Backward	This input signal has the same function as the **Ejector Backward** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the ejector backward movement.
🟢	DI#027	Jog: Ejector Forward	This input signal has the same function as the **Ejector Forward** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the ejector forward movement.
🟢	DI#028	Delivery Flap in Back Position	Limit switch that indicates that the delivery flap is in back position.
🟢	DI#029	Delivery Flap in Front Position	Limit switch that indicates that the delivery flap is in front position.
🟢	DI#030	Ejector Confirm Backward (Piston)	Signal has same functionality as "Ejector Confirm Backward" (see above). Can be used additionally as a 2nd redundant input. Unlike the "Ejector Confirm Backward"-input this input cannot be disabled on the ejector page (it is allways active once it is connected to the controller).
AI	AI#021	Ejector Actual Stroke	Ejector position transducer.
AO	AO#021	Ejector Servo Valve	Normally the ejector movement is actuated by directional valves. If a proportional valve for the ejector is used, connect this datapoint and specify the valve type in the Setup Wizard (Setup >> Ejector).

Injection

🔴	DO#041	DV Injection	Injection directional valve.
🔴	DO#042	DV Decompression	Decompression directional valve.

	DO#043	DV Plastification	Plastification directional valve.
	DO#044	Injection Regenerative Valve	Injection regenerative valve. A regenerative valve can be used for faster injection movement. The corresponding settings for the high speed injection must be made in the Setup Wizard (Setup >> Injection).
	DO#045	Nozzle Closure	This output signal controls a nozzle shut-off valve. The output is HIGH during injection and holding pressure in all operation modes.
	DO#046	Accumulator: Load	The output is HIGH when the accumulator is loaded (see Setup >> Accumulator)
	DO#047	Accumulator: Inject	The output is HIGH in manual, semi automatic and automatic mode during injection and holding pressure (see Setup >> Accumulator)
	DO#048	Accumulator: Unload	The output is HIGH when the motor is switched off or the accumulator function is disabled. It unloads the oil to the tank (see Setup >> Accumulator)
	DO#049	No Backpressure Valve	The output is HIGH during plastification in manual, semi automatic and automatic mode, but only if the zero backpressure option is set on page Pages >> Injection >> Plastification (420).
	DO#050	Close Nozzle	Output for "Nozzle Closure": close nozzle (see Pages >> Injection >> Nozzle Closure (402))
	DO#051	Open Nozzle	Output for "Nozzle Closure": open nozzle (see Pages >> Injection >> Nozzle Closure (402))
	DO#052	Accumulator: Hold	Inverted signal to "Accumulator: Unload". The inversion might be necessary as with the inverted signal the accumulator also unloads when the power is turned off (see Setup >> Accumulator)
	DI#041	External Switchover	This input signal can be used to trigger externally the switchover from injection to holding pressure control.
	DI#042	Jog: Decompression	This input signal has the same function as the **Decompression** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the decompression/ suckback movement.
	DI#043	Jog: Injection	This input signal has the same function as the **Injection** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the injection movement.
	DI#044	Jog: Plastification	This input signal has the same function as the **Plastification** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the plastification movement.
	DI#045	Gas Unit Stop Cycle	If this input signal is HIGH, injection and plastification movements are blocked in all operation modes.
	DI#046	Accumulator: Pressure OK	This input signal indicates that the accumulator has reached its set pressure. Accumulator loading is stopped, the output signal **Accumulator: Load** is switched off.
	DI#047	Nozzle Closed	Limit Switch: Nozzle is closed (HIGH)
	DI#048	Nozzle Opened	Limit Switch: Nozzle is opened (HIGH)
	DI#049	Jog: Close Nozzle	Jog Button: Close Nozzle Closure
	DI#050	Jog: Open Nozzle	Jog Button: Open Nozzle Closure
AI	AI#041	Injection Actual Stroke	Injection position transducer.
AI	AI#042	Injection Actual Pressure	Injection pressure sensor for closed loop holding pressure and back pressure control.

AI	AI#043	Accumulator Actual Pressure	Accumulator pressure sensor (see Setup >> Accumulator).
AI	AI#044	Cavity Pressure	Cavity (In-Mold-) pressure sensor for injection switchover.
AO	AO#041	Injection Servo/ Backprs. Valve	Normally the injection movement is actuated by directional valves. If a servo valve for injection is used, connect this datapoint and specify the valve type in the Setup Wizard (Setup >> Injection). Optionally this output signal can be used to connect a proportional valve for backpressure control only. Specify the valve type for plastification in the Setup Wizard (Setup >> Injection).
AO	AO#042	Plast. Set Rotation	Analog output for external plastification actuator (e.g. frequency inverter). See Setup >> Injection.

Injection Unit

	DO#061	DV Inj. Unit Backward	Injection unit backward directional valve.
	DO#062	DV Inj. Unit Forward	Injection unit forward directional valve.
	DO#063	DV Inj. Unit Rotate In	Injection unit rotate in directional valve.
	DO#064	DV Inj. Unit Rotate Out	Injection unit rotate out directional valve.
	DI#081	Inj. Unit Forward	Injection unit forward limit switch. When this limit switched is reached, it is assumed that the necessary nozzle touching force was reached and the injection unit forward movement is stopped. For an injection unit movement based on limit switches, you must select **LimitSwitch** as sensor type in the Setup Wizard (Setup >> Injection Unit).
	DI#082	Inj. Unit Forward (Pre)	Injection unit forward pre-limit switch. When this limit switched is reached, the nozzle protection step gets active. For this 2-limit-switch function select **LimitSwitch (+Pre)** as sensor type in the Setup Wizard (Setup >> Injection Unit).
	DI#083	Inj. Unit Backward	Injection unit backward limit switch. For an injection unit movement based on limit switches, you must select **LimitSwitch** as sensor type in the Setup Wizard (Setup >> Injection Unit).
	DI#084	Inj. Unit Backward (Pre)	Injection unit Backward pre-limit switch. It indicates the change from first profile step to the second profile step during the injection unit backward movement. For this 2-limit-switch function select **LimitSwitch (+Pre)** as sensor type in the Setup Wizard (Setup >> Injection Unit).
	DI#085	Jog: Inj. Unit Backward	This input signal has the same function as the **Injection Unit Backward** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the injection unit backward movement.
	DI#086	Jog: Inj. Unit Forward	This input signal has the same function as the **Injection Unit Forward** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the injection unit forward movement.
	DI#087	Screw Change	This input signal indicates that the screw is currently changed, it blocks the plastification and injection unit movements.
	DI#088	Inj. Unit Rotate In	Injection unit rotate in limit switch. For an injection unit rotate movement based on limit switches, you must select **LimitSwitch** as sensor type in the Setup Wizard (Setup >> Injection Unit).

	DI#089	Inj. Unit Rotate In (Pre)	Injection unit rotate in pre-limit switch. The injection unit rotate in movement slows down when reaching this limit switch shortly before stopping when reaching the end switch. To activate this function you must select **LimitSwitch (+Pre)** as sensor type in the Setup Wizard (Setup >> Injection Unit).
	DI#090	Inj. Rotate Out	Injection unit rotate out limit switch. For an injection unit rotate movement based on limit switches, you must select **LimitSwitch** as sensor type in the Setup Wizard (Setup >> Injection Unit).
	DI#091	Inj. Unit Rotate Out (Pre)	Injection unit rotate out pre-limit switch. The injection unit rotate out movement slows down when reaching this limit switch shortly before stopping when reaching the end switch. To activate this function you must select **LimitSwitch (+Pre)** as sensor type in the Setup Wizard (Setup >> Injection Unit).
	DI#092	Jog: Inj. Unit Rotate In	A pushbutton to jog the injection unit rotate in movement should can wired to this input signal.
	DI#093	Jog: Inj. Unit Rotate Out	A pushbutton to jog the injection unit rotate out movement should can wired to this input signal.
AI	DI#061	Inj. Unit Actual Stroke	Injection unit position transducer.

Cores

	DO#081	DV Core#1..6 Out	Core out directional valve.
	DO#082	DV Core#1..6 In	Core in directional valve.
	DI#101	Core#1..6 Out	Core out limit switch. For a core movement based on limit switches, you must select Move Mode **Limit Switch** or **Limit Switch (Edge)** on Pages >> Mold >> Core1 (220) .. Core6 (225).
	DI#102	Core#1..6 Out (IStop)	Core out intermediate stop limit switch. Two movement parameter sets (e.g. one for the intermediate stop movement, the other one for the final movement to the end position) are available on the Pages >> Mold >> Core1 (220) .. Core6 (225), in order to move to the intermediate stop limit switch the according checkbox must be activated.
	DI#103	Core#1..6 In	Core in limit switch. For a core movement based on limit switches, you must select Move Mode **Limit Switch** or **Limit Switch (Edge)** on the Pages >> Mold >> Core1 (220) .. Core6 (225).
	DI#104	Core#1..6 In (IStop)	Core in intermediate stop limit switch. Two movement parameter sets (e.g. one for the intermediate stop movement, the other one for the final movement to the end position) are available on the Pages >> Mold >> Core1 (220) .. Core6 (225), in order to move to the intermediate stop limit switch the according checkbox must be activated.
	DI#105	Core#1..6 In (Pulse)	Core pulse input. This optional input can be used for pulse-based movements (to count the number of pulses), although it is also possible to use the input "Core#1..6 In" for counting if this input is not connected.
	DI#106	Jog: Core#1..6 In	This input signal has the same function as the **Core In** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the core in movement.
	DI#107	Jog: Core#1..6 Out	This input signal has the same function as the **Core Out** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the core out movement.

Mold Height

🔴	DO#201	DV Mold Height Dec.	Mold height decrease directional valve.
🔴	DO#202	DV Mold Height Inc.	Mold height increase directional valve.
🟢	DI#221	Mold Height Dec. Limit	Limit switch that indicates that the minimum mold height is reached. No more decrease of the mold height is possible. Direct clamp close movement is also blocked if this limit switch is active.
🟢	DI#222	Mold Height Inc. Limit	Limit switch that indicates that the maximum mold height is reached. No more increase of the mold height is possible.
🟢	DI#223	Mold Height Motor Ok	If this input signal is LOW, the alarm **20-43 Mold height motor error** is triggered and no more mold height movement is possible.
🟢	DI#224	Jog: Mold Height Dec.	This input signal has the same function as the **Mold Height Decrease** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the mold height decrease movement.
🟢	DI#225	Jog: Mold Height Inc.	This input signal has the same function as the **Mold Height Increase** key on the SmartMold control unit. It can be used to wire an additional pushbutton to jog the mold height increase movement.

Safety Gate

🔴	DO#221	Safety Gate Close	This output is HIGH during an automatic closing of the safety gate.
🔴	DO#222	Safety Gate Close (Slow)	This output is HIGH during an automatic closing of the safety gate, as soon as the input **Safety Gate Close Slowdown** is HIGH.
🔴	DO#223	Safety Gate Open	This output is HIGH during an automatic opening of the safety gate.
🔴	DO#224	Safety Gate Open (Slow)	This output is HIGH during an automatic opening of the safety gate, as soon as the input **Safety Gate Open Slowdown** is HIGH.
🔴	DO#225	Safety Gate Close (Fast)	This output is HIGH during an automatic closing of the safety gate, before the input **Safety Gate Close Slowdown** is HIGH.
🔴	DO#226	Safety Gate Open (Fast)	This output is HIGH during an automatic opening of the safety gate, before the input **Safety Gate Open Slowdown** is HIGH.
🔴	DO#227	Safety Gate Fast	This output is HIGH whenever one of the outputs **Safety Gate Close (Fast)** or **Safety Gate Open (Fast)** is HIGH.
🟢	DI#231	Safety Gate Closed	Safety gate closed limit switch. The reactions to an open safety gate (which axes should be blocked, allow automatic mode or not, ...) can be defined **sw.ini**. Per default
🟢	DI#232	Safety Gate Closed (Redundant)	Redundant safety gate closed limit switch. If the **Safety Gate Redundancy Check Time** in the Setup Wizard (Setup >> Basic) is set to any other value than 0, a plausibility check is performed. It is checked whether this limit switch changes its state in parallel to the input **Safety Gate Closed** within the time specified.
🟢	DI#233	Safety Gate Not Closed (Redundant)	Redundant and inverse safety gate closed limit switch. If the **Safety Gate Redundancy Check Time** (Setup >> Basic) is set to any other value than 0, a plausibility check is performed. It is checked whether this limit switch changes its state in parallel to the input **Safety Gate Closed** within the time specified.
🟢	DI#234	Safety Gate Close Slowdown	This input signal indicates that the safety gate is getting near the closed position. When this limit switch is HIGH, the output **Safety Gate Close (Slow)** is activated.
🟢	DI#235	Safety Gate Opened	This input signal is HIGH when the safety gate has reached the open position. The automatic open movement of the safety gate will be stopped.

	DI#236	Safety Gate Open Slowdown	This input signal indicates that the safety gate is getting near the open position. When this limit switch is HIGH, the output **Safety Gate Open (Slow)** is activated.
	DI#237	Rear Gate Closed	Rear gate closed limit switch. The reactions to an open rear gate (switch off motor ...) can be adjusted in **sw.ini** (see Software Setup >> Software Options).
	DI#238	Rear Gate Closed (Redundant)	Redundant rear gate closed limit switch. The rear gate is considered closed if both input signals Rear Gate Closed and Rear Gate Closed (Redundant) are HIGH.
	DI#239	Nozzle Cover Closed	Limit switch of either the nozzle cover or the safety gate on injection side. If this input signal is LOW, no movements on injection side (injection, decompression, plastification, injection unit forward and backward) are permitted.
	DI#240	Safety Gate Prot. (Close)	If this input is HIGH, the automatic closing of the safety gate is interrupted and the alarm **20-88 Safety gate stopped by protection sensor** is triggered.
	DI#241	Safety Gate Prot. (Close, Redundant)	Redundant safety gate protection sensor which has the same effect like the input signal **Safety Gate Prot. (Close)**.
	DI#242	Safety Gate Prot. (Open)	If this input is HIGH, the automatic opening of the safety gate is interrupted and the alarm **20-88 Safety gate stopped by protection sensor** is triggered.
	DI#243	Bypass Interlocks	When this input signal is HIGH, certain movements are allowed with open safety gate. It can be configured in **sw.ini** (see Software Setup >> Software Options) which movements are allowed when the safety gate is open and for which this input is necessary. The input is also used to skip the dynamic (core) interlocking in setting mode (see Pages >> Mold >> Mold Open (210))
	DI#244	Safety Gate Motor OK	When this input signal is LOW, automatic safety gate movement is not possible and the alarm **20-42 Safety gate motor error** is triggered.
	DI#245	Jog: Safety Door Close	This input signal has the same function as the function button on page Pages >> Overview >> Machine Overview (100). It can be used to wire a pushbutton to jog the safety gate close movement.
	DI#246	Jog: Safety Door Open	This input signal has the same function as the function button on page Pages >> Overview >> Machine Overview (100). It can be used to wire a pushbutton to jog the safety gate open movement.
	DI#247	Safety Gate Closed Confirm	This input signal can be used for an additional confirm pushbutton, that the operator must press in order to confirm that the safety gate is closed. It has the same effect as the **Safety Gate Closed** signal. To activate this check of the confirm input the option **Enable Automatic Operation of Safety Gate** must be additionally set in the Setup Wizard (Setup >> Basic).

Motor/Hydraulics

For details on the motor IOs see the documentation Setup >> Motor.

	DO#241	Motor 1..3: Main Contact	Main contact for the pump motor. It is switched on a short time after switching on the **Star Contact**.
	DO#242	Motor 1..3: Star Contact	Star contact for the pump motor. Normal star-delta starter function: the **Star Contact** is switched on first, and after a delay time it is switched off and the **Delta Contact** is switched on.
	DO#243	Motor 1..3: Delta Contact	Delta contact for the pump motor. Normal star-delta starter function: the Star Contact is switched on first, and after a delay time it is switched off and the Delta Contact is switched on.
	DO#250	Servo Pump 1..3: Main Contact	Mains voltage relay for the Acopos drives. This output is switched on a certain time before the controllers on Acopos drives are switched on.
	DO#253	Oil Preheat Active	This output is HIGH when oil preheating is performed.

🟢	DI#261	Motor 1..3: Overload	Feedback of the circuit breaker that is HIGH when the motor has tripped.
🟢	DI#262	Motor 1..3: On	Feedback signal to confirm that the motor is running in delta.
🟢	DI#263	Oil Filter #1 Dirty	The feedback signal of an oil filter should be wired to this input. If the input signal is HIGH when the motor is running, the alarm **20-14 Oil filter dirty** is triggered and the motor is switched off.
🟢	DI#264	Oil Filter #2 Dirty	The feedback signal of an oil filter should be wired to this input. If the input signal is HIGH when the motor is running, the alarm **20-14 Oil filter dirty** is triggered and the motor is switched off.
🟢	DI#265	Hyd. Oil Level Low	Hydraulic oil tank level indicator. If the input signal is HIGH when the motor is running, the alarm **20-1 Hydraulic oil level low** is triggered and the motor is switched off.
🟢	DI#270	Motor 1..3: Inverter Error	Inverter Error Indicator. If the input signal is HIGH when the motor is on, the alarm **20-112 Inverter Error** is triggered. This signal can be used when e.g. a 3rd party servo-pump is used.

Pumps

For an explanation on the outputs related to the hydraulic pump system see the document Setup >> Pump System.

🔴	DO#262	Pump Sel. Valve#1..#5	Static pump-selection valve outputs (see Setup >> Static Pump-Selection)
🔴	DO#267	Pump Comb.#1.. #2 Connect	This output is set whenever the pump-combination #1 or #2 is used (requested by an axis). See Setup >> Pump Combination.
🔴	DO#268	Pump Comb.#1.. #2 Disconnect	This output is set whenever the pump-combination #1 or #2 is not used (not requested by an axis). See Setup >> Pump Combination.
🔴	DO#282	Pump#1..#3 DynValve#1..#4	Outputs to activate the sub-pumps for every PQ-system. This dynamic pump-selection valves are set depending on tha actually requested flow (see Setup >> Dynamic Pump-Selection)
AI	AI#102	Main/Sec./Third Pump Actual Pressure	Pressure sensor for PQ-systems (see Setup >> Pump System).
AO	AO#102	Main/Sec./Third Pump Flow Valve	Output for the flow-actuator of the PQ-system (see Setup >> Pump System).
AO	AO#103	Main/Sec./Third Pump Pressure Valve	Output for the pressure-actuator of the PQ-system (see Setup >> Pump System).

Lubrication

For details on the IOs related to the lubrication system see the documentation Setup >> Lubrication in the Setup Wizard.

🔴	DO#341	Lubrication Central Pump On	This output signal is HIGH, when any of the three lubrication pumps is running.
🔴	DO#342	Lubrication Central Error	This output signal is HIGH, when any of the three lubrication system is in error state.
🔴	DO#344	Lubrication 1-3 Pump On	Lubrication pump.

🔴	DO#345	Lubrication 1-3 Error	This output signal is HIGH, when the lubrication system is in error state. The reason can be either that the lubrication oil level is low (input signal **Lubrication 1-3 Level Low**), or that the feedback (input signal **Lubrication 1-3 Pressure OK**) did not come in time.
🟢	DI#282	Lubrication 1-3 Pressure OK	Feedback signal of the lubrication system. It can be configured in the Setup Wizard (Setup >> Lubrication) whether the lubrication finishes after this signal changes its state from LOW to HIGH, or 2 pulses are awaited before the lubrication finishes.
🟢	DI#283	Lubrication 1-3 Level Low	If this input signal is HIGH, the alarm **20-13 Lubrication main oil level low**, **20-75 Lubrication 2 oil level low** or **20-76 Lubrication 3 oil level low** is triggered.

Robot

All robot signals follow the Euromap 67 specification which can be downloaded at http://www.euromap.org/technical-issues/technical-recommendations.

🔴	DO#361	To Robot: Emergency stop ZA1	This output signal is LOW then the injection molding machine emergency stop device is being actuated.
🔴	DO#362	To Robot: Safety devices closed ZA3	This output signal is HIGH when safety gate devices (e.g. safety guards, footboard safety, etc.) on the injection molding machine are operative so that dangerous movements of the robot are possible. The signal is active in any operation mode. The signal must be the result of limit switch contact series of mold area safety devices according to EN 201.
🔴	DO#363	To Robot: Reject ZA5	HIGH signal when the molding is a reject, starting with the opening of the mold. It is reset to LOW when the next cycle starts. (for details see Pages >> Ejector >> Robot Interface (320))
🔴	DO#364	To Robot: Mold closed ZA6	HIGH signal when the mold closing is completed.
🔴	DO#365	To Robot: Mold open position ZA7	HIGH signal when mold opening position is equal or more than required position. The signal must remain HIGH as long as the mold is open and must not be interrupted by a change of operation mode or safety guard opening.
🔴	DO#366	To Robot: Intermediate mold opening position	Optional. HIGH signal when mold opening reaches a set position smaller than mold opening position. The signal remains HIGH to the end of mold opening position. It is currently not supported.
🔴	DO#367	To Robot: Automatic ZB2	HIGH signal when the injection molding machine is able to be operated with the robot. It is HIGH when the machine is in either automatic or semi automatic mode.
🔴	DO#368	To Robot: Ejector back position ZB3	HIGH signal when the ejector has been finally (after its repetition cycles) retracted regardless of the moving platen position.
🔴	DO#369	To Robot: Ejector forward position ZB4	HIGH signal when the ejector has been advanced.
🔴	DO#370	To Robot: Cores (1) In ZB5	HIGH signal when the core pullers 1 are in. It can be adjusted on Pages >> Mold >> Core1 (220) .. Core2 (225) which cores belong to the groups 1 and 2.
🔴	DO#371	To Robot: Cores (2) In ZB7	HIGH signal when the core pullers 2 are in. It can be adjusted on Pages >> Mold >> Core1 (220) .. Core2 (225) which cores belong to the groups 1 and 2.
🔴	DO#372	To Robot: Cores (1) Out ZB6	HIGH signal when the core pullers 1 are out. It can be adjusted on Pages >> Mold >> Core1 (220) .. Core2 (225) which cores belong to the groups 1 and 2.
🔴	DO#373	To Robot: Cores (2) Out ZB8	HIGH signal when the core pullers 2 are out. It can be adjusted on Pages >> Mold >> Core1 (220) .. Core2 (225) which cores belong to the groups 1 and 2.
🟢	DI#301	Robot: Emergency stop A1	This input signal is LOW when the robot emergency stop is being actuated, which causes an emergency stop of the injection molding machine.

	DI#302	Robot: Mold area free A3	This input signal is HIGH when the robot is outside the mold are and does not interfere with mold opening and closing movements.
	DI#303	Robot: Operation mode B2	LOW signal when the robot mode switch is "Operation with injection molding machine". HIGH signal when the robot mode switch is "No operation with injection molding machine". If this input signal is HIGH, the robot signals are not considered for the machine operations. It can be configured in **sw.ini** whether the robot must be disabled by this input signal or can be deactivated also by the **Robot Enable** setting on Pages >> Overview >> Machine Overview (100).
	DI#304	Robot: Enable ejector back B3	HIGH signal when the robot enables the movement for ejector back. The signal must remain HIGH at least until **Ejector back position ZB3** signal is given by the injection molding machine.
	DI#305	Robot: Enable ejector forward B4	HIGH signal when the robot enables the movement for ejector forward. The signal must remain HIGH at least until **Ejector forward position ZB4** signal is given by the injection molding machine.
	DI#306	Robot: Cores(1) In enable B5	HIGH signal when the robot is in position to enable the in movement of the core pullers 1. It can be adjusted on Pages >> Mold >> Core1 (220) .. Core2 (225) which cores belong to the groups 1 and 2.
	DI#307	Robot: Cores(2) In Enable B7	HIGH signal when the robot is in position to enable the in movement of the core pullers 2. It can be adjusted on Pages >> Mold >> Core1 (220) .. Core2 (225) which cores belong to the groups 1 and 2.
	DI#308	Robot: Cores(1) Out Enable B6	HIGH signal when the robot is in position to enable the out movement of the core pullers 1. It can be adjusted on Pages >> Mold >> Core1 (220) .. Core2 (225) which cores belong to the groups 1 and 2.
	DI#309	Robot: Cores(2) Out Enable B8	HIGH signal when the robot is in position to enable the out movement of the core pullers 2. It can be adjusted on Pages >> Mold >> Core1 (220) .. Core2 (225) which cores belong to the groups 1 and 2.
	DI#310	Robot: Enable mold closure A6	HIGH signal when the robot is retracted enough for start of mold closure. The signal must remain HIGH at least until **Mold closed ZA6** is available. As a result, mold closing is interrupted.
	DI#311	Robot: Enable full mold opening A7	Optional. HIGH signal when the robot has taken the part and allows to continue mold opening. It is currently not supported.
	DI#312	Robot: Cycle Start	This input signal is not part of the Euromap 67 specification. Before starting the next cycle (closing the mold) the injection molding machine waits for a HIGH level of this input signal. It is not necessary to keep it HIGH until the mold is fully closed, but sufficient to provide a pulse.
	DI#313	Robot: Emergency stop A2	This input signal is LOW when the robot emergency stop is being actuated, which causes an emergency stop of the injection molding machine (redundant, channel 2).

General

	DO#381	Part Reject	This output is set whenever the part is rejected (see Pages >> Ejector >> Robot Interface (320) for details)
	DO#382	Cycle Interval	Interval Signal Output. This output can be configured on Pages >> Overview >> Production(2) (102)
	DO#383	Alarm Light	Alarm-Light output. This output is set whenever a alarm is active with the configured alarm-reaction "Alarm-Light". This output is pulsing (on/off) when its active (see Machine Setup >> Software Options >> Settings)

	DO#384	Alarm Horn	Alarm-Horn output. This output is set whenever a alarm is active with the configured alarm-reaction "Horn" (output is constantly on), "Horn-Pulse" (output is pulsing (on/off)) or "Horn short" (output is on for a short time) - (see Machine Setup >> Software Options >> Settings).
	DO#385	Wait for Cycle Start	This output is on when the machine is in automatic or semiautomatic mode and is waiting for a start-command (cycle not started yet)
	DO#386	Alarm Light #2	Alarm-Light #2 output. This output is set whenever a alarm is active with the configured alarm-reaction "Alarm-Light #2". This output is pulsing (on/off) when its active (see Machine Setup >> Software Options >> Settings)
	DO#387	Alarm Light #3	Alarm-Light #3 output. This output is set whenever a alarm is active with the configured alarm-reaction "Alarm-Light #3". This output is pulsing (on/off) when its active (see Machine Setup >> Software Options >> Settings)
	DI#321	Emergency Stop	When this input is active (HIGH) than the alarm **20-0 Emergency button pressed** is set and all movements are stopped on the machine.
	DI#322	Drop Sensor	Drop Sensor input to detect a falling part (see Pages >> Overview >> Machine Overview (100))
	DI#323	Cycle Start	Input for "Cycle Start"-Button. With this button (positive edge) the cycle can be started in automatic and semi-automatic mode.
	DI#324	Additional Drop Sensor	Additional Drop Sensor to detect falling part. Either this sensor or the standard one (Drop Sensor - see above) can detect a part.
	DI#325	Auto Interrupt	Auto Interrupt input. A positive edge on this input switches the machine to the last active manual mode (manual or setting mode) and quits all pending alarms and diagnosis messages. A negative edge switches the machine to the last active automatic mode (auto or semi-auto).
	DI#326	Hydraulic Saftey Valve	Input to monitor the hydraulic safety vale (see Setup >> Hydraulic Safety Valve).
	DI#327	Login Key	When this input is connected than the controller can only be operated when the input is HIGH (user is automatically logged in as "Operator". Otherwise all jogs are locked and the user is automatically logged out.
	DI#328	Cooling Water Pressure Low	This inputs indicates a low pressure in the cooling water line. When the input is HIGH the alarm **20-71 Cooling water pressure not ok** is set.
	DI#329	Hopper Empty	This inputs indicates that the hopper is empty. When the input is LOW for more than 2 seconds the alarm **20-103 Hopper empty** is set.
	DI#330	Energy Pulse	Pulse input for energy-meters. For each pulse (pos. edge) a certain energy-amount can be defined.

Heating

	DO#402	Oil Cooling On	Output for oil-cooling (water-valve). See Pages >> Overview >> Oil, Lubrication (103)
	DO#403	Mold Cooling On	Output for mold cooling (water-valve). This output is set as long as the cooling time ("cooling time"-step - see Pages >> Overview >> Automatic Sequence (140)) is active
	DO#404	Cylinder Heating on	This output is set when the cylinder heating is turned on (see Pages >> Heating >> Cylinder Temperature (500))
	DO#405	Mold Heating on	This output is set when the mold heating is turned on (see Pages >> Heating >> Mold Temperature (530))
	DO#406	Traverse Cooling On	This output is set when the traverse cooling is active (see Pages >> Heating >> Cylinder Temperature (500))

	DO#421	Nozzle Zone.. Mold Zone#16 Heat	Heating output for the Zone. This output is on when the zone should be heated. It is pulse-width modulated according to the actual control-signal (see Setup >> Heating).
	DO#422	Nozzle Zone.. Mold Zone#16 Cool	Cooling output for the Zone. This output is on when the zone should be cooled (output is only set when the zone is configured for cooling). It is pulse-width modulated according to the actual control-signal (see Setup >> Heating).

Mold Shut-Off Valves

	DO#701. .	ShutOff Valve#1..10 Open	Output for opening mold shut-off valve #1. See Pages >> Injection >> Mold Shut-Off Valves (403)
	DO#702. ..	ShutOff Valve#1..10 Close	Output for opening mold shut-off valve #1. See Pages >> Injection >> Mold Shut-Off Valves (403)

AirBlows

	DO#801. ..	AirBlow #1..#6	These outputs are set when the air-blow outputs are acitve (See Pages >> Ejector >> AirBlows (310))

Free Prog. Inputs/Outputs

	DO#1002	FP Fix Out#1.. #8: *Desc. Text*	Free Programmable Fix Outputs (see Setup >> Free Prog. IOs). The description text is set by the user.
	DO#1102	FP Rec Out#1.. #4: *Desc. Text*	Free Programmable Outputs (see Pages >> Service >> Free Prog. Outputs (820)). The description text is set by the user.
	DI#342	FP Fix In#1.. #5: *Desc. Text*	Free Programmable Inputs (see Setup >> Free Prog. IOs). The description text is set by the user.
	DI#362	FP Rec In#1.. #5: *Desc. Text*	Free Programmable Outputs (see Pages >> Service >> Free Prog. Inputs (821)). The description text is set by the user.
AO	AO#201	Free Out#1..#2	Free Programmable Analog Outputs (see Setup >> Free Prog. IOs). The description text is set by the user.

Part III

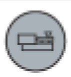
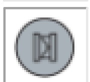
3 03_Pages

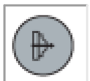
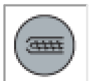
3.1 Accessing Pages

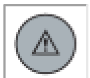
This document should give an overview of how all the pages can be accessed.

The pages are ordered in 8 main page-groups. This page-groups can be accessed directly via the page-keys on the panel (see Operation >> Control Unit).
The pages inside this group can than be accessed with the Keys F1-F5 (Icons above the keys will indicate the page content) and if one of this pages has one or more sub-pages it is possible to scroll through this pages using the key F6 (If sub-pages exist the icons for this pages will be displayed on the upper right corner of the screen - see Operation >> Screen Layout).

The pages can also be directly accessed from the main page by entering the page-number in the according field (see Pages >> Overview >> Machine Overview). The page-numbers are also listed in the overview below.

	**F1**	**-**	**100**	Pages >> Overview >> Machine Overview. Overview Page showing the most important machine parameters and settings
		F6/1	**101**	Pages >> Overview >> Production(1). Page showing the production parameters (cycle counter, shift settings).
		F6/2	**102**	Pages >> Overview >> Production(2). Page where general settings for the production can be made (Interval output, RunIn Cycles, Safety Gate...).
		F6/3	**102**	Pages >> Overview >> Oil, Lubrication. Page where the settings for the hydraulic oil, lubrication circuits and motors can be made.
	F2	-	**110**	Pages >> Overview >> Recipe. Saving and loading of Recipe- and FixData-files.
	F3	-	**120**	Pages >> Overview >> User Management. Login and logout of operators.
	F4	-	**130**	Pages >> Overview >> Delay Times(1). Delay- and Timeout-settings for the automatic sequence.
		F6/1	**131**	Pages >> Overview >> Delay Times(2). Delay- and Timeout-settings for the automatic sequence.
	F5	-	**140**	Pages >> Overview >> Automatic Sequence. Graphic display of the automatic sequence.
		F6/1	**141**	Pages >> Overview >> Sequence Editor. Graphic editor for changing the automatic sequence.
	**F1**	**-**	**200**	Pages >> Mold >> Mold Close. Mold Close Settings
		F6/1	**201**	Pages >> Mold >> Mold Close Fast. **Optional:** Settings for Mold Close Fast Valve.
		F6/2	**202**	Pages >> Mold >> Graph. Mold Protection. **Optional:** Graphical mold protection.

		F6/3	**203**	Pages >> Mold >> Mold Lock. **Optional:** Lock settings for direct clamp.
	F2	**-**	**210**	Pages >> Mold >> Mold Open. Mold Open Settings
		F6/1	**211**	Pages >> Mold >> Mold Open Fast. **Optional:** Settings for Mold Open Fast and Backpressure Valve.
		F6/2	**212**	Pages >> Mold >> Mold Unlock. **Optional:** Unlock settings for direct clamp.
	F3	**-**	**220**	Pages >> Mold >> Core1. Settings for Core #1.
		F6/1	**221**	Pages >> Mold >> Core2. **Optional:** Settings for Core #2.
		F6/2	**222**	Pages >> Mold >> Core3. **Optional:** Settings for Core #3.
		F6/3	**223**	Pages >> Mold >> Core4. **Optional:** Settings for Core #4.
		F6/4	**224**	Pages >> Mold >> Core5. **Optional:** Settings for Core #5.
		F6/5	**225**	Pages >> Mold >> Core6. **Optional:** Settings for Core #6.
	F4	**-**	**230**	Pages >> Mold >> Mold Height. Settings for MoldHeight Adjustment.
	**F1**	**-**	**300**	Pages >> Ejector >> Ejector. Hydraulic Ejector settings.
		F6/1	**301**	Pages >> Ejector >> Delivery Flap. **Optional:** Settings for Delivery Flap.
	F2	**-**	**310**	Pages >> Ejector >> Ariblows. Airblow (Pneumatic Ejector) settings.
	F3	**-**	**320**	Pages >> Ejector >> Robot Interface. **Optional:** Robot interface settings.
	**F1**	**-**	**400**	Pages >> Injection >> Injection. Injection and holdon settings.
		F6/1	**401**	Pages >> Injection >> Pre-Injection / Accu. **Optional:** Settings for pre-injection and injection accumulator.
		F6/2	**402**	Pages >> Injection >> Nozzle Closure. **Optional:** Settings for nozzle closure.
		F6/3	**403**	Pages >> Injection >> Mold Shut-Off Valves. **Optional:** Settings for mold shut-off valves.
	F2	**-**	**410**	Pages >> Injection >> Switchover. Injection switchover (to holdon) settings.
	F3	**-**	**420**	Pages >> Injection >> Plastification. Plastification settings.
	F4	**-**	**430**	Pages >> Injection >> Purge. Purge settings.
		F6/1	**431**	Pages >> Injection >> Intrusion. **Optional:** Intrusion settings.
	F5	**-**	**440**	Pages >> Injection >> Injection Unit. Settings for Injection Unit forward and backward.

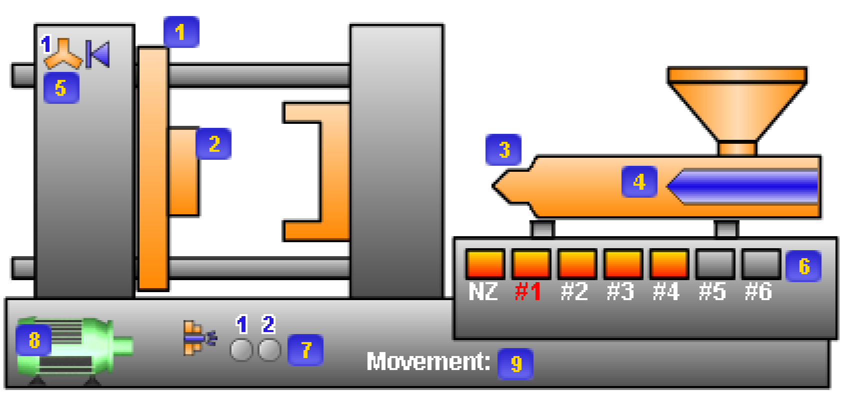
		F6/1	**441**	Pages >> Injection >> Injection Unit Rotate. **Optional:** Settings for Injection Unit Rotate.
	**F1**	**-**	**500**	Pages >> Heating >> Cylinder Temperature. Barrel (Cylinder) Heating settings.
	F2	**-**	**510**	Pages >> Heating >> Temperature Trend. Temperature Trend of the cylinder heating zones.
	F3	**-**	**520**	Pages >> Heating >> Temperature Calendar. Weekly calendar to control heating.
	F4	**-**	**530**	Pages >> Heating >> Mold Temperature 1. **Optional:** Mold Heating settings (Zone 1-8).
		F6/1	**531**	Pages >> Heating >> Mold Temp. Trend. **Optional:** Temperature Trend of the mold heating zones (Zone 1-8).
		F6/2	**532**	Pages >> Heating >> Mold Temperature 2. **Optional:** Mold Heating settings (Zone 9-16).
		F6/3	**533**	Pages >> Heating >> Mold Temp. Trend 2. **Optional:** Temperature Trend of the mold heating zones (Zone 9-16).
		F6/4	**534**	Pages >> Heating >> Mold Autotuning. **Optional:** Auto-Tuning for the mold heating.
	**F1**	**-**	**600**	Pages >> Alarms >> Alarms. List of actual alarms.
	F2	**-**	**610**	Pages >> Alarms >> Alarm History. Alarm-History list.
	F3	**-**	**620**	Pages >> Alarms >> Audit Trail. Audit Trail Display.
	F4	**-**	**630**	Pages >> Alarms >> Acopos Diagnosis 1. **Optional:** Diagnosis for first integrated servo-pump.
		F6/1	**631**	Pages >> Alarms >> Acopos Diagnosis 2. **Optional:** Diagnosis for second integrated servo-pump.
		F6/2	**632**	Pages >> Alarms >> Acopos Diagnosis 3. **Optional:** Diagnosis for third integrated servo-pump.
	**F1**	**-**	**700**	Pages >> Advanced >> Trace Setup. Setup of axis-trace.
		F6/1	**701**	Pages >> Advanced >> Trace Graphics. Display of axis-trace.
	F2	**-**	**710**	Pages >> Advanced >> SPC Setup. Setup of SPC (statistic process control).
		F6/1	**711**	Pages >> Advanced >> SPC Buffer. Display of recorded SPC values.
		F6/2	**712**	Pages >> Advanced >> SPC Graphics. Graphical display of recorded SPC values.
		F6/3	**713**	Pages >> Advanced >> SPC Distribution. Graphical display of SPC value distribution.
	F3	**-**	**720**	Pages >> Advanced >> Acopos Parameters. **Optional:**-.

		F6/1	**721**	Pages >> Advanced >> Acopos Trace Config 1. **Optional:**-.
		F6/2	**722**	Pages >> Advanced >> Acopos Trace Config 2. **Optional:**-.
	F4	**-**	**730**	Pages >> Advanced >> SmartWizard Basic Data. **Optional:** SmartWizard Basic Recipe Creation
		F6/1	**731**	Pages >> Advanced >> SmartWizard Correction. **Optional:** SmartWizard Basic Recipe Correction
		F6/2	**732**	Pages >> Advanced >> SmartWizard Optimization. **Optional:** SmartWizard Optimization of molding problems
	F5	**-**	**740**	Pages >> Advanced >> Production Data. **Optional:** Hourly Production Data
	F1	**-**	**800**	Pages >> Settings >> Settings 1. Basic controller settings (IP-Address, Brighness...)
		F6/1	**801**	Pages >> Settings >> Settings 2. Controller Unit Settings
	F2	**-**	**810**	Pages >> Settings >> IO Browser. IO module browser.
		F6/1	**811**	Pages >> Settings >> IO Monitor. Overview of all IO-datapoints.
	F3	**-**	**820**	Pages >> Settings >> Free Prog. Outputs. Free Programmable outputs for operator
		F6/1	**821**	Pages >> Settings >> Free Prog. Inputs. Free Programmable inputs for operator
	F4	**-**	**830**	Pages >> Settings >> Calibration. Axis calibration.
	F5	**-**	**840**	Pages >> Settings >> Setup Wizard. Setup Wizard: Access to all setup-pages.

3.2 01_Overview

3.2.1 Machine Overview

On the overview page the machine status and axes positions are visualized graphically.

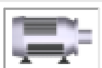
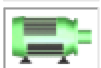
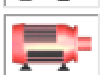


1	Animation of clamping unit. The graphic represents the actual mold position. When it is completely open it means, the actual mold position is equal or bigger than the mold open position set in the mold open profile.
2	Animation of ejector. The end positions that are set in the ejector forward and backward profiles (not the maximum/minimum position) are considered as the end positions in this graphic.
3	Animation of injection unit.
4	Animation of injection piston and screw rotation speed.
5	Animation of cores. Only the cores that are activated (this means the movement code is different to **Off**) in the core pages (220-225) (Pages >> Mold >> Core1 (220)..Core6 (225)) are shown. If graphical sequence programming is enabled, the state of all cores is shown.
6	State of cylinder heating zones. For a detailed description of possible states see the table below.
7	Animation of airblows. A red light indicates that the airblow output is on. Only the airblows that are activated (this means movement code is different to **Off**) on the airblow-page (Pages >> Ejector >> Airblows (310)) are shown. If graphical sequence programming is enabled, the states of all airblows are shown.
8	State of the motor. For a detailed description of possible states see the table below.

States of the cylinder heating zones. For more detailed information go to Pages >> Heating >> Cylinder Temperature (500):

	The zone is switched off, either because this single zone is not enabled or because the cylinder heating is switched off.
	The zone is either in autotuning or lowering or softstart state.
	The zone temperature is below tolerance or it is already in tolerance but the release time is still not over.
	Normal heating status. The zone temperature is within the tolerance.
	The zone temperature is above the tolerance.
	An error occurred, for details check Pages >> Alarms >> Alarms (600).

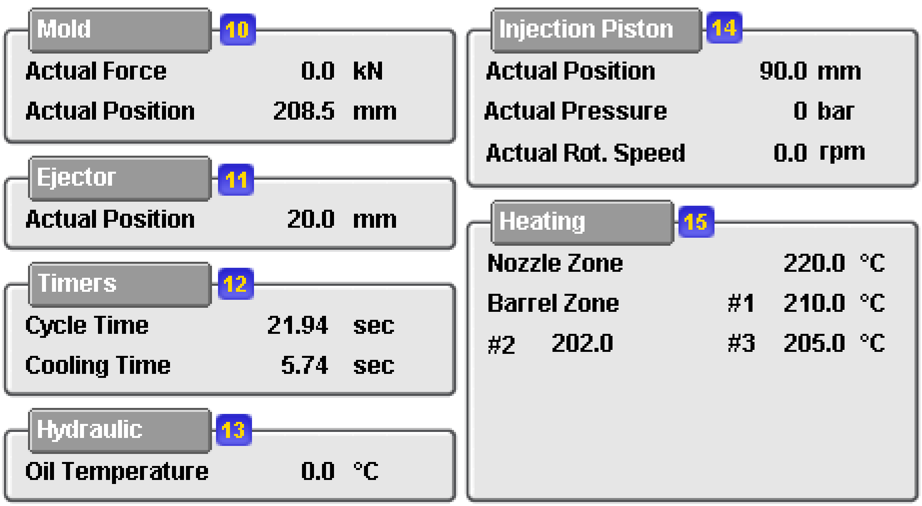
States of the motor:

	Motor is switched off.
	Motor is starting up. For hydraulic motors this state is active when waiting for the motor feedback after switching the motor from star to delta. For Acopos servo pumps this state is active when waiting for feedback from the Acopos servo drive after switching the controller on.
	Motor is on and running in normal condition.
	An error occurred, for details check Pages >> Alarms >> Alarms (600).

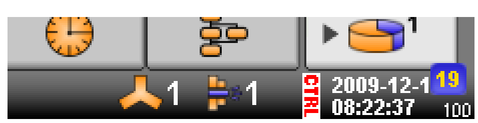
If a energy-measurement-device is connected the energy per cycle and per hour (average power) is displayed within the machine-icon:

1	Energy consumption per cycle. This display is updated at the end of the cycle
2	Energy-consumption per hour (=average power consumption). This display is updated every 5 minutes.

Below the machine animation the most important actual values are displayed:

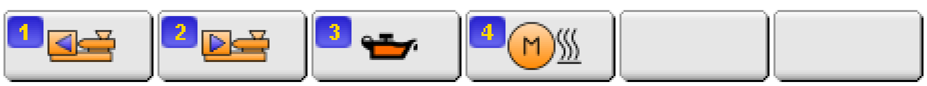


10	Actual values of the mold.
11	Actual values of the ejector.
12	Actual timer values.
13	Actual hydraulic values.
14	Actual values of the injection piston.
15	Actual values of the cylinder heating.



16	Set this option to activate the robot. When the robot is activated, the input signals from the robot are considered for interlocking and the automatic cycle. Additionally to this setting, the input signal **Robot: Operation mode B2** must be HIGH to activate the robot. This is a optional feature and only displayed if the robot-option for this kind of robot-operation is enabled.
17	Set this option to activate the drop sensor (photocell to detect falling parts). After every cycle the input signal **Drop Sensor** is checked. If during mold open or ejection a positive and negative edge of this input signal are detected, it is assumed that the product has fallen down and automatic cycle can continue. If not, the alarm **20-2 Part did not fall** is triggered. This check is not performed in the very first cycle, otherwise it is always done before mold close (or before first core movement before mold close) or after the Part Detect Timeout (see Pages >> Overview >> Delay Times(1) (130))
18	Enter a page number to jump directly to the desired page. (see Operation >> Accessing Pages for page numbers of main pages)
19	On every page in the bottom right corner of the screen its actual page number is displayed. This number can be entered in the field 18 to jump directly to the page.

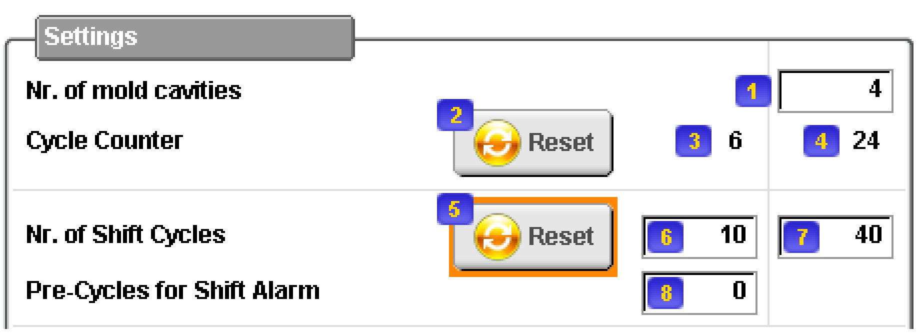
On this page control-keys are available to control the automatic safety gate and the main lubrication circuit:



1	**F1**: Jog-Key for safety gate open. If a automatic safety gate is installed you can use this key to open the gate at any time.
2	**F2**: Jog-Key for safety gate close. If a automatic safety gate is installed you can use this key to close the gate at any time.
3	**F3**: Key to trigger manual lubrication. Buttons works identical to the soft-key described on Pages >> Overview >> Oil, Lubrication (103) under section "Lubrication"
4	**F4**: Key to start oil pre.heating. Buttons works identical to the soft-key described on Pages >> Overview >> Oil, Lubrication (103) under section "Oil, Preheating"

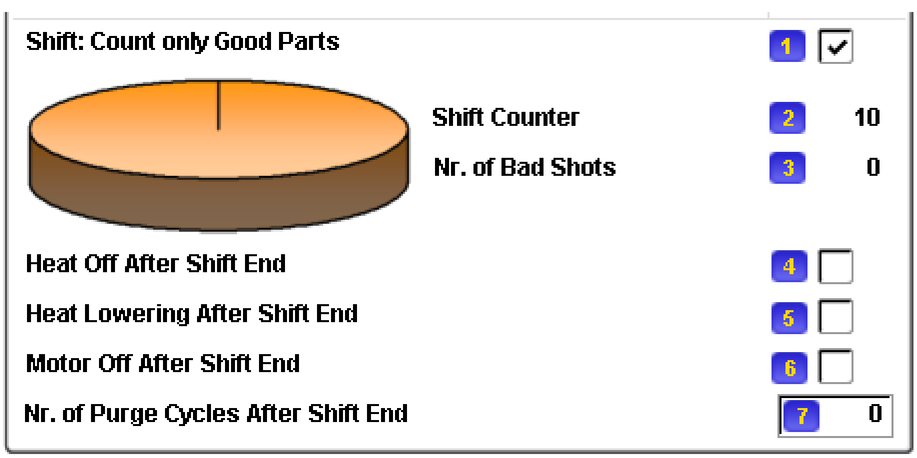
3.2.2 Production (1)

On this page the production data can be monitored.



1	Number of mold-cavities (number of parts produced with each shot).
2	Press this button to reset the total cycle 3 and part counter 4.
3	Total cycle counter. After every cycle this value is incremented by 1. It can be reset by pressing the button 1. SPC records (see page Pages >> Advanced >> SPC Buffer (711)) are referring to this cycle counter.
4	Total part counter. After every cycle this value is incremented by the number of parts produced per shot 1. It can be reset by pressing the button 1.
5	Press this button to reset the shift counter or to restart a new shift after the last was finished. The actual shift part-counters 6 will be set to 0 and the automatic cycle can be started again for the next shift.
6	Number of required cycles to finish a shift. After reaching the number of shift cycles the machine stops production and the alarm **20-45 Reset counter** is triggered. By changing this value also the required number of parts 7 is changed accordingly.
7	Number of required parts to finish a shift. By changing this value also the number of cycles 6 is set accordingly. This value can only be a multiple value of the mold-cavities 1. When a value is entered that is not a multiple of this value it will rounded up automatically.
8	Before the number of required shift cycles is reached, a pre-alarm can be triggered. Example: If **Pre-Cycles for shift-alarm** is set to 10 and **Nr. of shift cycles** is set to 100, after 90 cycles the alarm **20-44 Shift finished** is triggered to notify the operator that the shift will end soon.

A shift is a dedicated number of cycles that should be finished. For example during one working shift 1000 cycles should be made (e.g. to fill a box with 1000 pieces if the mold has one cavity). The shift counter is counting these cycles and after the shift is finished the automatic cycle stops and waits for a reset command by the operator.



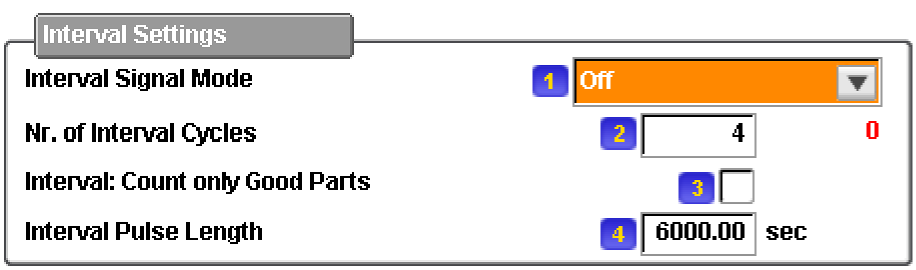
1	Selection whether only the good parts are counted for the shift (checkbox checked) or all parts (checkbox unchecked).
2	Actual counter of finished products (parts) in shift (counter shows only good parts if selection "Count only Good Parts" is active). The amount of produced part compared to the total amoung of need parts in the shift is displayed in the pie-chart on the left.

3	Actual counter of bad parts produced in shift (this counter is only visible when selection "Count only Good Parts" is active).
4	Set this option to turn off the heating automatically after the machine stops production at the end of a shift.
5	Set this option to turn on heat lowering automatically after the machine stops production at the end of a shift.
6	Set this option to turn off the motor automatically after the machine stops production at the end of a shift.
7	Number of automatic purge repetitions after shift end. If set to a value other than 0, purging is done automatically for the specified number of repetitions at the end of a shift.

1	Total operating time of the SmartMold controller.
2	Total time the motor was switched on.
3	Total time the machine was in automatic mode. It counts the time the machine is actually switched to automatic mode, not necessarily really running (producing) in automatic mode. It does not count the time the machine is in semiautomatic mode.

3.2.3 Production (2)

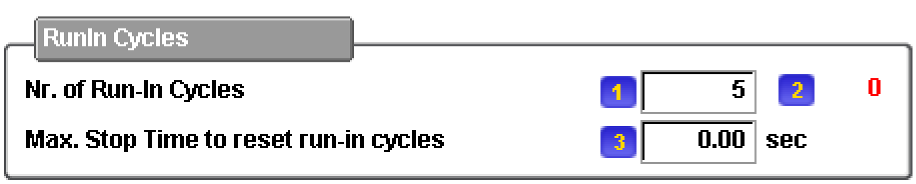
The interval settings refer to a digital output signal **Cycle Interval** (DO#382) that can be switched on after a certain number of cycles for a certain time. This signal can be used for example to activate a conveyor belt.



1	Interval signal mode. This setting refers to the exact point of switching on the interval output signal. • **Off:** The interval signal is not used. • **At Cycle End:** The signal is switched on at the end of the cycle (after Mold Open and Ejection). • **After Injection:** The signal is switched on after injection and holding pressure. • **After Mold Close:** The signal is switched on after the mold close movement.
2	The output signal is not switched on at every cycle, but only at the specified interval, for example after every 100 cycles. Right to the set interval the actual counter of interval cycles is displayed. When the actual counter reaches the required interval cycles, the output signal is switched on.
3	Selection whether only the good parts (checkbox checked) are used for increasing the actual interval counter or all parts (checkbox unchecked).
4	The time the output signal **Cycle Interval** remains HIGH after being activated.

The unmanned mode refers to a machine that is not producing (any more) and is not operated (no keys are pressed).

1	Activate unmanned mode. When unmanned mode is activated, the machine is not producing and is not operated (no keys are pressed) the following actions are taken after the set timeout: • Motor(s) off • Mold-Heating off or standby (optional) • Barrel-Heating off or standby (optional) • Alarm-Horn Off (optional) The actions may very depending on manufacturer and machine-type (see Software Setup >> Software Options #536).
2	If this option is selected additionally (to the in 1 mentioned actions) the mold is unlocked (see also the unlock settings on Pages >> Mold >> Mold Open (210)).
3	When the machine is not operated the actions 1 are not taken immediately, but this timeout has to pass without any action by the operator (no key pressed). The time must be set to a value bigger than 0, otherwise the unmanned mode is disabled!



1	Set number of run-in cycles. During this number of cycles the part is regarded to have "bad" quality and the reject-output is set.
2	Actual number of executed run-in cycles.

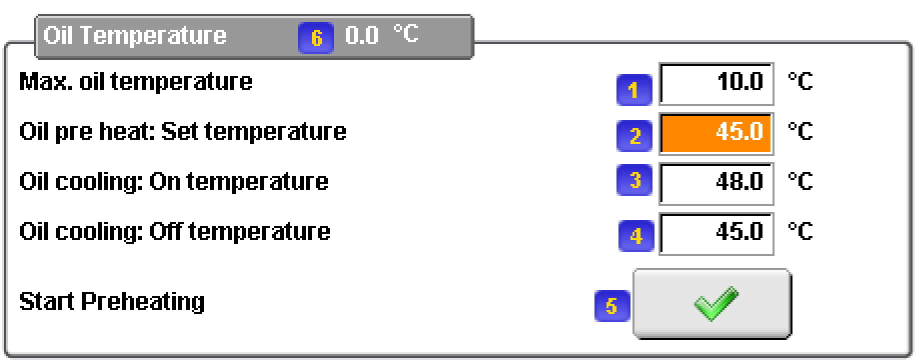
3	Time after which the actual run-in counter is reset to 0. If the machine is not producing (not running in semi-automatic or automatic mode - e.g. in manual mode or waiting for start command) the run-in cycle counter is reset after that time and the run-in function is started again when the machine is restarted.

The safety gate settings refer to the automatic operation of the safety gate. A pneumatic or electric gate must be available for this settings.

1	Safety Gate Mode. Determines when in the sequence the gate will be opened (in semi-automatic mode): • **Off:** The gate is not operated in the sequence • **After Injection:** The gate is opened directly after injection • **After Plastification:** The gate is opened directly after plastification • **During Mold Open:** The gate is opened during mold open (at the given release position 2) • **After Mold Open:** The gate is opened when the mold is fully opened.
2	Mold Release position for operating the gate parallel to mold open (see 1).
3	Time for opening the gate. This time is only necessary when the gate has no opened-sensor and the opening happens only time-based.

3.2.4 Oil, Lubrication

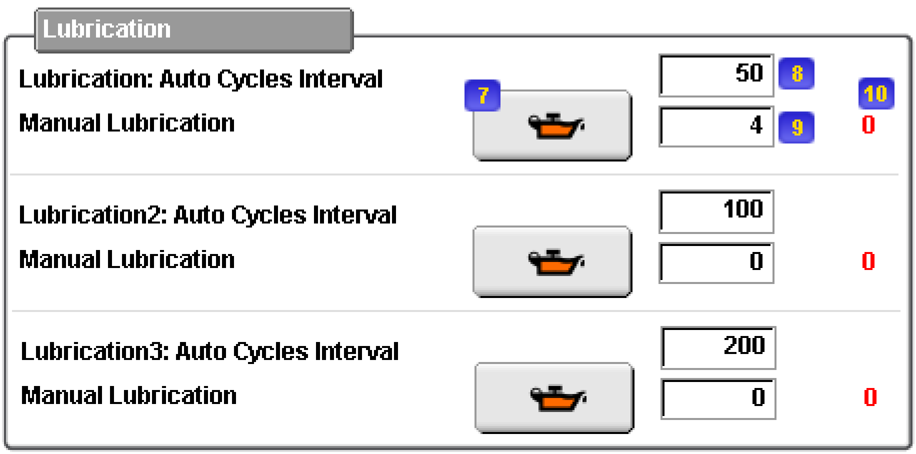
On this page the settings for the hydraulic oil cooling and the lubrication pumps can be made.



1	Maximum oil temperature. If the hydraulic oil temperature rises above this value, the alarm **20-22 Oil temperature high** is triggered.

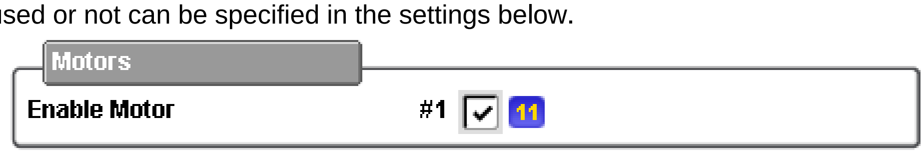
2	Set temperature for oil preheating. After oil preheating was turned on, it will continue until the hydraulic oil temperature reaches this value. This setting is only visible if oil preheating is enabled on the machine.
3	The oil cooling is turned on if the hydraulic oil temperature rises above this value.
4	The oil cooling is turned off again if the hydraulic oil temperature falls below this value.
5	Press this button to start oil preheating. Press the button a second time to stop oil preheating again. The button is only visible if oil preheating is enabled on the machine.
6	Actual hydraulic oil temperature (sensor signal **Oil**).

In total there are 3 lubrication pumps available. The settings for every lubrication pump are similar.



7	Press this button to turn on the lubrication pump manually. The lubrication pump is activated several times (multiple lubrication), if in 9 a number bigger than 1 is entered.
8	Automatic cycle interval to start lubrication. Lubrication is started automatically after this number of automatic cycles was reached. The number of lubrication repetitions for automatic mode (multiple lubrication) is fixed and can be specified in the Setup Wizard. Caution - it is different to manual lubrication repetitions that can be set in 9.
9	Number of lubrication cycles for multiple lubrication (valid for manual lubrication). As soon as a lubrication is requested either by pressing the button manually or after a certain number of automatic cycles were done, the lubrication pump can be activated several times (multiple lubrication). The number of lubrications that should be performed can be specified here. Enter 1 to do only 1 single lubrication.
10	Lubrication cycle counter. During performing a multiple lubrication, it counts up until the set value 9 has been reached.

Up to 3 hydraulic motors can be turned on when the Motor On button is pressed. Whether they are used or not can be specified in the settings below.



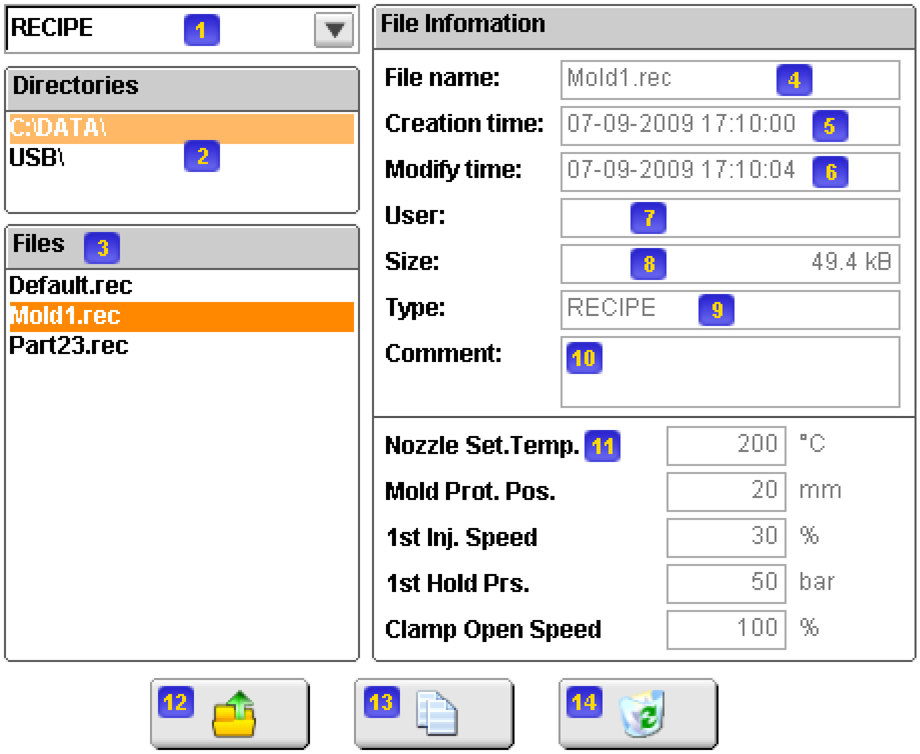
	Set this option to turn on this hydraulic motor (number 1, 2 or 3) when the Motor On button is pressed.

3.2.5 Recipe

On this page mold data can be saved or loaded. With higher user level it is possible to manipulate other file types, too:

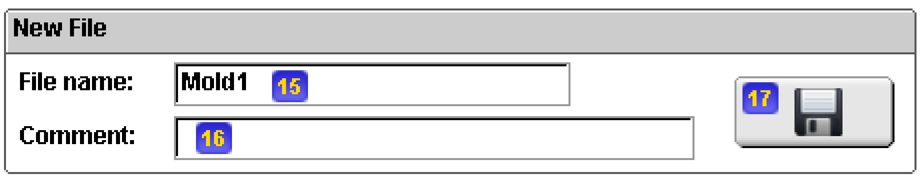
- **RECIPE**: All mold related data, like injection speed, mold open and close settings, ...
- **FIXDATA**: All machine related data. The fixdata can me modified by the OEM on page Pages >> Service >> Setup Wizard (840).
- **SWCFG**: Software configuration data. The software configuration defines for example the momentary/toggle behaviour of the manual movement keys. The file **sw.ini** is always loaded at power up. It cannot be loaded on this page. It can be copied to and from a USB stick to be edited in an external editor or it can be saved after the data was changed online.
- **IOCFG**: IO configuration data. The IO configuration which was made in the IO-configuration (Setup >> IO Configuration) is saved as file **iocfg.xml**. It cannot be saved or loaded on this page. It can be copied to a USB stick, to be imported later on another machine with the same IO wiring.
- **DTCFG**: Acopos drive trace configuration. For Acopos servo pumps it might be necessary to do a trace of certain drive parameters. The configuration for this trace can be loaded or saved on this page. The trace must be started then on Pages >> Advanced >> Drive Parameters (720)
- **SEQUENCE**: Default-Sequences for sequence editor (Pages >> Overview >> Sequence Editor (141))
- **USERDOC**: Any documentation in PDF format that can be copied (password level OEM) to the CF and copied (password level Operator) from the CF to the USB stick. The purpose for OEM is to distribute safely any machine documentation in digital format (PDF) so that the machine user can download it at any time later on to his USB stick.
- **USERCFG**: User-Configuration (Login-Data) can be saved and loaded (password level OEM) locally or to the USB. This way the user settings can be copied from one machine to another. ATTENTION: When such a file is loaded all local users on the machine are deleted!!

The name of the currently loaded mold data (recipe) and machine data (fixdata) is always displayed in the top area on every page. See the document Operation >> Screen Layout for details.



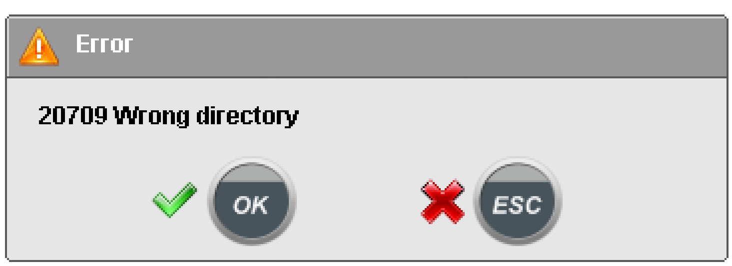
1	Select the type of file that should be loaded, saved, copied or deleted. The file types are listed depending on the current user level. For example an Operator can only manipulate recipe data, whereas Supervisors can also manipulate fixdata.
2	Select the directory, to which a file should be saved and which contents should be displayed in the list 3. For the file type RECIPE the following directories are available: • **C:\DATA**: This is a directory on the onboard Compact Flash of the SmartMold controller. • **USB**: USB stick that is plugged on the port USB1.
3	List of all files of file type 1 that can be found in directory 2. Select here the file that should be loaded, copied or deleted. As soon as a file is selected, all information regarding this file is displayed in the box File Information 4-11. The files **Default.rec** and **Default.fix** are B&R default data that cannot be deleted.
4	Full name of the currently selected file. All file types have different extensions.
5	The date and time when this file was created (saved for the first time).
6	The date and time when this file was last modified.
7	The user who created this file.
8	File size.
9	File type. It corresponds to the file type selection made in dropdown 1.
10	Comment on the contents of the file. When saving a file, an additional comment on the contents of the file can be entered in the field 16.

11	For recipe data, a preview is displayed. The most important mold settings are displayed in the preview as soon as a file is selected in the list 3. This feature should help the operator to check whether the correct file was selected, before actually loading it.
12	Press this button to load the file that is currently selected in list 3. After loading a recipe (mold data), the recipe file name is displayed in the top area of the screen. After loading fixdata (machine data), the machine name is displayed in the top area of the screen. It is not possible to load files in semi automatic or automatic mode. By default it is only possible to load mold data (files of type **RECIPE**) that were saved on the same machine or machines with the same "machine-name" (optionally this behaviour can be disabled).
13	Press this button to copy the file that is currently selected in list 3 to the second file device, either from Compact Flash to USB or viceversa. It is only possible to copy files with user level **Operator** or higher.
14	Press this button to delete the file that is currently selected in list 3. A dialog appears asking for confirmation. If confirmed, the file is permanently deleted. It is only possible to delete files with user level **Operator** or higher. It is not possible to delete the **Default** recipe and fixdata.



15	Enter here the name of the file that should be saved. You can freely choose the filename, except when fixdata is saved on the Compact Flash. It is only possible to save fixdata under the name **Machine.fix** on the Compact Flash.
16	Enter here a comment to the file that should be saved. As soon as a file is selected in list 3 later on, its comment is displayed in field 10.
17	Press this button to save the current data to a file with the name specified in field 15 including the comment specified in field 16 on the device selected in 2. It is only possible to save files with user level **Operator** or higher.

Error messages:
When trying to access a USB stick, but no USB stick is plugged on the USB1 port, the following dialog is displayed:

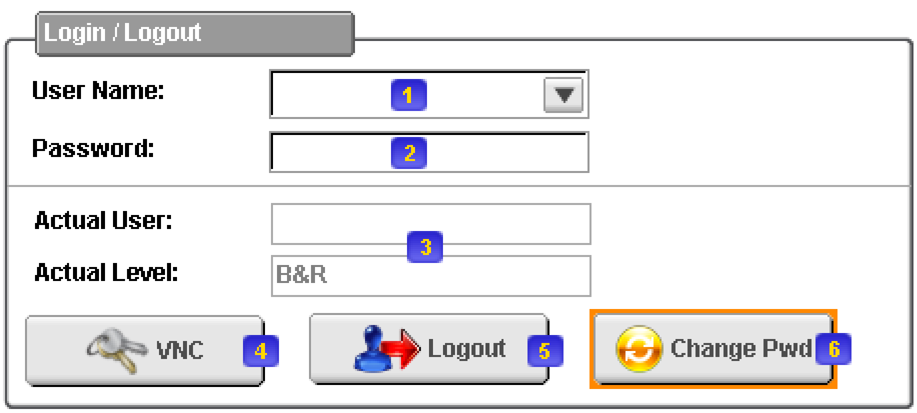


3.2.6 User Management

On this page, users can login and logout from the SmartMold controller. Depending on the access level of the user that is logged in, some pages, functions or input fields can be locked.

There are 5 user levels:
(0) None: After booting, no user is logged in. The machine can be operated and recipes can be loaded, but no parameters can be changed.
(10) Operator: Full machine operation is possible, mold parameters can be modified, additional access to special pages like Trace.
(20) Supervisor: Same like operator, additional access to special pages like Audit Trail.
(30) OEM: Same like OEM, additionally all pages in the Setup Wizard can be accessed to modify machine data.
(40) B&R: Same like OEM, additional access to B&R factory settings.
For a complete list of page access levels, see the table at the end of this chapter.

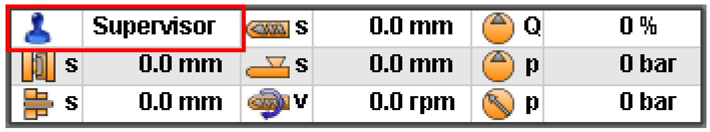
For every user level a default user is existing: The input field **User Name** must be left empty and only the correct password for the default user should be entered to log in at a certain access level with the default user.
If it is desired to distinguish between single machine users, for every access level some new users (with a particular user name) can be created.
Whether the current access level remains after power off/power on can be configured in **sw.ini**. Per default, after power off/power on the access level is reset to **None**.
If after power up automatically an access level other to **None** should be activated, change the password of the corresponding default user to an empty password (press button 5 to change the password). This access level will be default level and also active after a logout.



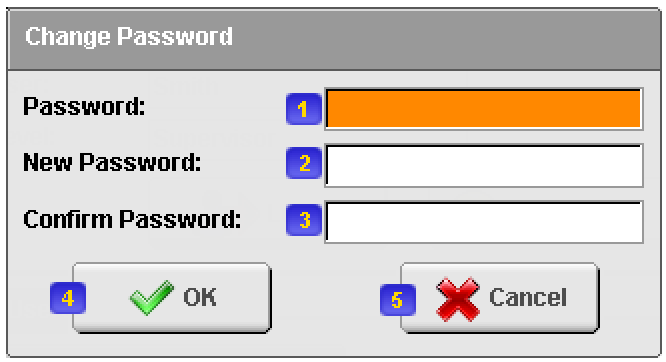
1	Choose the name of the user that should login. All available users are shown in the list. Leave this field empty to log in as default user.
2	Enter the correct password of the user selected in 1. If this field is left empty, you should enter here the password of a default user. Only numbers can be used in the password. The password entered is not shown on the screen, instead an asterisk '*' is shown as placeholder for every number. Confirm the password with the OK key. After pressing OK, the user is logged in automatically, assumed that the correct password was entered.
3	Name and access level of the user that is currently logged in. The current user level is also displayed on top of the screen, see the picture below.
4	Press the VNC-button to change the passwords for the VNC-server. This button is only visible when a user of OEM-Level or higher is logged in. Otherwise this function is not available.

5	Press the logout button to log out from SmartMold controller.
6	Press this button to change the password of the user that is currently logged in (shown in fields 3). The supervisor can also change the default-passwords for operator- or supervisor-level here. For details see the explanation of the dialog **Change Password** below.

The current user level is also displayed on top of the screen:

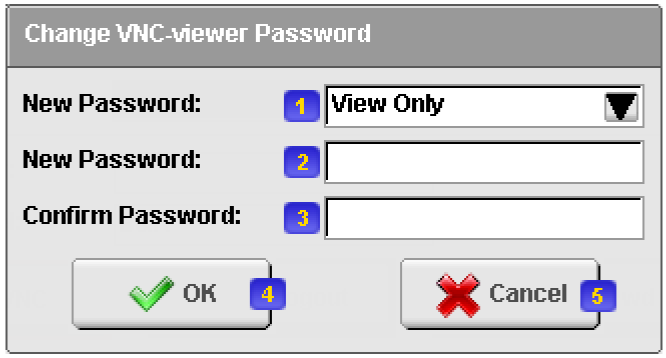


After pressing the **Change Password** button 5, the following dialog appears on the screen:



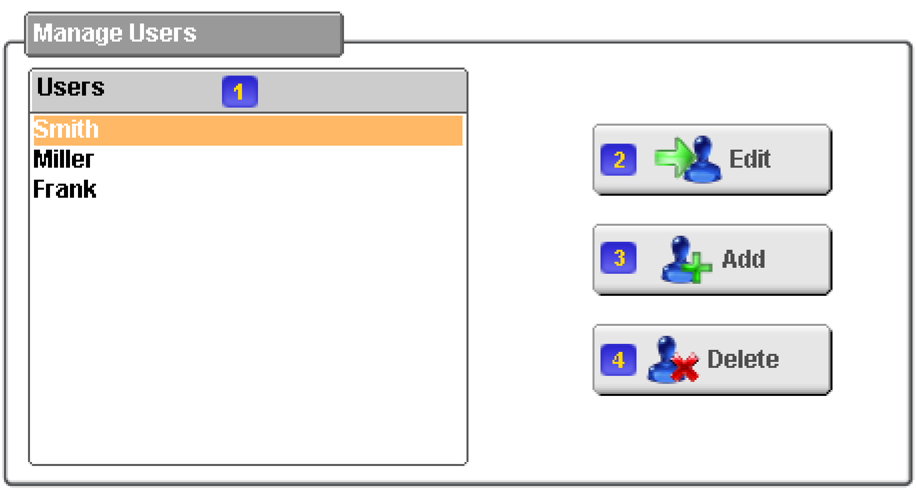
1	Enter here the (old) password of the user that is currently logged in. If changing the default-passwords for operator- and supervisor-level the according password for that level must be entered.
2	Enter here the new password, you have to enter the same password again in field 3. A password only can contain numbers, not characters.
3	Confirm the new password by entering it a second time here.
4	Press the **OK** button to confirm the change of password. Provided that the contents of fields 2 and 3 are equal, the password is changed.
5	Press the **Cancel** button to keep the old password.

After pressing the **VNC** button, the following dialog appears on the screen. With this dialog you can change the password for the VNC-server. VNC-viewers can only access the visualization with the correct password, otherwise access is denied.



1	Select here which password you want to change: • **View Only** .. Password for "View Only" mode • **Operate** .. Password for "View" and "Operate" (change pages etc.)
2	Enter here the new password, you have to enter the same password again in field 3.
3	Confirm the new password by entering it a second time here.
4	Press the **OK** button to confirm the change of password. Provided that the contents of fields 2 and 3 are equal, the password is changed.
5	Press the **Cancel** button to keep the old password.

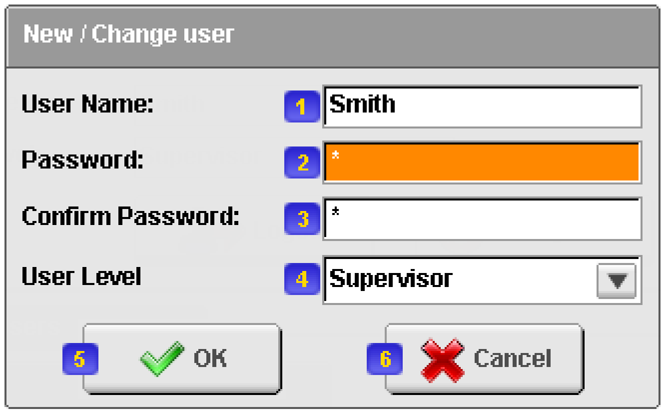
Besides the default users (empty user name) some particular users with different user names can be managed on the SmartMold controller. Users can be created, edited or deleted only with user level Supervisor or higher.



1	List of all users that have been created and are available on this SmartMold controller. Select here the user which you want to delete 4 or edit 2.
2	Press the **Edit** button to change the properties (user name, password, user level) of the user selected in the list 1. Only users with a lower or equal user level than the currently logged in user can be edited. For example a Supervisor can edit data of Operators and other Supervisors, but not OEM users. For details see the explanation of the dialog **New/Change User** below.

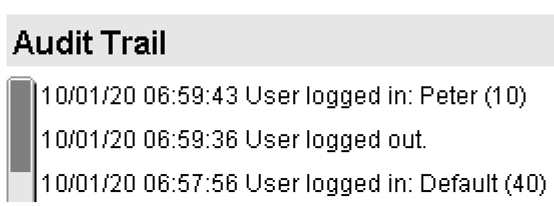
3	Press the **Add** button to create a new user. Only users with a lower or equal user level than the currently logged in user can be created. For example a Supervisor can create Operators and other Supervisors, but not OEM users. For details see the explanation of the dialog **New/ Change User** below.
4	Press the **Delete** button to delete the user selected in the list 1. Only users with a lower or equal user level than the currently logged in user can be deleted. For example a Supervisor can delete Operators and other Supervisors, but not OEM users.

After pressing the **Edit** button 2 or **Add** button 3, the following dialog appears on the screen:



1	Enter here the user name of the new user. This name will appear then in the user-list and dropdown for login.
2	Enter here the password, you have to enter the same password again in field 3.
3	Confirm the password by entering it a second time here.
4	Select the access level for this user.
5	Press the **OK** button to confirm the change of user data or the creation of a new user. Provided that the contents of fields 2 and 3 are equal, the new user is created.
6	Press the **Cancel** button to keep the old data or cancel the creation of a new user.

Login and logout of users are logged in the audit trail (see Pages >> Alarms >> Audit Trail (620)):

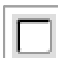
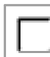


All pages can be accessed with user level **None**, except the pages that are listed in the following table:

Page Number	Page Title	Required Access Level
141	Sequence Editor	Supervisor

534	Mold Autotuning	Supervisor
620	Audit Trail	Supervisor
700	Trace Setup	Operator
701	Trace Graphics	Operator
710	SPC Setup	Operator
711	SPC Buffer	Operator
712	SPC Graphics	Operator
712	SPC Distribution	Operator
720	Drive Parameters	OEM
721	Drive Trace Config 1	OEM
722	Drive Trace Config 2	OEM
723	Drive Trace Config 3	OEM
810	IO Browser	Operator
811	IO Monitor	Operator
820	Free Prog. Outputs	Supervisor
821	Free Prog. Inputs	Supervisor
830	Calibration	Supervisor
840	Setup Wizard	OEM
2000-2211	Setup Wizard	OEM
2202	B&R Service Info	B&R

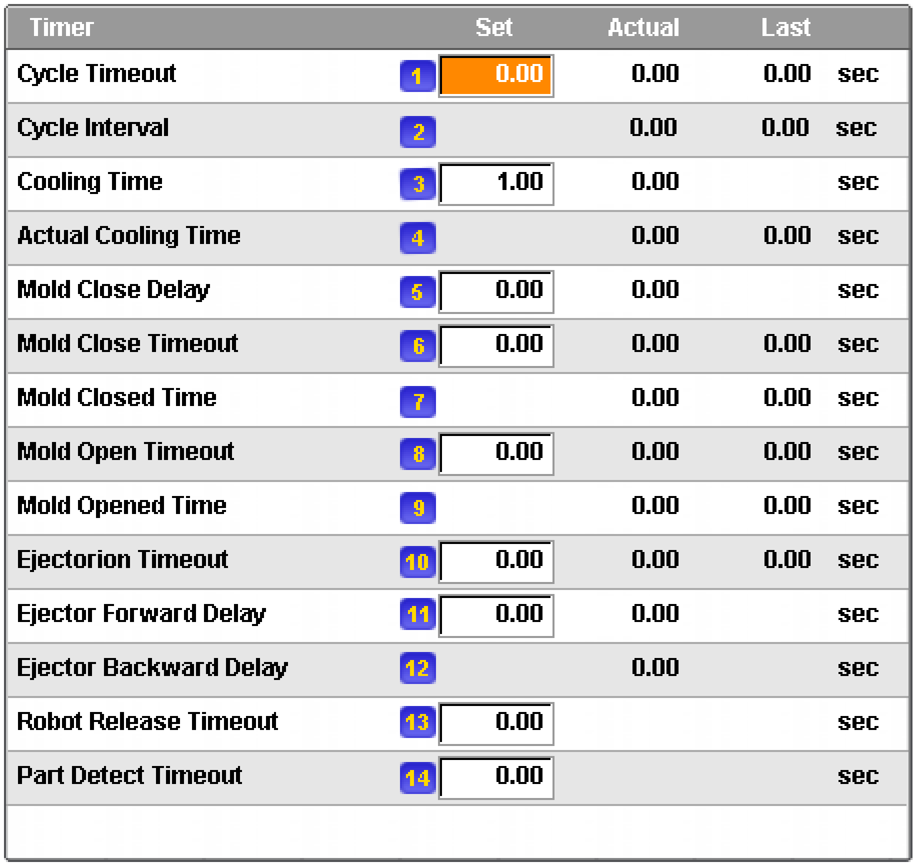
Input fields which are locked because the access level of the user currently logged in is not high enough are greyed out:

Locked Input	Accessible Input
	
	
	
	

3.2.7 Delay Times (1)

All delay times for semi automatic and automatic mode can be specified on the delay times page Pages >> Overview >> Delay Times (1) (130) and Pages >> Overview >> Delay Times (2) (131). The

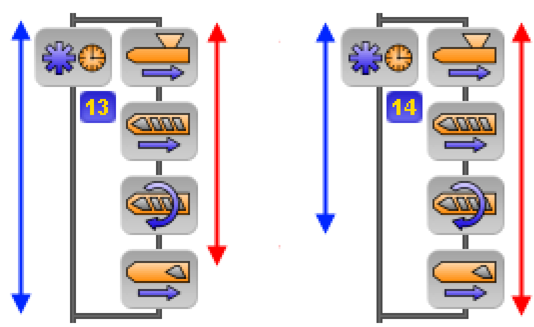
set time can be entered, the actual running times and the measured time of the previous cycle are displayed.
For all timers on this page: Enter 0 to disable timeout monitoring.



Timer		Set	Actual	Last	
Cycle Timeout	1	0.00	0.00	0.00	sec
Cycle Interval	2		0.00	0.00	sec
Cooling Time	3	1.00	0.00		sec
Actual Cooling Time	4		0.00	0.00	sec
Mold Close Delay	5	0.00	0.00		sec
Mold Close Timeout	6	0.00	0.00	0.00	sec
Mold Closed Time	7		0.00	0.00	sec
Mold Open Timeout	8	0.00	0.00	0.00	sec
Mold Opened Time	9		0.00	0.00	sec
Ejectorion Timeout	10	0.00	0.00	0.00	sec
Ejector Forward Delay	11	0.00	0.00		sec
Ejector Backward Delay	12		0.00		sec
Robot Release Timeout	13	0.00			sec
Part Detect Timeout	14	0.00			sec

1	Cycle Timeout: If a molding cycle lasts longer than this timeout, the alarm **20-8 Cycle timeout** is triggered and the cycle is stopped. On the right side the actual cycle time and the time of the last finished cycled is displayed. The cycle time is measured from the start of the cycle to the end of the cycle (the idle-time e.g. in semi-automatic mode to wait for the start-command is not measured).
2	Cycle Interval Time: Time between the end of the last cycle and the actual time. This interval time considers also the idle-time to wait for a new cycle start (in automatic mode it is identical to the cycle time). After changing to manual mode the time is reset to 0.
3	Cooling Time: After holding pressure the part is completely molded and needs to stay in the mold for a certain time to cool down, before the mold is opened again. The minimum time during which the mold stays closed after holding pressure can be specified here. This timer is running parallel to plastification, so if plastification lasts longer, it can happen that the actual cooling time is higher. For details see the diagram below.
4	Actual Cooling Time: This timer is measuring the time the mold remains closed after holding pressure. This time can be longer than the Cooling Time 2, depending on the duration of plastification. For details see the diagram below.
5	Mold Close Delay: This is the delay time before closing the mold. It is not active during the first cycle. It is not active in semi automatic mode either.

6	Mold Close Timeout: If a molding closing (including core movements inbetween mold closing) lasts longer than this timeout, the alarm **20-12 Mold close timeout** is triggered and the cycle is stopped.
7	Mold Closed Time: This timer is measuring the overall time the mold stays closed in a molding cycle.
8	Mold Open Timeout: If a molding opening (including core movements inbetween mold opening) lasts longer than this timeout, the alarm **20-11 Mold open timeout** is triggered and the cycle is stopped.
9	Mold Opened Time: This timer is measuring the overall time the mold stays opened in a molding cycle.
10	Ejection Timeout: If ejection (including ejector repetitions, forward and backward delay times) lasts longer than this timeout, the alarm **20-9 Ejection timeout** is triggered and the cycle is stopped.
11	Ejector Forward Delay: This is the delay time before moving the ejector forward. It is only active for the very first ejector forward movement and not for ejector repetitions.
12	Ejector Backward Delay: This is the delay time before moving the ejector backward. If there are ejector repetitions set, this delay time is running before the first ejector retraction (before all repetitions).
13	Robot Release Timeout: If the machine waits for the robot longer than this timeout, the alarm **20-26 Cycle stopped by robot** is triggered and the cycle is stopped. There is only one timeout setting for all kinds of robot signals.
14	Part Detection Timeout: If the Drop Sensor function is activated (see Pages >> Overview >> Machine Overview), than the part must be detected within this time (time starts at the beginning of mold open) otherwise the alarm **20-2 Part did not fall** is set and the cycle is stopped. If this time is set to 0 the timeout is disabled and the check if the part has fallen happens before mold close (or before core movement if a core is programmed before mold close). The same happens if the time is set to long.



13	To ensure reproducibility, the **Cooling Time** 2 should always be longer than the time needed for injection unit retraction. In this case the Actual Cooling Time 3 matches the Cooling Time 2.
14	The **Actual Cooling Time** is always measuring the time the part really stays in the mold. If the time needed for injection unit retraction, suckback and plastification is longer than the setting for **Cooling Time** 2, the **Actual Cooling Time** 3 is measuring that time.

3.2.8 Delay Times (2)

All delay times for semi automatic and automatic mode can be specified on the delay times page Pages >> Overview >> Delay Times (1) (130) and Pages >> Overview >> Delay Times (2) (131). The set time can be entered, the actual running times and the measured time of the previous cycle are displayed.
For all timers on this page: Enter 0 to disable timeout monitoring.

Timer		Set	Actual	Last	
Pre-Injection Delay	1	0.00	0.00		sec
Injection Delay	2	0.00	0.00		sec
Injection Time	3	0.00	0.00	0.00	sec
Decompression Before Delay	4	0.00	0.00		sec
Plastification Delay	5	0.00	0.00		sec
Plastification Timeout	6	0.00	0.00	0.00	sec
Decompression After Delay	7	0.00	0.00		sec
Injection Unit Forward Delay	8	0.00	0.00		sec
Injection Unit Forward Time	9		0.00	0.00	sec
Injection Unit Backward Delay	10	0.00	0.00		sec
Injection Unit Backward Time	11		0.00	0.00	sec

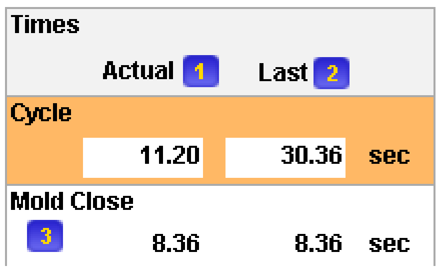
1	Pre-Injection Delay: This is the delay time before pre-injection. Pre-Injection is a optional feature and might not be shown on your controller.
2	Injection Delay: This is the delay time before injection.
3	Injection Time: This timer is measuring the time for injection and holding pressure. If the max. set time is exceeded the injection is stopped, the alarm **20-100 Injection timeout** is set and the automatic sequence is stopped at the end of the current cycle (this function is disabled if the time is set to 0).
4	Decompression Delay: This is the delay time before the first decompression (i.e. the injection piston backward movement before plastification).
5	Plastification Delay: This is the delay time before plastification.
6	Plastification Timeout: If plastification lasts longer than this timeout, the alarm **20-10 Plastification timeout** is triggered and the cycle is stopped. The timeout-function is disabled if the timeout is set to 0.
7	Suckback Delay: This is the delay time before the second decompression (i.e. the injection piston backward movement after plastification).
8	Injection Unit Forward Delay: This is the delay time before the injection unit advance movement.

