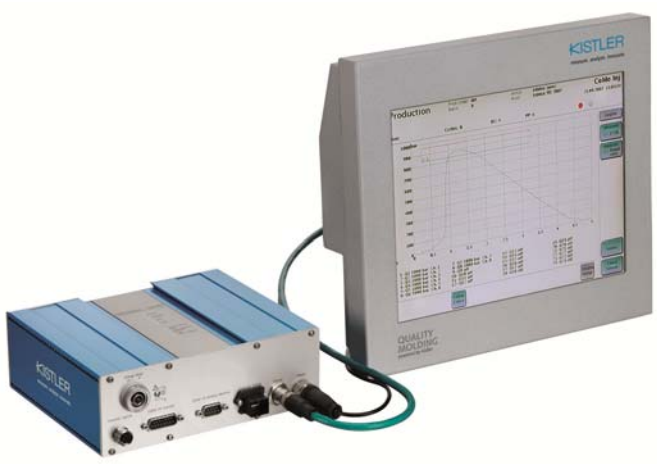
Instruction Manual

CoMo Injection
Type 2869B…

2869B_002-398e-06.13

KISTLER

measure. analyze. innovate.



Instruction Manual

CoMo Injection
Type 2869B...

2869B_002-398e-06.13

Foreword

We thank you for choosing a Kistler quality product distinguished by technical innovation, precision and long life.

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1. Introduction

Please take the time to thoroughly read this instruction manual. It will help you with the installation, maintenance, and use of this product.

To the extent permitted by law Kistler does not accept any liability if this instruction manual is not followed or products other than those listed under *Accessories* are used.

Kistler offers a wide range of products for use in measuring technology:

- Piezoelectric sensors for measuring force, torque, strain, pressure, acceleration, shock, vibration and acoustic emission
- Strain gage sensor systems for measuring force and torque
- Piezoresistive pressure sensors and transmitters
- Signal conditioners, indicators and calibrators
- Electronic control and monitoring systems as well as software for specific measurement applications
- Data transmission modules (telemetry)

Kistler also develops and produces measuring solutions for the engines, vehicles, manufacturing, plastics and biomechanics application sectors.

Our product and application brochures will provide you with an overview of our product range. Detailed data sheets are available for almost all products.

If you need additional help beyond what can be found either on-line or in this manual, please contact Kistler's extensive support organization.

1.1 Disposal Instructions for Electrical and Electronic Equipment



Do not discard old electronic instruments in municipal trash. For disposal at end of life, please return this product to an authorized local electronic waste disposal service or contact the nearest Kistler Instruments sales office for return instructions.

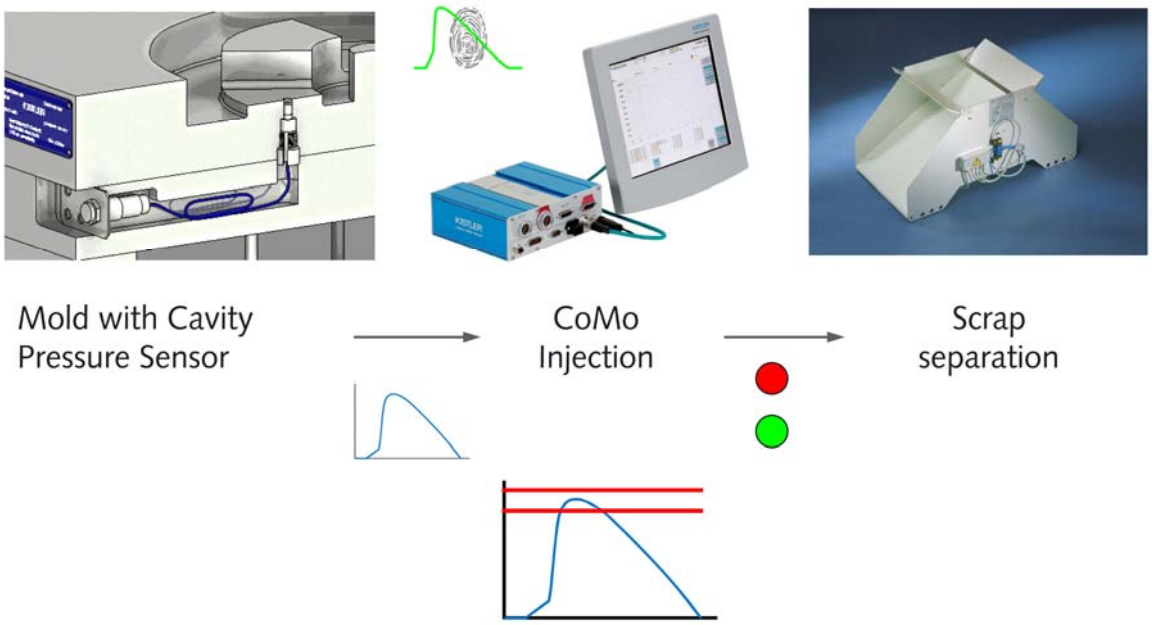
1.2 Software Upgrades and Updates

Kistler may from time to time supply upgrades or updates for embedded software. Such upgrades or updates must always be installed.

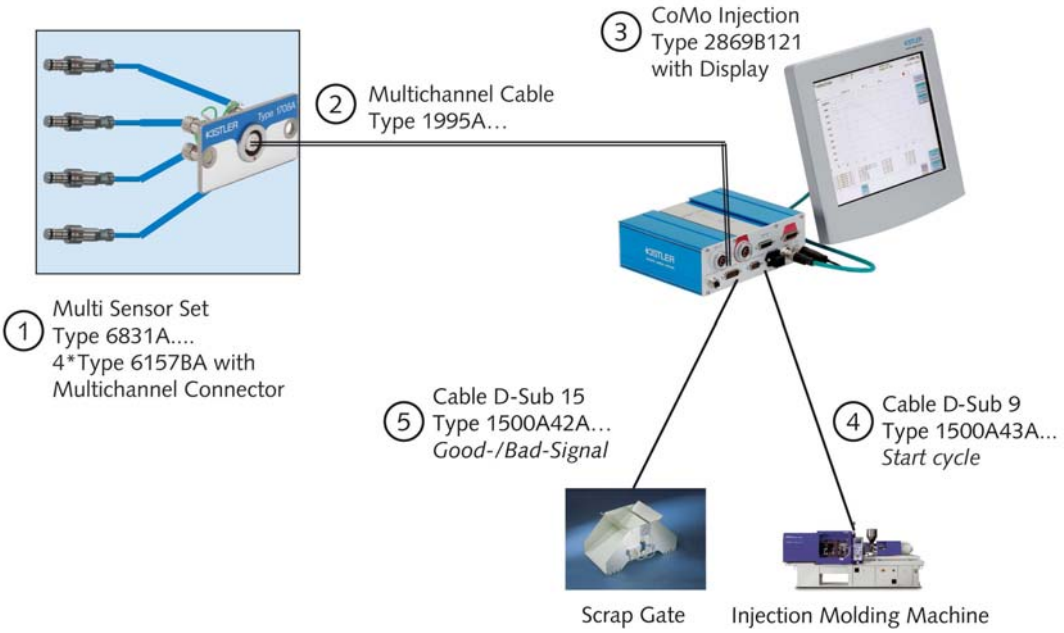
Kistler declines any liability whatsoever for any direct or consequential damage caused by products running on embedded software which has not been upgraded or updated with the latest software supplied.

2. System Overview

The CoMo Injection is a production optimization, control and monitoring system for injection molding of plastics. All of the functions required for evaluation and optimization of the injection molding process are integrated into this compact unit.

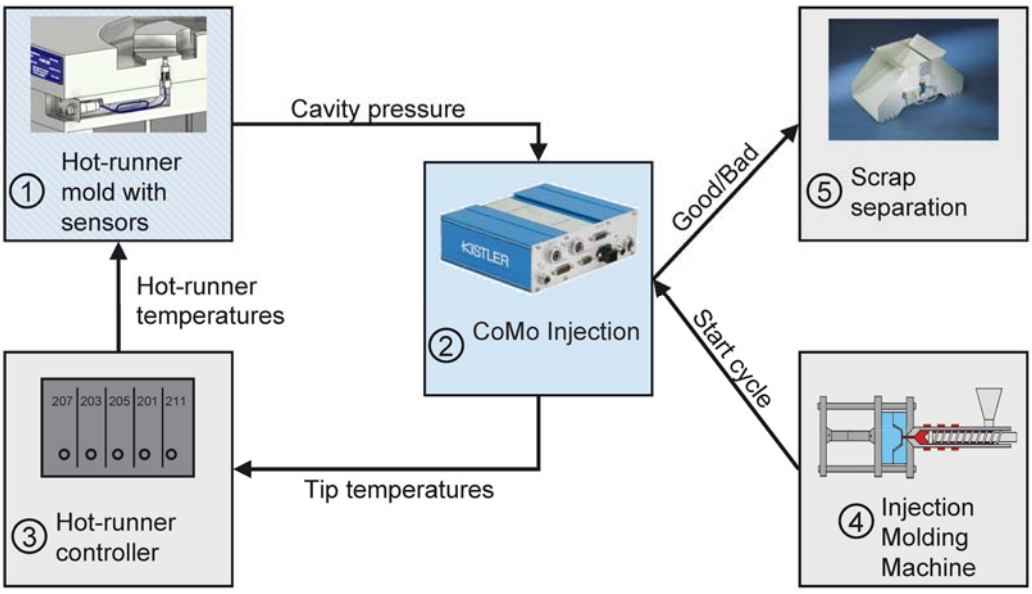


It allows direct connection of piezoelectric cavity pressure sensors, and signals from the injection molding machine or from other sensors can be acquired and evaluated as well.
Up to 48 monitoring functions allow reliable scrap separation on the basis of the recorded data. At the same time the injection molding process can be controlled using real-time switching functions. The injection molding machine or scrap gates can be controlled directly via 12 floating outputs.