9	Injection Unit Forward Time: This timer is measuring the time for the injection unit advance movement.
10	Injection Unit Retract Delay: This is the delay time before the injection unit backward movement.
11	Injection Unit Backward Time: This timer is measuring the time for the injection unit retraction.

3.2.9 Automatic Sequence

On this page the currently active automatic sequence can be seen. The individual steps are represented by icons. Each step lasts as long as the action it represents. As long as a step is active it is highlighted in red colour. Multiple steps may be active at the same time if the steps are programmed parallel.

On the left side of the page the actual times for the steps are displayed:



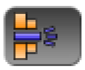
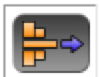
1	In this column the times from the actual cycle are displayed (upcounting).
2	In this column the times from the last cycle are displayed (static).
3	The main steps are listed here. If one of them is active the row will be highlighted in orange color. The first line is always active as it represents the complete cycle.

On the right side of the page the currently active sequence is displayed:

1	Actual Sequence. All steps are shown here. If the amount of steps exceeds the size of the page, scroll icons are displayed and the sequence will automatically scroll to the active steps when the sequence is running.

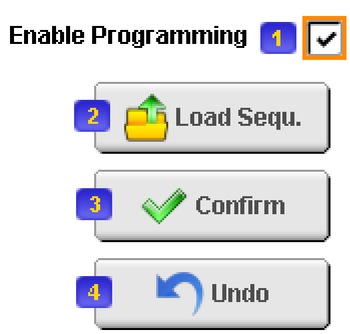
The following steps are used in the sequence display:

	**Mold Close**. If the mold moves to an intermediate position the icon is marked with a blue dot.
	**Mold Open**. If the mold moves to an intermediate position the icon is marked with a blue dot.
	**Ejection**. Includes ejector forward, repetition and backward movements.
	**Injection Unit Forward**.
	**Injection**. If the injection moves to an intermediate position the icon is marked with a blue dot.
	**Decompression Before**.
	**Plastification**.
	**Decompression After**.
	**Injection Unit Backward**.

	**Move Core In**. The index of the core (core number) is displayed inside of the icon as a blue number.
	**Move Core Out**. The index of the core (core number) is displayed inside of the icon as a blue number.
	**Cooling Time**. The step is active during the configured cooling time.
	**Wait for Plastification End**. This step just waits for the end of plastification. It is used when plastification is programmed parallel to mold open and close.
	**Air Blow Active**. The index of the airblow (airblow number) is displayed inside of the icon as a blue number.
	**Open Nozzle**. The nozzle closure is opened to enable injection.
	**Close Nozzle**. The nozzle closure is closed to prevent plastic from flowing out of the nozzle.
	**Core Repetition**. The index of the core (core number) is displayed inside the icon as a blue number. The core moves in and out for the set number of repetitions in this step.
	**Delay Time**. This step is active for the configured delay-time. Nothing happens during the execution of this step only the following steps are delayed.
	**Ejector Forward**. The ejector is moved forward. Together with the step Ejector Backward this includes the same functionality as "Ejection" (see above).
	**Ejector Backward**. The ejector is moved bacward. If repetitions are configured the repetition is also performed in this step. Together with the step Ejector Forward this includes the same functionality as "Ejection" (see above).

3.2.10 Sequence Editor

On this page it is possible to program the automatic sequence (active in automatic and semi automatic mode) graphically. The graphical programming of the automatic sequence is optional. Normally the sequence is generated automatically from the settings on the different pages (for example: **Ejector Mode** Sequential or Parallel on Pages >> Ejector >> Ejector (300)).
In the graphical sequence editor you can freely modify the automatic sequence and program any combination of steps that you need including cores and airblows. As soon as graphical programming is enabled, the settings on the other pages that refer to the sequence are locked and marked as **Programmed**.

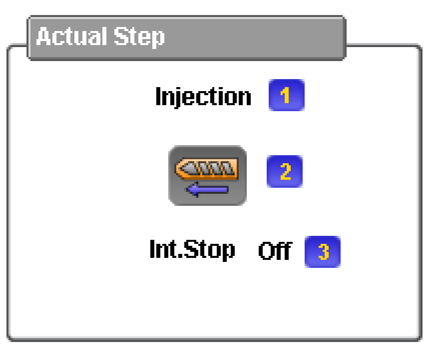


1	With this option graphic sequence programming can be enabled (otherwise the sequence is automatically generated from the settings on the individual pages). When this checkbox is active all settings on the other pages that refer to the sequence are locked and marked as **Programmed**. The sequence can then only be changed from the editor here.
2	With this button the actual active sequence (see Pages >> Overview >> Automatic Sequence (140)) can be loaded to the editor. This function can be used to undo all changes that were made in the editor after the sequence was activated the last time (by pressing button 3) or to upload a complicated sequence that was generated using the settings on the other pages.
3	With this button the edited sequence can be activated on the machine. The sequence on Pages >> Overview >> Automatic Sequence (140) is then identical to the one you have programmed.
4	With this button the last change can be undone (if the button is not visible a undo is not possible). It works only for the last change, no multiple undos are possible. This button is only displayed when an undo is possible.

It is possible to load default-programs that have been previously generated. Such default-programs can be generated by creating it first here in the editor and than saving it on page Pages >> Overview >> Recipe (110).

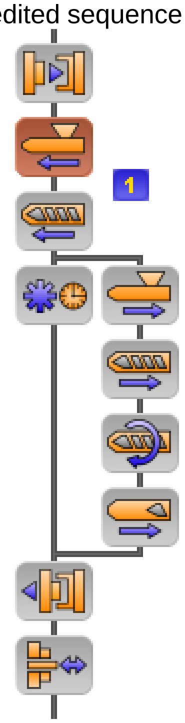
1	List of available default-sequences (dropdown).
2	Comment stored in the actual selected sequence. The comment will be displayed as soon as the selection is changed in 1. This text may contain uni-code characters.
3	With this button the selected sequence (1) can be loaded and activated. That means that the sequence will get active immediately after loading the data (loading is not allowed when the automatic sequence is active).

On the lower left corner of the page information about the actual selected step (marked red in the sequence) is displayed



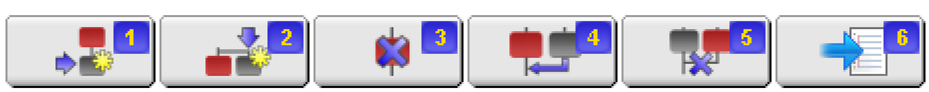
1	Name (Description) of the step
2	Step-symbol
3	Additional information about the step: **Mold Open/Close, Injection**: Intermediate Stop On/Off and Intermediate Stop Position **Core In/Out**: Core-index and parameter-set index **Air-Blow**: Air-Blow index

On the right side of the page the currently edited sequence is displayed:



1	Sequence to be edited. You can use the cursor keys to move through the steps. The selected step will be highlighted (red background color). Information on all possible steps and the icons used can be found in the documentation Pages >> Overview >> Automatic Sequence (140).

Once the cursor is moved into the sequence the function keys will be displayed automatically:

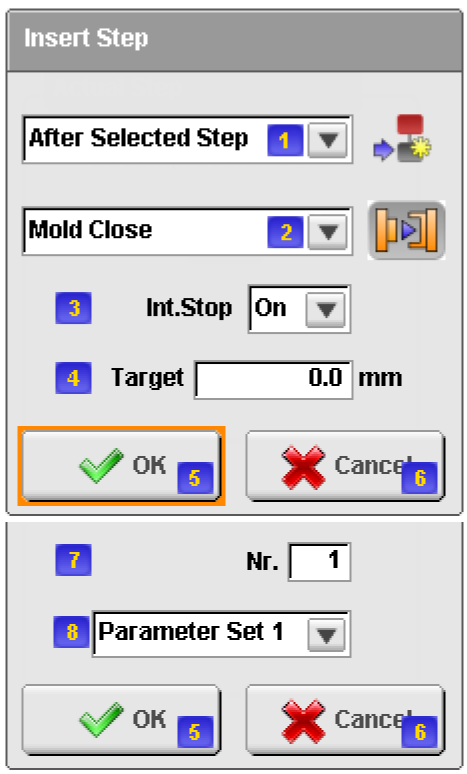


1	Insert a new step after the selected step (sequential). When you press this key the **Insert Step** dialog will be displayed (see below).
2	Insert a new step parallel to the selected one (parallel movement). When you press this key the **Insert Step** dialog will be displayed (see below).
3	Delete the selected step. The deletion will happen immediately without a confirm dialog. If you have pressed this key unintentionally you can use the Undo button to restore the step again.

4	Close a parallel brace after the selected step. If you press this button the next open layer will be closed. If there are two layers open and you want to close the next but one layer you need to close both layers first (press this key twice) and remove afterwards the closed brace from the layer which you do not want to be closed by pressing key 5. See also the screenshots below.
5	Remove the closed brace after the selected step (open the layer again). You need to select the last step in a parallel (already closed) layer. If you press this key the closed brace will be removed (layer will be open again).
6	By pressing this key you are directed automatically to the page where the settings for the currently selected step can be made. For example if the Ejection step is selected you will be directed to Pages >> Ejector >> Ejector (300).

Explanation on key 4 (how to close the next but one layer):

After pressing a key for inserting a new step, the following dialog is displayed:

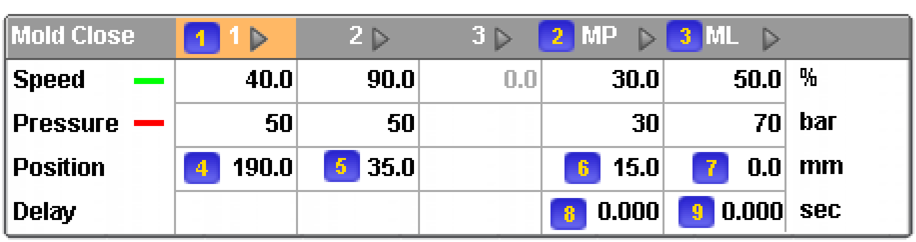


1	Here you can select where the step should be exactly inserted (depending on the key you have pressed to open that dialog the respective insert mode will be preselected). The possible settings are: • **After Selected Step** .. the new step will be inserted sequentially after the selected step • **Before Selected Step** .. the new step will be inserted sequentially before the selected step • **Parallel to Selected Step** .. the new step will be inserted parallel in a new layer to the selected step • **Replace Selected Step** .. the selected step will be replaced (old step will be deleted)
2	Here you can select the step that you want to insert. See also the documentation on page Pages >> Overview >> Automatic Sequence (140) for an explanation on all steps.
3	Additional settings for the step to be inserted (different settings are shown depending on the selected step). In the screenshot above an intermediate stop can be optionally programmed. See also 7 and 8 for further examples of additional settings.
4	Additional settings for the step to be inserted (different settings are shown depending on the selected step). In the screenshot above the intermediate stop position can be entered (if an intermediate stop is enabled). See also 7 and 8 for further examples of additional settings.
5	To complete the action and insert the new step you have to press this button.
6	Press this button to cancel the action. The sequence will not be changed.
7	Further example for additional settings for the step to be inserted (different settings are shown depending on the selected step). In the screenshot above the index for an airblow or core can be chosen (airblow or core number).
8	Further example for additional settings for the step to be inserted (different settings are shown depending on the selected step). In the screenshot above the parameter set for the core movement can be selected.

3.3 02_Mold

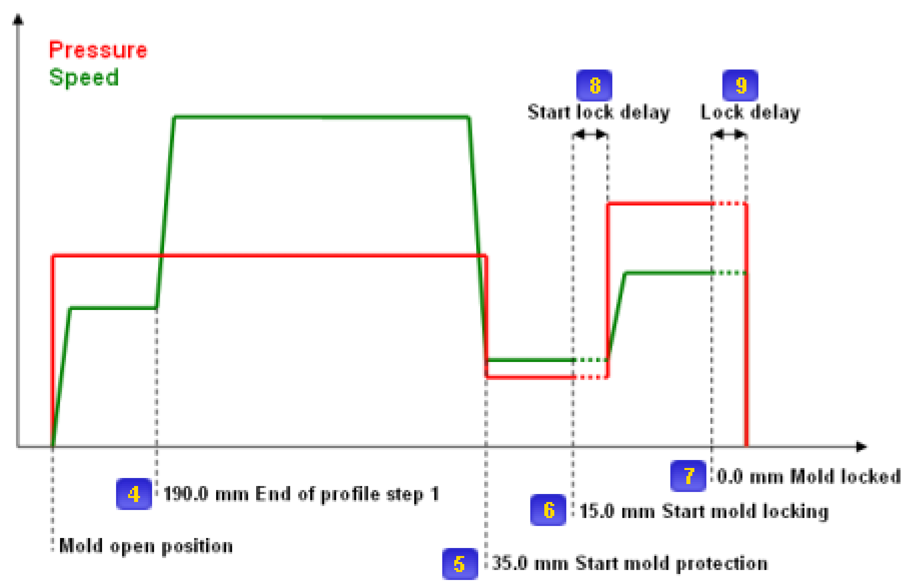
3.3.1 Mold Close

On this page all settings for the mold close movement and the mold protection can be made. This help first describes the settings for toggle clamps. Different settings for direct clamps are mentioned further below!
The mold close movement can be divided in up to 5 steps. For every single profile step the speed, pressure and position can be specified:

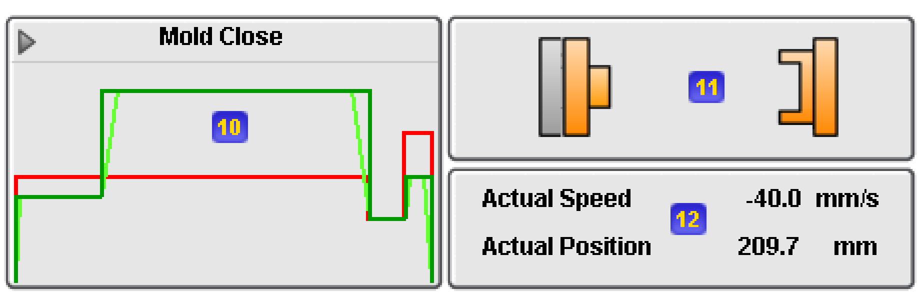


1	Profile steps 1-3. During the movement, the actual step the mold is running through is highlighted.

2	Mold protection step.
3	Mold lock step.
4	The position in every step is interpreted as target position. In the example above this means: Move in step 1 with 40% speed and 50 bar up to the position 190 mm, then change to the next step 2 in the profile.
5	Start position of mold protection phase.
6	Start locking position = End of mold protection. At this position the mold locking starts.
7	Mold locked position. At this position the mold locking ends. The mold is considered as locked when reaching this position.
8	Start locking delay. After the mold protection phase is finished the mold continues to move with mold protection speed and pressure for this time before change to the settings for locking. Note: This is not the mold protection timeout!
9	Mold lock delay. After the mold locking phase is finished the mold continues to move with locking speed and pressure for this time before the mold is considered as locked and the mold close movement is finished.

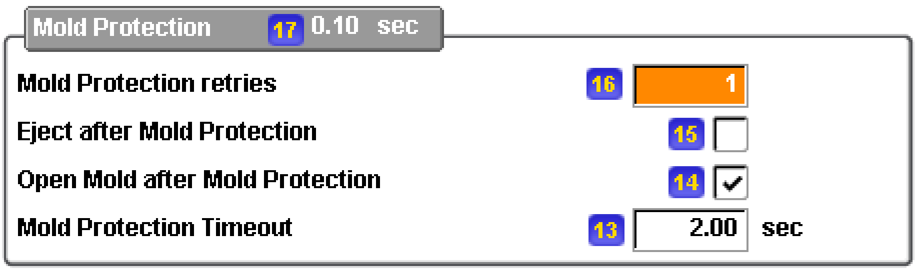


The graphic above explains the settings for mold closing. The profile entered is also visualized on the screen in a graphic of pressure and speed over position. The actual position of the mold is also visualized in an animation. Below the actual speed and position of the mold is displayed:



10	Pressure and speed profile for the movement. The set pressure is shown in red color. The set speed profile is shown in dark green color, for the speed profile additionally the rampings are calculated and shown in light green color.
11	The graphic shows the actual position of the mold. The graphic is in the left position when the mold is in the open position which is specified in the mold open profile.
12	Actual values.

The time needed in the step **MP** is monitored. If the mold needs more time than specified as **Mold Protection Timeout** to run through the mold protection step, the movement is stopped immediately and an alarm is triggered:



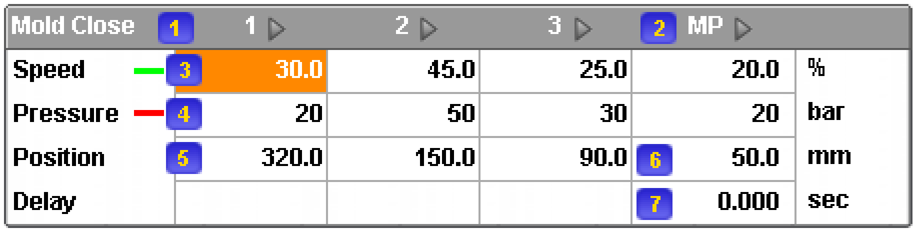
13	The time in which the mold should run through the MP step. If it gets stuck and needs more time than specified here, the alarm **20-6 Mold protection timeout** will be triggered.
14	If this option is set: when running in manual mode, the mold reopens automatically after a mold protection timeout.
15	If this option and option 14 are set: when running in manual mode, the mold reopens automatically after a mold protection alarm, additionally the ejector and cores are moved automatically as programmed.
16	When running in auto or semiauto mode, the mold can retry to close after a mold protection alarm happened. The number of retries can be specified here.
17	Actual time when the mold runs trough the mold protection step. The mold protection timeout can be set in field 13.

The parameters for moving the mold in setting mode can be adjusted on the bottom of the page:

18	Setting mode speed and pressure for mold close movement. These values have lower limits than the speed and pressure settings for manual and auto mode above.

Different settings for direct clamp:

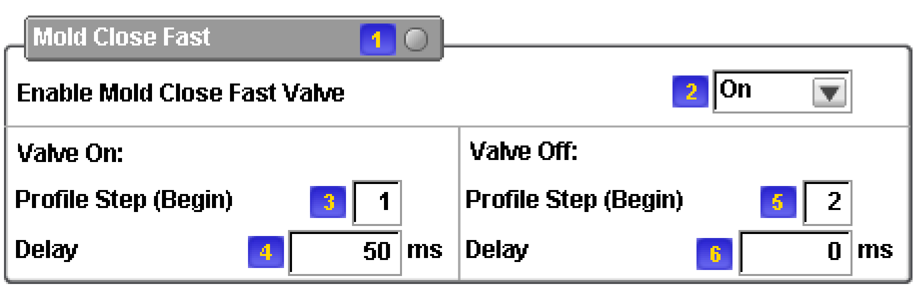
For direct clamps the settings for locking the mold are on a different page (Pages >> Mold >> Mold Locking (203)). On this page only the closing of the mold (incl. mold protection can be configured).



1	Profile steps 1-3. During the movement, the actual step the mold is running through is highlighted.
2	Mold protection step.
3	Set speed (velocity) for every movement phase
4	Set pressure for every movement phase
5	The position in every step is interpreted as target position. Each step is active until the position is reached. The last position from the profile is the start of mold protection phase. Unlike with the other positions the velocity will be decelerated in time so that mold protection velocity is reached at this given position.
6	Target position for mold close. End of mold protection phase. When this position is reached and the delay time 7 has expired than the close movement is finished and the locking of the clamp starts (see Pages >> Mold >> Mold Locking (203)).
7	Start locking delay. After the mold protection phase is finished the mold continues to move with mold protection speed and pressure for this time before change to the settings for locking. Note: This is not the mold protection timeout!

3.3.2 Mold Close Fast

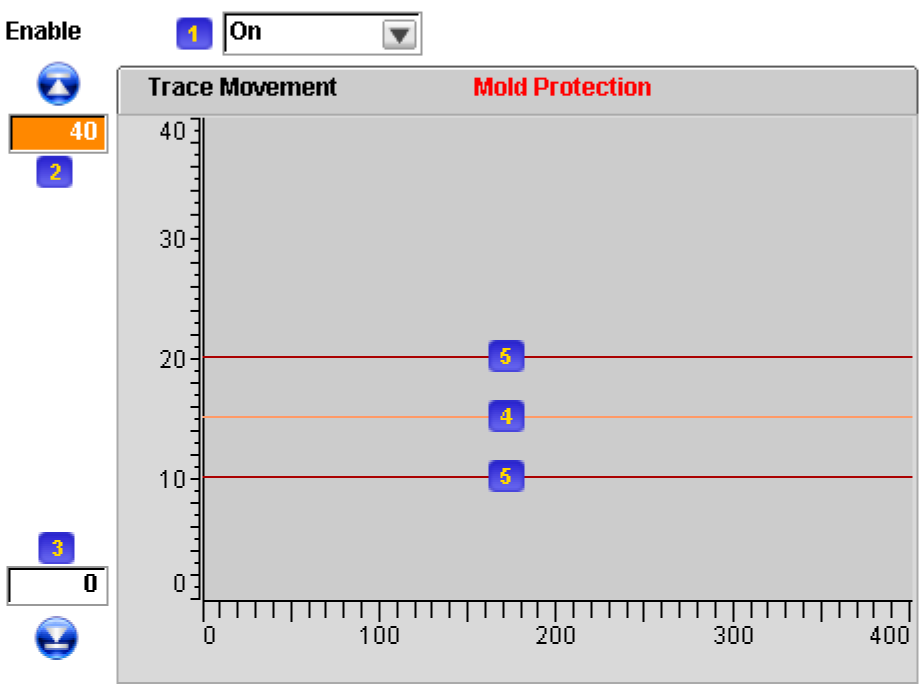
On this page all settings for the mold close fast valve can be made. This feature is optional and might not be visible on your controller.
The output signal **Mold Close Fast** actuates a valve that enables fast movement of the mold during closing. However this output signal can be used for any valve to be actuated during the mold close movement because the points of switching the valve on and off can be freely programmed.
How this mold close fast valve is controlled (based on profile steps, with or without delay times ...) depends on the hydraulic system and the type of valve used.
The below mentioed functions are the maximum available for the operator. All of these functions can be unlocked individually to be set by the operator, so some of the below mentioned functions might not be visible on your controller.



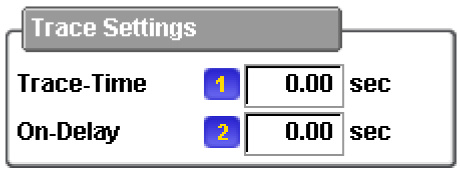
1	The LED icon shows the actual status of the digital output signal **Mold Close Fast** (Grey = LOW, Red = HIGH).
2	Here the operation of the fast valve can enabled ("On") or disabled ("Off"). If it is disabled the output signal for the valve always remains LOW. If it is enabled the output is set based on the criteria mentioned below.
3	Profile step (from the mold close movement profile) when the valve output signal is turned to HIGH. The point in time when the valve is actuated could be at the begin or at the end of the given profile step (check text on the left side).
4	Here you can set an additional delay time before the valve is actually set to HIGH after the criteria in 3 is fulfilled.
5	Profile step (from the mold close movement profile) during when the valve output signal is turned to LOW. The point in time when the valve is switched off could be at the begin or at the end of the given profile step (check text on the left side).
6	Here you can set an additional delay time before the valve is actually set to LOW after the criteria in 5 is fulfilled.

3.3.3 Graph. MoldProtect

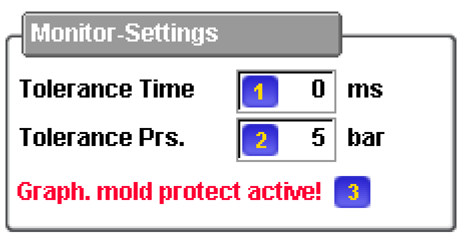
On this page all settings for the graphical mold protection can be made.
When the graphical mold protection is active then the system pressure during mold protection phase (see Pages >> Mold >> Mold Close (200)) is monitored.
Therefore the trend of the system pressure during mold protection is recorded and always compared to the trend from the last machine cycle. If the value from the actual cycle is outside a certain given tolerance than mold protection is triggered, the mold is stopped and the alarm **20-6 Mold protection timeout** is set (in automatic mode the mold may open automatically again depending on the operator settings - see Pages >> Mold >> Mold Close (200)).



1	Here the operator can enable or disable the whold graphical mold protection.
2	Max. value for the Y-scale of the graph.
3	Min. value for the Y-scale of the graph.
4	The orange curve shows the trend of the actual pressure during mold protection in the current cycle.
5	The brown curves show the upper and lower limit for the pressure. The pressure values in the actual cycle must be within this "tube" otherwise mold protection is triggered.

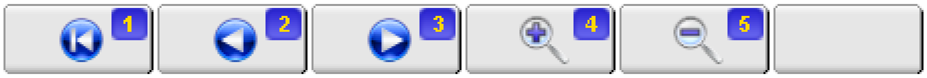


1	The trace time determines the min. recording time for the graphical mold protection. The trace will always start with the beginning of the mold protection phase and will end either end with the beginning of the mold locking phase or after the trace time has expired. The minimum actual trace time is 0.8 seconds (this is e.g. the recording the time if the setting for Trace-Time is 0) and can only be multiple of this value (1.6, 2.4, ...). Set the Trace-Time to 0 for most exact graphical mold protection or to a higher value if the mold protection phase takes longer!
2	With the On-Delay the start of the recording (and monitoring) can be delayed. The delay time stars with the beginning of the mold protection phase. This settting can be used if the beginning of the protection phase should not be monitored.



1	This is the max. time-deviation of the actual pressure to the pressure from the last cycle (horizontal distance of the upper and lower limit). This setting if the pressure rises or falls during mold protection.
2	This is the max. deviation of the actual pressure to the pressure from the last cycle (vertical distance of the upper and lower limit).
3	The text "Graph. mold protection active!" is highlighted in red when the monitoring is active. As the monitoring needs a compare-curve from the last cycle the graphical mold protection is not active in the first cycle after the activation of this function. Also when parameters for mold close are changed than the monitoring is disabled for one cycle to get a valid compare curve again!

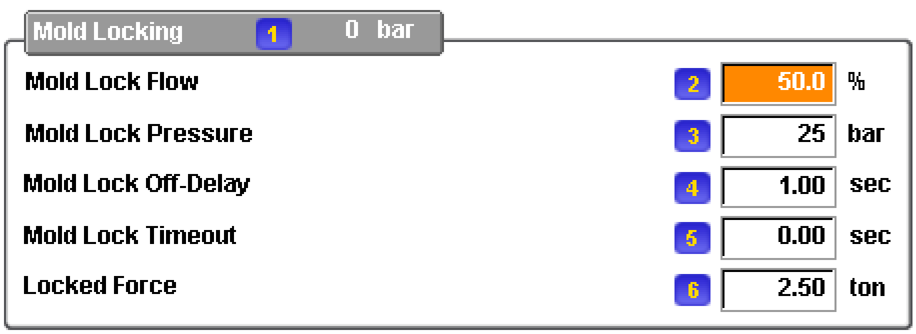
This page has some control-keys (press CTRL-key to access this keys) to control the graph-display:



1	**F1**: Disable Scroll (show oldest entries in graph)
2	**F2**: Scroll back (show older entries in graph). Works only if Zoom is active.
3	**F3**: Scroll forward (show newer entries in graph). Works only if Zoom is active.
2	**F4**: Zoom In (Show less entries in graph)
3	**F5**: Zoom Out (Show more entries in graph)

3.3.4 Mold Locking

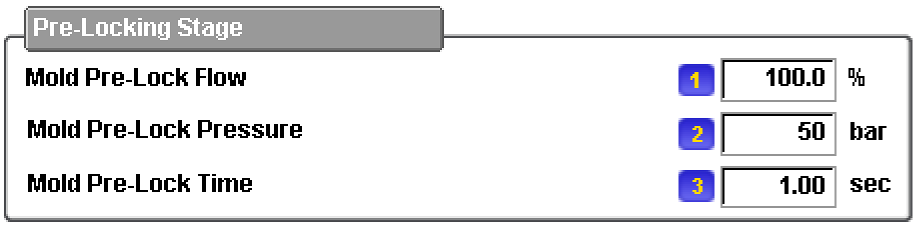
On this page all settings for the locking of the direct clamp can be made (the page is only visible if you are using a direct clamp - not visible for toggle clamps).
The locking starts after the target position for the mold close is reached (see Pages >> Mold >> Mold Close (200)).
Optionally a pre-locking stage is executed before the main locking starts. This is a seperate movement (e.g. to control a prefill-stage or bayonet lock device).



1	In the header-line the actual locking pressure is displayed (only when a locking pressure sensor is available).
2	Flow for locking the mold. In % of the maximum allowed flow.
3	Set target pressure for locking. When a pressure sensor is available the locking is finished when this pressure is reached. The clamp locking will always be done with this pressure (plus a certain offset adjustes in the setup-pages) independent of the sensor-type.
4	Clamp Lock Time or Delay. For locking with pressure sensor or pressure switch this time is the locking delay. After the locking is finished the flow and pressure will be maintained for this set time. For time-based locking this is the locking time.
5	Timeout for locking the clamp. If the locking does not finish within this time than the alarm **20-87 Clamp lock timeout** is set and the locking will be stopped. This timeout is only active when a pressure sensor or pressure switch is used for mold locking. For time-base locking the timeout is inactive and this settings is not visible.

6	Set Force for locking. When a pressure sensor is available the operator can set the locking force that should be reached when locking the clamp. The force value is calculated into the locking pressure 3, so chaning that value will automatically change the locking pressure as well (and vice versa). This setting is only visible if a pressure sensor for locking is available.

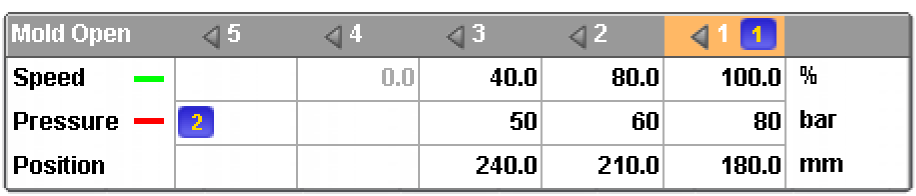
The pre-locking stage is optional. If it is not enabled the following settings are not visible.



1	Flow for the pre-locking stage in % of the maximum allowed flow.
2	Pressure for the pre-locking stage. The movement is executed with this pressure. If the pressure-sensor is also used to detect the movement end this is the pressure that must be reached.
3	Time for the pre-locking stage. This field is only displayed if the pre-locking stage is executed time-based.

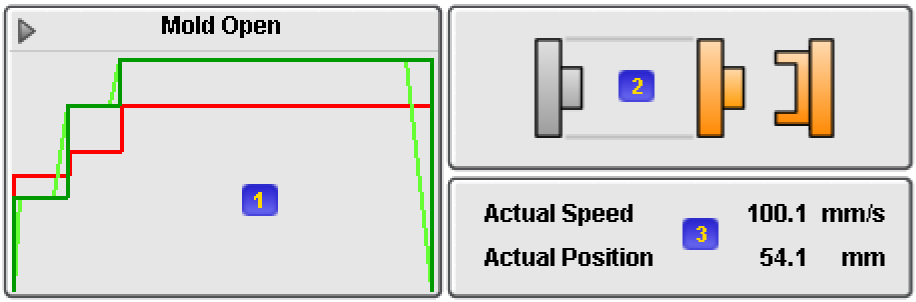
3.3.5 Mold Open

On this page all settings for the mold open movement can be made. This help first describes the settings for toggle clamps. Different settings for direct clamps are mentioned further below!
The mold open movement can be divided in up to 5 steps. For every profile step the speed, pressure and position can be specified:



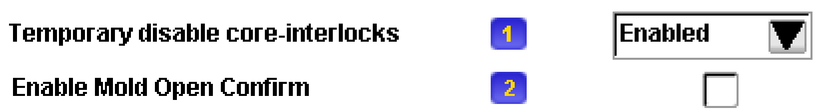
1	Profile steps 1-5. During the movement, the actual step the mold is running through is highlighted.
2	Pressure and speed settings for every step. The position in every step is interpreted as target position. In the example above this means: Move in step 1 with 100% and 80 bar up to the position 180 mm, then change to the next step 2 in the profile.

The profile entered is visualized in a graphic of pressure and speed over position. The actual position of the mold is also visualized in an animation. Below the actual speed and position of the mold is displayed:



1	Pressure and speed profile for the movement. The set pressure is shown in red color. The set speed profile is shown in dark green color, for the speed profile additionally the rampings are calculated and shown in light green color.
2	The graphic shows the actual position of the mold. The graphic is in the left position when the mold is in the open position which is specified in the open profile.
3	Actual values.

The following 2 settings are optional and might not be visible on your controller:



1	Dropdown do temporary disable the dynamic (core) interlocks in setting mode. This setting is only available if the core interlocking is also active in setting mode (see Software Setup >> Software Options - #553). The parameter is automatically reset to "Disabled" whenever the mode is changed! If a bypass-key (General >> IO Datapoints >> Safety Gate - DI#243) is connected to the controller it has to be active (HIGH) when this parameter is set to "Enabled" and a core, the clamp or the ejector should be moved!
2	If a mold open confirm input (General >> IO Datapoints >> Mold - DI#008) is connected to the controller it can be activated with this checkbox (only when this input-signal is HIGH the ejecter can be moved than).

The parameters for moving the mold in setting mode can be adjusted on the bottom of the page:

1	Setting mode speed for mold open movement. This value has a lower limit than the speed for manual and auto mode above.
2	Setting mode pressure for mold open movement. This value has a lower limit than the pressure settings for manual and auto mode above.

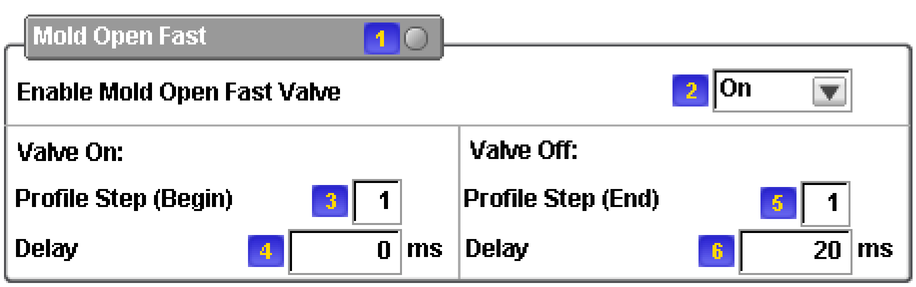
The unlock-settings below are just visible for toggle-clamp machines. They will be applied durig early unlock (see below) but also for unlock during unmanned mode (see...).

For direct clamps the unlocking can be configured on a seperate page (Pages >> Mold >> Mold Unlock (212)).

1	When this option is set (checkbox), the mold will unlock early (before the normal mold open is done). When this unlock is done can be specified in the dropdown 2
2	With the dropdown the operator can decide when the early unlock should happen: • **After Injection** ... Mold unlocks directly after injection & holdon pressure • **After Decomp.** ... Mold unlocks directly after decompression after
3	Target position for the unlock movement.
4	Delay time for the unlock movement. After reaching the unlock position 3, speed and pressure output continue for this time.

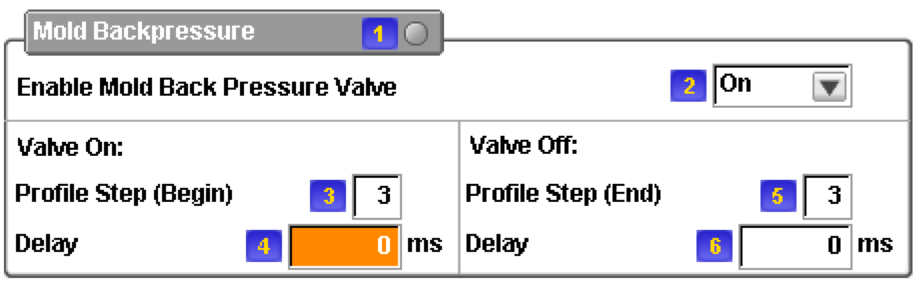
3.3.6 Mold Open Fast

On this page all settings for the mold open fast valve and mold open backpressure valve can be made. This feature is optional and might not be visible on your controller.
The output signal **Mold Open Fast** actuates a valve that enables fast movement of the mold during opening. The output signal **Mold Open Backpressure** actuates a valve that decelerates the clamp in order to stop it exactly. However these output signals can be used for any valves to be actuated during the mold open movement because the points of switching the valves on and off can be freely programmed.
How this mold open fast and backpressure valves are controlled (based on profile steps, with or without delay times ...) depends on the hydraulic system and the type of valve used.
The below mentioned functions are the maximum available for the operator. All of these functions can be unlocked individually to be set by the operator, so some of the below mentioned functions might not be visible on your controller.



1	The LED icon shows the actual status of the digital output signal **Mold Open Fast** (Grey = LOW, Red = HIGH).

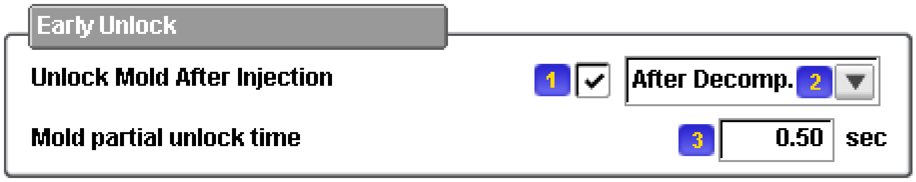
2	Here the operation of the fast valve can enabled ("On") or disabled ("Off"). If it is disabled the output signal for the valve always remains LOW. If it is enabled the output is set based on the criteria mentioned below.
3	Profile step (from the mold open movement profile) when the valve output signal is turned to HIGH. The point in time when the valve is actuated could be at the begin or at the end of the given profile step (check text on the left side).
4	Here you can set an additional delay time before the valve is actually set to HIGH after the criteria in 3 is fulfilled.
5	Profile step (from the mold open movement profile) during when the valve output signal is turned to LOW. The point in time when the valve is switched off could be at the begin or at the end of the given profile step (check text on the left side).
6	Here you can set an additional delay time before the valve is actually set to LOW after the criteria in 5 is fulfilled.



1	The LED icon shows the actual status of the digital output signal **Mold Open Backpressure** (Grey = LOW, Red = HIGH).
2	Here the operation of the fast valve can enabled ("On") or disabled ("Off"). If it is disabled the output signal for the valve always remains LOW. If it is enabled the output is set based on the criteria mentioned below.
3	Profile step (from the mold open movement profile) when the valve output signal is turned to HIGH. The point in time when the valve is actuated could be at the begin or at the end of the given profile step (check text on the left side).
4	Here you can set an additional delay time before the valve is actually set to HIGH after the criteria in 3 is fulfilled.
5	Profile step (from the mold open movement profile) during when the valve output signal is turned to LOW. The point in time when the valve is switched off could be at the begin or at the end of the given profile step (check text on the left side).
6	Here you can set an additional delay time before the valve is actually set to LOW after the criteria in 5 is fulfilled.

3.3.7 Mold Unlock

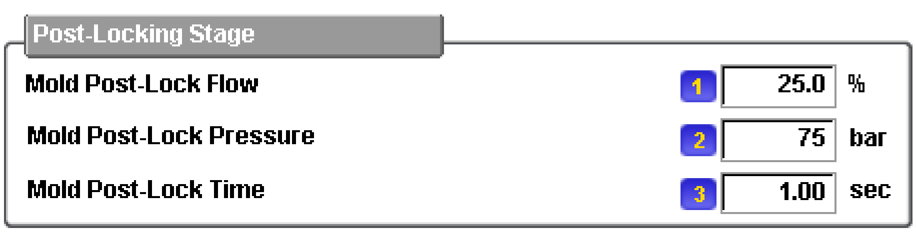
On this page the unlocking of the direct clamp can be configured. This page is not visible if a toggle-clamp is used.
Beside the normal unlock a optional post-locking stage (movement after the unlock has finished, before mold open starts) can be configured.



1	When this option is set (checkbox), the mold will unlock early (before the normal mold open is done). When this unlock is done can be specified in the dropdown 2
2	With the dropdown the operator can decide when the early unlock should happen: • **After Injection** ... Mold unlocks directly after injection & holdon pressure • **After Decomp.** ... Mold unlocks directly after decompression after
3	If the mold should not unlock completely a time-limit can be configured here. The early unlocking will stop after that time. This function is disabled if the value is set to 0.

1	In the header the actual pressure is displayed if the mold has a pressure sensor.
2	old Unlock Flow. Hydraulic flow rate used for unlocking the clamp (in % of max. allowed flow)
3	Unlock timeout or unlock time. When a sensor (pressure sensor, pressure switch) is used to detect the unlock-criteria the operator can set a timeout for the unlocking here. If the unlocking does not finish within this time the alarm **20-89 Clamp unlock timeout** is set and the unlocking is stopped. For time-based unlocking the operator can set the unlock-time here.

The post-locking stage is optional. The settings are only visible if the post-locking is enabled.

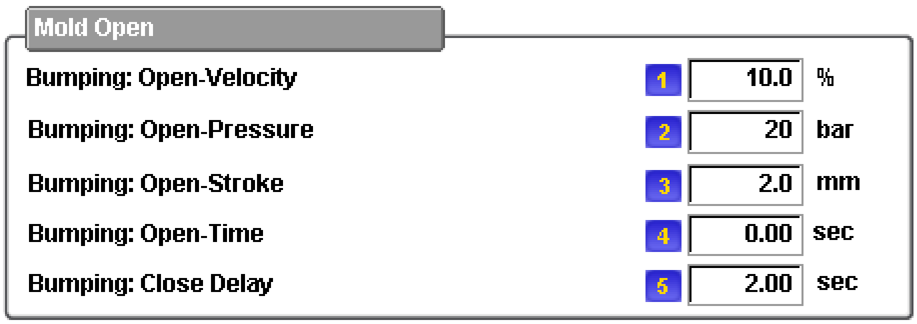


1	Flow for the post-locking stage in % of the max. allowed flow.
2	Pressure for the post-locking stage.
3	Post-locking stage time. This time is only used (and visible) if the post-locking stage is done time-based (no sensor).

3.3.8 Bumping

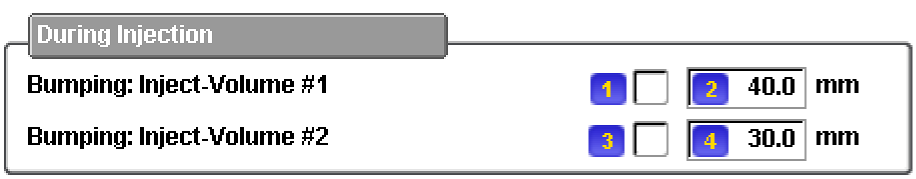
On this page the parameters for bumping (exhaust) can be set.
Bumping can be executed during injection or after injection (during cool-time). Bumping means that the clamp opens slightly and closes again in order to ventialate the mold.

In the first section the parameters for the open movement can be set. The closing happens with the standard parameters for closing and locking.



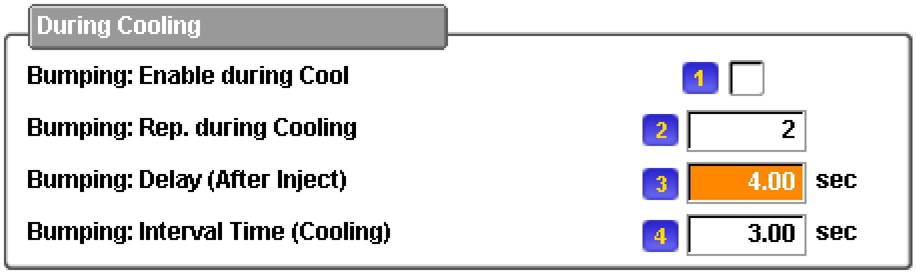
1	Velocity for the open-movement of the clamp during bumping.
2	Pressure for the open-movement of the clamp during bumping.
3	Stroke for opening movement. For direct clamps this is the target position. For toggle clamps the movement stops when this position is reached and the open-time 4 expired.
4	Open time (only for toggle clamps). The open-movement for bumping stops when the open-stroke 3 is reached and this time has expired (the time starts once the open-stroke is reached)
5	Delay time for closing the mold again after it has been opened.

Up tp 2 injection-position/volume can be given where the bumping should take place. The injection will stop at the given position and then the exhaust movement will take place (clamp will stay open for a given exhaust-time). After the mold is closed again the injection will continue. If the given position is not reached before the switchover to hold-pressure the exhaust-movement will not take place.



1 3	With the checkbox the bumping function for the given position 2 can be enabled. If the checkbox is not selected no bumping will take place.
2 4	Injection Volume/Position where the bumping should take place.

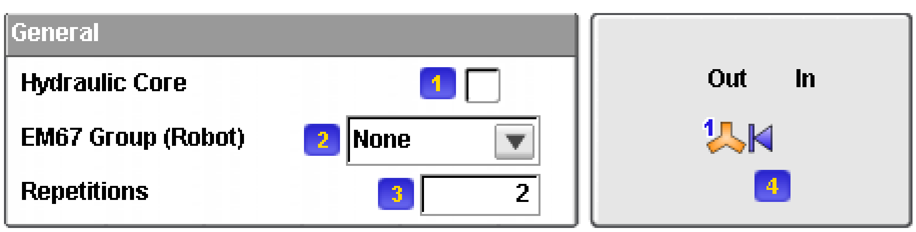
During cooling / after injection the bumping-movement can be repeated multiple times. The first exhaust-movement is started after a initial exhaust-delay time (starts with end of hold-pressure). The mold will stay open for the given exhaust-time and than close again. This function can be repeated a set number of times with a given interval-time inbetween.



1	With this checkbox the bumping function during cooling is enabled. If the checkbox is not selected no bumping will take place during cool-time.
2	Number of repetitions. The bumping will take place for the fiven number of times with the given interval-time 4 inbetween.
3	Delay time before the first bumping-movement will start (time starts with end of injection)
4	Interval time that has to expire between bumping-cycles when more than one repetition 1 is selected.

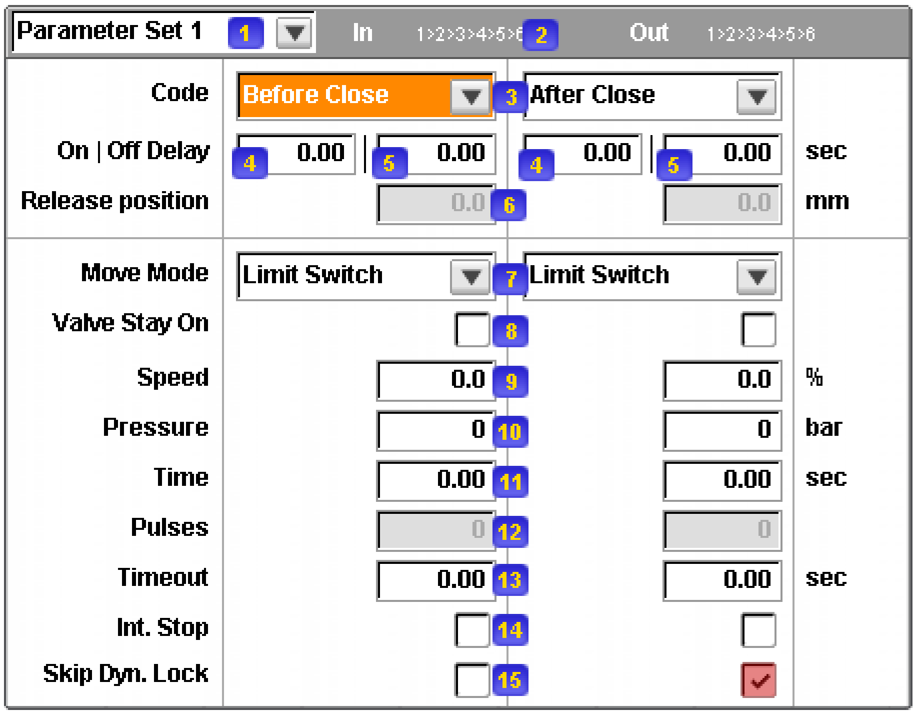
3.3.9 Core 1

The movement settings for cores 1 can be made on this page.
Either simple core programming or free core programming can be used. Per default simple core programming is assumed. Free core programming must be enabled explicitly on Pages >> Overview >> Sequence Editor (141).
If free programming is disabled, the core movement code can be adjusted on this page.
If free core programming is enabled, the point of time when the core moves must be defined in the graphical sequence editor and the setting for the movement code on this page does not have any influence.
In both cases, the settings for rest of the movement parameters (speed, pressure, time ...) must be made on this page.



1	Activate a hydraulic core. If this setting is deactivated, only a digital output for the core valve is set during movement (for example for pneumatic or electric cores). If the setting **Hydraulic Core** is activated, set speed and set pressure are forwarded to the pump.
2	With this setting you can determine to which core group this core belongs. This core group is used by the robot interface (Euromap67) that distinguishes between cores of type 1 and 2 for interlocking cores of a certain group. Possible settings are: • **None**: The core is not considered in the robot interface • **Group 1**: The core is considered as part of "core pullers 1" • **Group 2**: The core is considered as part of "core pullers 2"

3	This field is only visible if code **Rep. After Ejection** (see below) is set for the core or graphical sequence programming is enabled. Here the number of repetitions for the core movement can be set. This setting is only considered for code **Rep. After Ejection** or if in the graphical sequence editor the step **Core Repetition** (see Pages >> Overview >> Automatic Sequence (140)) is programmed. The core will not move if the number of repetitions is set to 0.
4	This graphic shows the actual status of the core (moving in, moving out, in, out).



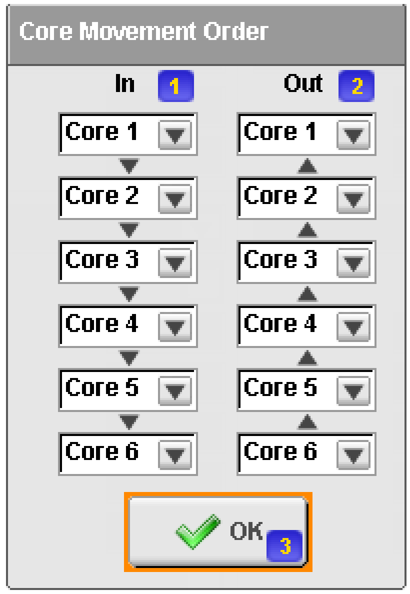
1	With this dropdown you can select the parameter set you want to edit. Each core supports up to 2 parameter sets, this means 2 movements with separate movement parameters in each direction. Movements with parameter set 2 can only be programmed in the graphical sequence editor. Multiple parameter sets are optional and might not be supported by your controller. Example: The core should move in after mold close to an intermediate stop position and later in the cycle during injection to the final end position. In this case for the parameter set 1 the option **Int. Stop** 12 should be enabled, whereas it should be disabled in the parameter set 2. In the graphical sequence editor (see Pages >> Overview >> Automatic Sequence (140)) you need to program the first core in movement with parameter set 1, and a second in movement during injection with parameter set 2.
2	Optional: Display of core-order. When selecting this display and pressing the ENTER- or SELECT-key a dialog to change the core-order will pop up (see below). The core-order is common for all cores. So chaning this on one core-page will change the order for all cores. The order applies to all cores with the same program-code!

<table>
<tr><td>3</td><td>Movement code: if graphic sequence programming is disabled, the point in the sequence when the core moves can be set here. Possible settings are:

Before Close: Core moves before the mold close movement.
Parallel to Close: Core moves parallel to the mold close movement, this means core and mold are moving at the same time. The core movement starts once the mold passes through the Release Position 6
Between Close: Core moves inbetween the mold close movement. The mold stops at the Release Position 6, then the core moves. After the core has stopped, the mold is continuing to move until its end position or the next intermediate stop.
After Close: Core moves after the mold close movement.
Before Open: Core moves before the mold open movement.
Parallel to Open: Core moves parallel to the mold open movement (just like Parallel to Close).
Between Open: Core moves inbetween the mold open movement (just like Between Close).
After Open: Core moves after the mold open movement.
After Injection: Core moves after injection and holdon pressure. The cooling time starts after the core movement is finished.
After Ejection: Core moves after the ejection process of the current cycle. If the ejector is disabled the core will move like After Open.
Rep. After Ejection: This option is only available for the In movement. Core will move repeatedly (see setting Repetitions above) in and out after the ejection process of the current cycle. If the number of repetitions are set to 0 the core will not move. If the ejector is disabled the core will move directly after mold open. For the Out movement the settings on the right side for Out will be used. No code can be set for the Out movement in that case.
Before Injection: Core moves directly before injection
Between Injection: Core moves inbetween injection. The injection piston stops at the Release Position 6, then the core moves. After the core has stopped, the injection is continuing to move until its end position or the next intermediate stop.
Parallel to Injection: Core moves parallel to the injection movement, this means core and injection piston are moving at the same time. The core movement starts once the injection piston passes through the Release Position 6
After Eject Forward: Core moves after the first ejector forward movement (before repetition and backward-movement)
</td></tr>
<tr><td>4</td><td>Delay time: Delay time to elapse before the core really starts to move.</td></tr>
<tr><td>5</td><td>Off Delay time: Delay that has to elapse after the core has finished its movement, before the following movement can start.</td></tr>
<tr><td>6</td><td>Release Position:
Meaning for movement code 2 Parallel to Close/Open: the core starts to move as soon as the mold runs through this position.
Meaning for movement code 2 Between Close/Open: The mold stops at this position, then the core moves.</td></tr>
</table>

7	Move Mode: • **Undefined**: Core does not move. • **Limit Switch**: Core moves until the according limit switch is active. • **Time Based**: Core moves until the movement time 9 that can be specified below is elapsed. • **Pulses**: The moves for a certain number of input pulses 10 (for rotational cores). • **Limit Switch (Edge)**: Core moves until the according limit switch is active, but the state of the limit switch is not monitored anymore during the rest of the cycle (for interlocking with other axes). This means that after a detecting a positive edge on the limit switch input signal the endposition is reached. The core will be assumed in **In** or **Out** position for the rest of the cycle no matter what will be the state of its limit switches.
8	Valve Stay On: If checked, the core valve remains actuated also after the movement has finished. If it is disabled, the valve is switched off after the core movement.
9	Speed: Set speed for core movement. Only important for hydraulic cores.
10	Pressure: Set pressure for core movement. Only important for hydraulic cores.
11	Time: Meaning for move mode 7 **Time**: movement time for timebased core movement. Meaning for move mode 7 **Limit Switch / Pulses**: Additional time the core valve and speed and pressure valves remain further actuated after the limit switch or set number of pulses has been reached.
12	Pulses: Core moves for this number of input pulses and stops after the specified number of pulses has been counted on the input.
13	Timeout: If the core movement needs longer than the timeout specified here, the alarm **20-5 Core timeout** is shown.
14	When this checkbox is checked the core moves to the intermediate stop position and not to the final In or Out position. This setting is important if an additional limit switch for the intermediate stop position is connected (digital input signals **Core#1-6 In/Out (IStop)**). This setting is optional and might not be available on your controller.
15	When this checkbox is checked the dynamic interlocking for this core is disabled. This means that the core can always be moved in all operation modes independent of the position of the mold. Vice versa the mold can only be moved when the core is in the correct position - this interlocking remains! Activating this function is potentially dangerous and could lead to damages of the mold. That is why this checkbox is automatically unchecked when the core code is changed and the active checkbox is always displayed with red background color. This setting is optiona and might not be available on your controller.

The core-order can (optionally) be defined with the following dialog on this page. The core-order is common for all cores and only affect cores that are programmed with the same code (for the codes "Between Close" and "Between Open" also the intermeiate stop position must be identical). The core-order has no affect when graphic sequence programming is enabled!



1	Here the order for the core-in movements can be defined. The cores will move sequentially starting with the first in the row to the last in the row (top to bottom). Each entry in the list must be unique - the software will automatically adjust all entries if one is changed. The operator needs to make changes in the list from top to bottom, otherwise the software will undo the changes!
2	Here the order for the core-out movements can be defined. The cores will move sequentially starting with the last in the row to the first in the row (bottom to top) Changes in the list must be done from bottom to top otherwise the software will reset the changes (see explanation in point 1)
3	To close the dialog the soft-button "OK" must be pressed

3.3.10 Core 2

The movement settings for core 2 can be made on this page.
All possible settings are identical to Pages >> Mold >> Core 1 (220)

3.3.11 Core 3

The movement settings for core 3 can be made on this page.
All possible settings are identical to page Pages >> Mold >> Core 1 (220)

3.3.12 Core 4

The movement settings for core 4 can be made on this page.
All possible settings are identical to page Pages >> Mold >> Core 1 (220)

3.3.13 Core 5

The movement settings for core 5 can be made on this page.
All possible settings are identical to page Pages >> Mold >> Core 1 (220)

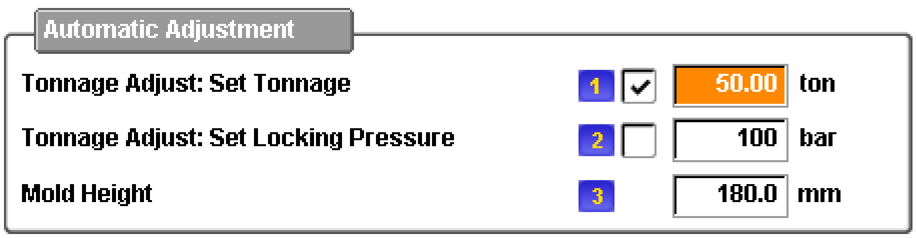
3.3.14 Core 6

The movement settings for core 6 can be made on this page.
All possible settings are identical to page Pages >> Mold >> Core 1 (220)

3.3.15 Mold Height

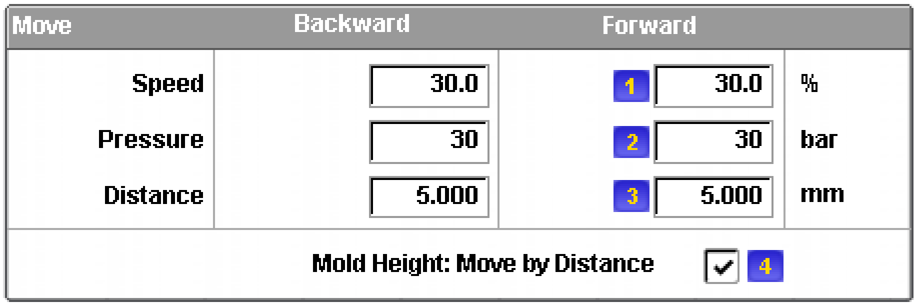
On this page the settings for tonnage adjustment and manual mold height movement can be made.

Automatic tonnage adjustment is performed when pressing the tonnage adjustment button. The automatic tonnage adjustment procedure can only be started in setting mode. The set tonnage and mold height for the adjustment procedure can be entered here:



1	Tonnage: Set tonnage for automatic tonnage adjustment. The checkbox enables the automatic tonnage adjustment at the end of mold height adjustment: At the end of the automatic mold height adjustment procedure the mold height moves a small distance forward beyond the mold touch point. The distance of this forward movement is calculated in a way that the tonnage reaches the set value specified here. For a more accurate result the mold height can be specified in 3. The calulation of the necessary forward-movement is based on a tabel adjusted by the OEM (see Setup >> Mold-Side >> Mold Height). The result depends on the exactness of this table (and the stiffness of the mold etc.). There is no guarantee that the desired tonnage is reached!
2	Locking Pressure: Set locking pressure for tonnage adjustment. The checkbox enables the automatic locking pressure evaluation at the end of mold height adjustment: At the end of the automatic mold height adjustment the mold height is adjusted that exactly the set locking pressure specified here is needed to lock the clamp. During this procedure the mold will be locked and unlocked several times.
3	Mold Height: Set mold height for automatic tonnage adjustment. For a more accurate result of automatic tonnage adjustment, the new mold height can be set here. At the end of the automatic tonnage adjustment procedure the mold height moves a small distance forward beyond the mold touch point. The calculation of this distance takes also the actual mold height as input parameter. This setting is hidden if the mold height position is remanent or absolute. The option of remanent storage of the mold height can be configured in **sw.ini**.

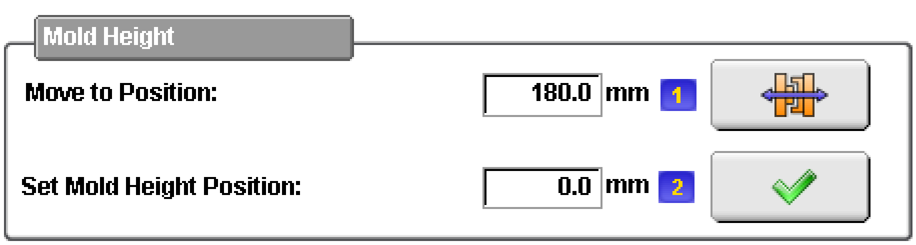
The mold height can only be moved in setting mode, the parameters for the movement can be specified here:



1	Set speed.
2	Set pressure.
3	Move distance. When pressing the mold height forward or backward movement key the mold height moves for this distance only, provided that **Move by Distance** 4 is enabled.
4	Move by Distance: If enabled, the mold height moves only for a certain distance when pressing the mold height forward or backward key. It stops after passing the distance specified in 3. If it is disabled, the mold height keeps moving as long as the mold height forward or backward movement key is pressed.

1	For the use of non-remanent position: The actual distance that has been passed since the last mold height movement was started. This is not an absolute position, it only shows the distance relative to the position where the mold height movement was started.
2	For the use of remanent position or absolute position encoders: The actual mold height.

The following settings are only displayed if a remanent position is used for the mold height:



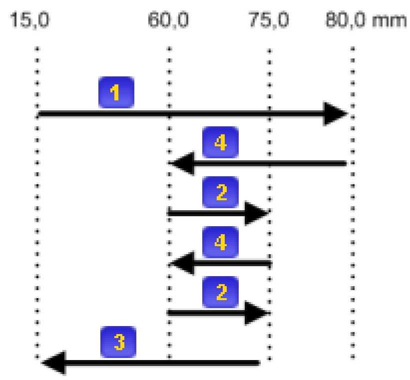
1	By pressing this button you can move the mold height to the given position. This movement can only be started in setting mode.
2	Specify and confirm the actual mold height position. By pressing this button the given position is accepted as the actual mold height position.

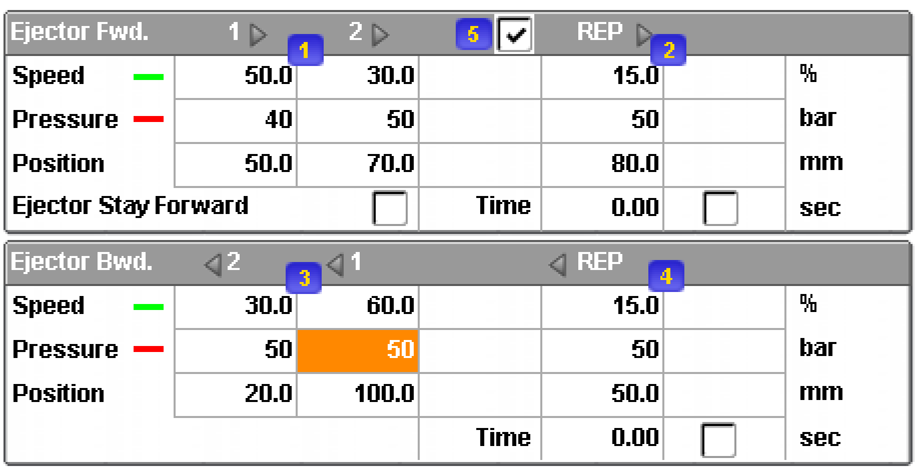
3.4 03_Ejector

3.4.1 Ejector

On this page all settings for the ejector can be made.

The whole ejection process consists of the ejector forward and backward movement (movement profiles with 2 steps) and the repetition forward and backward movement (single step).
The following diagram shows an ejection process with 2 repetitions and illustrates the meaning of all target positions (normal forward, normal backward, repetition forward and repetition backward target position). The time scale is going from top to down. The single movements 1 - 4 are carried out with the respective parameters of the movement profile shown below.
If repetition with separate parameters is not selected (5) than also the repetition movements are done with the standard-parameters. In this case movements 1 and 3 are repeated instead of the separate repetition movements 2 and 4

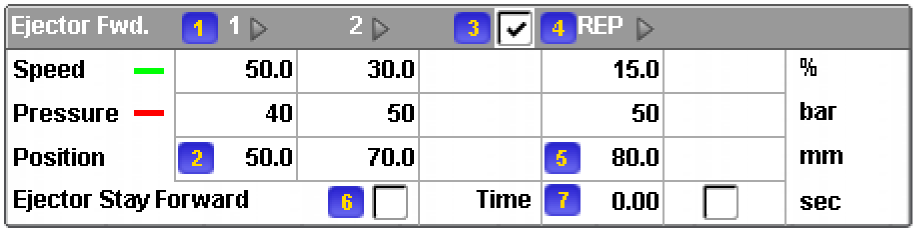




Ejector Fwd.	1 ▷	2 ▷	5 ☑	REP ▷		
Speed	50.0	30.0		15.0		%
Pressure	40	50		50		bar
Position	50.0	70.0		80.0		mm
Ejector Stay Forward		☐	Time	0.00	☐	sec

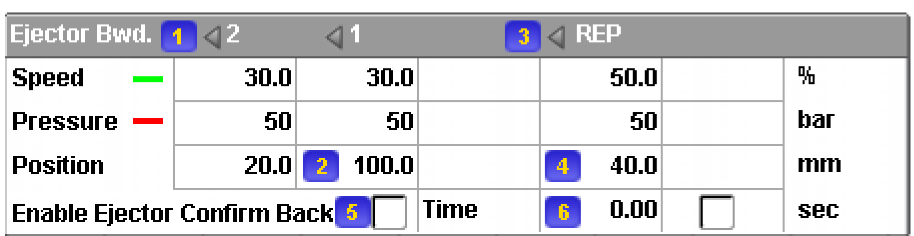
Ejector Bwd.	◁ 2	◁ 1		◁ REP		
Speed	30.0	60.0		15.0		%
Pressure	50	50		50		bar
Position	20.0	100.0		50.0		mm
			Time	0.00	☐	sec

Depending on the ejector sensor type (limit switches, position transducer, time) the ejector forward profile may look different on your controller:



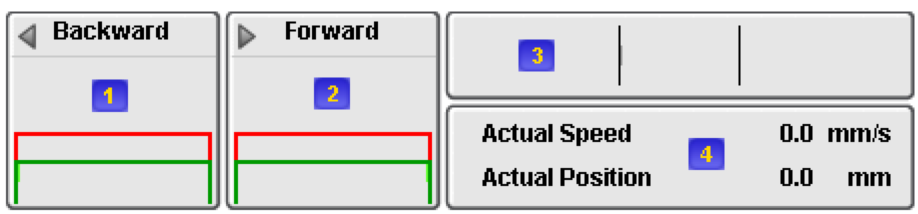
1	Profile steps 1-2 for normal forward movement. During the movement the actual step the ejector is running through is highlighted.
2	The position in every step is interpreted as target position. In the above example only one profile step is active, thus the ejector will stop at the target for profile step 1. If a second profile step is enabled the profile step 2 will get active when the position of profile step 1 is reached. The position inputs are only visible if a position transducer is used on the ejector. For a movement based on limit switches no inputs are visible. For a time based ejector movement you can enter the movement times here.
3	Selection whether separate parameters should be used for repetition. If this checkbox is unselected the parameters for repetition (4, 7, 8) will disappear and the repetition takes place with the standard parameters (1)
4	Repetition movement parameters. During the repetition movement the step "REP" is highlighted. See also the diagram above for an explanation on the ejector repetition movements.
5	Target position for the repetition movement. This position can be different to the target position for the normal movement.
6	If the option **Ejector Stay Forward** is enabled the ejector will stay forward at the end of the cycle in semi automatic mode. It will move back then at the beginning of the next cycle. In all other operation modes this setting has no effect.
7	If repetition by time is enabled (checkbox) the repetition will not stop at the given target 4 but will end after the given time. The software assumes that the ejector always passes through the whole distance in the given time (for safety interlocks) if this function is enabled.

Depending on the ejector sensor type (limit switches, position transducer, time) the ejector backward profile may look different on your controller:

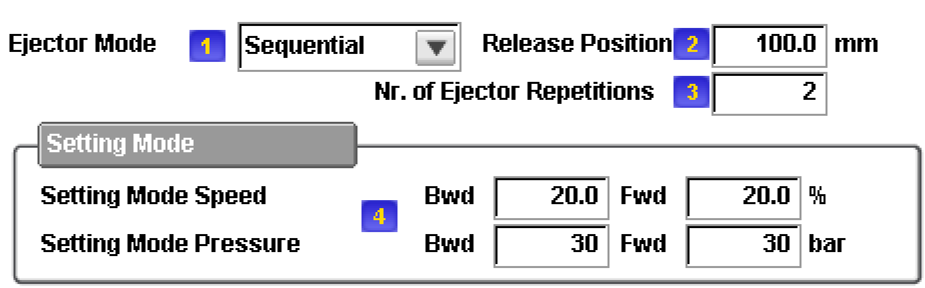


1	Profile steps 1-2 for normal backward movement. During the movement the actual step the ejector is running through is highlighted.

2	The position in every step is interpreted as target position. In the above example only one profile step is active, thus the ejector will stop at the target for profile step 1. If a second profile step is enabled the profile step 2 will get active when the position of profile step 1 is reached. The position inputs are only visible if a position transducer is used on the ejector. For a movement based on limit switches no inputs are visible. For a time based ejector movement you can enter the movement times here.
3	Repetition movement parameters. During the repetition movement the step "REP" is highlighted. See also the diagram above for an explanation on the ejector repetition movements.
4	Target position for the repetition movement. This position can be different to the target position for the normal movement.
5	If a ejector confirm back input (General >> IO Datapoints >> Ejector - DI#021) is connected to the controller than it can be activated here (the input must be HIGH than to allow mold close, mold height or core movements).
6	If repetition by time is enabled (checkbox) the repetition will not stop at the given target 4 but will end after the given time. The software assumes that the ejector always passes through the whole distance in the given time (for safety interlocks) if this function is enabled.



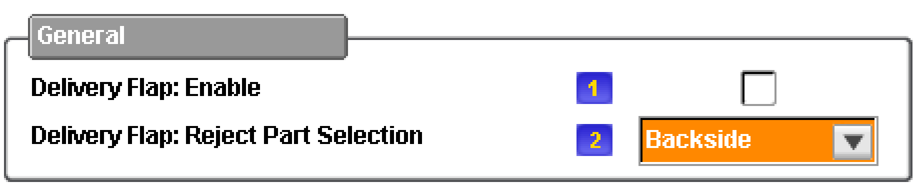
1	Pressure and speed profile for the normal backward movement. The set pressure is shown in red color. The set speed profile is shown in dark green color, for the speed profile additionally the rampings are calculated and shown in light green color.
2	Pressure and speed profile for the normal forward movement. The set pressure is shown in red color. The set speed profile is shown in dark green color, for the speed profile additionally the rampings are calculated and shown in light green color.
3	The graphic shows the actual position of the ejector. The graphic is in the left position when the ejector is completely retracted, this means when the ejector is in back position which is specified in ejector backward profile.
4	Actual position and speed of ejector.



1	The ejector mode defines when the ejection happens in the automatic sequence: • **Off:** Ejection is disabled • **Sequential:** Ejection happens after Mold Open is finished • **Mold Open:** Ejection happens parallel to Mold Open starting at the given release position 2. This option is only available on multi pump machines. • **Manual (Seq.):** Optional (not available on all controllers). Ejection can (must) be done manually in semi-automatic mode (possible after mold open with the jog-keys - movement of ejector possible also when safety gate is open!). In full automatic mode ejection happens after Mold Open is finished. • **Gate (Seq.):** Optional (not available on all controllers). After the first ejector forward movement (in semi-automatic mode) the safety gate must be opened and closed before the ejector movement continues (repetition and back-movement). The next cycle is not started again but has to be started manually again. In full automatic mode the ejector moves sequentially to the mold. • **Programmed:** Graphical sequence programming is enabled. Setting the ejector mode on this page is not possible.
2	The release position is the minimum mold opening that is needed to move the ejector forward. If the mold position is smaller than the release position, the ejector forward movement is not allowed. It is also used as start position for parallel operation for the ejector. This setting is limited by the ejection stroke (Max. forward position - Min. backward position) plus a safety stroke (fixed OEM setting).
3	Number of ejector repetitions. If this value is set to 1 only the main forward and backward movements are executed. If it is set to a higher value the repetition movements are executed before the ejector is moved back. For example if this value is set to 3 then the ejector is moved forward with the normal parameters, then it is moved forward and backward 2 times with the repetition parameters and finally it is moved back with the normal parameters. See also the diagram above. If this value is set to 0 then no ejector movement takes place.
4	Setting mode speed and pressure for ejector forward and backward movement.

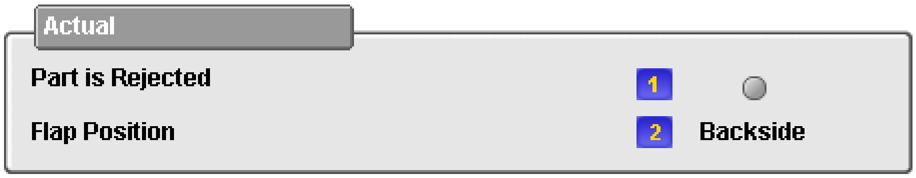
3.4.2 Delivery Flap

On this page all settings for the delivery flap control can be made. The delivery flap is a device that separate "bad parts" (rejected parts) from "good parts" when the parts are falling down after ejection. This page is optional and only visible if the delivery flap function is enabled on the controller.



1	With this checkbox the delivery flap function can be enabled. If it is enabled the flap will move to the "reject" position when the part is rejected or to the other position if the part is OK. The movement of the delivery flap will always be done at the start of mold open. This selection only happens in automatic or semi automatic mode, in all other modes the flap is always in the "reject" position. If the function is disabled the flap will always stay in the "reject" position.

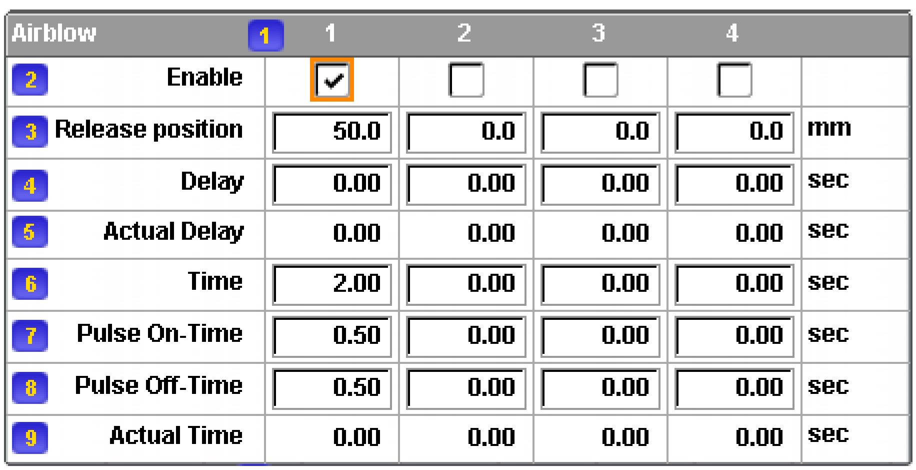
2	With this setting the "reject" position can be defined. The following settings are possible: • **Backside** .. The flap moves to the backside if a part should be rejected. • **Frontside** .. The flap moves to the frontside if a part should be rejected.



1	Display whether the current part is rejected (indicated by a red LED icon) or not (the LED icon stays grey).
2	Actual position of the delivery flap: • **Backside** .. The flap is in the backside position. • **Frontside** .. The flap is in the frontside position.

3.4.3 Air Blows

On this page all settings for the airblows can be made.
The airblows are always activated during mold open. If graphical sequence programming (see also Pages >> Overview >> Sequence Editor (141)) is enabled they can be activated in a different part of the machine cycle.

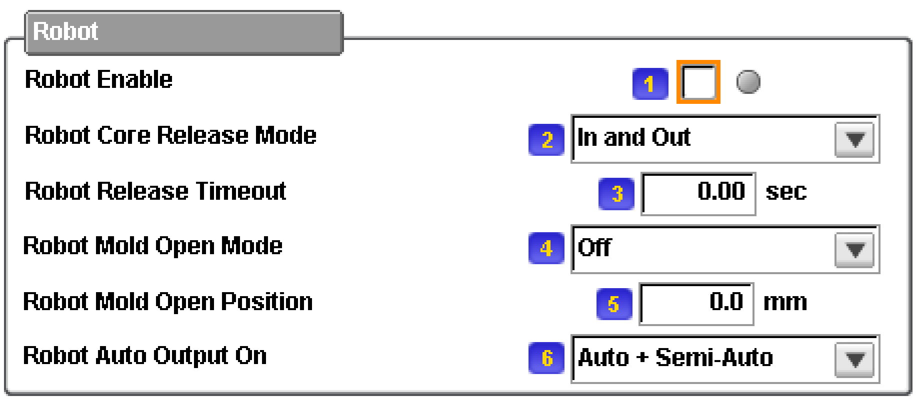


1	Index of the airblow (airblow number). When the according air-blow output is active the index text is highlighted (orange background-color)
2	Enable for the airblow. Only if this option is enabled the airblow gets active (otherwise it stays inactive). When graphical sequence programming is enabled then the checkbox is locked and has no function.
3	Release position for the airblow. The airblow will only start if the position of the mold exceeds this value. ATTENTION: The release position is also taken into consideration when graphical programming is enabled and the airblow is not programmed parallel to the mold. So if the airblow should be active while the mold is closed, the release position must be set to 0.

4	Delay time for the activation of the airblow. The time gets active once the clamp has reached the release position.
5	Display of the actual delay time (downcounting).
6	Blow time. The airblow output is active for this time once the release position was reached and the delay time has expired.
7	Pulse on-time. If the air-blow output should pulse during the set blow-time the on-time (time during which the output is HIGH) can be set here. If this value is set to 0 the pulsing is disabled and the output is HIGH during the whole set blow-time (6).
8	Pulse off-time. If the air-blow output should pulse during the set blow-time the off-time (time during which the output is LOW) can be set here. The pulsing will happen periodically with the set on- and off-time (period time = 7 + 8)
9	Display of the actual blow time (upcounting).

3.4.4 Robot Interface

On this the interface to the Robot (Euromap67) can be configured.



1	Set this option to activate the robot. When the robot is activated, the input signals from the robot are considered for interlocking and synchronisation with the machine automatic cycle. Additionally to this setting, the input signal **Robot: Operation mode B2** must be HIGH (or not connected) to activate the robot. The checkbox is optional (if not present only the input **Robot: Operation mode B2** defines wheter the robot is active or not). The LED-icon shows whether the robot-interface is currently active or not. The same setting can be made on the overview-page (Pages >> Overview >> Machine Overview (100)).

2	The robot core release mode refers to the Euromap67 input signals **Cores (1) In Enable B5**, **Cores (2) In Enable B7**, **Cores (1) Out Enable B6** and **Cores (2) Out Enable B8**. In and Out: All signals are considered for interlocking core movements. • **In and Out:** Both core movements (In and Out) are blocked by the robot-release-signals. • **Only In:** Only Core In movements are blocked by the respective signals B5 and B7. Core Out movements are not interlocked. • **Only Out:** Only Core Out movements are blocked by the respective signals B6 and B8. Core In movements are not interlocked.
3	The timeout for waiting for robot signals in automatic mode. There is only one timeout setting for all robot signals. For example: After opening the mold the machine waits for the signal **Robot: Enable ejector back**. If for 3 seconds the input signal is not coming, the alarm **20-26 Cycle stopped by robot** is triggered.
4	The robot "Mold Open Mode" refers to how the optional input-signal "Enable Full Mold Opening" (A7) and the optional output-signal "Intermediate Mold Open Position" (A8) are handled: • **Off:** Signals are not handled • **PreStart:** Handled as "robot early start". The output is set to HIGH when the given mold position 5 is reached. The mold does not stop • **Stop:** Handled as "stop and wait". The output is set to HIGH when the given mold position 5 is reached. The mold will stop there and wait until the release input is HIGH. Than the mold opens to the final target or the next intermediate stop (cores). This setting has no effect when graphic sequence programming is enabled. It only works with standard sequences!
5	Mold open position for configured "Mold Open Mode" 4.
5	This dropdown defines the mode in which the output "Automatic" (B2) is set: • **Auto + Semi-Auto** ... Output is set in automatic and semi-automatic mode • **Automatic** ... Output is only set in (full) automatic mode • **Semi-Auto** ... Output is ony set in semi-automatic mode • **Never** ... Output is never set

Below this settings the status of all IOs for the robot-interface is displayed. The LED-icons show the logical state of the signals. The text is displayed grey when the IO is not connected.

Explanation about "Reject"-output:
The Reject-output is set whenever the part is regarded to have bad quality. The output is always TRUE in manual or setting mode. In automatic or semi-automatic mode the signal is set or reset (depenging on the part quality) at the beginning of mold open.
If a part should be rejected is defined by the following criteria:

- Injection switchover timeout ... the switchover from injection to holding happened due to timeout (switchover criteria not reached - see Pages >> Injection >> Switchover (410))
- Injection target reached ... the injection target position was reached before the switchover to holding (see Pages >> Injection >> Injection (400))
- Cushion monitoring ... the cushion (injection position after holdon) is outside of the defined limits (see Pages >> Injection >> Switchover (410))
- Run-In cycles active ... machine just started to produce - run-in cycles active (see Pages >> Overview >> Production(2)(102))
- SPC-limit exceeded ... One of the recorded SPC-values was outside of the set-limit (see Pages >> Advanced >> SPC Setup (710))

3.5 04_Injection

3.5.1 Injection

On this page all settings for injection (velocity phase) and holding (pressure phase) can be made. The transition (switchover from injection to holding) can be configured on Pages >> Injection >> Switchover (410).
For the injection a 5-point velocity and pressure profile can be entered. This is normally a position based profile but also a time based profile can be optionally parametrized.

Injection	◁ 5	◁ 4	◁ 3	◁ 2	◁ 1		[1]
Speed		0.0	50.0	80.0	100.0	%	[2]
Pressure			70	60	50	bar	[3]
Position			0.0	20.0	40.0	mm	[4]
			Enable Injection by Time ☐				[5]

Injection	◁ 5	◁ 4	◁ 3	◁ 2	◁ 1		
Speed		0.0	50.0	80.0	100.0	%	
Pressure			70	60	50	bar	
Time			1.00	1.00	1.00	sec	[6]
Target [7]	10.0	mm	Enable Injection by Time ☑				

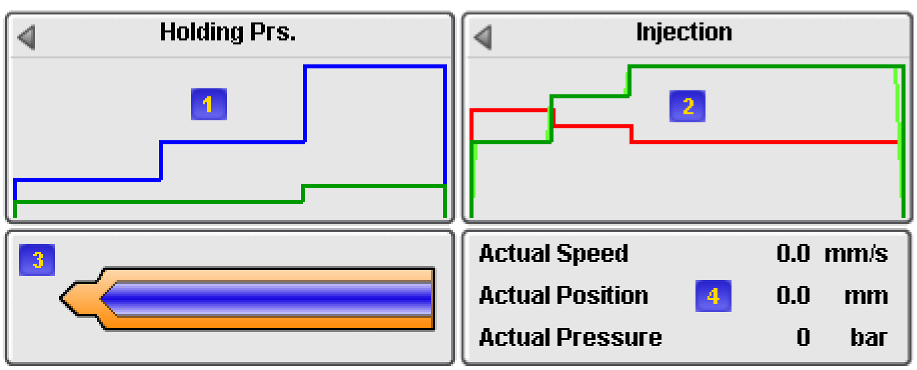
1	Profile steps 1-5 (executed from right to left). During the injection, the currently active step is highlighted.
2	Injection speed. Set speed for the profile step. This speed can only be reached if the movement is not limited by the set pressure.
3	Injection pressure. Set pressure for the profile step. This is only a limitation for the injection pressure. If the plastic can flow without too much force or resistance then this pressure is not reached.
4	The position in every step is interpreted as target position. In the example above this means: Move in step 1 with 100% speed and 50 bar up to the position 40 mm, then change to the next step 2 in the profile, and so on. The last position in the profile is normally the target position for the injection movement. If the switchover criteria is not reached before this position the injection process will be stopped. If the injection unit is in its forward position (touching mold) in this case, the alarm **20-84 Not enough plastic** is triggered. Optionally (depending on machine manufacturer: **sw.ini** setting) the last position can also be the switchover position. If position dependent switchover is enabled on the page Pages >> Injection >> Switchover (410) then the switchover to holding phase is done at that position. The target position is then set to 0 (same conditions for alarm 20-84 apply!).
5	If this option is enabled the injection profile is done time based.
6	Injection Time. Each profile step is active for the set time (position is not considered except the target position). When all configured profile steps are finished then the switchover to holding is done. Additionally any other switchover criteria can be activated on page on the page Pages >> Injection >> Switchover (410). If a configured switchover criteria is fulfilled, the switchover to holding happens immediately (before the time based profile is fully completed).

7	Injection target position. This input field is only visible if **Enable Injection by Time** is checked. The injection will stop at this position if it is reached before the time profile has been completed. If this happens while the injection unit is in its forward position (touching the mold) then the alarm **20-84 Not enough plastic** is triggered.

The holdon-pressure phase is done after the injection (after the switchover criterion are fulfilled which can be configured on the page Pages >> Injection >> Switchover (410)). It is always a time-dependent velocity and pressure profile.
The holdon-pressure phase is only executed if at least on type of switchover is selected (Pages >> Injection >> Switchover (410)). If not the input-fields for the holdon-pressure profile are locked.

Holding Prs.	5	4	3	2	1		1
Speed		0.0	10.0	10.0	20.0	%	2
Pressure			25	50	100	bar	3
Time			1.00	1.00	1.00	sec	4

1	Profile steps 1-5 (executed from right to left). During the holding phase the currently active step is highlighted.
2	Holding velocity limit. This is the maximum velocity for every holding step. During holding there is normally no or nearly no movement so this is usually just a limitation.
3	Holding pressure. This is the set pressure for every holding step. The pressure can only be reached if the mold is filled and the nozzle is touching the mold, otherwise the movement is limited by the set velocity and the pressure is lower than the set value.
4	Holding time. This are the set times for each holding step. Holding ends after every step has finished.



1	Display of the set holding pressure profile. The blue line shows the set holding pressure and the green line the velocity limit. The profile starts at the right side of the display (time=0) and ends on the left side (time = sum of all profile times).
2	Display of the set injection profile. The green line shows the injection set speed and the red line the pressure limit. The profile starts at the right side of the display (position = dosage + decompression, time = 0) and ends on the left side of the display (position = target, time = sum of all profile times).

3	Animation of the injection piston. The piston is shown in forward position (left) when the target is reached. The piston is shown on the right side when the dosage and decompression stroke is reached. For any other position it is displayed somewhere in between according to its actual position.
4	Display of actual injection speed, position of the screw and injection pressure.

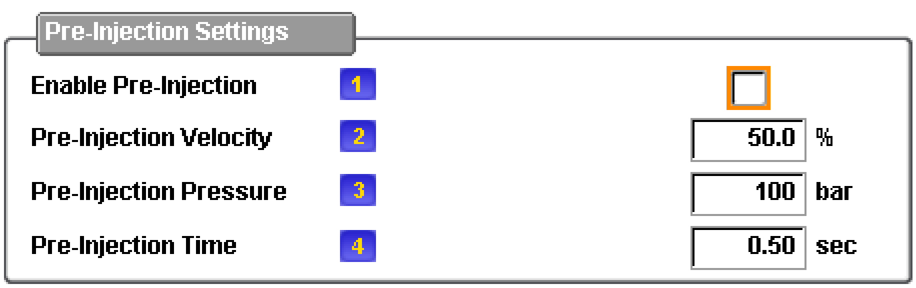
The parameters for moving the injection piston in setting mode can be adjusted on the bottom of the page:

1	Setting mode speed for injection movement. This value has a lower limit than the speed settings for manual and auto mode above.
2	Setting mode pressure for injection movement. This value has a lower limit than the pressure settings for manual and auto mode above.