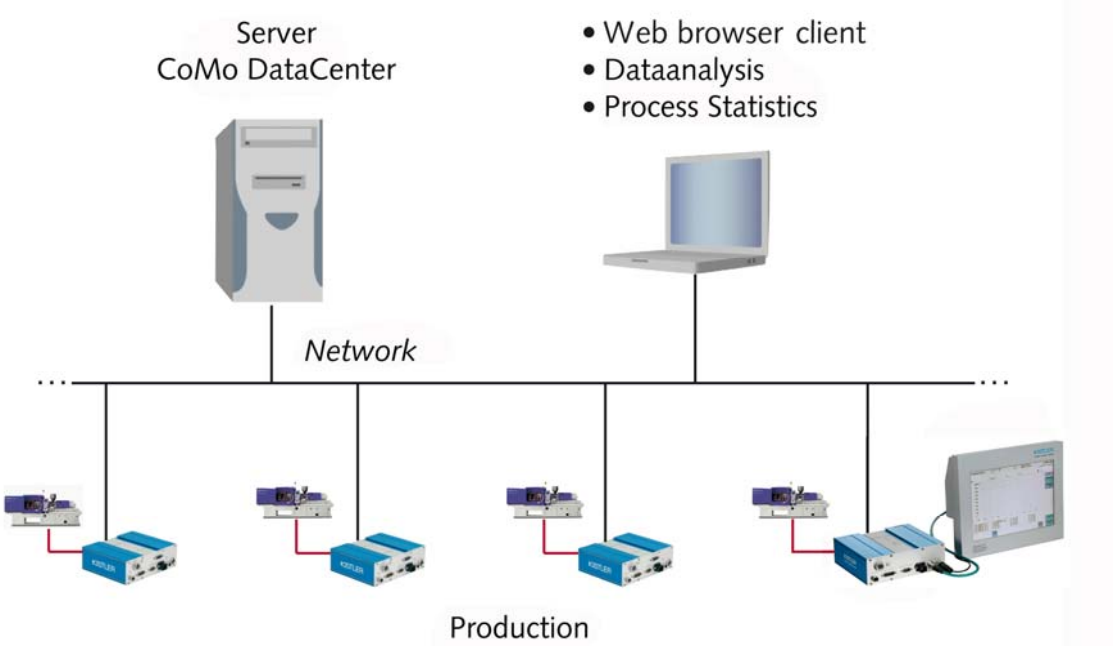


The process and the data calculated on the machine can be visualized and the system configured using either the optional touch screen display or a web browser (for example, on a PC).

The existing functions of the CoMo Injection are supplemented with the MultiFlow Type 2809A… option for automatic hot-runner balancing of multicavity molds. Based on the cavity pressure curves, the hot-runner temperatures are automatically optimized so that all cavities are filled synchronously.



The facilities of the CoMo Injection are supplemented by the CoMo DataCenter database system Type 2829B... with statistics functions and reporting. The CoMo Injection is networkable and can be easily integrated into the existing company network. The process data related to the production order can be saved in the Kistler CoMo DataCenter database Type 2829B… and evaluated with its integral visualization and statistics software. There is also support for linking with MES/ERP systems.



3. Control Concept

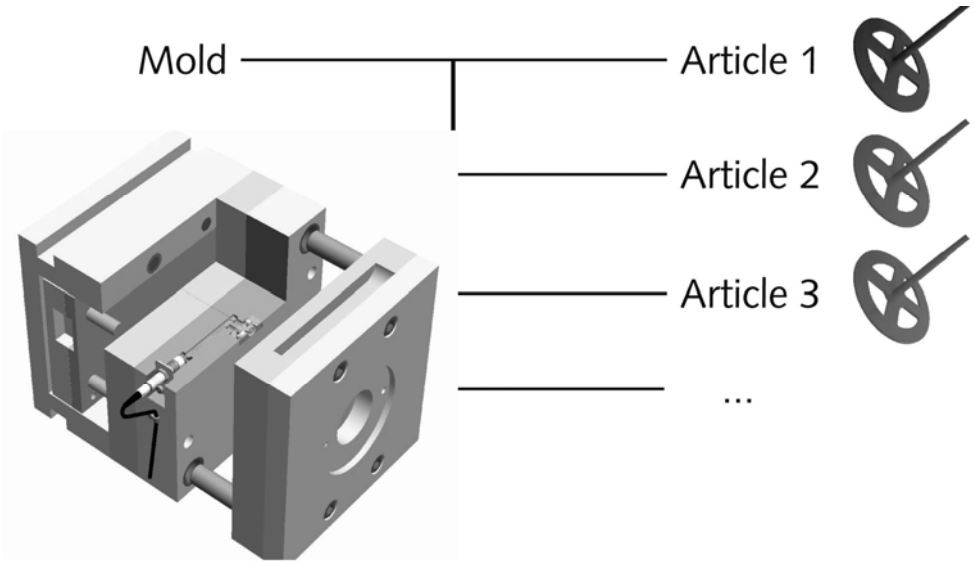
The CoMo Injection was developed with a control concept tailored to its role as a monitoring unit for the injection molding process. As usual with injection molding, configuration data is divided into mold and article data. Production data is organized in production orders and batches.

3.1 Configuration Data

Setting up of the CoMo Injection is divided into configuration data for mold and article:

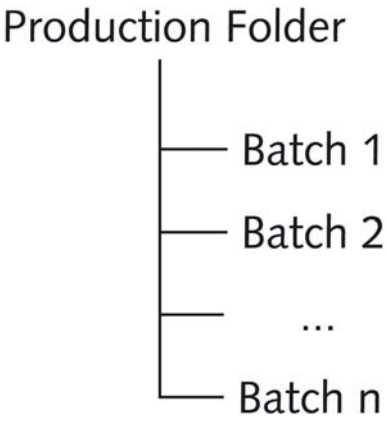
- The mold record contains all of the settings that depend on the mold. These are essentially mold number, description and sensors (mold configuration)
- All of the data relating to the process is saved in the article record. It contains article number, description, relation to mold, comparison curves, real-time thresholds and monitoring functions (article configuration)

Different (for example, in terms of color) articles can be produced with one and the same injection mold. The CoMo Injection therefore has several article configurations for a particular mold configuration.



3.2 Production Data

When used with the CoMo DataCenter Type 2829B... the production data is saved on the basis of the order. The production order contains all of the information needed for production. In addition to a unique description this is generally the associated configuration data consisting of mold and article record. A production order can be manufactured in batches.



The CoMo Injection supports batch production with four variants of batch and job management:

- *Manual batch number* requires the operator to enter a number at the start of each production run (default).
- *Automatic batch number* automatically increments the batch numbers.
- *No batch* switches batch management off.
- *Automatic POs*: automatically increments the production orders (POs).

The mode of operation can be specified in the system setup.

3.3 Work Phases

The work involved in fulfilling a new production order is divided into three phases:

1. Setup:
   - A mold configuration is either created or loaded
   - An article configuration compatible with the mold is created or loaded

2. Start-up:
   - The production order number and any batch number are entered.
   - The production process is set up and optimized by the Machine Setter

3. Production:
   - The system is switched to the production mode, thereby activating the sorting functionality (good/bad separation) and the (optional) data export facility of the system

The individual work phases are characterized by different system functionalities:

In the Setup phase:
- The system is in the setup mode. No measurement takes place
- The scrap gate control system is always set to "bad"

In the Start-up phase:
- The scrap gate control system is set to "bad" (default). There is also the option of controlling the scrap gate. Its behavior is specified in system control
- The real-time thresholds are optionally activated.
- Changes in the article setup (real-time thresholds, measuring time, evaluation objects, etc.) can be made
- No documentation data is saved. Saving for analytical purposes can be specified in the system setup

In the Production phase:

- Scrap gate control system, *real-time thresholds* and data storage are activated
- The setup cannot be changed



When working with real-time thresholds please note the safety precautions designed to protect the machine and the mold. These mean that requirements for earliest and latest switching points have to be defined and implemented on the machine for all switching functions. No liability is accepted for damage to the machine or the mold that can arise as a result of incorrect operation.