3.5.2 Pre-Injection, Accu

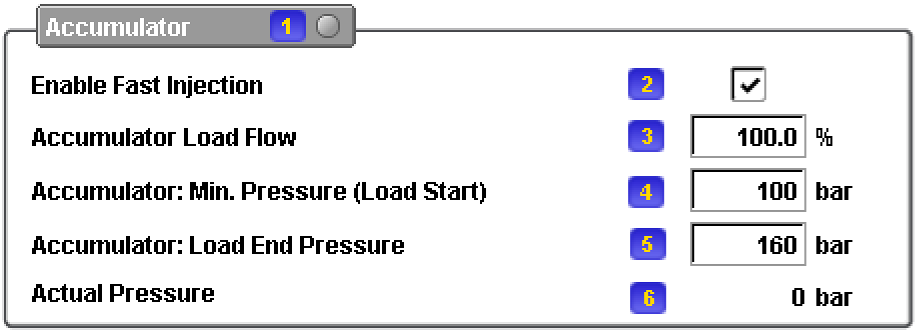
On this page all settings for the pre-injection and the loading of the accumulator can be done. Both are optional features and you might see only parts of the settings on your controller.

When the pre-injection is enabled it is always done before the injection unit is moved forward (in the graphical sequence editor it is part of the "injection unit forward" step). It is simply a short injection by time (and not to a certain position).



1	Enable Pre-Injection. Only when this checkbox is activated the pre-injection will be done.
2	Velocity for the pre-injection.
3	Pressure limit for the pre-injection.
4	Pre-Injection time. The injection is active for this set time and will stop after the time has expired. The target position for this movement is 0, which means that the injection would stop at position 0 if the time setting was too long and the time did not expire before.

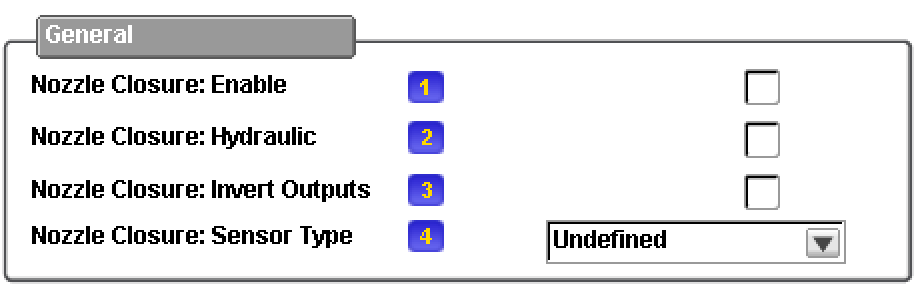
The loading of the accumulator works differently depending on the machine type and the sensors used. So not all the below mentioned inputs may be visible on your controller.



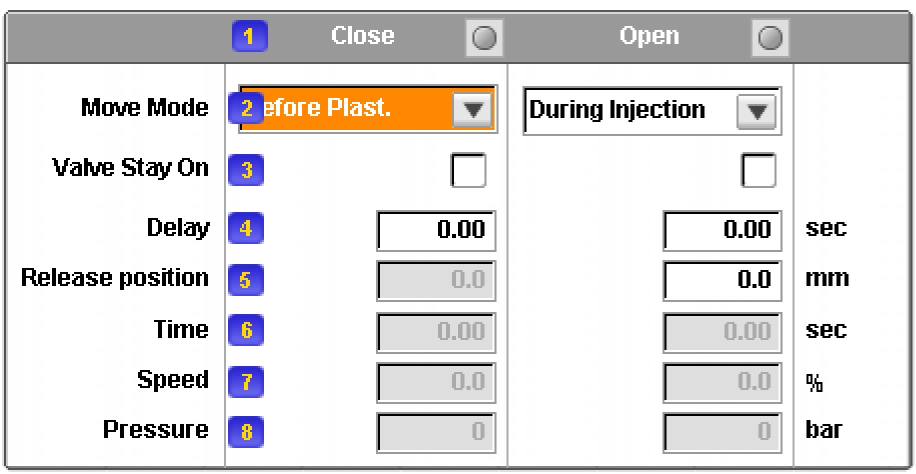
1	The LED icon displays the load status of the accumulator. Grey = the accumulator is not loaded, Green = the accumulator is loaded and ready to use. The LED is also green when the accumulator function is disabled.
2	Enable fast injection. Only if this option is enabled the accumulator is loaded and injection will happen with accumulator. If this option is disabled the accumulator unload output signal is always HIGH.
3	Accumulator load flow (optional). When the accumulator is loaded using the machine's normal pump system then you can input the loading flow (0-100% of maximum allowed loading flow).
4	Accumulator minimum pressure for loading start (optional). When the accumulator is equipped with a pressure sensor (instead of a pressure switch) you can enter the minimum pressure for loading. The accumulator will be loaded when the pressure falls below this value.
5	Accumulator Load End Pressure (optional). When the accumulator is equipped with a pressure sensor (instead of a pressure switch) you can enter the target pressure for loading. The accumulator will be loaded until this pressure is reached. Loading only starts when the pressure falls below the set pressure 4.
6	Accumulator Actual Pressure (optional). When the accumulator is equipped with a pressure sensor (instead of a pressure switch) the actual pressure in the accumulator is displayed here. The pressure value is reset if the accumulator function is disabled.

3.5.3 Nozzle closure

On this page all settings for the nozzle closure control can be made. The nozzle closure is an optional feature and might not be shown on your controller.



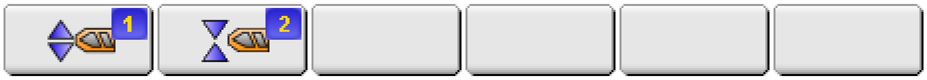
1	Enable nozzle closure. Only when this checkbox is checked the nozzle closure control is active. This checkbox is locked and has no function when graphical sequence programming is enabled.
2	This checkbox must be checked when the nozzle is actuated hydraulically. As a consequence there will be flow and pressure output to the assigned pump system during opening and closing of the nozzle.
3	Invert Outputs. If there is a nozzle installed with inverted behaviour (the open output causes the nozzle to close and the close output causes the nozzle to open) then you can activate this checkbox to invert the functionality (close output is then set for opening and open output for closing).
4	Type of sensor used for the detection of the nozzle closure position. Possible settings are: • **Undefined:** Opening and closing has no sensor. Simply the outputs are set for operating the nozzle. The option **Valve Stay On** 3 in the table below should be activated for this kind of operation. • **LimitSwitch:** Limit switches are connected to detect open and close position. • **Time:** For each direction the set time has to expire before the movement finishes. • **Limit and Time:** For closing there is a limit switch for opening the set time has to expire.



1	Display of the status of the movement output signals for open and close.

2	Move Mode: Defines when the nozzle is opened and closed. The possible settings are: • **Before Injection** (open only): The nozzle is opened before injection start. Injection is delayed until nozzle has opened. • **During Injection**: The nozzle is opened/closed during (parallel to) injection. The opening starts at the given release position 5. This means that the injection position must be smaller than the release position to start the nozzle opening/closing. • **Before Plast** (close only): The nozzle is closed before plastification, either after the front decompression or after injection. Plastification is delayed until the nozzle has closed. • **During Plast** (close only): The nozzle is closed during (parallel to) plastification. The closing starts at the given release position 5. This means that the injection piston position must be bigger than the release position to start the closing of the nozzle. • **After Plast** (close only): The nozzle is closed after plastification and before the rear decompression. Decompression is delayed until the nozzle is closed. • **During Suckback** (close only): The nozzle is closed during (parallel to) the rear decompression (suckback). The closing starts at the given release position 5. This means that the injection piston position must be bigger than the release position to start the closing of the nozzle. • **After Suckback** (close only): The nozzle is closed after the rear decompression (suckback). The following movement is delayed until the nozzle is closed. • **After Cooling** (close only): The nozzle is closed after cooling time is over and after decompression has been done and the injection unit is back. Mold open is delayed until the nozzle is closed. These settings get locked and show "Programmed" when graphical sequence programming is enabled.
3	Valve Stay On. When this checkbox is checked than the output signal to the valve (open and/or close) stays HIGH after the nozzle movement has finished. This checkbox should always be turned on when the **Sensor Type** 4 in the table above is set to **Undefined** and the valve should be turned on.
4	The delay time is active before starting the movement.
5	The release position can be entered when the nozzle is moving parallel to the injection axis (either programmed graphically or set in the **Move Mode** 2). Depending on whether it is programmed parallel to injection or plastification/decompression the position of the injection axis must be either smaller or bigger than the given release position.
6	Movement time. This setting is only active when the according **Sensor Type** 4 in the table above is selected. When sensor type is **Time** then for both directions a time can be entered. When sensor type is **Limit and Time** then only for opening a time can be entered. For all other sensor types the movement time is not needed.
7	The speed determines the hydraulic flow that actuates the nozzle (in % of the maximum allowed flow). This setting is only active when the **Hydraulic** option 2 in the table above is enabled.
8	The pressure determines the hydraulic pressure that is set for actuating the nozzle. This setting is only active when the **Hydraulic** option 2 in the table above is enabled.

On this page control-keys are available to manually actuate the nozzle closure. Normally the nozzle closure is moved together with the injection in manual mode, but you can use this keys to actuate the nozzle closure in setting mode.



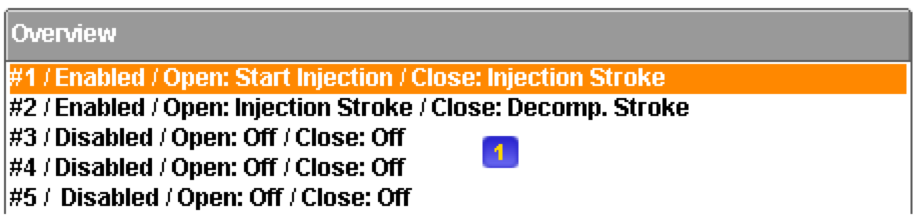
1	**F1**: Jog-Key for openeing nozzle closure
2	**F2**: Jog-Key for closing nozzle closure

3.5.4 Mold Shut-Off Valves

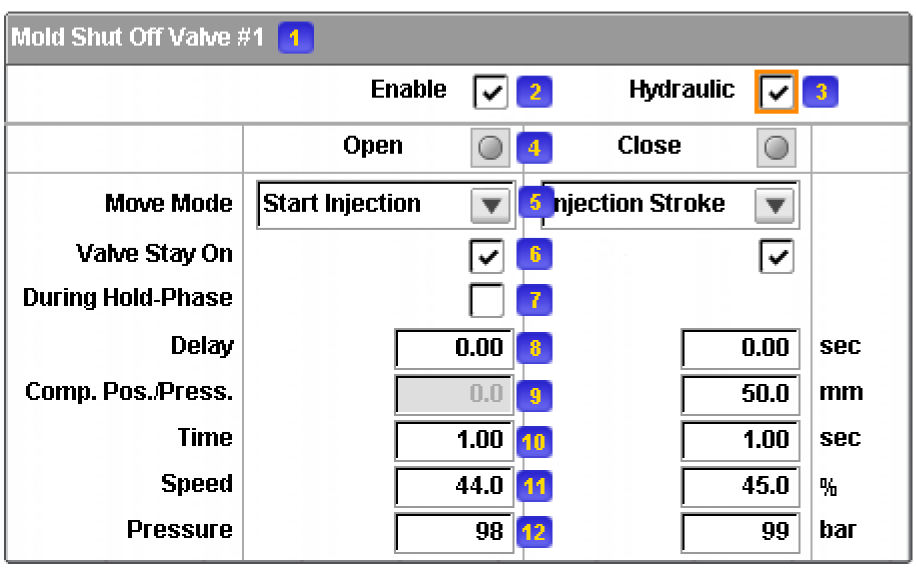
On this page all settings for the mold shut-off valves can be made. The mold shut-off valves are an optional feature and might not be shown on your controller. Also the number of available valves may vary.

All shut-off valves are operated by 2 digital outputs (1 for open, 1 for close) and there is no position feedback (only time-based movement is possible).

In the first part an overview of all available shut-off valves is given. This is a listbox where the valve to be edited can be selected.



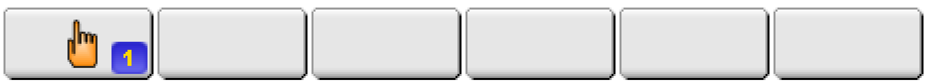
1	List of available valves with an overview of the most important settings for each valve (Enabled/Disabled, mode for opening, mode for closing)



1	In the header the index of the valve that is currently edited is shown. To edit another valve the operator needs to changed the selection in the overview-listbox (see above).
2	With this checkbox the valve-function can be enabled or disabled. If it is enabled the valve is operated according to the settings below. If it is disabled it is not operated (all outputs stay FALSE).
3	With this checkbox the operator can decide whether the valve is operated hydraulically (by a PQ-system) or not. If it is operated hydraulically the flow 11 and pressure 12 is requested from the assigned PQ-system during the movement-time 10.
4	Display of the outputs for the valve for Opening and Closing. If the output is TRUE the icon (LED) will appear in red color.
5	Move Mode: Defines when the operation mode of the shut-off valves. There are different settings possible for open and close: *Opening* • **Off**: The valve is never opened. It remains closed. • **Constant**: The valve will always be opened and remain open. • **Start Injection**: The valve will be opened immediately at the start of the injection movement. • **Injection Stroke**: The valve will be opened during injection once the release stroke 9 is reached (deceeded). • **Injection Pressure**: The valve will be opened during injection once the release pressure 9 is reached (exceeded). • **Before Injection**: The valve will be opened before the injection movement starts (Injection movement is delayed until valve is opened). *Closing* • **Off**: The valve is never closed. It remains opened once it was opened. • **HoldPrs End**: The valve will be closed at the end of injection (after holdon-pressure end). The valve will also be closed if the injection process is interrupted before the end of holdon-phase. • **Injection Stroke**: The valve will be closed during injection once the release stroke 9 is reached (deceeded). • **Decomp. Stroke**: The valve will be closed during decompression or plastification movement once the release stroke 9 is reached (exceeded). • **Start Plast.**: The valve will always be closed at the start of plastification. • **Plast. End**: The valve will be closed at the end of plastification. • **Decomp. End**: The valve will be closed at the end of decompression (after plastification). • **Cooling End**: The valve will be closed once the cooling delay-time is over (automatic mode). In manual mode the valve will be closed after the decompression and/or plastification is finisehd.
6	When this checkbox is on the digital output for the valve will remain on after the movement-time 10 is over. Otherwise the output is set to FALSE again after the time has expired.
7	Only for openeing: When this checkbox is on the valve will always be opened during holdon-pressure phase. Additional to the settings made for move-mode 5.

8	The delay-time gets active once the criteria for open- or close-mode 5 is reached. The valve will only be opened or closed after this delay-time.
9	Compare stroke or pressure for the selected open- or close-mode 5.
10	Movement-time: Time how long the digital output for opening or closing the valve stays on or how long the hydraulic values 11, 12 are applied.
11	Movement-speed: Only for hydraulic valves - speed (hydraulic flow) for the movement. This flow is requested from the assigned PQ-system during the movement time 10
12	Movement-pressure: Only for hydraulic valves - pressure (hydraulic) for the movement. This pressure is requested from the assigned PQ-system during the movement time 10

On this page a control-key is available to manually actuate the shut-off valves.



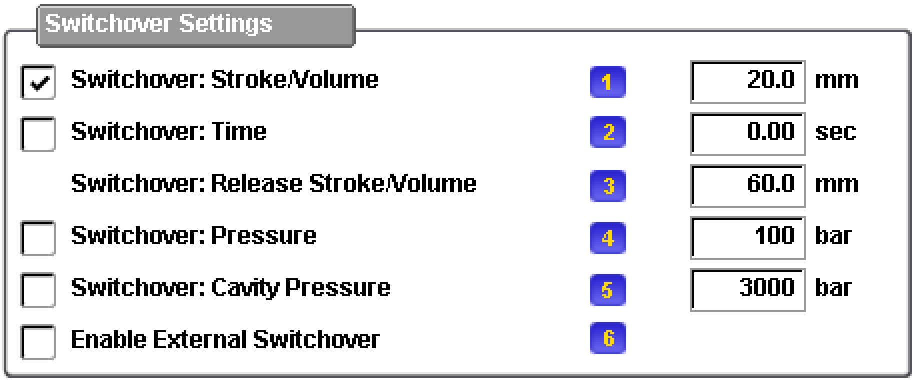
1	**F1**: Jog-Key for manually openeing the selected shut-off-valve. The valve can only be operated manually in setting and calibration mode. Once the key is pressed the valve will be opened, when the key is released again it will be closed.

3.5.5 Switchover

On this page all settings for the switchover (transition from injection to holding), the cushion monitoring and some general settings for the injection can be done.

1	Dry Cycle. When this checkbox is checked the injection-side (injection, injection unit, nozzle closure, etc...) is not moved in automatic or semi automatic mode. In manual mode injection and injection unit cannot be moved either.
2	Enable Fast Injection. This input is optional and only visible if a injection accumulator or a injection regenerative valve is present on the machine. When this checkbox is checked the accumulator and/or the regenerative valve are used.

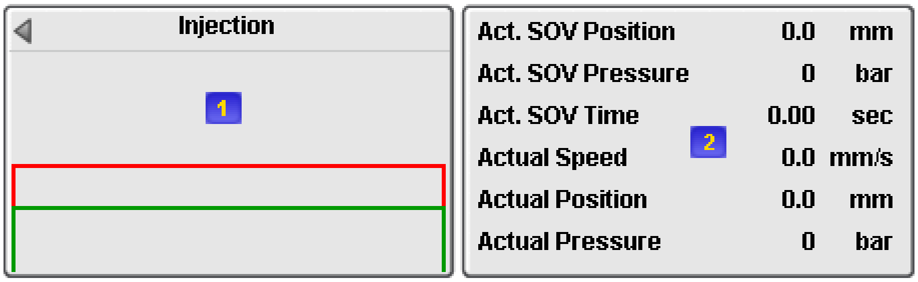
The type of switchover defines how and when the injection goes to holdon-pressure phase (see Pages >> Injection >> Injection (400)). If no type is selected the holdon-pressure phase will be skipped.



1	Switchover by injection position. If this function is enabled (checkbox) than the switchover will happen when the actual injection position gets below the set value.
2	Switchover time. If this function is enabled (checkbox) than the switchover will happen when the set time has expired. The time starts running with the beginning of injection. This time is also checked when the function is not enabled (checkbox unchecked). In this case this time acts like a monitoring time and if none of the other enabled switchover criteria is fulfilled within this time the switchover is forced and the alarm **20-28 Switchover time exceeded** is triggered. To disable this monitoring functionality the time has to be set to 0.
3	Release position for the pressure and cavity-pressure switchover. The actual injection position must be below that value so that the pressure switchover can happen.
4	Switchover pressure. If this function is enabled (checkbox) than the switchover will happen when the actual injection pressure rises over the switchover value, but only if the injection position is below the release position 4. The release position should be used to avoid an early false trigger of the pressure switchover if there is a peak in actual pressure when starting to fill the mold.
4	Switchover cavity (mold) pressure. If this function is enabled (checkbox) than the switchover will happen when the actual cavity (in-mold-)pressure rises over the switchover value, but only if the injection position is below the release position 4. The release position should be used to avoid an early false trigger of the pressure switchover if there is a peak in actual pressure when starting to fill the mold.
6	External switchover: If this function is enabled (checkbox) than the switchover will happen when the digital input signal **External Switchover** is HIGH.

The cushion monitoring checks the cushion (remaining amount of plastic) after injection. It depends on the machine manufacturer whether the cushion is measured as the minimum position during holding pressure or as the actual position right after holding pressure. If the actual cushion is outside of the limits the alarm **20-59 Cushion exceeded limits** is triggered and the reject signals **To Robot: Reject ZA5** and **Part Reject** are set.

1	With this checkbox the cushion monitoring can be activated (checked) or deactivated (unchecked).
2	Max. Cushion: HIGH limit for the cushion. The actual cushion must not exceed this value.
3	Min. Cushion: LOW limit for the cushion. The actual cushion must not be below this value.



1	Display of the actual injection profile (see Pages >> Injection >> Injection (400)).
2	Display of some actual values including the actual values at the time the switchover happened: • Act. SOV Position: Actual position of injection piston when switchover happened. • Act. SOV Pressure: Actual injection pressure when switchover happened. • Act. SOV Time: Actual switchover time (time from start of injection to switchover).

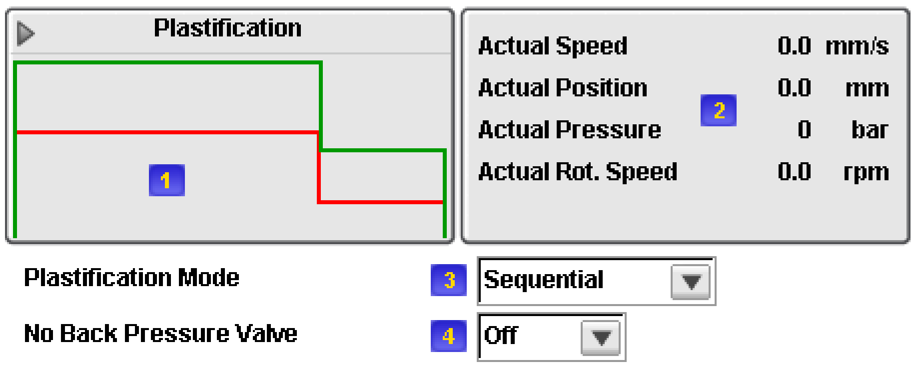
3.5.6 Plastification

On this page all settings for the decompression before, plastification and decompression after can be made.

Plastification	1	DEC	1	2	3	DEC	
Rotation Spd.	2	---	100.0	50.0	0.0	---	%
Backpressure	3	---	60	20		---	bar
Speed	4	30.0	---	---	---	30.0	%
Pressure	5	50		50		50	bar
Position	6	10.0	50.0	70.0		80.0	mm

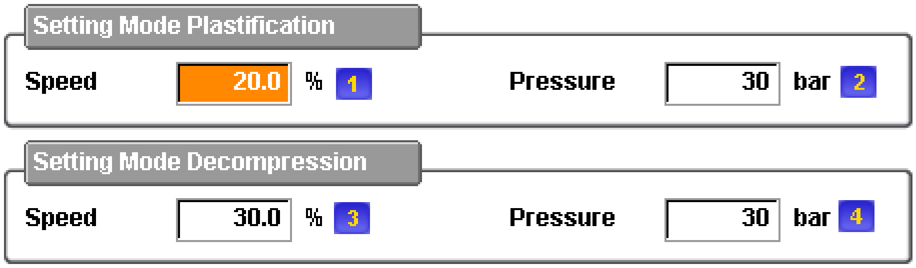
1	Profile steps for decompression before (DEC), Plastification (1-3) and decompression after (DEC). Each step is highlighted when the according movement and profile step is active.
2	Rotation speed for the plastification. This is the set value for the screw rotation.
3	Backpressure. These are the set values for backpressure during plastification. The backpressure is the pressure applied to the plastic during screw recovery (plastification) by the injection piston. It prevents the screw from moving back without force. These settings are only visible if a backpressure actuator is present (on some machine the backpressure is adjusted manually).
4	Speed for the decompression movements.

5	Pressure for decompression and for screw rotation during plastification. Per default there is only 1 set value for plastification pressure. Optionally (**sw.ini** setting) there can be separate pressure settings for every profile step.
6	Position for: • Decompression Before: Per default this position is the absolute target position for the front decompression movement. Optionally (**sw.ini** setting) this can be also a stroke relative to the cushion. If you set this value to 0 than no decompression before takes place. • Plastification: Target position for each plastification step (1-3). The last target (of the active steps) is the set dosage. • Decompression After: Per default this position is the absolute target position for the rear decompression movement. Optionally (**sw.ini** setting) this can be also a stroke relative to the dosage.



1	Display of the actual plastification profile. The green curve shows the set screw speed and the red curve the set backpressure.
2	Display of actual values for the plastification process.
3	Plastification Mode: Determines when the plastification process (decompression, plastification, injection unit back) is done in automatic mode. Plastification always starts at the end of injection and holding pressure.The following settings are possible: • **Sequential**: The plastification takes place parallel to cooling, mold open only starts when the plastification process is finished. • **Parallel to Mold Open**: The plastification takes place parallel to cooling and mold open and ejection. The next cycle (including mold close) starts only when the plastification process has finished. This setting is only available if the machine uses multiple pump system. It cannot be selected on machines with single pump system. • **Parallel to Mold Close**: The plastification takes place parallel to cooling, mold open, ejection and mold close. The injection process will only start when the plastification process has finished. This setting is only available if the machine uses multiple pump system. It cannot be selected on machines with single pump system. • **Before Injection**: The plastification (and decompression) after is done before injection (after mold is closed). Decompression before is done directly after injection end.
4	No Back Pressure Valve: This is an optional feature and not available on all machines. If this zero backpressure valve option is enabled then plastification happens without backpressure, therefore a digital output signal **No Backpressure Valve** is set to HIGH during plastification.

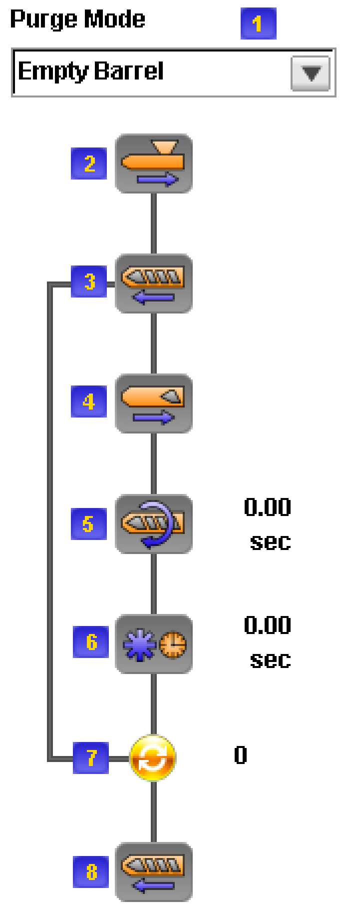
The parameters for moving the plastification and decompression in setting mode can be adjusted on the bottom of the page:



1	Setting mode (rotation) speed for plastification. This value has a lower limit than the set (rotation) speed for manual and auto mode above.
2	Setting mode pressure for plastification. This is the pressure to rotate the screw and not the backpressure. Backpressure is not controlled in setting mode. This value has a lower limit than the set pressure for manual and auto mode above.
3	Setting mode speed for decompression. This value has a lower limit than the set speed for manual and auto mode above.
4	Setting mode pressure for decompression. This value has a lower limit than the set pressure for manual and auto mode above.

3.5.7 Purge

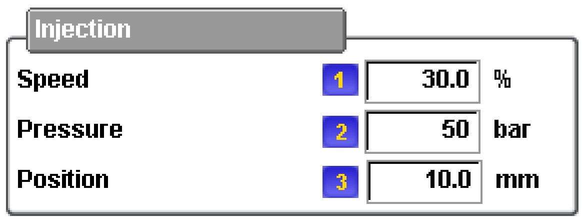
On this page all settings for the purge process can be made.



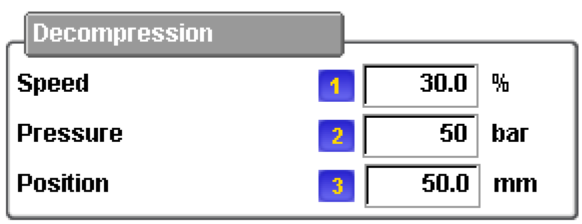
1	Purge Mode: • **Empty Barrel**: The purge cycle (steps 3 to 7) is repeated until a plastification timeout occurs, which indicates that the barrel is empty. The purge continues afterwards for the set number of repetitions (setting 2 in the table General). • **Change Color**: The purge cycle (steps 3 to 7) is repeated for the set number of repetitions (setting 2 in the table General). If a plastification timeout occurs before having finished the purge cycles the alarm **20-56 Purge timeout** is triggered.
2	Purge step: Move injection unit fully back. This step is executed only once at the beginning of the purge process. The icon is highlighted when the step is active.
3	Purge step: Inject to purge position (setting 3 in the table Injection). The icon is highlighted when the step is active.
4	Purge step: Decompression with special purge settings (settings 1-3 in the table Decompression). The icon is highlighted when the step is active.
5	Purge step: Plastification with special purge settings (settings 1-4 in the table Plastification). The icon is highlighted when the step is active. The actual plastification time (upcounting) is displayed on the right side of the icon.
6	Purge step: Purge Delay (setting 1 in the table General). The icon is highlighted when the step is active. The actual delay time (downcounting) is displayed on the right side of the icon.

7	End of purge cycle. If the set number of purge cycles have not been finished, the process starts again from step 3). On the right side of the icon the actual number of executed purge cycles is displayed. If mode **Empty Barrel** is selected this counter only counts up after a plastification timeout has occurred.
8	Purge step: Final injection to position 0 with special purge settings (settings 1-3 in the table Injection). The icon is highlighted when the step is active.

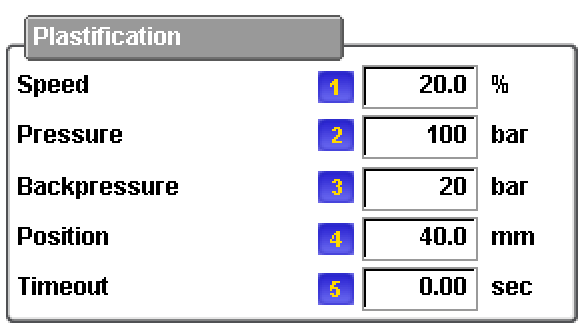
The injection settings are valid for the two steps "Inject to purge position" 3 and "Final injection to position 0" 8. The injection during purging is a simple forward movement, switchover to holding pressure and the holding pressure phase itself are disabled.



1	Injection speed for the purge process.
2	Injection pressure limit for the purge process.
3	Injection target position for the step "Inject to purge position" 3 in the step sequence above.



1	Decompression speed for the purge process.
2	Decompression pressure for the purge process.
3	Decompression position for the purge process. Per default this is an absolute position, optionally on certain controllers this can also be a stroke relative to the actual injection position.

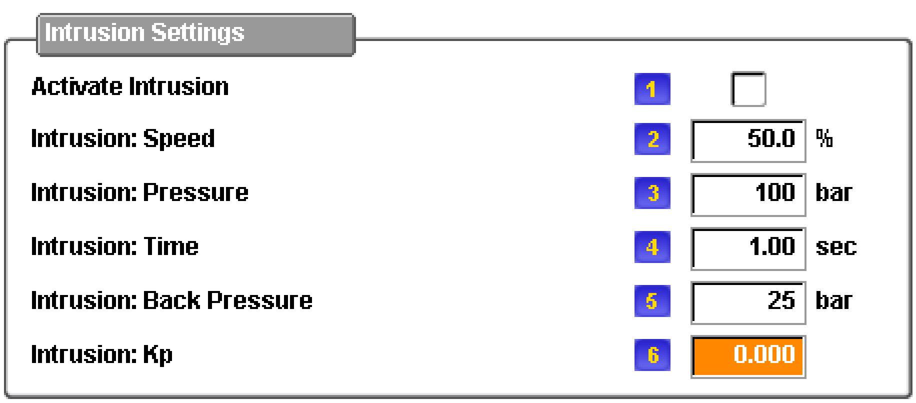


1	Set screw rotation speed for the purge process.
2	Set plastification pressure for the purge process.
3	Set backpressure for purge process.
4	Set target position for the purge process. The plastification stops when this position is reached.
5	Set timeout for the purge process. If the plastification is not finished within this time the plastification is stopped. Depending on the purge mode (setting 1 on top of this page) either the alarm **20-56 Purge timeout** is set or it is assumed that the purge has finished. Setting the timeout to 0 disables the timeout monitoring. For purge mode **Empty Barrel** this would lead to endless repetitions.

1	Set delay time for the purge process.
2	Set number of purge repetitions. For purge mode **Empty Barrel** this is the additional number of repetitions after a plastification timeout has occurred. For purge mode **Change Color** this is the number of overall repetitions of the purge cycle.

3.5.8 Intrusion

On this page all settings for the intrusion can be made. The intrusion takes always place before injection.
It is used to prefill the mold by rotating the screw before injection. The screw stands still by maintaining a high backpressure and by rotation of the screw the plastic is being pressed into the cavity. The intrusion always lasts for a certain time that can be set on this page.
The intrusion is an optional feature and might not be shown on your controller.

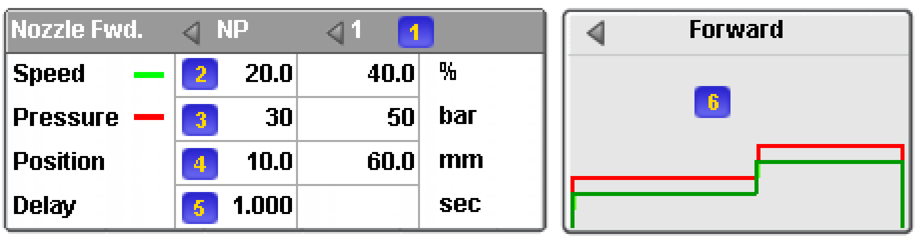


1	Activate Intrusion. Only when this checkbox is checked intrusion will take place.
2	Set screw rotation speed for intrusion.

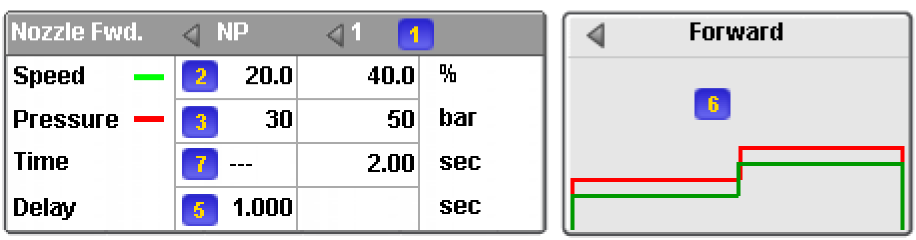
3	Set plastification pressure for intrusion.
4	Set time for intrusion. The intrusion (screw rotation) will stop after this time and injection will be done.
5	Backpressure for the intrusion process. This value should be set high enough so that the screw will not be pushed backwards.
6	Intrusion: Kp. This is an optional setting (default: 0). Setting this value to something bigger than 0 would activate a position control to keep the screw at its actual position during intrusion (by increasing the backpressure). If the backpressure 5 is set high enough this position control is not necessary.

3.5.9 Injection Unit

On this page all settings for the injection unit backward and forward movements can be made.

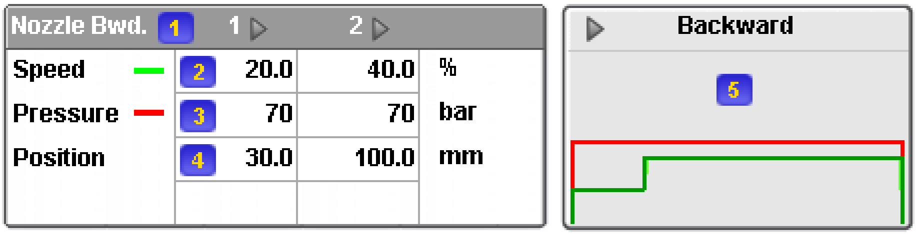


Depending on the sensor type of the injection unit the movement can be position based (picture above) or time based (picture below).

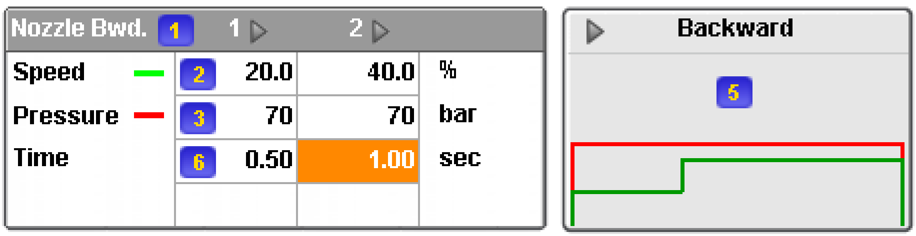


1	Profile steps 1 and "NP" (nozzle protection). During the forward movement, the actual active step is highlighted. The movement is executed from right to left.
2	Forward speed.
3	Forward pressure limit. For the nozzle protection step this can also be a set pressure setting if one of the analog input signals **Inj. Unit Actual Pressure** or **Main Pump Actual Pressure** is connected. The forward movement of the injection unit is continued until this pressure minus a configured tolerance is reached.
4	End position of the profile step.
5	After the end position of the "NP" profile step is reached and the actual pressure is inside the tolerance (criteria is only checked if one of the analog input signals **Inj. Unit Actual Pressure** or **Main Pump Actual Pressure** is connected) the injection unit forward movement will continue for this delay time.
6	Graph of the pressure and speed profile of the injection unit forward movement.

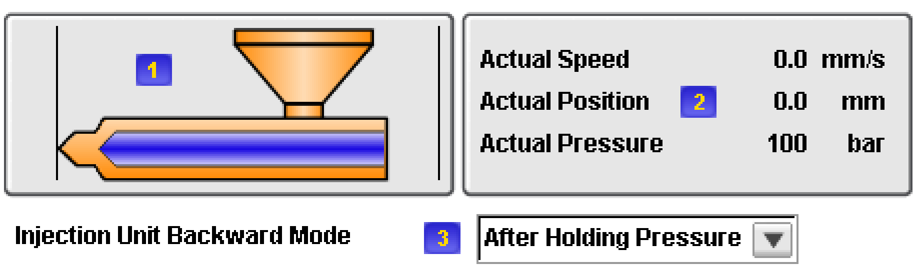
7	The first profile step is active for the time set here. The movement will then continue with the "NP" step (nozzle protection parameters) until the target is reached (limit switch or pressure OK). The nozzle protection delay 5 gets active after this target is reached, the injection unit forward movement will still continue for this delay time.



Depending on the sensor type of the injection unit the movement can be position based (picture above) or time based (picture below).

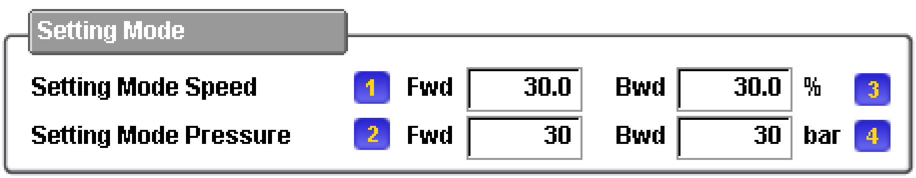


1	Profile steps of the injection unit backward movement. The steps are executed from left to right.
2	Backward speed.
3	Backward pressure limit.
4	End position of the profile step.
5	Graph of the pressure and speed profile of the injection unit backward movement.
6	Profile step is active for the time set here. When a limit switch for the back position is used then only the first time is displayed. The first profile step is then active for the set time and the second step until the limit switch is reached. When the backward movement is only time based then both set times are displayed. The movement is finished after the times for both profile steps have expired.



1	The animation shows the injection unit and injection piston position. The Injection unit is shown on the left end position after the nozzle forward movement has finished and on the right end position after injection unit backward movement has finished.
2	Actual speed, position and pressure of the injection unit.
3	Dropdown box for the position of the injection unit backward movement in the automatic sequence. Possible selections are: • **Off:** Injection unit backward movement is disabled. • **After Decomp. Before:** The injection unit moves back after the first decompression phase and before plastification starts. • **After Plastification:** The injection unit moves back after the plastification phase and before the rear decompression (decompression after plastification). • **After Decomp. After:** The injection unit moves back after the rear decompression phase (decompression after plastification). • **After Holding Pressure:** The injection unit moves back after the holding pressure phase. • **After Cooling:** The injection unit moves back after plastification has finished and cooling time is over

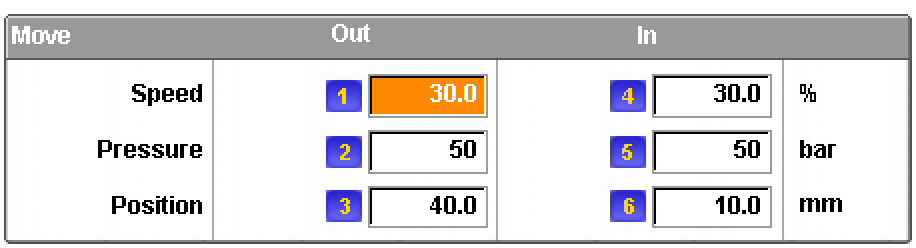
The parameters for moving the injection unit in setting mode can be adjusted on the bottom of the page:



1	Setting mode speed for injection unit movement. This value has a lower limit than the speed settings for manual and auto mode above.
2	Setting mode pressure for injection unit movement. This value has a lower limit than the pressure settings for manual and auto mode above.

3.5.10 Injection Unit Rotate

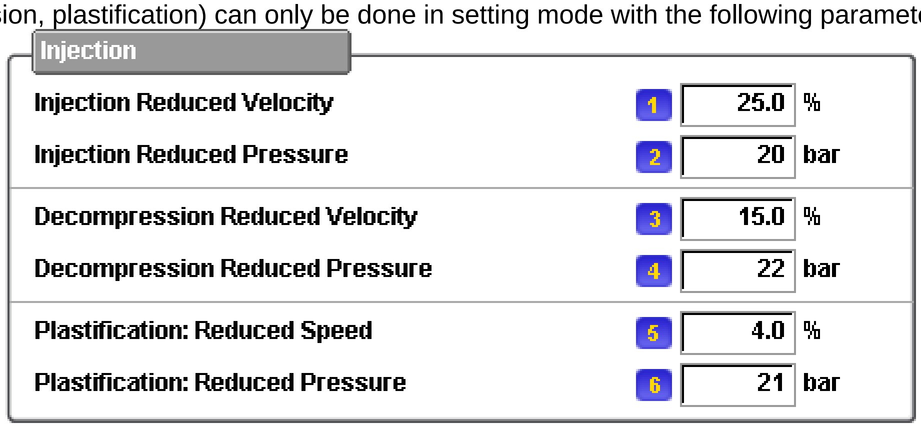
On this page all settings for the injection unit rotate axis (swing out / in) can be configured.
This axis can only be moved in setting mode, that is why there is only one set of parameters. Two jog keys (F1/F2) are available on this page to move the axis.



1	Speed for rotating out.
2	Pressure for rotating out.

3	Target position for rotating out. It is only needed if an position transducer is used as senor type.
4	Speed for rotating in.
5	Pressure for rotating in.
6	Target position for rotating in. It is only needed if an position transducer is used as senor type.

When the Injection Unit rotate axis is swiveled out then the injection movements (injection, decompression, plastification) can only be done in setting mode with the following parameters:



1	Velocity for injection movement in setting mode when Injection Unit is swiveled out.
2	Pressure for injection movement in setting mode when Injection Unit is swiveled out.
3	Velocity for decompression movement in setting mode when Injection Unit is swiveled out.
4	Pressure for decompression movement in setting mode when Injection Unit is swiveled out.
5	Speed for plastification (screw rotation) in setting mode when Injection Unit is swiveled out.
6	Pressure for plastification (screw rotation) in setting mode when Injection Unit is swiveled out.

To activate the function keys below you have to press the CTRL key:

1	F1: Rotate injection unit in (movement jog)
2	F2: Rotate injection unit out (movement jog)

3.6 05_Heating

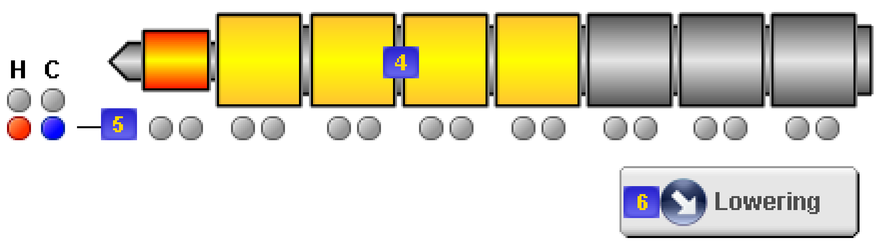
3.6.1 Cylinder Heating

On this page all settings for the cylinder heating and the water cooling of the traverse (feed hopper) can be made.

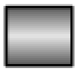
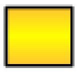
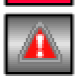
Settings	1	NOZ	CYL 1	CYL 2	CYL 3	CYL 4	CYL 5	CYL 6	CYL 7	
Set Temp.	2	200.0	200.0	200.0	200.0	200.0	200.0	200.0	100.0	°C
Pos Tol.	3	40.0	40.0	40.0	40.0	40.0	40.0	40.0	0.0	°C
Neg Tol.	4	40.0	40.0	40.0	40.0	40.0	40.0	40.0	0.0	°C
Lowering	5	150.0	150.0	150.0	150.0	150.0	150.0	150.0	100.0	°C
Enable	6	☑	☑	☑	☑	☑	☐	☐	☐	

1	Display of the heating zone (Nozzle, Cylinder 1, Cylinder 2....)
2	Set temperature for each individual zone.
3	Positive tolerance for each individual zone. The actual temperature of the zone must be below the set temperature plus this tolerance. Only if the actual temperature is within the tolerance and additionally a certain release time has expired (to ensure a fully heated resin) the screw can be moved.
4	Negative tolerance for each individual zone. The actual temperature of the zone must be above the set temperature minus this tolerance. Only if the actual temperature is within the tolerance and additionally a certain release time has expired (to ensure a fully heated resin) the screw can be moved.
5	Lowering temperature. When the lowering function is activated by pressing the button 6 in the screenshot below, the zones will heat to this temperature.
6	Enable for each individual zone. If a zone is not enabled (checkbox not checked) then it will not be heated and the temperature will not be monitored. Be careful not to disable temperature zones that actually are needed on the machine. The screw can be destroyed!

Act. Temp.	1	191.6	124.6	125.8	126.3	125.4	25.0	25.0	25.0	°C
Heat Out	2	35.6	18.9	4.7	0.0	11.5	0.0	0.0	0.0	%
Cool Out	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%

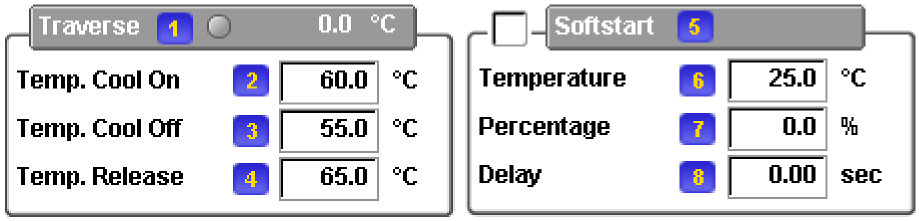


1	Display of the actual temperature for each individual zone.
2	Actual output [0-100%] to the heating actuator. The heating actuator/relay is controlled by the digital output signals **Nozzle / Cyl. Zone#1..7 Heat**. At 100% the corresponding output signal is constantly HIGH, otherwise the output signal is pulsing and the ratio of on and off time complies with this value. If the zone is configured only for manual operation you can input the set output here directly. If you want to manually control the cooling output you need to enter a negative value here.

3	Actual output [0-100%] to the cooling actuator. The cooling actuator/relay is controlled by the digital output signals **Nozzle / Cyl. Zone#1..7 Cool**. At 100% this output is constantly on, otherwise the output is pulsing and the ratio of on and off time complies with this value.
4	The status of each individual zone is visualized by different icons and colors: •  zone is off •  zone is auto tuning •  zone is lowering (in standby mode) •  zone is performing a softstart •  zone is on and temperature is below tolerance •  zone is on and temperature is within tolerance but the release time (warm up time) has not expired yet •  zone is on and the release time (warm up time) has expired, screw movement is possible •  zone is on, temperature is above tolerance •  zone is on, temperature is above switch off temperature •  other error has occurred in this zone
5	For each zones two LED icons are shown. The left icon indicates the actual status of the digital heating output signal (grey: off, red: on). The right icon indicates the actual status of the digital cooling output signal (grey: off, blue: on).
6	With this button you can turn the lowering on or off. When the "lowering" is active the set-temperature for every zone is reduced to the lowering set-temperature (see above).

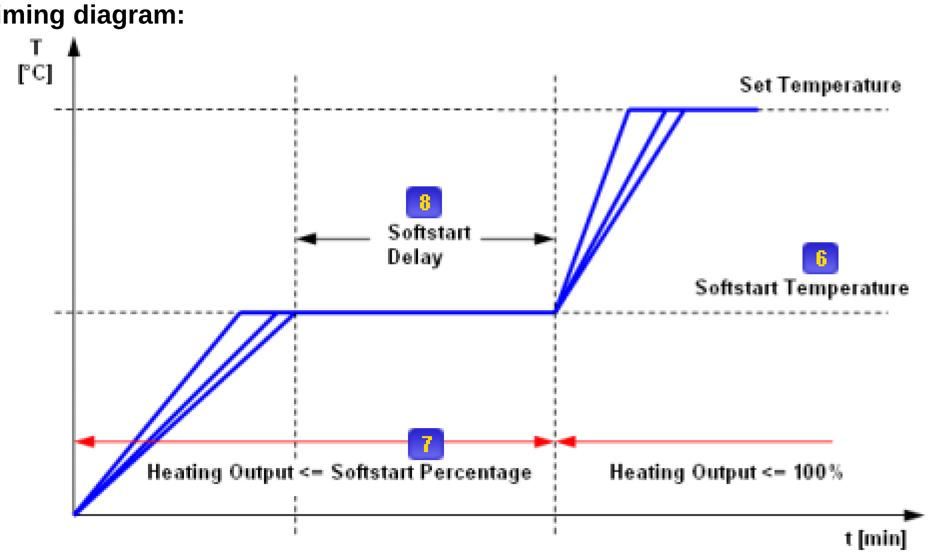
The traverse is the inlet for the material (at the feed hopper). It needs to be cooled, otherwise the material could melt and as a result it would jam the inlet.
The traverse cooling is controlled by a simple hysteresis. The cooling is switched on as soon as the temperature exceeds a certain limit and is switched off again when the temperature falls below another set value.
The settings for the traverse are only shown if the actual temperature signal is connected in the IO configurator.

With the softstart option the whole heating group (all zones) can be heated to an intermediate temperature with limited heating output.
After all zones have reached this temperature and a delay time has expired all zones will heat up normally to their set temperature. See also the sofstart timing diagram below.



1	Display of the actual traverse cooling output signal (grey LED: off, blue LED: on) and the actual traverse temperature.
2	Temperature at which the cooling output for the traverse is turned on.
3	Temperature at which the cooling output for the traverse is turned off.
4	Traverse release temperature. If the actual traverse temperature is above that value all screw movements are locked.
5	Softstart: If this checkbox is checked then a softstart will be performed every time the heating is turned on.
6	Softstart temperature. All zones will heat up to this intermediate temperature before they start heating to their final temperature.
7	Softstart percentage. During softstart the heating output during the first stage (heat up to intermediate temperature) can be limited. Here the maximum heating output for every zone can be set.
8	Softstart delay. After all zones have reached the intermediate softstart temperature this time has to expire before the zones start to heat up to their normal set temperature.

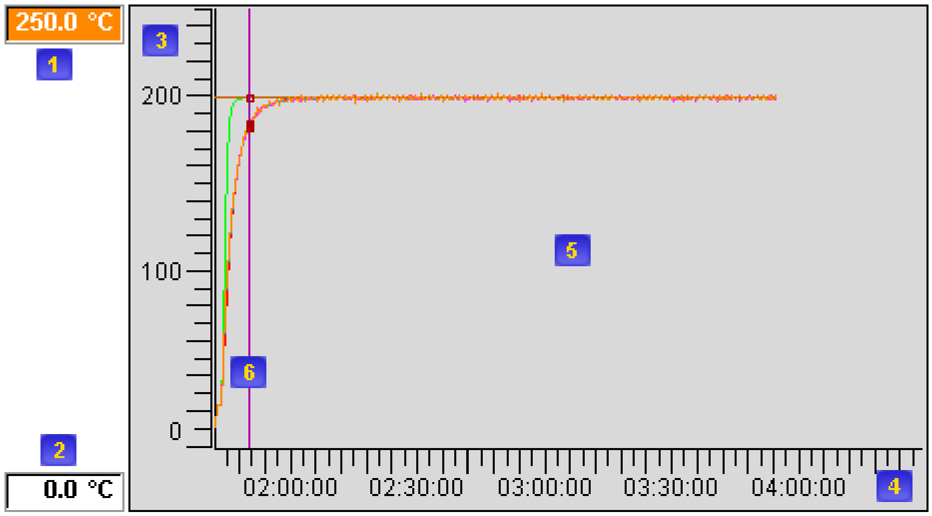
Softstart timing diagram:



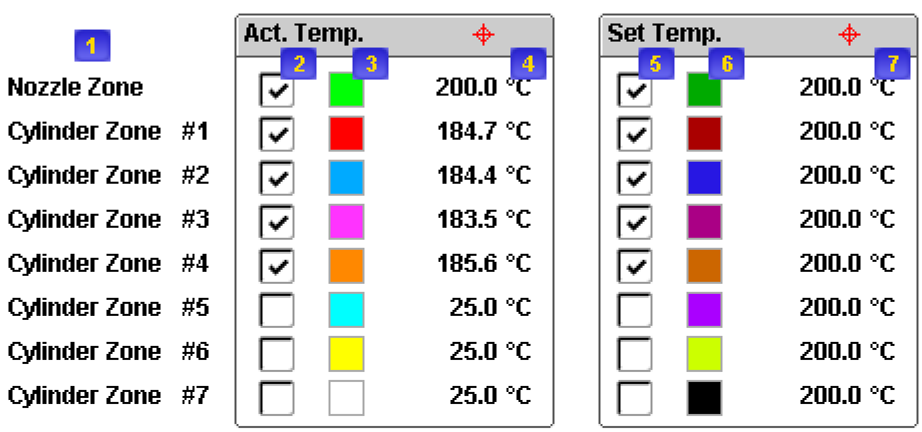
3.6.2 Temperature Trend

On this page the temperature trend can be seen. The graphic shows the temperature trend of all zones over the last 3 hours.

Control buttons are available on the screen (you have to press the CTRL key in order to show them) for zooming, scrolling and moving the cursor.



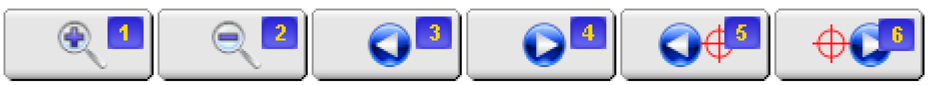
1	Maximum value of the graphic's temperature range. You can change the scaling of the graph here.
2	Minimum value of the graphic's temperature range. You can change the scaling of the graph here.
3	Temperature scale for the graphic. Units: °C
4	Time scale for the graphic. The real time (clock) for the displayed samples is shown here.
5	Drawing area. Here the curves for actual and set temperatures are displayed. The visibility of the curves can be freely configured below the graph (checkboxes 2 in the screenshot below).
6	The vertical lines show the cursor position. At the intersection with a curve a square is shown. The actual temperature values at the cursor position are shown below the graph (see 4 and 7 in the screenshot below).



1	Display of the heating zone names for which the following settings apply.

2	With these checkboxes you can control the visibility of the actual temperature curves. If they are checked the according curves are visible in the graph.
3	With this color picker control you can select the color of the actual temperature curves in the graph. Just press the OK key when you have focussed the colored box and select a new color from the pop-up.
4	Actual temperature at cursor position.
5	With these checkboxes you can control the visibility of the set temperature curves. If they are checked the according curves are visible in the graph.
6	With this color picker control you can select the color of the set temperature curves in the graph. Just press the OK key when you have focussed the colored box and select a new color from the pop-up.
7	Set temperature at cursor position.

The control keys are not visible when you get to the page at first. You need to activate and show them by pressing the CTRL key.



1	Zoom In: Press this key to zoom in the graph (time axis will be stretched).
2	Zoom Out: Press this key to zoom out the graph (time axis will be compressed).
3	Scroll Left: Press this key to scroll to the historic data (older samples will be displayed).
4	Scroll Right: Press this key to scroll to the actual data (newer samples will be displayed).
5	Cursor Left: Press this key to move the cursor to the left (toward the older samples).
6	Cursor Right: Press this key to move the cursor to the right (toward the newer samples).

3.6.3 Temperature Calendar

On this page it is possible to program a weekly calendar for the heating. With the help of this calendar heating can be turned on or off automatically on a weekly basis.

1	Enable: Only when this setting is "On" than the according calendar-entry is active.

2	Action to be performed on the specified time: • **Nothing** .. no action • **Cylinder Heating On** .. cylinder heating will be turned on • **Mold Heating On** .. mold heating will be turned on • **Oil PreHeat** .. oil pre-heating will be started • **Cylinder Lowering On** .. cylinder heating lowering (standby) will be activated • **Mold Lowering On** .. mold heating lowering (standby) will be activated
3	Day during the week that the specified action should be performed: • **None** .. no day • **Monday** .. only on mondays • **Tuesday** .. only on tuesdays • **Wednesday** .. only on wednesdays • **Thursday** .. only on thursdays • **Friday** .. only on fridays • **Saturday** .. only on saturdays • **Sunday** .. only on sundays • **Mo. to Fr.** .. on mondays to fridays • **All week** .. all week (ever day) • **Weekend** .. only on weekends (saturdays and sundays)
4	Time (hour) when the specified action should be performed (0-23).
5	Time (minute) when the specified action should be performed (0-59).

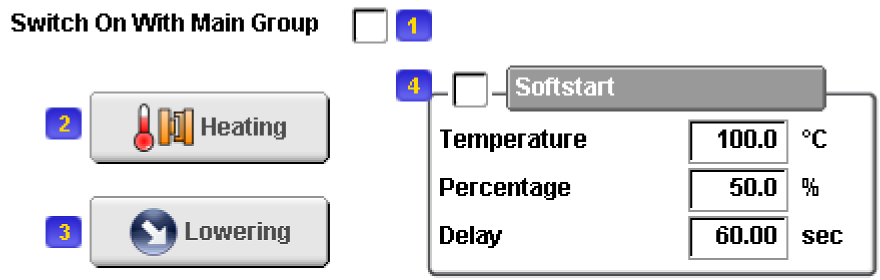
3.6.4 Mold Heating 1

On this page settings for the mold heating zones 1 to 8 can be made. Also some controls for all 16 zones are on this page. Like the button for the "Softstart" or the "Lowering".

Act. Temp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	°C
Heat Out	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
Cool Out	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	%
Module 1	01	01	01	01	01	01	02	02	

The Settings table and the status table with the animation is similar to Pages >> Heating >> Cylinder Temperature (500). So please open the cylinder heating help for a detailed description of this input and feedback fields.

1	Module number where the temperature input is connected (This is not the slot-number of the module but it refers to the setting for the sensor-type on Pages >> Heating >> Mold Autotuning (534)). There is only a module number shown if the temperature input is connected to a X20 module. After changing the IO-mapping of the mold temperature inputs in the IO-Configurator a warm restart is necessary to update this list.



1	If this check box is enabled the mold heating gets switched on/off with the cylinder heating.
2	Button for enabling the mold heating. If the checkbox 1 is enabled this button has no effect.
3	Starts the Lowering of all 16 mold heating zones. The temperature will be lowered to the "Lowering" temperature. If lowering is deactivated all zones will heat up again to set temperature.
4	Softstart of all 16 mold heating zones. Further description of this function is given on the "Cylinder Heating" help page 500

3.6.5 Mold Temp. Trend 1

On this page the temperature trend for mold zone 1 to 8 can be seen.
Please open the cylinder heating Pages >> Heating >> Temperature Trend (510) for a detailed function description.

3.6.6 Mold Heating 2

On this page settings for the mold heating zones 9 to 16 can be made.
The Settings table and the status table with the animation is similar to the cylinder heating. So please open the Pages >> Heating >> Cylinder Temperature (500) help for a detailed description of this input and feedback fields.
There are also some functions on Pages >> Heating >> Mold Temperature 1 (530) taking effect on this page. They are described in the corresponding Help of the page Pages >> Heating >> Mold Temperature 1 (530).

3.6.7 Mold Temp. Trend 2

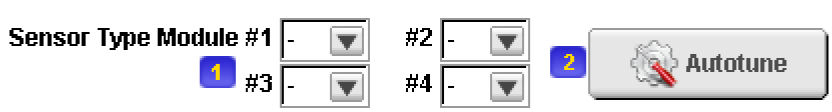
On this page the temperature trend for mold zone 9 to 16 can be seen.
Please open the cylinder heating Pages >> Heating >> Temperature Trend (510) for a detailed function description.

3.6.8 Mold Autotuning

On this page the mold auto tuning and the sensor type of additional X20 temperature modules can be configured.

Settings 1	MD 1	MD 2	MD 3	MD 4	MD 5	MD 6	MD 7	MD 8	
Kp 2	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	
Tn 3	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	sec
Tv 4	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	sec
Tdead 5	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	sec
TDHeat 6	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	°C
TDCool 7	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	°C
Act. Temp. 8	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	°C
Tune Status 9	0	0	0	0	0	0	0	0	

1	Display of the Mold heating zones 1 to 8. The heating zones 2 to 16 are displayed in the second table on this page
2	Proportional gain of the zone
3	Integral action time (I-component) of the zone
4	Derivative action time (D-component) of the zone
5	Dead time of the zone. Time till there is a reaction on the input (temperature sensor) after a output change.
6	Wind up protection for the heating. If there is a change in the set Temperature. (Pages >> Heating >> Mold Temperature 1 (530), Pages >> Heating >> Mold Temperature 2 (533) "SetTemp") and the change is bigger than this setting the wind up protection gets active. The Output will get open loop controlled till the actual temperature is closing in to the set temperature. This function also reduces the time necessary for changing between set temperatures.
7	Wind up protection for the cooling. If there is a change in the set Temperature. (Pages >> Heating >> Mold Temperature 1 (530), Pages >> Heating >> Mold Temperature 2 (533) "SetTemp") and the change is bigger than this setting the wind up protection gets active. The Output will get open loop controlled till the actual temperature is closing in to the set temperature. This function also reduces the time necessary for changing between set temperatures.
8	Actual temperature of the mold zone
9	Tuning Status of the mold zone tuning. Possible states are: **0:** Ready to Tune **20:** Waiting for actual temperature to stabilize **21:** Determining maximum slope and dead time **45:** Calculation of control parameters Kp, Tn, Tv **49:** Reset controller function block **50:** Tuning is complete



With this settings the sensor type for additional connected X20 modules can be changed. Supported are all temperature X20 modules. Not supported is the 7XX419L-50-1. The 7XX419L-50-1 sensor type has to be changed on the IO Configurator page 2204 with the configuration dialogue. This setting changes the senor type for the howl module. It is not possible to have a sensor with K and J characteristic on the same module. On the Pages >> Heating >> Mold Temperature 1 (530) and Pages >> Heating >> Mold Temperature 2 (533) the table entry "Module" shows to which module every sensor is connected. For example if the module 1 sensor type is changed from K to J the change takes effect on all temperature sensors connected to module 1.

1	Sensor type selection for X20 modules.
2	This button starts the auto tuning of the mold heating zones.

3.6.9 Mold Temp. Ext.

On this page the settings for the extended mold heating (Zones #17 - #32) can be made. The settings are identical to the settings of the standard mold heating zones (see Pages >> Heating >> Mold Temperature 1 (530))
The settings for soft-start from the main mold-heating page Pages >> Heating >> Mold Temperature 1 (530) also apply to this zones (as well as the commands for on/off and lowering).

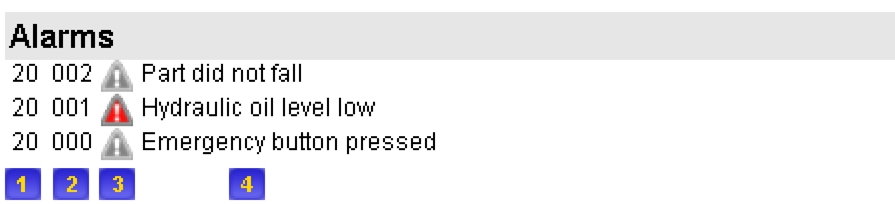
3.6.10 Mold Ext. Tune

On this page the controller-parameters for the mold heating extended zones (#17-#32) can be seen and edited.
The parameters are the same as on the main mold heating autotune page (Pages >> Heating >> Mold Autotuning (534)).
The tuning of the zones and the settings for the sensor-types can be made on the same main mold heating autotune page.

3.7 06_Alarms

3.7.1 Alarms

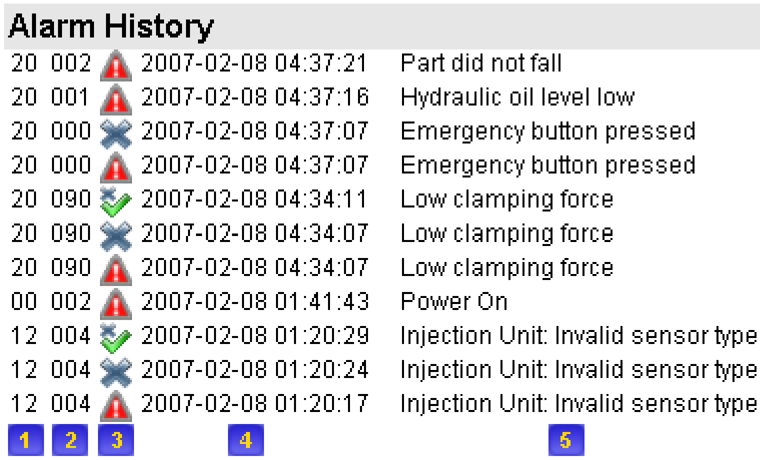
On this page all active and pending alarms can be seen.



1	Display of the alarm-group number.
2	Display of the alarm-number.
3	Display of the actual alarm status: • Alarm is active • Alarm is inactive
4	Alarm text.

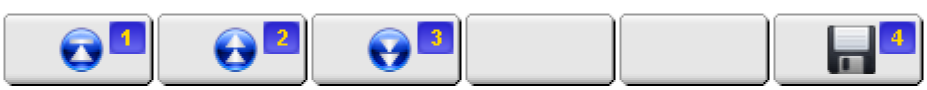
3.7.2 Alarm History

On this page the alarm history can be seen. The last 2000 alarm-events are recorded here.



1	Display of the alarm-group number.
2	Display of the alarm-number.
3	Display of the changed alarm status: • Alarm was set • Alarm was reset • Alarm acknowledge after reset • Alarm reset after acknowledge
4	Date and time when the status-changed happened.
5	Alarm-Text.

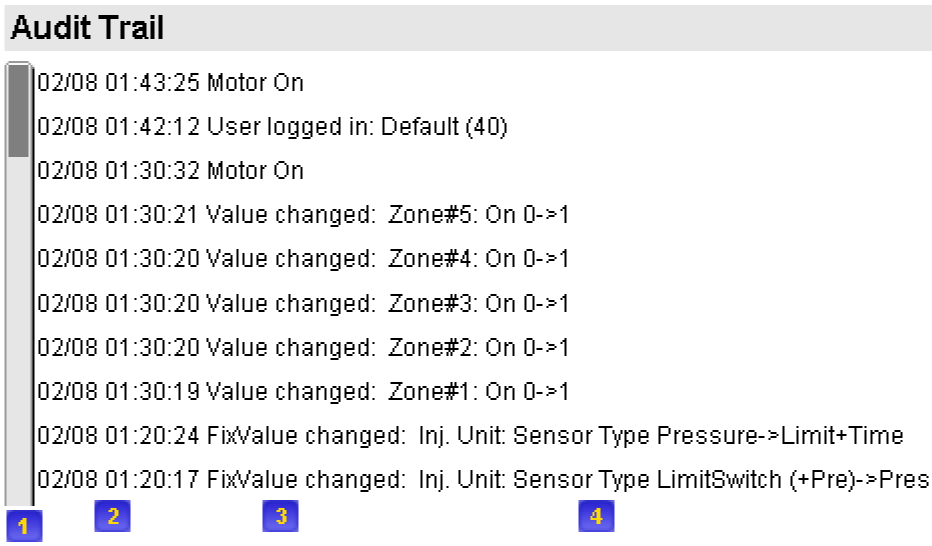
On the page a view control-functions are available (you have to press the CTRL-key in order to show the following function keys).



1	Move to first (newest) entries in list
2	Scroll Up - show newer entries in list
3	Scroll Down - show older entries in list
4	Save alarm-history to USB-stick. When you press this key a confirm-dialog pops up before the data is saved to a file.

3.7.3 Audit Trail

On this page the audit trail (record of all events on the controller) can be seen.



1	Scroll-Bar that indicates the position of the actual shown entries in the whole record. If the bar is on top it means that the newest entries are shown. If it is at the bottom the oldest entries are shown.
2	Date and time of the recorded event

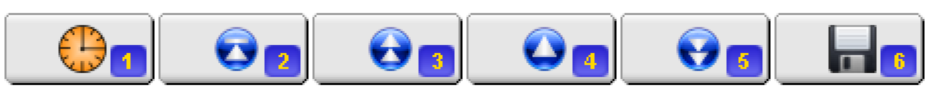
<table>
<tr>
<td>3</td>
<td>Type of event. The following events are recorded:

Value Changed .. A recipe-parameter (operator setting) was changed
Value Limited .. A recipe-parameter was limited (after loading a recipe-file or after changing a machine-parameter)
FixValue Changed .. A machine-parameter (OEM setting) was changed
Recipe Loaded .. A recipe-file was loaded
Recipe Saved .. A recipe-file was saved
User logged in .. A user has logged in
User logged out .. The current user has logged out
CPU-time changed .. The CPU-time (clock) was changed
Motor On .. The motor was turned on
Motor Off .. The motor was turned off
Wizard created basic recipe .. The molding wizard has created a basic recipe
Wizard changed .. The molding wizard has changed a value
Wizard undid last changes .. The molding wizard undid its last change
DI forced .. A digital input was forced (in IO-Browser, see Pages >> Service >> IO Browser (810))
DO forced .. A digital output was forced (in IO-Browser, see Pages >> Service >> IO Browser (810))
AI forced .. A analog input was forced (in IO-Browser, see Pages >> Service >> IO Browser (810))
AO forced .. A analog output was forced (in IO-Browser, see Pages >> Service >> IO Browser (810))
AT forced .. A temperature input was forced (in IO-Browser, see Pages >> Service >> IO Browser (810))
DI unforced .. The force of a digital input was reset (in IO-Browser, see Pages >> Service >> IO Browser (810))
DO unforced .. The force of a digital output was reset (in IO-Browser, see Pages >> Service >> IO Browser (810))
AI unforced .. The force of a analog input was reset (in IO-Browser, see Pages >> Service >> IO Browser (810))
AO unforced .. The force of a analog output was reset (in IO-Browser, see Pages >> Service >> IO Browser (810))
AT unforced .. The force of a temperature input was reset (in IO-Browser, see Pages >> Service >> IO Browser (810))

</td>
</tr>
</table>

4	Additional information for the event. The following information is entered: • **Value Changed** .. parameter-name: old value -> new value • **Value Limited** .. parameter-name: new value • **FixValue Changed** .. parameter-name: old value -> new value • **Recipe Loaded** .. file-name • **Recipe Saved** .. file-name • **User logged in** .. user-name (user-level) • **User logged out** .. - • **CPU-time changed** .. new CPU time • **Motor On** .. - • **Motor Off** .. - • **Wizard created basic recipe** .. - • **Wizard changed** .. parameter-name: old value -> new value • **Wizard undid last changes** .. - • **DI forced** .. Datapoint-name of connected variable or (if no variable connected) the IO-datapoint description • **DO forced** .. Datapoint-name of connected variable or (if no variable connected) the IO-datapoint description • **AI forced** .. Datapoint-name of connected variable or (if no variable connected) the IO-datapoint description • **AO forced** .. Datapoint-name of connected variable or (if no variable connected) the IO-datapoint description • **AT forced** .. Datapoint-name of connected variable or (if no variable connected) the IO-datapoint description • **DI unforced** .. Datapoint-name of connected variable or (if no variable connected) the IO-datapoint description • **DO unforced** .. Datapoint-name of connected variable or (if no variable connected) the IO-datapoint description • **AI unforced** .. Datapoint-name of connected variable or (if no variable connected) the IO-datapoint description • **AO unforced** .. Datapoint-name of connected variable or (if no variable connected) the IO-datapoint description • **AT unforced** .. Datapoint-name of connected variable or (if no variable connected) the IO-datapoint description

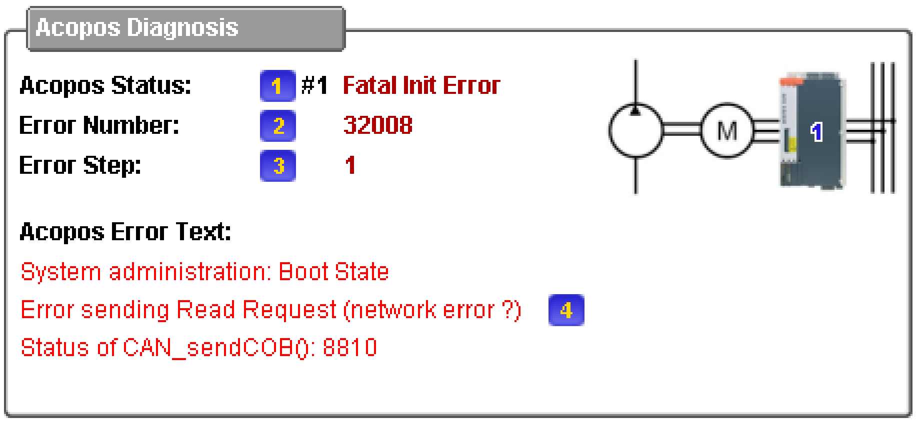
On the page a view control-functions are available (you have to press the CTRL-key in order to show the following function keys).



1	With this key you can hide the time-stamp for each audit-line in order to see more information about the entry. The key toggles the visibility of the time-stamp (date and time).
2	Move to first (newest) entries in list
3	Page Up - show newer entries in list (move a whole page-length up)
4	Line Up - show newer entries in list (move a single line up)
5	Page Down - show older entries in list (move a whole page-length down)
6	Save alarm-history to USB-stick (before this is done a confirmation dialog is displayed).

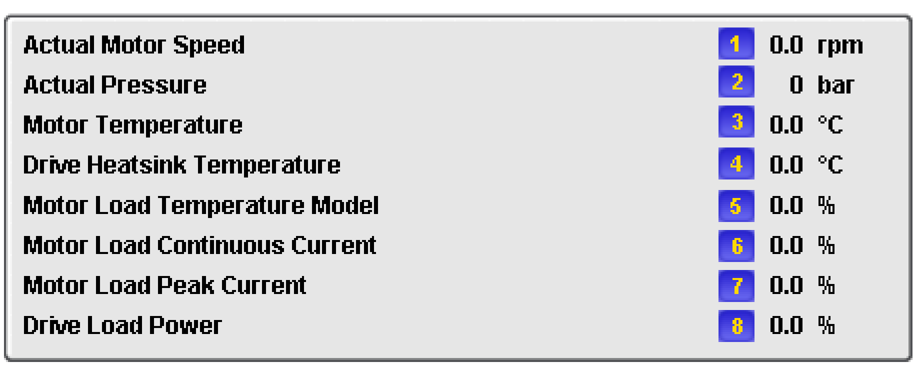
3.7.4 Acopos Diagnosis 1

On this page that actual status of the servo drive (Acopos) and the servo motor that turn the pump is shown. The error messages of the drive and motor are displayed in case of a problem.
The SmartPump is an optional software feature and might not be shown on your controller.



1	Actual drive status. The following displays are possible: • **Off**: The servo drive (Acopos) is turned off • **On**: The servo drive (Acopos) turned on and ready • **Fatal Init Error**: Fatal initialization error, no operation possible. See documentation on alarm **SA-0 Acopos #(1-3): Fatal initialization error** for details. • **Init Failed**: Initialization failed, reboot necessary. See documentation on alarm **SA-1 Acopos #(1-3): Initialization failed** for details. • **Error**: SmartPump is in error state. Check error message and fix problem.
2	Number of the pending error.
3	Drive-step in which the error occurred.
4	Display of error text for the pending error.

Below the status display is the display of some actual values from the drive:



1	Actual motor rotation speed

2	Actual hydraulic pressure (from pressure sensor)
3	Motor winding temperature
4	Temperature of the heatsink (cooling plate) in the drive
5	Actual motor load. The allowed range is 0 to 100%. The drive will turn off if the load exceeds 100%
6	Actual continous current load of the drive. The allowed range is 0 to 100%. The drive will turn off if the load exceeds 100%
7	Actual peak current load of the drive. The allowed range is 0 to 100%. The drive will turn off if the load exceeds 100%
8	Actual power load of the drive. The allowed range is 0 to 100%. The drive will turn off if the load exceeds 100%

3.7.5 Acopos Diagnosis 2

Display of the actual status of SmartPump#2. See Pages >> Alarms >> Acopos Diagnosis 1 (630).

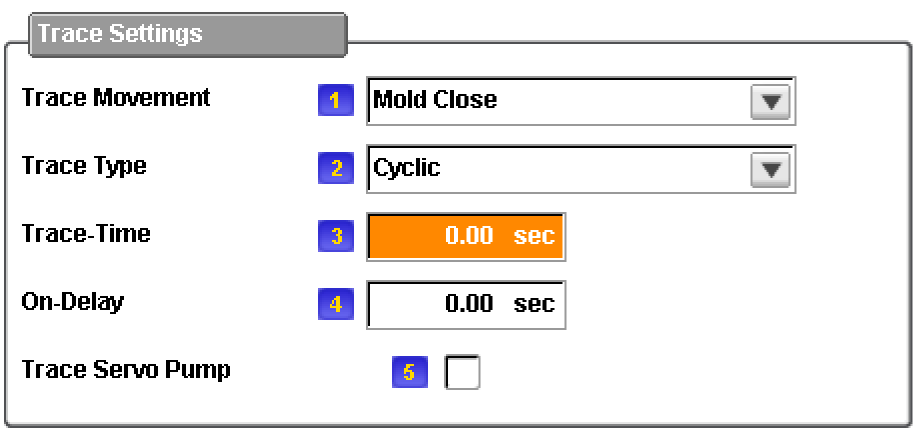
3.7.6 Acopos Diagnosis 3

Display of the actual status of SmartPump#3. See Pages >> Alarms >> Acopos Diagnosis 1 (630).

3.8 07_Advanced

3.8.1 Trace Setup

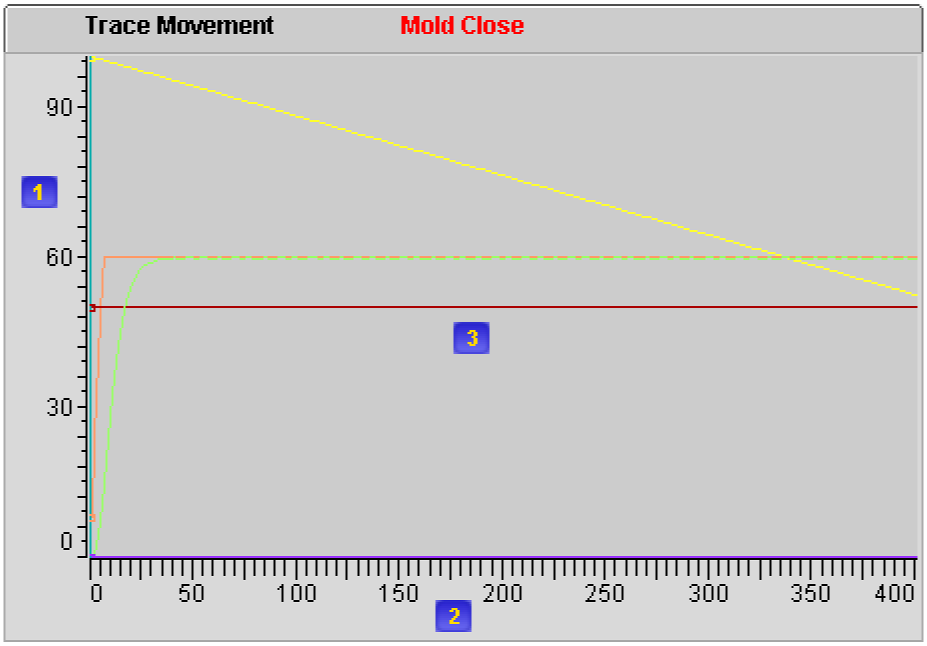
On this page the trace (recording and graphical display of movement parameters) can be configured.



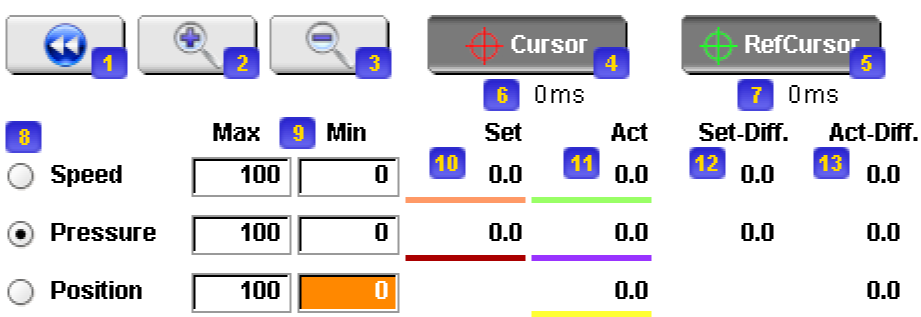
1	With this drop-down you can select the movement that should be recorded: • **Injection** • **Plastification** • **Decompression Before** • **Decompression After** • **Mold Close** • **Mold Open** • **Mold Protection** • **Ejector Forward** • **Ejector Backward** • **Inj. Unit Forward** • **Inj. Unit Backward** Data is recorded for the selected axis. The recording starts with the start of the movement and it ends when the recording-buffer is full.
2	Type of tracing. Here you can select the following options: • **Off** .. no recording • **Singe Shot** .. Movement is recorded once • **Cyclic** .. Movement is recorded always when it is started.
3	Minimum Trace Time. The trace-buffer records data for at least this given time. The actual recording time can be higher as the sample time for taking records can only be multiple of 2ms and the minimum recording time is 0.8 seconds.
4	On Delay. Here you can set a delay for the recording. The recording will start that time after the movement has started.
5	Trace Servo Pump. This is a optional setting and only available if a servo-pump is configured. By activating this feature the values from the servo-pump (speed, pressure) are recorded instead of the axis values.

3.8.2 Trace Graphics

On this page the recorded data from the trace is displayed.



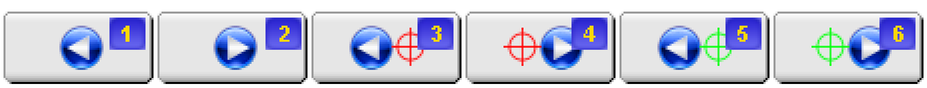
1	Scale for the Y-axis of the graph. Here either the scale for Speed, Pressure or Position is shown - this can be selected by the radio-buttons (see below).
2	Scale for the x-axis of the graph. Here the index of the samples (0-400) is being displayed.
3	Drawing area. Here the curves for the different values are drawn: • Orange .. set speed • Green .. actual speed • Brown .. set pressure • Violet .. actual pressure • Yellow .. actual position The cursor (red) and reference cursor (green) are displayed as vertical lines. At the intersection with the curves a rectangular is drawn.



1	With this soft-button you can scroll back to the beginning (deactivate scroll).
2	With this soft-button you can zoom in - the graph is stretched (less samples are displayed on the screen).
3	With this soft-button you can zoom out - the graph is compressed (more samples are displayed on the screen).

4	With this soft-button you can hide / show the cursor. When the button is pressed the cursor is visible, if it is released the cursor and all controls for the cursor are hidden.
5	With this soft-button you can hide / show the reference-cursor. When the button is pressed the reference-cursor is visible, if it is released the reference-cursor and all controls for the cursor are hidden.
6	This time shows the position of the cursor (time since start of tracing).
7	This time shows the time-difference between the cursor-position and the reference-cursor-position.
8	With this radio-buttons you can select which scale should be used for the Y-axis of the graph (Speed, Pressure or Position).
9	Scaling for the Y-axis of the graph. You can select a MIN- and MAX-value for the speed-curves (set and actual speed), the pressure curves (set and actual pressure) and the position curve (actual position).
10	Set-values (Speed, Pressure) at the actual cursor-position. This outputs are hidden if the cursor is disabled.
11	Actual values (Speed, Pressure, Position) at the actual cursor-position. This outputs are hidden if the cursor is disabled.
12	Set-value difference (Value at cursor-position minus value at reference-cursor-position) for Speed and Pressure. This outputs are hidden if the reference-cursor is disabled.
13	Actual value difference (Value at cursor-position minus value at reference-cursor-position) for Speed, Pressure and Position. This outputs are hidden if the reference-cursor is disabled.

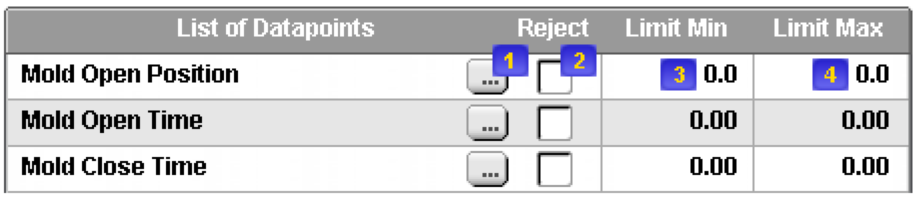
On the page a view control-functions are available (you have to press the CTRL-key in order to show the following function keys).



1	Scroll Left. Older values are being displayed. This function only works if you are zoomed in (less than 400 samples are displayed in the graph) and if you have not reached the oldest value (sample 0) yet.
2	Scroll Right. Newer values are being displayed. This function only works if you are zoomed in (less than 400 samples are displayed in the graph) and if you have not reached the newest value (sample 400) yet.
3	Move Cursor Left. By pressing this button you move the cursor to the left (older values). This key is hidden when the cursor is disabled.
4	Move Cursor Right. By pressing this button you move the cursor to the right (newer values). This key is hidden when the cursor is disabled.
5	Move Reference-Cursor Left. By pressing this button you move the reference-cursor to the left (older values). This key is hidden when the reference-cursor is disabled.
6	Move Reference-Cursor Right. By pressing this button you move the reference-cursor to the right (newer values). This key is hidden when the reference-cursor is disabled.

3.8.3 SPC Setup

On this page the SPC (statistic process control) data recording can be configured.
You can configure a list of parameters that you want to record and configure a MIN- and a MAX-value for it. A sample will be taken at every machine-cycle (some data is recorded after injection, some at cycle end) and if the limits are violated than a alarm is set and the reject-signal is set (if configured).
A change of the configuration when the recording is active is not possible (input fields are locked). In order to change the configuration the recording has to be stopped first and after the change started again.



1	With this control you can open a tree-view-window from which you can select the parameter you want to record. The parameter-name will than be displayed on the left side. Please see further below for a list of the available datapoints.
2	Reject. If you activate this checkbox a violation of the limits will set the reject-signal (output, robot). The limits of parameters that are evaluated until the end of injection are checked immediately after injection and will set the reject-signal in the actual cycle. The other parameters are checked at the end of the cycle and will affect the reject-signal for the next cycle (see list below, entry "PreTrigger").
3	MIN-Limit for the recorded parameter. If the recorded value is below that limit the alarm **20-41 SPC value exceeded min/max range** is set and the reject-signal is set (if configured - see above). Checking if MIN/MAX-Limit is disabled if both limits are set to 0.
4	MAX-Limit for the recorded parameter. If the recorded value is above that limit the alarm **20-41 SPC value exceeded min/max range** is set and the reject-signal is set (if configured - see above). Checking if MIN/MAX-Limit is disabled if both limits are set to 0.

1	With the "Start SPC"-button you can start and stop the recording of the configured list. If any parameter-selection has changed since the last recording the data in the record-buffer is lost (there will be a pop-up window to inform you about that).
2	With the "Clear All"-button you can clear all the recorded data (a dialog has to be confirmed before this is done).

By activating "Enable File Logging" the data is written to a file on the USB-stick as well (a USB-device has to be connected!!).
The created file is csv-text-file (unicode UTF8-encoded) which contains the values of all configured parameters. At the beginning of the file is the header containing the datapoint names and units, and after that at the end of every cycle a new line is added with all actual values from the cycle.
Each line starts with the actual date and time (YYYY.MM.DD hh:mm:ss), than comes the SPC record index (starting with 0 at the start of the logging) and after that the machine cycle number. After that general information the actual values of the configuread datapoints are entered. After each value a column is added that conatins information whether the value was outside the set limits ("X") or caused a reject ("R") or was ok ("").