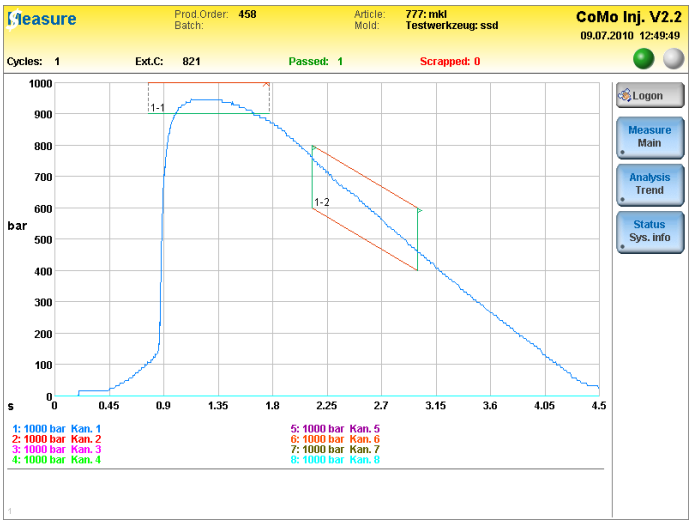
3.4 User Levels

CoMo Injection supports six different user levels with password protection:

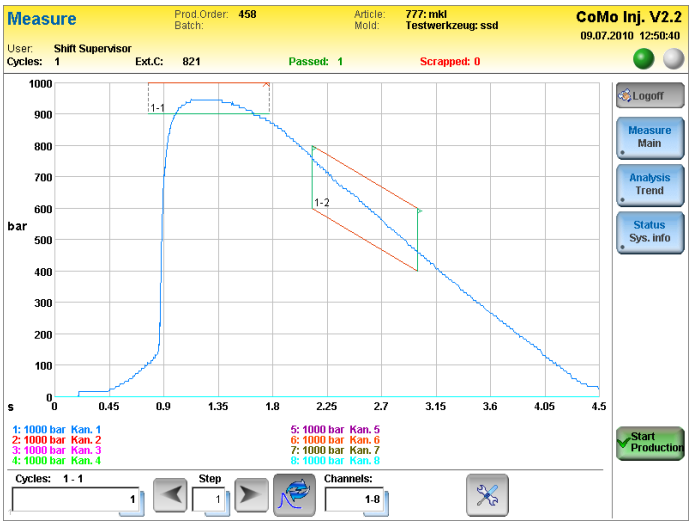
- Unregistered
- Shift Supervisor
- Job Setter Mold
- Job Setter Article
- Job Setter Mold and Article (M+A)
- Supervisor

Authorizations depend on the user level.

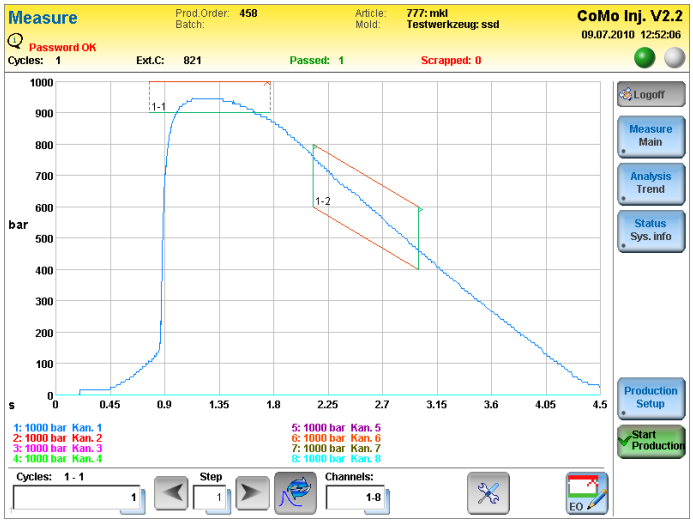
If there is *no user* logged on it is only possible to look at data. Setup changes and the starting and stopping of production orders are prohibited.



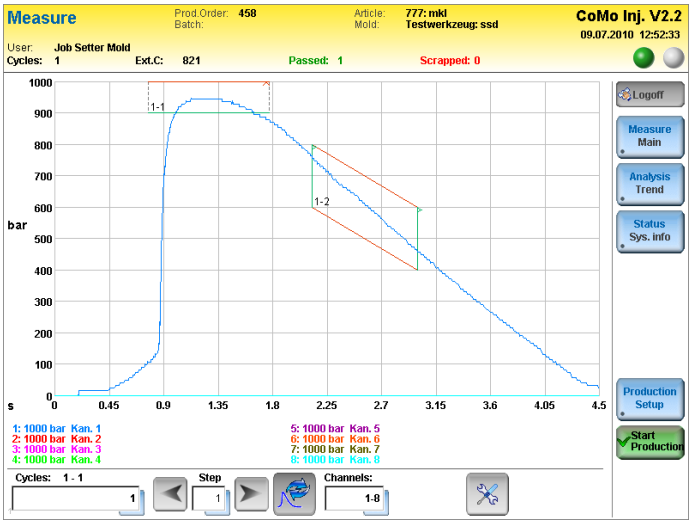
The Shift Supervisor can start, pause, restart or stop the productions for the currently loaded tools/items. He is authorized to switch between existing data records of tools and items.



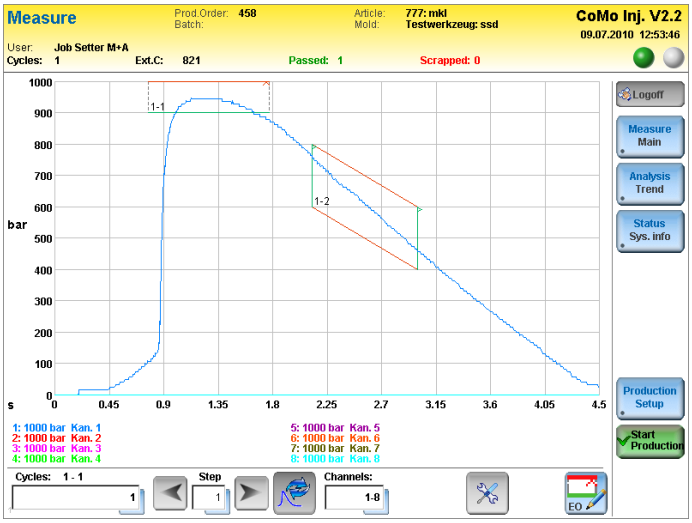
As well as being able to start, interrupt and end a production order (like the Shift Supervisor), the *Job Setter Mold* can create a new mold configuration. Mold configurations can only be created or changed if the system is not in the *Production* mode.



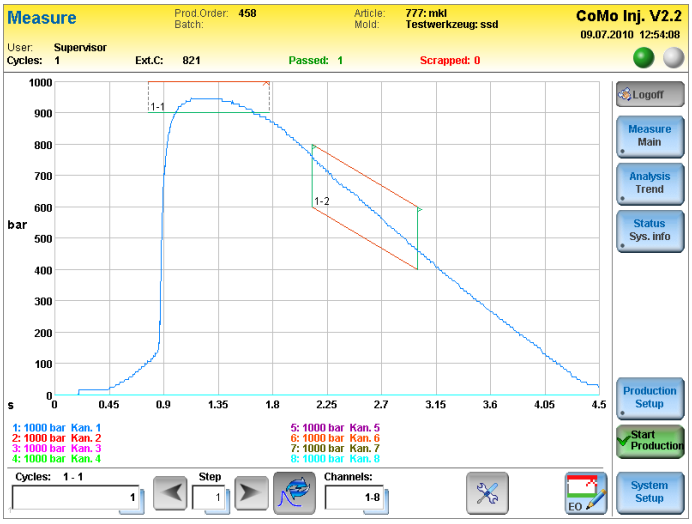
The *Job Setter Article* can start, interrupt and end a production order or create a new article configuration. A mold configuration can be associated with several article configurations. However, only one mold configuration is possible for each article configuration. If a mold configuration is chosen, only the matching article configuration is displayed when choosing articles. Article configurations can only be created or changed if the system is not in the *Production* mode.



As well as starting, interrupting and ending a production order, the *Job Setter Mold and Article* can create a new configuration set. This record consists of a mold configuration and an article configuration. A mold configuration can be associated with several article configurations. However, only one mold configuration is possible for each article configuration. If a mold configuration is chosen, only the matching article configurations are displayed when choosing an article. Mold and article configurations can only be created or changed if the system is not in the *Production* mode.



The *Supervisor* combines the access authorizations of all of the user groups and can also install the CoMo Injection, set parameters, assign passwords and perform functional tests.



3.5 Work Phases and Access Authorizations

The following steps are involved in preparing the CoMo Injection for measurement:

1. Create a mold configuration, entering the sensor system and its sensitivity. If the mold configuration already exists, it can be copied onto the CoMo Injection.
2. Create an article configuration with measuring time, monitoring functions and/or real-time switching thresholds in conjunction with the associated mold. If the article configuration is already available it can be copied onto the CoMo.
3. Optimize the monitoring functions/real-time thresholds until production stabilizes and bad parts are being reliably rejected. This step is omitted for articles and molds that have already been introduced into production.
4. Start production, entering production order number and any required batch number.

As the technical requirements are very different depending on the step involved, the different user levels have different authorizations.

The dialog boxes are designed to reflect these levels.