The following datapoints can be recorded with the SPC:

Mold	
Mold Open Position	Position of the mold when it was opened. The sample is taken after the mold open movement is finished.
Mold Open Time	Time for the mold open process. The time is measured from the start to the complete end of mold opening. If cores are programmed in between mold open or the robot moves in between open this actions are also part of this time.
Mold Close Time	Time for the mold close process. The time is measured from the start to the complete end of mold closing. If cores are programmed in between mold close this core-movements are also part of this time.
Mold Max Position	Max. Position of the mold during the cycle. While the "Mold Open Position" is a single sample taken after the end of mold opening this value contains the max. position that was reached (overshoots are considered here).
Ejector	
Ejector Forward Position	Position of the ejector when it was in forward position. The sample is taken after the end of the forward-movement.
Ejector Backward Position	Position of the ejector when it was in backward position. The sample is taken after the end of the backward-movement.
Ejector Time	Time of the ejection process. Time from start of first ejector forward movement to the end of the ejections (when option "Ejector Stay Forward" (see Pages >> Ejector >> Ejector (300)) the process ends in semi-automatic mode when the ejector is forward, otherwise it ends when the ejector is back).
Ejector Min Position	Min. Ejector position reached during the cycle
Ejector Max Position	Max. Ejector position reached during the cycle.
Injection Unit	
Inj. Unit Forward Time	Time from start to the end of the injection unit forward movement.
Inj. Unit Backward Time	Time from start to the end of the injection unit backward movement.

Nozzle Temperature	Temperature of the nozzle at the end of injection
Inj. Unit Backward Position	Position of the injection unit after the end of the backward movement.
Injection	
Max. Injection Pressure	Max. Injection Pressure during injection and holdon-pressure phase.
Injection Speed	Max. Injection velocity.
Switchover Position	Position of the injection screw at the switchover from injection to holdon-phase.
Switchover Time	Time from start of injection to the switchover from injection to holdon-phase.
Dosage	Position of the injection screw after the end of the plastification movement.
Cushion	Cushion position. This is the minimum position reached during holdon-pressure phase or optionally (see Software Setup >> Setup Options >> #528) the position at the end of the holdon-pressure phase.
Switchover Pressure	Injection pressure at the switchover from injection to holdon-phase.
Plastification Time	Time of the plastification process.
Injection Back Position	Position after end of the decompression after movement.
Injection Max Position	Max. position reached by the injection piston during the cycle.
General	
Cycle Time	Cycle Time of the machine. Time from start of the cycle to the end of the cycle.
Cycle Interval	Cycle Interval time. Time between the actual end of cycle and the end of the last cycle (this time considers also the idle time in semi-automatic mode, otherwise it is identical to "Cycle Time").
Production Time	Time from start of the cycle to the end of the cycle or to the opening of the safety gate (if gate is opened before cycle end, e.g. parallel to mold open). When the gate is not opened during cycle this time is equal to the "Cycle Time", otherwise it is shorter.
Acopos ServoPump #1.. #3	
SPump#1..#3 Motor Temp	Temperature of the servo-motor of the SmartPump
SPump#1..#3 Heatsink Temp	Temperature of the heat-sink (servo-drive) of the SmartPump
SPump#1..#3 Load MotModel	Motor Load (0..100%) of the servo-motor of the SmartPump

SPump#1..#3 Load ContCurr	Continuous current load (0..100%) of the servo-drive of the SmartPump
SPump#1..#3 Load PeakCurr	Peak current load (0..100%) of the servo-drive of the SmartPump
SPump#1..#3 Load Power	Power load (0..100%) of the servo-drive of the SmartPump

3.8.4 SPC Buffer

On this page you can view the data that was recorded by the SPC. Beside the recorded data also the statistic evaluation for each parameter is displayed.

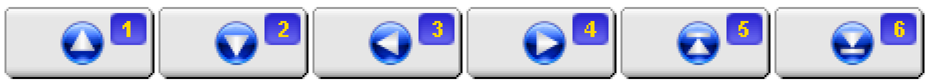
Index 1	Cycle 2	Mold Open Position [mm] 3	Mold Open Time [sec]	Ejector Forward Position [mm]	Ejector Backward Position [mm]	<None> []
23	2351	199.51	6.700	70.50	19.50	0.00
22	2348	199.51	6.700	70.50	19.50	0.00
21	2347	199.51	6.700	70.50	19.50	0.00
20	2346	199.51	6.700	70.50	19.50	0.00

1	Index of the record. This is a continuous index that starts with 1 whenever the SPC-recording is started new.
2	Machine cycle. This is the value of the cycle counter (see page Pages >> Overview >> Production(1) (101)) when the data-set was recorded.
3	Values recorded for the selected parameter. On this page up to 5 datapoints are shown simultaniously. If more parameters are recorded it is possible to scroll through the parameters using the function keys (see below). Values are displayed (highlighted) in red color if they have violated the set limits.

Mean Value	1	199.83	6.700	70.17	19.85	0.00
Standard Dev	2	0.23	0.000	0.24	0.23	0.00
CpK	3	1.185	Inf	1.156	1.228	0.000
Measured Max	4	200.00	6.700	70.50	20.00	0.00
Measured Min	5	199.51	6.700	70.00	19.50	0.00
Limit Max	6	201.00	7.000	71.00	21.00	0.00
Limit Min	7	199.00	6.500	69.00	19.00	0.00
Reject	8					

1	Mean value. Here the mean (average) value for the parameter is displayed.
2	Here the standard deviation for the parameter is shown. It shows how much variation there is from the average value. A low standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation indicates that the data is spread out over a large range of values. For a normal distributed value 68% of all samples are within the range of +/-1 x standard deviation from the average value.

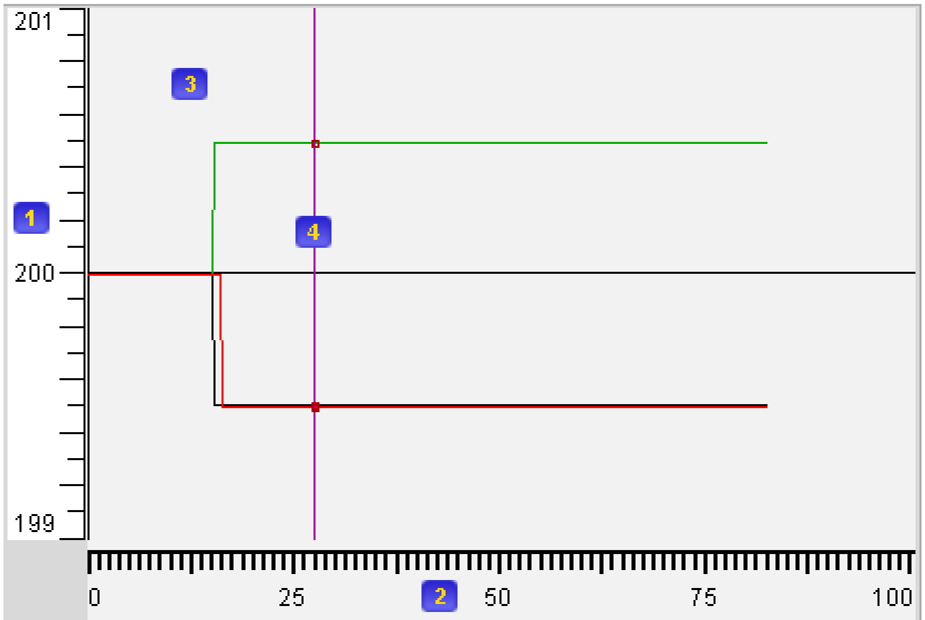
3	Here the process capability index is shown (The ability of a process to produce output within specified MIN/MAX-limits). It should be as high as possible (>1).
4	Maximum measured value in the recording period.
5	Minimum measured value in the recording period.
6	Specified max. limit for the parameter.
7	Specified min. limit for the parameter.
8	Indicates whether a violation of the specified limits leads to a reject of the part.



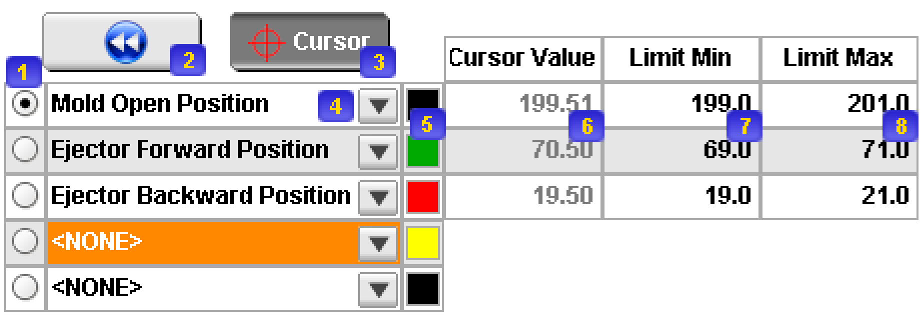
1	Moves one line up (newer data) in the displayed record data. Works only if not already the newest data is shown.
2	Moves one line down (older data) in the displayed record data. Works only if not already the oldest data is shown.
3	Scroll Left. Display different (first) parameters. This button can be used to scroll through the parameters if more than 5 were selected.
4	Scroll Right. Display different (last) parameters. This button can be used to scroll through the parameters if more than 5 were selected.
5	Moves on page up (newer data) in the displayed record data. Works only if not already the newest data is shown.
6	Moves one page down (older data) in the displayed record data. Works only if not already the oldest data is shown.

3.8.5 SPC Graphics

On this page the recorded data is shown as a graph. Up to 5 parameters can be selected that are displayed.

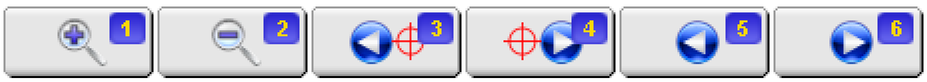


1	Value-Scale for the graph. The values refer to only one curve from the graph. It can be selected by the radio-buttons (see below) which scale should be displayed.
2	Time-scale for the graph. It shows the record-index for the values.
3	Graph drawing area. Here the different curves (color can be selected - see below) are displayed.
4	Cursor. The cursor is displayed as a vertical line. At the intersection with the curves a rectangular is drawn.



1	This radio buttons are used to determine which vale is used as a reference for the value-scale in the graph.
2	With this soft-button you can scroll back to the oldest values in the record buffer.
3	With this soft-button you can show/hide the cursor. If the cursor is disabled also the outputs for cursor-values and the cursor-keys are hidden.
4	With the dropdown you can select which recorded parameter should be displayed. If you set the selection to "" than the curve will not be visible.
5	With this color-picker control you can select the color for each curve. Just press enter when you have selected the colored box and select the new color from the pop-up window.

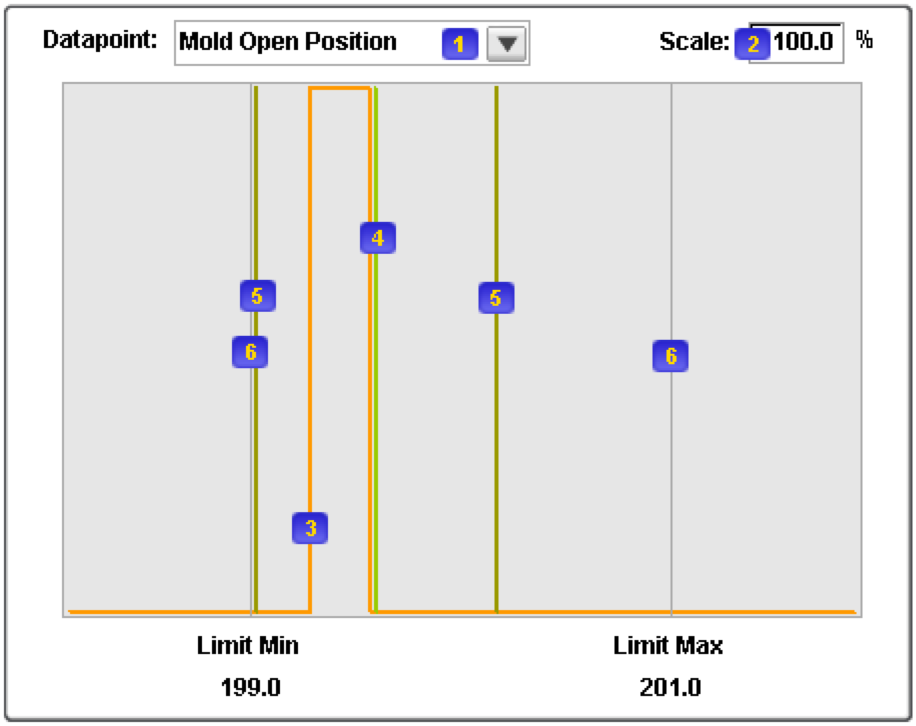
6	Value of the parameter at the actual cursor position.
7	Min. Limit for the scaling of the graph. As Default the specified min. limit for recording is used. Changing this value affects only the scaling of the graph but not the limits that are used for recording (reject).
8	Max. Limit for the scaling of the graph. As Default the specified max. limit for recording is used. Changing this value affects only the scaling of the graph but not the limits that are used for recording (reject).



1	Zoom In. If you press this key less values are displayed in the graph (curves are stretched). Only works if the max. possible zoom-factor is not reached yet.
2	Zoom Out. If you press this key more values are displayed in the graph (curves are compressed). Only works if the min. possible zoom-factor is not reached yet.
3	Move cursor left. Moves the cursor to the left side of the screen (toward older values).
4	Move cursor right. Moves the cursor to the right side of the screen (toward newer values).
5	Scroll the display to the left (older, historic data)
6	Scroll the display to the right (newer, actual data).

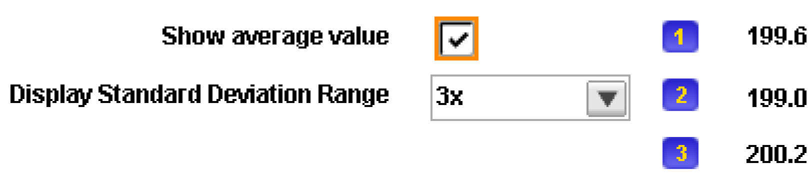
3.8.6 SPC Distribution

On this page the distribution of the values is shown. It shows where (in perspective to the specified min- and max-limit) the samples have occurred.
On the x-axis for the graph the sample-value is shown. On the y-axis the frequency of the sample (in % of all taken samples) at certain value-ranges is shown.



1	Here the parameter can be selected for which the distribution should be shown.
2	Scaling (Y-scale) for the graph. The value is in percent of all taken samples.
3	Display of the sample-distribution (orange curve).
4	The vertical light-green line shows the average value for the parameter. (visibility of that line can be configured - see below).
5	The vertical dark-green lines show the standard-deviation range (1x, 2x or 3x standard deviation) for the value (for the configuration of this curves see below).
6	The vertical thin grey lines show the specified min- and max-limit for the parameter. The values are also shown in numeric format below that lines.

With the following settings the display of the distribution can be configured.



1	With this checkbox you can configure whether the average value (vertical light-green line) should be displayed in the graph above. The average value is displayed as a numeric value on the right side of the checkbox.

2	With this dropdown you can select if and which standard-deviation range (vertical dark-green lines) should be displayed in the graph above. • **OFF** .. range is not displayed • **1x** .. +/- 1x std. deviation is shown • **2x** .. +/- 2x std. deviation is shown • **3x** .. +/- 3x std. deviation is shown On the right side of that setting the minimum value for the selected range is shown (hidden if selection is "OFF").
3	Here the maximum value for the selected range is shown (hidden if selection is "OFF").

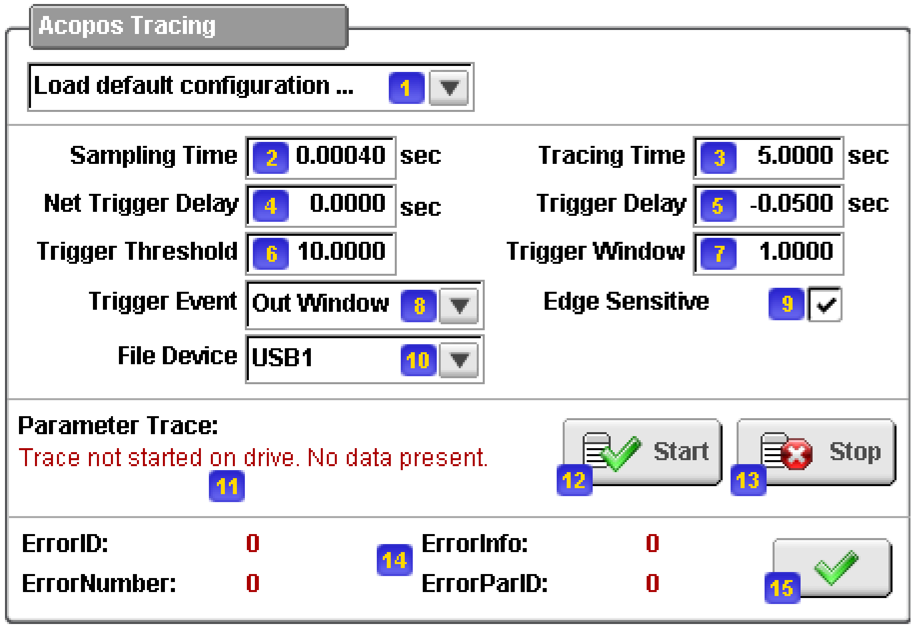
3.8.7 Acopos Parameters

This is a service-page that can be used to access data from the integrated SmartPump servo drives.

In the section "Read/Write Acopos Parameters" parameters from the drive can be accessed directly:

1	With this drop down the drive that should be accessed can be selected (the controller support up to 3 servo-driven SmartPumps).
2	Status display of the read or write request. The following stats might be displayed: • Nothing .. no action performed • "Error" .. an error had occurred during reading or writing of the requested parameter - see error number (??) for details • "OK" .. the parameter was written to the drive without errors • "Reading..." .. the parameter is currently read from the drive • Numerical value .. Value that was read from the drive or that is going to be written to the drive
3	ID of the parameter that should be read or written to/from the drive
4	Button to trigger a read-request. When this button is pressed the desired parameter 3 is read from the requested drive 1.
5	Numeric input for the value that should be written to the parameter on the drive
6	Button to trigger a write-request. When this button is pressed the value 5 is written to the desired parameter 3 on the requested drive 1. A confirm-dialog has to be acknowledged before the value is really written.

In the "Tracing"-section a parameter-trace on the drives can be configured. On this page the general trace-configuration can be made and the trace can be activated. The parameters to be traced can be configured on the following pages (see Pages >> Advanced >> Acopos Trace Config (721)).

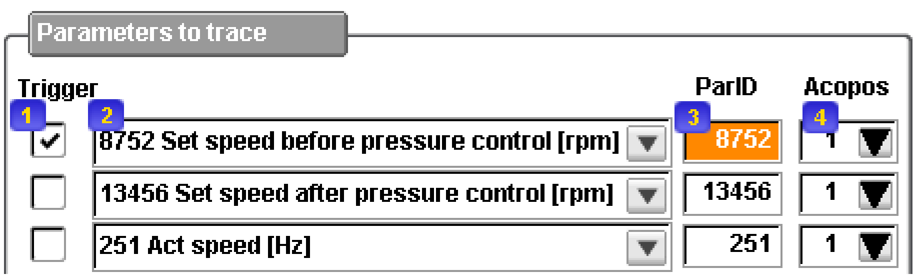


1	With this drop down a default configuration can be loaded. By selecting a element from the list a according default-configuration (for any combination of drives) is loaded. This default-configuration includes a default-trigger-setting and a list of parameters to be traced (see Pages >> Advanced >> Acopos Trace Config (721)).
2	Sampling interval of the ParIDs
3	Maximum trace recording length (not necessarily reached)
4	Delay time of the trigger via the network
5	Trigger delay. Delay for starting the recording after the trigger-event is active. Also negative delays are possible (recording will than start before the trigger is active).
6	Threshold value for the trigger.
7	Window around the threshold value.
8	Trigger-Event. Defines the type of trigger-event that starts the tracing: • **Off** .. trigger is off. tracing stars immediately once the trace is activated. • **In Window** .. value of the trigger-parameter must be inside the defined window (6 +/- 7) • **Out Window** .. value of the trigger-parameter must be outside of the defined window (6 +/- 7) • **Above Window** .. value of the trigger-parameter must be above the defined window (> 6 + 7) • **Below Window** .. value of the trigger-parameter must be below the defined window (< 6 - 7)
9	Check box defines whether the trigger-criteria is edge-sensitive. When the check box is checked the tracing only starts at a positive edge on the trigger-criteria (FALSE -> TRUE). If it is not checked the trigger-criteria is level-sensitive and the tracing starts as soon as the trigger-criteria is TRUE.

10	File-Device where the result of the tracing is saved. The data is saved as CSV-file. • **USB1** .. file is stored to the USB-port (device must be connected) • **C:/LOGDATA** .. file is stored locally on the flash.
11	Text-display for the actual state of the tracing.
12	Button to start the tracing. When this button is pressed the trace is activated as configured. When the tracing is finished (trigger reached and trace-buffer full) than the data is automatically stored to the given device (10)
13	Button to stop the tracing prematurely. With this button the tracing can be stopped before it is finished (e.g. to download a new configuration).
14	Detailed information about a error that may occurred during the tracing (e.g. configuration incorrect)
15	Button to quit (acknowledge) the trace error-information.

3.8.8 Acopos Trace Config

On this page the parameters to be trace with the parameter-trace (see Pages >> Advanced >> Acopos Parameters (720)) can be configured



1	With this check box the trigger-parameter can be selected. The tracing starts when this parameter fulfills the tracing-criteria (see Pages >> Advanced >> Acopos Parameters (720)). Only one parameter can be used as trigger. If more parameters are selected (more check boxes checked) the first in the list is used as the trigger.
2	List of typical parameters to trace. If a parameter should be traced that is not in this list it can be entered numerically in field 3
3	ID of the parameter that should be traced (can be entered directly here or by selecting a parameter from the list 2)
4	Drive on which this parameter is traced. The trace can record parameters on multiple drives.

3.8.9 Acopos Trace Config 2

Continued list from previous page (see Pages >> Advanced >> Acopos Trace Config (721))

3.8.10 SmartWizard Basic Data

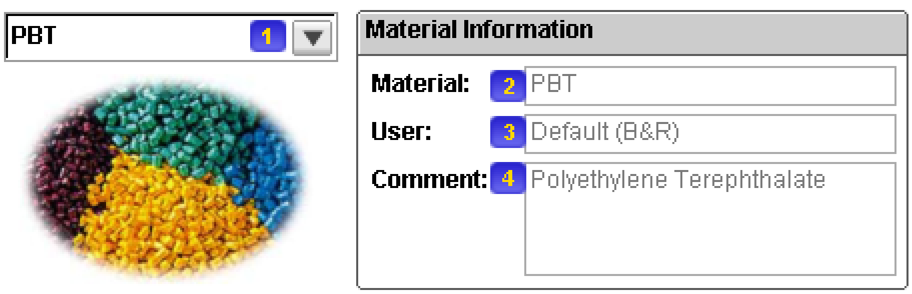
The SmartWizard does a self-tuning of molding parameters. The self-tuning can be started right after mounting of the mold, or at any time when a certain molding defect (burr formation, sink marks, burn marks ...) should be eliminated.

The SmartWizard is consists of 3 main phases:
1. Calculation of Basic Data
2. Fill-Study and Correction of Dosage (see Pages >> Advanced >> SmartWizard Correction (731))
3. Optimization and Elimination of Molding Defects (see Pages >> Advanced >> SmartWizard Optimization (732))

In the **Basic Data** step a root recipe is calculated based on key data of the mold such as shot weight and material.
The **Correction** step adapts these basic settings until the part is fully filled and a stable automatic cycle can be run.
The **Optimization** step contains then guided procedures that allow the operator to eliminate molding problems in an easy and standard way without the necessity of expert knowledge and experience.

Attention:
SmartWizard only adjusts the injection and plastification settings.
Mold open and close settings must be made manually.
Core, ejector and injection unit settings must be made manually as well.

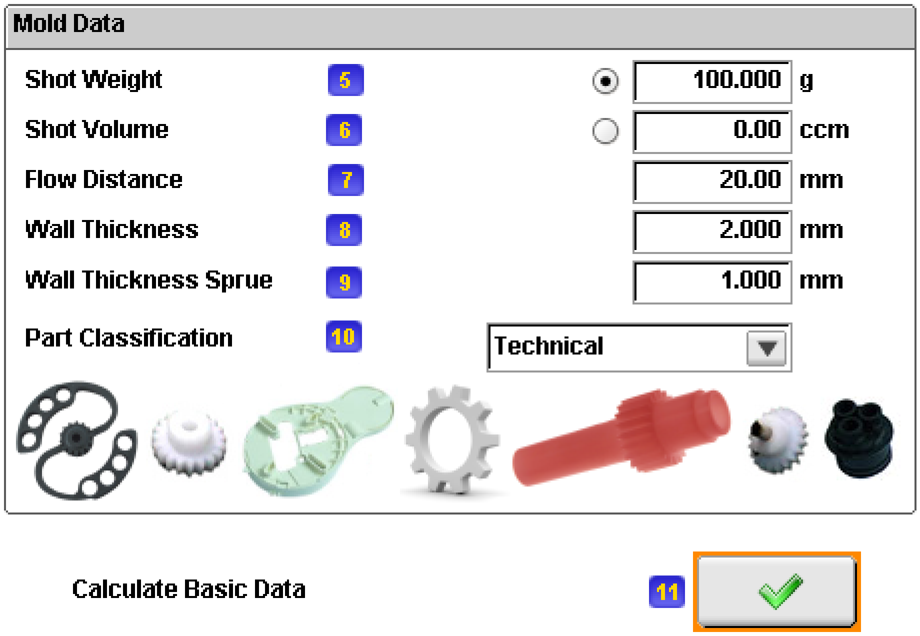
The first step of SmartWizard is to specify the physical data of the mold and to select the material out of the integrated material database. Based on this data the basic mold settings will be calculated.



1	The type of material can be selected here. Find below a description of the available materials. The list is sorted from generally lower to higher cost, temperature and strength. The material database can easily be extended by loading new MDS (Material Data Sheet) files to the Compact Flash.
2	Abbreviation of the selected thermoplastic
3	User which created the material data sheet for the selected thermoplastic
4	Description of the selected thermoplastic

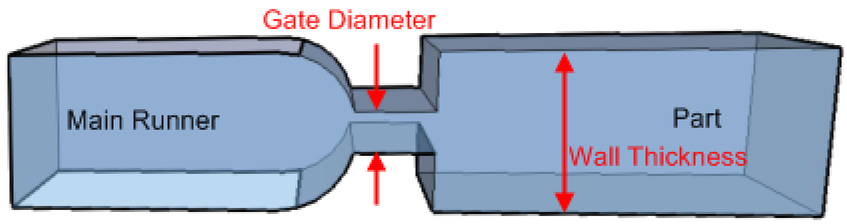
PE	**Polyethylene**	Semi-crystalline thermoplastic used for commodity products. Low cost, low strength, low temperature resistance. PE can be used for food containers, shampoo bottles, toys, ... The typical plastic shopping bags are also made of PE.

PP	**Polypropylene**	Semi-crystalline thermoplastic used for commodity products. Low cost, low strength, low temperature resistance. PP is often used for food containers, particularly those that need to be dishwasher safe, since its melting point of PP is much higher that that of PE.
PS	**Polystyrene**	Amorphous thermoplastic used for commodity products such as food packaging, toys, CD and DVD cases. Low cost, low strength, low temperature resistance.
SAN	**Styrene Acrylonitrile**	It is widely used in place of PS because of its greater thermal resistance. Uses include food containers, toothbrush handles, kitchenware, computer products, packaging material, battery cases and plastic optical fibers.
ABS	**Acrylonitrile Butadiene Styrene**	Amorphous thermoplastic used to make light and rigid products such as pipes, musical instruments etc. ABS has satisfactory stiffness, dimensional stability and a glossy surface.
ASA	**Acrylonitrile Styrene Acrylate**	ASA has similar characteristics as ABS, but is more resistant to atmospheric attack (good UV resistance). Therefore it can be used for carbodys, garden furniture, surfboards and any other outdoor applications.
PMMA	**Polymethyl Methacrylate**	A transparent thermoplastic that is often used as a light or shatter-proof replacement of glass. It is sold under many trade names including Plexiglas and is commonly called acrylic glass.
PA 6	**Polyamide 6**	Semi-crystalline thermoplastic that is a tough and strong material affording parts with good damping characteristics and high shock resistance. It can be used for gears, cams, rollers, bearings, nuts and bolts, power tool housings, electrical connectors, combs, coil formers, fuel tanks for cars or kitchen utensils.
PA 66	**Polyamide 66**	A versatile eingineering plastic with similar characteristics to PA6. It is a good candidate for metal replacement applications.
PBT	**Polybutylene Terephthalate**	Semi-crystalline thermoplastic that is resistant to solvents and mechanically strong, simliar in properties to PET. Applications include electrical and automotive components and power tool casings.
PC	**Polycarbonate**	Amorphous and almost completely transparent thermoplastic with enormous strength combined with light weight. It can be used for example for bulletproof windows, eyeglasses, cell phone casings, CDs/DVDs or medical industry applications.
POM	**Polyoxymethylen e**	An engineering thermoplastic. It is used in precision parts that require high stiffness, low friction and excellent dimensional stability, such as bearings, gears and conveyor belt limits, electric kettles and water jugs, chemical pumps, showerheads, telephone keypads and housings for domestic appliances.

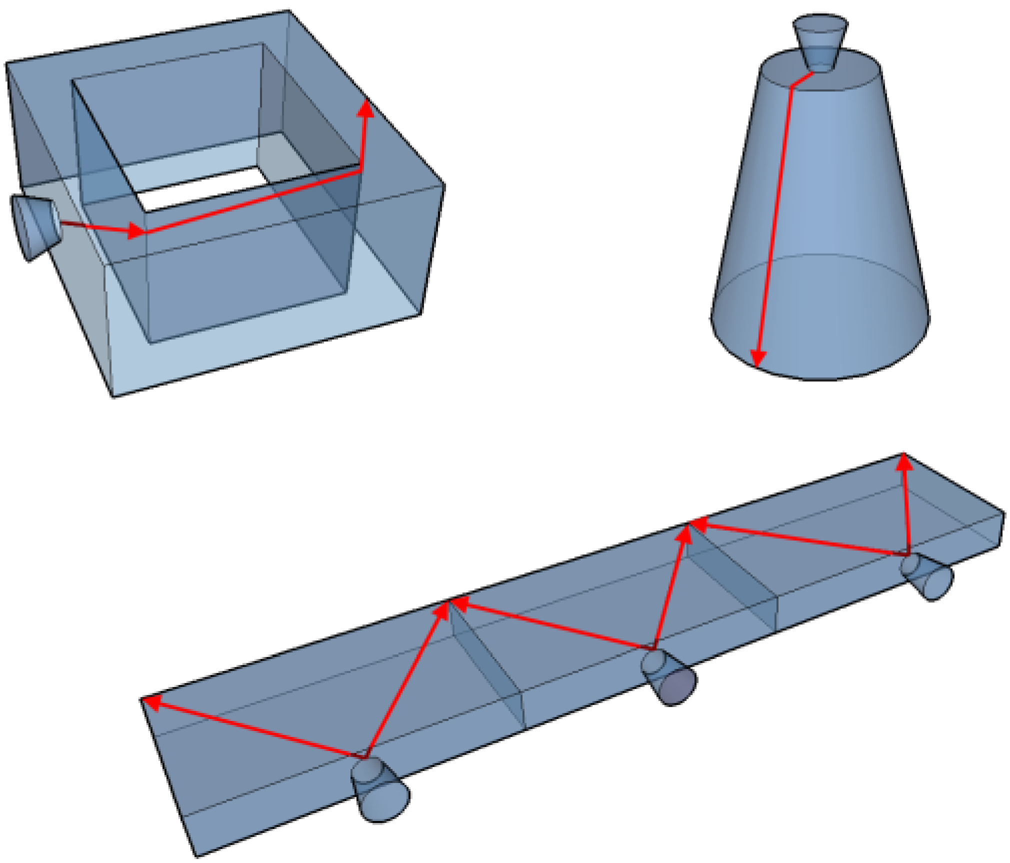


5	**Shot Weight:** Made up of the weight of all cavities and the sprue. If the shot weight is not known exactly, it is safer to estimate it rather too little than too high. As a consequence the Correction step will need a little bit longer time to determine the correct dosage. Alternatively the shot volume can be specified.
6	**Shot Volume:** Alternatively to the shot weight the volume can be specified (Weight = Volume * Density).
7	**Flow Distance:** The maximal distance from the entrance to the cavity (gate) to the farthest point in the cavity. It can be determined on the finished part with a measuring tape, measuring the distance from the gate to the supposed end of the melt flow. The flow can separate due to openings, in this case the maximum flow distance must be specified here. It is safer to estimate the flow distance rather too short than too long. As a consequence the Correction step will need a little bit longer time to determine the correct injection pressure to fill the part. See also the graphic below for an explanation.
8	**Wall Thickness:** The average wall thickness of the part. The wall thickness should be specified as exact as possible, because cooling time and holding time depend on it. Too high values will lead to unnecessary long cycle times, however it is safer to estimate the wall thickness rather too high than too small to ensure proper ejection. See also the graphic below for an explanation.
9	**Gate Diameter:** Diameter of the entrance to the cavity. Especially for pinpoint gates the smallest diameter must be taken. See also the graphic below for an explanation.
10	**Part Classification:** Select the "complexity" of the molded part. Especially the injection speed depends on the part complexity. To simplify matters and to avoid the danger of mis-classification there are only 3 part classes available: Technical, Packaging and General. See the table below for an explanation on the part classes.
11	Press this button to calculate the root recipe based on the mold data and material specified above. **Attention:** The current settings for injection and plastification will be overwritten by the settings calculated by SmartWizard.

8 Wall Thickness and 9 Gate Diameter:



7 Flow Distance for different part geometries:

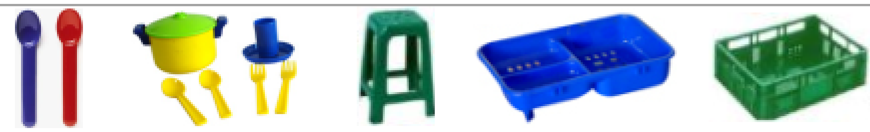


10 Part Classification:

Technical:	Suitable for technical parts e.g. gear, crank, case with high precision requirements.

Packaging:	Suitable for parts with simple geometry and large ratio of flow distance / wall thickness e. g. dishes, bottle caps.

General:	Suitable for all standard parts e.g. cases, covering caps, toys etc.



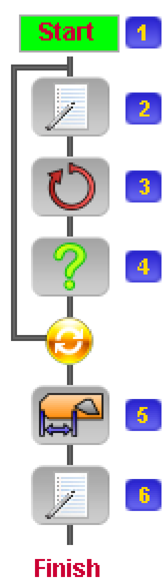
3.8.11 SmartWizard Correction

In the correction phase the basic recipe (see Pages >> Advanced >> SmartWizard Basic Data (730)) is corrected.
Therefore fill-studies (injection without holding pressure) are made in order to find the correct dosage and injection parameters.

The operator is guided through the steps that are necessary to find the correct parameters for:

- Injection pressure
- Dosage (plastification volume)
- Injection velocity

The steps are shown graphically on the left side of the page, the actual active step is highlighted with a green back-color. To the right of that diagram a description of the actual active step is shown and the user has to make certain entries (see list below):



1	**Start of Fill-Study.** The operator is reminded that the mold-side (mold, ejector, cores) must be adjusted before the start of this test. After the operator confirms this dialog the correction of the basic recipe starts.

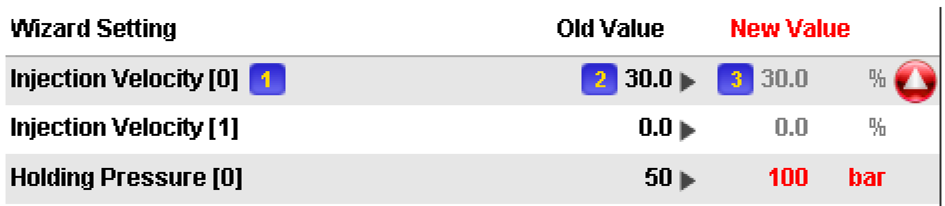
2	**Adapt Parameters**. In this step a list of parameters that will be changed by the Wizard is displayed (old value in black and new value in red are shown). The operator can either accept the change and continue with the correction or cancel the change - the correction will be stopped than.
3	**Testrun in Semiautomatic**. In this step the operator must run the machine in automatic or semi-automatic mode for at least 2 cycles (the operator does not need to change any parameters - just put the machine in the according mode and start the cycle). When the 2 cycles are finished than the operator can go to the next step by pressing the "OK"-button or cancel the correction by pressing "Cancel"-button. 2 cycles are necessary to be sure that all changed parameters are really affecting the resulting part (e.g. correction the dosage takes only affect in the 2nd cycle).
4	**Evaluate Molded Part**. In this step the operator must evalute the result of the test (the molded part). He has to evaluate the fill-status of the part and whether it is totally cooled down. ***Part is not fully cooled*** The operator must activate this checkbox when the part is not fully cooled down ***Fill Status*** Depending on the last action that has been performed by the wizard you can select the following options from the dropdown: • **OK** .. the part is filled correctly • **Over-Filled / Flash** .. the part is overfilled (flashes are visible) • **Non-Filled (Short Shot)** .. the part is not fully filled or • **OK** .. the part is filled correctly • **Over-Filled / Flash** .. the part is overfilled (flashes are visible) • **Same or worse (Short Shot)** .. the fill-status has not changed compared to the last evaluation or got worse • **Better (Short Shot)** .. the fill-status has got better compared to the last evaluation but the mold is still not filled Selection "OK" does not necessarily mean that the wizard has finished the correction afterwards. If the injection pressure was not increased yet the test might continue with increased pressure.
5	**Correct Dosage**. After the fill-study is finished the injection is tested with holding-phase to evaluate the correct cushion. In this step 1 machine-cyle must be executed in semi-automatic or automatic mode.
6	**Adapt Dosage**. The resulting cushion is evaluated automatically and if values need to be corrected it is displayed here. The operator can either confirm or cancel this changes.

On the bottom of the page an excerpt from the audit-trail is shown that contains only the entries for the SmartWizard (see Pages >> Alarms >> Audit Trail (620)). Here you can see the last actions performed by the SmartWizard
For scrolling there are some control-keys available:

1	**F1**: Press this key to display the newest entries in the audit-trail excerpt.
2	**F2**: Move one line up (towards newer entries) in the audit-trail excerpt

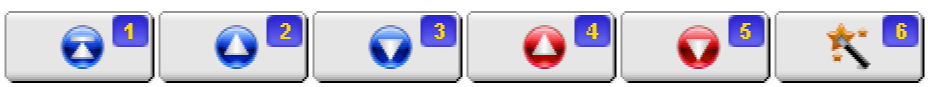
3	**F3**: Move one line down (towards older entries) in the audit-trail excerpt
4	**F6**: Open the Settings-overview (see below)

The settings-overview shows all the parameters that are considered by the SmartWizard. These parameters are evaluated automatically by the in basic recipe (see Pages >> Advanced >> SmartWizard Basic Data) or copied from the recipe the operator entered when the SmartWizard is activated to correct a problem.
The settings-overview can be shown by pressing the F6-control key when the normal view is active (see above).



1	Name of parameter
2	Old Value. Value before the SmartWizard made the last change.
3	New Value. Value after the SmartWizard made the last change. If the value was affected by this change it is highlighted in red color

Not all settings fit on one page so the control-keys can be used to scroll through the settings:

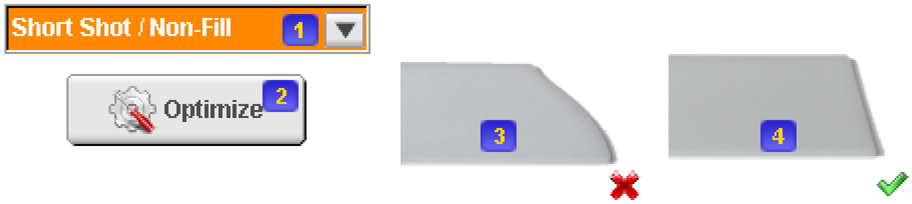


1	**F1**: Press this key to display the newest entries in the audit-trail excerpt.
2	**F2**: Move one line up (towards newer entries) in the audit-trail excerpt
3	**F3**: Move one line down (towards older entries) in the audit-trail excerpt
4	**F4**: Scroll up in settings list (show previous settings)
5	**F5**: Scroll down in settings list (show next settings)
4	**F6**: Change back to normal view.

3.8.12 SmartWizard Optimization

The Optimization can be used for recipes created by the SmartWizard (see Pages >> Advanced >> SmartWizard Basic Data (730)) but also to correct recipes made by the operator (as lond as they are compatible - not to many injection and holding steps....).

The operator can select from a list of problems and the SmartWizard will adjust some injection parameters to fix that problem:



1	With the dropdown the operator can select the problem that is present: • **Short Shot / Non-Fill** .. the part does not get fully filled • **Sink Mark Close to Gate** .. sink marks occur on the part surface close to the injection gate • **Sink Mark Far From Gate** .. sink marks occur on the part surface far from the injection gate • **Burr Formation / Flashing** .. Excess material in thin layer exceeding normal part geometry • **Weld Lines** .. Small lines on the backside of core pins or windows in parts that look like just lines. • **Jetting** .. Deformed part by turbulent flow of material • **Grooves** .. Circular grooves appear on the surface (looks like a old gramophone record) • **Burn Marks / Dieseling** .. Burn marks are visible on the part • **Matt Places Close to Gate** .. Matt area occur close to the gate • **Burn Streaks** .. Burn streaks are visible on the part • **Voids** .. Air pockets are visible in the part • **Color Streaks** .. color streaks are visible in the part (only for colored material) • **Little Shine (Polished Mold)** .. The part surface has not enoght shine (mold surface is polished) • **Little Shine (Structured Mold)** .. The part surface has not enough shine (mold surface is structured) • **Strain Breaks**.. The material shows strain breaks (white break lines)
2	This button has to be pressed to start optimization for the selected problem.
3	Picture showing an example of the selected defect (pictures are not available for all problems)
4	Picture showing an example of the part without the selected defect (pictures are not available for all problems)

For solving the selected defect the operator must follow the step-sequence that is shown on the left side of the screen. For achieving good results the machine should run in automatic mode (production) during the optimization. The active step is highlighted with green backcolor:

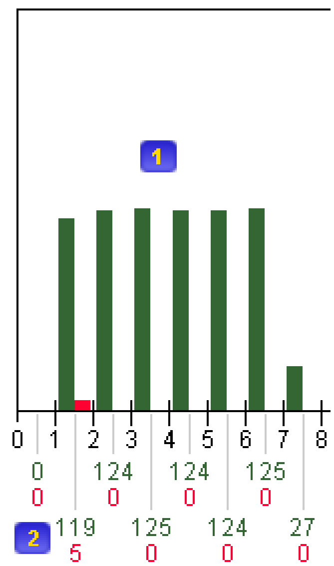
1	**Start**: The operator must select the problem and start the optimization (see above).
2	**Adapt Parameters**: The parameters that will be changed by the Wizard are displayed (old value in black color and new value in red color). The operator can confirm this changes (optimization continues) or cancel this changes (optimization stops).
3	**Testrun in Automatic**: At least two machine-cycles must be executed in this step after the changes have been made (automatic or semi-automatic mode).
4	**Evaluate Molded Part**: The last molded part (after the cycles from the precious step) must be evaluated by the operator. From a dropdown the operator can select the following options: • **Part OK. Defect eliminated.** .. Part is okay. Optimization will stop. • **Part improved. Defect not fully eliminated.** .. Optimization will continue with the same step (same procedure) if possible or go to the next one • **Part stayed the same or got worse.** .. Optimization will undo the last changes and continue with the next step.

On the bottom of the page an excerpt from the audit-trail is visible. Please see Pages >> Advanced >> MoldingWizard Correction (731) for a detailed description about that and the settings-view that is also possible on this page.

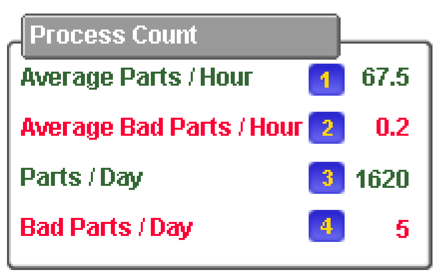
3.8.13 Production Data

On this page the hourly production data for the last 30 days can be seen.
The production data is displayed for a selected day by a bar chart showing the production for each hour of the day. The operator can decide whether all produced parts should be displayed without regard whether they have been rejected or not, or if good and bad parts should be displayed separately.

On the top of the page the date of the displayed data is shown. When the actual day is selected the bars and numbers will update continuously.



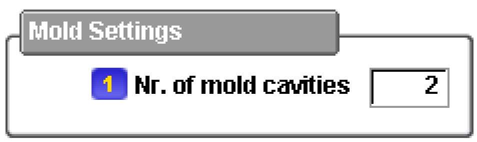
1	The bars show the number of the produced parts for each hour of the day (0-23). The green bars show the number of good (non-rejected) parts, the red bars the number of bad (rejected) parts. If the operator has selected not to separate good and bad parts (see 1 in the section **Display Settings** below) only the green bar showing the total number of produced parts is displayed. The bar is twice as wide then. The full height of the bar (100%) refers to the maximum number of parts produced per hour on the selected day. So one bar in the diagram always has the maximum height.
2	Below every bar the actual number of parts is displayed also numerically (green = good parts or total parts, red = bad parts). The actual number of bad parts (red number) is only visible if the operator has selected to separate good and bad parts (see 1 in the section **Display Settings** below). The numbers are not visible if no data has been recorded for the respective hour. If the machine did not produce during that hour the value 0 is displayed.



1	The average parts per hour show the average (good) parts produced per hour on the selected day. If the current day is selected, only those hours are considered for which already data exists.
2	The average bad parts per hour show the average bad (rejected) parts produced per hour on the selected day. If the current day is selected, only those hours are considered for which already data exists. This output is only visible if the operator has selected to separate good and bad parts (see 1 in the section **Display Settings** below).
3	The parts per day show the total number of (good) parts produced on the selected day.

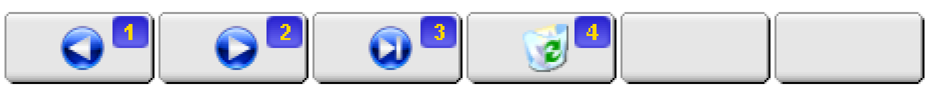
3	The bad parts per day show the total number of bad (rejected) parts produced on the selected day. This output is only visible if the operator has selected to separate good and bad parts (see 1 in the section **Display Settings** below).

1	With this checkbox the operator can decide whether good (non-rejected) and bad (rejected) parts should be treated separately or whether they are all displayed as produced parts. When the checkbox is checked the values will be separated.
2	With this setting the operator can directly jump back (0-29) and display older data of the previous days. When the scroll is set to 0 than the actual day is displayed, by increasing the value older data is shown. The scrolling is limited to that actually available number of days for which production data has been recorded. It is also possible to scroll back and forward using the functions keys (F1..F3), in this case the actual scroll offset is displayed here.



1	Here the number of mold cavities (number of produced parts per shot) can be entered. The part counter will be increased by this value after a cycle is completed on the machine.

On this page function keys are available. In order to access this you need to press the CTRL key (see Operation >> Control Unit).



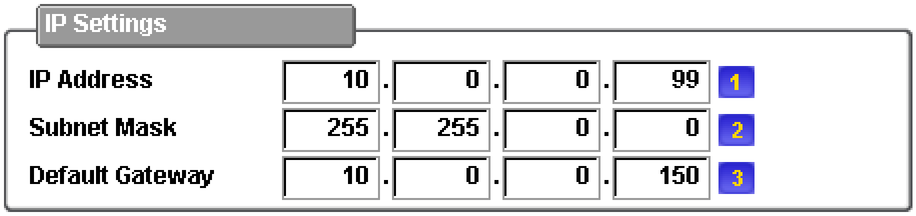
1	**F1**: By pressing this key older data (1 day older) is displayed.
2	**F2**: By pressing this key newer data (1 day newer) is displayed.
3	**F3**: By pressing this key the actual day is displayed.
4	**F4**: In order to delete all recorded production data this key must be pressed. Before the data is really erased a confirm dialog is displayed.

3.9 08_Settings

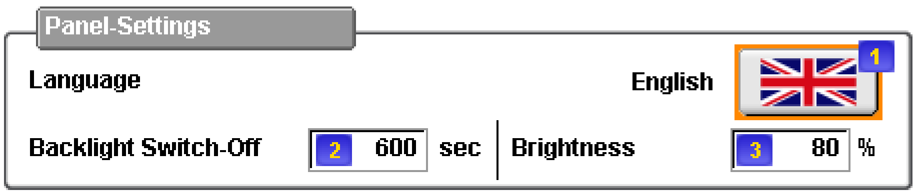
3.9.1 Settings 1

On this page general settings for the controller can be made that do not refer to the operation of the machine directly.

The IP-address of the controller must be set manually. The use of DHCP-server is currently not supported.



1	IP-Address that should be used by the controller
2	Subnet-Mask that should be used by the controller
3	Default Gateway that should be used by the controller.

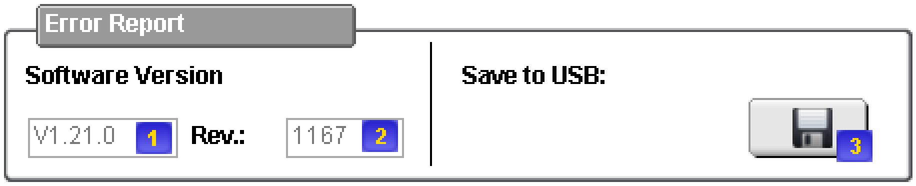


1	With this soft-button you can scroll through the available languages. For the current active language the national flag is shown. You have to press this button until the desired language appears.
2	After this time (if no key is pressed on the panel) the backlight will be switched off and the screen goes dark.
3	Here you can set the brightness of the display (0-100%).

With the screenshot-function you can make a copy of the actual visible screen to the USB-device (as a Bitmap). Screenshots can be made by pressing the Print-Key on the panel (see topic Control Unit). Here the status of the screenshot-operation can be seen.

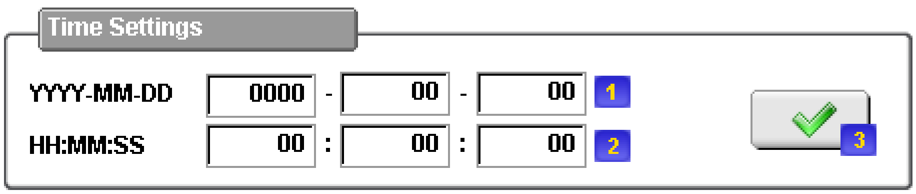
1	Device where the screenshot (bitmap) is saved to (fixed: USB1 - first USB-slot)
2	Status of the screenshot-operation: • **OK** .. last screenshot successful • **Error** .. error occurred at last screenshot (USB-device connected?)

The error report is a summary of the controller settings and actual data that will be saved to the USB device. In case of an error on the controller this system dump will help the software development to find the problem quickly.
Please always make such an error report when an unknown problem occurs with the controller, it is most useful to save the error report immediately after the problem happened.



1	Current software version used on the controller
2	Exact software revision used on the controller
3	To create a error report you need to press this button. A confirmation dialog will appear before the error report is really written.

Here you can change the controller date and time.



1	Date to be set on the controller
2	Time to be set on the controller.
2	Press this soft-button to activate the settings for data 1 and time 2.

3.9.2 Settings 2

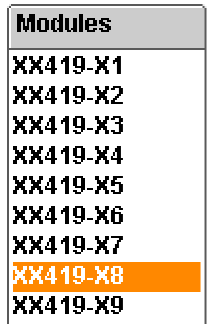
On this page the display units can be changed.

1	With this two radio-buttons you can select between SI(metric) and imperial unit display.
2	With this two radio-buttons you can select between relative (distance) and absolute (volume) units for the injection parameters. This setting is optional and not available on all controllers.

3.9.3 IO Browser

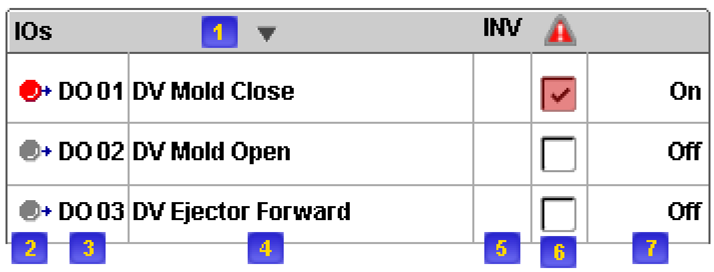
On this page all configured IO-modules can be seen. It is possible to access all IO-datapoints for each module as well as the module-information (e.g. serial-number)., module-configuration (e.g. channel-types) and module-status (e.g. readback of outputs).
IO-datapoints can be forced on this page. Also a diagnosis-function is available to find out about

missing or wrongly inserted modules.



On the left side of the screen a list of all the configured IO-modules can be seen. If a XX419-IOBox is used than it will be split up and every connector is shown as one module. For X20-modules only one line is used.

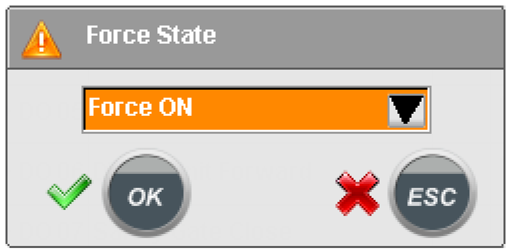
For the selected module the available IOs will be displayed on the right side of the screen (as default, it is also possible that other views are displayed - see below).



1	Dropdown to change the view and display different information on the right side of the screen: • **IOs** .. Display IO-datapoints for selected module • **Configuration** .. Display configuration for selected module • **Status** .. Display status-information for selected module • **Information** .. Display general information for selected module • **PLC** .. Display information about used PLC
2	Physical Status of the IO (status at the connector): • Input LOW • Input HIGH • Output LOW • Output HIGH • IO not connected, module not connected
3	Short description of the IO and the IO-index. The following descriptions are possible: • **DI** .. digital input • **DO** .. digital output • **AI** .. analog input • **AO** .. analog output • **AT** .. temperature input • **RO** .. digital (relay) output • **PM** .. PWM output

4	Name of the connected controller-parameter.
5	A checkbox indicates whether the IO is inverted. This feature is only available for digital inputs. For all other IOs this checkboxes are hidden.
6	With this checkbox you can change the force-status of the IO. When you click on the checkbox the force-dialog (see below) will appear that allows you the set the force-status and force-value of the IO. Forced IOs will be highlighted with a checked checkbox with red back-color (like first IO in example). Forcing is only possibel for users with access-level "Supervisor" or higher.
6	Value of the IO-parameter in the software (this value already regards the invert-flags etc.)

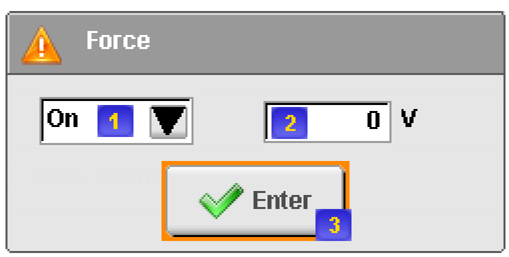
For digital signals the following force-dialog will be shown:



Just select the force status from the drop-down menu:
- **Disable Force** .. IO will not be forced
- **Force ON** .. IO will be forced to HIGH (on)
- **Force OFF** .. IO will be force to LOW (off)

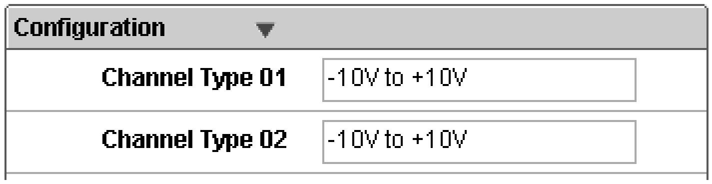
The dialog will automatically close once you have selected something from the drop-down or pressed cancel (force-status will not change than).

For analog signals the following force-dialog will be shown:

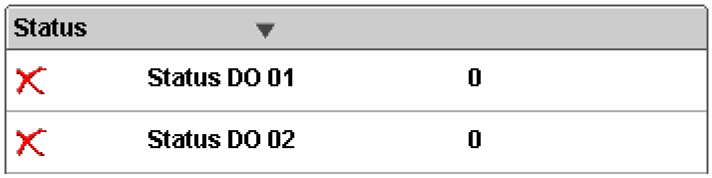


1	Set the force status: • **Off** .. IO will not be forced • **On** .. IO will be forced
2	Force-value. This value will be applied to the IO when the force-status is "on". Units may vary depending on IO-type.
3	To activate the new force-values you need to press this soft-button.

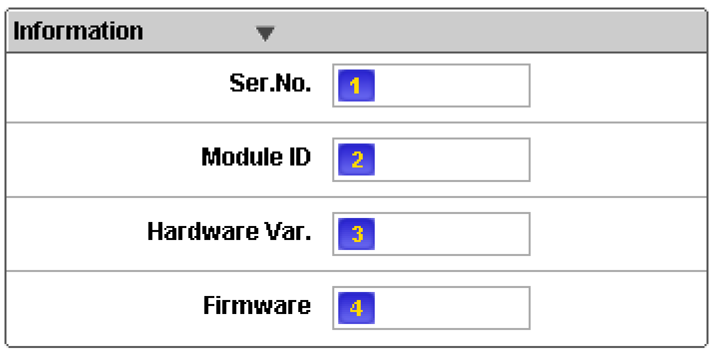
When you have selected the configuration view than you can see the possible configuration-settings for the selected module. If no configuration is necessary or available for that module that screen stays empty.



When you have selected the status view than you can see the available status-information for that module. The type of information displayed here depends on the module-type - in the following example the readback-status of digital outputs is displayed.

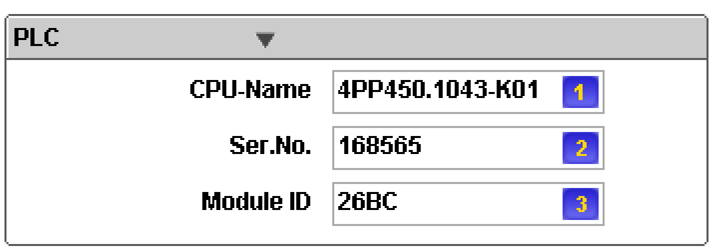


When you have selected the information view than you can see the module-information that is identical for all modules:



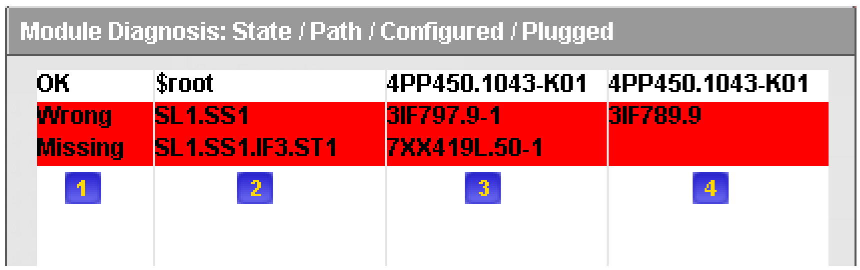
1	Serial-number of the module
2	Module ID (identification number). The full serial number of the module consists of the Module ID and the serial number above 1.
3	Hardware Variant. Represents the hardware-revision of the selected module.
4	Firmware. Version-number of firmware used by the selected module.

When you have selected the PLC-information view than you can see information about the used CPU (Panel):



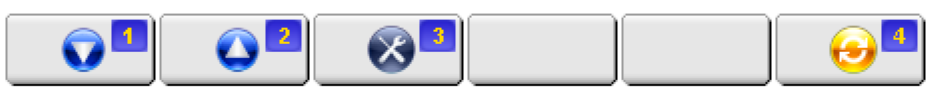
1	Name (order-code) of the used CPU (Panel).
2	Serial number of the PLC.
3	Module ID (identification number). The full serial number of the PLC consists of this Module ID and the serial number above 2.

The diagnosis-function and the diagnosis-screen can be activated with the key F3 on this page (see below). It will give you information about which modules are configured and which are really plugged:



1	Status of the listed module. If a module is plugged incorrectly or missing the whole line is highlighted with red back-color. The following stati are possible: • **Missing** .. module is configured but not connected • **Not. conf.** .. the connected module is not configured • **OK** .. module is configured and at its correct position • **Wrong** .. wrong module connected
2	Routing to the module. Gives the exact routing-path to that module (the last number is always the node-number of the module).
3	Name of the configured module
4	Name of the plugged (connected) module

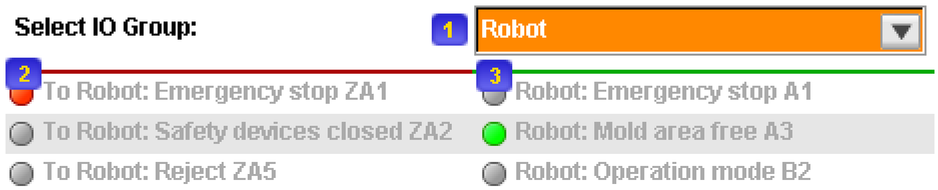
The function-keys (F1-F6) are immediatly visible once you change to the IO-Browser-page:



1	Select next module in list
2	Select previous module in list
3	Open diagnosis-screen
4	Reload the actual IO-configuration from the PLC. A confirmation dialog will appear after you pressed this button. Reloading the IO-configuration is normally not necessary unless it was changed by an external source.

3.9.4 IO Monitor

On this page a overview of all IO-datapoints is given.
Unlike the IO-Browser (see Pages >> Settings >> IO-Browser) where only the actually assigned IO-datapoints can be seen, here all the IOs for certain functional groups are displayed.



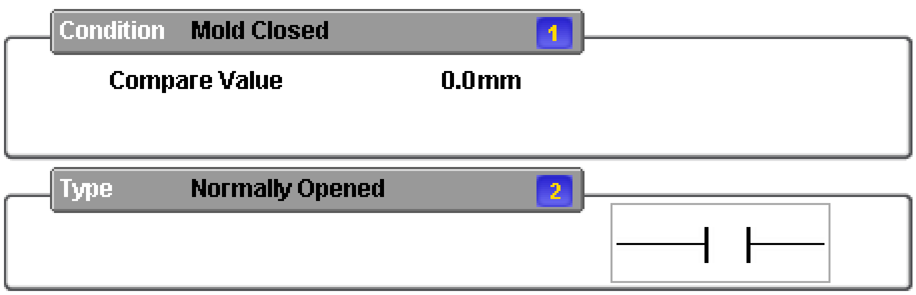
1	Here the functional group can be selected, for which all related IO-datapoints are displayed. The following groups can be selected: • **Hydraulic Main** • **Hydraulic Aux** • **Endswitches** • **Motor, Lubrication** • **General** • **Safety Gate** • **Temperature Cylinder** • **Temperature Mold 1** • **Temperature Mold 2** • **Robot** • **Cores** • **Jog Buttons** • **Free Programmable**
2	Outputs are displayes in red color. For digital outputs a LED-icon is displayed that is red when the output is on (HIGH) or grey if it is off (LOW). For analog outputs the actual signal is shown in red letters. The datapoint name is shon in grey (like in the example) when the IO-datapoint is not connected (not assigned to a physical IO-point) or black if it is actually assigned to a IO-module.
3	Outputs are displayes in green color. For digital outputs a LED-icon is displayed that is green when the input is active (HIGH) or grey if it is inactive (LOW). For analog inputs the actual signal is shown in green letters. The datapoint name is shon in grey (like in the example) when the IO-datapoint is not connected (not assigned to a physical IO-point) or black if it is actually assigned to a IO-module.

3.9.5 Free Prog. Outputs

On this page the free programmable outputs can be configured. The configuration on this page is stored in the recipe-data and can be changed by the operator of the machine.
Up to 4 outputs can be configured here.

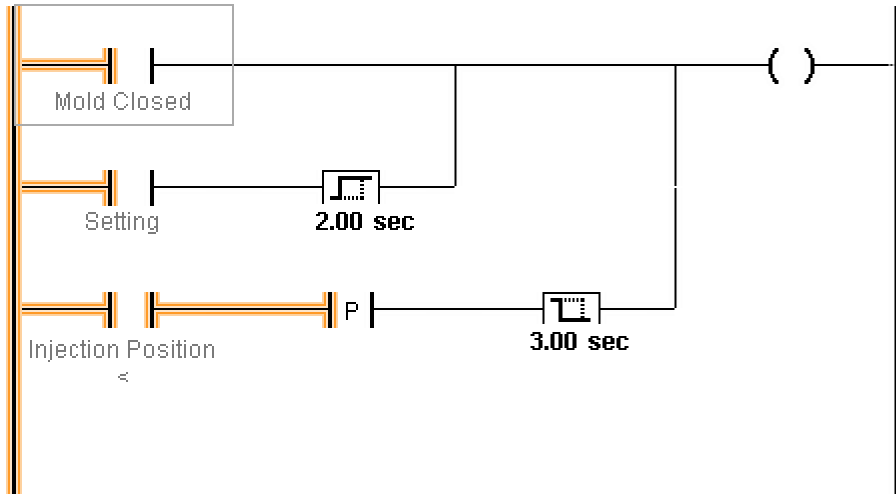
1	The LED-icon is showing the actual status of the selected free programmable output (grey = LOW, red = HIGH).
2	With this dropdown you can select the free programmable output you want to edit. In the list the number of the output is shown (e.g. "#1:") and maybe the description text for the output (if a text was assigned).
3	With this dropdown you can select whether the output is enabled ("on") or disabled ("off"). If it is disabled than the output is always LOW and the logic is not executed. If it is enabled than the output is set according to the programmed logic.
4	Here you can enter a description text for the output. This text will appear everywhere the output is used (e.g. in IO-list etc.).

In the following section information about the actual selected step in the ladder logic is displayed. Depending on the selected step this information may vary!

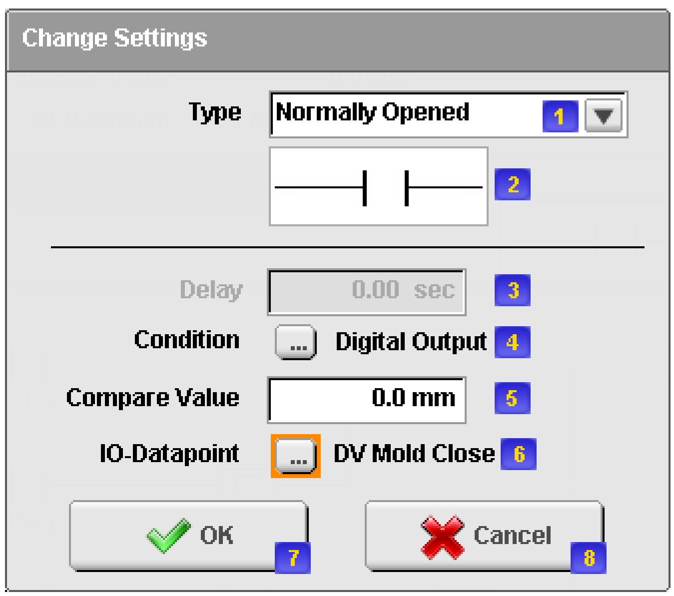


1	Information about the condition used in the selected ladder-step. In the top bar the type of condition is displayed. In the field below the compare value or the IO-datapoint is displayed if necessary for the selected step.
2	Information about the logic used in the selected ladder-step. In the top bar the text for the used logic is displayed. In the field below the icon used is displayed. If necessary also the delay-time for the step is displayed here.

In the ladder-logic different steps can be linked using different logical connection.
You can navigate through the logic using the normal cursor-keys. The actual cursor-position is displayed by a thin rectangular around the selected step. At first this rectangular is grey (inactive) as the focus is on the setting-inputs (see above). Once you move the focus down (cursor-key down) than the rectangular turns red (gets active) and the function keys (see below) are displayed. You can than navigate through the steps. If your are in the top-line of the logic and move the focus further up (cursor-key up) then the setting-inputs get active again and the rectangular turns grey again (function keys will disapear again).
In the ladder-display icons for the used logic are displayed. If necessary the used condition or the set delay-time is displayed below the icon.
If the output is enabled than the signal-status is displayed in the logic using a orange background (signal = HIGH) for all the symbols and connections. With this power-flow you can monitor the exact function of the logic.
The last column in the ladder-logic is reserved for defining the type of output (direct, indirect, set, reset).



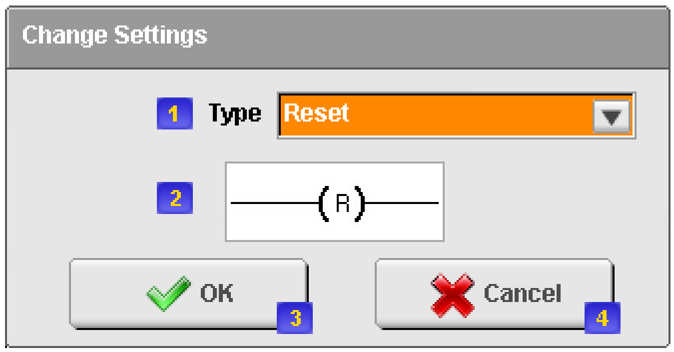
When you decide to insert a new step (see description of function keys further below) in one of the first three columns (logical connection) then the following dialog will appear:



1	Here you can select the type of logical connection that should be inserted (see below for list of possible connections).
2	Here the icon for the selected logical connection is displayed
3	Here the delay time can be entered if a according logical connection (On-Delay or Off-Delay) is selected.
4	For "Normally Opened"- and "Normally Closed"-steps you can select the used condition here. This condition defines whether the contact is closed or not.
5	Depending on the condition that you have chosen you can enter the compare-value here.
6	If a condition is chosen that need an IO-datapoint you can select this datapoint here.

7	When all the settings are okay and you want to insert the step at the actual position you have to press this soft-button.
8	When you do not want to insert the new step you can cancel the operation by pressing this soft-button.

When you decide to insert a new step (see description of function keys further below) in the last column (output) then the following dialog will appear:



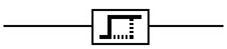
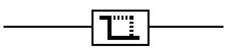
1	Here you can select the type of output you want to set (see below for list of possible outputs).
2	Here the icon for the selected output is displayed
3	When all the settings are okay and you want to insert the step at the actual position you have to press this soft-button.
4	When you do not want to insert the new step you can cancel the operation by pressing this soft-button.

The following function keys will appear automatically once you have moved the focus to the ladder-logic:

1	Make or remove the vertical connection to the higher layer after the selected step.
2	Insert a link (connection without logical function) at the current position.
3	Insert a new step at the current position. After pressing this key the insert-dialog (see above) will appear.
4	Remove the step at the current position. The field will be empty after pressing this key.

The following logical connections may be inserted:

	Link. The status of the input will be passed to the output without any logical connection.

—| |—	Normally Opened Contact. When the assigned condition is TRUE than the status of the input will be passed to the output. If the condition is FALSE than the output-status is always LOW.
—|/|—	Normally Closed Contact. When the assigned conditions is TRUE than the output-status is always LOW. If it is FALSE than the status of the input will be passed to the output.
	On-Delay. When the status on the input turns from LOW to HIGH this change is delayed on the output for the set delay-time. When the input turns from HIGH to LOW this change is passed to the output immediately. No condition is used for this step.
	Off-Delay. When the status on the input turns from HIGH to LOW this change is delayed on the output for the set delay-time. When the input turns from LOW to HIGH this change is passed to the output immediately. No condition is used for this step.
—|P|—	Positive Edge. The output status of this step is HIGH for one cycle (2ms) when a positive edge (change from LOW to HIGH) occurs on the input of this step.
—|N|—	Negative Edge. The output status of this step is HIGH for one cycle (2ms) when a negative edge (change from HIGH to LOW) occurs on the input of this step.

The following type of outputs can be used:

—( )—	Direct. The status of the input of this symbol is passed directly to the output.
—(/)—	Inverted. The status of the input is inverted and than passed to the output (e.g. if input is LOW the output is set to HIGH).
—(S)—	Set. If the status on the input of this symbol is HIGH than the output is set to HIGH. When the status of the input returns to LOW the output remains HIGH. The status of the output can only be set to LOW again by the output-type "Reset" (see below).
—(R)—	Reset. If the status on the input of this symbol is HIGH than the output is set to LOW. When the status of the input returns to LOW the output remains LOW. The status of the output can only be set to HIGH again by the output-type "Set" (see above).

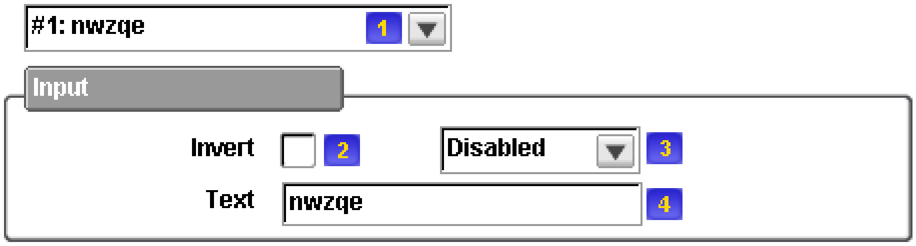
The following conditions may be used for the logical connections:

Mold	• **Mold Opened.** TRUE if mold is at or higher open position. • **Mold Closed.** TRUE if mold is closed and locked. • **Mold Touch.** TRUE if mold position is smaller than mold lock start position. • **Mold Position >.** TRUE if mold position is bigger than given compare position. • **Mold Position <.** TRUE if mold position is smaller than given compare position. • **Mold Closing.** TRUE if mold close movement is active. • **Mold Opening.** TRU if mold open movement is active. • **Mold Protection Phase active.** TRUE if mold close movement is in mold protection phase. • **Mold Locking Phase active.** TRUE if mold locking is active. • **Mold Open Profile Step.** TRUE if mold open move is active and profile-step (velocity/pressure-profile) is identical to compare value. • **Mold Close Profile Step.** TRUE if mold close move is active and profile-step (velocity/pressure-profile) is identical to compare value.
Ejector	• **Ejector is Forward.** TRUE if ejector is in its normal forward position. • **Ejector is Backward.** TRUE if ejector is in its normal backward position. • **Ejector Position >.** TRUE if ejector position is bigger than given compare position. • **Ejector Position <.** TRUE if ejector position is smaller than given compare position. • **Ejector is Forward (Rep.).** TRUE if ejector is in its repetition forward position. • **Ejector is Backward (Rep.).** TRUE if ejector is in its repetition backward position. • **Ejector Moves Forward.** TRUE if ejector forward movement (any) is active. • **Ejector Moves Forward.** TRUE if ejector forward movement (any) is active.
Inj. Unit	• **Inj. Unit is Backward.** TRUE if Inj. Unit is back (retracted position). • **Inj. Unit is Forward.** TRUE if Inj. Unit is forward (touching mold) • **Inj. Unit Moves Backward.** TRUE if Inj. Unit is moving backward. • **Inj. Unit Moves Forward.** TRUE if Inj. Unit is moving forward.
Injection	• **Injection Forward End.** TRUE if injection is forward (after injection) • **Holding Pressure Active.** TRUE if holding pressure phase is active. • **Injection Active.** TRUE if injection movement is active. • **Plastification Active.** TRUE if plastification is active. • **Plastification Finished.** TRUE when plastification is okay (material ready). • **Dec. Before Active.** TRUE if decompression before movement is active. • **Dec. After Active.** TRUE if decompression after movement is active. • **Injection Position >.** TRUE if injection position is bigger than compare position. • **Injection Position <.** TRUE if injection position is smaller than compare position. • **Injection Pressure >.** TRUE if injection pressure is bigger than compare pressure. • **Injection Holding Time >.** TRUE if injection holding time is bigger than compare time.
Cores	• **Core#X is In.** TRUE if core is in. • **Core#X is Out.** TRUE if core is out. • **Core#X Moves In.** TRUE if core in movement is active • **Core#X Moves Out.** TRUE if core out movement is active.
Airblows	• **Airblow#X Active.** TRUE if airblow is active (output HIGH). • **Any Airblow Active** TRUE if any of the airblows is active (any output HIGH).

Modes	• **Manual or Setting** TRUE if machine is in manual or setting mode. • **Manual** TRUE if machine is in manual mode • **Setting** TRUE if machine is in setting mode • **Automatic or Semiautomatic** TRUE if machine is in automatic or semi-automatic mode. • **Automatic** TRUE if machine is in automatic mode • **Semiautomatic** TRUE if machine is in semiautomatic mode • **Calibration** TRUE if machine is in calibration (service) mode • **Waiting for Start Command** TRUE if machine is in automatic or semi-automatic mode and waiting for the start-command. • **Cooling Time Active** TRUE as long as cooling time is active. • **Cooling Finished** TRUE from end of cooling time to start of next cycle.
Alarms	• **Any Alarm not Acknowledged** TRUE if a alarm is pending on the HMI. • **Alarm (Index) Active** TRUE if the alarm with the given index (compare value) is active. • **Alarm (Index) not Acknowledged** TRUE if the alarm with the given index (compare value) is pending on HMI. • **Diagnosis Pending** TRUE if a diagnosis dialog is visible on HMI.
Heating	• **Cylinder Heating On** TRUE if a cylinder (barrel) heating is turned on. • **Mold Heating ON** TRUE if the mold heating is turned on. • **Cylinder Heating Lowering** TRUE if cylinder (barrel) heating is in lowering (standby). • **Mold Heating Lowering** TRUE if the mold heating is in lowering (standby).
Signals	• **Safety Gate Closed** TRUE if (front) safety gate is closed. • **Rear Gate Closed** TRUE if rear gate is closed. • **Nozzle Cover Closed** TRUE if the nozzle cover is closed. • **All Covers Closed** TRUE if all safety gates and covers are closed. • **Emergency Stop** TRUE if the emergency stop is active. • **Reject Active** TRUE if the reject output is active. • **Motor is On** TRUE if the motor is turned on. • **Any Movement Active** TRUE if any axis movement is active • **F7 Pressed** TRUE if the free programmable key F7 is pressed
IO Datapoints	• **Digital Output** TRUE if the selected digital output is HIGH • **Digital Input** TRUE if the selected digital input is HIGH • **Analog Output >=** TRUE if the signal of the selected analog output is bigger than the compare value. • **Analog Input >=** TRUE if the signal of the selected analog input is bigger than the compare value. • **Temperature Input >=** TRUE if the signal of the selected temperature input is bigger than the compare value.

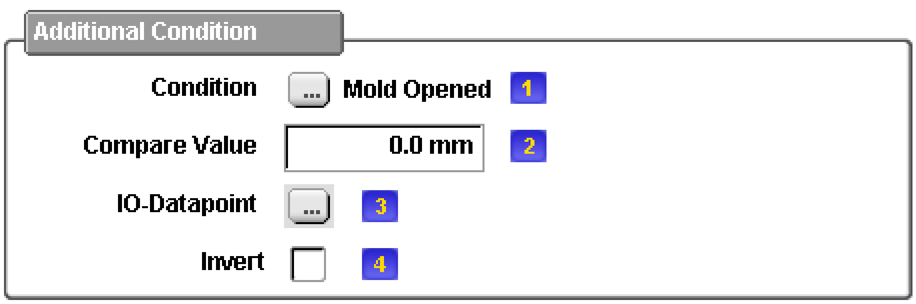
3.9.6 Free Prog. Inputs

On this page the free programmable inputs can be configured. Up to 5 inputs are available for the operator.



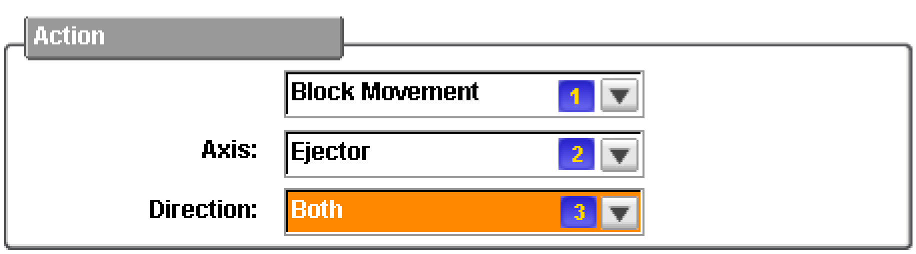
1	With this dropdown you can select the input that you want to edit/view. In the list the number of the input (e.g. "#1:") will appear and maybe the description text (if one was configured).
2	By checking the checkbox the input will be inverted. That means that the configured action (see below) will be executed when the input is LOW. Normally the action is only performed when the input is HIGH.
3	With this dropdown you can enable or disable the whole free programmable input function. If it is "Disabled" than the configured action will never be performed. If it is "Enabled" than the action will be performed when the input has the desired status.
4	Description text for the input. This text will appear everywhere the input is used (e.g. also in the alarm- or diagnosis-message that will be set.

For the input a additional condition can be configured that must be TRUE in order to execute the configured action (see further below).



1	Type of condition (please see Page 820 - Free Prog. Outputs for a list of possible conditions).
2	Depending on the condition that you have chosen you can enter the compare-value here.
3	If a condition is chosen that need an IO-datapoint you can select this datapoint here.
4	With this checkbox you can logically invert the condition (e.g. in the example above the condition is inverted - so it is TRUE when the mold is NOT opened).

For every input you can define a action that should be performed when the input is active and the additional condition is TRUE:



1	With this first dropdown you can select the type of action: • **None:** Nothing will be done • **Set Alarm:** The alarm **20-60/61/62/63/64 Free Input#1/2/3/4/5: *Description Text*** is set • **Set Alarm (Edge):** The alarm **20-60/61/62/63/64 Free Input#1/2/3/4/5: *Description Text*** is set when a positive edge on the input (and condition) occurs • **Block Movement:** A movement is blocked without a diagnosis message • **Block Movement (+Diag):** A movement is blocked and a diagnosis message is given • **End Cycle (Alarm):** The alarm **20-60/61/62/63/64 Free Input#1/2/3/4/5: *Description Text*** is set and the cycle is stopped at the end of the current cycle • **Stop Cycle (Alarm):** The alarm **20-60/61/62/63/64 Free Input#1/2/3/4/5: *Description Text*** is set and the cycle is stopped immediately
2	If a the input should block a movement you can select the axis here that should be blocked.
3	If a the input should block a movement you can select the direction that should be blocked: • **Both:** both direction • **Negative:** only block negative direction • **Positive:** only block positive direction

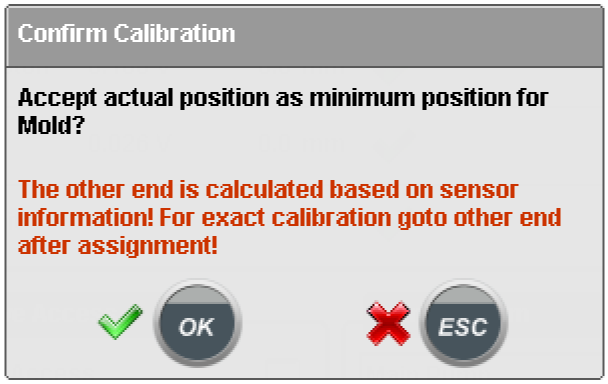
At the bottom of the page the actual status of the input is displayed:

1	Display of the physical status of the IO (status at the connector-pin): Grey = LOW, Green = HIGH
2	Display of the logical status of the free programmable input (considering invert and condition): Grey = LOW, Green = HIGH(active)

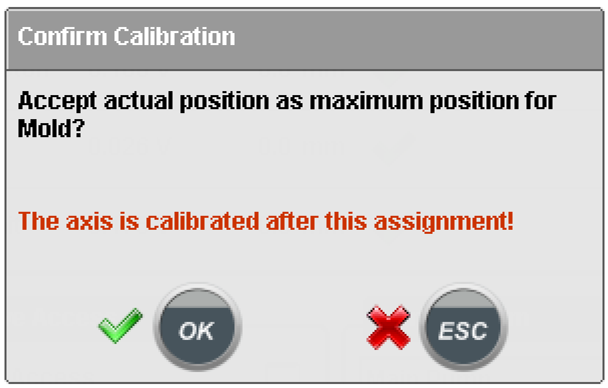
3.9.7 Calibration

On this page the axis can be calibrated and you can directly access the PQ-system outputs.
If you select this page and switch to setting mode than the system will automatically change to calibration mode (LED on setting mode key will blink). Only in this calibration mode the functions on this page are active.

The main purpose of this page is to calibrate the axis when the machine is commissioned or when the position-sensor is changed. The axis are normally moved with setting-mode parameters during calibration but they do not have a target position (that means they are moved until the physical limit is reached).
To calibrate a axis you just have to move it to the physical limit and stay on the movement-jog until the following dialog appears:

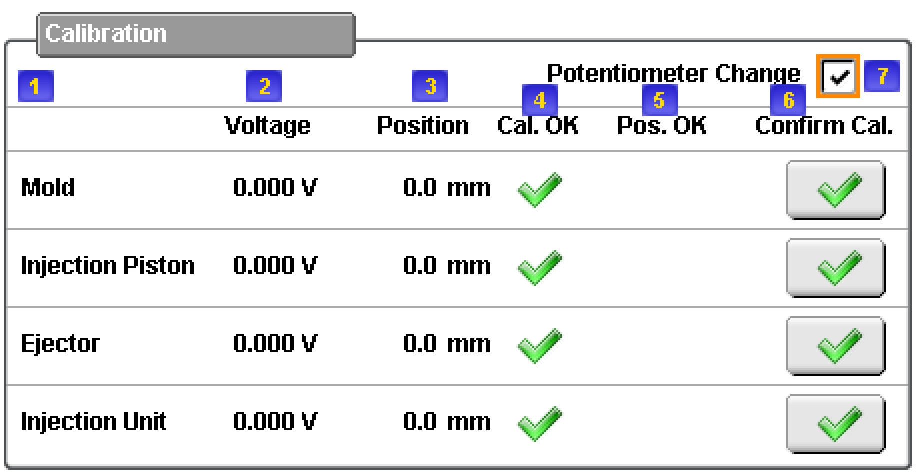


You can either confirm that dialog if you want to calibrate the axis and the information displayed is correct. Or you can cancel it if you don t want to calibrate the axis or the information is wrong.
The text for the calibrated axis and position ("mold" and "minimum" in the example above) depend on the axis movement that you have started. If a potentiometer-length for the axis is entered in the fix-data than the other end is automatically calculated. If not or if you want to do exact calibration you need to move the axis in the opposite direction to the physical limit and keep the jog-key pressed until the next dialog appears:



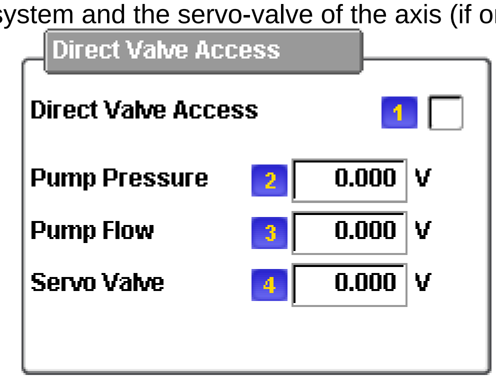
When you confirm that dialog the calibration for that axis is finished.

On the calibration page also a overview of all axis is given:



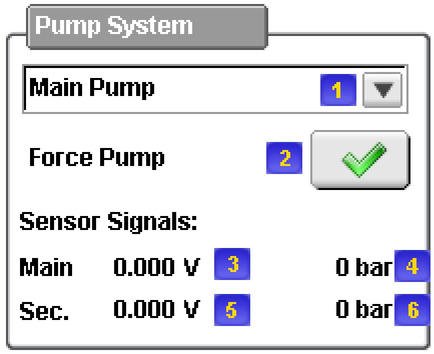
1	Names of axis for which information is displayed
2	Actual input voltage coming from the position sensor.
3	Actual axis position
4	The green OK-sign indicates that the axis is calibrated.
5	This column is only shown when the checkbox "potentiometer change" 7 is checked. A green OK-sign is showing when the voltage coming from the sensor is close to the voltage for min. position (see description for point 7 below).
6	With this button you can confirm that the potentiometer was changed and that the axis is at its minimum position.
7	By checking this checkbox you activate the "potentiometer change"-function. With this function it is possible to change the position sensor without re-calibrating the axis. For this the axis has to be moved to its minimum position (e.g. ejector back) and there the new potentiometer has to be mounted in such a way that the OK-icon 5 will be shown. Once the potentiometer is mounted you have to press the confirm-button 6.

In calibration mode the axis are normally moved with setting mode parameters. Optionally it is possible to activate the "Direct Valve Access". Than it is possible to directly set the outputs to the flow- and pressure-actuator of the PQ-system and the servo-valve of the axis (if one is used).



1	With this checkbox you can activate the "Direct Valve Access"-function
2	Output to the pressure-actuator of the PQ-system
3	Output to the flow-actuator of the PQ-system
4	Output to the servo-valve of the axis.

In calibration mode it is also possible to directly force the outputs to the PQ-system without moving an axis. The pressure- and flow-values from the "Direct Valve Access"-function (see above) are applied to the pump when the forcing is active:

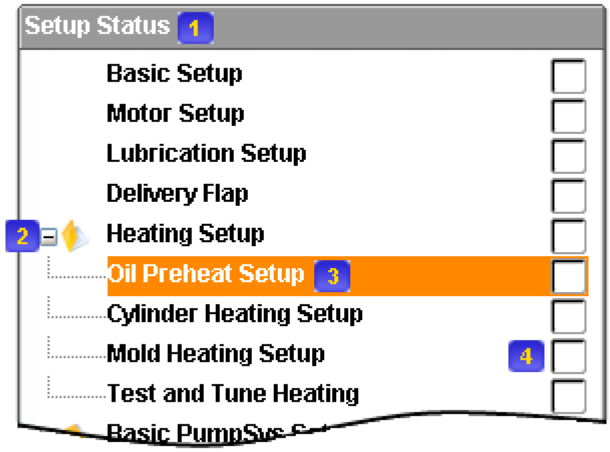


1	Here you can chose the PQ-system that you want to force.
2	With this soft-button you can activate the force of the pump. It has a toggle function. When you press it once the forcing gets active (button appears "pressed"). When you press it again the forcing is disabled (button appears "released").
3	Actual signal from the pressure sensor of the main PQ-system.
4	Actual pressure in the main PQ-system
5	Actual signal from the pressure sensor of the second PQ-system.
6	Actual pressure in the second PQ-system

3.9.8 Setup Wizard

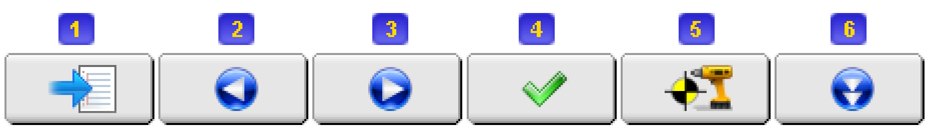
This page is the door way to all the machine configurations and machine manufacturer settings. On this page the setup wizard, a tree overview, of all the configuration pages is shown. Also the function buttons of this page lead to additional configuration pages for the machine manufacturer or B&R. The pages behind the function buttons are described shortly in the following columns because they are not sub pages of a button on the panel, they are sub pages of this page.

F1: Free Programmable outputs: On this page the machine manufacturer can program up to 8 special digital outputs for his machine.
F2: Free Programmable inputs: On this page the machine manufacturer can program up to 5 special digital inputs for his machine.
F3: IO Configurator: On this page all the In- and Outputs can be configured. The Hardware tree can be designed, the variables can be mapped and the configuration of the In- and Outputs can be changed.
F4: B&R Service Info: Information for B&R.
F5: Logbook: Logbook of the CPU.



1	Setup Wizard window. In a tree structure all the page titles are listed.
2	Folder of pages. A lot of pages are grouped in folders. The folder of the screen shot "Heating Setup" contains all the pages necessary for the setup of the heating zones.
3	Focus: The focus can be moved with the arrow buttons. A page or folder can be opened with the right arrow button or with the OK button. The folder can be closed again with the left arrow button or with the OK button.
4	Most setup wizard pages have a finished status. This status can be set on the page and the status is afterwards visible in the wizard. This makes it easier to keep track of the open work during commissioning.

All the setup wizard pages can have the following functions available with F? buttons.



1	**F1:** Back to Setup Wizard. The Setup Wizard page is opened.
2	**F2:** Open previous page.
3	**F3:** Open next page.
4	**F4:** Toggle page status. This button is not available on all setup wizard pages. With it the page status can be set to finished. This status is visible afterwards in the setup wizard. This makes it easier to keep track of the open work during commissioning.
5	**F5:** Axis Test Window. This button is not available on all setup wizard pages, only on some movement related setup pages. After pressing the button the Axis Test Window is opened (page 2210).
6	**F6:** Toggle through Sub-pages. This button is not available on all setup wizard pages. Not all page titles are listed in the setup wizard. Some configuration pages are just sub-pages of setup wizard pages. If this symbol is available then the setup wizard page has a sub-page or even several sub-pages. With the F6 button it is possible wrap around through all the sub-pages.

Part IV

4 04_Pages_Setup

4.1 Accumulator

1 Function Description

The accumulator is a hydraulic accumulator which is used for injection (parallel to the pump or exclusive). The setting for accumulator are only visible if the according option is not disabled!

The whole accumulator-function is only active when it is enabled in the setup-pages and the operator enables fast injection.
The accumulator is controlled by 4 digital outputs: 1 to load (charge) the accumulator (DO#046), 1 to unload to injection piston during injection (DO#047), 1 to unload the accumulator to the tank (DO#048) and 1 to hold the pressure (DO#052, inverted signal to "unload to tank"). Optionally the accumulator can be loaded by a PQ-system (flow and pressure is requested from the PQ-system during loading).

The accumulator is loaded whenever the pressure is not ok (pressure-switch or pressure-sensor), if no PQ-system is used for loading (that means a seperate pump is used to load the accumulator). The loading must be finished until start of injection, otherwise the injection is delayed until the accumulator is fully loaded.
If a PQ-system is used for loading the accumulator you need to define when the accumulator should be loaded (see below)
It is unloaded to the tank whenever the motor is turned off or if the function is disabled.

2 Software Options (SW.ini)

#702	Enable the use of the accumulator. If this option is disabled the setup-pages will not be visible.

3 Setup Parameters

Injection Accumulator (2088)

Section: General

Enable Injection Accumulator	With this checkbox you can enable the accumulator-function on the machine. Only when you enable it here the operator can activate the "Fast Injection"-function (Pages >> Injection >> Pre-Injection / Accu (401), Pages >> Injection >> Switchover (410)).

Inject by Accumulator only	When this checkbox is checked than the injection will happen only by the accumulator (no flow is requested from the PQ-system during injection). Otherwise injection happens with flow from the accumulator and the PQ-system.
Accumulator: Stop Loading when Pump Valve#5 is On	When this checkbox is checked the loading of the accumulator is interrupted when the static pump selection valve#5 is ON. This function can be used to interrupt the loading of the accumulator if certain movements are active or in certain modes (see Setup >> Static Pump-Selection). The pump valve#5 does not need to be mapped to an IO for this function!!
Accumulator: Load Timeout	When the loading of the accumulator does not finish within this time the alarm **20-99 Accu Load Timeout** is set and the loading is stopped (Loading will resume when the alarm is acknowledged).

Section: PQ-System

PQ-System	With the checkbox left of the topic you can enable the use of a PQ-system. With this function it is possible to use a PQ-system (and not a separate static pump) for loading the accumulator. During loading flow and pressure is requested from the assigned PQ-system than. All settings in this section only apply to loading with a PQ-system!
Accumulator: Load Type	The Load Type defines when the accumulator should be loaded (as it cannot be loaded when a axis requests the same PQ-system). Possible Settings are: • **Always in idle time**.. the loading is done every time no axis requests the PQ-system. If the loading is not finished until injection the injection will be delayed until the accumulator is fully loaded • **During Cooling**.. the loading is done only when the cooling time is active. If the loading is not finished until the end of cooling time the alarm **20-98 Accu did not finish loading** is set and the cooling time is extended until the loading is finished. • **During Cool (after Plast.)**.. the loading is done only when the cooling time is active and plastification-process has finished. If the loading is not finished until the end of cooling time the alarm **20-98 Accu did not finish loading** is set and the cooling time is extended until the loading is finished. • **Before Injection**.. the loading is done right before injection. The injection is delayed until the accumulator is fully loaded
Accumulator: Assigned Pump	Here the PQ-system that is used to load the accumulator can be selected

Accumulator: Max. Pressure	This is the max. limit for the loading pressure that can be adjusted by the operator (Pages >> Injection >> Pre-Injection / Accu (401))
Accumulator: Max. Loading Flow	Here you can adjust the max. loading flow for loading the accumulator. The operator can adjust than the real loading flow in % of this value here (Pages >> Injection >> Pre-Injection / Accu (401)).
Accumulator: Flow/Pressure Delay	This is the delay-time for requesting flow and pressure from the PQ-system after the load-valve was set

Section: Pressure

For a description about the sensor-settings please see Setup/AxisSettings-Sensor Scaling.

Pressure	With this checkbox on the left side of the topic you can enable the use of a analog pressure sensor. Otherwise a pressure switch input is used. In the topic also the signal from the sensor is displayed.

Section: Pump-Valves

This settings are for the 5 static pump-selection valves (Setup/Static Pump-Selction)

Mode	Status of the static pump-selection valves during loading of the accumulator (see Setup >> Static Pump-Selection)

4.2 Axis Settings

1 Basic Setup
2 Velocity Setup
3 Pressure Setup
4 General Setup
5 Movement profile
6 Movement hydraulics
7 Sensor Scaling
8 Software Options

1 Basic Setup

The basic setup contains parameters that may be adjusted before the actual commissioning (this data can be evaluated from the mechanical design and the hydraulic plan).

Max. Stroke	The maximum allowed stroke for this axis. This the max. position that the operator can enter for target- or profile-positions for the axis. The min. position is always 0.

Phy. axis stroke	This is the max. mechanical possible stroke of the axis. This setting is important for calibration where the mechanical limits are reached.
Sensor (Pot.) Stroke	Here you should enter the length of the potentiometer (position transducer). With the length of the transducer the calibration can be made easier (only one end has to be calibrated and not both, see Pages >> Service >> Calibration (830)). If you do not know the length of the transducer just enter 0 here (the only effect is that for calibration you have to calibrate both ends of the axis).
Actuator Type	The actuator type of the axis. Defines how the axis is actuated. For most axis only the setting "Hydraulic" is possible. Here are all the possible settings: • **Hydraulic**.. The axis is moved hydraulically. Flow and Pressure are requested from the assigned PQ-system to move the axis. • **Pneumatic**.. The axis is moved pneumatically. For the movement of the axis only the digital outputs are set. • **Electric**.. The axis is moved by servo-drive. Not supported yet. • **Mechanic**.. The axis is moved mechanically and not by the software.
Valve Type	The Valve Type defines the type of valve that is used for the hydraulically actuated axis. Not all axes support all the possible settings. Here is a list of all: • **Servo Valve**.. A servo-valve is used to control the velocity (additional to the flow and pressure requested from the pump). For a servo-valve a 2-point velocity linearization is used. • **Prop. Valve**.. A proportional valve is used to control the velocity (additional to the flow and pressure requested from the pump). For a prop. valve a multi-point velocity-linearization is used • **Pump**.. Only the PQ-system is used to control the velocity. No additional valve.

Sensor Type	The Sensor Type defines what kind of position sensor is used. Possible Settings: • **Potentiometer**.. a potentiometer (analog position transducer) is used to measure the position of the axis • **LimitSwitch**.. limit switches (1 for each direction) are used to detect the target-position for the axis • **LimitSwitch (+Pre)**.. limit switches (1 for each direction) are used to detect the target-position for the axis. Additional limit switches (1 for each direction - each optional) are used to detect a pre-limit position where the axis can be decelerated to a lower velocity. • **LimitSwitch (+IStop)**.. limit switches (1 for each direction) are used to detect the target-position for the axis. Additional limit switches (1 for each direction - each optional) are used to detect a intermediate-stop position • **Pulses**.. Pulses from a digital input (limit-switch input) are used to detect a relative move distance. • **Pressure**.. The target is detected by the axis- or system-pressure sensor. The target is reached when the actual pressure is close to the set-pressure. This only works for movements to the a physical limit. • **Time**.. No sensor is connected. The movement will be time-based only. • **Limit+Time**.. a limit switch is used to detect the negative end. The movement in positive direction is only time-based.
Assigned Pump	The PQ-system that is normally used by the axis can be adjusted here. It can be either one of the 3 standard PQ-systems or one of the 2 pump-combinations.
Fallback Pump	The fallback pump function is optional (checkbox). It works like that: If another axis is moved parallel that uses the same PQ-system or in case of a pump-combination (Setup >> Pump Combination) one of the combined PQ-systems is identical than the axis will use its fallback PQ-system. If axis are moved parallel is already determined before the movement start (so the pump-assignment is not changed during the movement but already at the start). *Example:* Mold: Assigned Pump = "Pump Comb #1" ("Main Pump" + "Second Pump"), Fallback Pump = "Main Pump" Ejector: Assigned Pump = "Second Pump" For sequential ejector movement the clamp will use "Pump Comb #1". For parallel ejector movement the clamp will move only with the PQ-system "Main Pump"!!

Pump Priority	The pump priority handles multiple axis-requests for one PQ-system! If two or more axis are moving parallel using the same PQ-system (or in case of a pump-combination (Setup >> Pump Combination) one of the combined PQ-systems is identical) than the pump priority of the axis defines whether both axis are allowed to move simultaneously (flows are added, max. pressure is used) or if one axis must wait until the other is finished. The pump priority function is disabled when it is set to 0. That means that parallel movements of axis with pump-priority 0 are always accepted. If a pump priority is set (!= 0) than the movement with the higher priority (higher value = higher priority) is done first and the movement with the lower priority has to wait until the other movement is finished. If a movement with a lower priority is active it will be stopped and it will be continued after the movement with the higher priority has finished. *Example:* Mold: Pump Priority = 2, Assigned Pump = "Main Pump", Fallback Pump = Disabled Plastification: Pump Priority = 1, Assigned Pump = "Main Pump", Fallback Pump = Disabled The plastification is set "parallel to mold open". After injection the plastification starts. After the cooling time has expired the clamp open movement will start. If the plastification has not finished at this time than it will be stopped as the mold has a higher priority. The mold will open and when the movement has finished the plastification will be started again.

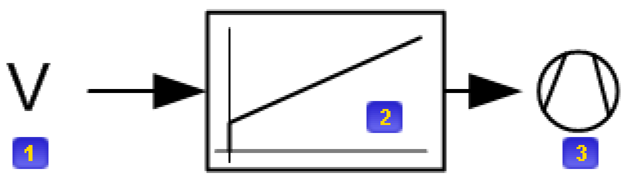
2 Velocity Setup

The velocity setup contains parameters for velocity-limits, pump flow-scaling and servo-valve settings. They can normally only be evaluated at the machine.
The velocity scaling can be evaluated using the axis test-window (Setup >> Axis Test Window)

Veloc. Meas. Filter Time	Filter time for the velocity measurement. Increase this value to reduce the noise of the velocity signal. But do not make it to big otherwise the measurement delay gets to big (check trace). Default = 20ms.
Max. Velocity	The max. velocity for the axis. This is the limit for all inputs on the operator-screens but also used for the pump-flow scaling and the servo-valve scaling.
Max. Pump Flow	Pump Flow Scaling: Pump Flow that is needed to reach the max. velocity of the axis.
Min. Pump Flow	Pump Flow Scaling: Pump Flow to start the movement (Flow request below that value do no lead to a movement of the axis). When the pump is linearized correctly this value is normally 0.

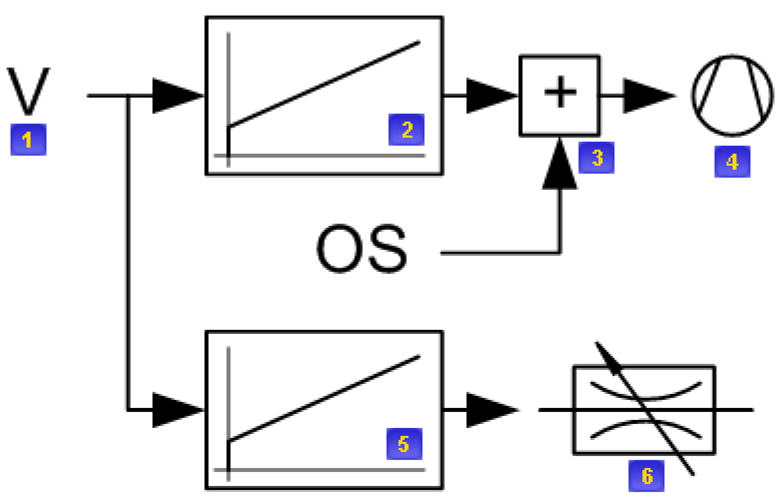
Flow Offset (Servo Valve Operation)	If a servo valve is used to control the axis this value is added to the requested pump flow that is calculated from the pump-flow scaling (see above). This setting is necessary so that the pump is always delivering enough flow so that the fast servo-valve is doing the control and not the slow PQ-system.
Max. Servo Valve Signal	Servo Valve Scaling: This is the servo-valve signal that is necessary to reach the max. axis velocity.
Min. Servo Valve Signal	Servo Valve Scaling: This is the servo-valve signal that is necessary to move the axis (valve-overlap). Signals below that value do not lead to a axis movement (no flow passes through the valve).
Setting Mode Velocity	This is the max. velocity during setting mode. It is used as the limit for the operator-entry for setting mode velocity!

The velocity scaling for using the PQ-system looks like this:



1	The input is the set velocity generated by the profile generator (see Movement Profile below)
2	The velocity is scaled to the necessary pump-flow: *Velocity = 0 ... Flow = Min. PumpFlow* *Velocity = Max. Velocity ... Flow = Max. PumpFlow*
3	The output is the set flow for the assigned PQ-system.

The velocity scaling for using a servo-valve looks like this (if a servo-valve is used the PQ-system still has to deliver a flow):



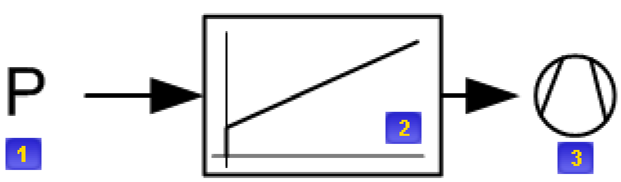
1	The input is the set velocity generated by the profile generator (see Movement Profile below)
2	The velocity is scaled "open loop" to the necessary pump-flow: *Velocity = 0 ... Flow = Min. PumpFlow* *Velocity = Max. Velocity ... Flow = Max. PumpFlow*
3	The "*Flow Offset (Servo Valve Operation)*" is added to the calculated flow.
4	The output-flow is the set flow for the assigned PQ-system
5	The velocity is scaled to the necessary servo-valve signal *Velocity = 0 ... Flow = Min. Servo Valve Signal* *Velocity = Max. Velocity ... Flow = Max. Servo Valve Signal*
6	The resulting signal (voltage) is forwarded to the servo-valve output.

3 Pressure Setup

The pressure-setup contains parameters for pressure-limits and -scaling. The pressure setup can only be done directly at the machine.

Max. Pressure	The max. pressure for the axis. This is the limit for all inputs on the operator-screens and the max. pressure that the axis may requests from the assigned PQ-system.
Pump Pressure Offset	Pressure where the axis starts to move. With this value you could compensate a pressure-drop in the pipes. Default = 0.
Setting Mode Pressure	This is the max. pressure in setting mode. It is used as the limit for the operator-entry for setting mode pressure!

The pressure scaling for each axis looks like this:



1	The input is the set pressure generated by the profile generator (see Movement Profile below)
2	The pressure is scaled to compensate pressure drop in the pipes: *Pressure = 0 ... Pump-Pressure = Pump Pressure Offset* *Pressure = Max. Pressure ... Pump-Pressure = Max. Pressure*
3	The output is the set pressure for the assigned PQ-system

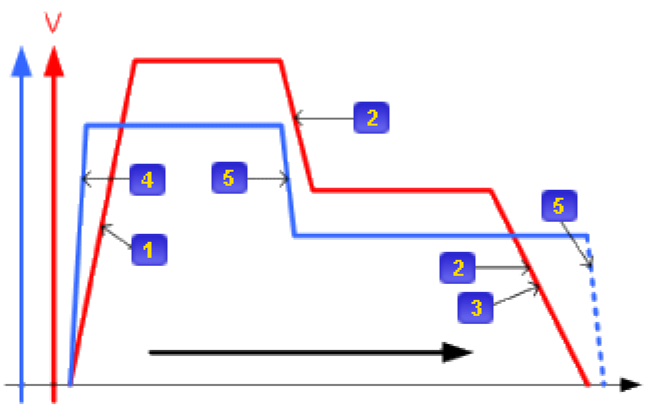
4 General Setup

In the general setup stroke- and time-tolerance are defined.

Stroke tolerance	This is the max. stroke (position) tolerance for the axis status monitoring and the dynamic interlocking.
Time tolerance	If the axis does not reach the target-position but is stopped within the tolerance from the target-position the movement will be stopped after that time (and it is assumed that the axis has reached the target). This settings is only used to guarantee that the machine will go on producing if the target might not be reached fully for some reason. The axis should normally reach its target position and the movement must not be stopped prematurely by this function. This function is disabled if the value is set to 0. Default = 0.

5 Movement profile

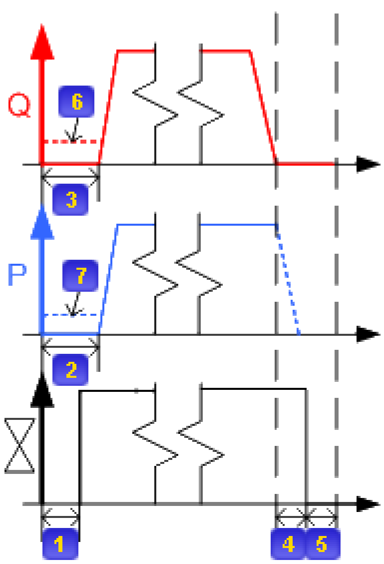
The settings for the movement profile define all acceleration and deceleration times for velocity and pressure.



1	**Acceleration Time**	Velocity acceleration time. This is the time to reach the max. axis velocity. This ramp-setting is considered for the start of the movement and whenever the set-velocity is increased.
2	**Deceleration Time**	Velocity deceleration time. This is the time to go from max. velocity to 0. This ramp-setting is considered whenever the set-velocity is decreased and for reaching the target position. The ramp for reaching the target position is pre-calculated based on the actual axis position - for that ramp also the dead time is considered (see below).
3	**Dead Time Compensation**	Dead time of the hydraulic system. This value needs to be adjusted to reach the target-position exactly. It compensated the slow reaction time of the hydraulic system.

4	**Pressure Acc. Time**	Pressure Acceleration Time. This is the time to reach the max. axis pressure. This ramp-setting is considered for the start of the movement and whenever the set-pressure is increased.
5	**Pressure Dec. Time**	Pressure Deceleration Time. This is the time to go from max. axis pressure to 0. This ramp-setting is considered whenever the set-pressure is decreased and at the end of the movement if a valve off-delay is configured (pressure is ramped down to 0).

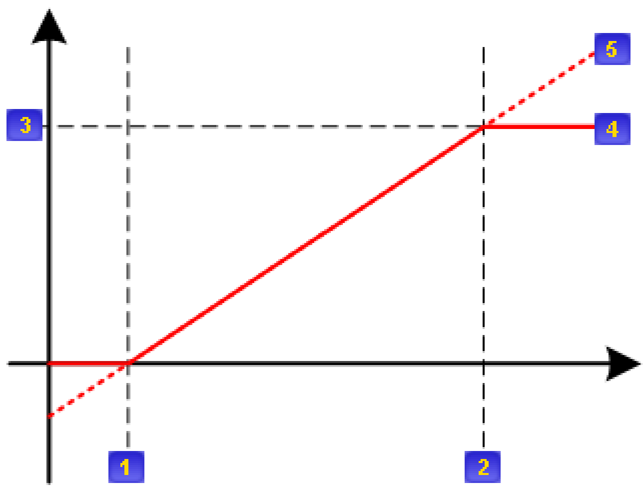
6 Movement hydraulics



1	**Valve On Delay.**	Delay time for turning on the valve outputs (HIGH) after the movement start. Default = 0.
2	**Delay Pressure**	Delay time for the pressure request to the PQ-system after the movement start. The ramp-up to the first set-pressure will start after that delay-time.
3	**Delay Flow**	Delay time for the flow request to the PQ-system after the movement start. The ramp-up to the first set-velocity will start after that delay-time.
4	**Valve Off Delay**	Delay time to turn off the valve-output (LOW) after the movement target has been reached. During that time the pressure-request to the PQ-system is ramped to 0. Default = 0.

5	**Delay Move Off**	Delay after movement finished until the next movement can start. Default = 0.
6	**Flow during Flow Delay**	Flow-request to the PQ-system during flow delay time.
7	**Pressure during Pressure Delay**	Pressure-request to the PQ-system during pressure delay time.

7 Sensor Scaling



1	**Sensor Min. Signal**	Min. Signal from sensor. This is the voltage for a resulting value of 0.
2	**Sensor Max. Signal**	Signal coming from the sensor at max. result value (max. pressure, max. force).
3	**Sensor Max. Pressure / Force**	Max. Pressure or Force measured by the sensor (at max. input signal)
4	**Result value**	The red solid line shows the resulting value when the inputs are limited to the defined range. For this limitation the option "SWcfg.bLimitInputs" must be set.
5	**Result value**	The red doted line shows the resulting value when the input is not limited to the defined range. Negative values may be shown if the signal drops the defined min. signal. Values may exceed the max. pressure or force if the input signal goes above the defined max. sensor signal.

8 Software Options

The following options can be adjusted in the file "SW.ini".

SWcfg.AxMovePos[*AX*].bSettingStop	Axis movement in positive direction stops at target position also in setting mode. (Default: No stop, move until physical limit)
SWcfg.AxMoveNeg[*AX*].bSettingStop	Axis movement in negative direction stops at target position also in setting mode. (Default: No stop, move until physical limit)
SWcfg.AxMovePos[*AX*].bJogToggle	The jog for the positive movement has a toggle function (press once -> start move, press again -> stop move) in manual and setting mode.
SWcfg.AxMoveNeg[*AX*].bJogToggle	The jog for the negative movement has a toggle function (press once -> start move, press again -> stop move) in manual and setting mode.
SWcfg.AxMovePos[*AX*].bBypassSG	Allow movement in positive direction with open safety gate.
SWcfg.AxMovePos[*AX*].bBypassSG	Allow movement in negative direction with open safety gate.
SWcfg.AxMovePos[*AX*].bBypassRG	Allow movement in positive direction with open rear (maintenance) gate.
SWcfg.AxMoveNeg[*AX*].bBypassRG	Allow movement in negative directions with open rear (maintenance) gate.
SWcfg.AxMovePos[*AX*]. bCheckBypassKey	Allow bypassing of gates (bBypassSG, bBypassRG) for positive movements only with active bypass key input.
SWcfg.AxMoveNeg[*AX*]. bCheckBypassKey	Allow bypassing of gates (bBypassSG, bBypassRG) for negative movements only with active bypass key input.

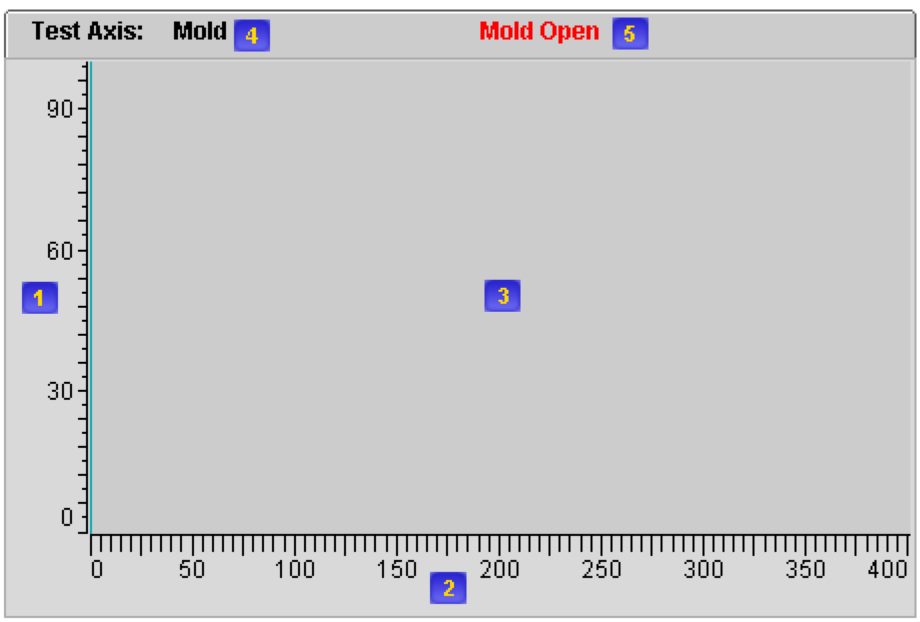
4.3 Axis Test Window

The axis test window can be used to setup the axis flow- and pressure-scaling. It can be reached from any axis setup-page where velocity- or pressure-scaling has to be done (see ...).

When the user changes to this page the mode is automatically changed to "manual". The axis to be tested is automatically set depending from which setup-page the trace-window was opened. But not the normal parameters from the operator-pages are used, instead you can set the movement-parameters (velocity, pressure, target) directly on this page. Also the trace is pre-configured to show the data that you need to trace this axis.

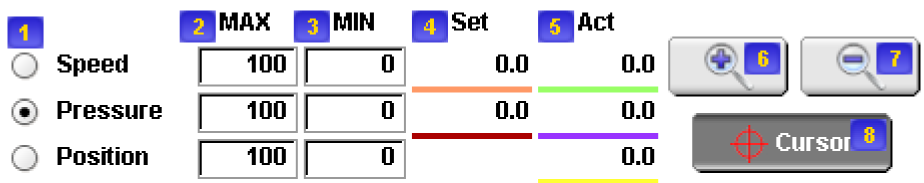
Changing the following values will effect the next movement (new parameters are not accepted during a active movement). The value will also be copied to the normal setup-page if you change it here.

1	Minimum Trace Time. The trace-buffer records data for at least this given time. The actual recording time can be higher as the sample time for taking records can only be multiple of 2ms and the minimum recording time is 0.8 seconds.
2	The radio-buttons define which movement should be traced (positive or negative movement)
3	**Q.Min**. Here the min. pump flow for both directions can be set (see Setup >> AxisSettings >> Velocity: Min. Pump Flow).
4	**Q.Max**. Here the max. pump flow for both directions can be set (see Setup >> AxisSettings >> Velocity: Max. Pump Flow).
5	**V.Max**. Here the max. velocity for both directions can be set (see Setup >> AxisSettings >> Velocity: Max. Velocity).
6	**V.Ovr**. Velocity override for the movement [0..100%]. The movement is normally done with the max. velocity (V.Max). If the axis should move with a lower velocity a override-value can be set in % of the max. velocity.
7	**P.OS**. Here the pump pressure offset for both directions can be set (see Setup >> AxisSettings >> Pressure: Pump Pressure Offset).
8	**P.Max**. Here the max. pressure for both directions can be set (see Setup >> AxisSettings >> Pressure: Max. Pressure).
9	**P.Ovr**. Pressure override for the movement [0..100%]. The movement is normally done with the max. pressure (P.Max). If the axis should move with less pressure you can set a override in % here.
10	**Target**. Target position for each movement.

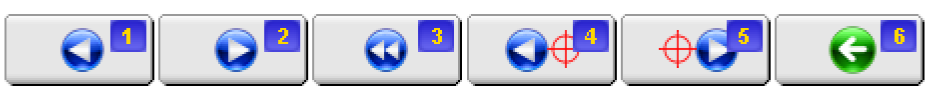


1	Trace Value Scale. Here the scale for the selected parameter (speed, pressure or position - see next picture) is shown.
2	Scale for the x-axis of the graph. Here the index of the samples (0-400) is being displayed.

3	Drawing area. Here the curves for the different values are drawn: • Orange .. set speed • Green .. actual speed • Brown .. set pressure • Violet .. actual pressure • Yellow .. actual position The cursor (red) is displayed as vertical lines. At the intersection with the curves a rectangualar is drawn.
4	Name of axis that is currently tested (for which all settings apply) is displayed here.
5	Display of the actually traced movement.



1	The radio-buttons define which value-scale (Y-axis) is displayed in the trace-graph.
2	Y-axis-scaling for the curves: Max. value
3	Y-axis-scaling for the curves: Min. value
4	Set Value at cursor position.
5	Actual Value at cursor position.
6	Zoom In: Display less data in the trace-graph (stretch time-axis)
7	Zoom Out: Display more data in the trace-graph (compress time-axis)
8	Show / Hide cursor (toggle button).



1	Scroll Left. Display older data in trace-graph.
2	Scroll Right. Display newer data in trace-graph.
3	Disable Scroll. Show oldest data in trace-graph.
4	Move cursor left (toward older data).
5	Move cursor right (toward newer data).
6	Go back to setup-page (stop test window).

4.4 Basic

1 Function Description

On this page the basic machine setup can be made.

2 Software Options (SW.ini)

#714	Defines whether the settings for the PWM-outputs are visible on the setup-pages or not.
#700	Enable the use of the absolute units (volume instead of stroke for injection)......

3 Setup Parameters

Basic Setup (2000)

Section: General

Machine Name	This name is visible on every page in the header. Below the machine manufacturer name and above the recipe data name. The machine name itself is saved in the fix data but also every recipe data file saves the machine name it was created for. By default it is not possible to load recipe data saved with a different Machine Name than the actual active one. The software assumes that recipe data with a different machine name is from a completely different machine and so it cannot be loaded. Optionally this can be disabled though (see Software Setup >> Software Options - Setting #552)
Automatic User Logout Time	The function is disabled if a time of 0 minutes is set. After the set time is expired and there was no button pressed the user level is reset to the default user level. The default user level is the highest user level without password.
Energy Meter: Energy per Pulse	If a energy-meter is connected that supplies a pulse, the energy per pulse can be set here.

Section: Service Intervals

Oil Change Timeout	The function is disabled if a time of 0 minutes is set, this also resets the internal timer. After the set time is expired a Error message is displayed **20-46 Oil change required**. The alarm will disappear after the acknowledge. This alarm will appear only once after a machine is delivered to the customer because the timer will not be reset except somebody restarts the timer. This can be done be disabling and enabling the timer, or by pressing the button "Reset clocks (hour-meters)" on page 2150 "Miscellaneous" (see Setup >> Misecellaneous)
MoldHeight Lubrication Interval	The function is disabled if a time of 0 minutes is set, this also resets the internal timer. After the set time is expired a Error message is displayed **20-19 Screw lubrication timeout**. The alarm will disappear after the acknowledge and the internal timer will be reset and started again.

Section: Service Intervals

Enable Automatic Operation of Safety Gate	This option should be set if a automatic safety gate (electrically or mechanically actuated) is installed. Otherwise the settings for the gate are not visible on the operator-pages (Pages >> Overview >> Production(2) (102)) and certain functions are disabled.
Redundancy Check Time	If a value >0 is entered here a redundancy check for the safety gate (closed) input signals is activated. That means that the all sensor-inputs must indicate the same door status (opened or closed), within the this time. Otherwise the alarm **20-85 Safety gate not fully closed** is set.
Auto Close Timeout	If this parameter is set >0 than the automatic safety gate will be closed at the beginning of the cycle if also the opening is set to happen during the cycle (Pages >> Overview >> Production(2) (102)). Otherwise it is closed only by operator request). If the close-movement does not finish within the set time than the alarm **20-72 Cycle stopped by open gate** will be set.
Mold Mech. Lock Check Time	If this parameter is set >0 than the controller will check if the mold mechanical lock (DI#005) has engadget within this time. If not the alarm **20-104 Mold Mech. Lock Error** will be set

Section: Hardware

Max. Potentiometer Signal Error	If the signal from a axis position transducer (potentiometer) is outside of the calibrated range (deviation bigger than this value) than the alarm **AA-0 *Axis:* Stroke sensor error (out of range)** is set. This check is not done in calibration mode. If this value is set to 0 than this check is disabled.

Max. Pressure Signal Error (Max. Value)	If the signal from a pressure sensor exceeds the configured max. input signal by this value than the alarm **AA-1 *Axis:* Pressure sensor error (out of range)** is set. The checking of the positive sensor-range is disabled when this value is set to 0.
Max. Pressure Signal Error (Min. Value)	If the signal from a pressure sensor deceeds the configured min. input signal by this value than the alarm **AA-1 *Axis:* Pressure sensor error (out of range)** is set. The checking of the negative sensor-range is disabled when this value is set to 0.
Min. Potentiometer Voltage (0/-10V)	This is the minimum input signal from the position transducers. Depending on the used hardware this could be 0 or -10V (-100%). This setting is only important if the length of the potentiometer is known (Setup >> AxisSettings >> Basic) and the 2nd calibration should be calculated during calibration of the axis (Pages >> Service >> Calibration (830))

IO Units (2139)

Section: IO Units

Stroke Inputs	Here it can be decided how all stroke (position) input signals are displayed on the controller: • **-10 to 10Volt** ... Inputs are displayed as voltage (for normal +/-10V analog voltage inputs) • **0 to 20mA** ... Inputs are displayed as current (for 0 to 20mA current inputs) • **0 to 100%** ... Inputs are displayed as % of max. range (for potentiometer inputs)
Pressure Inputs	Here it can be decided how all pressure sensor input signals are displayed on the controller: • **-10 to 10Volt** ... Inputs are displayed as voltage (for normal +/-10V analog voltage inputs) • **0 to 20mA** ... Inputs are displayed as current (for 0 to 20mA current inputs) • **0 to 100%** ... Inputs are displayed as % of max. range (for potentiometer inputs)
Pump Valve Outputs	Here it can be decided how all analog outputs to the PQ-system valves should be displayed: • **-10 to 10Volt** ... Inputs are displayed as voltage (for normal +/-10V analog voltage outputs) • **0 to 20mA** ... Inputs are displayed as current (for 0 to 20mA current outputs) • **0 to 100%** ... Inputs are displayed as % of max. range (for PWM outputs)

Other Analog Outputs	Here it can be decided how all other analog outputs (servo valves) should be displayed: • **-10 to 10Volt** ... Inputs are displayed as voltage (for normal +/-10V analog voltage outputs) • **0 to 20mA** ... Inputs are displayed as current (for 0 to 20mA current outputs) • **0 to 100%** ... Inputs are displayed as % of max. range (for PWM outputs)
PWM Currents	Here it can be decided how all PWM-currents are displayed: • **%** ... Percent of max. configurable module-current (not equal to max. possible current) • **A** ... Real currents on XX419

Section: PWM-Output

Mold: Max. Current to Servo PWM-Output	Max. current for the mold servo valve PWM-output. The configured signal (0..100%) is scaled to this configured current.
Ejector: Max. Current to Servo PWM-Output	Max. current for the ejector servo valve PWM-output. The configured signal (0..100%) is scaled to this configured current.
Injection: Max. Current to Servo PWM-Output	Max. current for the injection servo valve PWM-output. The configured signal (0..100%) is scaled to this configured current.
PWM Frequency	Set frequency for the PWM outputs (see Setup >> PWM Outputs)

Section: Stroke Input Filter

Mold: Stroke Meas. Filter Time	Filter time for the analog input signal **Mold Actual Stroke**. If a filter time > 0 is set, a moving average filter with the according filter time is applied to the position transducer input signal.
Ejector: Stroke Meas. Filter Time	Filter time for the analog input signal **Ejector Actual Stroke**. If a filter time > 0 is set, a moving average filter with the according filter time is applied to the position transducer input signal.
Injection: Stroke Meas. Filter Time	Filter time for the analog input signal **Injection Actual Stroke**. If a filter time > 0 is set, a moving average filter with the according filter time is applied to the position transducer input signal.
Inj. Unit: Stroke Meas. Filter Time	Filter time for the analog input signal **Inj. Unit Actual Stroke** . If a filter time > 0 is set, a moving average filter with the according filter time is applied to the position transducer input signal.

4.5 Cores

1 Function Description

The cores are axis that are not directly part of the machine, but part of the mold.
So during setup you do not know what kind of sensor these axes have or what kind of movement this axes will make. This will be adjusted by the operator (see Pages >> Mold >> Core1 (220)). The SmartMold currently supports up to 6 cores. The setup is for hydraulic movement of the cores - the operator might configure the core to be not hydraulic than the setup-parameters do not apply.

As it is also not clear when the cores will move during the operation of the machine (can be set by the operator, see Pages >> Mold >> Core1 (220)) it is necessary to calculate some interlocking between the cores, clamp and ejector based on the operator-settings - this is the so called dynamic interlocking. This dynamic interlocking takes care that all those axis are not allowed to move differently in manual mode than configured by the operator for the automatic mode. Here is an overview which axes are interlocked:

/	**Mold Position**	**Ejector Position**	**Core Status**
Mold Open/Close	-	X	X(2)
Cores In/Out	X	X	X(1)
Ejector Forward	X(3)	X	X(2)
Ejector Backward	-	-	X(2)

- **-** ... axis is not interlocked
- **X** ... axis is always interlocked
- **X(1)** ... axis is only interlocked if core-status is determined by limit-switches. No interlock for time-based movement of the core.
- **X(2)** ... axis is normally always interlocked. Optionally the locking can be skipped if core-movement was time-based (see 2 Software Options (SW.ini) below)
- **X(3)** ... optional interlock (see Setup >> Ejector)

2 Software Options (SW.ini)

For standard software options please see Setup/AxisSettings->Software Options.

#718	Max. number of cores available (visible) on the controller. Possible settings: 1-6
#724	When this option is enabled it is possible to define the core-order for in- and out-movement without graphic sequence-programming

#513	If this option is enabled than for dyn. interlock with intermediate stops (e.g. of clamp) the position of the axis at the intermediate stop must be within tolerance (Setup >> AxisSettings >> Basic) of the target position for that stop.
#514	Skip dynamic interlocking of clamp and ejector with cores that were moved time-based (no sensor-feedback). See above (1 Function Description) option "X(2)".
#541	Enable the function that the operator can disable the interlocking of the cores (That means that the core can be moved independent of the position of the mold - vice versa the clamp can only be moved when the core is in the correct position - this interlocking remains). See Pages >> Mold >> Core1 (220).
#553	The dynamic (core) interlocking is checked also in setting mode

3 Setup Parameters

Basic Core Setup (2021)

Section: Core Sel. Normal

Assigned Pump System	See Setup >> AxisSettings >> Basic. All cores use the same PQ-system.
Pump Priority	See Setup >> AxisSettings >> Basic. All cores have the same pump-priority.

Section: Pump Valves (Sel. Normal)

This settings are for the 5 static pump-selection valves (Setup >> Static Pump-Selection). All cores have one common pump-selection (for In- and Out-movement).

Section: Core Sel. Other

Only the normal core-selection is supported right now!

Section: Pump-Valves (Sel. Other)

Only the normal core-selection is supported right now!

Core In Setup (2062)

Core Out Setup (2063)

Section: Flow Scaling

You can adjust the flow-scaling for every core individually. As the real velocity is not know during setup of the machine the core velocity is to be adjusted in %.
All settings are described in Setup >> AxisSettings >> Velocity.

Section: Pressure Scaling

You can adjust the pressure-scaling and -limits for every core individually.
All settings are described in Setup >> AxisSettings >> Pressure.

Section: Movement Profile

You can adjust the acceleration time and deceleration time for every core individually.

Acc. Time	The acceleration time for the velocity/flow (see Setup >> AxisSettings >> Movement Profile)
Dec. Time	The deceleration time for the velocity (see Setup >> AxisSettings >> Movement Profile). Is currently only used when stopping the core before the target is reached.

There are nor ramps for the pressure. There is also no dead-time compensation as the core never has a target-position (no actual position available).

Section: Hydraulic Delays

Flow/Press. Delay	Delay for flow- and pressure-request to PQ-system after movement start. For standard axis separate delay-times for flow- and pressure-request can be set (compare Setup >> AxisSettings >> Hydraulics). The directional valve is always turned on immediately (no delay possible).
Off Delay	Delay after the core-movement ends before the next movement can start (compare "Delay Move Off" in Setup >> AxisStettings >> Hydraulics)

4.6 Cycle Init Cond.

1 Function Description

With the cycle init conditions a check of all positions can be enabled before starting the automatic and semi-automatic mode. Also without this check enabled there is a cyclic check active! In Automatic mode the mold will never close with the ejector in forward position, does not matter which cycle init setting is active. The advantage of the cycle init check is that there is a check before even starting the mode. But this also comes with a disadvantage. For example the cycle init check is enabled for the ejector. If now the ejector is not in backward position and the automatic mode is started a diagnosis message will appear "18 Ejector is not retracted". If the same happens with disabled cycle init check, the ejector will move to the backward position automatically and automatic mode will continue. The automatic movement of the ejector makes working of course faster.

Page 2094 Cycle Init Conditions

Core 1..6	Enable cycle init check for the core movements.
Inj. Unit Rotate	Enable cycle init check for the injection unit rotate.
Mold Height	Enable cycle init check for the mold height.
Mold	Enable cycle init check for the mold. Mold must be in backward position to start the automatic mode.
Injection Piston	Enable cycle init check for the injection piston. Injection Piston must be in backward position to start the automatic mode.
Injection Unit	Enable cycle init check for the injection unit. Injection Unit must be in backward position to start the automatic mode.
Ejector	Enable cyle init check for the ejector. Ejector must be retracted to start the automatic mode.

4.7 Delivery Flap

1 Function Description

The delivery flap is used to separate good from bad parts.

Depending whether the part is rejected or not the delivery flap is moved to the back- or front-position. Flaps with or without limit-switches are supported.

2 Software Options (SW.ini)

#701	Only if this option is enabled the delivery flap function is available on the controller.

3 Setup Parameters

Delivery Flap (2115)

Section: General

Enable	Enable the delivery flap function. If it is disabled here the function is not available and the operator-page (Pages >> Ejector >> DeliveryFlap (320)) is hidden.

Use Limit Switches	Enable this function if the delivery flap has limit-switches for front- and back-position.
Outputs Stay On (After Limit)	Enable this function if the digital outputs (directional outputs) should stay on after the limit-switches are reached. If no limit-switches are used the outputs will always stay on until the flap is moved in the opposite direction.
Move Timeout	If during a movement the limit-swich is not reached within this time the alarm **20-92 Delivery flap timeout** is set. This function can be disabled if the value is set to 0.

4.8 Ejector Setup

1 Function Description

The ejector is a hydraulic axis to unmold the part.
It can be moved sequential or parallel to the mold open movement. The movement is interlocked by the mold- and core-position (see also Setup >> Cores).

2 Software Options (SW.ini)

For standard software options please see Setup >> AxisSettings >>Software Options.

#723	Number of ejector forward and backward movement profile steps (see Pages >> Ejector >> Ejector (300))
#512	In semi-automatic mode when Option "Ejector Stay Forward" (Pages >> Ejector >> Ejector (300)) is selected the ejector repetitions are executed at the begin of the new cycle (after cycle start). Normally the repetitions are done at cycle end in this case.
#515	Do not use dynamic interlocking (see Setup >> Cores - option X(3)) for ejector with clamp position. The ejector should always be able to move when the clamp-position is bigger than the given release-position (see Pages >> Ejector >> Ejector (300)).
#542	In manual mode (process mode selected for mold) the ejector should not move when mold open is done.
#557	ejector can be moved parallel to clamp even if it is assigned to the same PQ-system

#558	mode to move ejector manually in semi-automatic mode (see Pages >> Ejector >> Ejector (300)) is availabe

3 Setup Parameters

Basic Ejector Setup (2016)

Section: General

All parameters are described in Setup >> AxisSettings >> Basic.

Section: Safety

Safe Stroke	The safe stroke is added to the minimum ejector release stroke. The minimum release stroke is the ejector-travel (max. forward position minus min. backward position) if position-based movement is done, or the max. ejector stroke (see Setup >> AxisSettings >>Basic) if no position sensor is present of time-based movement is done. The minimum release stroke plus this safe-stroke is the lower limit for the release-stroke input on the operator-page (Pages >> Ejector >> Ejector (300)).

Section: Pump Valves

Settings for the 5 static pump selection valves (see Setup >> Static Pump-Selection).

Ejector Fwd General (2038)

Section: Velocity Scaling

All parameters are described in Setup >> AxisSettings >> Velocity.

Section: Pressure Scaling/Lmits

All parameters are described in Setup >> AxisSettings >> Pressure.

Section: General

All parameters are described in Setup >> AxisSettings >> General.

Section: General

This section is only visible if servo-valve operation is selected for the ejector. All parameters are described in Setup >> AxisSettings >> Velocity.

Ejector Fwd Move Profile (2039)

Section: Movement Profile

All parameters are described in Setup >> AxisSettings >> Movement Profile.

Ejector Fwd Hydraulics (2121)

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Ejector Bwd General (2040)

Section: Velocity Scaling

All parameters are described in Setup >> AxisSettings >> Velocity.

Section: Pressure Scaling/Lmits

All parameters are described in Setup >> AxisSettings >> Pressure.

Section: General

All parameters are described in Setup >> AxisSettings >> General.

Section: General

This section is only visible if servo-valve operation is selected for the ejector. All parameters are described in Setup >> AxisSettings >> Velocity.

Ejector Bwd Move Profile (2041)

Section: Movement Profile

All parameters are described in Setup >> AxisSettings >> Movement Profile.

Ejector Bwd Hydraulics (2122)

Section: Hydraulic Delays

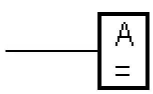
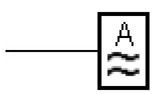
All parameters are described in Setup >> AxisSettings >> Hydraulics.

4.9 Free Prog. IOs

1 Free Programmable Fix Outputs

The free programmable fix outputs work identical to the normal free programmable outputs (Pages >> Service >> Free Prog. Outputs (820)).
The main difference is the storage area. While the normal free programmable outputs can be accessed by the operator and are stored in the recipe-file this fix outputs can only be accessed on the OEM-level and are stored in the fix-data-file.

There is also on additional feature:
For the first 2 outputs also a analog output can be programmed. Additionally to the normal digital output-functions there are two analog output functions:

	**Set Analog**. As long as the input (of that output symbol) is HIGH the analog output is set to the configured value (value is a step-property). When the input is LOW this function is not executed - To set the output to another value this output function has to be programmed a 2nd time.
	**Copy Analog**. As long as the input (of that output symbol) is HIGH the value of a selected analog output (step-property) is copied to the free programmable output. When the input is LOW this function is not executed - To set the output to another value this output function or the function "Set Analog" has to be programmed additionally.

2 Free Programmable Fix Inputs

The free programmable fix inputs work identical to the normal free programmable inputs (Pages >> Service >> Free Prog. Inputs (821)).
The main difference is the storage area. While the normal free programmable inputs can be accessed by the operator and are stored in the recipe-file this fix outputs can only be accessed on the OEM-level and are stored in the fix-data-file.

4.10 Heating

1 Function Description

The heating-controller controls heating zones. A heating zone consists of a heating- and/or cooling-output and a temperature-measurement. The temperature of each zone can be controlled by actuating the heating- and/or cooling-outputs.
The individual zones are combined into groups (cylinder-heating and mold-heating). A heating group is defined as a number of zones having a common purpose and parameters. Certain function can only be activated for a whole group.

Zone Break Detection

The zone-break detection gets active once the control signal exceeds a certain level (Break Detection Output). If the actual temperature does than not rise for a certain value (Break Detection Temp.Diff.) within a certain time (Break Detection Time) the alarm **ZA-2 *Zone*: Heater broken** is set, the zone is turned off and the heating-status goes to "ERROR".

Tolerance Monitoring

Every zone is checked if the temperature is within the tolerance or not. The tolerance-band can be set for every zone (positive and negative tolerance, see Pages >> Heating >> Cylinder Temperature (500)).
When the zone is in tolerance the injection movement are still locked until a certain time (Heating Release Time) has expired.

Output pulse width modulation

The control-signal [0 to 100%] is transformed into a digital output signal that is pulse-width modulated - that means that the on- and off-time for the output corresponds to the control signal value (e.g. control signal 70%: on-time = 70%, off-time = 30%).
The period-time for this modulation can be set for every output (e.g. period-time = 2000ms, control-signal = 70% ... on-time = 1400ms, off-time = 600ms). Additionally a min. pulse- and pause-time can be configured (very short pulses or pauses might not make sens due to the switching-delay of the actuator!).
A pulse with the specified duration min. time is output, and the period is simultaneously extended if an input signal is present, which calculates a pulse that is shorter than the minimum pulse duration. The period is extended in such a manner that the ratio from the switch-on duration to the switch-off duration is equal to the input signal. In the event that an input signal is specified which generates an idle time shorter than the min. time, then a pulse pause with the duration of the min. time is output and the period is extended to reach the correct pulse/pause ratio.

Auto-Tuning

Auto-tuning is available for heat-only and heat-cool-zones. Tuning can only be started if the temperature of all zones is below the set-temperature (minus the min. difference to start the tuning).
Once the auto-tuning is started it is executed as follows:

- **Stabilization** .. During the stabilization-phase the zone is not heated. The tuning function checks whether the temperature is constant. Within the stabilization check-time (1 to 5 minutes, depending on the set zone dead-time) the temperature must be between 0 and 125 degree Celsius and must not rise or fall more than 3 degrees. If one of the criteria is not met the stabilization chech-time restarts.
- **Heat step response** .. After all zones in the group are stabilized they all start to heat with 100%. The tuning is finished once the max. temperature-gain is reached and than the zone starts to heat normally. For heating-only zones the tunig is finished than
- **Heating** .. For heat-cool-zones the autotuning continues with normal heating and stabilizing at the zone set-temperature. The actual temperature must be within +/- 1 degree of the set temperature for the stabilization check-time before the tuning can continue.

- **Cool step response** .. After all zones in the group are stable thy all start to cool with 100%. The tuning is finished once the max. negative temperature gain is reached. Afterwards the zone starts to operate normally again.

During the auto-tuning the PID-parameters (Kp, Tn, Tv) for the controller are evaluated. Additionally the zone dead-time is measured (which is used for the anti-windup-protection).

Anti Windup control

The anti windup-control is used to avoid overshoots of the temperature when the heating is turned on or the set-value is changed.
The anti windup-control is activated as soon as the set-temperature is changing more than TDHeat or TDCool (depending on direction). For the set-value change the PID-control is disabled and the zone will be heated with 100% (or cooled with 100%) until close to the set-temperature (depends on zone dead-time) where the controller is activated again.

2 Software Options (SW.ini)

#705	Enable mold heating on controller
#722	Enable extended mold heating zones

3 Setup Parameters

Cylinder Heating Setup (2005)

Mold Heating Setup (2006)

Section: Group Parameters

All settings in this section refer to all zones within the group.

Max. Temperature	Max. Temperature limit for all zone set-temperature and softstart-temperature (Pages >> Heating >> Cylinder Temperature (500), Pages >> Heating >> Mold Temperature1 (530)).
Min. Temperature	Min. Temperature limit for all zone set-temperature and softstart-temperature (Pages >> Heating >> Cylinder Temperature (500), Pages >> Heating >> Mold Temperature1 (530)).
Heating Switch Off Temperature	If a zone in the group exceeds that temperature it is switched off and the alarm zone-alarm **ZA-3 *Zone:* Maximum temperature exceeded** is set.
Max. Pos. Tolerance	Max. Limit for all positive zone tolerances (tolerance for exceeding set temperature, Pages >> Heating >> Cylinder Temperature (500), Pages >> Heating >> Mold Temperature1 (530))
Max. Neg Tolerance	Max. Limit for all negative zone tolerances (tolerance for deceeding set temperature, Pages >> Heating >> Cylinder Temperature (500), Pages >> Heating >> Mold Temperature1 (530))

Min. Temp. Diff. for Tune	Minimum temperature difference to start the auto tuning. The actual zone temperature (of all zones) must be below the set temperature (Pages >> Heating >> Cylinder Temperature (500), Pages >> Heating >> Mold Temperature1 (530)) minus this value so that auto-tuning can be started. Default-Value: 100
Heating release time	Delay-time after all zones have reached the set-temperature (+/- Tolerance) before the injection is released. This time is needed for sufficient throughout heating of the plastic (as the sensor is normally not mounted in the material directly this time is neede to know that also the material is heated correctly).
Heating sensor Error Time	Delay-Time (Filter-Time) for sensor errors. If a sensor-error (sensor broken or incorrect sensor connected) is detected by the temperature-module than this time has to pass before the alarms **ZA-0** ***Zone:*** **Thermocouple broken** or **ZA-1** ***Zone:*** **Invalid signal from thermocouple** are set and the zone is turned off. During that time the heating is continued with the last valid sensor-signal. This time is needed to suppress short-time errors of the signal.
Break Detection Output	Min. heating output to start zone-break detection (see Function Description)
Break Detection Temp.Diff.	Min. temperature gain within the detection time for the zone-break detection (see Function Description)
Break Detection Time.	Monitoring time for the zone-break detection (see Function Description)

Section: Traverse

Traverse Overtemp. interlocks Injection	When this checkbox is active than the injection is interlocked when the traverese temperature is above the release temperature (Pages >> Heating >> Cylinder Temperature (500))

Cylinder Zone Setup (2022)
Mold Zone Setup (2023)

Section: Zone Settings

Here the settings for each individual zones can be made.

Zone Type	Here the type of zone-control can be selected: • **Off** .. The zone is off (not used) • **Heat** .. The zone supports heating only (PID-control). • **Cool** .. The zone supports cooling only (PID-control). Autotuning is not possible for cool-only zones! • **HeatCool** .. The zone supports heating and cooling (PID-control) • **Cool Hyst.** .. The zone is only used for cooling (no PID-control). The cooling-output is turned on when the actual temperature is above the set-temperature. It is turned off again if the temperature falls below the set-temperature minus the negative tolerance (all settins on Pages >> Heating >> Cylinder Temperature (500)). For the tolerance-monitoring only the exceeding of the set-temperature is checked. • **Measure** .. The zone is not controlled, only the temperature is measured and displayed. The tolerance-monitoring is active. • **Manual** .. The zone output (control signal) is set manually. The tolerance-monitoring is disabled. • **HeatCoolhyst.** .. The zone supports heating (PID-control) and cooling (hysteresis operation). Cooling is turned on when actual temperature is bigger than "set temperature + TDCool". It is turned off when the actual temperature is smaller than "set temperature + (1-Kp(Cool)) * TDCool" - This means if Kp(Cool) is 0 it will be turned off immediately if the temperature falls below "set temperature + TDCool", if Kp(Cool) is 1 or bigger the cooling will be turned off if the temperature is below "set temperature".
Heat PWM - Pulse	Min. Pulse / Pause time for the pulse-width modulation of the heating output.
Heat PWM - Period	Period time for the pulse-width modulation of the heating output.
Cool PWM - Pulse	Min. Pulse / Pause time for the pulse-width modulation of the cooling output.
Cool PWM - Period	Period time for the pulse-width modulation of the cooling output.
Temp Corr.	Correction temperature for the zone. This value is added to the measured temperature before it is displayed or used for control.

Test and Tune Heating (2007)

This page can be used to test the zone-outputs, start the autotuning and view/change the PID-parameters for the zones.

All the PID- and other zone-parameters (Tdead, TDHeat, TDCool) are evaluated during auto-tuning of the zone and should not be changed manually

Section: Settings

Set Temp.	Set Temperature for the Zone
Enable	Turn Zone On/Off
Kp	Proportional gain for heating PID-control (P-part).
Tn	Integral action time for the heating PID-control (I-part).
Tv	Derivative action time for the heating PID-control (D-part).
Tdead	Zone dead time for heating. This parameter is used for the anti-windup during set temperature changes.
TDHeat	Min. set value change to start anti-windup-function for heating (see Function Description)
Kp (Cool)	Proportional gain for cooling PID-control (P-part). For Cooling-hystereses control (Zone Type = HeatCoolhyst.) this factor defines the cooling-off level (range: 0 to 1, see above).
Tn (Cool)	Integral action time for the cooling PID-control (I-part).
Tv (Cool)	Derivative action time for the cooling PID-control (D-part).
Tdead (C.)	Zone dead time for cooling. This parameter is used for the anti-windup during set temperature changes.
TDCool	PID-control: Min. set value change to start anti-windup-function for cooling (see Function Description) Cooling Hysteresis control (Zone Type = HeatCoolhyst.): Temperature-difference to start cooling (act temp. bigger set temp. plus TDCool)

4.11 Hydraulic Safety Valve

1 Function Description

The software does not control the valve directly but only monitors the correct operation of the valve.

The function is only available (and the setup-page is only visible) when the hydraulic safety valve input is connected (assigned to a physical IO).

When the front gate is opened the feedback "Hydraulic Saftey Valve" (DI#326) must be LOW after the given "Lock Delay", otherwise the alarm **20-96 Hydraulic safety malfunction** is set. If the "Lock Delay" is 0, the comparison check with the front safety gate is disabled. This alarm can only be reset when the gate is closed and opened again with correct function of the valve.

When the gate is closed the feedback "Hyd. safety" must be HIGH after the given "Unlock Delay", when the function "Check directly when SG closed" is selected. Otherwise the feedback is only checked when one of the selected movements (list of axes and directions which are blocked by the valve) is active - the "Unlock Delay" is also considered here. If the "Hyd. safety" does not engage correctly when the gate is closed there is no alarm, but the selected movements are blocked with a diagnosis.

2 Setup Parameters

Hyd. Safety Valve (2140)

Hydraulic Safety Valve	Display of the actual digital input status "Hydraulic Saftey Valve" (DI#326) (grey = LOW, green = HIGH)
Safe Valve OK	Display if operation of safety valve was OK (grey = not OK, green = OK)
Check Lock Delay	Delay time to check feedback of hydraulic safety valve after safety gate was opened. If the feedback is not OK after that time the alarm **20-96 Hydraulic safety malfunction** is set
Check Unlock Delay	Delay time to check feedback of hydraulic safety valve after gate was closed or movement was started (see 1 Function Description).
Check directly when SG closed	Option: Check feedback of safety valve directly after gate is closed and do not wait until one of the configured movements (see below) is started.

Section: Check Axis Movements

Here you can configure which axes are locked by the hydraulic safety valve (and if option "Check directly when SG closed" is not enabled for which movements you have to wait until the feedback of the valve is checked). The following settings are possible for every axis:

- **Do not check** .. Axis is not locked by safety valve, feedback is not checked
- **Positive** .. Axis is locked only in positive direction (feedback is only checked when axis is moved positive)
- **Negative** .. Axis is locked only in negative direction (feedback is only checked when axis is moved negative)
- **All directions** .. Axis is locked in both directions (feedback is checked for every movement).

4.12 Injection Control

1 Introduction

On the injection axis the following parameters can be controlled:

- Injection Velocity
- Holdon Pressure
- Screw Speed
- Plastification Back-pressure

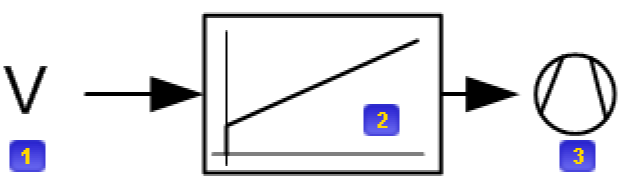
During the setup the commissioning engineer can decide whether this parameters are controlled "open loop" (without actual value feedback) or "closed loop" (with PID-control of actual value).

2 Injection Velocity Control

The injection velocity is either controlled by the PQ-system directly or by a servo-valve. The actual control depends on this type of valve and the type of control itself (closed or open loop):

PQ-system, Open Loop

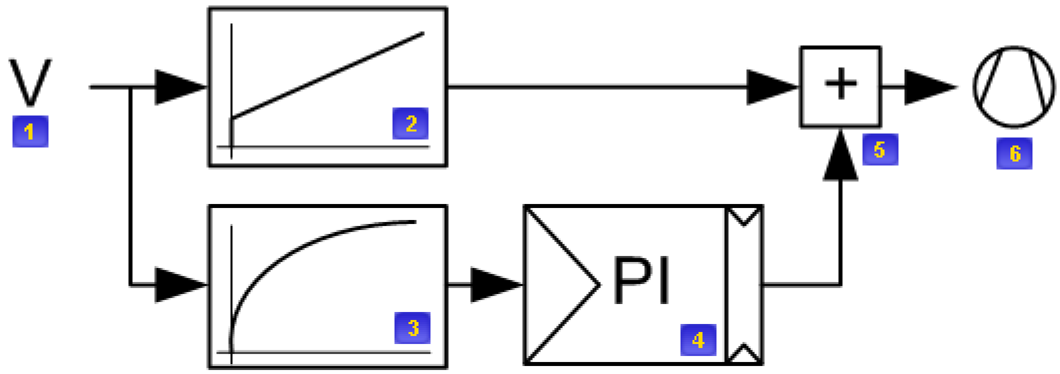
If the velocity is controlled by the PQ-system "Open Loop" the control happens just like on all other axis:



1	The input is the set velocity generated by the profile generator (see Setup >> AxisSettings >> Movement Profile)
2	The velocity is scaled to the necessary pump-flow: *Velocity = 0 ... Flow = Min. PumpFlow* *Velocity = Max. Velocity ... Flow = Max. PumpFlow* See settings at Setup >> AxisSettings >> Velocity
3	The output is the set flow for the assigned PQ-system.

PQ-system, Close Loop

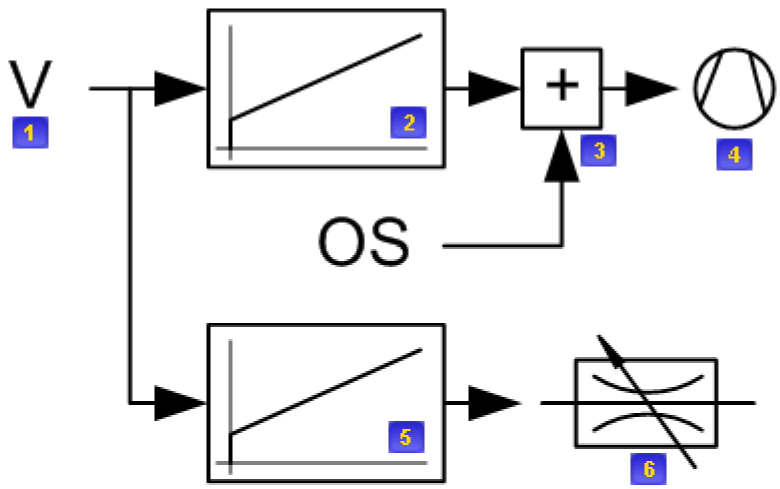
If the velocity is controlled "Closed Loop" the actual velocity signal is used to correct the flow-output to the PQ-system.
The actual velocity signal is slow (measurement delay) so the PID-controller is only used to correct the error. The main velocity control is done "Open Loop" and the signal of the controller can be restricted:



1	The input is the set velocity generated by the profile generator (see Setup >> AxisSettings >> Movement Profile)
2	The velocity is scaled "open loop" to the necessary pump-flow: *Velocity = 0 ... Flow = Min. PumpFlow* *Velocity = Max. Velocity ... Flow = Max. PumpFlow* See settings at Setup >> AxisSettings >> Velocity
3	The set-velocity is delayed to compensate the measurement delay of the actual velocity (delay-time configured internally).
4	The PID-controller compares set- and actual-velocity. The output of the PI-controller is normally limited to a few % of the max. pump flow (see below: Correction Controller (with open-loop part)) to avoid overshoots during set velocity changes.
5	The correction-flow from the PID-controller is added to the normally "open loop" scaled flow.
6	The output is the set flow for the assigned PQ-system

Servo-valve, Open Loop

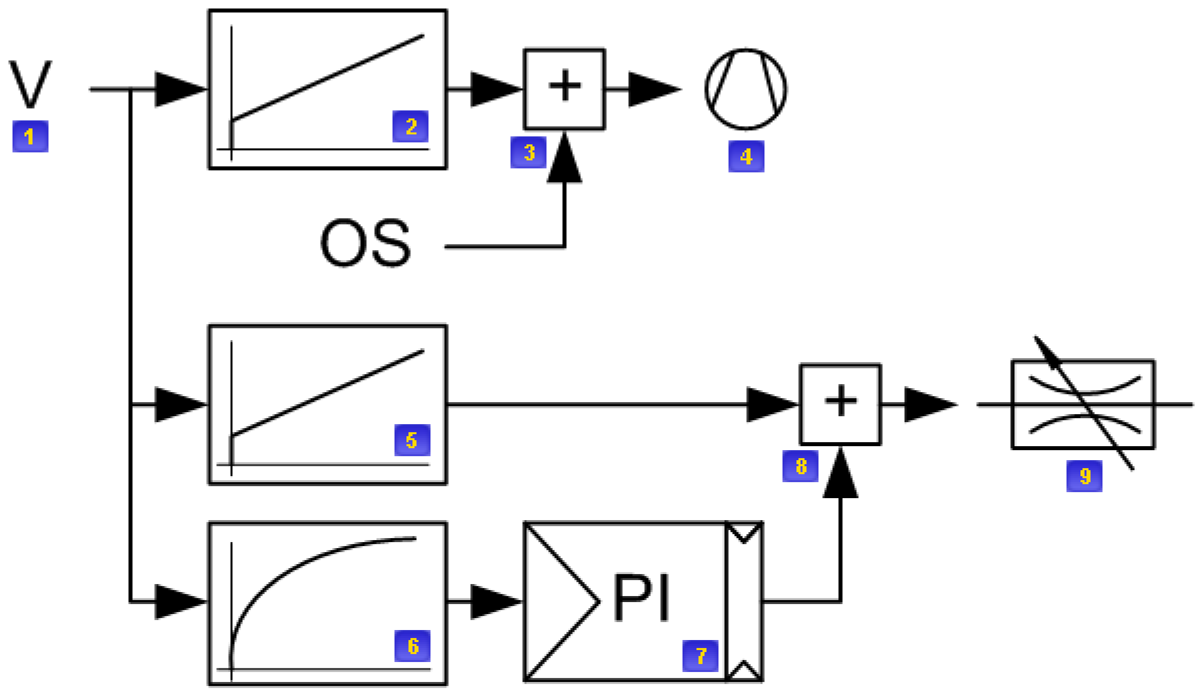
If the velocity is controlled by a servo-valve the PQ-system has to deliver enough flow to not interfere with the servo-control (as the PQ-system reacts slower than the servo-valve it must deliver more flow than necessary).



1	The input is the set velocity generated by the profile generator (see Setup >> AxisSettings >> Movement Profile)
2	The velocity is scaled "open loop" to the necessary pump-flow: *Velocity = 0 ... Flow = Min. PumpFlow* *Velocity = Max. Velocity ... Flow = Max. PumpFlow* See settings at Setup >> AxisSettings >> Velocity
3	The "Flow Offset (Servo Valve Operation)" (see Setup >> AxisSettings >> Velocity) is added to the calculated flow
4	The output-flow is the set flow for the assigned PQ-system
5	The velocity is scaled "open loop" to the necessary servo-valve signal *Velocity = 0 ... Flow = Min. Servo Valve Signal* *Velocity = Max. Velocity ... Flow = Max. Servo Valve Signal* See settings at Setup >> AxisSettings >> Velocity
6	The resulting signal (voltage) is forwarded to the servo-valve output.

Servo-valve, Close Loop

If the velocity is controlled by a servo-valve the PQ-system has to deliver enough flow to not interfere with the servo-control (as the PQ-system reacts slower than the servo-valve it must deliver more flow than necessary).
The actual velocity signal is slow (measurement delay) so the PI-controller is only used to correct the error. The main velocity control is done "Open Loop" the signal of the controller can be restricted:



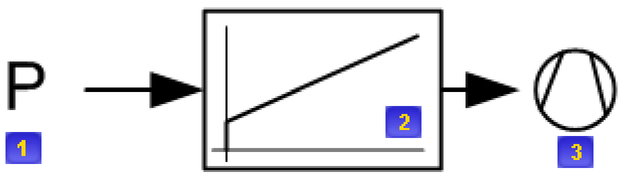
1	The input is the set velocity generated by the profile generator (see Setup >> AxisSettings >> Movement Profile)
2	The velocity is scaled "open loop" to the necessary pump-flow: *Velocity = 0 ... Flow = Min. PumpFlow* *Velocity = Max. Velocity ... Flow = Max. PumpFlow* See settings at Setup >> AxisSettings >> Velocity
3	The "Flow Offset (Servo Valve Operation)" (see Setup >> AxisSettings >> Velocity) is added to the calculated flow
4	The output-flow is the set flow for the assigned PQ-system
5	The velocity is scaled "open loop" to the necessary servo-valve signal *Velocity = 0 ... Flow = Min. Servo Valve Signal* *Velocity = Max. Velocity ... Flow = Max. Servo Valve Signal* See settings at Setup >> AxisSettings >> Velocity
6	The set-velocity is delayed to compensate the measurement delay of the actual velocity (delay-time configured internally).
7	The PID-controller compares set- and actual-velocity. The output of the PI-controller is normally limited to a few % (+/-) of the max. servo valve signal (see below: Correction Controller (with open-loop part)) to avoid overshoots during set velocity changes.
9	The "open loop"-signal and the signal from the controller are added.
9	The resulting signal (voltage) is forwarded to the servo-valve output.

3 Holdon Pressure Control

The holding pressure is either controlled by the PQ-system directly or by a servo-valve. The actual control depends on this type of valve and the type of control itself (closed or open loop). With a servo-valve only "closed loop"-control is possible (the servo-valve only controls the flow directly!):

PQ-system, Open Loop

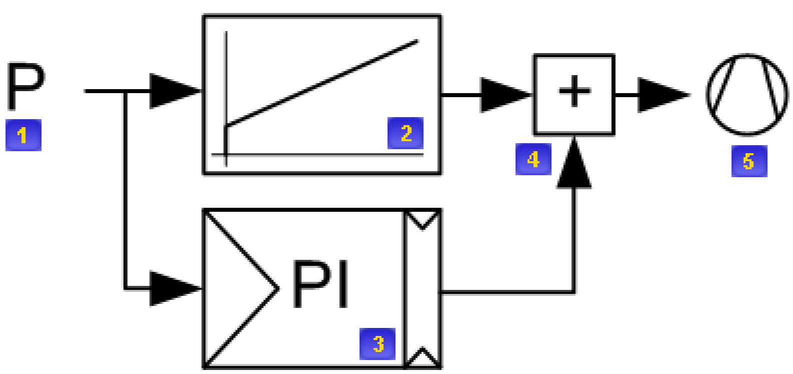
If the pressure is controlled "Open Loop" with the PQ-system the control happens just like on all other axis:



1	The input is the set pressure generated by the profile generator (see Setup >> AxisSettings >> Movement Profile and (see Setup >> Injection))
2	The pressure is scaled to compensate pressure drop in the pipes: *Pressure = 0 ... Pump-Pressure = Pump Pressure Offset* *Pressure = Max. Pressure ... Pump-Pressure = Max. Pressure* See settings at Setup >> AxisSettings >> Pressure
3	The output is the set pressure for the assigned PQ-system

PQ-system, Close Loop

If the pressure is controlled "Closed Loop" the actual pressure signal is used to correct the pressure-output to the PQ-system.
The main pressure control is still done "Open Loop" as this is quite exact (pump-linearization!) and the PI-controller is only used to correct the error (output is restricted):

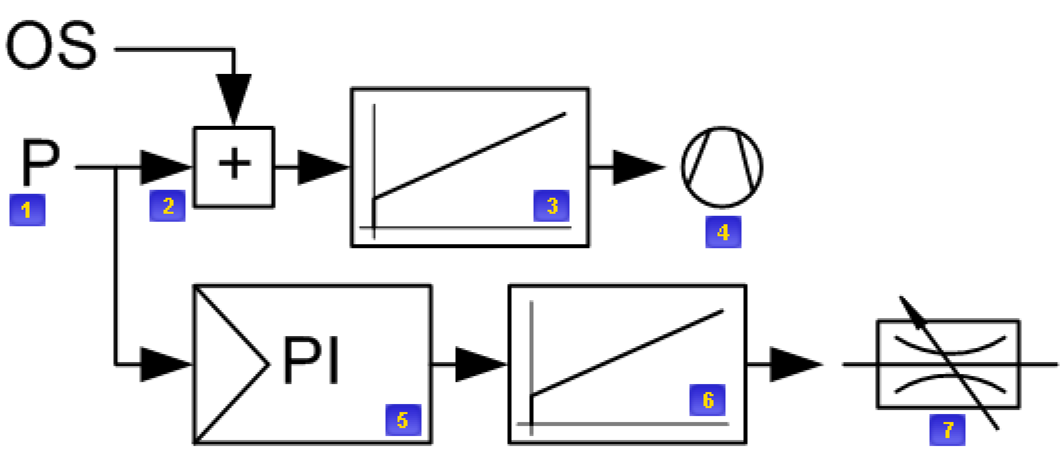


1	The input is the set pressure generated by the profile generator (see Setup >> AxisSettings >> Movement Profile and (see Setup >> Injection))

2	The pressure is scaled to compensate pressure drop in the pipes: *Pressure = 0 ... Pump-Pressure = Pump Pressure Offset* *Pressure = Max. Pressure ... Pump-Pressure = Max. Pressure* See settings at Setup >> AxisSettings >> Pressure
3	The PID-controller compares set- and actual-pressure. The output of the PID-controller is normally limited to a few % of the max. pump pressure (see below: Injection Controllers (2067)) to avoid overshoots during set pressure changes.
4	The correction-pressure from the PID-controller is added to the normally "open loop" scaled pressure (see Correction Controller (with open-loop part))
5	The output is the set pressure for the assigned PQ-system

Servo-valve, Close Loop

If the pressure is controlled by a servo-valve the PQ-system has to limit the pressure high enough to not interfere with the servo-control (as the PQ-system reacts slower than the servo-valve).
The pressure control cannot be done "open loop" (the servo-valve only controls the flow directly), so the controller has to do the full control



1	The input is the set pressure generated by the profile generator (see Setup >> AxisSettings >> Movement Profile and (see Setup >> Injection))
2	The "Pressure Offset during Holding" (Setup >> Injection) is added to the pressure (actually it is added to the max. pressure from the holding profile - which is not correctly displayed in the sketch above).
3	The resulting pressure is scaled to compensate pressure drop in the pipes: *Pressure = 0 ... Pump-Pressure = Pump Pressure Offset* *Pressure = Max. Pressure ... Pump-Pressure = Max. Pressure* See settings at Setup >> AxisSettings >> Pressure
4	The output is the set pressure for the assigned PQ-system
5	The PID-controller compares set- and actual-pressure. The output of the PI-controller is limited to +/-100% (always full control). See Direct control (no open-loop part)

6	The output of the PI-controller is scaled to set servo-valve limits (see Setup >> Injection): *controller = -100% ... Signal = Max. Servo Valve Signal (Pressure)* *controller = 100% ... Signal = Min. Servo Valve Signal (Pressure)*
7	The resulting signal (voltage) is forwarded to the servo-valve output.

4 Screw Speed Control

The screw speed control works identical to the injection velocity control. But only operation with the PQ-system is possible (no servo-valve available).
PQ-system, Open Loop

See Injection Velocity Control - PQ-system, Open Loop.
The according settings are described below in Plastification Controllers (2068)
PQ-system, Close Loop

See Injection Velocity Control - PQ-system, Close Loop.
The according settings are described below in Plastification Controllers (2068)
TODO: external unit!!

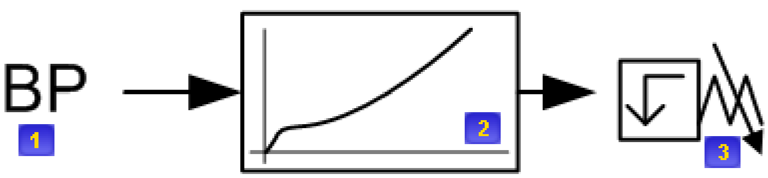
5 Backpressure Control

The backpressure control is used to control the pressure in the injection piston during plastification. This can be done by the following valves:

- Servo Valve ... controls the flow from the piston (pressure control only "closed loop" possible)
- Prop. Valve ... a separate pressure proportional valve is used to control the pressure.
- PQ-system ... the pressure proportional valve from the PQ-system is used to control the pressure (no pressure control for screw-rotation!).

The control with the prop. valve from the PQ-system is identical to the control with the separate prop. valve just another output is used!

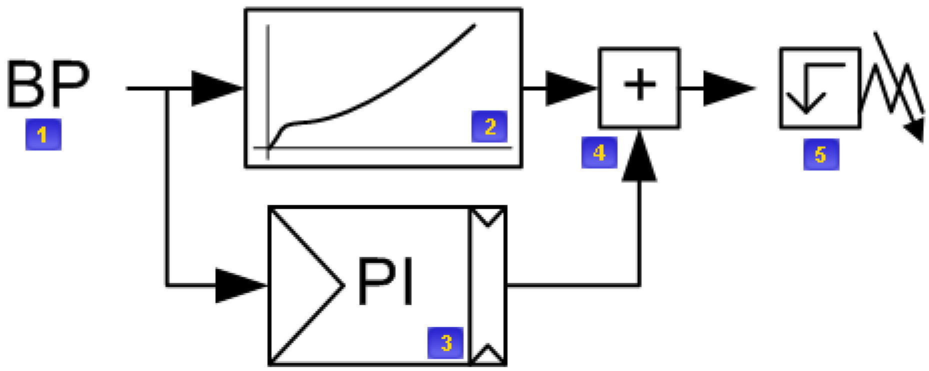
Prop. Valve, Open Loop



1	The input is the set back-pressure generated by the profile generator (see Setup >> AxisSettings >> Movement Profile and Setup >> Injection))
2	The pressure is linearized using a linearization table (see Setup >> Injection)
3	The output-signal is forwarded to the analog output for the prop. valve

Prop. Valve, Close Loop

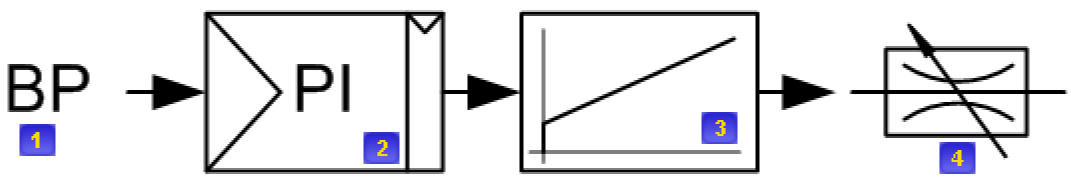
The main pressure control is still done "Open Loop" as this is quite exact (linearization-table) and the PID-controller is only used to correct the error (output is restricted):



1	The input is the set back-pressure generated by the profile generator (see Setup >> AxisSettings >> Movement Profile and (see Setup >> Injection))
2	The pressure is linearized using a linearization table (see Setup >> Injection)
3	The PID-controller compares set- and actual-pressure. The output of the PID-controller is normally limited to a few % of the max. prop. valve signal (see below Correction Controller (with open-loop part)) to avoid overshoots during set pressure changes.
4	The correction-signal from the PID-controller is added to the normally "open loop" scaled signal.
5	The output-signal is forwarded to the analog output for the prop. valve

Servo Valve, Close Loop

The servo valve can only control the flow from the injection piston. The PI-controller has to set the flow in order to control the pressure:



1	The input is the set back-pressure generated by the profile generator (see Setup >> AxisSettings >> Movement Profile and (see Setup >> Injection))
2	The PID-controller compares set- and actual-pressure. The output of the PID-controller is limited to the negative range (0 to -100%) as the injection piston should not go forward during plastification. For setup of the parameters see below Direct control (no open-loop part)
3	The output of the controller is scaled to a signal to the servo valve: *controller = 0% ... Signal = Plast.: Min. Servo Valve Signal* *controller = -100% ... Signal = Plast.: Max. Servo Valve Signal* See Setup >> Injection for this parameters
4	The output-signal is forwarded to the analog output for the servo valve

6 Adjusting controller parameters

Correction Controller (with open-loop part)

The control happens here mostly open loop - the PID-controller only corrects the remaining error. To avoid overshoots during set-value changes the controller output limit should be set as low as possible (just high enough to compensate the error).

Follow the following procedure to set-up the controller-parameters:

- Start-Values: Controller-output-limit = 100%, Kp=1, Tn=0, Td=0
- Do the according process (injection, plastification) and increase Kp until system (controlled value) starts to oscillate (always double the value)
- Decrease Kp by 1/2 from that critical value (where oscillation starts)
- Automatic setup of Tn: Measure the oscillation period time (with high Kp) and set Tn = 0.85 x Tp (=oscillation period time). If system is oscillation increase the value by factor x2
- Manual setup of Tn: Set Tn=1sec and decrease the value until system starts to oscillate - than increase it by factor x2
- Decrease the controller output limit to the lowest value possible (where the error from the open loop part can still be compensated).

Direct control (no open-loop part)

The control happens here with the PID-controller only (no open loop part). The setting for controller output limit has no effect here.

Follow the following procedure to set-up the controller-parameters:

- Start-Values: Kp=1, Tn=0, Td=0
- Do the according process (injection, plastification) and increase Kp until system (controlled value) starts to oscillate (always double the value)
- Decrease Kp by 1/2 from that critical value (where oscillation starts)
- Automatic setup of Tn: Measure the oscillation period time (with high Kp) and set Tn = 0.85 x Tp (=oscillation period time). If system is oscillation increase the value by factor x2
- Manual setup of Tn: Set Tn=1sec and decrease the value until system starts to oscillate - than increase it by factor x2

7 Setup Parameters

Injection Controllers (2067)

Section: Holding Pressure:

Type of Pressure Control	Type of holdon-pressure control: • **Open Loop** .. Control happens open loop (without actual value feedback) • **Closed Loop** .. Control with PI-controller
Pressure Controller Output Limit	Limit for the pressure controller output. This is the max. error-correction the controller does (in % of max. control signal) if the pressure is controlled by the PQ-system, if the control is done by servo-valve this limit has no effect (see 3 Holdon Pressure Control)

Pressure Controller Prop. Gain Kp	Proportional Gain for the holdon-pressure PID-controller (P-part). *Unit*: %/bar. That means Kp is defining the output (% of the output range - which is either the voltage-range for the servo-valve, or the pressure-range for the pump) per bar pressure deviation. *Default (Starting) Value*: 1. During setup you should set this value as high as possible. Once the system starts to oscillate you need to reduce the KP-value by a 1/3.
Pressure Controller Integral Action Time Tn	Integral Action time for the holdon-pressure PID-controller (I-part). *Unit*: Seconds. During setup start without a integral part (Tn=0). For setting up the I-part start with a big integral action time (>1 second) and than reduce it until you get the desired result.
Pressure Controller Filter Time Tf	Filter Time for the D-part of the PID-controller (D-part). *Unit*: Seconds. The D-part is normally not used (to complicate to set up).
Pressure Controller Derivative Action Time Td	Filter Time for the D-part of the PID-controller (D-part). *Unit*: Seconds. The D-part is normally not used (to complicate to set up).

Section: Inject Velocity:

Type of Velocity Control	Type of injection velocity control: • **Open Loop** .. Control happens open loop (without actual value feedback) • **Closed Loop** .. Control with PI-controller
Velocity Controller Output Limit	Limit for the velocity controller output. This is the max. error-correction the controller does (in % of the output range). See above 2 Injection Velocity Control
Velocity Controller Prop. Gain Kp	Proportional Gain for the velocity PID-controller (P-part). *Unit*: %/%. That means Kp is defining the output (% of the output range - which is either the voltage-range for the servo-valve, or the flow-range for the pump) per % (of input range) control deviation. *Default (Starting) Value*: 1. During setup you should set this value as high as possible. Once the system starts to oscillate you need to reduce the KP-value by a 1/3.
Velocity Controller Integral Action Time Tn	Integral Action time for the velocity PID-controller (I-part). *Unit*: Seconds. *Default (Starting) Value*: 0. During setup start without a integral part (Tn=0). For setting up the I-part start with a big integral action time (>1 second) and than reduce it until you get the desired result.
Velocity Controller Filter Time Tf	Filter Time for the D-part of the velocity PID-controller (D-part). *Unit*: Seconds. *Default (Starting) Value*: 0. The D-part is normally not used (to complicate to set up).

Velocity Controller Derivative Action Time Td	Filter Time for the D-part of the velocity PID-controller (D-part). *Unit*: Seconds. *Default (Starting) Value*: 0. The D-part is normally not used (to complicate to set up).

Plastification Controllers (2068)

Section: Back Pressure

Type of Back Pressure Control	Type of backpressure control: • **Open Loop** .. Control happens open loop (without actual value feedback) • **Closed Loop** .. Control with PI-controller
Pressure Controller Output Limit	Limit for the backpressure controller output. This is the max. error-correction the controller does (in % of max. control signal). See above 5 Backpressure Control
Pressure Controller Prop. Gain Kp	Proportional Gain for the backpressure PID-controller (P-part). *Unit*: %/%. That means Kp is defining the output (% of the output range - which is the voltage range of the servo-/prop-valve) per % (of input range = max. back pressure) control deviation. *Default (Starting) Value*: 1. During setup you should set this value as high as possible. Once the system starts to oscillate you need to reduce the KP-value by a 1/3.
Pressure Controller Integral Action Time Tn	Integral Action time for the backpressure PID-controller (I-part). *Unit*: Seconds. *Default (Starting) Value*: 0. During setup start without a integral part (Tn=0). For setting up the I-part start with a big integral action time (>1 second) and than reduce it until you get the desired result.
Pressure Controller Filter Time Tf	Filter Time for the D-part of the backpressure PID-controller (D-part). *Unit*: Seconds. *Default (Starting) Value*: 0. The D-part is normally not used (to complicate to set up).

Pressure Controller Derivative Action Time Td	Filter Time for the D-part of the backpressure PID-controller (D-part). *Unit*: Seconds. *Default (Starting) Value*: 0. The D-part is normally not used (to complicate to set up).