User Level	**Authorizations**
Shift Supervisor	Step 4
Job Setter Mold	Steps 1 and 4
Job Setter Article	Steps 2 to 4
Job Setter Mold and Article	Steps 1 to 4
Supervisor	Steps 2 to 4 plus CoMo setup

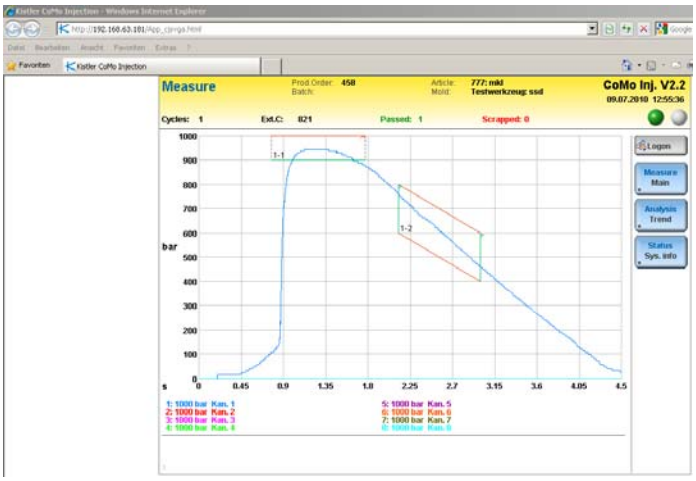
4. Fundamentals of CoMo Injection Operation

The CoMo Injection is designed to be operated via a web application. This means that the actual software runs on the CoMo and the visualization is implemented using a web client. This can be either the Kistler touch screen display Type 5629B3 or a web browser with Java, for example Mozilla Firefox or Internet Explorer. The graphical user interface is designed to suit the use of a touch screen enabling operation without any physical keyboard. The CoMo Injection can of course also be operated conventionally with a keyboard and a mouse. The description of operation relates to monitor Type 5629B3.

4.1 Starting CoMo Injection

The CoMo Injection is operated with Kistler monitor Type 5629A1 or Type 5629B3, or with a web browser. After being connected to the base unit, the monitor shows the CoMo Injection main screen. No further measures are necessary. In the Networking mode it is only necessary to match the IP addresses. The procedure is described in the Installation Manual.

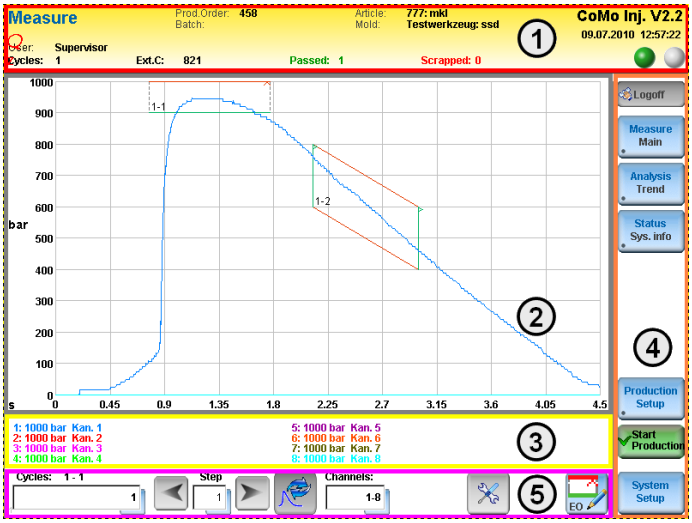
If a web browser is used, it has to be told the IP address under which it can connect to the CoMo Injection. This is done by entering the IP address of the CoMo Injection in the navigation bar. If the IP has not been changed, the default IP address: *192.168.101.64* is entered.



If the IP address has been changed, the new address has to be entered. The web browser now starts Java and after a short delay displays the Measuring screen of the CoMo Injection.

4.2 Screen Layout

The screen of the CoMo Injection is divided into five sections:



1. Information bar:
   This contains all of the important information about the current status of the CoMo and production
   The status of the CoMo Injection is shown on the left. The three modes (Setup, Measuring and Production) are displayed. The status of the CoMo is also indicated by the color of the bar:
   - Whitish grey: Production
   - Yellow: Measuring
   - Red: Setup

   Information about current production (divided into production order, batch, mold and article) is displayed in the middle.

   On the extreme right are the name of the CoMo Injection and the current date with the time.

   The bottom line provides information about current production. It shows the number of cycles, the number of good parts produced and the bad cycles.

   Alongside these items, two LEDs indicate the status of the CoMo. The left LED is red if the limit of a monitoring function has been breached during the last cycle. If the last cycle was within the limits this LED is green. The right LED shows whether measurement is currently in progress, in which case its color changes from grey to yellow.

   If the handling system is being actuated the handling icon appears on the immediate left of the LED.

If the optional MultiFlow hot-runner balancing system is activated, the MultiFlow icon is displayed. When the CoMo communicates with the hot runner controller, the icon is green. A red icon signalizes a communication error.



Error messages and other indications are displayed in a red font.

2. Data display:
   The data of the current cycles is plotted against time. If all channels are using the same unit, the scale of the value axis shows this unit. If they are using different units, the value axis shows the percentage of the maximum scale.
   The display of the curves can be split into two diagrams in one window (Split view). Alternative information is also displayed in this section.

3. Key:
   The key shows the channel numbers and the descriptions. The color coding enables them to be related to the curves. If the key entries do not fit in the area, a scroll button appears on the right.

4. Selection of functions:
   The selection of available functions is on the right. It makes it possible to switch between different display options and settings.

5. Selection of display:
   The bottom section allows selection of different display options. It also contains the "EO" button on the right. This gives access to the menu for creating and modifying the evaluation objects.

4.3 Controls

The different controls used by the CoMo Injection will now be briefly described.

4.3.1 Buttons

Buttons can initiate various commands. Any button that initiates an event directly will be labeled accordingly.



Any button that opens a submenu will also have a small dot on the bottom left.



4.3.2 Entry Boxes

Boxes for entering numbers or texts are provided. A frame in the bottom right corner indicates that values can be entered. Touching a box opens the on-screen keyboard to allow entry of a value or description.

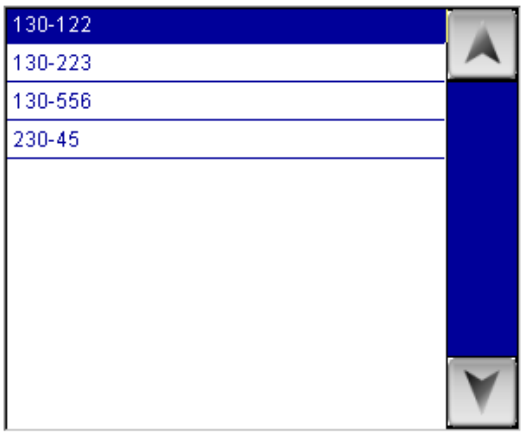




The entry box for the 5,7" touch screen display 5629A1 is different. It has a "Set" button on the immediate right of the Edit box. This button is pressed to make an entry in the box.

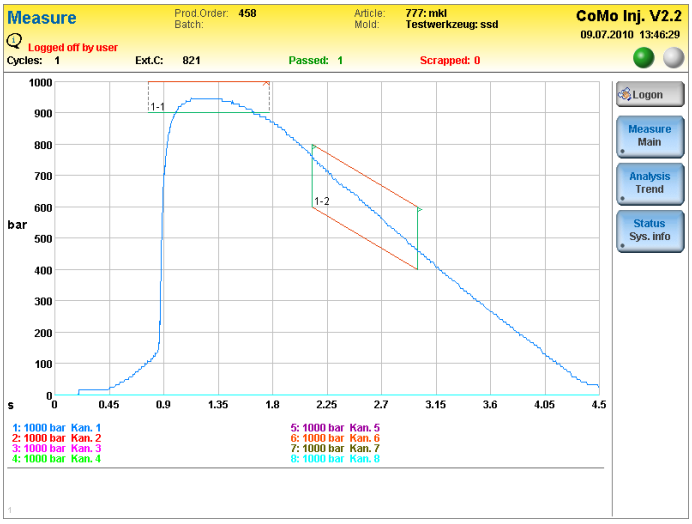
4.3.3 Selection Boxes

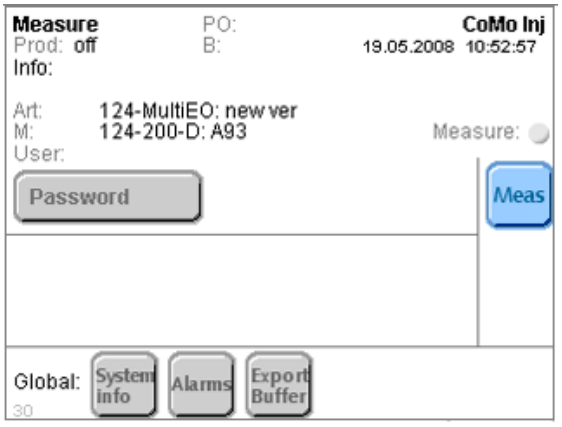
Selection boxes allow one of a number of different lines to be chosen; for example, different molds or articles. The corresponding line is touched to choose the required entry.



4.4 Logging onto System

You have to log on to work with the CoMo Injection.
When started the CoMo displays the measuring screen appropriate to the particular touch screen display connected.

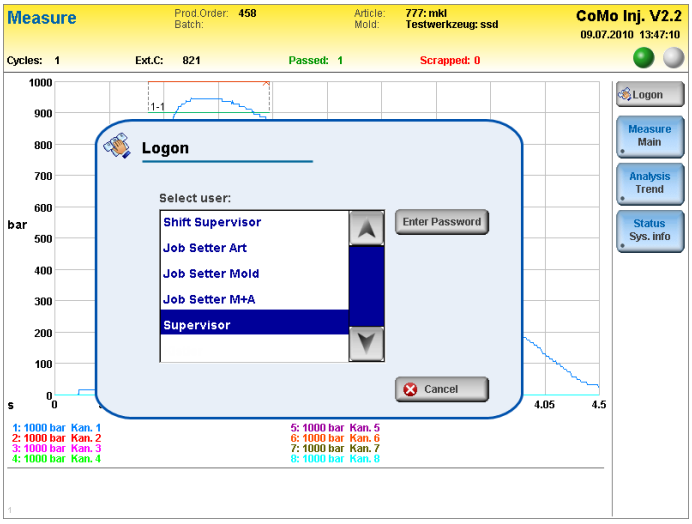




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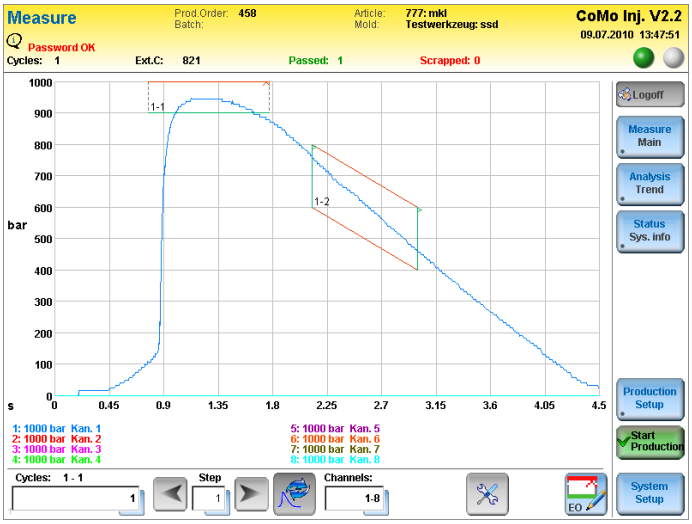
If the 5,7" control unit (touch screen display) Type 5629A1 is being used you have to press the Meas. button to change to the control screen. The displayed screens can differ from those shown here.

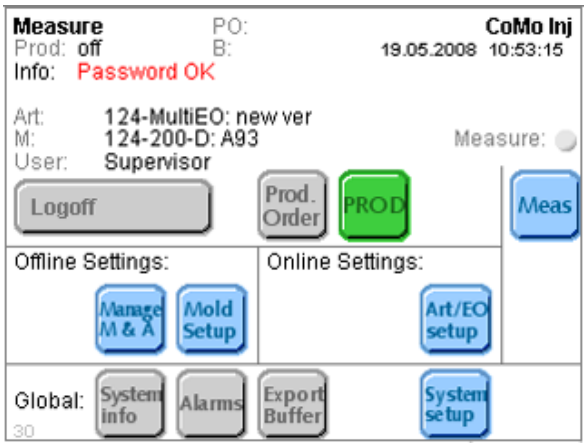
The operator can use the **Logon** button to log on as a user with a password. A box from which the relevant type of user can be chosen is displayed.



The **Enter Password** button is then used to display an on-screen keyboard for entering the password. In the default configuration no password is set. The first time the system is started a blank password therefore has to be entered and confirmed with **OK**.

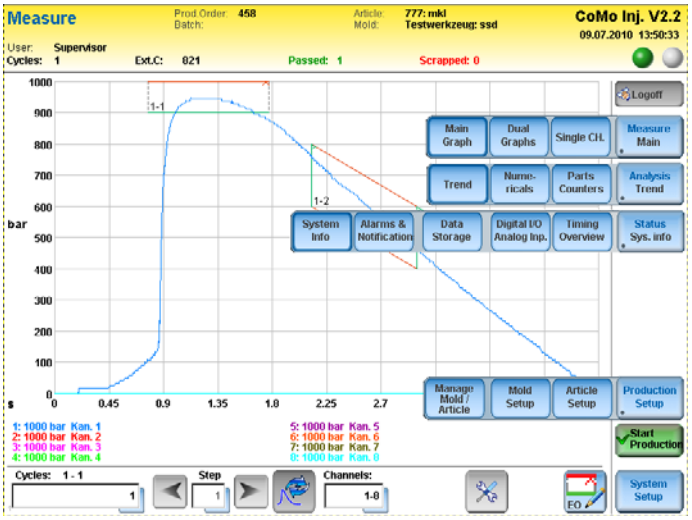
The screen now contains the controls corresponding to the user (see Section 3 Control Concept). All of the options are available to the user logged on as a Supervisor:





4.5 Choosing Functions

The buttons for choosing the different functions are on the right.



A user is logged on or off with the **Logon** button.
This is followed by buttons for selecting different views. Underneath these are menus for setting up the CoMo Injection. They are only visible to appropriately authorized users.

5. Display and Analysis of Recorded Data

The CoMo Injection has a wide variety of functions for displaying and analyzing the recorded data. The views are divided into three aspects corresponding to the related buttons on the function bar.

- **Measure** displays the recorded curves against time
- **Analyze** provides a configurable Trend view, parts statistics and a numerical representation
- **Status** contains various items of information about the CoMo Injection system and process

The **Measure** button is used to access the different curve views (all channels, individual channels and split). (see 5.1.5 – 5.1.7).

5.1 Display Options



5.1.1 Curve Superimposition

To enable more effective cross-comparison of different cycles, it is possible to have a number (up to 20) of curves displayed superimposed. The following examples elucidate the various entry formats available for this purpose:

- Entry: "3-11" ➔ all curves from cycle 3 up to and including cycle 11 are displayed.
- Entry: "3,6,8" ➔ the curves of cycles 3, 6 and 8 are displayed
- Entry: "3-6, 20" ➔ the curves of cycles 3,4,5,6 and 20 are displayed

The Refresh button  being on by default means that after each measurement the screen is automatically updated and the last measurement displayed. This can be annoying with functions such as Curve Superimposition, if only the family of curves actually chosen is to be viewed. The button and hence automatic updating can therefore be deactivated.

Example of automatic updating of the screen (standard case):

- Curve superimposition entered: cycles 1-10
- Curves displayed after measurement of the 11th cycle: cycles 2-11
- Curves displayed after measurement of the 12th cycle: cycles 3-12



When individual cycles (e.g. 3,6,9), or a number of curves not ending with the last cycle (e.g. 1-5 in the case of 10 measured cycles), are entered, automatic updating is deactivated.

5.1.2 Curve History and Selection of Channels



The adjacent arrow buttons are used to scroll through the selection of cycles quickly. The left arrow reduces and the right arrow increases this selection. The **Incr.** field specifies the number of cycles (increment) by which the selection is increased or decreased.

Example:

- Cycles 1001 and 2001-2010 are displayed. The **Cycles** field accordingly contains the entries "1001, 2001-2010"
- To scroll through this selection in increments of 1000 the number 1000 is entered in the **Incr.** field
- Pressing the arrow buttons now increases or decreases the selection in the **Cycles** field by 1000
- Left arrow: cycles 1 and 1001-2010 are displayed
- Right arrow: cycles 2001 and 3001-3010 are displayed

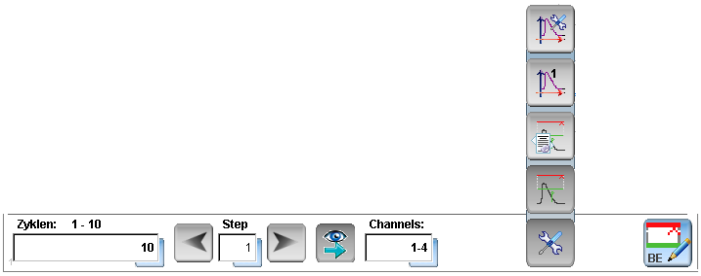
The particular channels to be displayed are entered in the **Chan** field, with selection of either individual or several channels also possible here. In a similar way to channel selection the comma serves as a delimiter between individual channels. Ranges are defined with a hyphen.

Examples:

- Selection of channels 1 and 7: "1,7"
- Selection of channels 1 to 8: "1-8"
- Selection of channels 1 to 4 and 6: "1-4,6"

5.1.3 "Quick-Link" Menu

The "Quick-Link" menu  offers quick access to individual display options as described below:



Reference Curve Setup 

The menu offers some of the setting options of the main menu for reference curves, which can be displayed using "Production Setup" ➔ "Article Setup" ➔ "Reference Curve". These options are explained in 6.3.3.

Select Reference Curve 

Pressing this button allows toggling between the specified reference curves 1, 2, 3 and "No reference curve". The number on the button indicates the reference curve currently displayed.

Display/Hide EO Data 

This button displays or hides some of the information about the evaluation objects.
More detailed information about all EOs can be obtained using the  ➔ "EO List" button.

Display/Hide EOs 

This button can be used to display or hide all of the EOs created for the current article.