Section: Plast. Speed

Type of Rotation Speed Control	Type of screw speed control: • **Open Loop** .. Control happens open loop (without actual value feedback) • **Closed Loop** .. Control with PI-controller
Speed Controller Output Limit	Limit for the speed controller output. This is the max. error-correction the controller does (in % of max. control signal). See above 4 Screw Speed Control
Speed Controller Prop. Gain Kp	Proportional Gain for the screw speed PID-controller (P-part). *Unit*: %/%. That means Kp is defining the output (% of the output range = max. pump flow) per % (of input range = max. rotation speed) control deviation. *Default (Starting) Value*: 1. During setup you should set this value as high as possible. Once the system starts to oscillate you need to reduce the KP-value by a 1/3.
Speed Controller Integral Action Time Tn	Integral Action time for the screw-speed PID-controller (I-part). *Unit*: Seconds. *Default (Starting) Value*: 0. During setup start without a integral part (Tn=0). For setting up the I-part start with a big integral action time (>1 second) and than reduce it until you get the desired result.
Speed Controller Filter Time Tf	Filter Time for the D-part of the screw speed PID-controller (D-part). *Unit*: Seconds. *Default (Starting) Value*: 0. The D-part is normally not used (to complicate to set up).
Speed Controller Derivative Action Time Td	Filter Time for the D-part of the screw speed PID-controller (D-part). *Unit*: Seconds. *Default (Starting) Value*: 0. The D-part is normally not used (to complicate to set up).

4.13 Injection Setup

1 Function Description

This document describes the setup for injection, decompression and plastification movement.
The injection movement is split up in the movement phase and the hold pressure phase. So beside the velocity- also the pressure-control has to be configured.
For the plastification the screw rotation and the backpressure control has to be configured.
The decompression is a simple backward movement. Decompression before and after use the same configuration.

2 Software Options (SW.ini)

For standard software options please see Setup >> AxisSettings >> Software Options.

#709	Enable the use (by operator) of pre-injection function (Pages >> Injection >> Pre-Injection / Accu (401))
#506	The stroke entered by the operator for decompression before is relative (Pages >> Injection >> Plastification (420)). That means the target for the decompression before movement is the actual axis position plus the entered value.
#507	The stroke entered by the operator for decompression after is relative (Pages >> Injection >> Plastification (420)). That means the target for the decompression after movement is the dosage (plastification target) plus the entered value.
#508	On the operator-page for plastification (Pages >> Injection >> Plastification (420)) multiple plastification (screw) pressures are displayed instead of a single one
#509	The last position in the injection profile on the operator page (Pages >> Injection >> Injection (400)) is not the target position but the switchover-position (to holding phase)
#510	On the operator-page for plastification (Pages >> Injection >> Plastification (420)) the "No Backpressure Valve"-function is displayed.

#511	The switchover to holding is not supported by the hardware
#520	The plastification Key (Operation >> Control Unit) is also used for decompression after when the dosage is already reached.
#518	The period-time measurement for the rotation pulse is done internally (in the task) and not exactly on the module directly. This function can be used if the input is bouncing and this bouncing leads to incorrect measurements on the module directly.
#528	1: Cushion is measured as position after holdon pressure finished, 0: Cushion is measured as minimal position during holdon pressure

3 Setup Parameters

Basic Injection Setup (2018)

Section: General:

For all parameters not described here please see Setup >> AxisSettings >> Basic.

Enable Use of Regenerative Valve	When this checkbox is checked the use of a regenerative valve is supported. The operator can than enable the fast injection on the operator pages (Pages >> Injection >> Switchover (410)) and than the output for the regenerative valve is set during the injection movement.
Pressure Ratio	This is the relation between the specific pressure in the barrel (plastic pressure) and the hydraulic pressure in the injection hydraulic cylinder. All the operator settings and actual displays can optionally (...) show the specific plastic pressure. All the operator-settings are stored as specific pressure in the recipe-file. For that you have to enter the correct relation here (normally > 1). If you do not know that relation you can enter one here, but than the display of the specific pressure does not work.
Screw Diameter	This is the diameter of the inserted plastification screw. All the operator settings for injection and plastification are internally in absolute values (volume instead of stroke) and can optionally be displayed in that way as well (...). For the correct display of this values you have to enter the screw-diameter here. If you do not know the diameter you can enter 0 here. All parameters are than also treated internally as relative (stroke) values.

Section: Pressure Settings:

In the header-line the actual signal form the pressure sensor is displayed.
See Setup >> AxisSettings >> Sensor Scaling for a description of the scaling values.

Pressure Filter Time	Filter time for the injection pressure signal. Increase this value if you have to much noise on the signals, but do not make it to big to avoid slow reaction from the system.

Cavity Pressure Setup (2147)

Section: Pressure Settings

Input-scaling for cavity pressure sensor. For a description of all parameters please see Setup >> AxisSettings >> Sensor.

Basic Plastification Setup (2019)

Section: Servo Valve

Servo Valve Idle Voltage	Idle signal for the injection servo valve. This signal is applied to the servo-valve output when the injection axis is not used.

Section: Plastification:

The settings here apply to the screw rotation. The axis dimension and position sensor does not need to be configured here as this is already done for the injection axis.
For all parameters not described here please see Setup >> AxisSettings >> Basic.

Max. stroke	Max. possible plastification stroke. This value must be lower or equal than the injection stroke and is a separate limit for the dosage (Pages >> Injection >> Plastification (420)).
Nr. of Rotation Pulses	Number of pulses per rotation for the screw rotation measurement.
Rotation Meas. Filter Time	Filter Time for the rotation speed measurement.

Section: Decompression:

Valve Type	Valve Type for the decompression movement. See Setup >> AxisSettings >> Basic.

Section: Pump Valves for Decompression:

These settings are for the 5 static pump-selection valves (Setup >> Static Pump-Selection)

Injection General (2048)

Section: Control Types

Type of Holdon Pressure Control	Type of holdon pressure control: Open or Closed Loop. See Setup >> Injection Controllers.
Type of Injection Velocity Control	Type of injection velocity control: Open or Closed Loop. See Setup >> Injection Controllers.

Section: Velocity Scaling:

Velocity Scaling for the injection movement. All parameters are described in Setup >> AxisSettings >> Velocity

Section: Servo Valve

Servo Valve settings for the injection movement. All parameters are described in Setup >> AxisSettings >> Velocity

Servo Valve Signal for Use of Pump	Signal to servo valve for operation with PQ-system only (signal to servo valve during injection if valve type is set to "pump").

Section: Fast Movement

The fast movement configuration is used for operation with accumulator or regenerative valve. It is simply a different pump flow scaling for that mode.

Max. Velocity (Fast Move)	Max. velocity for operation with fast move. Compare "Max. Velocity" in Setup >> AxisSettings >> Velocity
Max. Pump Flow (Fast Move)	Pump Flow for max. velocity in fast move operation. Compare "Max. Pump Flow" in Setup >> AxisSettings >> Velocity
Min. Pump Flow (Fast Move)	Pump Flow to start movement in fast move operation. Compare "Max. Pump Flow" in Setup >> AxisSettings >> Velocity

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Injection General (2049):

Section: Pressure Scaling/Limits

Pressure Limits for the injection movement. All parameters not listed here are described in Setup >> AxisSettings >> Pressure

Pressure Filter Time	Filter time for the actual injection pressure signal.
Max. Pressure (Fast Move)	Max. Pressure in fast move operation. Compare "Max. Pressure" in Setup >> AxisSettings >> Pressure
Pressure Offset during Holding	When the holding pressure is controlled by servo-valve (Actuator Type for injection = "Servo Valve") the pressure requested from the PQ-system is the max. pressure from the holding profile (Pages >> Injection >> Injection (400)) plus this offset. The pressure requested from the PQ-system is constant during the whole holding phase. This offset is needed that the servo-valve is doing the exact pressure control and is not limited by the system pressure.

Section: Servo Valve

Max. Servo Valve Signal (Pressure)	Max. Servo Valve Signal for holding pressure control. See also Setup >> Injection Controllers.
Min. Servo Valve Signal (Pressure)	Min. Servo Valve Signal for holding pressure control. See also Setup >> Injection Controllers.

Section - General:

For all parameters not described here please see Setup >> AxisSettings >> General.

Piston Area	Piston area to calculate the injection force. Unit: mm2??

Injection Pump Selection (2050):

Section: Pump Valves

Pump Selection Table for injection movement. For details about pump-selection see Setup >> Static Pump.Selection.

Velocity#1 - #4	Status of the 5 static pump-selection valves for (until) the defined velocity. You can used up to 4 different velocity points (enter velocity = 0) if you do not need one of them. The max. possible velocity should be part of that table.
Enable Sep. Pump Selection for holding	When you enable this checkbox than you can define a separate pump-selection for the holding phase, otherwise the same as for injection (see above) is used.
Holding Pressure	Optional: Status of the 5 static pump-selection valves for (until) the holding phase.

Injection Move Profile (2129)

Section: Movement Profile

For all parameters not described here please see Setup >> AxisSettings >> Profile.

Holding Pressure Acceleration Time	Pressure Acceleration and Deceleration Time for the holding phase. This is the time for the ramp from 0 to the max. injection pressure. With this rate the set-pressure is changing during holding-phase.
Deceleration Time at end of holding	Pressure Deceleration Time for the end of holding phase (ramp from the last holding pressure point to 0).

Injection Hydraulics (2130)

Hydraulic Delays:

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Decompression General (2051)

Section: Velocity Scaling/Limits

Velocity Scaling and Limits for the decompression movements (injections screw back).
All parameters are described in Setup >> AxisSettings >> Velocity.

Section: Pressure Scaling/Limits

Pressure Scaling and Limits for the decompression movements (injections screw back).
All parameters are described in Setup >> AxisSettings >> Pressure.

Section: General

All parameters which are not listed here are described in Setup >> AxisSettings >> General.

Decomp.: Min Stroke	Minimum decompression stroke. This is the lower limit for the decompression before (absolute value). The decompression before is always done at least to this position before plastification is started!
Decomp.: Servo Valve Signal	Signal to the servo valve during decompression if the decompression is done with the PQ-system only (valve type = "Pump").

Decompression Move Profile (2052)

Section: Movement Profile

All parameters are described in Setup >> AxisSettings >> Profile.

Decompression Hydraulics (2126)

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Plastification General (2053)

Section: Control Types

Type of Back Pressure Control	Type of backpressure control: Open or Close Loop. See Setup >> Injection Controllers.
Type of Rotation Speed Control	Type of screw speed control: Open or Close Loop. See Setup >> Injection Controllers.

Section: Speed Scaling / Limits

All parameters not listed here are described in Setup >> AxisSettings >> Velocity.
The plastification supports a analog output to a external plastification unit (e.g. frequency inverter):

Max. Speed Parallel	Max. rotation speed for parallel movement of the plastification (parallel to mold open or close).
Max. Signal to Extern Unit	Signal to external unit for max. rotation speed.
Min. Signal to Extern Unit	Signal to external unit for min. rotation speed (=0).

Section: Pressure Scaling / Limits

All parameters are described in Setup >> AxisSettings >> Pressure.

Section: General

All parameters are described in Setup >> AxisSettings >> General.
There is no separate tolerance for plastification. The same tolerance as for decompression is used.

Plastification Backpressure (2054)

Section: Backpressure Limits

Max. Back Pressure	Max. backpressure. This is the limit for all operator entries for back-pressure (Pages >> Injection >> Plastification (420))
Max. Velocity (during Back Pressure)	Max. backward velocity during backpressure control (not supported yet).

Section: Servo Valve

Controlling the backpressure with a servo-valve can only work "closed loop". Please see Setup >> Injection Controllers.

Max. Servo Valve Signal	Max. signal to servo valve during backpressure control (see Setup >> Injection Controllers)
Min. Servo Valve Signal	Min. signal to servo valve during backpressure control (see Setup >> Injection Controllers)

Section: Prop. / Pump Valve Linearization

The control of the backpressure with a proportional valve or the pump-valve itself can work "open loop" or "closed loop" (for details please see Setup >> Injection Controllers) A pressure linearization table is supported to calc. the valve voltage from the set pressure.

Voltage #1-#10	Voltage to the backpressure valve for the according backpressure. Up to 10 points can be entered. If you need less just enter 0 in the voltage fields.
Backpressue #1-#10	Resulting Backpressure for the given voltage.

Plastification Backpressure (2055)

Section: Pump Valves

Pump Selection Table for screw rotation. For details about pump-selection see Setup >> Static Pump-Selection.

Speed#1 - #4	Status of the 5 static pump-selection valves for (until) the defined screw speed. You can used up to 4 different speed points (enter velocity = 0) if you do not need one of them. The max. possible speed should be part of that table.

Plastification Move Profile (2127)

Section: Movement Profile

For all parameters not described here please see Setup >> AxisSettings >> Profile.

Backpressure Acc. Time	Pressure Acceleration and Deceleration Time for the backpressure. This is the time for the ramp from 0 to the max. back-pressure. With this rate the set back-pressure is changing during plastification.
End Deceleration Time	Deceleration time to stop the plastification when target (dosage) is reached. This time is needed to ramp from max. speed to 0.

Injection Hydraulics (2128)

Hydraulic Delays:

All parameters are described in
Setup >> AxisSettings >> Hydraulics.

4.14 Inj. Unit

1 Function Description

The injection unit (carriage) is moving the injection piston and nozzle forward (towards the mold) and backward (away from the mold).
Additional to the normal forward and backward movement there is a options sideway movement (swing-out) supported (injection unit rotate).

2 Software Options (SW.ini)

For standard software options please see Setup >> AxisSettings >> Software Options.

#543	Injection unit forward only allowed when clamp is locked (also in manual, default: only automatic)
#554	Injection unit moves back without target in manual mode
#703	Enable the injection unit rotate movement (axis)

3 Setup Parameters

Basic Inj. Unit Setup (2017)

Section: General

All parameters are described in Setup >> AxisSettings >> General.

Section: Pressure Sensor

The settings in this section are for a seperate injection unit pressure sensor. All settings are described in Setup >> AxisSettings >> SensorScaling.

Section: Pump Valves

Settings for the 5 static pump selection valves (see Setup >> Static Pump-Selection).

Inj. Unit Fwd General (1/2) (2043)

Section: Velocity Scaling

All parameters are described in Setup >> AxisSettings >> Velocity.

Section: Pressure Scaling/Lmits

All parameters are described in Setup >> AxisSettings >> Pressure.

Section: General

All parameters are described in Setup >> AxisSettings >> General.

Section: Servo Valve

This section is only visible if servo-valve operation is selected for the injection unit axis. All parameters are described in Setup >> AxisSettings >> Velocity.

Inj. Unit Fwd General (2/2) (2044)

Section: Touch Settings

Valve Stay On	Option: In automatic or semiautomatic mode the directional valve for forward-movement should stay on (output = HIGH) after movement is finished. The valve will be reset when the injection unit is moved back or after end of "decompression after".
Valve Stay On in Manual	Option: In manual mode the directional valve for forward-movement should stay on (output = HIGH) after movement is finished. The valve will be reset when the injection unit is moved back again.
Pressure Tolerance (Touch)	Pressure Tolerance if sensor-type of injection unit is set to "pressure" or position-measurement is used. The actual pressure (either system pressure or if available the injection unit pressure sensor) must than reach the nozzle protection pressure (Pages >> Injection >> Injection Unit (440)) minus this tolerance to detect that the target is reached. If the checking of the pressure should be disabled (e.g. if position-measurement is used) this value must be increase to a very high value (> max. system pressure).

Piston Area	Total hydraulic piston area for the forward movement to calculate touching force. Not used right now!

Inj. Unit Fwd Move Profile (2123)

Section: Movement Profile

All parameters are described in Setup >> AxisSettings >> Movement Profile.

Inj. Unit Fwd Hydraulics (2124)

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Inj. Unit Bwd General (2045)

Section: Velocity Scaling

All parameters are described in Setup >> AxisSettings >> Velocity.

Section: Pressure Scaling/Lmits

All parameters are described in Setup >> AxisSettings >> Pressure.

Section: General

All parameters are described in Setup >> AxisSettings >> General.

Section: Servo Valve

This section is only visible if servo-valve operation is selected for the injection unit axis. All parameters are described in Setup >> AxisSettings >> Velocity.

Inj. Unit Bwd Move Profile (2046)

Section: Movement Profile

All parameters are described in Setup >> AxisSettings >> Movement Profile.

Inj. Unit Bwd Hydraulics (2125)

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Basic Inj. Unit Rotate Setup (2077)

Section: General

All parameters are described in Setup >> AxisSettings >> General.

Section: PumpValves

Settings for the 5 static pump selection valves (see Setup >> Static Pump-Selection) for the injection unit rotate in and out movement.

Inj. Unit Rotate In Setup (1/2) (2079)

Section: Velocity Scaling / Velocity Limits

All parameters are described in Setup >> AxisSettings >> Velocity.

Section: Pressure Scaling/Lmits

All parameters are described in Setup >> AxisSettings >> Pressure.

Section: General

All parameters not listed here are described in Setup >> AxisSettings >> General.

Deceleration Stroke	Stroke relative to the target position (befor the target) where the velocity is decreased to the "Deceleration Velocity" (see below). This setting is only important if a position-transducer is used.
Deceleration Velocity	Deceleration Velocity that is used before reaching the target. For position-based movements the set-velocity will be reduced to this value when the "Deceleration Stroke" is reached (see above). For limit-switch based movements (with pre-limit switch) this velocity gets active once the pre-limit switch was reached. For all other sensors used this setting has no effect.

Inj. Unit Rotate In Setup (2/2) (2080)

Section: Movement Profile

All parameters are described in Setup >> AxisSettings >> Movement Profile.

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Inj. Unit Rotate Out Setup (1/2) (2081)

Section: Velocity Scaling / Velocity Limits

All parameters are described in Setup >> AxisSettings >> Velocity.

Section: Pressure Scaling/Lmits

All parameters are described in Setup >> AxisSettings >> Pressure.

Section: General

All parameters not listed here are described in Setup >> AxisSettings >> General.

Deceleration Stroke	Stroke relative to the target position (befor the target) where the velocity is decreased to the "Deceleration Velocity" (see below). This setting is only important if a position-transducer is used.
Deceleration Velocity	Deceleration Velocity that is used before reaching the target. For position-based movements the set-velocity will be reduced to this value when the "Deceleration Stroke" is reached (see above). For limit-switch based movements (with pre-limit switch) this velocity gets active once the pre-limit switch was reached. For all other sensors used this setting has no effect.

Inj. Unit Rotate Out Setup (2/2) (2082)

Section: Movement Profile

All parameters are described in
Setup >> AxisSettings >> Movement Profile.

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Section: Injection Parameters

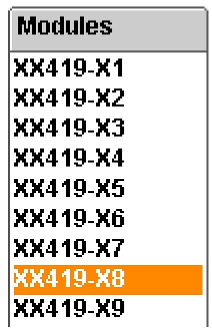
In this section the limits for reduced pressure and velocity for all injection movements is defined. The reduced parameters are applied in setting mode when the injection unit is not swiveled in (see (see Pages >> Injection >> Injection Unit Rotate (441)).

4.15 IO Configuration

With the IO-configurator you can change the existing or create a new IO-configuration.
You have the following possibilities:

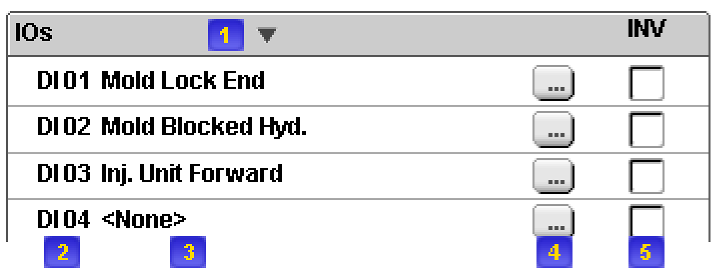
- Shift modules up or down (change the order)

- Delete modules from the configuration
- Add new modules to the configuration
- Change or add IO-datapoints
- Invert digital inputs
- Change the configuration of modules (e.g. ChannelType for analog inputs)



On the left side of the screen a list of all modules in your current configuration can be seen. This is the list that you currently edit so it may not be identical to the active configuration.
If a XX419-IOBox is used than it will be split up and every connector is shown as one module. For X20-modules only one line is used.

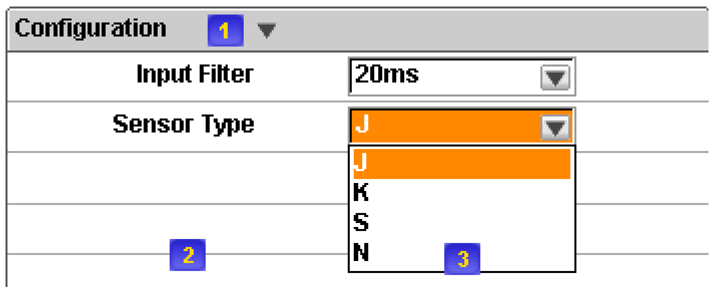
For the selected module the available IOs or configuration will be displayed on the right side of the screen.



1	Dropdown to toggle between IO- and configuration-view. • **IOs** .. Display IO-datapoints for selected module • **Configuration** .. Display configuration for selected module
2	Short description of the IO and the IO-index. The following descriptions are possible: • **DI** .. digital input • **DO** .. digital output • **AI** .. analog input • **AO** .. analog output • **AT** .. temperature input • **RO** .. digital (relay) output • **PM** .. PWM output
3	Name of the connected controller-parameter. A list of all available IO-datpoints can be found in General >> IO Datapoints.
4	With this soft-button you can open a TreeView-window to select a new controller-parameter for the according IO-datapoint.

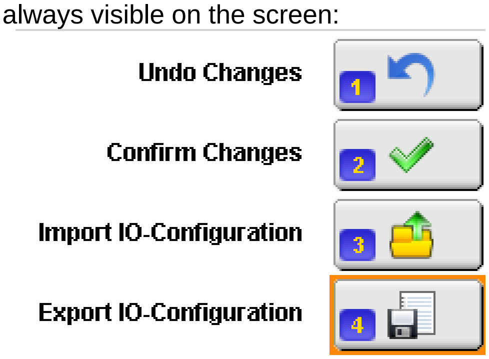
5	The checkbox can be used to invert the IO-signal. This feature is only available for digital inputs. For all other IOs these checkboxes are hidden.

When you have selected the configuration view than you can see the possible configuration-settings for the selected module. If no configuration is necessary or available for that module that screen stays empty.



1	Dropdown to toggle between IO- and configuration-view. • **IOs** .. Display IO-datapoints for selected module • **Configuration** .. Display configuration for selected module
2	List of available configurations for the selected modules. The following configurations are possible: • **Channel Type** .. channel type for analog IOs (voltage, current..) • **Input Filter** .. Input filter time for analog inputs • **Sensor Type** .. Sensor type for temperature modules • **Pwm Mode** .. Mode for PWM-output (see Setup >> PWM Outputs for details) • **Decay Mode** .. Decay Mode for PWM-output (see Setup >> PWM Outputs for details) • **Dither Amplitude** .. Dither amplitude for PWM-output (see Setup >> PWM Outputs for details) • **Dither Frequency** .. Dither frequency for PWM-output (see Setup >> PWM Outputs for details)
3	Dropdown to select the different options for the configuration. Here only the options that are really available for that configuration are displayed.

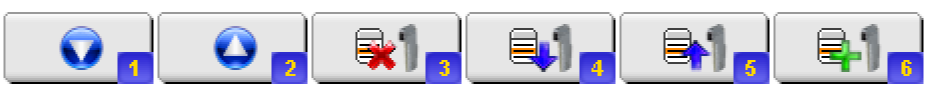
The following soft-buttons are always visible on the screen:



1	Undo Changes If you press this soft-button all changes you have made to the IO-configuration are undone. The actual active IO-configuration is loaded to the IO-configurator. Before this is done a confirm-dialog is shown to confirm that action.

2	Confirm Changes With this soft-button you can confirm your changes in the IO-configuration. The configuration will be activated on the PLC (The hydraulic motor will be turned off before). Before this is done a confirm-dialog is shown that informs the user that the PLC might reboot during that operation. The actual IO-configuration will be lost if you confirm the changes!
3	Import IO-Configuration With this soft-button you can import a existing IO-configuration from a connected USB-device (memory stick). Three types of IO-configuration import types are supported: • **iocfg.xml** .. The internal format of the IO-configuration that can be saved on the Recipe-Page (Pages >> Overview >> Recipe (110)). In this way you can copy the IO-configuration from one controller to the next. • **XXXXX.sio** .. The export format of the IO-configuration that was created with the export-function on this page (see below). This files can have any name but always have the ending ".sio". • **arconfig.xml, iomap.xml** .. The raw-format of the IO-configuration. These files can either be found in the error-report of the SmartMold or can be generated with AutomationStudio (e.g. with the binary project). Before the import takes place a dialog appears where the operator can select the file to import. The file to import can also be located in a sub-folder. The name of sub-folders appear with a "/" at the end and a change to the directoy is possible by selecting it and pressing OK (going back is possible by selecting the folder "../"). The actual IO-configuration will be lost after a import of a new one and the PLC might reboot during that operation!!
4	Export IO-Configuration With this soft-button it is possible to export the current IO-configuration to a connected USB-device. A name for the export-file can be selected and it is saved with the extension *.sio on the drive. This file can be imported on other controllers again. It is also possible to copy the internal IO-configuration file (iocfg.xml) on the recipe-page (Pages >> Overview >> Recipe (110)). This can be used in the same with the exception that it must not be renamed!

The function-keys (F1-F6) are immediately visible once you change to the IO-Configurator-page:



1	Select next module in list
2	Select previous module in list
3	Delete actual selected module (a confirm-dialog will be displayed before the module is really deleted)
4	Shift the actual selected module down (Exchange position with next module)
5	Shift the actual selected module up (Exchange position with previous module)
6	Add new module. After pressing this button a dialog with the available IO-Modules will appear. Select the desired module and press ENTER to insert a new module. Press ESC to cancel the insertion of a new module.

List of modules that are currently supported by the SmartMold:

7XX419L	XX419 compact IO-Box for SmartMold (see Service >> Wiring)
X20AI2622	The AI2622 module is equipped with two inputs with 12 bit digital converter resolution. Using different connection terminal points you can select between the current and voltage signal.
X20AI4622	The AI4622 module is equipped with four inputs with 12 bit digital converter resolution. Using different connection terminal points you can select between the current and voltage signal.
X20AI4632	The AI4632 module is equipped with four inputs with 16 bit digital converter resolution. Using different connection terminal points you can select between the current and voltage signal.
X20AO2622	The AO2622 module is equipped with two outputs with 12 bit digital converter resolution. Using different connection terminal points you can select between the current and voltage signal.
X20AO4622	The AO4622 module is equipped with four outputs with 12 bit digital converter resolution. Using different connection terminal points you can select between the current and voltage signal.
X20AT2402	The AT2402 module is equipped with two inputs for J, K, N, and S thermocouple sensors. The module has an integrated terminal temperature compensation.
X20AT6402	The AT6402 module is equipped with six inputs for J, K, N and S thermocouple sensors. The module has an integrated terminal temperature compensation.
X20BR9300	The bus receiver BR9300 is used to connect the X20 System to the X2X Link. The module is equipped with a feed for the X2X Link as well as the internal I/O supply.
X20DI2377	The DI2377 module is equipped with two inputs for 3-wire connections. Both inputs can be configured as event counters. Gate measurement is only ever possible on one channel.
X20DI2377cnt	The DI2377 module is equipped with two inputs for 3-wire connections. Both inputs can be configured as event counters. Gate measurement is only ever possible on one channel. This module is already pre-configured to measre the mold-height-pulses and screw-rotation.
X20DI9371	The DI9371 module is equipped with twelve inputs for 1-wire connections. The DI9371 designed for sink input wiring (PNP-sensors).
X20DO4332	The DO4332 module is equipped with four outputs for 3-wire connections. The rated output current is 2.0 A.
X20DO4649	The DO4649 module has four relay outputs.
X20DO6529	The DO6529 module has six relay outputs.
X20DO8322	The DO8322 module is equipped with eight outputs for 1-wire connections. The DO8322 designed for source output wiring.
X20DO8332	The DO8332 module is equipped with eight outputs for 1-wire connections. The rated output current is 2 A. The output supply is fed directly to the module. An additional supply module is not needed. There is no connection between the module and the I/O supply potential on the bus module.

X20DO9322	The DO9322 module is equipped with twelve outputs for 1-wire connections. The DO9322 designed for source output wiring.
X20PS2100	The PS2100 supply module is used for internal I/O supply.
X20PS4951	To connect a potentiometer, you need a module with the right power supply. The potentiometer supply module PS4851 can be used to supply four potentiometers with +/-10 V. The values are evaluated using standard analog input modules.
X20MM2436	PWM-output module with 2 PWM-channels (3 A rated - 3.5 A max current).

4.16 Lubrication

1 Function Description

The software can control up to 3 independent lubrication circuits, each of them behaves identical.

If the output for the central main-pump (DO#341) is used (assigned to a IO-datapoint) only one lubrication circuit can be active at a time (simultaneous operation of 2nd circuit is blocked as long as the lubrication is active or the min. off time is active). This output is HIGH whenever one of the circuits is active. The circuit pump output can than be used to control a switching valve (that distributes the lubricant).

2 Software Options (SW.ini)

#719	Max. number of lubrication circuits that are available (visible) on the controller. Possible Settings: 1-3

3 Setup Parameters

Lubrication Setup (2002)

Lubrication 2 Setup (2083)

Lubrication 3 Setup (2084)

Section: Lube Parameters

Type	The lubrication type defines the behavior of the lubrication circuit: • **Off** .. The lubrication circuit is not used. Lubrication is not controlled • **Grease (2 Pulses)** .. After the start the lubrication-pump-output is turned on (HIGH) immediately. It stays high until 2 pulses (neg. edge) are detected on the pressure ok input. If the pulses are not detected within the lubrication timeout than the alarm (**1*) is set and lubrication is stopped (pump output LOW). Otherwise the pump output stays HIGH for the set lubrication time before the lubrication is stopped (pump output LOW). Before the start of the next lubrication cycle a minimum off-time has to expire. • **Oil (Prs. Ok Signal)** .. After the start the pump-output is turned on (HIGH) immediately. It stays high until the pressure ok input is HIGH. If this does not happen within the lubrication timeout than the alarm (**1*) is set and lubrication is stopped (pump output LOW). Otherwise the pump output stays HIGH for the set lubrication time before the lubrication is stopped (pump output LOW). Before the start of the next lubrication cycle a minimum off-time has to expire. • **Open Loop (No Sensor)** .. After the start the pump-output is turned on immediately and it will stay HIGH for the set lubrication time. After that time the pump-output will be LOW and a minimum off-time has to expire before the next cycle can be started.
Lubrication Time	Lubrication time after feedback of lubrication is OK (see "Type" above).
Min. Off Time	Minimum off time between 2 lubrications. This time is also considered for different lubrication circuits (e.g. lubrication of circuit 2 can only happen when the min. off time has expired after lubrication of circuit 1).
Timeout	If the lubrication feedback (see "Type" above) is not OK after that time the alarm **1* is set.
DO off-delay	Off-delay for the circuit pump output. When this time is set the output for the circuit pump stays on after end of the lubrication for the set time, while the central lubrication pump output is turned off (LOW). This time can be used if the circuit pump output is used to control a switching-valve and the valve should stay actuate for a while after the pump is already turned off. This time is part of the "min. off time" (see above) as it is assumed that no pump is active during that time. Still this time has to expired before a next lubrication can be started!
Rep. Cycles	Number of lubrication repetition cycles. If a value >1 is entered here than the lubrication is repeated for the set number of time (lubrication - min. off-time - lubrication -....)

Interval Time	Lubrication interval time. Additional to other criterias (e.g. number of machine-cycles) the lubrication happens in that given interval time (independent if the machine is in standstill or not).
Lubricate when motor turned on	When this checkbox is activated the lubrication happens every time the motor is turned on (this function is only available for circuit 1 and 2).
Lubricate before mold height adjustment	When this checkbox is activated the lubrication is started prior to mold height adjustment (mold height adjustment will only start once lubrication is finished). This function is currently only available for circuits 3.

**1*
circuit1: **20-27 ALARM_LUBRICATION_FAILURE**
circuit2: **20-33 ALARM_LUBRICATION2_FAILURE**
circuit3: **20-34 ALARM_LUBRICATION3_FAILURE**

Section: Outputs

Pump On	Display of digital output: Circuit lubrication pump

Section: Inputs

Pressure Ok	Display of digital input: Pressure OK / Pulse feedback
Level Low	Display of digital input: Lubrication Level Low. If the input indicates low oil level (input HIGH) the following alarms are set: circuit1: **20-13 ALARM_LUB_OIL_LEVEL_LOW** circuit2: **20-75 ALARM_LUB2_OIL_LEVEL_LOW** circuit3: **20-76 ALARM_LUB3_OIL_LEVEL_LOW**

Section: Manual Lubrication

Manual Rep. Cycles	Set number of repetition cycles for manual lubrication.
Actual Lubrication Cycles	Actual number of executed repetition cycles
Button	The lubrication process is repeated by the set number of times once this button is pressed. Lubrication can be stopped early by pressing this button for a 2nd time.

4.17 Miscellaneous

1 Function Description
. . . Miscellaneous (2150)
. . . SPC Delays and Filter times (2116)

1 Function Description

The Miscellaneous page 2150 offers some general functions and settings. On page 2116 it is possible to set delays and filter times for the data capturing of the SPC (statistic process control). This can increase the accuracy of the measured data in the SPC.

Miscellaneous (2150)

Reset Alarm History and Audit Trail	This button erases the alarm History (Pages >> Alarms >> Alarm History (610)) and Audit Trail (Pages >> Alarms >> Audit Trail (620)) data.
Reset clocks (hour-meters)	Resets all timers of the machine.
Available Languages	All Languages enabled here can be toggled trough by the end user on the setting (Pages >> Service >> Settings 1 (800)). Be aware that in the standard Smart Mold package not every of the available Languages on this page is translated.

Free prog. key F7	There is a free assignable function key on the panel. Following functions can be assigned to the key F7: • **None:** No function is assigned to the key. • **Lubrication:** Key starts lubrication cycle 1. Same functionality like the software button "Manual Lubrication" of lubrication cycle 1 onPages >> Overview >> Oil, Lubrication (103). • **Robot On/Off:** Key turns the Robot function On/Off. Same functionality like the check box "Robot Enable" on Pages >> Overview >> Machine Overview (100). • **Drop Sensor On/Off:** Key turns the drop sensor function On and Off. Same functionality like the check box "Drop Sensor Active" on the main Pages >> Overview >> Machine Overview (100). • **Logout User:** Key logs out the user. Same functionality like the "Logout" button in the user management Pages >> Overview >> User Management (120). • **Cylinder Heating Lowering On/Off:** Key turns the cylinder heating lowering On and Off. Same functionality like the software button "Lowering" on Pages >> Heating >> Cylinder Temperature (500). • **Mold Heating On/Off:** Key turns the mold heating On and Off. Same functionality like the software button "Heating" on Pages >> Heating >> Mold Temperature 1 (530). • **Mold Heating Lowering On/Off:** Key turns the mold heating lowering On and Off. Same functionality like the software button "Lowering" on Pages >> Heating >> Mold Temperature 1 (530). • **Cycle Start:** Key starts Automatic and Semi-automatic mode. The F7 key can be used instead of the mold close key and instead of the closing safety gate (of course the safety gate still has to be closed) to start the cycle. • **Goto Page:** After pressing the key the page is changed to the configured one. • **Change Language:** Key changes the displayed language. • **Axis Jog for Negative Direction:** Key jogs the configured axis in negative direction. • **Axis Jog for Positive Direction:** Key jogs the configured axis in positive direction. • **Axis Toggle (Preferred Neg.):** Key toggles the configured axis. Preferred is the negative direction. • **Axis Toggle (Preferred Pos.):** Key toggles the configured axis. Preferred is the positive direction. • **Airblow:** Key activates the configured air blow. • **All Lubrication:** Key starts all lubricationc circuits. When the key is pressed ann all lubrication circuits are off all lubricatin circuits are started. If the key is pressed when at least one lubrication circuit is active (manual started) than the lubrication is stopped.

SPC Delays and Filter Times (2116)

All stop positions for logging in the SPC (statistic process control) are latched in general at the end of the movement after the move off delays are expired. If on a machine there is still a mechanical movement (overshoot) after the hydraulic move is finished, the latch time can be delayed further with the settings below in order to latch the end position when the axis is really standing still. If the position transducer input shows a high noise, a filter time can be applied to get a better result in the SPC. This special filter time for SPC is not active and not shown on this page if there is a general filter applied on a position transducer input. The general position filters can be adjusted on page 2139 IO Units, see also Setup >> Basic >> IO Units).
Further information of the SPC functionality (statistical process control) is given on Pages >> Advanced >> SPC Setup (710) and Pages >> Advanced >> SPC Buffer (711).

Section: Filter Times

Mold: Act. Position Filter for SPC	Time constant for filtering the mold position for SPC.
Ejector: Act. Position Filter for SPC	Time constant for filtering the ejector position for SPC.
Injection: Act Position Filter for SPC	Time constant for filtering the Injection position for SPC.
Inj. Unit: Act. Position Filter for SPC	Time constant for filtering the Injection Unit position for SPC.

Section: Delay Times

Mold Open: Stop Position Latching Delay for SPC	Time delays the latch of the mold open position. Timer starts after the movement is finished. If there is a off delay configured for the movement, the timer starts after all the off delays.
Ejector Forward: Stop Position Latching Delay for SPC	Time delays the latch of the ejector forward position. Timer starts after the movement is finished. If there is a off delay configured for the movement, the timer starts after all the off delays.
Ejector Backward: Stop Position Latching Delay for SPC	Time delays the latch of the ejector backward position. Timer starts after the movement is finished. If there is a off delay configured for the movement, the timer starts after all the off delays.
Decomp: Stop Position Latching Delay for SPC	Time delays the latch of the decompression end position. Timer starts after the movement is finished. If there is a off delay configured for the movement, the timer starts after all the off delays.
Injection: Cushion Latching Delay for SPC	Time delays the latch of the injection end position. Timer starts after the movement is finished. If there is a off delay configured for the movement, the timer starts after all the off delays.

Plast: Dosage Latching Delay for SPC	Time delays the latch of the injection position after plastification before the second decompression phase. If there is a off delay configured for the movement, the timer starts after all the off delays.
Inj. Unit Backward: Stop Position Latching Delay for SPC	Time delays the latch of the injection unit backward stop position. If there is a off delay configured for the movement, the timer starts after all the off delays.

4.18 Mold Setup

1 Function Description

The mold can be either a toggle- or a direct-clamp.

Toggle Clamps
For toggle clamps only one movement (for opening/closing) has to be set up. Additionall a linearization of the position and the movement is available (see Setup >> Toggle Linearization) to compensate the non-linearity of the toggle

Direct Clamps
For the direc clamp up to three movements have to be set-up. The first is the normal open- and close-movement, the second one is the lock- and unlock-movement and the third (optional) one ist the PreLock- and PostLock-movment.
This are all seperate movements with there own hydraulic delays and movement profiles. The clamp will come to complete stop between each movement.

Open/Close
Used to open and close the mold. All general settings (valve type, sensor-type, etc..) refer to this movement.

Lock/Unlock
The lock and unlock movement are used to build or release the clamping force.

PreLock/PostLock
The PreLock- and PostLock-movements can be enabled seperatly. They are done before the locking starts (PreLock) or after the locking ends / before the openeing starts (PostLock).
This movements/stages can be used to either control a hydraulic fill-stage or a bayonet-lock to engage the mold to the locking pistons.

2 Software Options (SW.ini)

For standard software options please see Setup >> AxisSettings >> Software Options.

#704	Enable mold fast valves (see Setup >> MoldValves)
#529	Open mold after mold protection occurred also in manual mode (when ProcMode = TRUE)
#517	DirectClamp: mold height offset is not subtracted from position, but set as locking position.
#523	check mold locked position always (also parallel to locked limit switch)

3 Setup Parameters

Basic Mold Setup (2013)

Section: General

For all parameters not described here please see Setup >> AxisSettings >> Basic.

Direct Clamp	Enable this checkbox for control of a direct clamp (default: toggle clamp)

Section: Toggle Settings

This section is only available if a toggle-clamp is used (see section "General" above).
For a description about the sensor-settings please see Setup >> AxisSettings >> Sensor Scaling.

Mold Locked Alarm Time	Max. time the mold might be locked before the alarm **20-23 Mould locked** is set. This function is disabled when the time is set to 0.

Section: Direct Clamp Settings

This section is only available if a direct clamp is used (see section "General" above).
For a description about the sensor-settings please see Setup >> AxisSettings >> Sensor Scaling.

Lock Sensor type	Type of sensor used for detecting the locked and unlocked criteria in the locking cylinder: • **LimitSwitch** .. 2 pressure switches are used. One for "Locked" and one for "Unlocked" • **Pressure** .. A pressure-sensor is available to detect the "Locked"- and "Unlocked"-pressure • **Time** .. Locking and Unlocking happens only time-based (no sensor connected) • **Limit + Time** .. A pressure switch is used for detecting the "Locked"-Pressure. The unlocking happens time-based.
Pre/Post-Lock Sensor type	Type of sensor used for the pre- and post-locking stage. • **LimitSwitch** .. 2 limit switches are used. One for PreLock finished and one for PostLock finished. • **Pressure** .. The mold pressure-sensor is used to detect the PreLock-(Pressure >=) and PostLock-End (Pressure <=) • **Time** .. PreLock and PostLock happens only time-based (no sensor connected) • **Limit + Time** .. A pressure switch is used for detecting the "Locked"-Pressure. The unlocking happens time-based.

Mold Close General (2031)

Section: Velocity Scaling/Lmits

For all parameters not described here please see Setup >> AxisSettings >> Velocity.

Max. Protection Velocity	Velocity limit for mold-protection phase.
Max. Locking Velocity	Velocity limit for mold-locking phase.
Velocity when Locked	Only for use with servo- or prop-valve: Velocity (valve-opening) when mold is locked.

Section: Velocity Scaling/Lmits

For all parameters not described here please see Setup >> AxisSettings >> Pressure.

Max. Pressure Locking	Pressure limit for mold-locking phase.
Max. Pressure Mold Protection	Pressure limit for mold-protection phase.

Section: General

For all parameters please see Setup >> AxisSettings >> General.

Mold Close Pump Selection (2032)

Section: Pump Valves

Pump Selection Table for mold close movement. For details about pump-selection see Setup >> Static Pump-Selection.

Velocity#1 - #4	Status of the 5 static pump-selection valves for (until) the defined velocity. You can used up to 4 different velocity points (enter velocity = 0 if you do not need one of them). The max. possible velocity should be part of that table.
Enable Sep. Pump Selection for Locking	When you enable this checkbox than you can define a separate pump-selection for the mold locking phase, otherwise the same as for mold close (from the table, see above) is used.
Mold Lock	Optional: Status of the 5 static pump-selection valves for the locking phase.
Enable Sep. Pump Selection for Mold Prot.	When you enable this checkbox than you can define a separate pump-selection for the mold protection phase, otherwise the same as for mold close (from the table, see above) is used.
Mold Protection	Optional: Status of the 5 static pump-selection valves for the protection phase.

Mold Close Move Profile (2117)

Section: Movement Profile

For all parameters not described here please see Setup >> AxisSettings >> Movement Profile.

Dec. Time for Intermediate Stop	Deceleration time for intermediate stops (e.g. for cores moving between clamp close). Compare deceleration time at Setup >> AxisSettings >> Movement Profile.
Dec. Time After Tonnage build	Deceleration time at end of movement (after tonnage build). You can set this to 0 for normal hydraulic machine but you may have to enter a value for servo-pump driven machines.
Stop Deceleration Time	Deceleration time for quick stops (release of button during manual movement, interrupt of movement by interlock..). Compare deceleration time at Setup >> AxisSettings >> Movement Profile.

Mold Close Hydraulics (2118)

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Mold Close Fast Valve (2091)

Section: Mold Close Fast Valve

All parameters are described in Setup >> MoldValves.

Mold Open General (2034)

Section: Velocity Scaling/Lmits

All parameters are described in Setup >> AxisSettings >> Velocity.

Section: Velocity Scaling/Lmits

All parameters are described in Setup >> AxisSettings >> Pressure.

Section: General

For all parameters not described here please see Setup >> AxisSettings >> General.

Max. Unlock Stroke	Limit for the unlock-position (for unlocking after injection, unmanned timeout). See Pages >> Mold >> Mold Open (210) -> Mold Unlock: Position

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Mold Open Pump Selection (2035)

Section: Pump Valves

Pump Selection Table for mold open movement. For details about pump-selection see Setup >> Static Pump-Selection.

Velocity#1 - #4	Status of the 5 static pump-selection valves for (until) the defined velocity. You can used up to 4 different velocity points (enter velocity = 0 if you do not need one of them). The max. possible velocity should be part of that table.
Enable Sep. Pump Selection for Unlocking	When you enable this checkbox than you can define a separate pump-selection for the mold unlocking phase, otherwise the same as for mold open (from the table, see above) is used.
Mold Unlock	Optional: Status of the 5 static pump-selection valves for the unlocking phase. For unlocking of direct clamp and unlock-movement of toggle (not for normal open movement).

Mold Open Move Profile (2119)

Section: Movement Profile

For all parameters not described here please see Setup >> AxisSettings >> Movement Profile.

Dec. Time for Intermediate Stop	Deceleration time for intermediate stops (e.g. for cores moving between clamp open). Compare deceleration time at Setup >> AxisSettings >> Movement Profile.
Stop Deceleration Time	Deceleration time for quick stops (release of button during manual movement, interrupt of movement by interlock..). Compare deceleration time at Setup >> AxisSettings >> Movement Profile.

Mold Open Hydraulics (2120)

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Mold Open Fast Valve (1/2) (2092)

Mold Open Fast Valve (2/2) (2093)

Section: Mold Open Fast Valve
Section: Mold Open Backprs. Valve

All parameters are described in Setup >> MoldValves.

Clamp Lock General (2107)

This page is only available for direct clamps. Here the movement of the locking cylinder can be configured.

Section: Limits/Scaling

For all parameters not described here please see Setup >> AxisSettings >> Velocity and Setup >> AxisSettings >> Pressure.

Pressure Tol. for Locking	Tolerance for monitoring the pressure in the locking cylinder. If the pressure deceeds the set pressure minus this tolerance the injection is locked and the alarm **20-90 Low clamping force** is set.
Piston Area	Total Area of all hydraulic locking-pistons to calculate the locking force from the actual locking pressure.

Section: Movement Profile

All parameters are described in Setup >> AxisSettings >> Movement Profile.

Section: PreLocking Stage

All parameters are described in Setup >> AxisSettings >> Movement Profile.

Pre-Lock: Enable	With this dropdown the pre-locking movement can be enabled / disabled. When it is disabled the movement will not be executed and all setup- and operator-settings for this movement are hidden.

Mold Lock Hydraulics (2131)

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Clamp Pre-Lock General (2142)

This page is only available for direct clamps and when the Pre-Lock stage is enabled. All settings refer to the PreLock-Movement which is done directly before locking the mold.

Section: Limits/Scaling

For all parameters not described here please see Setup >> AxisSettings >> Velocity and Setup >> AxisSettings >> Pressure.

Pump Pressure Offset	This pressure is added to the locking pressure (see Pages >> Mold >> Mold Locking (203)) during the locking phase. This is necessary for sensor-type "pressure" as the locking pressure must be reached.

Section: Movement Profile

All parameters are described in Setup >> AxisSettings >> Movement Profile.

Section: Pump-Valves

Pump Selection for the 5 static pump-selection valves during the Pre-Lock stage. For details about pump-selection see Setup >> Static Pump-Selection.

Clamp Pre-Lock Hydraulics (2143)

This page is only available for direct clamps and when the Pre-Lock stage is enabled. All settings refer to the PreLock-Movement which is done directly before locking the mold.

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Clamp Unlock General (2108)

This page is only available for direct clamps. Here the movement of the locking cylinder (unlock movement) can be configured.

Section: Limits/Scaling

For all parameters not described here please see Setup >> AxisSettings >> Velocity and Setup >> AxisSettings >> Pressure.

Unlocked Pressure	The actual pressure must be below this pressure so that the clamp is considered as "Unlocked".

Section: Movement Profile

All parameters are described in Setup >> AxisSettings >> Movement Profile.

Mold Unlock Hydraulics (2132)

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

Clamp Post-Lock General (2144)

This page is only available for direct clamps and when the Post-Lock movement is enabled. All setting refer to the post-lock movement which is done after the unlock is finished (before start of open movmement).

Section: Limits/Scaling

For all parameters not described here please see Setup >> AxisSettings >> Velocity and Setup >> AxisSettings >> Pressure.

Unlocked Pressure	The actual pressure must be below this pressure so that the Post-lock movement is regarded as "finished". This setting is only important if sensor-type "pressure" is chosen.

Section: Movement Profile

All parameters are described in Setup >> AxisSettings >> Movement Profile.

Section: Pump-Vlaves

Pump Selection for the 5 static pump-selection valves during the post-lock stage. For details about pump-selection see Setup >> Static Pump-Selection.

Clamp Post-Lock Hydraulics (2145)

This page is only available for direct clamps and when the Post-Lock movement is enabled. All setting refer to the post-lock movement which is done after the unlock is finished (before start of open movmement).

Section: Hydraulic Delays

All parameters are described in Setup >> AxisSettings >> Hydraulics.

4.19 Mold Height

1 Sw.ini Options
2 Commissioning the mold height
3 Basic mold height setup page 2020
4 Mold height adjustment page 2065
5 Advanced mold height linearization page 2114
6 Tonnage adjustment
7 Maximum Tonnage and Pressure adjustment
8 Stroke linearization
8.1 simplified stroke linearization
8.2 advanced stroke linearization
8.3 finding the linearization parameters

The basic setup of the mold height can be done on page 2020 "Basic Mold Height Setup". For the Mold height adjustment there are the pages 2065 "Mold Height Adjustment" and the sub-page 2114 "Tonnage Linearization" for a advanced linearization setup. Before starting to tune the mold height adjustment the basic mold height setup on the page 2020 "Basic Mold Height Setup" should be finished. Also important is to test if the mold height pulse sensor is working correct!

Sw.ini parameters for the Mold height:

#534	Defines start-criteria for mold height adjustemnt
#538	Necessary user level for stating a Mold Height movement can be set. Works for mold height adjustment and manual movement. 0 ... None, 10 ... Operator, 20 ... Supervisor, 30 ... OEM
#516	Mold height position is absolute (With pulse sensor). If this option is set the mold height position is displayed absolute, and also can be moved absolute. Be aware an additional commissioning step has to be done if the position is displayed absolute.

#519	Measure mold height pulses in 2ms task (without event counter function). If this option is enabled the pulses are measured a lot slower than normal. One half of the pulse period (low or high) of the mold height pulse input has to be bigger than 2ms, otherwise pulses are lost. But setting this option can bring advantages if there is a lot of noise on the mold height pulse input.
#533	Show relative mold height strokes in [pulses] instead of [mm].
#527	MoldHeight buttons are used to start Safety Gate movement in the modes Manual, Semi-automatic and Automatic.

Commissioning the mold height:

1	Test if the pulse sensor is working. Open the Mold Height page (Pages >> Mold >> Mold Height (230)) and move the mold height backward and forward. If the position is changing everything is correct. If not open the IO-Browser and have a look at the pulses input. This input is toggling when the mold height is moved and there are pulses coming in. So if it is not toggling during the movement something with the wiring is wrong. Another reason for a not changing actual position on Pages >> Mold >> Mold Height (230) can be that the "Mold Height: Pulses per Rotation" or "Mold Height: Stroke per Rotation" parameters are not configured on the Basic Mold Height Setup page 2020.
2	Test the "Mold Height: Pulses per Rotation" and "Mold Height: Stroke per Rotation" parameters of the Basic Mold Height Setup page (2020). The Test can be done the following way: **1:** Close the mold. If necessary move the mold height back so that there is a gap between the two parts of the mold. **2:** Measure the width of the gap, between the fix part and the moving part of the mold. **3:** Move the mold height back a exact distance. On Pages >> Mold >> Mold Height (230) this can be done with a relative movement. For example move back 50mm. **4:** Now measure again the gap, between the fix part and the moving part of the mold. The gap should be 50mm bigger now. If that is not the case one of the above mentioned parameters is wrong.
3	If the Sw.ini option for displaying the Mold height position absolute is enabled (SWcfg. bMhStkAbsolute). The Mold Height absolute position has to be set once. This can be done the following way: **1:** Close the mold. If necessary move the mold height back so that there is a gap between the two parts of the mold. **2:** Measure the width of the gap, between the fix part and the moving part of the mold. **3:** Enter the gap in the input field "Set Mold Height Position" (Pages >> Mold >> Mold Height (230)). And confirm the input with the button next to the input field. Afterwards the correct absolute position should be displayed (Pages >> Mold >> Mold Height (230)).
4	Now the mold height adjustment can be tuned.

Basic Mold Height Setup: Page 2020

Mold Height: Max. Height	Maximum mold height position.

Mold Height: Min. Height	Minimum mold height position.
Mold Height: Pulse Measurement Delay	This function is disabled if a time of 0ms is entered. After a movement of the mold height is finished (movement button is released), the logic continues counting the pulses for the set time. After the time is expired no pulses are considered anymore. If the function is disabled pulses are considered all the time, also after a movement, for calculating a correct absolute position.
Mold Height: Move monitor timeout	This function is disabled if a time of 0ms is entered. If a movement of the mold height is active and there is no input signal of the pulses sensor for the set time a alarm message is displayed "No mold height movement".
Mold Height: Pulses per Rotation	Number of pulses on the "Mold height pulses sensor" per rotation. Has fit together with "Stroke of the Mold per rotation". For example if 20 pulses per rotation are entered here and the "Mold Height. Stroke per Rotation" is set to 1mm. The software assumes the mold height moves the clamp 0,05mm with every pulse (1/20).
Mold Height. Stroke per Rotation	Stroke of the Mold per rotation.

Mold Height Adjustment: Page 2065

Mold Height. Stroke Offset for Adjustment	In the first step of the mold height adjustment process the mold tries to close and fully stretch the toggle (this means go to 0 position). If the newly mounted mold is too big, the platens will touch without having fully stretched the toggle (for example stopping at position 25 mm). The mold height should to be now increased by exactly that value (25 mm) in order to be able to close and fully stretch the toggle in the next attempt. To make really sure that the toggle can fully stretch after the increase of the mold height, this offset is added (e.g. this offset set to 1 mm plus the 25 mm mold stroke result in a mold height increase of 26 mm). If the position of the clamp is measured at the piston (setting **Stroke Sensor Mounted at Piston** on page 2014 Toggle Linearization) and the toggle linearization is disabled (setting **Enable Toggle Linearization** on page 2014 Toggle Linearization) the exact distance for the mold height increase cannot be calculated. In this case only this offset is considered, the mold height is moving back only by this offset before the next attempt to fully stretch the toggle. In this case this setting should be big enough to ensure a fast mold height adjustment procedure.
Mold Height: Mold Open Position for Adjustment	During the mold hight adjustment the clamp is opened to this position for changing the Mold Height position.

Mold Height: Mold Stop Detection Time for Adj.	During the mold hight adjustment the clamp is closing (to test if it is possible to close the clamp). If it is not possible to close the clamp the clamp close movement gets stuck. So if the position of the clamp is not changing during the mold close for this set time the logic knows the clamp cannot close.
Mold Height: Mold Height Stop Detection Time for Adj.	During the mold hight adjustment the mold height is moved forward (with stretched toggle) in order to find the plate touch-position. If the two platen are touching than the mold height gets stuck. So if the position (pulses) of the mold height is not changing during the mold height decrease for this set time the logic knows the platen are touching.
Mold Height: Tonnage Adjust Step Delay	Delay time between all steps of the maximum tonnage adjustment process. During the maximum tonnage adjustment process the mold height does some very short movements. In order to ensure proper operation of the clamp and the mold height and to prevent the two axes from influencing each other because of dead times in the hydraulic system, a delay time between each step can be configured.
Mold Height: Max. Tonnage	Maximum tonnage of the machine
Tonnage Alarm Limit	This setting is only used for machines with a tonnage sensor. If the sensed tonnage is above that value a alarm will be set and the mold will open again.
Mold Height: Stroke Step for Tonnage Adj.	During Max. Tonnage adjustment the maximum possible mold height decrease after the touchpoint is determined automatically. During this "trial and error" process the mold continuously tries to lock with maximum pressure, after always slightly modifying the mold height, until the point is found where the mold still can lock with the maximum available pressure. In the first step of this procedure, the mold height is decreased by this stroke "Mold Height: Stroke Step for Tonnage Adj.". Then the mold tries to lock. If it can lock, the mold height is decreased again by the same stroke, until the mold cannot lock anymore. After that a fine-adjustment takes place using a binary search algorithm.
Mold Height: Stroke for Max. Tonnage at Max. Height	Linearization point of the Tonnage/Stroke characteristic of the mold height. Alternatively a more accurate linearization can be configured on page 2114. If the linearization is not enabled on page 2114 this linearization is taken. This value is the necessary stroke (that the mold height needs to be decreased after finding the touch-position) of the mold height to achieve max. tonnage at max. possible mold height.

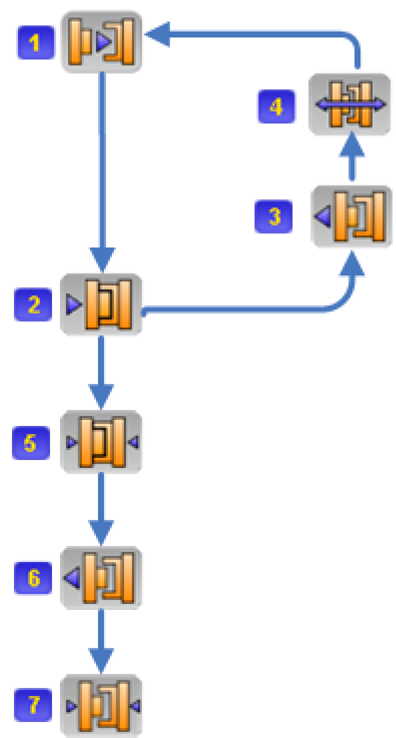
Mold Height: Stroke for Med. Tonnage at Max. Height	Linearization point of the Tonnage/Stroke characteristic of the mold height. Alternatively a more accurate linearization can be configured on page 2114. If the linearization is not enabled on page 2114 this linearization is taken. This value is the necessary stroke (that the mold height needs to be decreased after finding the touch-position) of the mold height to achieve 50% of the max. tonnage at max. possible mold height.
Mold Height: Stroke for Max. Tonnage at Min. Height	Linearization point of the Tonnage/Stroke characteristic of the mold height. Alternatively a more accurate linearization can be configured on page 2114. If the linearization is not enabled on page 2114 this linearization is taken. This value is the necessary stroke (that the mold height needs to be decreased after finding the touch-position) of the mold height to achieve max. tonnage at min. possible mold height.
Mold Height: Stroke for Med. Tonnage at Min. Height	Linearization point of the Tonnage/Stroke characteristic of the mold height. Alternatively a more accurate linearization can be configured on page 2114. If the linearization is not enabled on page 2114 this linearization is taken. This value is the necessary stroke (that the mold height needs to be decreased after finding the touch-position) of the mold height to achieve 50% of the max. tonnage at min. possible mold height.
Enable Max Tonnage Adjustment check box	If the check box is enabled a max tonnage adjustment is executed before the normal mold height adjustment (the result of the max. tonnage adjustment is entered in the 4 values above).
Adjust button	This soft button also starts the mold height adjustment. Same functionality as the hardware button

Advanced Tonnage Linearization page 2114

Enable	This check box enables the advanced tonnage linearization table. If both graphs are disabled the simplified linearization on page 2065 is active. If one or both tables are enabled the advanced tonnage linearization table is active.
Mold Height	Mold height position of the linearization table. The relation between Stroke and Tonnage is changing with the size of the mold. That's the reason why it is necessary to fill in two tables. This two tables of course should be filled for two different mold sizes (Mold Heights). For further information have also a look at the Advanced Linearization table chapter.

Stroke, Pressure and Tonnage tables	There are two tables with 10 interpolation points for the Stroke, Pressure and Tonnage relation on this page. The Two tables are necessary to catch the dependency of the linearization data to the size of the mold (Mold Height). There is a description how to find the values for this tables in the chapter: Finding the Linearization parameters

Tonnage Adjustment

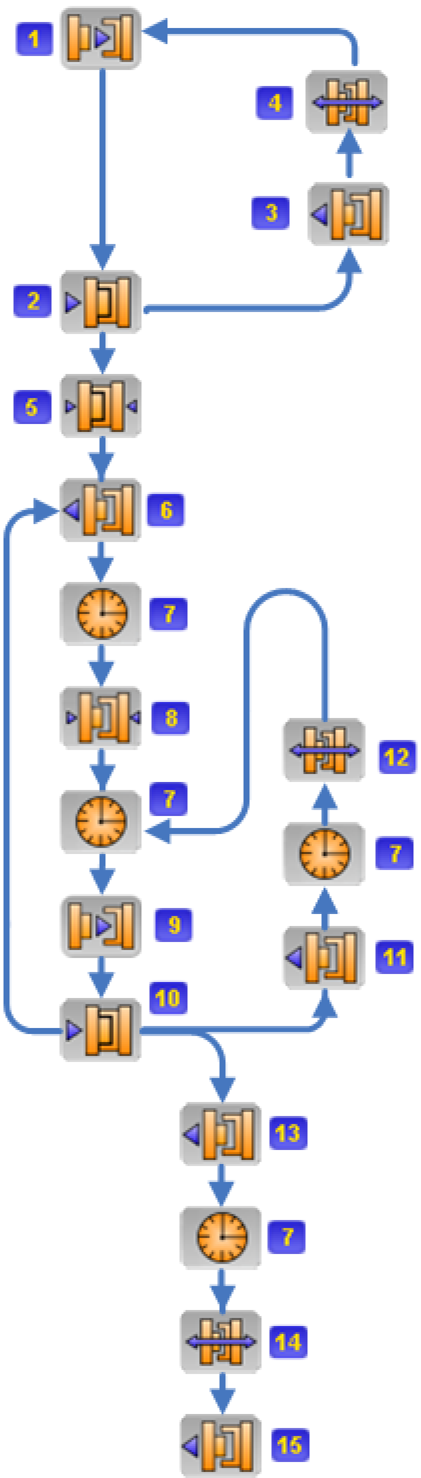


This adjustment can be activated with the check box "Tonnage Adjust: Set Tonnage" (Pages >> Mold >> Mold Height (230)). The Mold height adjustment will tune now the set tonnage. The clamp is moved with the setting mode parameters during the adjustment.

1	Mold close
2	If the mold can lock the sequence continues with the mold height decrease step 5. Otherwise the sequence is continued with step 3. The parameter "Mold Height: Mold Stop Detection Time for Adj." (page 2065) is the timeout for the software to detect whether the mold can lock or not. If the position of the mold transducer is not changing anymore for this time the software assumes the mold cannot lock.
3	Mold is opened to position "Mold Height: Mold Open Position for Adjustment" (page 2065)

4	Mold height is increased. The distance the mold height gets increased is calculated. Distance = "Mold Height. Stroke Offset for Adjustment " (page 2065) + Position where the mold got stuck during the last clamp close. For example in step 2 the clamp gets stuck at position 10.0mm and there is a value of 1mm configured for "Mold Height: Stroke Offset for Adjustment ". The mold height will be increased 11mm in step 4.
5	The mold height is decreased in this step till the mold height gets stuck. If the mold height position is not changing anymore for the configured time "Mold Height: Mold Height Stop Detection Time for Adj." (page 2065) the next step is started.
6	Mold is completely opened.
7	The distance the mold height gets decreased is calculated out of the active linearization for the set tonnage (Pages >> Mold >> Mold Height (230)).

Pressure Adjustment and Maximum Tonnage Adjustment



The Maximum Tonnage Adjustment is a special adjustment to find the linearization parameters during commissioning. The check box "Enable Max Tonnage Adjustment" has to be enabled on the page 2065. The adjustment is afterwards performed with the maximum pressure for mold closing to find the maximum possible mold height stroke. After the adjustment the check box gets automatically

deactivated again and the linearization values are entered into the active linearization table. But still this adjustment cannot fill all the extended linearization table parameters. This has to be done manually if the extended table is active. The clamp is moved with the setting mode parameters during the adjustment, except for the pressure during clamp close.
The Pressure Adjustment can be activated with the check box "Tonnage Adjust: Set Locking Pressure" on Pages >> Mold >> Mold Height (230). The Mold Height adjustment will tune now the set pressure (Pages >> Mold >> Mold Height (230)). After the tuning the "Tonnage Adjust: Set Locking Pressure" is copied to the Mold lock step, of the clamp close profile. The clamp is moved with the setting mode parameters during the adjustment.

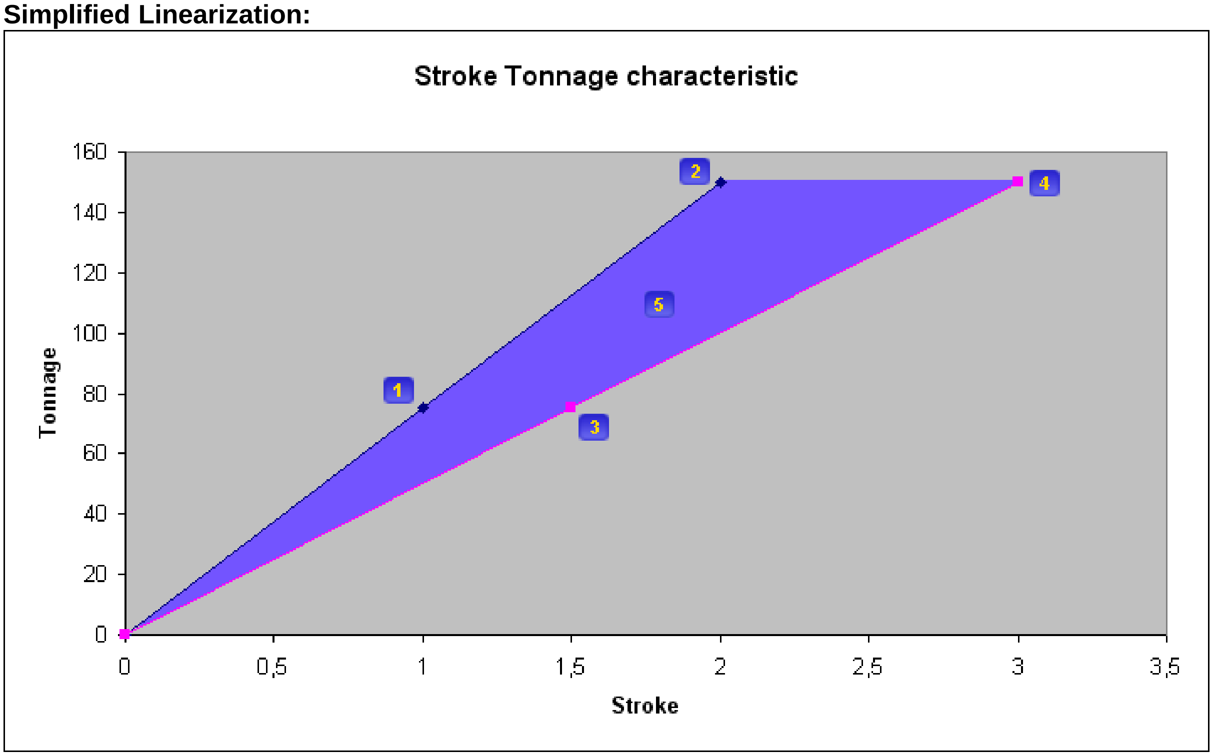
1	Mold close
2	If the mold can lock the sequence continues with the mold height decrease step 5. Otherwise the sequence is continued with step 3. The parameter "Mold Height: Mold Stop Detection Time for Adj." (page 2065) is the timeout for the software to detect whether the mold can lock or not. If the position of the mold transducer is not changing anymore for this time the software assumes the mold cannot lock.
3	Mold is opened to position "Mold Height: Mold Open Position for Adjustment" (page 2065)
4	Mold height is increased. The distance the mold height gets increased is calculated. Distance = "Mold Height. Stroke Offset for Adjustment " (page 2065) + Position where the mold got stuck during the last clamp close. For example in step 2 the clamp gets stuck at position 10.0mm and there is a value of 1mm configured for "Mold Height: Stroke Offset for Adjustment ". The mold height will be increased 11mm in step 4.
5	The mold height is decreased in this step till the mold height gets stuck. If the mold height position is not changing anymore for the configured time "Mold Height: Mold Height Stop Detection Time for Adj." (page 2065) the next step is started.
6	Mold is opened to position "Mold Height: Mold Open Position for Adjustment" (page 2065)
7	Delay time between the movements. "Mold Height: Tonnage Adjust Step Delay" (page 2065)
8	Mold height is decreased. The distance the mold height gets decreased depends on the selected kind of adjustment (Max. Tonnage or Pressure) and on the repetition cycle. **Pressure Adjustment:** The distance is initialized with the value calculated out of the active linearization, for the set pressure "Tonnage Adjust: Set Locking Pressure" on (Pages >> Mold >> Mold Height (230)). Every repetition cycle the mold gets stuck (path 11-->7-->12) the distance gets halved. **Maximum Tonnage Adjustment:** The distance is initialized with the value "Mold Height: Stroke Offset for Adjustment" on page 2065. Every repetition cycle the mold gets stuck (path 11-->7-->12) the distance gets halved.
9	Mold close
10	If the mold can lock the sequence continues with the mold height decrease step 6. Otherwise the sequence is continued with step 11 or 13. The parameter "Mold Height: Mold Stop Detection Time for Adj." (page 2065) is the timeout for the software to detect whether the mold can lock or not. If the Mold cannot lock the mold height movement distance for step 8 and 12 is compared with the maximum resolution of the mold height sensor (Calculated out of the values "Mold Height: Pulses per Rotation" and "Mold Height: Stroke per Rotation" on page 2020). If it still make sense to repeat the sequence, with the half of the previous Mold height movement distance, the process continues with step 11 otherwise with step 13
11	Mold is opened to position "Mold Height: Mold Open Position for Adjustment" (page 2065)

12	Mold height is increased. The distance the mold height gets increased depends on the selected kind of adjustment (Max. Tonnage or Pressure) and on the repetition cycle. **Pressure Adjustment:** The distance is initialized with the value calculated out of the active linearization, for the set pressure "Tonnage Adjust: Set Locking Pressure" on (Pages >> Mold >> Mold Height (230)). Every repetition cycle the mold gets stuck (path 11-->7-->12) the distance gets halved. **Maximum Tonnage Adjustment:** The distance is initialized with the value "Mold Height: Stroke Offset for Adjustment" on page 2065. Every repetition cycle the mold gets stuck (path 11-->7-->12) the distance gets halved.
13	Mold is opened to position "Mold Height: Mold Open Position for Adjustment" (page 2065)
14	Mold height is increased. The mold height is increased to the last position where the mold was still able to close.
15	Mold is completely opened.

Mold height stroke linearization

There are two tables. A small one on page 2065, Mold Height Adjustment, for a basic linearization of stroke to tonnage and a advanced linearization table on page 2114, Tonnage Linearization, for a more accurate linearization of stroke to pressure and tonnage.
The mold height stoke and tonnage relation cannot be linearized with one graph because there is a second dependency and that's the size of the mold. That's the reason why it is possible to define two graphs for the simplified and two for the advanced linearization.

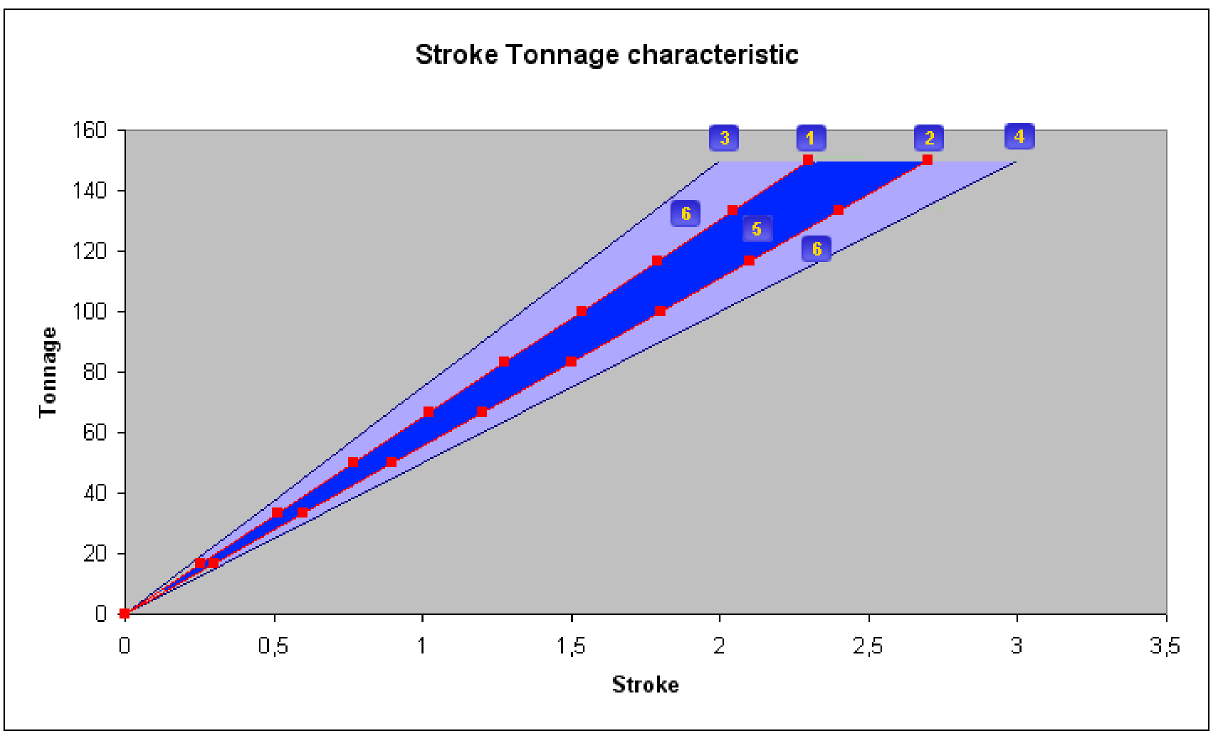
Simplified Linearization:



1	Parameter: "Mold Height: Stroke for Med. Tonnage at Min. Height" on page 2065. The Parameter defines the Mold Height stroke with half of the maximum tonnage for the smallest possible Mold (smallest possible mold hight).
2	Parameter: "Mold Height: Stroke for Max. Tonnage at Min. Height" on page 2065. The Parameter defines the Mold Height stroke with maximum tonnage for the smallest possible Mold (smallest possible mold hight).
3	Parameter: "Mold Height: Stroke for Med. Tonnage at Max. Height" on page 2065. The Parameter defines the Mold Height stroke with half of the maximum tonnage for the biggest possible Mold (biggest possible mold hight).
4	Parameter: "Mold Height: Stroke for Max. Tonnage at Max. Height" on page 2065. The Parameter defines the Mold Height stroke with maximum tonnage for the biggest possible Mold (biggest possible mold hight).
5	Linearization are. This area is a line if the same parameter are entered for Max. Height and Min. Height. After configuring the four previous mentioned parameters the software is able to calculate out of the set tonnage and the actual mold height the necessary stroke to build the tonnage.

Advanced Linearization

Also for the advanced tonnage linearization there are two tables. The principle between the two graphs is the same like for the simplified linearization. But there is one difference. The simplified linearization forces to enter the linearization points for minimum and maximum mold height. For the advanced linearization it is possible to set the mold height for the entered linearization points freely. For example it is possible with the advanced table to have a min Mold Height of 200mm, a maximum Mold Height of 500mm and enter a Table with 300mm and the other one with 400mm. the Mold height area between 300mm and 400mm will be interpolated, like for the simplified linearization. The area from 200 to 300 and from 400 to 500 will be extrapolated.



The advanced table interpolates and extrapolates the pressure to stroke graphs the same way like tonnage to stroke.

1	Linerization points of the first linearization table (small mold height). The advanced table has 10 interpolation points for one graph
2	Linearization points of the second advanced linearization table (big mold height). The advanced table has 10 interpolation points for one graph
3	Graph of the smallest possible mold height.
4	Graph of the biggest possible mold height.
5	interpolation area. This area is a line if only one table is configured.
6	extrapolation area.

Finding the Linearization parameters

Simplified linearization table on page 2065

The parameters for the simplified table can be found automatically with the Max. Tonnage Adjustment. This adjustment is described in the chapter:
Pressure Adjustment and Maximum Tonnage Adjustment
. After the adjustment is finished the advanced Tonnage linearization table is automatically activated and two interpolation points are entered there.

1. Interpolation point: Defines the Position of zero stroke and zero tonnage.

2. Interpolation point: Defines the Position of max. stroke and max. tonnage.

Important is only the second line. Enter this stroke value for Max. Tonnage on page 2065 and halve of this stoke value as Med. Tonnage. Afterwards do not forget to deactivate the advanced linearization on page 2114.

Advanced linearization table on page 2114

1	First Enable one of the advanced linearization tables and make the Max. Tonnage Adjustment. This adjustment is described in the chapter: Pressure Adjustment and Maximum Tonnage Adjustment. After the adjustment the first two lines of the table are filled. This is now a linearization with two interpolation points. 1. Interpolation point: Defines the Position of zero stroke and zero tonnage. 2. Interpolation point: Defines the Position of max. stroke and max. tonnage.

2	The linearization now already works but is not very accurate. To get a better linearization it is necessary to make pressure adjustments for additional interpolation points between the already existing ones. Enable the pressure adjustment on (Pages >> Mold >> Mold Height (230)) and set a pressure. After the adjustment enter the new interpolation point between the already existing ones. If the Sw.ini option "SWcfg.bMhStkAbsolute" is Enabled the mold height stroke can be found on Pages >> Mold >> Mold Height (230) "Actual Position". From this position you have to subtract the "Mold Height" of the table (2114) before entering the value into the table. If the Sw.ini option is not enabled it is necessary to measure the mold height position difference between a zero tonnage adjustment and the pressure adjustment manually. If no locking force sensor is available the tonnage should be estimated as linear to the stroke. This means the Tonnage for the new interpolation point can be calculated the following way. Tonnage = (Max. Tonnage/Max. Stroke)*Actual Measured Stroke. Be aware that the interpolation points have to be entered with increasing stroke form the top to the bottom of the table.
3	If possible also enter the values for the second table with a different mold size (Mold Height).

4.20 Prog. Mold Valves

1 Function Description

There are 3 programmable mold valves:

- Mold Close Fast Valve, Pages >> Mold >> Mold Close Fast (201), Setup >> Mold
- Mold Open Fast Valve, Pages >> Mold >> Mold Open Fast (211), Setup >> Mold
- Mold Open Backprs. Valve, Pages >> Mold >> Mold Open Fast (211), Setup >> Mold

They can be configured on the setup-pages to work (output = HIGH) during certain profile-steps. Additionally delays and whether the operator can edit the settings can be configured.

2 Software Options (SW.ini)

#704	enable mold fast valves

3 Setup Parameters

Enable	Enable the use of the programmable valve.
Enable by User	Defines whether the operator can set if the valve should be used or not.
On: Value Set by User	Defines whether the operator can set the compare value for the ON-criterion.
On: Delay Set by User	Defines whether the operator can set the delay-time for the ON-criterion.

On: Criterion	Criterion for turning the valve on (output: HIGH): • **Immediately** .. Valve is turned on immediately at start of movement • **Profile Step (Begin)** .. Valve is turned on at the beginning of the given profile step • **Profile Step (End)** .. Valve is turned on at the end of the given profile step
On: Delay Time	Delay time for turning on the valve after the ON-criterion is reached. This setting has no effect if "On: Delay Set by User" is activated.
On: Compare Value	Compare Value (Profile Step) for the ON-criterion. This setting has no effect is "On: Value Set by User" is activated.
Off: Value Set by User	Defines whether the operator can set the compare value for the OFF-criterion.
Off: Delay Set by User	Defines whether the operator can set the delay-time for the OFF-criterion.
Off: Criterion	Criterion for turning the valve of (output: LOW): • **Immediately** .. Valve is turned off immediately at start of movement • **Profile Step (Begin)** .. Valve is turned off at the beginning of the given profile step • **Profile Step (End)** .. Valve is turned off at the end of the given profile step
Off: Delay Time	Delay time for turning off the valve after the OFF-criterion is reached. This setting has no effect if "Off: Delay Set by User" is activated.
Off: Compare Value	Compare Value (Profile Step) for the OFF-criterion. This setting has no effect is "Off: Value Set by User" is activated.

4.21 Motor Setup

1 Function Description

In this document the setup for the motors (which drive the hydraulic pump) is described.
Up to 3 motors are supported, although most machines only have one (the main) motor. These motors are always turned on and off together by the operator with the motor-key. Depending on the configuration (see below) the operator can enable or disable certain motors.
For each motor the startup-behavior can be configured (start-delta or normal startup).

2 Software Options (SW.ini)

#505	If this option is set to TRUE (1) than the motor is turned off when the rear gate (maintenance gate) is opened and the alarm **20-4 Rear gate open** is set.
#720	Max. number of motors available (visible) on the controller. Possible settings: 1-3
#524	If this option is set to TRUE (1) than the motor cannot be turned off when the machine is in automatic or semi-automatic mode. If the operator tries to turn on the motor he will get a diagnosis message (dialog). If this option is not set than turning off the motor during automatic or semiautomatic mode will stop the cycle immediately (mode is changed to manual) and the alarm **20-82 Cycle stopped by motor** is set.
#525	If this option is set to TRUE (1) than the motor can only be turned on if the barrel (cylinder) temperature is ok (all zone-temperatures within tolerance and release time expired). If the operator turns on the motor before he will get a diagnosis-message.

3 Setup Parameters

Motor Setup (2001)

Section: General:

Motor Min. Off Time	This is the minimum off time for all motors. After switching off the motors this time must expire before they can be turned on again. If the operator turns them on before the alarm **20-39 Motor on delay** is set.

Section: Main Motor

Main Motor	With the checkbox left of the topic you can enable the motor. If it is enabled a checkbox for the motor will be displayed on the operator-page Pages >> Overview >> Oil, Lubrication (103). If this checkbox is than enabled by the operator the motor is used and turned on when the operator presses the motor-key.
Main Motor always on	With this checkbox you can force the motor to "always on". That means that the operator cannot disable the motor on page Pages >> Overview >> Oil, Lubrication (103), instead the checkbox is locked there and displayed as checked.
Main Motor Time to Check Feedback	This time is the maximum reaction time for the motor-feedback ("motor is on") after the last contact for the motor is closed. If the feedback is not HIGH after this time the alarm **20-70 Motor feedback missing** is set and all motors are turned off.

Main Motor Main Contact Delay	This is the delay time between turning on the star-output (contact) and the main-output(contact) for the motor. The star-contact is closed first in order to avoid sparks in the relays. This delay time is only active if star-delta startup is configured (Main Motor Star-Delta Delay is set bigger than 0).
Main Motor Main Star-Delta Delay	This is the delay time between turning on the star-output (contact) and turning on the delta-output(contact). When turning on the delta-output the start-output is turned off at the same time. If you set this time to 0 than the star-delta startup is disabled and only the main contact is turned on in order to run the motor.

Section: 2nd Motor

For the second motor the same settings are used as for the main motor - see above!

Section: 3rd Motor

For the third motor the same settings are used as for the main motor - see above!

4.22 Shut-Off Valves

1 Function Description

The SmartMold supports two types of shut-off valves:

- **Nozzle Closure**: The nozzle closure is a hydraulic or pneumatic axis (or just a output signal) to control a shut-off nozzle for injection.
- **Mold Shut-Off Valves**: The mold shut-off valves are hydraulic or pneumatic actuators that block/release the flow of material inside the mold (e.g. to fill the mold-parts sequentially).

2 Software Options (SW.ini)

#708	Enable the nozzle closure function on the controller.
#725	Number of mold shut-off valves supported.

3 Setup Parameters

Shut-Off Valves (2141)

Section: Nozzle Closure

Assigned Pump	Here the PQ-system that is used to move the nozzle closure (in case it is hydraulic) can be selected
Max. Pumpflow	Here you can adjust the max. flow for actuating the nozzle closure. The operator can adjust than the real flow in % of this value.
Max. Pressure	This is the max. pressure limit for actuating the nozzle closure. (See also Setup >> AxisSettings >> Pressure)
Pump Pressure Offset	Offset for pump pressure (See also Setup >> AxisSettings >> Pressure)
Acc. Time	Acceleration time for hydraulic flow (see also Setup >> AxisSettings >> Movement Profile)
Dec. Time	Deceleration time for hydraulic flow (see also Setup >> AxisSettings >> Movement Profile)
Valve On Delay	Delay for flow- and pressure-request to PQ-system after movement start. For standard axis separate delay-times for flow- and pressure-request can be set (compare Setup >> AxisSettings >> Hydraulics). The directional valve is always turned on immediately (no delay possible).
Valve Off Delay	Delay after the core-movement ends before the next movement can start (compare "Delay Move Off" in Setup >> AxisStettings >> Hydraulics)

Section: Mold Shut-Off Valves

Assigned Pump	Here the PQ-system that is used to move the mold-shutoff valves (in case they are hydraulic) can be selected./td>
Max. Pumpflow	Here you can adjust the max. flow for actuating the shut-off valves.. The operator can adjust than the real flow in % of this value.
Max. Pressure	This is the max. pressure limit for actuating the mold shut-off valves. (See also Setup >> AxisSettings >> Pressure)
Pump Pressure Offset	Offset for pump pressure (See also Setup >> AxisSettings >> Pressure)

4.23 Oil Temperature

1 Function Description
2 Software Options (SW.ini)
3 Setup Parameters
. . . Oil PreHeat Setup (2004)

1 Function Description

This chapter describes the oil-preheating, oil-cooling and geren oil-temperature settings.

Oil Pre-Heating:
The oil preheating is either started manually (Pages >> Overview >> Oil, Lubrication (103)), by the weekly calender (Pages >> Heating >> Temperature Calender (520)) or when at the start of the motor the oil temperature is below the min. oil temperature (see below).
For the oil preheating the motor will circulate oil through the hydraulic system (via the pressure releife valve) until the oil has reached the set temperatuere (Pages >> Overview >> Oil, Lubrication (103)).

Oil Cooling:
The oil cooling simply sets a digital output that should switch on / off cooling water for the oil depending on a on- and off-temperatuer (Pages >> Overview >> Oil, Lubrication (103)). The limits for this on- and off-temeperature are defined here.

2 Software Options (SW.ini)

#522	Pre-Heating can be started although the motor is already running. Default: Preheating is not started and instead the alarm **20-40 Oil preheating not possible - motor running is set** is set.

3 Setup Parameters

Oil PreHeat Setup (2004)

Section: Oil Heat Parameters

Enable	The oil-preheating function is only active when it is enabled here. If it is disabled the pre-heating is simply not started when requested.
Pump System	PQ-system that is used for oil pre-heating (see Setup >> Pump System).
Flow Signal	Signal to flow actuator (of PQ-system) during oil preheating
Pressure Signal	Signal to pressure actuator (of PQ-system) during oil preheating
Min. Temperature Rise	Min. temperature rise within the observation time (see next entry) during oil-preheating. If the temperature does not rise the alarm **20-36 Oil preheat error** is set.
Observation time	Observation time for monitoring the oil temperature rise (see previous entry)

Section: Oil Temp. Limits

Max. Oil Temperature	This is the max. limit for the oil temperature settings (alarm-limit, oil cooling on- and off-temperature, oil preheating set-temperature) on the operator page (Pages >> Overview >> Oil, Lubrication (103)).
Min. Oil Temperture	This is the min. limit for the oil temperature settings (alarm-limit, oil cooling on- and off-temperature, oil preheating set-temperature) on the operator page (Pages >> Overview >> Oil, Lubrication (103)). The oil preheating is started automatically if the oil temperature is below that value and the motor is turned on.
Oil Temperature Correction	Correction value for the oil temeperature measurement. This value is added to the measured value before it is used for control and display.

4.24 Pump Combination

1 Function Description

Pump Combinations offer the possibility to combine up to 3 PQ-systems.

Normally a axis is assigned to a single PQ-system but there is no way that a axis requests flow directly from 2 or more PQ-systems. With the pump-combination it is possible that a axis gets flow from multiple PQ-systems.
In the setup for the up to 2 pump-combinations it must be defined which PQ-systems are combined and how the flow-request from the axis is distributed to the different PQ-systems.
The pressure-request is identical for all combined systems.
When multiple internal servo-driven pumps (SmartPumps) are used the combination also offer the possibility for totally synchronized operation (Master/Slave) of the servo-pumps.

2 Software Options (SW.ini)

#711	Enable the use of pump-combinations. If this option is disabled the settings for pump-combinations are hidden.