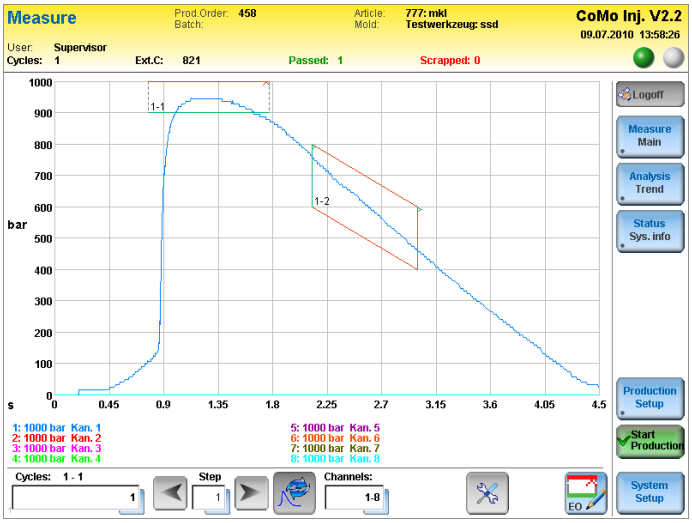
5.1.4 Zoom

Individual details of the curve can be enlarged with this function. A Zoom window can be dragged and dropped in the diagram area to open it and display its contents enlarged. Double-clicking returns to the default view.

5.2 Measurement

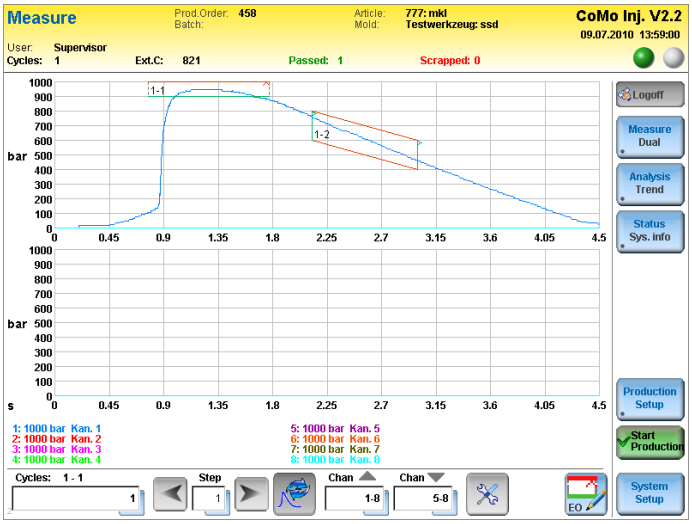
5.2.1 All Channels

The default view is a diagram on which one or more curves can be shown. It always displays the measurements shown as a function of time. If these curves have exactly the same measuring range, the unit of measurement is indicated on the graduated value axis. If the range of values or unit of measurement of the curve differs, the value axis shows the percentage value relative to the maximum of the measuring range.



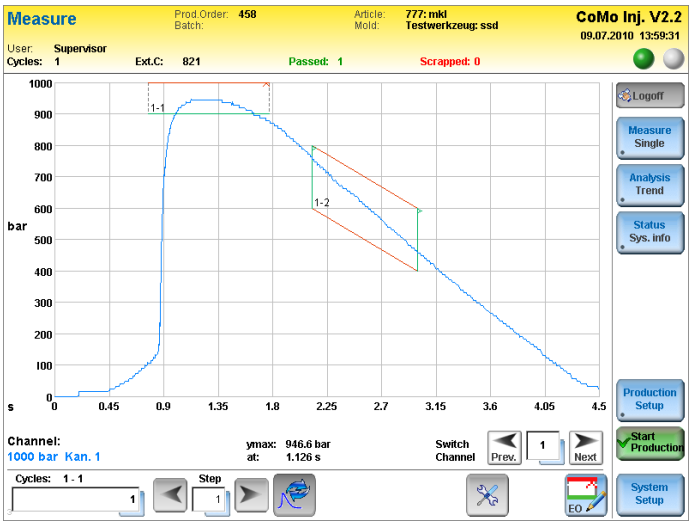
5.2.2 Split View

In the interest of clarity the displayed curves can be represented in two coordinate systems (Dual Graph).



5.2.3 Displaying Individual Channels

To enable its curve to be considered in greater detail an individual measuring channel can be viewed. Additional information about this channel is shown in the key area. The two buttons **Forward** and **Back** are used to scroll through the channels.

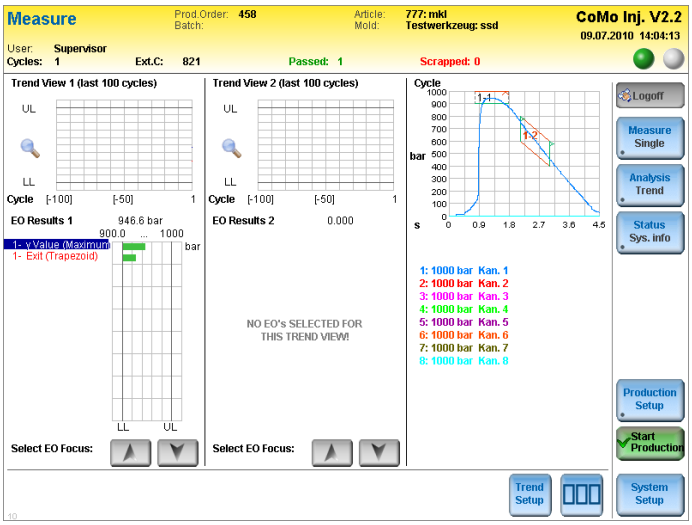


5.3 Analysis

The CoMo Injection offers numerous means of analysis. The different views are accessed with the **Analyze** button.

5.3.1 Trend View

The Trend view provides an overview of the current production status with trend graphs and bar charts.

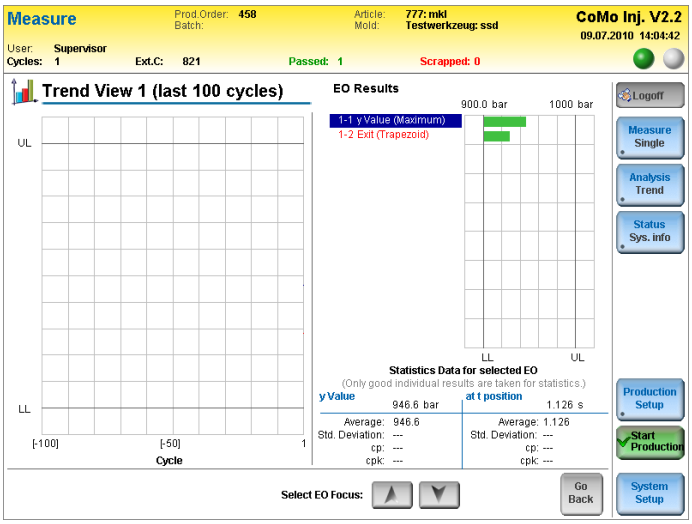


There are two alternative views: either two trends and one measuring view (all channels only), or three trends are displayed on the screen. Each trend graph has an associated bar chart. The button with two or three rectangles on the extreme right of the command bar at the bottom can be used to switch between the views.
Each of the trend graphs contains information about the last 100 cycles for all of the chosen monitoring functions. Magnitudes are represented relative to the defined upper (UL) and lower (LL) limits. For clarity these limits are shown on the diagram as bold grey lines.

The bar charts under the trend graphs show the results of the last cycle. If the calculated values of the evaluation objects are within the specified limits the associated bar is green. If a value falls outside the limits the bar of the evaluation object concerned it changes to red.
The active evaluation object can be chosen with the arrow buttons. The numerical values of the lower (LL) and upper (UL) limits of the chosen evaluation object are shown above the bar chart.

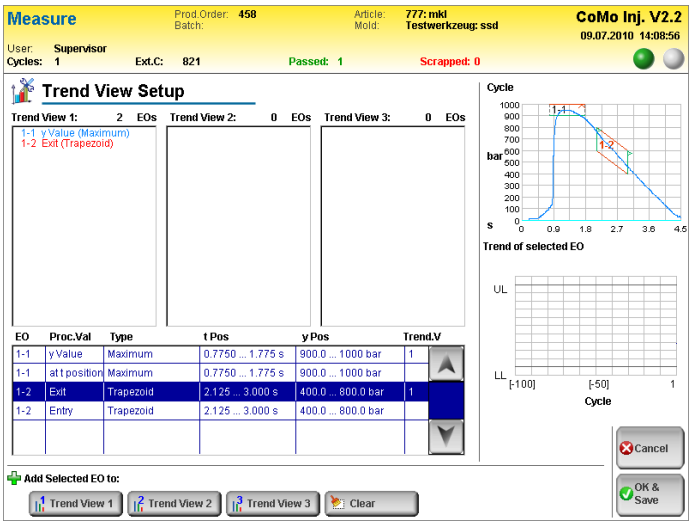
Touching the trend graph directly opens a detailed view. In addition to the trend graph and the bar chart this lists the statistics of the process values for the chosen monitoring function. The process values themselves depend on the type of monitoring function.

- Process value (numerical with unit)
- Mean over the last 100 cycles
- Standard deviation
- cp
- cpk



5.3.2 Setting Up Trend View

The data to be shown in the Trend view are defined by users logged on as *Supervisor* or *Job Setter Mold and Article*. These users press the **Trend View Setup** button to access setting up of the Trend screen.



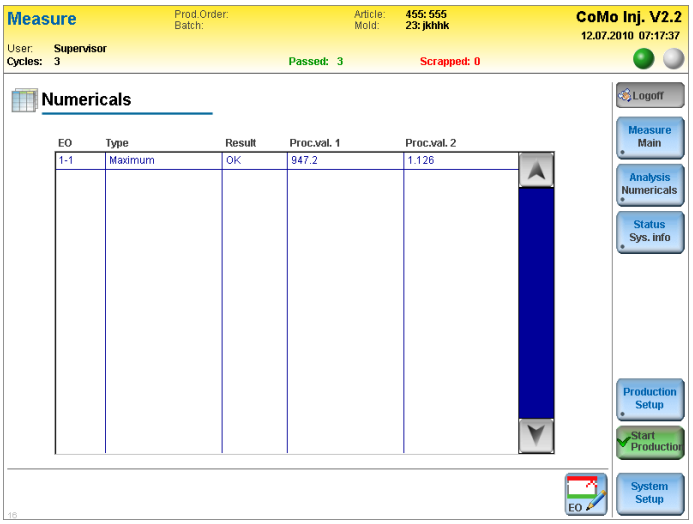
On the Setup screen the monitoring functions defined in the article configuration can be related to the different trend graphs.

On the right half of the screen the current cycle and the trend of the chosen evaluation object are displayed.

The left half contains three lists representing the three trend graphs. Underneath these is a list of the available monitoring functions. Right at the bottom there are three buttons (**Trend Display 1**, **Trend Display 2** and **Trend Display 3**). These are used to add the monitoring function to the trend graph. It is displayed at the top in the associated section. The **Delete** button removes the chosen evaluation object from the view.

5.3.3 Numerical Values

The results of all of the monitoring functions of the last cycle are tabulated here.

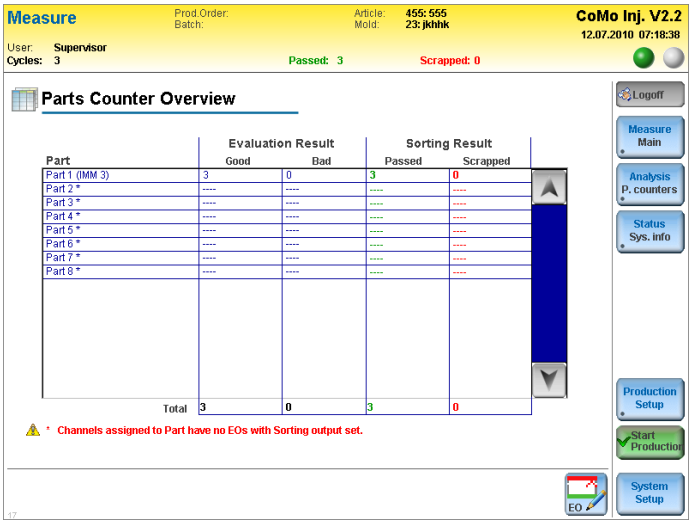


This table contains the following individual entries:

- *EO:* channel and number of the monitoring function, for example: *3-2* corresponds to monitoring function 2 on channel 3
- *Type:* type of monitoring function
- *Results:* within limits (OK) or outside limits (NOK)
- *Process value 1/2:* values of the last cycle depending on the type of monitoring function

5.3.4 Parts Counter

The CoMo Injection is capable of determining the number of good parts produced, even when a multicavity or family mold is being used. This keeps the user informed at all times about the current production situation. Through comparison with the parts counter on the status bar it makes it possible to see the number of parts produced from the individual cavities.



Two classifications are shown in the table. The first is the evaluation result, which specifies the number of good and bad cycles of each individual cavity.

Example:
As soon as the pressure curve for cavity 1 (channel 1) fails to meet the specified criteria of an evaluation object, it is considered to be "bad". If, on the other hand, the pressure curve meets the criteria of all of the evaluation objects, it counts as "good".

The other displayed classification is the sorting result. This specifies the numbers of good and scrapped parts. Both of these quantities also depend on the method of separation.

Example:
4-cavity mold with one pressure sensor per cavity.

Case A: Individual separation with robot
- Sorting result always corresponds to the evaluation result

Case B: Separation with a scrap gate
- Sorting result can differ from the evaluation result, as the number of good parts is only increased by the separation if all cavities evaluate the cycle as "good".

The evaluations of the individual cavities are added up and displayed as the overall result in the "Total" line at the bottom of the table.

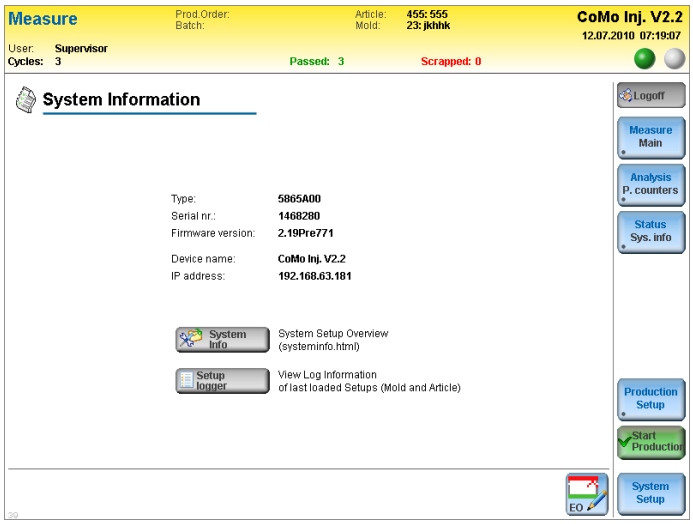
5.4 Status

The *Status* menu allows the user to display all of the current information about the CoMo Injection.

5.4.1 System Info

The System Info screen shows basic information about the CoMo Injection:

- Type
- Serial number
- Firmware version
- Name of the CoMo
- IP address

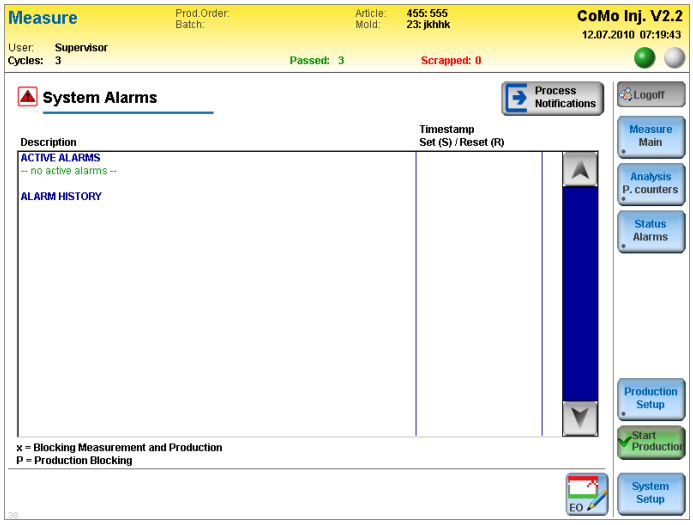


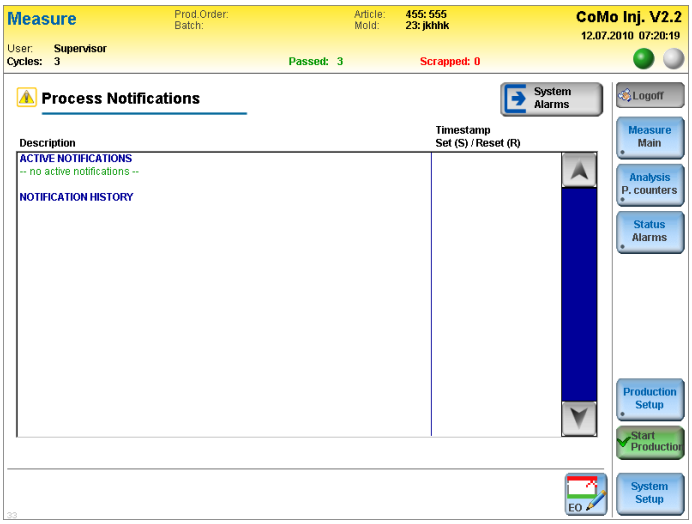
Systeminfo.html contains a detailed report on the CoMo Injection and the current setup. Pressing the Sys. Info button opens a new browser window with this file. The Setup Logger provides information about the currently loaded article and mold data.

5.4.2 Alarms and Messages

There are two lists documenting alarms and messages. The first shows the system alarms and the second the process messages. The button on the top right is used to toggle between the two lists. System alarms are those that block continued production (such as an evaluation object defined on an inactive channel). Process messages (such as that about a predefined number of good parts having been reached), on the other hand, are advisory only, so production is continued even after they have been displayed. In addition to the list, on the top right of the screen a red warning symbol is displayed when a system

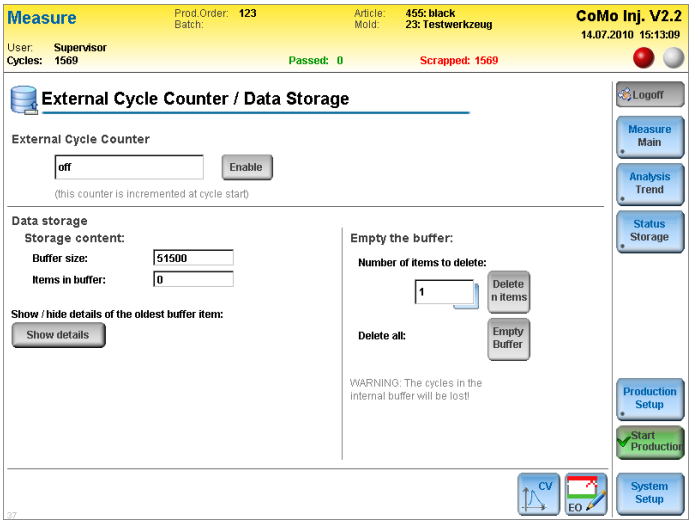
alarm is triggered and a yellow warning symbol for a process message.