3 Setup Parameters

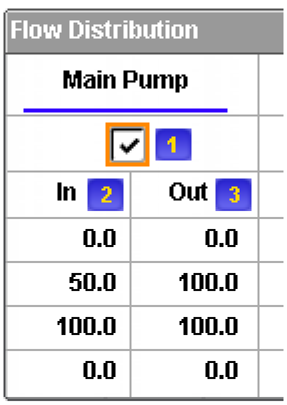
Pump Comb. #1 (2095):

Pump Comb. #2 (2096):

Max. Flow	Max. Flow for the pump combination. If physical units are used this must be the sum of the max. flow of all combined PQ-systems. If percentage is used for the pump flow any combination is possible. E.g. the max. flow of the combination could 100% and the max. flow of every combined PQ-system can be 100% as well. This is simple the max. flow the axis may request from the combination.
Sync. Operation	If "Sync. Operation" is enabled the combined PQ-systems will work synchronous. That means that the requested flow will be evenly distributed to all combined PQ-systems. If 2 or more SmartPumps (internal servo-driven pumps) are combined in this way the Master-Slave coupling (direct synchronization between the drives) will be activated on this drives.

Section: Flow Distribution

The distribution of the flow is also visible in the graphic on top of the screen! Use this graphic to check if your settings are correct!



1	With this checkbox you can configure whether this PQ-system should be part of the combination or not
2	Input flow. This is the flow-request for the pump combination. You can configure up to 4 points here. The values must be ascending and the list must include the max. flow for the combination.
3	Output flow. This is the flow-request for the PQ-system. You can configure up to 4 points here that correspond with the input settings

4.25 Pump Linearization

1 Function Description
2 Software Options (SW.ini)
3 Setup Parameters

1 Function Description

The flow- and pressure-output to each PQ-system can be linearized. The linearization data can be entered manuall or evaluated automatically.

If the linearization data is knwon it can be entered manually (see....).

If the linearization curve of a PQ-systems's pressure or flow valve is not known, the valve can be linearized automatically on the page Auto. Pump Lin. (2/2) (2070). The settings for the automatic linearization must me made on this page 2028 Automatic Pump Linearization (1/2).
In this document it is assumed that the valves are connected to analog voltage outputs (0-10V). If the valves are connected to PWM outputs it does not make much of a difference, except that the maximum signal to the output is not 10V but the **Max. Current to PWM-Output** (Setup / PumpSystem).

Automatic Pressure Linearization

During automatic pressure linearization all directional valves remain closed, as an option the injection valve is opened. The signal to the flow valve is kept constant while the pressure signal is increased step by step. For every increment the actual pressure from the pressure sensor is evaluated and inserted in the linearization table.
It can be configured whether the pressure linearization should be done until the maximum hardware signal (10V for voltage outputs) or to stop at the maximum system pressure (Setup >> Pump System).

The following settings must be completed to start automatic pressure linearization:
Max. Pressure and **Max. Flow** for the pump system on on the basic pump system setup pages (2010, 2011, 2097).
Pressure sensor scaling on the basic pump system setup pages (2010, 2011, 2097), but only when the option **Pump Pressure Lin.: Use Injection Pressure** is not set.
Pressure sensor scaling for the injection axis (Setup >> Injection), but only when the option **Pump Pressure Lin.: Use Injection Pressure** is set.
Valid calibration of the injection piston stroke transducer, but only when the option **Pump Pressure Lin.: Use Injection Pressure** is set.

During the automatic pressure linearization procedure the following steps are run through:
1) Measure Minimum Pressure: The actual pressure is measured at 0V output to the pressure valve.
2) Search Pressure Offset: The voltage should be found at which the first significant change in actual pressure can be measured. The output to the pressure valve is incremented by **Pump Pressure Lin.: Step Size to Find Min. Change** until the **Pump Pressure Lin.: Min. Pressure Change** was detected, which means that the actual pressure has risen by this value compared to the minimum pressure that was measured in the previous step. This is also the first point in the linearization table.
3) Search Maximum Pressure: The voltage should be found at which the maximum pump pressure can be measured. The output to the pressure valve is incremented by **Pump Pressure Lin.: Step Size to Find Max. Pressure** until the maximum pump pressure was detected.
4) Linearize Pressure: The voltage range between minimum and maximum pressure is divided into the available number of table entries. For each step the actual pressure is measured and inserted into the linearization table. Only if the option **Pump Pressure Lin.: Stop at Max. Pressure** is disabled, the last step is extrapolated and forms the last entry in the table "Actual pressure at 10V", otherwise the last entry in the table is the voltage at the maximum system pressure.

5) Idle: Linearization has finished successfully.
6) Linearization Error: There was an error during the linearization. Possible causes for pressure linearization failures are:
- The injection piston is moving during linearization, but only when the option **Pump Pressure Lin.: Use Injection Pressure** is set.
- In step **Search Pressure Offset** the pressure valve output reached 10V and there could not be detected a significant change in actual pressure.
- In step **Search Maximum Pressure** the pressure valve output reached 10V and the maximum pump pressure could not be reached.

Automatic Flow Linearization

During automatic flow linearization the hydro motor of the plastification unit is turned to measure the actual rotation speed. It is assumed that the hydro motor has linear characteristics and therefore it is possible to measure the non-linearity of the pump flow valve. The signal to the pressure valve is kept constant while the flow signal is increased step by step. For every increment the actual rotation speed of the screw is evaluated and inserted in the linearization table.
It can be configured whether the flow linearization should be done until the maximum hardware signal (10V for voltage outputs) or to stop at the maximum screw speed.

The following settings must be completed to start automatic flow linearization:
Max. Pressure and **Max. Flow** for the pump system on on the basic pump system setup pages (2010, 2011, 2097).
Nr. of Rotation Pulses on the page 2019 Basic Plastification Setup, to ensure a proper measurement of screw rotation speed.

During the automatic flow linearization procedure the following steps are run through:
1) Search for Minimum Flow: The voltage should be found at which the screw starts to turn. The output to the pressure valve is incremented by **Pump Flow Lin.: Step Size to Search Min. Speed** until the **Pump Flow Lin.: Min. Speed** is detected. This is also the first point in the linearization table.
2) Search for Maximum Flow: The voltage should be found at which the maximum screw rotation speed can be measured. The output to the flow valve is incremented by **Pump Flow Lin.: Step Size to Search Max. Speed** until the maximum screw rotation speed is detected.
3) Linearize Flow: The voltage range between minimum and maximum speed is divided into the available number of table entries. For each step the actual screw rotation speed is measured and inserted into the linearization table. Only if the option **Pump Flow Lin.: Max. Flow at Max. Screw Speed** is disabled, the last step is extrapolated and forms the last entry in the table "Actual rotation speed at 10V", otherwise the last entry in the table is the voltage at the maximum screw rotation speed.
4) Idle: Linearization has finished successfully.
5) Linearization Error: There was an error during the linearization. Possible causes for flow linearization failures are:
- In step **Search for Minimum Flow** the flow valve output reached 10V and there could not be measured the minimum actual rotation speed.
- In step **Search for Maximum Flow** the flow valve output reached 10V and the maximum screw rotation speed could not be reached. Additionally the alarm **20-53 Calibration: maximum speed for flow lin. could not be reached** is triggered.

3 Setup Parameters

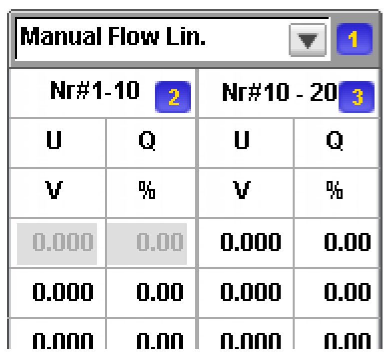
Main Pump Lin. Data (2026)

Sec. Pump Lin. Data (2027)
Third Pump Lin. Data (2098)

Section: General

Use Automatic Flow Lin. Data	Use the linearization data evaluated by the automatic flow linearization for flow linearization (This data is stored only locally and is not saved in the fixdata-file on a USB-stick). The data from the automatic flow linearization can be optionally copied to the manual lineraization table (see Auto. Pump Lin. (2/2) (2070)) - than this function does not need to be activated.
Use Automatic Pressure Lin. Data	Use the linearization data evaluated by the automatic flow linearization for pressure linearization (see above).

Section: Manual Flow/Pressure Lin.



1	With the dropdown you can select between displaying the manual flow- or pressure linearization.
2	Linearization points #1-#10. For Flow-Linearization you have to enter different output signals to the flow-actuator (in ascending order) and the resulting flow. For Pressure-Linearization you have to enter different output signals to the pressure-actuator (in ascending order) and the resulting pressure. The first points is always fixed [0, 0]. The number of points that you want to enter is flexible. Just enter 0 in the voltage-column for the first unused point.
3	Linearization points #10-#20. See Above.

Section: Flow, Pressure

In the graphs the manual entered linearization is displayed. The scale of the graphs is fixed: x-axis = 0..Max. output signal (e.g. 10V), y-axis = 0..Max.Pressure/Max.Flow).

Auto. Pump Lin. (1/2) (2028)

Section: General

Pressure Lin.: Stop at Max. pressure	If this option is set, the last entry in the pressure linearization table is the voltage at the maximum pump pressure. As a consequence, the output to the pressure valve can never rise above the maximum system pressure. This is usually what the machine manufacturer wants. If this option is not set, the last step in the automatic linearization is extrapolated to get the (theoretical) pressure at 10V and inserted as last entry in the linearization table.
Pressure Lin.: Use Injection pressure	If this option is set, the injection piston forward valve is opened during pressure linearization and the actual pressure is read from the input **Injection Actual Pressure**. This option must be used if the pressure sensor is located in the hydraulic piston of the injection axis.
Pressure Lin.: Flow Signal	Constant output to flow valve during automatic pressure linearization.
Pressure Lin.: Step Size to find Max. Pressure	Voltage increments on the pressure valve output during finding the maximum pressure in the step **Search Maximum Pressure**.
Pressure Lin.: Step Size to find Min. Change	Voltage increments on the pressure valve output during finding the first significant change in actual pressure in the step **Search Pressure Offset**.
Pressure Lin.: Min. Pressure Change	Offset to the minimum pressure (actual pressure measured at 0V) that must be reached in the step **Search Pressure Offset**.
Pressure Lin.: Stabilization Delay	The time for one incremental step in the automatic pressure linearization. The pressure valve output is set to a certain voltage and remains at this voltage for this time. Then the actual pressure is measured and the next incremental step is made.
Flow Lin.: Max. Flow at Max. Screw Speed	If this option is set, the last entry in the flow linearization table is the voltage at the maximum screw rotation speed. As a consequence, the output to the flow valve can never rise above the flow at maximum screw rotation speed. If this option is not set, the last step in the automatic linearization is extrapolated to get the (theoretical) flow at 10V and inserted as last entry in the linearization table.
Flow Lin.: Pressure Signal	Constant output to pressure valve during automatic flow linearization.
Flow Lin.: Step Size to search Max. Speed	Voltage increments on the flow valve output during finding the maximum rotation speed in the step **Search for Maximum Flow**.
Flow Lin.: Step Size to search Min. Speed	Voltage increments on the flow valve output during detecting the flow at which the screw starts to turn in the step **Search for Minimum Flow**.
Flow Lin.: Min. Speed	The minimum rotation speed that must be detected in the step **Search for Minimum Flow**.

Flow Lin.: Max. Speed	The maximum allowed screw rotation speed. It is the same setting as on the page 2019 Basic Plastification Setup.
Flow Lin.: Stabilization Delay	The time for one incremental step in the automatic flow linearization. The flow valve output is set to a certain voltage and remains at this voltage for this time. Then the actual screw rotation speed is measured and the next incremental step is made.

Section: Pump Valves for Linearization

These are the settigns for the 5 static pump selection valves for flow- and pressure-linearization (see Setup >> Static Pump-Selection).

Auto. Pump Lin. (2/2) (2070)

Section: Actual State

Shows the actual phase during the linearization procedure (see Function Description).

Section: Direct Valve Access

By direct valve access it is possible to force the pump flow and pressure output to certain values, keeping all directional valves closed. It can be used to test the pump before starting the automatic linearization.

Pump Pressure	Voltage to pressure valve during pump forcing.
Pump Flow	Voltage to flow valve during pump forcing.
Force Pump	Choose the pump system that should be forced.
OK-Button	Press this button to force the selected pump system to the pressure and flow entered. All directional valves remain closed.

Section: Automatic Linearization

- (DropDown)	Choose the pump system that should be linearized.
Pressure	Press this button to start automatic pressure linearization.
Flow	Press this button to start automatic flow linearization.

Copy to FixData	After autoamtic pressure linearization has finished, press this button to copy the retrieved linearization data to the fixdata. By default the automatic pump linearization data is stored within the calibration data and not shown explicitely on a screen. Calibration data is saved with fixdata on the Compact Flash but not on the USB stick. By pressing this button the linearization data will be copied to the tables on pages 2026 Main Pump Lin. Data, 2027 Sec. Pump Lin. Data and 2098 Third Pump Lin. Data and as a consequence saved with the fixdata also on USB stick. Alternatively you can select the options **Use Automatic Flow Lin. Data** on those pages to use the linearization out of the calibration data.

Section: Output signals

Pressure	Actual output to the pressure valves of the available pump systems.
Flow	Actual output to the flow valves of the available pump systems.

4.26 Dynamic Pump-Selection

1 Function Description

The dynamic pump-selection can be used to control up to 4 sub-pumps (on/off) in each a PQ-system (a PQ-system can consist of multiple pumps with a common flow- and pressure-actuator, e.g multiple fixed displacement pumps that can be switched on to increase the max. flow of the PQ-system)
The outputs for these sub-pumps are set according to the flow that is currently requested from the PQ-system. So this outputs are set after the movement has started and the flow-delay-time for the axis has expired.

For each sub-pump you can make the following settings:

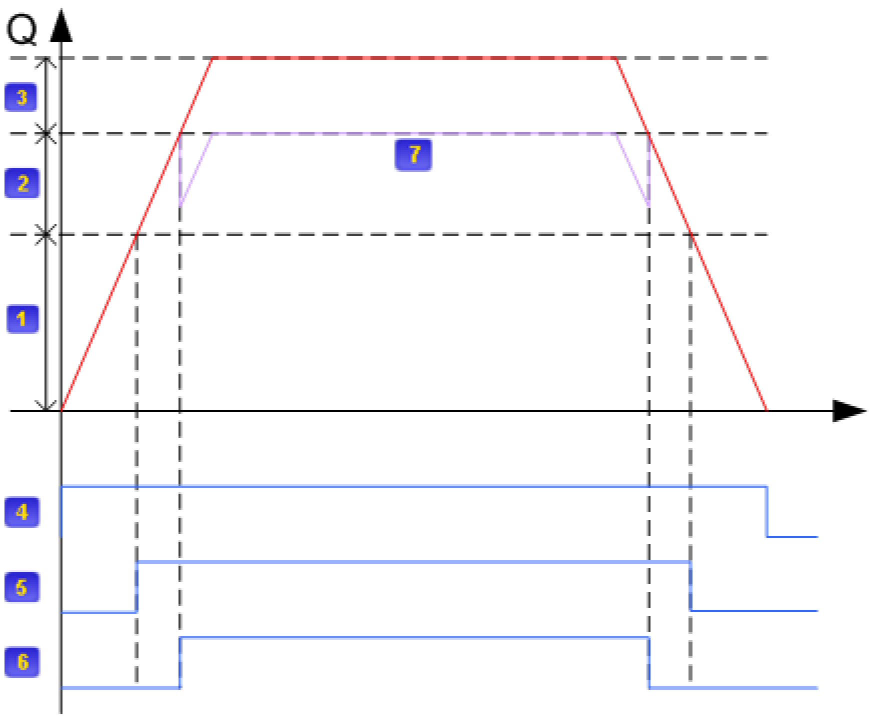
Static	When you enable the parameter "Static" the flow from the pump is assumed to be "fixed". That means that the flow from this sub-pump cannot be controlled but is constant (its output is not passing through the flow-actuator).
Flow	Flow that the sub-pumps can deliver. The sum of all flows from all sub-pumps inside a PQ-system must be identical to the max. possible flow from the PQ-system.

The sub-pumps are switched on in the order they are configured (first sub-pump #1 than #2 than #3....):

Sub-pump #1 (=main pump) is always on as soon as flow is requested from the PQ-system.
Sub-pump #2 is switched on when the requested flow exceeds the max. flow of sub-pump#1.
Sub-pump #3 is switched on when the requested flow exceeds the max. flow of sub-pump#1 and sub-pump#2
....

If a sub-pump is configured to be static the flow of the preceding (normally controlled) pumps must be higher than the static one (otherwise the flow of the PQ-system cannot be controlled)!! So it is never useful to configure sub-pump #1 as "static".

The following diagram shows the control of 3 sup-pumps (the red line shows the flow-request for the PQ-system):



1	Flow of sub-pump#1 (main pump). In this example 50% of max. PQ-system flow.
2	Flow of sub-pump#2. In this example 30% of max. PQ-system flow.
3	Flow of sub-pump#3. In this example 20% of max. PQ-system flow.
4	Sub-pump output #1
5	Sub-pump output #2
6	Sub-pump output #3
7	If we would assume that the sub-pump#3 is "static" than the violet line shows the flow that is controlled by the flow actuator. If sub-pump#3 is not "static" than the flow controlled by the actuator would be identical to the red-line (flow request to the PQ-system).

4 Example

Example1:
A PQ-system (max. flow = 100%) consists of 3 fixed displacement pumps (#1: 50% flow, #2: 35% flow, #3 15% flow) and the flow of all pumps is controlled by a proportional flow valve:

Sub-Pump#1: Static=OFF, Flow=50%
Sub-Pump#2: Static=OFF, Flow=35%
Sub-Pump#3: Static=OFF, Flow=15%
Sub-Pump#4: Static=OFF, Flow=0%

Example2:
A PQ-system (max. flow = 70l/m) consists of a variable-displacement pump that can deliver 60l/m flow. A fixed displacement pump is delivering 10l/m of flow, but its flow cannot be controlled (fixed).

Sub-Pump#1: Static=OFF, Flow=60l/m
Sub-Pump#2: Static=ON, Flow=10l/m
Sub-Pump#3: Static=OFF, Flow=0l/m
Sub-Pump#4: Static=OFF, Flow=0l/m

4.27 Static Pump-Selection

1 Function Description

The static pump-selection can control up to 5 valves (digital outputs) that depend on the actual active movement (+max. velocity set for the movement) and the actual active mode.
The outputs can be used to switch-on sub-pumps (to increase the flow of the according pump-system) or any other pump-system valves (e.g. low-pressure valves). These pump-selection outputs are set exactly at the movement start and are not changed during the movement (unless explicit mentioned for certain movement sections - e.g. mold protection). Valve-, Flow- and Pressure-delay for the movement are considered afterwards.

For every movement (see list below) you can define a pump selection as well as for every mode (see list below). The two selections are combined and the result defines the output.
The following settings are possible for the pump-selection (for each of the 5 valves):
- **-** .. output undefined (default: off)
- **ON** .. output on
- **OFF** .. output off (overrides ON)

The following combinations lead to the following results (first column and first row show the two set status, the fields in between the status of the valve-output):

	-	**ON**	**OFF**
-	LOW	HIGH	LOW
ON	HIGH	HIGH	LOW
OFF	LOW	LOW	LOW

2 List of pump-selection settings for modes

For the following modes a pump-selection can be defined:

Setting	This pump selection is active when a movement is active in setting mode (Setup >> Pump System)
Normal	This pump selection is active when a movement is active in manual, automatic or semiautomatic mode (Setup >> Pump System)
Calibration	This pump selection is active when a movement is active in calibration mode (Setup >> Pump System)
Cal.: Pressure Lin.	This pump selection is active when the pump-pressure linearization (in calibration mode) is done (Setup >> Pump Linearization)
Cal.: Flow Lin.	This pump selection is active when the pump-flow linearization (in calibration mode) is done (Setup >> Pump Linearization)
Idle	This pump selection is active when no movement is active (pump in idle) (Setup >> Pump System))

3 List of pump-selection settings for movements

For the following movements (or actions) a pump-selection can be defined:

Ejector	For the ejector a common pump-selection for both movements can be set (Setup >> Ejector)
Inj. Unit	For the injection unit a common pump-selection for both movements can be set (Setup >> Inj.Unit)
Inj. Unit Rotate	For the injection unit rotate axis a common pump-selection for both movements can be set (Setup >> Inj.Unit)
Mold Height	For the mold height a common pump-selection for both movements can be set (Setup >> MoldHeight)
Cores	For all core-movements a common pump-selection can be set (Setup >> Cores)
Mold Close	For the mold close movement a pump-selection table is available. Different pump-selections can be defined depending on the max. mold close velocity from the movement profile (Setup >> Mold)
Mold Lock	For the mold locking a separate pump-selection is available. This selection is optional and if it is disabled the selection from "Mold Close" is applied (Setup >> Mold)
Mold Protection	For the mold protection phase a separate pump-selection is available. This selection is optional and if it is disabled the selection from "Mold Close" is applied (Setup >> Mold)

Mold Open	For the mold open movement a pump-selection table is available. Different pump-selections can be defined depending on the max. mold open velocity from the movement profile (Setup >> Mold)
Mold Unlock	For the mold unlocking a separate pump-selection is available. This selection is optional and if it is disabled the selection from "Mold Close" is applied (Setup >> Mold)
Injection	For the injection movement a pump-selection table is available. Different pump-selections can be defined depending on the max. injection velocity from the injection profile (Setup >> Injection)
Holdon Pressure	For the holdon pressure phase a separate pump-selection is available. This selection is optional and if it is disabled the selection from "Injection" is applied (Setup >> Injection)
Plastification	For the plastification movement (screw rotation) a pump-selection table is available. Different pump-selections can be defined depending on the max. screw speed in the plastification profile (Setup >> Injection)
Decompression	For the injection back movement (decompression) a pump-selection can be set (Setup >> Injection)
Accumulator	For loading the accumulator a pump-selection is available (Setup >> Accumulator)

4 Example

Example1
:
Control of sub-pumps. A supplementary pump should be turned on for injection movements faster than 60mm/s and for screw rotations faster than 50rpm. For this valve the pump selection valve-output #1 is used.

Injection Pump Selection Table (Page 2050): Until velocity#1 (60mms) the valve#1 should be off (setting:-), for all higher velocities it should be on (setting:ON)
Velocity#1 = 60mm/s Valves#1 = -
Velocity#2 = MAX Valves#1 = ON

Plastification Pump Selection Table (Page 2055): Until speed#1 (50rpm) the valve#1 should be off (setting:-), for all higher rotation speeds it should be on (setting:ON)
Speed#1 = 50rpm Valves#1 = -
Speed#2 = MAX Valves#1 = ON

Example2*:*
Control of a low-pressure valve. This valve should be on for all movements in setting mode and calibration mode and always during mold protection phase. For this valve the pump selection valve-output #1 is used.

Pump Selection for modes (Page 2009): for calibration and setting movements pump valve#1 should be on. It should be off in all other cases.
Calibration Move, Valve#1 = ON

Setting Move, Valve#1 = ON
Normal Move, Valve#1 = -
Idle, Valve#1 = -

Mold Close Pump Selection Table (Page 2032): The separate pump-selection for mold protection has to be enabled and during mold protection the valve#1 has to be turned on.
Enable Sep. Pump Selection for Mold Prot. = Check
Mold Protection, Valve#1 = ON

4.28 PumpSys Setup

1 Function Description

Under Pump-system (or PQ-system) we understand a unit consisting of one or more pumps (static pumps, displacement pumps or servo pumps) that supports the possibility to control the pressure (P) and flow (Q) from that system (proportional valves, pump displacement, servo-pump-control).
The SmartMold-software can support up to 3 pump-systems (Main, Secondary, Third), but only the first is not optional (the second two pump-systems might not be visible on your controller). Additionally 2 pump-combinatios (combinations of 2 PQ-systems) are optionally available (see Setup >> Pump Combination).

For each pump-system the SmartMold supports 2 analog outputs: One to control the flow and one to control the pressure. Each output is also available as a PWM-output (see Setup >> PWM Outputs)

As each pump-system can consist of multiple pumps digital outputs are supported to control (switch-on/off) those pumps.
The first option is the dynamic pump-selection. It is available for every pump-system and switches the pumps on depending on the actual requested flow (Setup >> Dynamic Pump-Selection).
The second option is the static pump-selection. Is is available for all pump-systems in common and depends on the active movement (Setup >> Static Pump-Selection).

2 Software Options (SW.ini)

#721	Max. number of pump-systems that are available (visible) on controller. Possible Settings: 1-3
#713	Only if this option is enabled the static pump-selection functionality is available on the controller.
#715	Only if this option is enabled the internal servo-pump functionality (SmartPump) is available on the controller
#716	Enable the use the dynamic pump selection.

3 Setup Parameters

General PumpSys Setup (2009)

Pump Flow Unit	With this dropdown you can chose the type of unit used for the pump-flow (this unit will be used in all following settings for the pump-flow). The following units are possible: • **l/m** ... physical unit liter / minute. This setting is advisable if you want to use the same axis settings for different pumps • **%** ... percentage of the max. possible flow. This setting is advisable if you do not know the exact pump flow.

Section: Servo Pumps

Acopos Servo Pump Drive	With this checkbox you can enable the servo-pump operation for the according pump system. You only need to enable this if you want to use the SmartPump-control (internal control using a ACOPOS-servo drive). If you use a servo-pump from another supplier you must not enable this function.

Section: PWM-Output

Max. Current to Flow PWM-Output	Max. possible current for the pump flow actuator pwm-output (see Setup >> PWM Outputs)
Max. Current to Pressure PWM-Output	Max. possible current for the pump pressure actuator pwm-output (see Setup >> PWM Outputs)

Section: Pump-Valves

This settings are for the 5 static pump-selection valves (Setup >> Static PumpSel). This setting refers to all pump-systems not to a particular one!

Calibration Move	Static Pump Selection for all movements in calibration mode
Setting Move	Static Pump Selection for all movements in setting mode
Normal Move	Static Pump Selection for all movement in all other modes (manual, automatic, semiautomatic).
Idle	Static Pump Selection if no movement is active (machine in idle).

Main PumpSys Setup (2010)

Secondary PumpSys Setup (2011)

Third PumpSys Setup (2097)

Section: Max. Settings

Max. Flow	Max. possible flow from that pump-system. If you use unit "l/m" you should enter the exact physical value. If you use unit "%" you may always enter 100% here. But if you use multiple pump-systems and want to combine them you should consider the real physical relation between those pump-systems.
Max. Pressure	Max. possible pressure from that pump-system. The axes will never be able to request more pressure than that from that system.
Copy Max. Pressure to All Assigned Axes	If you press this button the max. possible pressure is copied to all axes that are assigned to this pump-system.

Section: Idle Settings:

Apply Idle Settings	When this checkbox is checked than the configured idle values (see below) are applied to the pump-actuators if no axis requests this pump.
Idle Flow	Flow that the pump-flow-actuator is set to when the pump is not requested (in idle operation).
Idle Pressure	Pressure that the pump-flow-actuator is set to when the pump is not requested (in idle operation).

Section: Pressure Sensor

Pressure Sensor Min. Signal	Min. Signal from the system pressure sensor (when this signal is active on the input the pressure-value 0 is displayed).
pressure Sensor Max. Signal	Max. Signal from the system pressure sensor (when max. pressure is measured).
Pressure Sensor Max. Pressure	Pressure value that is measured by the sensor at the given max. signal (see above).
Pressure Sensor Filter Time	Filter time for the system pressure signal. Increase this value if you have to much noise on the signals, but do not make it to big to avoid slow reaction from the system.
Actual Signal	Display of actual signal from pressure sensor.

Section: Sub-Pumps

Static	When you check this checkbox the flow from the pump is assumed to be "static". That means that the flow from this sub-pump cannot be controlled (its output is not passing through the flow-actuator) but is fixed (see Setup >> Dynamic Pump-Selection for details)
Flow	Flow that each of the sub-pumps can deliver. The sum of all flows must be identical to the max. possible flow from the pump-system (see Setup >> Dynamic Pump-Selection for details)

4.29 PWM Outputs

2 Software Options (SW.ini)

#714	Only if this option is enabled PWM outputs and all according settings are available on the controller.

1 Function Description

PWM outputs on the hardware module 7XX419L.50-1 can be used to drive proportional valves directly without having to use an additional 3rd party amplifier card. All available analog outputs (pump flow and pressure, axis servo valves) can be mapped in the IO configurator to a normal analog voltage output (+/- 10V) or to a PWM output (0 - 3.5A).
For details on wiring the PWM outputs see the documentation Service >> Wiring.

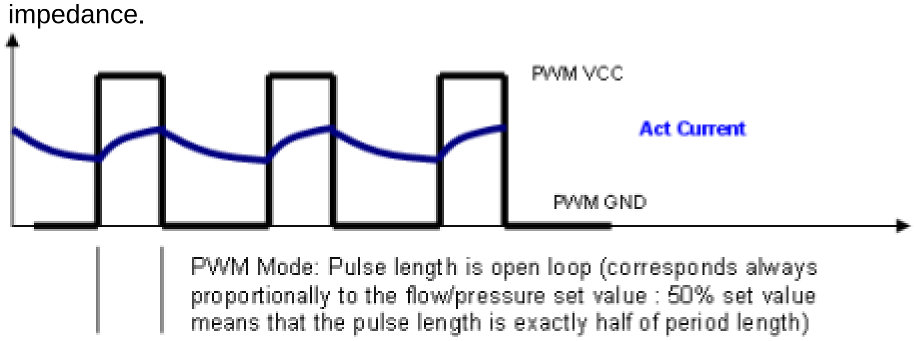
Technical details:

Number of outputs	2
Type	Push/Pull
Supply voltage	External; 24 VDC - 38.5 VDC +/-25%
Rated current	3 A
Max. current / output	3.5 A (2 sec)
PWM period / frequency **Resolution**	20us - 65ms / 15Hz - 50kHz 16-bit
Dither can be adjusted	Amplitude (8-bit) , frequency (50 Hz - 200 Hz)

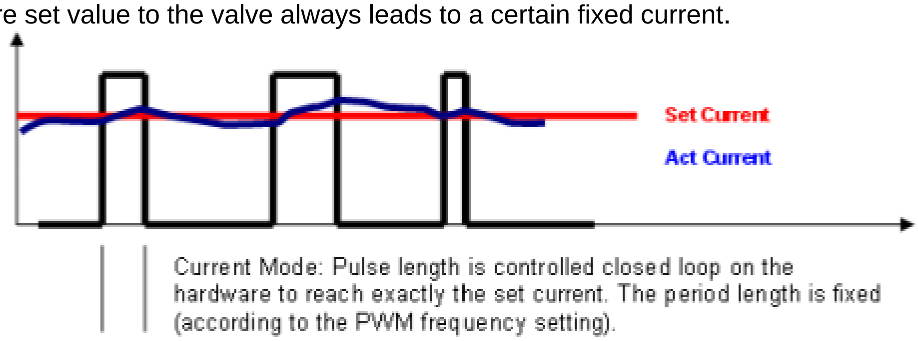
Reverse polarity protection for supply voltage	No / must be protected externally

Basically the PWM outputs provide a certain current to the valve by switching between GND PWM and VCC PWM. This method is called **pulse width modulation**. Any supply voltage between 24 VDC and 38.5 VDC can be applied, typically it will be 24VDC.
There are 2 basic modes for the PWM outputs which can be selected in the IO configurator: **PWM mode** and **Current mode**. Normally the current mode is always the first and better choice.

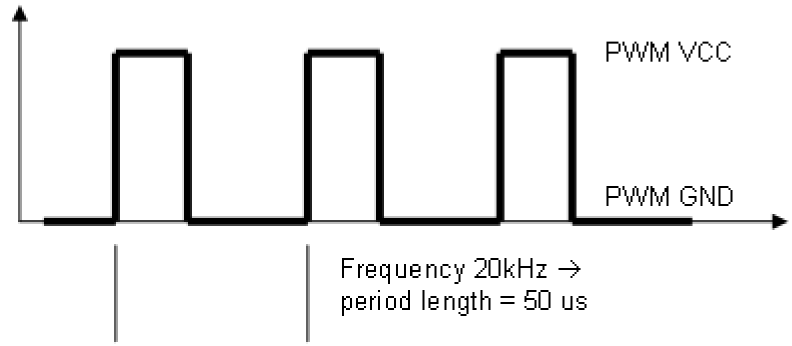
In PWM mode the pulse length is open loop, so the flow/pressure set value to the valve always leads to a certain fixed pulse length. 100% ouptut to the valve means that the voltage VCC PWM is applied continuously on the PWM output. The current flowing through the valve is a result of the PWM signal and the load impedance.

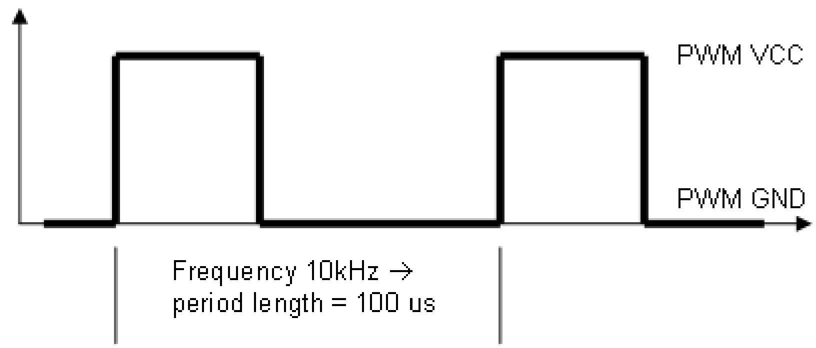


In current mode the pulse length of the PWM signal is controlled closed loop on the hardware, so the flow/pressure set value to the valve always leads to a certain fixed current.



For both modes the period length is fixed and can be adjusted by setting the PWM frequency (see Basic Setup (2000)).





Error Handling

Overcurrent error:
An overcurrent error is registered if:
a) >= 3.5A are flowing from a PWM output for at least 2 seconds, or
b) >= 5A are flowing for 3 consecutive PWM cycles.
In both cases, the affected PWM output is disabled by the firmware (= PWM output pins are shortcircuited) and cannot be reactivated until the error has been acknowledged.
For both PWM outputs the same alarm **20-80 PWM output 01 error** is triggered.

Overtemperature shut-off:
If the temperature on the PWM outputs reaches or exceeds the 85 C limit value, then all of the module's PWM outputs are disabled (= PWM output pins are shortcircuited). After the module temperature has dropped to the permissible range, the output can return to normal operation by acknowledging the error.
For both PWM outputs the same alarm **20-81 PWM output 02 error** is triggered.

3 Setup Parameters

Basic Setup (2000)

PWM Frequency	The frequency of the PWM signals, common to both PWM outputs. Applies both for PWM mode and current mode. See 1 Function Description for details.

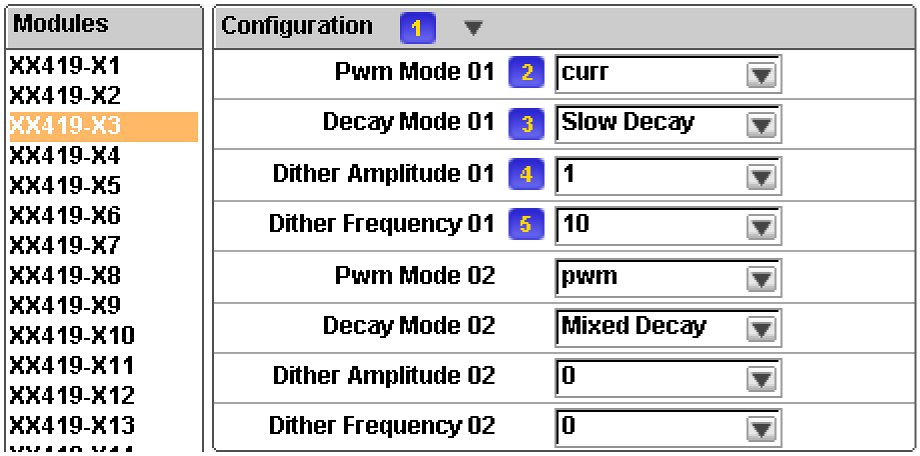
IO Units (2139)

PWM Currents	The display unit for maximum PWM output settings (see below) can be chosen here (**A** or **%**). If the PWM outputs are configured as current mode, it makes sense to change the display unit to **A**(mpere). If the PWM outputs are configured as PWM mode, the display unit should be set to **%**, because all settings refer then to the proportion pulse length to period length.
Mold: Max. Current to Servo PWM-Output	The maximum output to the mold servo valve (in case it is driven by a PWM output) can be set here. All other settings for the mold servo valve (like linearization tables or direct valve access on the calibration page) refer to this maximum. For example if you set here 1 A max. current and if you do a 10% direct valve access on calibration page (830), it will result in an overall 10% of 1A = 0,1 A output to the valve.
Ejector: Max. Current to Servo PWM-Output	See Mold: Max. Current to Servo PWM-Output.
Injection: Max. Current to Servo PWM-Output	See Mold: Max. Current to Servo PWM-Output.

General PumpSys Setup (2009)

Main/Sec./Third Pump: Max. Current to Flow PWM-Output	See Mold: Max. Current to Servo PWM-Output.
Main/Sec./Third Pump: Max. Current to Pressure PWM-Output	See Mold: Max. Current to Servo PWM-Output.

IO Configuration (2204)



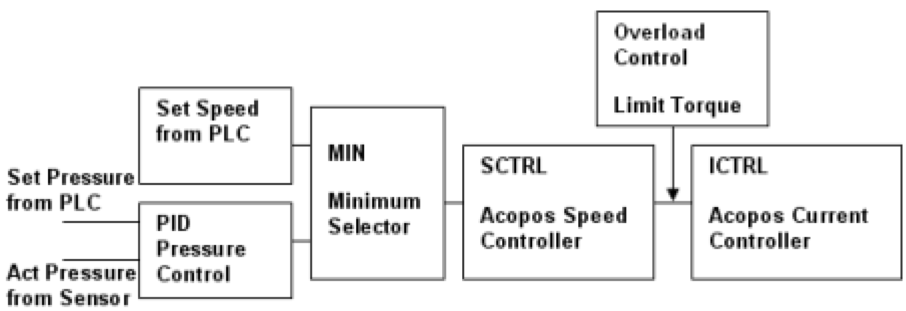
1	After assigning an Io datapoint (servo valve or pump flow/pressure) to the output, switch to the IO **configuration** to adjust the settings for the PWM outputs.
2	Pwm Mode: Choose between Current or Pwm Mode. See 1 Function Description for details.
3	Decay Mode: Choose between Slow Decay or Mixed Decay. The decay configuration determines the method and dynamics of current reduction for inductive loads. The following options are available: **Slow Decay**: In this mode, the current is automatically reduced relatively slowly with resistance in the load. No energy is regenerated into the module. **Mixed Decay**: This mode is recommended for applications that require a dynamic and linear reduction of current. In this mode, energy is regenerated into the module during part of the PWM cycle.
4	Dither Amplitude [unit 0.1%]: A dither can be used to prevent valves from sticking. The effects of static friction on the operation of the solenoid are reduced by the application of a small AC current. The hysteresis and repeatability of the valve are improved by this practice. This function is supported in PWM mode and in current mode. The pulse width (PWM mode) and the current (current mode) is adjusted according to the dither amplitude and the dither frequency. Example: Valve specification: Dither needed between 20% and 35% peak to peak of the rated maximum valve current 2A. This corresponds to a dither amplitude between 11.4% and 20% related to 3.5A (which is the maximum current). The dither amplitude must be set as +/- rather than a peak to peak value, so we should set it to a value between +/-5.7% and +/-10%, e.g. 80 (unit is 0.1%).
4	Dither Frequency [unit 2 Hz]: see Dither Amplitude. Example: Valve specification: Dither frequency 40Hz - 70 Hz. We select a setting of 25. This corresponds to a frequency of 50 Hz.

4.30 Smartpump

1 Function Description

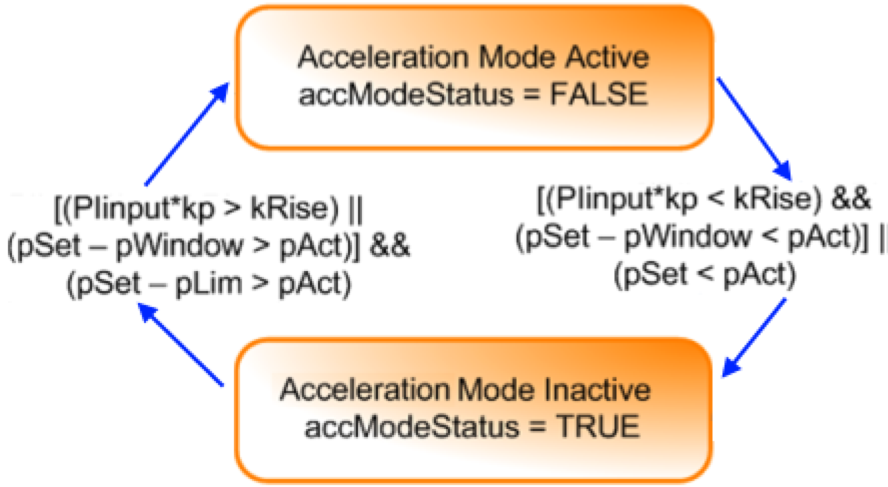
The software can control up to 3 Acopos servo pumps. It is necessary to insert the interface card 4PP065.IF23-1 with a CAN interface into the panel. All B&R Acopos drives 8V* either with B&R motors or third party synchronous servomotors can be used.
Set pressure and set speed are forwarded to the servo pump, which is doing speed control and pressure limit control. If the actual pressure comes near or even rises over the set pressure, the speed demand cannot be followed. Instead, the speed is automatically reduced to ensure that the set pressure is not exceeded.
The Acopos drives must be given the CAN node numbers 1-3. The pump system pressure sensor must be wired to the Acopos, therefore an additional plug-in card 8AC131.60-1 must be used.

Controller structure:



The servo pump always tries to follow the set speed demand. In parallel a pressure PID controller is running which calculates in its most basic form as a P controller the following output: Output = (SetPressure - ActPressure) * Kp
A minimum selector chooses always the minimum of set speed and pressure controller output. If the gap between set and actual pressure is becoming smaller, there will be a point where the minimum selector switches from set speed to pressure controller output, ensuring that the speed will be reduced in a way that the actual pressure does not exceed the set pressure.

Acceleration mode:



If during acceleration the hydraulic pressure rises it would result immediately in a reduction of the rotation speed (see controller structure above), depending on the PID settings of the pressure controller. Especially the D-part is sensitive, since it reacts immediately to rising slopes on the actual pressure.
However, if the actual pressure is still far below the set pressure it is not desirable to reduce the speed. Therefore the acceleration mode can be enabled, which basically deactivates the pressure controller when the actual pressure is still far below the set pressure. Typically satisfactory results can be achieved just ba tuning the PID pressure controller and it is not necessary to activate acceleration mode.

Commissioning Steps

Basic Settings

Specify how many pump systems are driven by an Acopos servo pump on page General PumpSys Setup (2009). The respective Acopos drives must be connected correctly via CAN to the interface card 4PP065.IF23-1. When the **Motor On** key is pressed, the servo drives are switched on instead of the hydraulic motor. Therefore you should deactivate also all hydraulic motors on page Motor Setup (2001).
Make the correct settings for the pressure sensor on page Setup >> Pumps >> PumpSys Setup >> Main PumpSys Setup (2010).
All parameters on page Acopos SP#1 General (1/2) (2072) must be set correctly before switching on the drives for the first time.

Motor Parameters

If a third party motor or a B&R motor with resolver is used, you must specify all motor parameters on the pages Acopos SP#1 Motor (1/2) (2074) and Acopos SP#1 Motor (2/2) (2075). If a B&R motor with Endat encoder is used, it is not necessary to specify the motor parameters. See standard B&R documentation for an explanation of all motor parameters.
The motor parameters must be specified correctly before switching on the motor for the first time.

Overload Controller

The overload control prevents the drive from switching off (for example because of junction overtemperature or motor overload) if the injection duty cycle exceeds the power of the drive and motor (for example too long and high holding pressure). Instead of switching off the drive, the motor torque is reduced dynamically. At the beginning disable the overload controller by setting high parameters for Kp on page Acopos SP#1 General (2/2) (2073). Only if later the problem arises that the drive is switching off frequently for example with junction overtemperature, then decrease Kp until the

Acopos drive is not switching off anymore.

Speed Controller Tuning

Before switching on the drive for the first time, set initial values for the speed controller on page Acopos SP#1 General (2/2) (2073): The proportional gain should be rather low, the integral action time and the filter time should be set to 0.
The **Ready** LED on the Acopos must be steadily green. If it is not green, see the page Pages >> Alarms >> Acopos Diagnosis (630) to find out the reason. Switch on the servo drive by pressing the **Motor On** key on the panel. The **Run** LED on the Acopos should be orange now. If the drive cannot be switched on, see the pages Pages >> Alarms >> Acopos Diagnosis (630) and Pages >> Alarms >> Alarm History (610) to find out the drive error numbers.
If the drive can be switched on, you can do a basic tuning of the speed controller. Increase Kp (**Speed Ctrl. Prop. Gain**) until you can hear a loud noise in the motor. The speed controller parameters can be changed while the motor is switched on and are adopted immediately. Try if the noise can be eliminated by increasing the **Speed Ctrl. Filter Time**. If the filter time has no markable influence on the oscillation, leave it to 0. If you can here a loud noise that you cannot eliminate with the help of the filter time, decrease the Kp by 1/3, which is then your final value.
Now reduce the **Speed Ctrl. Integr. Action Time** until you can hear again a loud noise on the motor. Increase then the integral action time by 1/3, which is your final value.

Test the Pump

Set the unit system for the Pump Valve Outputs to **0% to 100%** on page Setup >> Basic >> IO Units (2139).
For the first test disable the pressure control on page Acopos SP#1 Parameter Sets (2086). Then force the pump on page Pages >> Service >> Calibration (830).
Check whether the pump is moving in the correct direction. If necessary, you can change the direction of the motor rotation with the setting **Reverse Motor Direction** on page Acopos SP#1 General (1/2) (2072).

Pressure Controller Tuning

First of all ensure that all axes run with the same parameter set on page Acopos SP Param. Selection (2087). Find this basic PID parameter set, that should be used for as many axes as possible. As a second step, you can choose then for some of the axes (especially injection) another parameter set and do the fine tuning.
Configure the actual pressure sensor filter on page Setup >> Pumps >> PumpSys Setup >> Main PumpSys Setup (2010).
If the filter time is set too low, signal disturbances are not suppressed enough with the effect that the motor shows a characteristic oscillation already with rather low Kp setting of the pressure controller. However, setting the filter time too high reduces the dynamics of the pressure control. A good starting value is 2-4 ms.
The PID parameters for the pressure controller can be found on page Acopos SP#1 Parameter Sets (2086). Start with a small Kp, set the desired set pressure and let the motor drive the cylinder until it hits the stopper. Then keep increasing the Kp until the noise on the motor increases significantly. Divide the kp by 2, let the motor drive the cylinder until it hits the stopper and evaluate the result.
To achieve the desired set pressure Tn must be set above zero. Start with a high value. Slowly reduce Tn until the control loop almost enters a continuous oscillation. This is initiated by running the cylinder against the stopper. Then multiply Tn by 2.
Increase Tv until almost no overshoot remains. Tf can be used to damp the differentiator of the PID controller. A good starting value is Tf = Tv/10. However, T1 should not be set higher than Tv/3. If the motor is not running smoothly, or if the actual speed creates too much noise, reduce Kp and do the procedure to determine Tn and Tv again.

Acceleration Mode

Typically, it is not necessary to activate the acceleration mode. Set the parameter **Prs. Ctrl. pWind** to 0 on page Acopos SP#1 Parameter Sets (2086) to disable accleration mode. It should only be used as a back door if by modification of the PID parameters of the pressure controller the desired result cannot be achieved.

2 Software Options (SW.ini)

SWcfg.Options.bServoPumps	Activate the use of servo pumps
sp_con:initParameter[X].uParID[Y] **sp_con:initParameter[X].sValue[X]**	Up to 20 additional ParID initializations can be added here all of the configured servo pumps (1-3) on the machine. You might need it for example to specify a lower default DC bus voltage. The Acopos parameter ID specified in **uParID** will be set to the value specified in **sValue** after power up. X ... servpump number [1-3], Y ... index of additional parameter ID initialization [0-20]

3 Setup Parameters

General PumpSys Setup (2009)

Section: Servo Pumps

Main Pump: Acopos Servo Pump Driven	When this option is activated, the flow and pressure of the main pump system are forwarded to the Acopos drive with node number 1. When the **Motor On** key is pressed, the Acopos drive with node number 1 is switched on. Error handling for the drive with node number 1 is activated. If the drive cannot be found on the CAN bus the alarm **20-73 Acopos drive not connected** is triggered.
Sec. Pump: Acopos Servo Pump Driven	When this option is activated, the flow and pressure of the secondary pump system are forwarded to the Acopos drive with node number 2. See also description for main pump.
Third Pump: Acopos Servo Pump Driven	When this option is activated, the flow and pressure of the secondary pump system are forwarded to the Acopos drive with node number 3. See also description for main pump.

Acopos SP#1 General (1/2) (2072)
Acopos SP#2 General (1/2) (2102)
Acopos SP#3 General (1/2) (2109)

Section: General Parameters

Filter Time Neg. Setpressure Jump	To avoid cavitation, any negative jump in the set pressure is filtered before being forwarded to the servo pump. Cavitation is the formation of vapor bubbles in a region where the pressure of the hydraulic oil falls below its vapor pressure.
Max. Rotation Speed	The maximum rotation speed of the servo pump. It should not exceed the limits of the motor. All pump system flow settings refer to this maximum rotation speed, that means that at 100% flow the servo pump will rotate with this speed.
Leakage Compensation	Currently not used. Set this parameter to 0.
Reverse Motor Direction	If this option is activated, the rotational direction of the pump can be reversed.
Limit Current Quad. Component	Currently not used, applies only for induction motors (asynchronous motors).
Actual Pressure Signal Input Source	Configuration of the signal source for the actual pump system pressure. Depending on the wiring, it must be set to one of the following values: • **131** .. wired to channel 1 of AC131 in slot 3 • **132** .. wired to channel 2 of AC131 in slot 3 • **141** .. wired to channel 1 of AC131 in slot 3 • **142** .. wired to channel 2 of AC131 in slot 3
Motor Off Temperature	If the motor temperature exceeds this value, the alarm **SA-4 Acopos #*X* Motor temperature high** is triggered. Set the Motor Off Temperature to 0 to disable this alarm. However the drive will turn off itself if the internal maximum motor temperature is reached.
Set Speed Acc. Time	Acceleration time for the set speed (pump rotation) to the servo pump. It is only applied in service (calibration) mode, because in all other modes the normal axis acceleration and deceleration settings are effective anyway. Set to 0 to disable speed ramping.
Set Speed Jolt Time	Jolt time for the set speed (pump rotation) to the servo pump. It is applied in all operation modes on the set speed demand to the servo pump. It should be kept as short as possible not to affect the dynamics of movements and increased only if noise can be noticed when going from one movement profile step to another. Set to 0 to disable jolt limitation.
Set Pressure Acc. Time	Acceleration time for the set pressure to the servo pump. It is applied in all modes on the set pressure demand to the servo pump. If pressure acceleration rates are configured for every single axis, then this setting should be disabled. Set to 0 to disable pressure ramping. Note: the setting only has effect in movement phases where the servo pump is in pressure control. See 1 Function Description for a descripion of the automatic control algorithm.

Set Pressure Jolt Time	Jolt time for the set pressure to the servo pump. It is applied in all operation modes on the set pressure demand to the servo pump. It should be kept as short as possible not to affect the dynamics of movements and increased only if noise can be noticed when going from one movement profile step to another. Set to 0 to disable jolt limitation. Note: the setting only has effect in movement phases where the servo pump is in pressure control. See 1 Function Description for a descripion of the automatic control algorithm.
Main Contact Delay	When the servo drive is switched on by pressing the **Motor On** key, first the digital output signal **Servo Pump 1..3: Main Contact** for the power mains contactor is set to HIGH. The servo drive controller is switched on after this delay time expires.
Main Contact Off Delay	When the servo drive is switched off by pressing the **Motor On** key, first the servo drive controller is switched off. After this delay time expires, the digital output signal **Servo Pump 1..3: Main Contact** for the power mains contactor is reset to LOW. If this parameter is set to 0, the main contactor is not reset to LOW when switching off the drive. It remains always HIGH.

Acopos SP#1 General (2/2) (2073)
Acopos SP#2 General (2/2) (2103)
Acopos SP#3 General (2/2) (2110)

Section: Acopos Controllers

Speed Ctrl. Prop. Gain	Proportional gain (Kp) of the Acopos drive speed controller.
Speed Ctrl. Integral Action Time	Integral action time (Tn) of the Acopos drive speed controller.
Speed Ctrl. Filter Time	Filter time for filtering the actual speed signal derived from the actual encoder position. With a longer filter time it is usually possible to increase the proportional gain of the speed controller. However the filter time must not be too long (not longer than 0.0032 seconds) not to have a bad effect on the dynamics of the motor.
Overload Control: Kp Junction	If the IGBT junction temperature of the drive rises and is about to exceed the maximum junction temperature, the motor torque will be reduced by a closed loop P controller. Motor Torque = Kp * (Max. Junction Temperature - Actual Junction Temperature). The lower Kp is set the sooner the controller takes action and reduces the torque. Set Kp to a high value (> 100) to disable the overload control.

Overload Control: Kp Load	If the motor load rises and is about to exceed the maximum load of 100%, the motor torque will be reduced by a closed loop P controller. Motor Torque = Kp * (100 - Actual Motor Load). The lower Kp is set the sooner the controller takes action and reduces the torque. Set Kp to a high value (> 100) to disable the overload control.

Acopos SP#1 Motor (1/2) (2074)
Acopos SP#2 Motor (1/2) (2104)
Acopos SP#3 Motor (1/2) (2111)

Acopos SP#1 Motor (2/2) (2075)
Acopos SP#2 Motor (2/2) (2105)
Acopos SP#3 Motor (2/2) (2112)

Section: Motor Parameters

See standard B&R documentation for an explanation of all motor parameters. The parameter ID is shown on the screen next to each motor parameter input field.
Note: A reboot is necessary to activate motor parameters that were changed.
Note: Only synchronous servo motors are supported.

Name	Name of the motor. The only purpose of the name is to be displayed on the page and saved with the fixdata. It is not used by the control software.
Download Data	If this option is activated, the motor parameters are downloaded at power up. Deactivate this option when a B&R motor with Endat encoder is used, because all motor parameters are stored already on the Endat encoder.
Encoder Type	Type of encoder used: • 4 ... Endat-Encoder (AC120) • 5 ... Resolver (AC122) • 8 ... Hiperface-Encoder (AC121) • ....
Encoder Increments	Encoder scaling: increments per enocder (motor) revolution (must be > 0)
Resolver Polepairs per Rev.	Resolver polepairs per encoder (motor) revolution (must be > 0)
Ignore Line Check	Encoder: Ignore check • Bit0: AB line check ignore • Bit1: R line check ignore • Bit2: Edge distance check ignore • Bit3: Power check ignore
Type	Type of motor: • 1..Induction Motor • 2..Synchronous Motor

Software Compatibility	Thermal motor model: • 513..Standard • 514..Parameter MOTOR_WIND_TEMP_MAX is supported • 515..Parameter MOTOR_TAU_THERM is supported and Parameter MOTOR_THERMAL_CONST is supported no longer.
Winding Connection	Motor: Winding connection. Must always be 1.
Number of polepairs	Motor: Number of pole-pairs
Thermal Time Constant 0x0202	Motor: Thermal time constant for thermal motor model 514 (see above)
Thermal Time Constant 0x0201	Motor: Thermal time constant for thermal motor model 513 (see above)
Temperature Sensor Parameter #1 .. #10	-
Rated Voltage	Motor: Rated voltage
Voltage Constant	Motor: Voltage constant [mVmin]
Rated Speed	Motor: Rated speed [1/min]
Maximum Speed	Motor: Maximum speed [1/min]
Stall Torque	Motor: Stall torque [Nm]
Rated Torque	Motor: Rated torque [Nm]
Peak Torque	Motor: peak torque [Nm]

Acopos SP#1 Parameter Sets (2086)
Acopos SP#2 Parameter Sets (2106)
Acopos SP#3 Parameter Sets (2113)

10 different parameter sets for servo pump pressure control are available, that can be switched through during runtime. For every axis and every movement direction one out of the pool of the 10 parameter sets can be configured on page Acopos SP Param. Selection (2087).

Prs. Ctrl. Kp	Proportional gain of pressure controller. Units: [rev/(min*bar)]. Permitted value range: kp >= 0.
Prs. Ctrl. Tn	Integral action time of pressure controller. Units: [sec]. Permitted value range: Tn >= 0. The integrator is disabled when Tn = 0.
Prs. Ctrl. Tv	Derivative action time of pressure controller. Units: [sec]. Permitted value range: Tv >= 0. The differentiator is disabled when Tv = 0.

Prs. Ctrl. Tf	Filter time constant for the differentiator (dp/dt -> PT1). Units: [sec]. Permitted value range: T1 = 0. If T1 = 400usec, then the differentiated signal is no longer filtered, the low-pass works like a true proportional element.
Prs. Ctrl. kRise	Switch-off condition for acceleration mode. The larger the kRise, the earlier acceleration mode is deactivated. Units: [rpm]. Permitted value range: -inf < kRise < inf. The kRise condition for acceleration mode is disabled when kRise is set to a very high value (e.g. 1000000), which makes the use of acceleration mode easier.
Prs. Ctrl. pWind	Switch-off condition for acceleration mode. Actual pressure must rise over (Set pressure - pWind) to exit acceleration mode. Units: [bar]. Permitted value range: pWindow >= 0. The acceleration mode is disabled when pWind = 0.
Prs. Ctrl. pLimit	Switch-on condition for acceleration mode. Actual pressure must fall below (Set pressure - pLim) to enter acceleration mode. This parameter is only active in automatic mode. Units: [bar]. Permitted value range: pLim >= 0.
Max Reverse Spd	Maximum permissible reverse speed. Units: [rpm]. Permitted value range: nRev <= 0. Allowing to turn the pump in reverse direction might be necessary to be able to relieve the pressure in certain situations.
Disable Pressure Control	Activate this option to disable the servo pump pressure controller. The servo pump will just follow the speed demand not considering the set pressure. **Caution!** This option should only be used for testing purpose during startup. A pressure relief valve should be installed in the hydraulic circuit for safety.

Acopos SP Param. Selection (2087)

10 different parameter sets for pressure control (for each servo pump) are available, see Acopos SP#1 Parameter Sets (2086) and following pages. These parameter sets are selected depending on the currently active movment.

For every axis and every movement direction a distinct parameter set can be specified this page:

Def	Default parameter set. This parameter set is used when the movement is active and the axis is driven by a single servo pump. The given number refers to one 1 of the pool of 10 parameter sets of the servo pump that is assigned to the axis.
#1	Parameter set for servo pump #1 if the axis is driven by multiple servo pump. For details on pump combination see Setup >> Pumps >> Pump Combination.
#2	Parameter set for servo pump #2 if the axis is driven by multiple servo pump. For details on pump combination see Setup >> Pumps >> Pump Combination.

#3	Parameter set for servo pump #3 if the axis is driven by multiple servo pump. For details on pump combination see Setup >> Pumps >> Pump Combination.

4.31 Toggle Linearization

1 Function Description

The toggle linearization is used to calculate the platen position from the piston position and to linearize the set velocity for a constant velocity of the platen.

Calculating the platen position is only necessary when the stroke sensor is mounted at the crosshead of the toggle (at the piston) and the platen position should be displayed. The platen position is calculated based on the toggle linearization table.

It is also possible to linearize the flow for the mold piston in order to move the plate with the set speed (without linearization only the crosshead is moved with the given speed). The amplification (linearization) table is calculated from the toggle linearization table - in this case the data is needed even if the stroke sensor is mounted on the plate directly. It is possible configure the max. and min. amplification.

2 Setup Parameters

Toggle Linearization (2014)

Section: Toggle Settings

Enable Toggle Linearization	Only when the toggle linearization is enabled all the described functions are available. If it is not enabled than the displayed position is always the value from the sensor (crosshead- or plate-position depending where it is mounted) and the linearization of the flow does not work.
Stroke Sensor Mounted at Piston	This must be checked, when the sensor is mounted at the piston (at the togge crosshead) but all displayed and entered position values should refer to the platen position. This setting works only if the toggle linearization is enabled and correct toggle-data is entered.

Locked LS Connected	If this feature is activated then the input from the "toggle stretched"-sensor must be HIGH to complete the mold locking (if not only the target-position must be reached).
Velocity Linearization Max.	Max. amplification for velocity linearization (>= 1). If linearization should be disabled set this value to 1.
Velocity Linearization Min.	Min. amplification for velocity linearization (<= 1). If linearization should be disabled set this value to 1.

Section: Automatic Evaluation

With the automatic evaluation the toggle linearization table (see below) can be calculated automatically from the toggle geometry (works only for 4point- or 5point-toggles).
The geometry has to be entered like shown on the sketch on the page. **ATTENTION:** The angle "Beta" has to be entered in radient and not in degrees!! (360 degrees = 2*pi radiant!).
When pressing the confirm-button a new linearization table is created (old data is lost). If the given geometry data is not correct and the table could not be created the alarm **20-54 Toggle geometry not correct** is set.

Toggle Linearization Table (2015)

Section: Toggle Lin. Data

On this page you can see the calculated data or enter you own linearization table.

No. of Entries	Number of valid entries in the linearization table. Always set this to the number of entered linearization points. When the table was generated automatically always the full 100 points are used.

Plate Stroke #1-#100	Stroke of the plate for the corresponding crosshead (piston) stroke. First value must be 0 all following values must be strictly ascending. The table must include values for the max. possible clamp stroke (Setup >> Mold) otherwise the alarm **20-16 Error in toggle linearization data** is set.
Head Stroke #1-#100	Stroke of the crosshead (piston) for the corresponding plate stroke. First value must be 0 all following values must be strictly ascending.

Part V

5 05_Machine_Setup

5.1 Text Import

From SmartMold V1.50 on it is possible to import translations during runtime without compiling the project (only translations for existing languages can be imported - new languages cannot be added).

To import texts the following things have to be done:

1. Export the texts from the binary project (open Visualcomponents-editor and chose function "File -> Export VC texts...") or use the standard-text file "SmartMoldGlobal.csv" and "SmartMoldLocal.csv" from the release.
2. If the text-file has been exported from the binary project split the file up in one containing the global texts (starting with "Source[global]") and one containing the local texts (starting with "Source[local]" - see standard-text files for reference). The name of the files is not important
3. Add the new translated texts to the file (ATTENTION: In the reference-language no texts can be changed!)
4. Copy the modified files to the compacte flash (global file: F:\VCRES\Texts\Shared, local file: F:\VCRES\Texts\Vis)
5. Restart the controller - the new texts are only read during booting

Remarks:

Splitting the file is a requirment by the VC-runtime. The global file contains datapoint-descriptions that are mostly used on the setup-pages and the audit-trail. The local file contains texts from all text-groups and pages.
There is no information whether a error occured during the import - you need to check the texts after you have copied the file.
In worst case a incorrectly created file can lead to a PLC-crash and the PLC will only reboot after the file is removed from the flash (FTP-client necessary). So the files have to be tested before they are given to a customer!

5.2 Software Options

This section gives an overview about all software-options.
These options must be set in the file "SW.ini". If they are not set there they have their default-value (0 if not explicitly mentioned).

There are 2 ways to change the content of the "SW.ini"-file:
(1) Upload the file from the controller (or use a default-file) and edit it manually (use a text-editor to open it and modify the content). Afterward transer it to the controller again (directory: F:\CONFIG). For up- and downloading the file you can either use a FTP-client or simply do it with a USB-stick via the "Recipe"-page (Pages >> Overview >> Recipe (110)).
(2) You can change all settings on 5000 (and following). You can only access this pages from the overview-page (Pages >> Overview >> Machine Overview(100)) via the "Go to Page"-input and only if you have a sufficient security level (B&R). To save the settings you need to save the data on the "Recipe"-page (Pages >> Overview >> Recipe (110)).

1 Options
2 Settings

1 Options

ID	Variable Name	Description
#700	**SWcfg.Options.bAbsoluteUnits**	Only if this option is enabled, the display and settings in absolute units can be activated on the controller. This means that injection settings can me made referring to absolute melt volumes and absolute melt pressures instead of linear stroke and hydraulic pressure. All recipe data is saved as absolute units and can be loaded on other machines of different size.
#701	**SWcfg.Options.bDeliveryFlap**	Only if this option is enabled the delivery flap function is available on the controller. See Setup >> Delivery Flap.
#702	**SWcfg.Options.bInjAccumulator**	Only if this option is enabled the injection accumulator function is available on the controller. See Setup >> Accumulator.
#703	**SWcfg.Options.bIURotate**	Only if this option is enabled the injection unit rotate function is available on the controller. See Pages >> Injection >> Injection Unit Rotate (441) and Setup >> Injection Unit.
#704	**SWcfg.Options.bMoldFastValves**	Only if this option is enabled the mold fast valve function is available on the controller. See Setup >> Mold Valves.
#705	**SWcfg.Options.bMoldHeating**	Only if this option is enabled the mold-heating is available on the controller.
#706	**SWcfg.Options.bMoldingWizard**	Only if this option is enabled the molding wizard is available on the controller. See Pages >> Advanced >> Molding Wizard (730)
#707	**SWcfg.Options.bMpGraph**	Only if this option is enabled the graphical mold protection is available on the controller. Not released yet!!
#708	**SWcfg.Options.bNozzleClosure**	Only if this option is enabled the nozzle closure is available on the controller. See Setup >> Nozzle Closure.
#709	**SWcfg.Options.bPreInjection**	Only if this option is enabled the pre-injection function is available on the controller. See Pages >> Injection >> Pre-Injection, Accu (401)
#710	**SWcfg.Options.bProdData**	Only if this option is enabled the hourly production data is available on the controller. See Pages >> Advanced >> Production Data (740)
#711	**SWcfg.Options.bPumpComb**	Only if this option is enabled the pump-combinations (combination of multiple PQ-systems) is available on the controller. See Setup >> Pump Combination.
#712	**SWcfg.Options.bPumpManage**	Only if this option is enabled the pump-management settings (Fallback-pump, Pump-priority) are available on the controller. See Setup >> Axis Settings >> Basic.

#713	**SWcfg.Options.bPumpSelection**	Only if this option is enabled the static pump-selection functionality is available on the controller. See Setup >> Pump System.
#714	**SWcfg.Options.bPwmOutputs**	Only if this option is enabled PWM outputs and all according settings are available on the controller. See Setup >> PWM Outputs.
#715	**SWcfg.Options.bServoPumps**	Only if this option is enabled the internal servo-pump functionality (SmartPump) is available on the controller. See Setup >> Pump System.
#716	**SWcfg.Options.bSubPumps**	Only if this option is enabled the dynamic pump-selection settings (sub-pums) are available on the controller. See Setup >> Pump System or Setup >> Dynamic Pump-Selection
#717	**SWcfg.Options.uNrBlows**	Max. number of airblows available (visible) on the controller. Possible settings: 0-6. See Pages >> Ejector >> Airblows (310).
#718	**SWcfg.Options.uNrCores**	Max. number of cores available (visible) on the controller. Possible settings: 1-6. See Setup >> Cores
#719	**SWcfg.Options.uNrLubeCircuits**	Max. number of lubrication circuits that are available (visible) on the controller. Possible Settings: 1-3. See Setup >> Lubrication
#720	**SWcfg.Options.uNrMotors**	Max. number of motors available (visible) on the controller. Possible settings: 1-3. See Setup >> Motor
#721	**SWcfg.Options.uNrPumps**	Max. number of pump-systems that are available (visible) on controller. Possible Settings: 1-3. See Setup >> Pump System
#722	**SWcfg.Options.bMoldHeatExt**	Extended Mold Heating. If this option is enabled 32 instead of 16 mold zones are supported. For the additional 16 zones no trending is available (see Pages >> Heating >> Mold Temp. Ext. (540))
#723	**SWcfg.Options.uNrEjectSteps**	Number of ejector forward and backward movement profile steps (see Pages >> Ejector >> Ejector (300)). The default-value is 2 and changing only affects the base-project but not the HMI. So this parameter must only be changed if the HMI is changed accordingly in the binary project!
#724	**SWcfg.bCoreOrder**	When this option is enabled it is possible to define the core-order for in- and out-movement without graphic sequence-programming. The core-order can be defined on the core-page (Pages >> Mold >> Core1 (220))
#725	**SWcfg.Options.uNrMoldShutoff**	Number of available mold shut-off valves. Possible Settings: 0-10. See (Pages >> Injection >> Mold Shut-Off Valves (403))

2 Settings

ID	Variable Name	Description
-	**SWcfg.wsControlName**	Controller-name that will be shown in the upper left corner of the page (see Operation >> Screen Layout). Displaying Chinese characters is possible - it needs to UTF8-encoded in the SW.ini-file
#501	**SWcfg.bSimulation**	**0** .. Normal operation with machine (simulation mode off) **1** .. Machine is simulated (simulation mode on). The controller can be operated without IOs and without a real machine (all axis-positions are simulated). **ATTENTION**: this setting must never be 1 if the controller is operated on a real machine!! A warning "Simulation Active" will be displayed on the overview-page (Pages >> Overview >> Machine Overview (100)) when the simulation is active.
#502	**SWcfg.bStartAfterSemi**	**0** .. Start next cycle immediately after change from semi-automatic to automatic mode **1** .. Start command (clamp close or cycle start button) necessary after change from semi-automatic to automatic mode.
#503	**SWcfg.bGateStartsAuto**	**0** .. The cycle in automatic mode can only be started with the start-button or clamp-close-key **1** .. Also closing the safety gate starts the cycle in automatic mode (not only semi-automatic).
#504	**SWcfg.bButtonStartsSemi**	**0** .. The cycle in semi-automatic mode can only be started by closing the safety gate **1** .. The cycle in semi-automatic mode can only be started by the start-button
#505	**SWcfg.bRGStopsMotor**	**0** .. The motor(s) can operate independent of the rear-gate status (opened or closed) **1** .. The motor(s) are stopped when the rear gate is opened (see Setup >> Motors)
#506	**SWcfg.bDecBeforeRelative**	**0** .. The "Decompression Before"-stroke is interpreted as a absolute value **1** .. The "Decompression Before"-stroke is relative to actual axis position (actual position after holdon pressure)
#507	**SWcfg.bDecAfterRelative**	**0** .. The "Decompression After"-stroke is interpreted as a absolute value **1** .. The "Decompression After"-stroke is relative to dosage (decompression always happens to dosage + decompression stroke)

#508	**SWcfg.bPlastMultPressure**	**0** .. There is only one pressure setting (system pressure for screw rotation) for all plastification steps **1** .. Each plastification profile step has its separate pressure setting (system pressure for screw rotation). See Pages >> Injection >> Plastification (420).
#509	**SWcfg.bInjProfEndSov**	**0** .. The last stroke in the Injection profile is the target position for injection **1** .. The last stroke in the Injection profile is the switch over position for injection (target stroke = 0). The switchover is always done at this position as long as at lease one switchover-type (see Pages >> Injection >> Switchover (410)) is selected. See Pages >> Injection >> Injection (400).
#510	**SWcfg.bNoBackPrsValve**	**0** .. Hide the zero-backpressure valve option **1** .. Display the zero-backpressure valve option See Pages >> Injection >> Plastification (420).
#511	**SWcfg.bDisableHwSov**	**0** .. Disable hardware support (XX419) for switchover. Switchover is checked by software **1** .. Enable hardware support (XX419) for switchover
#512	**SWcfg.bEjRepAfterClose**	This setting is important if the "Ejector Stay Forward"-Option (Pages >> Ejector >> Ejector (300)) is enabled: **0** .. Ejector repetitions are executed at end of cycle and is only retracted at start of next cycle **1** .. Ejector repetitions and retract are executed at start of next cycle
#513	**SWcfg.bDynLockIStop**	This setting applies for checking intermediate stop position of axis for dynamic interlocking (e.g. mold position when core moves "between" open or close, see Setup >> Cores): **0** .. The position of the axis must be bigger (positive stop) or smaller (negative stop) than the target-position plus or minus the stroke-tolerance (Setup >> AxisSettings >> Basic). **1** .. The position of the axis must be within tolerance (Setup >> AxisSettings >> Basic) of the target position for that stop
#514	**SWcfg.bDynLockSkipWeak**	**0** .. Interlock clamp and ejector with cores independent of the used type of sensor **1** .. Skip dynamic interlocking of clamp and ejector with cores that were moved time-based (no sensor-feedback) see Setup >> Cores.
#515	**SWcfg.bDynLockSkipEjCu**	**0** .. Use dynamic interlocking for ejector with clamp position (see Setup >> Cores) **1** .. Do not use dynamic interlocking for ejector with clamp position (see Setup >> Ejector)

#516	**SWcfg.bMhStkAbsolute**	**0** .. The mold height stroke is always relative **1** .. The mold height stroke is absolute (position is remanent)
#517	**SWcfg.bCuDisMhOffset**	**0** .. DirectClamp: mold height offset is subtracted from position, plate always touch at position = 0. **1** .. DirectClamp: mold height offset is not subtracted from position, but set as locking position
#518	**SWcfg.bRotMeasInternal**	**0** .. The period-time-measurement for the rotation pulse input is done on the IO-module directly (exact measurement) **1** .. The period-time-measurement for the rotation pulse input is done in the task (2ms) This function (internal) can be used if there is some noise on the sensor-signal and this would lead to wrong measurements on the module.
#519	**SWcfg.bMhMeasInternal**	**0** .. The counting of the mold height pulses is done on the IO-module directly **1** .. The counting of the pulses is done internally in the task (2ms) The internal measurement might be necessary if there is some noise (bouncing) on the sensor-signal and this would lead to wrong counting on the module directly (as the fast counters there also count the nois-signals).
#520	**SWcfg.bPlastKeyDecomp**	**0** .. Only the decompression key (Operation >> Control Unit) is used to start "Decompression After". **1** .. The plastification Key (Operation >> Control Unit) is also used for "Decompression After" when the dosage is already reached.
#521	**SWcfg.bActiveDiagBlocksMove**	**0** .. Any new movement can be started if diagnosis is not acknwoledged. Diagnosis will dissappear automatically if diagnosed movement is started without problems. **1** .. if any diagnosis is active during manual or setting mode (popup window is visible on screen), no other movements are possible until diagnosis is acknowledged
#522	**SWcfg.bOilPreheatMotorRunning**	**0** .. Oil Pre-Heating cannot be started when motor is running (see Setup >> Oil Temperature) **1** .. Oil Pre-Heating can be started although the motor is already running
#523	**SWcfg.bCheckLockedStk**	This setting applies to toggle-clamps with a limit-switch for detecting the stretched-position (see Setup >> Toggle Linearization) **0** .. Only the status of the limit-switch is checked (target position cannot be set on Pages >> Mold >> Mold Close (200)) **1** .. Additionally to the limie-switch also the target-position is checked.

#524	**motor:bDisMotorOffAuto**	**0** .. turning off the motor during automatic or semi-automatic mode will stop the cycle immediately **1** .. the motor cannot be turned off when the machine is in automatic or semi-automatic mode (see Setup >> Motor)
#525	**motor:bCheckBarrelHeat**	**0** .. the motor can be turned on independent from the status of the barrel (cylinder) heating. **1** .. the motor can only be turned on if the barrel (cylinder) temperature is ok (see Setup >> Motor)
#526	**page_ctr:bMainPageFuncToggle**	**0** .. The control-keys for the page can be only activated by pressing the CTRL-key (see Operation >> Screen Layout) **1** .. The control-keys can also be activated by pressing the page-button a second time.
#527	**key_clc:bMHButtonsMoveSG**	**0** .. The safety gate can only be moved with the control-keys on the main page (see Pages >> Overview >> Machine Overview (100)) **1** .. MoldHeight keys (see Operation >> Control Unit) are used to control SafetgGate movement in modes Manual, Semiauto and Automatic
#528	**ip_con:bCushionAfterHoldon**	**0** .. The cushion-position is always the minimum position reached during holdon-pressure phase **1** .. The cushion-position is always measured at the end of holdon-pressure
#529	**SWcfg.bMpOpenManual**	This setting is important for the manual process mode (Mold Close): **0** .. When mold protection occurs mold just stops and alarm is set **1** .. When mold protection occurs mold is opened again (just like in automatic, but without the retries). Alarm is set immediately.
#530	**login:bPassLevelRetain**	**0** .. User level is reset to "None" (user logged out automatically) after power on/off **1** .. User level remains (user stays logged in) after power on/off
#531	**hmi_clc:bSetUnitVelPct**	**0** .. Show all velocities and speeds in physical units **1** .. Show all velocities and speeds in %
#532	**hmi_clc:bSetUnitForceKN**	**0** .. Show all force-values in [ton] **1** .. Show all force-values in [kN]
#533	**hmi_clc:bSetUnitMhPulse**	**0** .. Show relative mold height strokes in [mm] **1** .. Show relative mold height strokes in [pulses]
#534	**SWcfg.uMhAdjustStartOpt**	**0** .. Automatic mold height adjustment can be start any time when setting mode is active **1** .. Automatic mold height adjustment can only be started if the mold-height page is displayed **2** .. Automatic mold height adjustment and also the normal mold height movements can only be started if the mold-height page is displayed

#535	**SWcfg.uPurgeStartOpt**	**0** .. Allow start of purge only in manual mode **1** .. Allow start of purge only in setting mode and when purge-page is displayed
#536	**SWcfg.uUnmannedOptions**	With this settings the reactions after "unmanned" timeout (see Pages >> Overview >> Production(2) (102)) can be defined: The reactions are bit-coded (with each bit you can activate a reaction - just sum the numerical value in the brackets below if you want to combine some reactions): • **Bit0 (1)** .. Turn off all reactions (if you don´t want any reactions to a unmanned timeout you have to set this bit - otherwise the default reactions are used) • **Bit1 (2)** .. MoldHeating off • **Bit2 (4)** .. MoldHeating lowering • **Bit3 (8)** .. Barrel Heating off • **Bit4 (16)** .. Barrel Heating lowering • **Bit5 (32)** .. Horn Off • **Bit6 (64)** .. Unlock clamp If you set this value to 0 (or not set it at all) the default reactions are used (mold-heating lowering + barrel-heating lowering + Unlock clamp).
#537	**SWcfg.uRobotMode**	This setting can influence the basic operation mode of the robot: • 0 .. The robot-interface can switched on/off by the operator (Pages >> Overview >> Machine Overview (100), Pages >> Overview >> Production(2) (102)) • 1 .. The robot-interface is always active. The robot is disabled if the according signal input signal is set (see ...) • 2 .. Off. No robot-interface available on controller
#538	**SWcfg.eUsrLevelMhMove**	Required user level to start a MH movement (Automatic Adjustment or Movement): • **0** ... None • **10** ... Operator • **20** ... Supervisor • **30** ... OEM
#539	**SWcfg.bCuOpenGate**	This setting is important for the manual process mode (Mold Close): **0** .. Opening the safety gate just stops the mold movement. **1** .. Open mold automatically if close movement was interrupted by open safety gate (only working when SWcfg.AxMovePos[10].bBypassSG = 1 and SWcfg.bActiveDiagBlocksMove = 0)

#540	**SWcfg.bDisableSGAuto**	**0** .. Disable safety gate movement in automatic mode (safety gate will only move in semi-automatic mode). **1** .. Safety gate movement in Automatic- and Semiautomatic Mode
#541	**SWcfg.bDynLockEnSkip**	**0** .. Dynamic interlocking of cores is always active **1** .. Enable the function that the operator can disable the dynamic interlocking of the cores. See Pages >> Mold >> Core1 (220) and Setup >> Cores.
#542	**SWcfg.bEjDisMoldOpen**	This setting is important for the manual process mode (Mold Open): **0** .. Ejection is part of mold open process **1** .. Disable ejection during mold open
#543	**SWcfg.bIuFwdLocked**	**0** .. In manual mode the injection unit can be moved forward although clamp is not locked (it is locked in automatic mode in that case) **1** .. Injection unit forward only allowed when clamp is locked (also in manual mode)
#544	**SWcfg.bIuHideFwdTime**	Setting applies to the injection unit forward movement with limit-switch or pressure-sensor (see Pages >> Injection >> Injection Unit (440)): **0** .. The first profile step is time-based, the 2nd will be used after that time until limit is reached and delay time finished **1** .. The first profile step is active until the limit is reached, the 2nd for the set delay time.
#545	**SWcfg.bLimitInputs**	**0** .. Values from analog inputs (stroke, pressure) are not limited to their assigned range (values below min- or above max-Value might be displayed if the analog input delivers a according signal) **1** .. Values from analog inputs (stroke, pressure) are limited to their range (e.g. for positions this is 0 and the max. stroke, or for pressures this is 0 and the max. pressure of the sensor). (see Setup >> AxisSettings >> Sensor Scaling)
#546	**mode:bLockAutoChange**	See also option #573 if change between automatic / semi-automatic mode should be possible directly. **0** .. Modes can be changed in every possible way. **1** .. Direct change between automatic, semi-automatic and setting mode is not possible. The operator always has to change to manual mode first.
#547	**alarm:tAlarmHornOn**	Alarm Horn On Time (for pulse mode) [ms]. Default: 1000ms
#548	**alarm:tAlarmHornOff**	Alarm Horn Off Time (for pulse mode) [ms]. Default: 1000ms
#549	**alarm:tAlarmLightOn**	Alarm Light On Time [ms]. For a pulsing alarm-light output this is the on-time. Default: 500ms

#550	**alarm:tAlarmLightOff**	Alarm Light Off Time [ms]. For a pulsing alarm-light output this is the off-time. Default: 500ms
#551	**alarm:tAlarmHornShort**	Alarm Horn Short time (for horn short mode) [ms]. Default: 2000ms
#552	**dat_save:bCfgCheckMachineDis**	**0** .. Recipe can only be loaded if the machine name entered in the recipe is correct **1** .. Recipe can be loaded independent of the set machine name
#553	**SWcfg.bDynLockSetting**	**0** .. The dynamic (core) interlocking is not checked in setting mode **1** .. The dynamic (core) interlocking is checked also in setting mode. Temporary the interlocking can be disabled on the page Pages >> Mold >> Mold Open (210). When this option is enabled (1) the clamp must stop also in setting mode at the target positions (otherwise the interlocking for intermediate stops does not work). Therefore also this option "Stop movement at target in setting mode" must be enabled for mold open and close (see Setup >> AxisSettings >> Software Options).
#554	**iu_con:bManPosNoTarget**	**0** .. The injection unit stops in manual mode at the given target (position, limit, time) **1** .. The injection unit does not stop at the target in manual mode but will continue to the max. position (potentiometer use) or to the physical limit (limit switch, time-based movement... the parameters will be reduced to the setting mode parameters once the target is reached).
#555	**alarm:bQuitAlarmOperator**	**0** .. alarms can be quit any time by pressing the quit-key on the panel **1** .. alarms can only be quit if a operator is logged in.
#556	**ax_org:bCfgIuFwdMoldOpen**	**0** .. injection unit can only be moved forward if mold is closed (see also option #543) **1** .. injection unit can be moved forward any time.
#557	**SWcfg.bEjEnParallel**	**0** .. ejector can only be moved parallel to clamp if it assigned to a different PQ-system or both axes have a seperate analog control valve **1** .. ejector can be moved parallel in any way.
#558	**SWcfg.bEjSemiManual**	**0** .. mode to move ejector manually in semi-automatic mode is not available **1** .. mode to move ejector manually in semi-automatic mode (see Pages >> Ejector >> Ejector (300)) is availabe

#559	**ax_org:bCfgGateNoStopAuto**	when a movement is stopped during automatic or semit-automatic mode by a open safety gate... **0** .. the cycle is stopped and mode is changed to manual **1** .. the movement is stopped but mode is not changed. The cycle is continued as soon as the gate is closed again.
#560	**ip_con:bDisSovTimeout**	when the time-based switchover (see Pages >> Inections >> Switchover(410)) is not enabled, the **0** .. switch-over time acts as a timeout (if > 0) and a alarm is set when the timeout expires. **1** .. switch-over time has no effect
#561	**ax_org: bCfgDisableInjAutoMoldOpen**	**0** .. injection piston can be moved forward any time (see also option #562) **1** .. injection piston can be moved forward in automatic mode only when the mold is locked (does not affect manual mode!)
#562	**ax_org:bCfgDisableInjMoldOpen**	**0** .. injection piston can be moved forward any time (see also option #561) **1** .. injection piston can be moved forward in automatic and manual mode only when the mold is locked
#563	**ax_org: bCfgDisablePlastAutoMoldOpen**	**0** .. injection piston can be moved forward any time (see also option #564) **1** .. injection piston can be moved forward in automatic mode only when the mold is locked (does not affect manual mode!)
#564	**ax_org: bCfgDisablePlastMoldOpen**	**0** .. injection piston can be moved forward any time (see also option #563) **1** .. injection piston can be moved forward in automatic and manual mode only when the mold is locked
#565	**SWcfg.bMhMoveClampOp**	**0** .. Mold height can be moved at any clamp position independent of its actuator type **1** .. Mold height can only be moved when the clamp is open (mold open confirm TRUE and mold position bigger than minimum value). Also the mold height adjust process is adapted accordingly.
#566	**alarm:tBatteryLowTimeout**	Battery Low Alarm Filter Time [ms]. Low battery status must be detected for at least this time until the alarm is shown on visualization. Default: 180min
#567	**ax_org:bCfgInjHeatCheckInit**	Check Heating for Injection only before start. **0** .. The temperature of all barrel- and mold-heating zones is checked throughout the injection movement. **1** .. The correct temperatue of all barrel- and mold-heating zones is only checked when starting the injection movement. If the temperature is out of tolerance during the movement it will not be stopped.

#568	**ax_org:bCfgPlastHeatCheckInit**	Check Heating for Plast. only before start. **0** .. The temperature of all barrel- and mold-heating zones is checked throughout the plastification or decompression movement. **1** .. The correct temperatue of all barrel- and mold-heating zones is only checked when starting the plastification or decompression movement. If the temperature is out of tolerance during the movement it will not be stopped.
#569	**SWcfg.bEjGateMode**	The ejector-mode "Gate (Seq.) is enabled (see Pages >> Ejector >> Ejector (300))
#570	**SWcfg.bWaitStartDlg**	Display "Wait Start" Dialog. When this option is enabled a "Wait for Cycle Start"-dialog is displayed when the machine is in automatic or semi-automatic mode and is waiting for a start-command.
#571	**mc_con:bCfgManualProc**	**0** .. The mold gate valve (mold shut-off valves) are moved in manual like in automatic mode (according to injection position / movement) **1** .. The mold gate valve (mold shut-off valves) are closed immediately after releasing the injection key in manual and setting mode. In manual mode additionally the decompression before is executed before the gate is closed.
#572	**robot:bCfgDisableOutputs**	**0** .. The outputs to the robot (robot-interface) are also maintained when the robot is off (except Automatic ZB2) **1** .. The outputs to the robot (robot-interface) are all turned off when the robot is off (except Emergency Stop ZA1)
#573	**mode:bLockSettingChange**	**0** .. Modes can be changed in any possible way **1** .. A direct change from setting-mode to automatic or semi-automatic mode is not possible. First manual mode needs to be activated. Unlike with option #546 a direct change between automatic and semi-automatic mode is possible.
#574	**mode:bLockModeSwiveled**	**1** .. When the Injection-Unit is swiveled (outside) only setting-mode can be selected (all other modes locked).
#575	**SWcfg.bRobotCheckCont**	**0** .. Before starting the cycle the "CycleStart"-signal is checked whether it is TRUE. **1** .. Before starting the cycle there must be a positive edge on the "CycleStart"-input (after end of clamp open). The signal must remain TRUE throughout the clamp close movement.

#576	**SWcfg.bBypassSPI**	**0** .. The safety gate bypass key works normally: The bypass of the gate-interlock is acitve in all modes (for configured axes) when key-input is TRUE **1** .. The safety gate bypass works according to SPI "Motion Mode": The bypass of the gate-interlock is active only in semi-automatic mode and only if the key-input was turned on (positive edge) after the last mode change ("Motion Mode" must be activated after each mode change again).
#577	**SWcfg.bRecSaveSPC**	**0** .. The SPC-configuration is independent of the recipe-file (not saved in the file or altered when loading a recipe-file) **1** .. The SPC-configuration is saved in the recipe-file. Whenever a recipe is loaded the SPC-configuration will be changed and the SPC-recording is started if configured. The recorded SPC-data is lost when a recipe is loaded!!
-	**SWcfg.AxMovePos/AxMoveNeg**	see Setup >> AxisSettings >> Software Options

-	**alarm:alarmCfg[*ALM*]**	Alarm configuration for any general alarm (20-*ALM* ... see Service >> Alarm1_20 / Alarm21_40 / Alarm41_59 / Alarm60_79 / Alarm80_99). It is possible to configure the alarm-reactions when the alarm is active or not acknowledged here. The reactions are bit-coded as follows: • **Bit0 (1)** .. Reactions defined external (this bit has to be set if the reactions are to be defined here) • **Bit1 (2)** .. The alarm-light output is set (pulsing) • **Bit2 (4)** .. The alarm-horn output is set (constant) • **Bit3 (8)** .. The alarm-horn output is set for a short time (see above, alarm: tAlarmHornShort) • **Bit4 (16)** .. The alarm-horn output is set (pulsing) • **Bit5 (32)** .. The alarm-light output #2 is set (pulsing) • **Bit6 (64)** .. The alarm-light output #3 is set (pulsing) • **Bit7 (128)** .. The cylinder (barrel) heating is turned off • **Bit16 (65536)** .. Alarm can only be acknowledged by user with access level >= supervisor • **Bit17 (131072)** ... Alarm stops the automatic sequence immediately but does not change to manual mode Please take care that once you set Bit0 to 1 than all reactions have to be configured externally (default-settings are overwritten). *Example:* *The alarm "20-3 Rear gate open" should turn off the cylinder heating and set the second alarm-light output:* *Bit0 (1) = 1 to defined the reaction externally* *Bit5 (32) = 1 to set the 2nd light output* *Bit7 (128) = 1 to turn of the cylinder heating* *... so the correct setting for this would be...* *alarm:alarmCfg[3] = 1 + 32 + 128 = 161*

Part VI

6 06_Service

6.1 Alarms1_20

The following alarms are described in this document:

20-0 Emergency button pressed
20-1 Hydraulic oil level low
20-2 Part did not fall
20-3 Rear gate open
20-4 System pressure sensor error
20-5 Core timeout
20-6 Mould protection timeout
20-7 Motor overload
20-8 Cycle timeout
20-9 Ejection Timeout
20-10 Plastification timeout
20-11 Mould open timeout
20-12 Mould close timeout
20-13 Lubrication (main) oil level low
20-14 Oil filter dirty
20-15 Invalid fix data
20-16 Error in toggle linearization data
20-17 Error in calculation of automatic sequence
20-18 IO module communication error
20-19 Screw lubrication timeout
20-20 Injection unit not advanced

20-0 Emergency button pressed

Description	The emergency-stop input (DI#321) is active.
Cause	• The emergency stop button was pressed. • Malfunction of emergency-stop circuit (short circuit?) • *Commissioning:* Wrong input connected or inverted.
Reaction	• Motor is turned off • All movements are blocked • Cycle is stopped immediately • Alarm-Light is On
Remedy	• Release the pressed emergency-stop button • Check emergency stop circuit • *Commissioning:* Check input in IO-configurator and whether it must be inverted

20-1 Hydraulic oil level low

Description	The input for "Hyd. Oil Level Low" (DI#265) is active. This indicates the the hydraulic oil level in the tank is low.

Cause	• Oil in the tank is low • Oil level-sensor malfunction • *Commissioning:* Wrong input connected or inverted
Reaction	• Motor is turned off • All hydraulic movements are blocked • Cycle is stopped immediately • Alarm-Horn and -Light.
Remedy	• Fill Oil in tank • Check sensor signal and sensor • *Commissioning:* Invert Signal in IO-configurator if necessary

20-2 Part did not fall

Description	The "Drop Sensor"-function is active and no part was detected before the first core-movement or before mould-close was started. To detect a part a positive and negative edge is necessary on the "Drop Sensor"-input (DI#322).
Cause	• Part did not fall (still in mould) • Droput-"Box" is full and part still detected by drop sensor (no negative edge) • Mould Close Delay (Pages >> Overview >> Delay Times(1) (130)) is to short • Sensor did not recognize falling part
Reaction	• Alarm-Horn and -Light • Cycle is stopped immediately
Remedy	• Check if part is still in mould and remove it • Increase Mould Close Delay (Pages >> Overview >> Delay Times(1) (130))

20-3 Rear gate open

Description	The rear gate was opened when the motor was running
Cause	• Rear Gate was opened • Rear Gate closed sensor defect
Reaction	• Motor is stopped • Alarm-Horn and -Light • Cycle is stopped immediately
Remedy	• Close Rear-Gate and re-start Motor

20-4 System pressure sensor error

Description	The signal of the pressure sensor for the main PQ-system is out of range - outside of the configured MIN- and MAX-voltage (*Main PumpSys Setup -> Pressure Sensor -> Main Pump: Pressure Sensor Min. Signal / Main Pump: Pressure Sensor Max. Signal*)

Cause	• Sensor disconnected or short-circuit on input • *Commissioning:* Sensor not configured correctly (MIN/MAX voltage) • *Commissioning:* Error limit for checking MIN- and MAX-range to low (Setup >> Basic)
Reaction	• Alarm-Horn and -Light
Remedy	• Check connection to sensor • *Commissioning:* Check voltage-range of sensor • *Commissioning:* Check error-limits for checing (Setup >> Basic)

20-5 Core timeout

Description	The core-movement (Pages >> Mold >> Core1 (220), Pages >> Mold >> Core2 (221), ...) timed out before the limit-switch was reached (input HIGH).
Cause	• Core cannot reach limit-switch • No limit switch connected • Limit switch failure • Timeout (Pages >> Mold >> Core1 (220), Pages >> Mold >> Core2 (221), ...) set to short
Reaction	• Alarm-Horn and -Light • Cycle is stopped immediately
Remedy	• Check core-settings (Pages >> Mold >> Core1 (220), Pages >> Mold >> Core2 (221), ...) if everything is set correctly • Check core-limit switch • Increase timeout

20-6 Mould protection timeout

Description	The mould did not pass through the mould-protection area within the set timeout (Pages >> Mold >> Mold Close (200)). In automatic mode all configured retries where unsuccessful.
Cause	• Part is stuck in mould • Mould protection pressure to low • Mould protection timeout to low
Reaction	• Alarm-Horn and -Light • Cycle is stopped immediately
Remedy	• Check if anything is stuck in the mould • Increase mould protection timeout • Increase mould protection pressure

20-7 Motor overload

Description	One of the digital input signals "Motor 1..3: Overload" (DI#261) was HIGH when the motor was turned on.

Cause	• Motor overload input is active • *Comissioning:* Motor overload input signal connected incorrectly or must be inverted
Reaction	• Alarm-Horn and -Light • Cycle is stopped immediately • Motor is stopped
Remedy	• Check why motor got overloaded (min. off-time (Setup >> Motor) to short)

20-8 Cycle timeout

Description	The machine cycle took longer than the set timeout (Pages >> Overview >> Delay Times(1) (130)).
Cause	• Cycle got stuck for some reason • Cycle Timeout set too short
Reaction	• Alarm-Horn and -Light • Cycle is stopped immediately
Remedy	• Check where and why the sequence got stuck • Increase cycle timeout

20-9 Ejection Timeout

Description	The ejection process (ejector forward, repetition and back) took longer than the adjusted timeout (Pages >> Overview >> Delay Times(1) (130)).
Cause	• Ejector did not reach one of its targets • Ejection timeout to short
Reaction	• Alarm-Horn and -Light • Cycle is stopped immediately
Remedy	• Check why ejector got stuck • Check target positions for ejector movement • Increase ejection timeout

20-10 Plastification timeout

Description	The plastification took longer than the adjusted timeout (Pages >> Overview >> Delay Times(2) (131)).
Cause	• No more material (hopper empty or inlet congested) • Plastification timeout to short
Reaction	• Cycle is stopped at the end of current cycle • If plastification time exceed 2x timeout than the plastification is stopped and cycle continues • Alarm-Horn and -Light

Remedy	• Fill hopper with new material • Check material inlet at barrel • Increase plastification timeout

20-11 Mould open timeout

Description	The mould open process (from first start of the mould to reaching the target-position) took longer than the adjusted timeout (Pages >> Overview >> Delay Times (1) (130)).
Cause	• Mould could not reach target position • Core movement in-between clamp open did not finish • Mould open timeout is to short
Reaction	• Alarm-Horn and -Light • Cycle is stopped immediately
Remedy	• Check mould open target position • Check core moving between clamp open • Increase mould open timeout

20-12 Mould close timeout

Description	The mould close process (from first start of the mould to reaching the target-position) took longer than the adjusted timeout (Pages >> Overview >> Delay Times (1) (130)).
Cause	• Mould could not reach target position • Mould could not lock • Core movement in-between clamp close did not finish • Mould close timeout is to short
Reaction	• Alarm-Horn and -Light • Cycle is stopped immediately
Remedy	• Check mould close target position • Check core moving between clamp close • Increase mould close timeout

20-13 Lubrication (main) oil level low

Description	The lubrication oil level in the main lubrication cycle is low (Setup >> Lubrication). The input "Lubrication 1-3 Level Low" (DI#283) is HIGH.
Cause	• Lubrication oil level is low • *Commissioning:* Sensor malfunction • *Commissioning:* Sensor inverted
Reaction	• Alarm-Horn and -Light • Cycle is stopped at end of current cycle

Remedy	• Check lubrication oil • *Commissioning:* Check wiring and if signal is inverted

20-14 Oil filter dirty

Description	One of the oil filters ("Oil Filter #1 Dirty"-DI#263, "Oil Filter #1 Dirty"-DI#264) indicates that it is dirty (obstructed)
Cause	• One of the oil filter obstructed • *Commissioning:* Sensor malfunction • *Commissioning:* Sensor inverted
Reaction	• Alarm-Horn and -Light • Cycle is stopped at end of current cycle
Remedy	• Check oil filter and clean it • *Commissioning:* Check wiring and if signal is inverted

20-15 Invalid fix data

Description	There is no valid fix-data loaded on the machine. The data got lost and neither the "Machine.fix"- nor the "Default.fix"-file could be loaded.
Cause	• Permanent data lost and files are missing on flash-disc
Reaction	• Alarm-Horn and -Light • Cycle is stopped immediately
Remedy	• Load valid fix-data (from USB-stick) • Restore fix-data-files on flash

20-16 Error in toggle linearization data

Description	The given toggle linearization data (table, see Setup >> Toggle Linearization) is not correct (not compatible to the clamp dimension or other error in data).
Cause	• Length of clamp bigger than biggest entry in table • Entries in table not ascending
Reaction	• Alarm-Horn and -Light • Operation of machine locked (no movement possible)
Remedy	• Correct linearization data • Adjust clamp strokes

20-17 Error in calculation of automatic sequence

Description	There was an internal error when generating the step-sequence for automatic mode

Cause	• Internal error
Reaction	• Alarm-Horn and -Light • Cycle cannot be started
Remedy	• Send error-report of actual situation to your supplier

20-18 IO module communication error

Description	There is no communication with one or more of the configured IO-modules
Cause	• Module is not connected • Incorrect IO-configuration • Module or backplane is damaged • Error in X2X-wiring
Reaction	• Alarm-Horn and -Light • Cycle is stopped immediately
Remedy	• Check modules (go to IO Browser page (Pages >> Service >> IO Browser (810)) and activate diagnosis function - missing modules will be shown) • Check wiring • Check IO-configuration

20-19 Screw lubrication timeout

Description	The mould-height screw lubrication time (Setup >> Basic) has expired - this is a periodically event!
Cause	• Mould height screw lubrication time has expired
Reaction	• Alarm-Light
Remedy	• Lube screw and quit alarm • Alarm can only be quit by operator with access-level >= supervisor

20-20 Injection unit not advanced

This alarm is currently not used!

6.2 Alarms21_40

The following alarms are described in this document:

20-21 Oil temperature low
20-22 Oil temperature high
20-23 Mould locked
20-24 Cushion exceeded

20-25 Inproper cushion control
20-26 Cycle stopped by robot
20-27 Lubrication (main) failure
20-28 Switchover time exceeded
20-29 Injection out of tolerance
20-30 Invalid recipe data
20-31 Default fix data was loadedt
20-32 Default recipe data was loaded
20-33 Lubrication #2 failure
20-34 Lubrication #3 failure
20-35 Software Error
20-36 Oil preheat error
20-37 Dosage already reached
20-38 Invalid operation mode
20-39 Motor on delay
20-40 Oil preheating not possible - motor running

20-21 Oil temperature low

Description	The motor is on and the oil-temperature is below the minimum value (Setup >> Oil Temperature).
Cause	• Oil temperature low • Minimum oil temperature value to high • Temperature sensor error (disconnected or short circuit)
Reaction	• Oil pre-heating is started (if enabled) • Cycle is stopped at end of current cycle • Alarm-Light is On
Remedy	• Do oil-preheating • Set minimum oil temperature to lower value

20-22 Oil temperature high

Description	The oil temperature is above the maximum value (Setup >> Oil Temperature).
Cause	• Oil temperature to high (oil cooling error?) • Maximum oil temperature value set to low • Sensor error (disconnected or short circuit)
Reaction	• Cycle is stopped at end of current cycle • Motor is not allowed to start • Alarm--Light
Remedy	• Check oil cooling settings (Pages >> Overview >> Oil, Lubrication (103)) • Wait until oil is cooled down • Increase max. oil temperature value • Check sensor

20-23 Mould locked

Description	The toggle-clamp is locked in a forbidden status - motor is off or lock-time is longer than alarm-limit (Setup >> Mold)
Cause	• Motor turned off when toggle-clamp was locked • Toggle clamp was locked to long
Reaction	• Alarm-Light • Cycle is stopped at end of current cycle
Remedy	• Turn on motor and open toggle clamp • Increase or disable (set to 0) the alarm-time

20-24 Cushion exceeded

This alarm is currently not used.

20-25 Inproper cushion control

This alarm is currently not used.

20-26 Cycle stopped by robot

Description	The cycle was stopped by a missing robot-release signal. The cycle is first delayed by the missing signal and after a timeout (Pages >> Ejector >> Robot Interface (320)) this alarm is set.
Cause	• Robot release was missing for the set timeout
Reaction	• Alarm--Light • Cycle is stopped immediately
Remedy	• Check robot release signals • Increase or disable robot timeout

20-27 Lubrication (main) failure

Description	An error has occurred during lubrication of the main circuit. The feedback from lubrication was not OK before the timeout (Setup >> Lubrication)
Cause	• Timeout when waiting for the pressure-ok-signal during lubrication (oil) • Timeout when waiting for the 2 pulses from the pressure-sensor during lubrication (grease)
Reaction	• Alarm-Light • Cycle is stopped at end of current cycle
Remedy	• Check lubrication circuit • Check lubrication oil level • Increase lubrication timeout

20-28 Switchover time exceeded

Description	The injection switchover-criteria was not reached. Switchover to holding happened due to timeout (Pages >> Injection >> Switchover (410)).
Cause	• Injection switchover criteria was not reached before timeout
Reaction	• Alarm-Light • Cycle is stopped at end of current cycle
Remedy	• Check switch-over criteria • Increase timeout

20-29 Injection out of tolerance

This alarm is currently not used.

20-30 Invalid recipe data

Description	The recipe-data is not valid. The data was corrupted and the default-data could not be loaded.
Cause	• Data corrupted (Panel-Barrer low) • Default-data-file (Default.rec) not present on flash-disc
Reaction	• Alarm-Light • Cycle is stopped at end of current cycle
Remedy	• Load recipe from file • Copy default-recipe to flash

20-31 Default fix data was loaded

Description	The default fix-data (Default.fix) was loaded from the flash since the data on the PLC were corrupted
Cause	• Fix-Data corrupted (lost), software update
Reaction	• Alarm--Light
Remedy	• Load correct fix-data from file

20-32 Default recipe data was loaded

Description	The default recipe-data (Default.rec) was loaded from the flash since the data on the PLC was corrupted
Cause	• Recipe data corrupted (lost), software-update
Reaction	• Alarm-Light

Remedy	• Load correct recipe-data from file

20-33 Lubrication #2 failure

Description	An error has occurred during lubrication of circuit #2. The feedback from lubrication was not OK before the timeout (Setup >> Lubrication).
Cause	• Timeout when waiting for the pressure-ok-signal during lubrication (oil) • Timeout when waiting for the 2 pulses from the pressure-sensor during lubrication (grease)
Reaction	• Alarm-Light • Cycle is stopped at end of current cycle
Remedy	• Check lubrication circuit. • Increase lubrication timeout

20-34 Lubrication #3 failure

Description	An error has occurred during lubrication of circuit #3. The feedback from lubrication was not OK before the timeout (Setup >> Lubrication).
Cause	• Timeout when waiting for the pressure-ok-signal during lubrication (oil) • Timeout when waiting for the 2 pulses from the pressure-sensor during lubrication (grease)
Reaction	• Alarm-Light • Cycle is stopped at end of current cycle
Remedy	• Check lubrication circuit. • Increase lubrication timeout

20-35 Software Error

Description	There is a internal error in the software - the controller is not ready to operate.
Cause	• Error in code added in the binary project version
Reaction	• All operation on controller is locked
Remedy	• Check entries in CPU-logbook "User" • Check code added in "binary project"

20-36 Oil preheat error

Description	During oil pre-heating the oil-temperature did not rise. The oil must rise by a certain temperature within the observation period (Setup >> Oil Temperature)
Cause	• Oil temperature did not rise • Min. rise configured to high • Oil temperature sensor error
Reaction	• Alarm-Light • Oil preheat is interrupted • Motor is turned off
Remedy	• Check oil preheat-settings • Check oil temperature sensor signal

20-37 Dosage already reached

Description	Info to operator in manual: Plastification not possible, dosage already reached
Cause	• Plastification key was pressed although dosage already reached
Reaction	-
Remedy	-

20-38 Invalid operation mode

Description	INFO: A action was requested by the operator which is not possible in the current operation mode
Cause	• Toggle data should have been calculated when the machine was in semiautomatic- or automatic-mode • Fix-data should have been copied when the machine was in semiautomatic- or automatic-mode • Motor should have been turned on when the machine was in semiautomatic- or automatic-mode
Reaction	-
Remedy	-

20-39 Motor on delay

Description	Motor should have been turned on during the minimum off-time (Setup >> Motor).
Cause	• Operator tried to turn on motor during minimum off-time
Reaction	-
Remedy	• Decrease minimum off-time

20-40 Oil preheating not possible - motor running

Description	Oil-preheating was activated when the motor was already running (Setup >> Oil Temperature).
Cause	• Oil-preheating was activated when the motor was already running
Reaction	-
Remedy	-

6.3 Alarms41_59

The following alarms are described in this document:

20-41 SPC value exceeded min/max range

Description	A value recorded in the SPC was outside the given MIN/MAX-range (Pages >> Advanced >> SPC Setup (710))
Cause	• Recorded SPC-value changed for some reason • MIN/MAX-range for value to small
Reaction	• Alarm-Light
Remedy	• Find reason for change of SPC-value • Increase MIN/MAX-range

20-42 Safety gate motor error

Description	A error occurred on the electric motor that drives the automatic safety gate (LOW signal on input "Safety Gate Motor OK" (DI#244))
Cause	• Motor overheated or other motor-error • Wrong signal (wire break) • *Commissioning:* Signal configured wrong (position, inverted?)
Reaction	• Alarm-Light
Remedy	• Check motor and motor-switch • Check wiring to PLC • *Commissioning:* Check if signal should be inverted

20-43 Mould height motor error

Description	A error occurred on the electric motor that drives the mould height (LOW signal on input "Mold Height Motor Ok" (DI#223))
Cause	• Motor overheated or other motor-error • Wrong signal (wire break) • *Commissioning:* Signal configured wrong (position, inverted?)
Reaction	• Alarm-Light
Remedy	• Check motor and motor-switch • Check wiring to PLC • *Commissioning:* Check if signal should be inverted

20-44 Shift finished

Description	The machine has nearly finished a shift - the set number of shift cycles (Pages >> Overview >> Production(1) (101)) is nearly reached. Alarm is set a number of cycles (Pages >> Overview >> Production(1) (101)) before the final number of cycles is reached.
Cause	• Shift nearly finished • Shift counter set incorrectly or unwittingly
Reaction	• Short Alarm-Horn
Remedy	• Reset shift-counter when shift is finished • Deactivate shift-function by setting shift set-count to 0

20-45 Reset counter

Description	The end of the current shift is reached - the set number of shift cycles (Pages >> Overview >> Production(1) (101)) is reached. The new cycle cannot be started unless the shift-counter is reset.
Cause	• Shift is finished • Shift counter set incorrectly or unwittingly

Reaction	• Production not possible any more • Reactions according to operator settings (Pages >> Overview >> Production (1) (101)): Heating turned off, - Activate lowering for heating, Motor off, Purge with the set number of purge-cycles
Remedy	• Reset shift-counter and restart machine

20-46 Oil change required

Description	The service-interval for "Oil Change" has expired (Setup >> Basic). The operator is remeinded that the hydraulic oil needs to be changed.
Cause	• Service interval expired
Reaction	• Short Alarm-Horn output
Remedy	• Change oil and quit alarm • Alarm can only be quit by operator with access-level >= supervisor

20-47 Recipe value limited - see audit trail

Description	A recipe-value (operatore-setting) was limited after changing a fix-value or after loading a recipe- or fixdata-file. Details can be found in the audit-trail (Pages >> Alarms >> AuditTrail (620)).
Cause	• Recipe-value limited because it was outside of set limits
Reaction	-
Remedy	-

20-48 Mould height adjustment finished

Description	The automatic mould height adjustment process has finished. The new mould height is adjusted
Cause	• Automatic Mould Height adjustment finished.
Reaction	• Short Alarm-Horn
Remedy	-

20-49 Purge finished

Description	INFO: The purge process has finished
Cause	• Purge process finished
Reaction	• Short Alarm-Horn

Remedy	-

20-50 Fix data loaded from file

Description	During booting of the PLC the fix-data was loaded from the local fix-datafile (Machine.fix)
Cause	• Fix-data in permanent memory corrupted or lost • Panel: Battery low
Reaction	• Alarm-Light
Remedy	• Check if data is still ok (if file was actual) • Alarm can only be quit by operator with access-level >= supervisor

20-51 Error loading software configuration

Description	An error has occurred during booting: The content of the file "SW.ini" could not be read without errors. A detailed description of the error can be found in the CPU-Logbook "User". It can be accessed via the page "Logbooks" (2203).
Cause	• "SW.ini"-file is not present • Content of file corrupted
Reaction	• Alarm-Light • Machine- and software-options might be incorrect. Different machine behaviour.
Remedy	• Check if file is on flash (F:\CONFIG\SW.ini). • Check content of file (variable-names, line-breaks) • Alarm can only be quit by opertor with access-level >= supervisor

20-52 Calibration: stroke sensor signal out of range

Description	Error during calibration of a potentiometer (stroke-sensor): At one of the end-positions the voltage from the sensor is below the minimum voltage (Setup >> Basic)
Cause	• Sensor is mounted incorrectly (min poti-limit reached before physical limit is reached) • Sensor is to short (range smaller than movement range of axis)
Reaction	• Alarm-Light
Remedy	• Mount potentiometer correctly

20-53 Calibration: maximum speed for flow lin. could not be reached

Description	An error has occurred during the automatic flow linearization: the maximum screw speed could not be reached
Cause	• Max. screw speed set to high (Setup >> Pump Linearization) • Signal to pump pressure actuator to low (Setup >> Pump Linearization) • Stabilization time to measure rotation speed is to low (Setup >> Pump Linearization) • Hydraulic valves set incorrectly
Reaction	• Alarm-Light
Remedy	• Check settings (see Cause).

20-54 Toggle geometry not correct

Description	Error occurred during calculating the toggle linearization table (Setup >> Toggle Linearization): The given toggle data is not valid (impossible data),
Cause	• Incorrect toggle geometry entered (take especially care about the angle "beta": its unit is "radiant" and not "degrees").
Reaction	• Alarm-Light
Remedy	• Enter correct toggle geometry and try again

20-55 Purge is active

Description	INFO: The purge process is active
Cause	• Purge process started
Reaction	-
Remedy	-

20-56 Purge timeout

Description	Error during purge process (mode "Colour Change"): A plastification timeout occurred
Cause	• No more material or inlet obstructed • Timeout for purge (Pages >> Injection >> Purge (430)) set to short
Reaction	• Alarm-Light • Purge is stopped
Remedy	• Check material in hopper • Check material inlet • Increase timeout

20-57 Mould height adjustment: limits exceeded

Description	Error during automatic mould height adjustment: the min. or max. moldheight was reached during adjustment
Cause	• Mounted mould to big or to small
Reaction	• Alarm-Light • Mould Height Adjustment is stopped
Remedy	• Try to adjust mold height manually

20-58 Mould height adjustment active

Description	INFO: the automatic mould height adjustment is active
Cause	• MoldHeight Adjustment started
Reaction	-
Remedy	-

20-59 Cushion exceeded limits

Description	During active cushion monitoring the cushion was outside of the set limits (Pages >> Injection >> Switchover (410))
Cause	• Cushion outside of limits
Reaction	• Alarm-Light • Reject-Signal is set
Remedy	• Change cushion limits

6.4 Alarms60_79

The following alarms are described in this document:

20-60 Free Input#1:
20-61 Free Input#2:
20-62 Free Input#3:
20-63 Free Input#4:
20-64 Free Input#5:
20-65 Fix Input#1:
20-66 Fix Input#2:
20-67 Fix Input#3:
20-68 Fix Input#4:
20-69 Fix Input#5:
20-70 Motor feedback missing
20-71 Cooling water pressure not ok
20-72 Cycle stopped by open gate
20-73 Acopos drive not connected
20-74 Acopos servo pump motor temperature high

20-75 Lubrication (2) oil level low
20-76 Lubrication (3) oil level low
20-77 Error setting mould temp. Sensor type
20-78 Audit trail nearly full
20-79 Hardware switchover error - disabled

20-60 Free Input#1:

20-61 Free Input#2:

20-62 Free Input#3:

20-63 Free Input#4:

20-64 Free Input#5:

Description	Alarm set by free programmable input ("FP Rec In#1..#5: *Desc. Text*" (DI#362). Alarm text is configured with free programmable user-inputs (Pages >> Service >> Free Prog. Inputs (821))
Cause	• Condition for free programmable input TRUE
Reaction	• Alarm-Light • Additional reaction according to configuration of input (Stop Cycle, End Cycle)
Remedy	• Depends on input-configuration

20-65 Fix Input#1:

20-66 Fix Input#2:

20-67 Fix Input#3:

20-68 Fix Input#4:

20-69 Fix Input#5:

Description	Alarm set by free programmable input ("FP Fix In#1..#5: *Desc. Text*" (DI#342)). Alarmtext is configured with free programmable fix-inputs (Setup >> Free Prog. IOs).
Cause	• Condition for free programmable input TRUE
Reaction	• Alarm-Light • Additional reaction according to configuration of input (Stop Cycle, End Cycle)
Remedy	• Depends on input-configuration

20-70 Motor feedback missing

Description	The feedback from a motor "Motor 1..3: On" (DI#262) is LOW although the motor is turned on. The signal "motor is on" is checked with a certain delay (Setup >> Motor) after the motor is turned on.

Cause	• Motor did not turn on • Feedback signal error • Delay for checking feedback to short
Reaction	• Alarm-Light
Remedy	• Check if motor turned on - if not, find reason • *Commissioning:* Check is signal is wired correctly • Increase delay for checking feedback

20-71 Cooling water pressure not ok

Description	The pressure in the cooling water line is not ok (signal "Cooling Water Pressure Low" (DI#328) is HIGH)
Cause	• Cooling water not turned on • Cooling water pressure low • Sensor defect • *Commissioning:* Sensor signal wired incorrectly or inverted
Reaction	• Alarm-Light
Remedy	• Turn on cooling water • Check pressure sensor and wiring • *Commissioning:* Check if sensor-signal needs to be inverted

20-72 Cycle stopped by open gate

Description	The safety gate was opened during automatic- or semiautomatic-mode and blocked a movement
Cause	• Safety gate was opened • Safety gate sensor defect
Reaction	• Cycle is stopped immediately
Remedy	• Close gate and restart cycle

20-73 Acopos drive not connected

Description	A necessary servo-drive for a servo driven pump is not connected
Cause	• Servo drive not connected or missing • Incorrect wiring to servo-drive • Power supply for servo-drive missing • Servo drive damaged • Node-number of servo-drive not set correctly
Reaction	• Cycle is stopped immediately • Alarm-Horn and -Light

Remedy	• Check servo drive (power supply, node number, wiring)

20-74 Acopos servo pump motor temperature high

This alarm is currently not used

20-75 Lubrication (2) oil level low

Description	The lubrication oil level in lubrication circuit #2 is low (Setup >> Lubrication)
Cause	• Lubrication oil level is low • *Commissioning:* Sensor malfunction • *Commissioning:* Sensor inverted
Reaction	• Cycle is stopped at end of current cycle • Alarm-Light and -Horn
Remedy	• Check lubrication oil • Commissioning: Check wiring and if signal is inverted

20-76 Lubrication (3) oil level low

Description	The lubrication oil level in lubrication circuit #3 is low (Setup >> Lubrication)
Cause	• Lubrication oil level is low • *Commissioning:* Sensor malfunction • *Commissioning:* Sensor inverted
Reaction	• Cycle is stopped at end of current cycle • Alarm-Light and -Horn
Remedy	• Check lubrication oil • Commissioning: Check wiring and if signal is inverted

20-77 Error setting mould temp. Sensor type

Description	An error occurred during changing the sensor-type for the mould-heating temperature sensors
Cause	• Temperature-module is not plugged • Set sensor-type (Pages >> Heating >> Mold Autotuning (534)) is not supported
Reaction	• Alarm-Light
Remedy	• Check if module is plugged • Check sensor-type setting and whether it is supported by module

20-78 Audit trail nearly full

Description	The max. entries for the audit-trail is nearly reached since the last export of the audit-trail-data. *Remark*: The audit-trail is a ring-buffer so it will not stop recording once the max. number of entries is reached. Only the oldest entries will be lost than.
Cause	• Max. number of audit-trail entries nearly reached
Reaction	-
Remedy	• Go to audit-trail page (Pages >> Alarms >> Audit Trail (620)) and export audit-trail

20-79 Hardware switchover error - disabled

Description	Configuring the hardware (XX419-module) to support the injection-switchover failed. A exact description of the error can be found in the CPU-logbook "User". It can be accessed via the page "Logbooks" (2203).
Cause	• Module does not support switchover
Reaction	• Alarm-Light
Remedy	• Make error-report, contact development

6.5 Alarms80_99

The following alarms are described in this document:

20-80 PWM output 01 error
20-81 PWM output 02 error
20-82 Cycle stopped by motor
20-83 Synchronisation error on mainboard
20-84 Not enough plastic
20-85 Safety gate not fully closed
20-86 Acopos servo pump feedback missing
20-87 Clamp lock timeout
20-88 Safety gate stopped by protection sensor
20-89 Clamp unlock timeout
20-90 Low clamping force
20-91 Battery low - change CPU battery
20-92 Delivery flap timeout
20-93 Selected Option not present on machine
20-94 Recipe-Parameter not supported
20-95 No mould height movement
20-96 Hydraulic safety malfunction
20-97 Clamp Force High
20-98 Accu did not finish loading
20-99 Accu Load Timeout

PWM output 01 error

PWM output 02 error

Description	A error has occurred on the first or second PWM-output (high or low current, high temperature - see Setup >> PWM Outputs)
Cause	• Overload on PWM-output
Reaction	• Alarm-Light • Cycle is stopped at end of current cycle
Remedy	• Check exact error on IO-Browser page (Status of PWM-output). To determine whether overtemeprature or over-current has occured • Check if valve needs more current than XX419 can deliver • Check if short-circuit is present on output

20-82 Cycle stopped by motor

Description	The motor was turned off during automatic- or semiautomatic-mode
Cause	• Motor was turned off
Reaction	• Cycle is stopped immediately
Remedy	• Turn on motor again. Restart cycle

20-83 Synchronisation error on mainboard

Description	Internal error - contact machine-manufacturer
Cause	-
Reaction	-
Remedy	-

20-84 Not enough plastic

Description	The injection piston has reached the target-position before it has reached the switchover-criteria (Pages >> Injection >> Switchover (410))
Cause	• Not enough plastic (dosage low) • Switchover-criteria set incorrectly • Target-position set incorrectly
Reaction	• Alarm-Light • Cycle is stopped at end of current cycle
Remedy	• Correct parameters

20-85 Safety gate not fully closed

Description	The safety gate is not fully closed. A part of the safety-gate-limit-switches indicates "closed" others "opened". The status of the gate is evaluated by the following signals: "Safety Gate Closed" (DI#231), "Safety Gate Closed (Redundant)" (DI#232) and "Safety Gate Not Closed (Redundant)" (DI#233)
Cause	• Gate not fully closed • Check-Time (Setup >> Basic) set to short. • Limit-switch malfunction
Reaction	-
Remedy	• Close or open gate fully • Increase Check-Time • Check limit-switch function

20-86 Acopos servo pump feedback missing

Description	The servo-drive for the servo driven pump did not turn on within 2 seconds
Cause	• Servo drive malfunction • ....
Reaction	• Alarm-Light • ...
Remedy	• ...

20-87 Clamp lock timeout

This alarm is currently not used

Description	Direct Clamp: The locking did not complete before the configured timeout (Pages >> Mold >> Mold Close (200))
Cause	• Clamp cannot be locked • Timeout set to short
Reaction	• Locking of clamp is interrupted • Alarm-Light • Cycle is stopped immediately
Remedy	• Check locking parameters • Increase timeout

20-88 Safety gate stopped by protection sensor

Description	The automatic safety gate movement was stopped by a protection sensor
Cause	• Something is inside the gate • Protection sensor malfunction

Reaction	• Cycle is stopped immediately • Alarm-Light
Remedy	• Check gate

20-89 Clamp unlock timeout

Description	Direct Clamp: The unlocking did not complete before the configured timeout (Pages >> Mold >> Mold Open (210))
Cause	• Clamp cannot unlock • Timeout set to short
Reaction	• Cycle is stopped immediately • Alarm-Light
Remedy	• Check unlocking parameters • Increase timeout

20-90 Low clamping force

Description	Direct Clamp: The closing force is to low for injection. This alarm is set when the actual locking pressure is below the set locking pressure (Pages >> Mold >> MoldClose(200)) minus a configured tolerance (see Setup >> Mold) when the injection is started.
Cause	• Pressure dropped in locking cylinders • Pressure-tolerance to low
Reaction	• Alarm-Light • Cycle is stopped at end of current cycle • Injection is skipped
Remedy	• Check why pressure has dropped • Increase pressure tolerance

20-91 Battery low - change CPU battery

Description	The battery of the CPU is low - it needs to be replaced
Cause	• Battery is discharged
Reaction	• Alarm-Light • Permanent data might be lost when PLC is turned off
Remedy	• Change battery

20-92 Delivery flap timeout

Description	Delivery flap movement did not finish before the set timeout (Setup >> Delivery Flap)
Cause	• Delivery flap is jammed • Delivery flap malfunction • Timeout set to short
Reaction	• Cycle is stopped immediately
Remedy	• Check delivery flap (mechanics) • Increase timeout

20-93 Selected Option not present on machine

Description	A option that is active in the currently loaded fix-data is not supported by the software (Option disabled in "SW.ini")
Cause	• Option is disabled
Reaction	• Alarm-Light
Remedy	• Check whether operation with the data is still OK

20-94 Recipe-Parameter not supported

Description	A setting in the currently loaded recipe-data is not supported by the software (Option disabled in "SW.ini")
Cause	• Option is disabled
Reaction	• Alarm-Light
Remedy	• Check whether operation with the data is still OK

20-95 No mould height movement

Description	The mould height did not move during the configured timeout Setup >> MoldHeight) although a movement was active.
Cause	• Mould Height does not move • Mould Height sensor signal error • Timeout to short
Reaction	• Alarm-Light
Remedy	• Check why mould height is not moving • Check mold height pulse sensor • Increase timeout

20-96 Hydraulic safety malfunction

Description	The hydraulic safety valve did not engage when the safety gate was opened within the configured delay (Setup >> Hydraulic Safety Valve)
Cause	• Hydraulic safety malfunction • Delay to short
Reaction	• Alarm-Light • Cycle is stopped immediately
Remedy	• Check why safety is not working (close and open gate again • Increase timeout

20-97 Clamp Force High

Description	The measured clamp force (toggle clamp) is to high (it exceeds the alarm-limit (Setup >> MoldHeight))
Cause	• Tonnage set to high • Delay to short
Reaction	• Cycle is stopped at end of current cycle • Alarm-Light • Clamp close is stopped and clamp is opened
Remedy	• Increase mould height

20-98 Accu did not finish loading

Description	The accumulator was not fully loaded at end of cooling time (see Setup >> Accumulator)
Cause	• Accumulator needs longer time to load
Reaction	• Alarm-Light
Remedy	• Increase cooling time • Increase loading flow

20-99 Accu Load Timeout

Description	The accumulator did not finish loading within the configured timeout (Setup >> Accumulator).
Cause	• Problem with loading the accumulator • Load Timeout to short
Reaction	• Alarm-Light and -Horn • Cycle is stopped immediatley • Loading of accumulator is interrupted

Remedy	• Check Accumulator • Increase timeout

6.6 Alarms100_119

The following alarms are described in this document:

20-100 Injection Timeout
20-101 Emergency Stop Robot
20-102 Mold Height Position out of range
20-103 Hopper empty
20-104 Mold Mech. Lock Error
20-105 Robot: Mold Close Enable Missing
20-106 Robot: Mold Open Enable Missing
20-107 Robot: Eject Bwd Enable Missing
20-108 Robot: Eject Fwd Enable Missing
20-109 Robot: Core Out Enable Missing
20-110 Robot: Core In Enable Missing
20-111 Robot: Cycle Start Enable Missing
20-112 Inverter Error

Injection timeout

Description	The injection was stopped due to a timeout (see Pages >> Overview >> Delay Times (2) (131))
Cause	• Timeout (Pages >> Overview >> Delay Times (2) (131)) set to short • Switchover-criterion (Pages >> Injection >> Switchover (410)) not reached. • Injection (Nozzle) congested
Reaction	• Alarm-Light • Alarm-Horn • Cycle is stopped at end of current cycle
Remedy	• Increase timeout • Correct switch-over criterions • Check nozzle

20-101 Emergency Stop Robot

Description	The emergency-stop from the robot (DI#301, DI#313) is active.
Cause	• The emergency stop button on the robot interface was pressed. • Malfunction of the robot-interface) • *Commissioning:* Wrong input connected or inverted.
Reaction	• Motor is turned off • All movements are blocked • Cycle is stopped immediately • Alarm-Light is On

Remedy	• Release the pressed emergency-stop button • Check robot-interface circuit • *Commissioning:* Check input in IO-configurator and whether it must be inverted

20-102 Mold Height Position out of range

Description	The actual mold height position is out of range (exceeds given min/max-range)
Cause	• The mold height position was not set correctly (see Pages >> Mold >> Mold Height (230)) • The mold height position was re-initiatlized after software-update • *Commissioning:* Mold-height data (scaling, min. or max. positions) set incorrectly (see Setup >> Mold Height)
Reaction	• Motor is turned off • All movements are blocked • Cycle is stopped immediately • Alarm-Light is On
Remedy	• Release the pressed emergency-stop button • Check emergency stop circuit • *Commissioning:* Check input in IO-configurator and whether it must be inverted

20-103 Hopper Empty

Description	No more material in the hopper. Alarm is set when the input Hopper Empty (DI#329) is active for more than 2 seconds.
Cause	• No more material in the hopper • The signal from the hopper empty sensor is not correct. • *Commissioning:* The signal from the hopper empty signal maybe has to be inverted.
Reaction	• Alarm-Light and Alarm horn • Machine is stopped at end of current cycle
Remedy	• Refill material • Check sensor signal • *Commissioning:* Maybe invert input

20-104 Mold Mech. Lock Error

Description	The mechanical lock (safety bar, DI#005 - Mold Blocked Mech.) of the clamp did not engage within the set time (see (see Setup >> Basic (2000) >> Mold Mech. Lock Check Time)) after the safety gate was closed.
Cause	• Mech. Lock jammed or other defect. • *Commissioning:* Timeout set to low.

Reaction	• Alarm-Light • Machine is stopped at end of current cycle
Remedy	• Check Mech. Lock (safety bar) • *Commissioning:* Increase or disable timeout

20-105 Robot: Mold Close Enable Missing

Description	Addition information for alarm **20-26 Cycle stopped by robot**: The signal "Enable Mold Closure (A6)" is missing. The time for this signal starts after the clamp close delay time and after all core-movements that happen before mold close.
Cause	See main alarm.
Reaction	See main alarm.
Remedy	See main alarm.

20-106 Robot: Mold Open Enable Missing

Description	Addition information for alarm **20-26 Cycle stopped by robot**: The signal "Enable Full Mold Opening (A7)" is missing. The time for this signal stars after all core-movements that happen before mold open.
Cause	See main alarm.
Reaction	See main alarm.
Remedy	See main alarm.

20-107 Robot: Eject Bwd Enable Missing

Description	Addition information for alarm **20-26 Cycle stopped by robot**: The signal "Enable Ejector Back (B3)" is missing.
Cause	See main alarm.
Reaction	See main alarm.
Remedy	See main alarm.

20-108 Robot: Eject Fwd Enable Missing

Description	Addition information for alarm **20-26 Cycle stopped by robot**: The signal "Enable Ejector Forward (B4)" is missing.
Cause	See main alarm.

Reaction	See main alarm.
Remedy	See main alarm.

20-109 Robot: Core Out Enable Missing

Description	Addition information for alarm **20-26 Cycle stopped by robot**: The signal "Cores(1) Out Enable (B6)" and/or "Cores(2) Out Enable (B8)" is missing.
Cause	See main alarm.
Reaction	See main alarm.
Remedy	See main alarm.

20-110 Robot: Core In Enable Missing

Description	Addition information for alarm **20-26 Cycle stopped by robot**: The signal "Cores(1) In Enable (B5)" and/or "Cores(2) In Enable (B7)" is missing.
Cause	See main alarm.
Reaction	See main alarm.
Remedy	See main alarm.

20-111 Robot: Cycle Start Enable Missing

Description	Addition information for alarm **20-26 Cycle stopped by robot**: The signal "Cycle Start" is missing from the robot.
Cause	See main alarm.
Reaction	See main alarm.
Remedy	See main alarm.

20-112 Inverter Error

Description	One of the motors signalised a inverter error (see (DI#270)). The alarm is set when the inverter-error signal is TRUE after the motor has been turned on (and the on-delay has expired).
Cause	• One or more motor-inverters defective (check inverter). • *Commissioning:* Motor On Delay time set to short (see???)
Reaction	• Alarm-Light • Machine is stopped at end of current cycle

Remedy	• Check Inverter • *Commissioning:* Increase Motor On Delay • *Commissioning:* Invert Input-Signal?

6.7 Axes Alarms

The following alarms are described in this document:

AA-0 *Axis:* Stroke sensor error (out of range)
AA-1 *Axis*: Limit switch error (both on)
AA-2 *Axis*: Pressure sensor error (out of range)
AA-3 *Axis*: Wrong fix data connected
AA-4 *Axis*: Invalid sensor type
AA-5 *Axis*: Invalid actuator type

The group-number (AA) and axis-name (Axis) is different for every zone:

AA	***Axis***	***Description***
1	Core 1	Axis = Core #1
2	Core 2	Axis = Core #2
3	Core 3	Axis = Core #3
4	Core 4	Axis = Core #4
5	Core 5	Axis = Core #5
38	Core 6	Axis = Core #6
6	Nozzle Closure	Axis = Nozzle Closure
7	Safety Gate	Axis = Safety Gate
8	InjUnit Rot.	Axis = InjUnit Rotate
9	Mold Height	Axis = Mold Height
10	Mold	Axis = Mold (Clamp)
11	Injection	Axis = Injection
12	Injection Unit	Axis = Injection Unit
13	Ejector	Axis = Ejector
14	Plastification	Axis = Plastification

AA-0 *Axis:* Stroke sensor error (out of range)

Description	The stroke sensor signal is out of range. It is outside of the calibration values for min. and max. position. (see Setup >> Basic).
Cause	• Sensor error or disconnect • New sensor mounted and not calibrated • Disturbance in sensor signal
Reaction	• Alarm-Light • Movement of axis is blocked in automatic, semiautomatic and manual mode
Remedy	• Check sensor and sensor-signal • Calibrate axis

AA-1 *Axis:* Limit switch error (both on)

Description	The limit-switches for both ends (positive and negative limit) are on (input = HIGH) at the same time.
Cause	• Limit switches mounted incorrectly • Limit-switch or connection problem
Reaction	• Alarm-Light
Remedy	• Check limit-switch and signal

AA-2 *Axis*: Pressure sensor error (out of range)

Description	The signal from the pressure sensor for the axis is out of range. Outside of configured min./max. signal range (see Setup >> Basic).
Cause	• Connection probelm (wire-break, short circuit) • Sensor configured incorrectly
Reaction	• Alarm-Light • Movement of axis is blocked in automatic, semiautomatic and manual mode
Remedy	• Check sensor signal and wiring • Check sensor configuration

AA-3 *Axis*: Wrong fix data connected

This alarm is currently not used

AA-4 *Axis*: Invalid sensor type

Description	The configured sensor-type (see Setup >> AxisSettings >> Basic) for the axis is not supported by the software.

Cause	• Incorrect sensor-type set • Fix-Data corrupted or incorrect
Reaction	• Alarm-Light • Axis-movement is blocked
Remedy	• Set sensor type correctly • Load Fixdata-file (Pages >> Overview >> Recipe (110))

AA-5 *Axis*: Invalid actuator type

Description	The configured actuator-type (see Setup >> AxisSettings >> Basic) for the axis is not supported by the software.
Cause	• Incorrect sensor-type set • Fix-Data corrupted or incorrect
Reaction	• Alarm-Light • Axis-movement is blocked
Remedy	• Set sensor type correctly • Load Fixdata-file (Pages >> Overview >> Recipe (110))

6.8 Heating Alarms

The following alarms are described in this document:

Zone-related alarms:

ZA-0 *Zone:* Thermocouple broken
ZA-1 *Zone*: Invalid signal from thermocouple
ZA-2 *Zone*: Heater broken
ZA-3 *Zone*: Maximum temperature exceeded
ZA-4 *Zone*: Error during autotuning
ZA-5 *Zone*: Controller error
ZA-6 *Zone*: Manual control

Group-related alarms:

GA-0 *Group:* Temperature is below low tolerance
GA-1 *Group:* Temperature is above high tolerance
GA-2 *Group:* Temperature is above maximum
GA-3 *Group:* Internal error
GA-4 *Group:* Temp-Diff to low to start auto-tuning

The zone-alarm-number (ZA) and zone-name (Zone) is different for every zone:

ZA	***Zone***	***Description***
41	Cylinder Zone 1	Cylinder (Barrel) Heating Zone #1
42	Cylinder Zone 2	Cylinder (Barrel) Heating Zone #2

43	Cylinder Zone 3	Cylinder (Barrel) Heating Zone #3
44	Cylinder Zone 4	Cylinder (Barrel) Heating Zone #4
45	Cylinder Zone 5	Cylinder (Barrel) Heating Zone #5
46	Cylinder Zone 6	Cylinder (Barrel) Heating Zone #6
17	Cylinder Zone 7	Cylinder (Barrel) Heating Zone #7
16	Mold Zone 1	Mold Heating Zone #1
18	Mold Zone 2	Mold Heating Zone #2
19	Mold Zone 3	Mold Heating Zone #3
21	Mold Zone 4	Mold Heating Zone #4
22	Mold Zone 5	Mold Heating Zone #5
23	Mold Zone 6	Mold Heating Zone #6
24	Mold Zone 7	Mold Heating Zone #7
25	Mold Zone 8	Mold Heating Zone #8
26	Mold Zone 9	Mold Heating Zone #9
27	Mold Zone 10	Mold Heating Zone #10
28	Mold Zone 11	Mold Heating Zone #11
29	Mold Zone 12	Mold Heating Zone #12
32	Mold Zone 13	Mold Heating Zone #13
33	Mold Zone 14	Mold Heating Zone #14
34	Mold Zone 15	Mold Heating Zone #15
35	Mold Zone 16	Mold Heating Zone #16

The group-alarm-number (GA) and group-name (Group) is different for every group:

GA	***Group***	***Description***
30	Cylinder Heating Group	Cylinder (Barrel) Heating
31	Mold Heating Group	Mold Heating

ZA-0 *Zone:* Thermocouple broken

Description	No sensor is connected to the temperature model input. The IO-module has detected that problem and delivers a incorrect temperature-signal.
Cause	• No senso connected • Sensor or connection broken

Reaction	• Alarm-Light • Affected heating-zone is turned off • Heating-status goes to "ERROR" - injection and plastification is locked
Remedy	• Check sensor and sensor-connection

ZA-1 *Zone:* Invalid signal from thermocouple

Description	The signal from the temperature-sensor is not valid. The voltage is out of range for the configured thermocouple-type.
Cause	• Wrong thermocouple connected • Wrong sensor-type set • Thermocouple damaged or connection problem
Reaction	• Alarm-Light • Affected heating-zone is turned off • Heating-status goes to "ERROR" - injection and plastification is locked
Remedy	• Check sensor-type of thermo-couple • Check thermo-couple and wiring

ZA-2 *Zone*: Heater broken

Description	A zone break was detected. Zone breaks (zone does not heat anymore) are detected if the zone-temperature does not rise although the zone-output is active (Setup >> Heating)
Cause	• The zone heater is damaged • The fuse for the zone has blown • The settings for the break-detection are to restrictive
Reaction	• Alarm-Light • Affected heating-zone is turned off • Heating-status goes to "ERROR" - injection and plastification is locked
Remedy	• Check temperature on heating trend (Pages >> Heating >> TemperatureTrend (510), Pages >> Heating >> Mold Temp Trend1 (531)) if zone really did not heat anymore. • Check heater and fuse • Check break-detection settings

ZA-3 *Zone*: Maximum temperature exceeded

Description	The temperature of the zone has exceeded the switch-off temperature (Setup >> Heating)
Cause	• Temperature exceeded switch-off tempereature
Reaction	• Alarm-Light • Affected heating-zone is turned off • Heating-status goes to "ERROR" - injection and plastification is locked

Remedy	• Check if the heating relais is damaged (short-circuit) • Check if switch-off temperatuer is set correctly

ZA-4 *Zone*: Error during autotuning

Description	A error has occurred during autotuning of the heating zones
Cause	-
Reaction	• Alarm-Light • Affected heating-zone is turned off • Heating-status goes to "ERROR" - injection and plastification is locked
Remedy	-

ZA-5 *Zone*: Controller error

Description	A error has occurred in the PID-controller of the heating zone.
Cause	-
Reaction	• Alarm-Light • Affected heating-zone is turned off • Heating-status goes to "ERROR" - injection and plastification is locked
Remedy	-

ZA-6 *Zone*: Manual control

Description	INFO: The zone is controlled manually. This alarm is currently not used
Cause	-
Reaction	-
Remedy	-

GA-0 *Group:* Temperature is below low tolerance

Description	The temperature of a zone within the group is below set-temperature minus tolerance. This alarm is currently not displayed!
Cause	• Heating on but temperature low
Reaction	• -
Remedy	• Wait until temperature rises

GA-1 *Group:* Temperature is above high tolerance

Description	The temperature of a zone within the group is above set-temperature plus tolerance. This alarm is currently not displayed!
Cause	• Temperature high
Reaction	• -
Remedy	• Wait until temperature sinks

GA-2 *Group:* Temperature is above maximum

Description	The temperature of a zone within the group is above the maximum (switch-off) temperature. This alarm is currently not displayed!
Cause	• Temperature high
Reaction	• Heating group is switched off
Remedy	• Wait until temperature sinks

GA-3 *Group:* Internal error

Description	This alarm is currently not displayed!
Cause	• Internal controller-error. Check other alarms
Reaction	• Heating group is switched off
Remedy	• -

GA-4
Group:
Temp-Diff to low to start auto-tuning

Description	Start of auto-tuning is not possible as the the temperature of one or more zones in the group is to close to the set-temperature (below min. difference)
Cause	• Tuning was started with high zone temperature
Reaction	• Tuning is stopped.
Remedy	• Wait until all zones are cooled down sufficiently

6.9 Smartpump Alarms

The following alarms are described in this document:

SA-0 Acopos #*X* Fatal initialization error
SA-1 Acopos #*X* Initialization failed
SA-2 Acopos #*X* Drive error (*Drive error number*)
SA-3 Acopos #*X* Controller error
SA-4 Acopos #*X* Motor temperature high

The group-number (SA) and servo drive number (X) is different for every servo pump:

SA	***X***	***Description***
15	1	Servo pump #1, main pump system
36	2	Servo pump #2, secondary pump system
37	3	Servo pump #3, third pump system

SA-0 Acopos #*X*: Fatal initialization error

Description	This alarm can occur when the basic initialization for a servo pump is done, which is typically right after booting. It indicates an error in the initialization of the most basic data (such as motor data) that makes the operation of the servo pump impossible. It usually comes together with the alarm **Acopos #*X*: Drive error (*Drive error number*)** which gives more information about the cause of the error. See the page Pages >> Alarms >> Acopos Diagnosis (630) for further details.
Cause	• Wrong settings in the servo pump setup screens • Acopos servo drive not connected or missing • Incorrect wiring to servo drive • Power supply for servo drive missing • Servo drive damaged • Node number of servo drive not set correctly
Reaction	• Alarm-Light • Cycle is stopped immediately • No movement possible
Remedy	• Check servo drive (power supply, node number, wiring) • See the page Pages >> Alarms >> Acopos Diagnosis (630) for further details • Revise the settings on all servo pump setup screens (Setup >> Smartpump) • It is necessary to reboot the panel for the new settings to get into effect

SA-1 Acopos #*X*: Initialization failed

Description	This alarm can occurs when the initialization of the servo pump is done, which is typically right after booting. It indicates an error in the initialization of the servo pump controller settings that makes the operation of the servo pump impossible. Typically one of the settings on the servo pump setup pages (see Setup >> Smartpump) is out of the valid range. See the page Pages >> Alarms >> Acopos Diagnosis (630) for further details on the error.
Cause	• Wrong settings in the servo pump setup screens

Reaction	• Alarm-Light • Cycle is stopped immediately • No movement possible
Remedy	• See the page Pages >> Alarms >> Acopos Diagnosis (630) for further details • Revise the settings on all servo pump setup screens (Setup >> Smartpump)

SA-2 Acopos #*X*: Drive error (*Drive error number*)

Description	The Acopos servo drive has an internal error, specified by the error number. Details on the drive error can be found in standard B&R documentation such as Automation Studio help.
Cause	• Internal error in the Acopos servo drive
Reaction	• Alarm-Light • Cycle is stopped immediately • Servo drive is switched off
Remedy	• See the page Pages >> Alarms >> Acopos Diagnosis (630) for further details on this error • Read the section about drive errors in standard B&R documentation such as Automation Studio help

SA-3 Acopos #*X* Controller error

Description	The servo pump control has an internal error. Details on the
Cause	• Internal error in the Acopos servo drive
Reaction	• Alarm-Light • Cycle is stopped immediately • Servo drive is switched off
Remedy	• See the page Pages >> Alarms >> Acopos Diagnosis (630) for further details on this error • Read the section about drive errors in standard B&R documentation such as Automation Studio help

SA-4 Acopos #*X* Motor temperature high

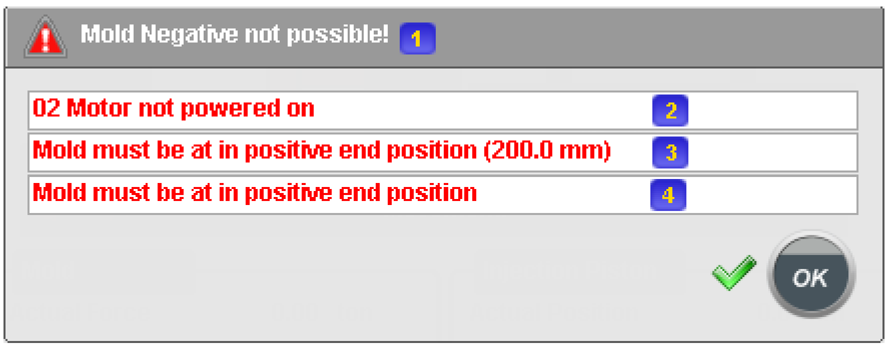
Description	The motor temperature of the servo pump exceeded the maximum value (see Setup >> AxisSettings >> Basic).
Cause	• Injection duty cycle too demanding (for example too high or too long holding pressure) • Motor temperature sensor broken • Motor temperature sensor not configured correctly • Motor temperature sensor not connected or wrong wired
Reaction	• Alarm-Light • Cycle is stopped at end of current cycle

Remedy	• Make the injection duty cycle less demanding (shorter/lower holding pressure, longer cooling time, add other delay times) • Check motor temperature sensor configuration (Setup >> Smartpump >> Motor (1/2)) • Increase motor temperature limit (Setup >> Smartpump >> General (1/2)) • Check motor temperature sensor wiring

6.10 Diagnostics

Diagnosis-dialogs appear when a action requested by the operator or by the automatic sequence is not possible due to some interlocks.

The dialog looks like this:



1	Header-text is informing which action is not possible: • ***Axis Direction* not possible** ... movement of the given axis not possible in the given direction • ***Mode* not possible** ... change to the given mode not possible • **Cycle Start not possible!** ... cycle start not possible because cycle start conditions not ok • **Requested action not possible!** ... Action not possible because user-level to low • **Invalid page number** ... Page with given number does not exist • **Motor On/Off not possible** ... Turning on/off the hydraulic motor is not possible
2	Release message: a list of all possible release-messages can be found below. At the beginning of the line the index of the message is displayed followed by the message-text./td>
3	Dynamic interlocking: Informs the operator which axis is not at the correct position.
4	Cycle start interlocking: Informs the operator which axis has not the correct status.

List of possible release-messages:

Nr	Text	Description
01	Emergency button pressed	The emergency input (DI#321) is active. No movement or action possible.

02	Motor not powered on	The motor (for the hydraulic pump) is not turned on. Hydraulic movements are not possible.
03	Maintenance door not closed	The rear gate is not closed. The status of the rear-gate is evaluated by up to 2 digital inputs: "Rear Gate Closed" (DI#237) and "Rear Gate Closed (Redundant)" (DI#238).
04	Safety gate not closed	The front safetey gate is not closed. The status of the safety gate is evaluated by up to 3 digital inputs: "Safety Gate Closed" (DI#231), "Safety Gate Closed (Redundant)" (DI#232) and "Safety Gate Not Closed (Redundant)" (DI#233)
05	Nozzle cover removed	The nozzle cover (injection door) is not closed. The status of the nozzle cover is evaluated by single digital input "Nozzle Cover Closed" (DI#239)
06	Heating not powered on	The cylinder heating is not turned on.
07	Temperature not within tolerance	The temperature of one or more cylinder heating zones is not within the configured tolerance (see Pages >> Heating >> Cylinder Heating (500)).
08	Heating optimization turned on	The cylinder heating is currently evaluating the controller parameters (auto-tuning).
09	Safety gate protection sensor on	The safety gate cannot be closed or opened as a protection-sensor input ("Safety Gate Prot. (Close)" (DI#240), "Safety Gate Prot. (Close, Redundant)" (DI#241), Safety Gate Prot. (Open) (DI#242)) is active. Maybe something is stuck in the door.
10	Motor thermal protection on	Thermal overload on one of the hydraulic motors.
11	Mold side mechanically locked	The mold movement is locked by a mechanical safety device (Input "Mold Blocked Mech." (DI#005) is HIGH). All movements on the clamp side are prohibited.
12	Mold side hydraulically locked	The mold movement is locked by a hydraulic safety device (Input "Mold Blocked Hyd." (DI#004) is HIGH). All movements on the clamp side are prohibited.
13	Oil level low	The hydraulic oil level is low (Input "Hyd. Oil Level Low" (DI#265) is HIGH).
14	Oil filter 1 dirty	The hydraulic oil filter #1 is dirty (obstructed) (Input "Oil Filter #1 Dirty" (DI#263) is HIGH)
15	Oil filter 2 dirty	The hydraulic oil filter #2 is dirty (obstructed) (Input "Oil Filter #2 Dirty" (DI#264) is HIGH)
16	Core limit switch error	Both limit switches of a one or more cores are on at the same time. Core-status cannot be evaluated and all movements on the mold-side are locked.
17	Ejector back feedback missing	The ejector back confirm feedback is missing. This diagnosis is coming when either the input "Ejector Confirm Backward" (General >> IO Datapoints >> Ejector - DO#021) or "Ejector Confirm Backward (Piston)" (General >> IO Datapoints >> Ejector - DI#030) is not HIGH. The input "Ejector Confirm Backward" can be disabled on the ejector-page (Pages >> Ejector >> Ejector (300)).

18	Ejector not retracted	Ejector is not retracted (not at its back-position). This diagnosis is coming if the ejector-position is to big or the ejctor back limit switch is not HIGH.
19	Mold release is missing	The mold is not opened sufficiently (mold must be opened more). The mold release position can be entered on the ejector-page (Pages >> Ejector >> Ejector (300))
20	Gas unit failure	The external unit for gas-assisted injection is not ready and blocks the injection. This diagnosis comes when the digital input "Gas Unit Stop Cycle" (General >> IO Datapoints >> Injection - DI#045) is HIGH.
21	Mold Height maximum reached	The max. possible mold height is reached. The input "Mold Height Inc. Limit" (DI#222) is HIGH.
22	Mold Height minimum reached	The min. possible mold height is reached. The input "Mold Height Dec. Limit" (DI#221) is HIGH
23	Warm-up time not finished	The cylinder zone temperatures (Pages >> Heating >> Cylinder Heating (500)) are all in tolerance but the release-time (Setup >> Heating) has not expired.
24	Mold locked	The mold (clamp) is locked.
25	Pivoting of injection unit	The injection unit is swiveld (pivoted). The input "Screw Change" (DI#087) is HIGH.
26	Robot is in	The robot is in the mold area (input "Robot: Mold area free A3" (DI#302) is LOW)
27	Emergency stop from robot	The robot indicates a emergency stop (input "Robot: Emergency stop A1" (DI#301) is LOW).
28	Axis not calibrated	The axis is not calibrated. Before the required action the axis must be calibrated (Pages >> Settings >> Calibration (830)).
29	Mold is not locked	The mold (clamp) is not locked
30	Axis is not is position	One or more axis are not in the correct position
31	Machine is in error state	The machine or controller have a fatal error - no action is possible
32	Controller error	The axis controller has a fatal error
33	Axis is not initialized	The requested axis is not initialized (not available on controller)
34	Oil preheat active	Oil preheating is active
35	Free In#1: {FpRec1Text}	The free programmable input #1 is blocking the movement (Pages >> Settings >> Free Programmable Inputs (821))
36	Free In#2: {FpRec2Text}	The free programmable input #2 is blocking the movement (Pages >> Settings >> Free Programmable Inputs (821))
37	Free In#3: {FpRec3Text}	The free programmable input #3 is blocking the movement (Pages >> Settings >> Free Programmable Inputs (821))

38	Free In#4: {FpRec4Text}	The free programmable input #4 is blocking the movement (Pages >> Settings >> Free Programmable Inputs (821))
39	Free In#5: {FpRec5Text}	The free programmable input #5 is blocking the movement (Pages >> Settings >> Free Programmable Inputs (821))
40	Fix In#1: {FpFix1Text}	The free programmable fix input #1 is blocking the movement (Setup >> Free Prog. IOs)
41	Fix In#2: {FpFix2Text}	The free programmable fix input #2 is blocking the movement (Setup >> Free Prog. IOs)
42	Fix In#3: {FpFix3Text}	The free programmable fix input #3 is blocking the movement (Setup >> Free Prog. IOs)
43	Fix In#4: {FpFix4Text}	The free programmable fix input #4 is blocking the movement (Setup >> Free Prog. IOs)
44	Fix In#5: {FpFix5Text}	The free programmable fix input #5 is blocking the movement (Setup >> Free Prog. IOs)
45	Calibration active	Calibration mode is active
46	Traverse temperature to high	Traverse (material inlet) temperature is to high (see Pages >> Heating >> Cylinder Temperature (500))
47	Invalid operation mode	Wrong operation mode acitve
48	Injection is disabled	Injection side is disabled - dry cycle (Pages >> Injection >> Switchover (410))
49	Ejector is disabled	Ejector movement is disable (Pages >> Ejector >> Ejector (300))
50	Core is not programmed	The requested core is not programmed (Pages >> Mold >> Core1 (220))
51	Mold Height motor error	The motor actuating the mold height is not ready for operation. The input "Mold Height Motor Ok" (DI#223) is LOW.
52	Safety gate motor error	The motor actuating the safety gate is not ready for operation. The input "Safety Gate Motor OK" (DI#244) is LOW.
53	Mold open confirm missing	The "Mold Open Confirm"-input (DI#008) is LOW
54	Synchronisation error on mainboard	Internal controller error - please contact machine manufacturer
55	Accumulator not loaded	The injection accumulator is not loaded (is still loading)
56	Safety Gate closed not confirmed	The closing of the automatic safety gate was not confirmed.
57	Clamping force low for injection	Direct Clamps: The clamping force is not high enough for injection (see Pages >> Mold >> Mold Locking (203))

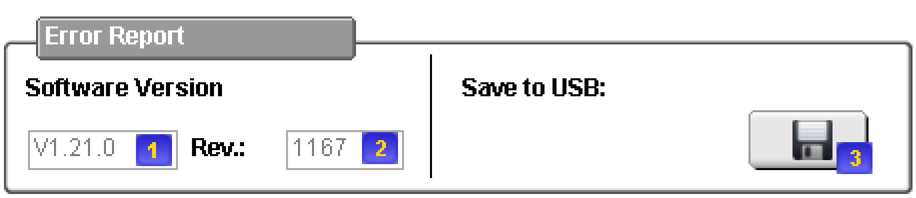
58	Delivery flap not on target position	The delivery flap is not in the set position.
59	Auto-Stop input active	A change to automatic or semi-automatic mode is not possible as the input "Auto Interrupt" (DI#325) is HIGH.
60	Hydraulic safety active	The hydraulic safety valve is blocking the movement (see Setup >> Hydraulic Safety Valve)
61	Release from Handling missing	The release (enable) from the handling is missing.
62	Ejector might not be retracted	Ejector position not clear. Might not be retracted.
63	Function only available on according page	The requested function is only available if the according page is selected on the HMI.
64	Bypass key not pressed	The bypass key (General >> IO Datapoints >> Safety Gate - DI#243) is not pressed. Movement not possible in the current situation without active bypass-input.
65	Lubrication active	Lubrication is active. The action is not possible before lubrication has finished.
66	Lubrication min. off time active	Lubrication cannot be started manually because the min. off time for the according lubrication circuit is not over.
67	Injection Unit swiveled out	The injection unit is not in center position (it is swiveled out or partly swiveled out).

6.11 Software Update

The SmartMold control software can be updated either via USB stick or by inserting a new Compact Flash with the new version. When performing a USB Update, no special care must be taken because all machine specific configuration files as well as mold data (recipe) files remain on the original Compact Flash. When the Compact Flash is exchanged, the machine specific configuration files and recipe files must first be saved and later reloaded.

1 Check Current Version

On page Pages >> Service >> Settings 1 (800) the current software version can be checked.



1	Current software version used on the controller
2	Exact software revision used on the controller

An error report copies all important machine specific configuration to the USB stick. It can therefore be used to back up the machine configuration files before performing a software update. A confirmation dialog will appear before the error report is really written.

2 Machine Specific Files

The behaviour of the SmartMold software package can be parametrized with certain files that are on the Compact Flash. This means that the software core is always the same for every machine and can be adapted by the content of the following files in order to fit to a particular machine. Therefore it is necessary that after a software update the same files are again present on the system.
All files can be managed (copied, deleted, ...) on page Pages >> Overview >> Recipe (110).

RECIPE: All mold related data, like injection speed, mold open and close settings. The settings can be modified on all normal operator pages. A recipe file can be loaded on page Pages >> Overview >> Recipe (110). If the system detects during booting that the current recipe data is corrupt, it loads the default recipe. After being loaded the data remains in the battery buffered permanent memory.
Filename: Various files, extenstion **.rec**
Location on Compact Flash: F:/DATA
Default data: Default.rec

FIXDATA: All machine related data. The fixdata can me modified by the OEM on page Pages >> Service >> Setup Wizard (840). The fixdata can be loaded on page Pages >> Overview >> Recipe (110). If the system detects during booting that the current fixdata data is corrupt, it tries to load the machine fixdata (Machine.fix) first, if it is not available it loads the default fixdata. After being loaded the data remains in the battery buffered permanent memory.
Filename: **Machine.fix**
Location on Compact Flash: F:/DATA
Default data: Default.fix

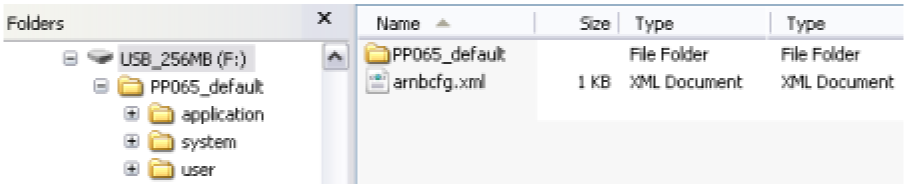
SWCFG: Software configuration data. The software configuration defines for example the momentary/toggle behaviour of the manual movement keys. The software configuration file is always loaded at power up. That is why this file must be present always.
Filename: **Sw.ini**
Location on Compact Flash: F:/CONFIG

IOCFG: IO configuration data. The IO configuration which was made in the IO Configurator (Setup >> IO Configuration) is saved as file **iocfg.xml**. This files contains the IO module configuration for the machine: the type and numer of IO modules, the digital and analog IO channel mapping and the channel configuration (for example the thermocouple type J, K, L, ...). The current IO configuration is stored internally on the Compact Flash, so this file can also be deleted and must not necessarily be present on the system. When the system detects that the file was changed, it loads at power up the IO configuration from the file **iocfg.xml**.
Filename: **iocfg.xml**
Location on Compact Flash: F:/CONFIG

3 Update via USB

1) Check the current version on page Pages >> Service >> Settings 1 (800).
2) Save the current mold data (RECIPE) and machine data (FIXDATA) on page Pages >> Overview >> Recipe (110). The current settings on the screens will be lost after the update. So they must be saved to files before doing the update. These files will remain on the Compact Flash and are not deleted during the update.
3) (Optional) Create a back up copy of all RECIPE files (mold data) by copying them one by one to a USB stick on page Pages >> Overview >> Recipe (110).
4) (Optional) Create a back up copy of all machine configuration files by generating an error report on

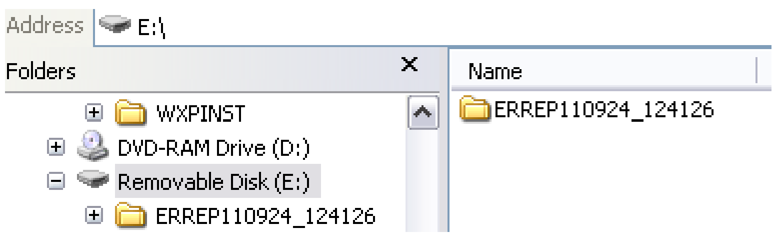
the USB stick on page Pages >> Service >> Settings 1 (800).
5) Unzip and copy the USB Update to a USB stick, the contents of the USB stick should look like in this screenshot:

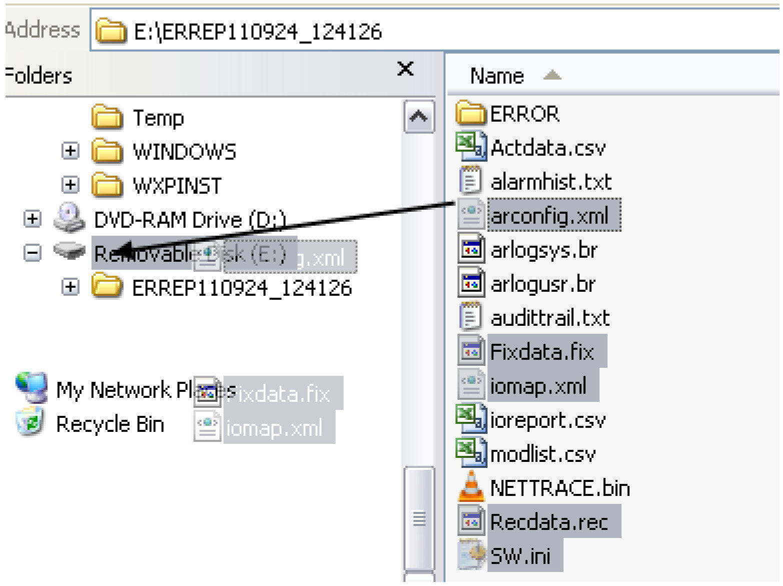


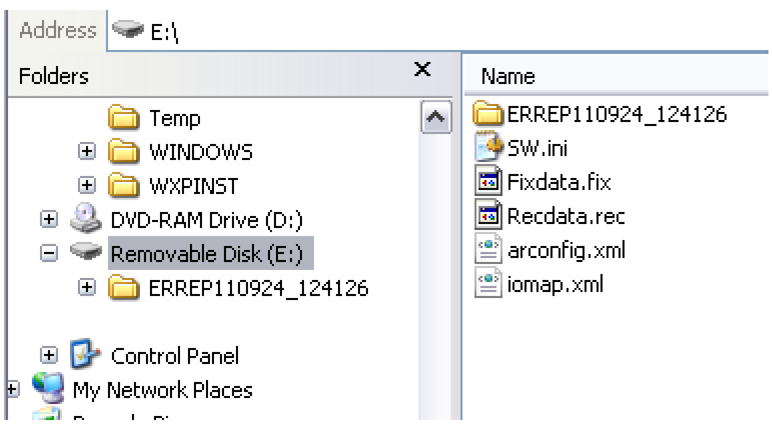
6) Power off the panel, insert the USB stick with the software update, power on the panel again. The booting phase will last longer than normal because of the software update.
7) Reload the machine data (FIXDATA) and mold data (RECIPE) and on page Pages >> Overview >> Recipe (110) that you saved in step 2, before booting with the USB update stick.
8) Check the new version on page Pages >> Service >> Settings 1 (800) to be sure that the update has been performed properly.

4 Update via Compact Flash

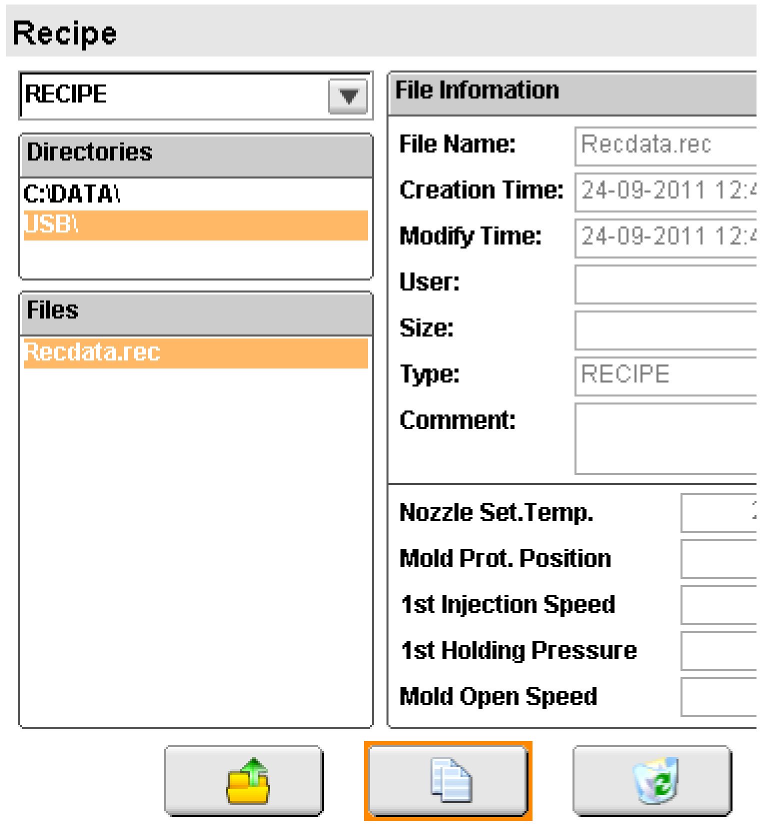
1) Check the current version on page Pages >> Service >> Settings 1 (800).
2) Save the current mold data (RECIPE) and machine data (FIXDATA) on page Pages >> Overview >> Recipe (110). The current settings on the screens will be lost after the update. So they must be saved to files before doing the update.
3) Create a back up copy of all RECIPE files (mold data) by copying them one by one to a USB stick on page Pages >> Overview >> Recipe (110).
4) Create a back up copy of all machine configuration files by generating an error report on the USB stick on page Pages >> Service >> Settings 1 (800).
5) Insert the USB stick in your computer and move the files **arconfig.xml**, **Fixdata.fix**, **iomap.xml**, **Recdata.rec** and **Sw.ini** from the folder **ERREPyymmdd_hhmmss** to the root directory of the USB stick:







6) Power off the panel, replace the Compact Flash and power on the panel again.
7) Insert the USB stick and copy the files **Fixdata.fix**, **Recdata.rec** and **Sw.ini** from the USB stick to the Compact Flash using the copy function on page Pages >> Overview >> Recipe (110). Please note that the file **Fixdata.fix** is automatically renamed to **Machine.fix** on the Compact Flash.



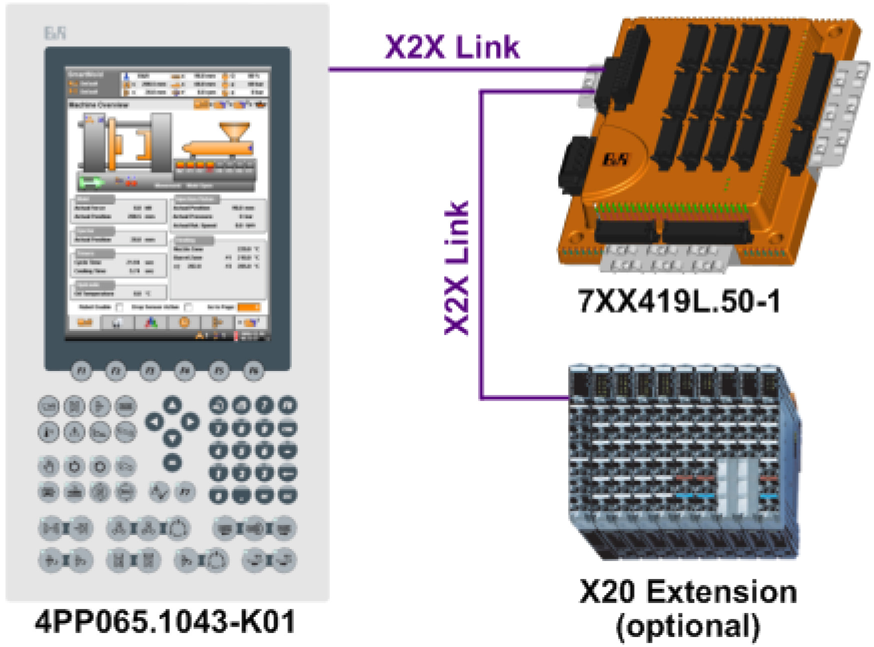
8) Load the machine data and mold data, respectively the files **Machine.fix** and **Recdata.rec** on page Pages >> Overview >> Recipe (110).
9) Import the IO configuration on page Setup >> IO Configuration (2204). The system will then reboot automatically.

10) Check the new version on page Pages >> Service >> Settings 1 (800) to be sure that the update has been performed properly.

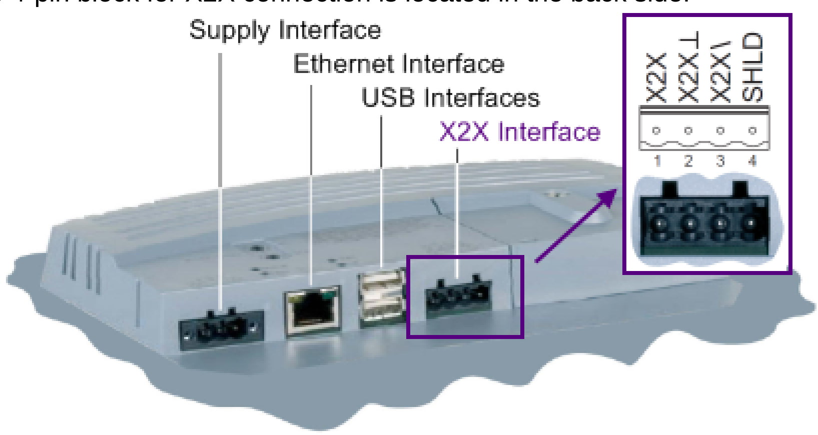
6.12 Wiring

1 System Topology and X2X Link Wiring

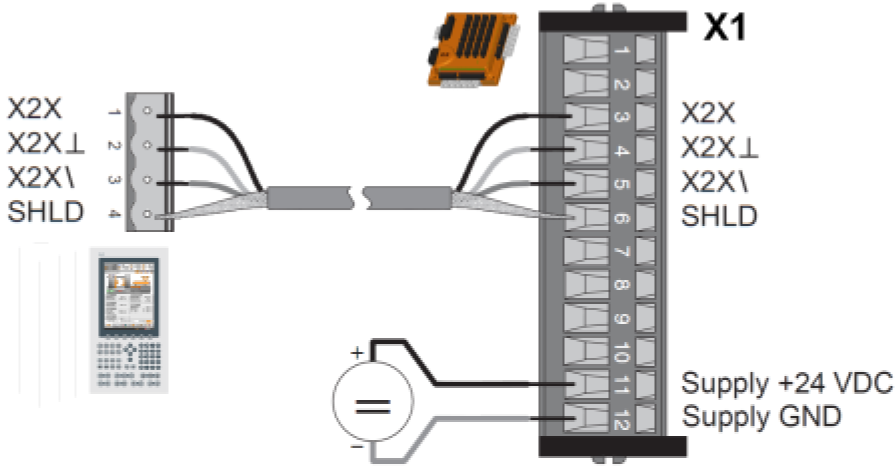
The SmartMold control unit (in the following called PP65) and the SmartMold IO unit (in the following called XX419) are linked by X2X bus. Optionally the system can be expanded with additional X20 IO blocks, which are also linked by X2X bus:



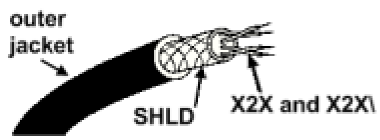
On the PP65 the 4-pin block for X2X connection is located in the back side:



The X2X link connection between PP65, XX419 and the optional additional X20 IOs must be done with a shielded twisted pair cable:



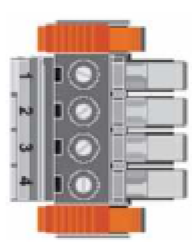
Guidelines for X2X wiring:
Use a shielded and twisted pair cable (see picture below).
The signals **X2X** and **X2X** must be one twisted pair.
Connect the shield on both sides.
Keep the unshielded part as short as possible.
PP65 and XX419 must be connected to the ground potential. Connection can be reached either by a good contact of all module fixing screws to the wall of the electrical cabinet, or by using grounding cables to the designated connection PINs on the modules. Cabinet doors and other doors that are connected to the main frame only via a frame-joint should be connected additionally via an earthing cable.



2 XX419 Wiring

2.1 Supply Voltage (X2)

Supply Voltage for the digital outputs on connectors X8-X13. There is a separate supply for the digital outputs on connectors X8-X10 and for the digital outputs on connectors X11-X13.



Connection	Name
1	+24VDC_DO1 (for X8-X10)
2	GND_DO
3	GND_DO
4	+24VDC_DO2 (for X11-X13)

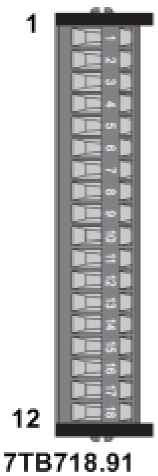
2.2 Counter Inputs and PWM Outputs (X3)

There are 2 PWM outputs (max. 3A), 2 event counters and 1 incremental encoder input available on connector X3.

Connection	Name
1	GND PWM
2	VCC PWM
3	PWM 1 + Connect injection servo valve (if existing) or main pump pressure either here or on X6-AO1!
4	PWM 1 -
5	PWM 2 +
6	PWM 2 -
7	COM si For counter inputs 9-12: +24VDC in source/(NPN sensor) operation, GND in sink/(PNP sensor) operation
8	COM so For counter inputs 9-12: +24VDC in sink/(PNP sensor) operation, GND in source/(NPN sensor) operation
9	Counter 1 Connect Moldheight counter here!
10	Counter 2 Connect Screw RPM counter here!
11	Counter 3 Input A
12	Counter 3 Input B

2.3 Thermocouple Inputs (X4)

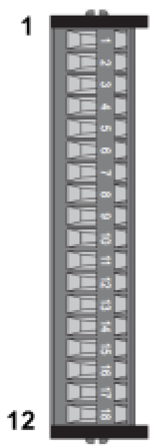
There are 8 thermocouple inputs available on X4 that support the sensor types J, K, S and N.



Connection	Name
1	Shield
2	Thermocouple 1 +
3	Thermocouple 1 -
4	Thermocouple 2 +
5	Thermocouple 2 -
6	Thermocouple 3 +
7	Thermocouple 3 -
8	Thermocouple 4 +
9	Thermocouple 4 -
10	Thermocouple 5 +
11	Thermocouple 5 -
12	Thermocouple 6 +
13	Thermocouple 6 -
14	Thermocouple 7 +
15	Thermocouple 7 -
16	Thermocouple 8 +
17	Thermocouple 8 -
18	Shield

2.4 Potentiometer Displacement Gauge and Analog Inputs (X5)

There are 4 analog inputs for potentiometer (0-10V or 0-20mA, 4.5 V, 14-bit) and 2 analog inputs (+/-10V or 0-20mA, 12-bit) available on X5.



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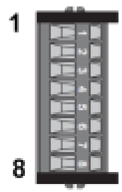
Connection	Name
1	AI1_I +
2	AI1_U + Connect injection pressure sensor (if existing) or main pump system pressure sensor here!
3	AI1 -
4	AI2_I +
5	AI2_U +
6	AI2 -
7	+ Supply voltage for pot 1+2
8	AI3_I +
9	Slider on potentiometer 1 / AI3_U + Connect injection piston stroke transducer here!
10	AI4_I +
11	Slider on potentiometer 2 / AI4_U +
12	GND Supply voltage for pot 1+2 / AI3 - / AI4 -
13	+ Supply voltage for pot 3+4
14	AI5_I +
15	Slider on potentiometer 3 / AI5_U +
16	AI6_I +
17	Slider on potentiometer 4 / AI6_U +
18	GND Supply voltage for pot 3+4 / AI5 - / AI6 -

2.5 Analog Outputs (X6)

There are 4 analog outputs (+/- 10V, 12-bit) available on connector X6.



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Connection	Name
1	AO1 + Connect injection servo valve (if existing) or main pump pressure either here or on X3-PWM1!
2	AO1 GND
3	AO2 +
4	AO2 GND
5	AO3 +
6	AO3 GND
7	AO4 +
8	AO4 GND

2.6 Relay Outputs (X7)

There are 6 relay outputs (N.O., 230V / 1A) available on connector X7.

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Connection	Name
1	NO 1
2	COM 1
3	NO 2
4	COM 2
5	NO 3
6	COM 3
7	NO 4
8	COM 4
9	NO 5
10	COM 5
11	NO 6
12	COM 6

2.7 Digital Outputs (X8-X13)

There are 48 digital outputs (2A 50%, 24 VDC) available on connectors X8-X13. 2A 50% means that all outputs are 2A outputs, but not all outputs can be stressed with 2A at the same time. Only 50% of

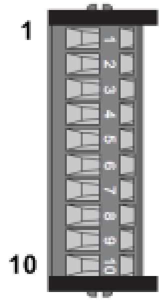
all outputs may be stressed with 2A simultaneously.
All **GND_DO** are connected internally.
The outputs on X8, X9 and X10 are powered via **24VDC_DO1** on X2. The outputs on X11, X12 and X13 are powered via **24VDC_DO2** on X2.

Connection	Name
1	DO1
2	DO2
3	DO3
4	DO4
5	DO5
6	DO6
7	DO7
8	DO8
9	GND_DO
10	GND_DO

Connections for X9-13 follow the same pattern.

2.8 Digital Inputs (X14-X19)

There are 44 digital inputs (24 VDC, sink/source) available on connectors X14-X19. Sink operation applies for PNP sensors, source operation for NPN sensors.
All **COM si** are connected internally. All **COM so** are connected internally.



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Connection	Name
1	DI1
2	DI2
3	DI3
4	DI4
5	DI5
6	DI6
7	DI7
8	DI8
9	COM so (GND in source/(NPN sensor) operation, +24 VDC in sink/(PNP sensor) operation)
10	COM si (GND in sink/(PNP sensor) operation, +24 VDC in source/(NPN sensor) operation)

Connections for X15-X19 follow the same pattern.