5.4.3 Data Export

This screen provides data export information. If the CoMo Injection is connected to a CoMo DataCenter Type 2829B..., in addition to the external cycle counter the screen contains the internal memory usage.



5.4.3.1 External Cycle Counter

In addition to the internal cycle counter, which is incremented after each cycle, the CoMo Injection has an external cycle counter, whose value is also incremented after each cycle.
A logged on user can specify the starting value in the *External Cycle Counter* box, which contains the number of the current cycle.
Provided the CoMo DataCenter is set up accordingly, both the external and the internal cycle counter are saved with the production data in the MIS system.

5.4.3.2 Data Memory

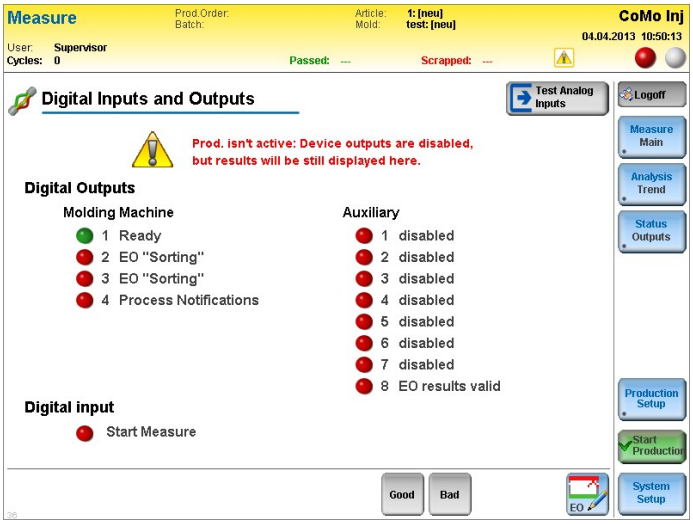
If the CoMo Injection is configured for use with the CoMo DataCenter Type 2829B…, it can be used to save, process and display the recorded data. The CoMo Injection also has an internal memory. If the connection to the CoMo DataCenter is interrupted, the data is stored temporarily (buffered) in this memory until the connection is restored.
The size and usage of the buffer are displayed near the bottom of the screen. The details of the oldest entry can be shown.

The *Supervisor* is authorized to delete data from the memory in the following two ways:

- **Delete Items:** the entered number of cycles is deleted, starting with the oldest one
- **Empty Buffer:** All of the data in the memory is deleted

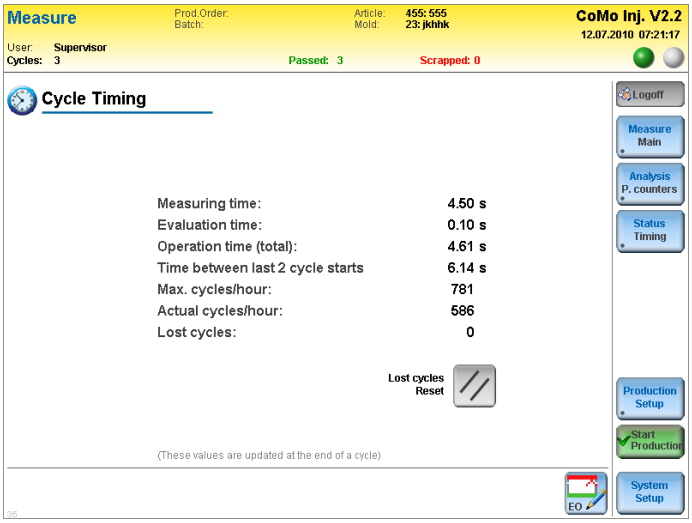
5.4.4 Digital Outputs

The current status of the digital outputs can be displayed on a screen. The digital outputs of the *Digital I/O Molding Machine* connector are shown on the left and those of the *Digital I/O Auxiliary* on the right. The electrical status of the output is indicated by a red or green LED. Red means the output is not activated (isolated). A green LED indicates that the output is not activated (conducting). The adjacent figure indicates the number of the output. The following text describes the function that has been specified by the Supervisor.
Moreover, the functionality of the sorting feature can be tested using the Good and Bad buttons. If for instance, Good is chosen, a good part is simulated for the next cycle and this is output as a digital trigger. The simulation is valid only for the next cycle and is thereafter automatically deactivated. This test function is available only in the measure mode.



5.4.5 Timing Overview

The *Timing* screen provides detailed information about the cycle time and other timing.



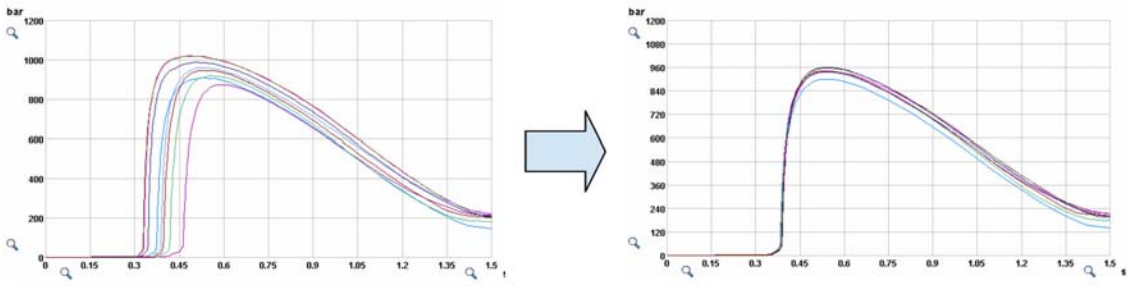
Lost cycles:
If the CoMo Injection receives a "Start of Cycle" signal while measurement is actually in progress, the "Lost Cycles" counter is incremented.

5.5 MultiFlow Automatic Hot-Runner Balancing System (optional)

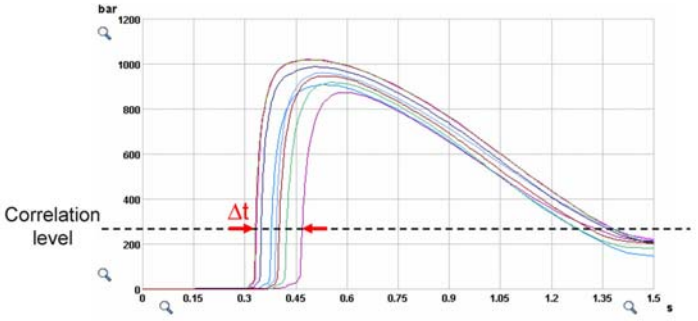
CoMo Injection is available with the MultiFlow option for automatic hot runner balancing. The mold cavity pressure curves are analyzed to optimize the temperatures of the hot runner tips for synchronous filling of all cavities. The new temperature set points are automatically transferred via an interface to the control unit or the machine. This produces a closed control loop, which automatically ensures synchronized filling of all cavities during the whole production. The balancing of the hot runner during multicavity mold start-up is done completely automatically. This completely eliminates any need for manual optimization. The system also automatically compensates for production variations.

5.5.1 MultiFlow Functionality

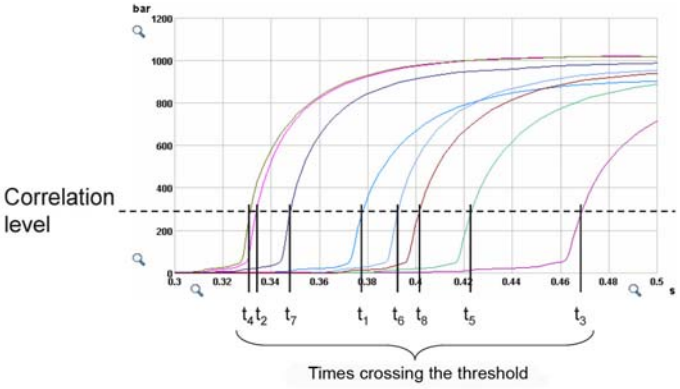
The aim of MultiFlow is to balance a multicavity mold. Since the cavity pressure correlates directly with the filling degree of the cavity, the mold curve indicates the balancing of the mold.



In a balanced mold the cavity pressure curves increase within a short time. The balancing can be measured by means of the maximal time difference Δt during increase of the cavity pressure curves.

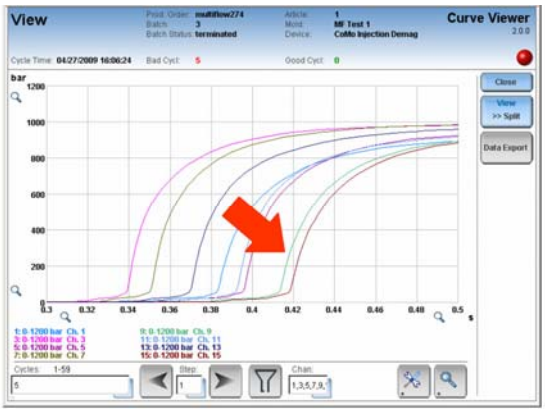


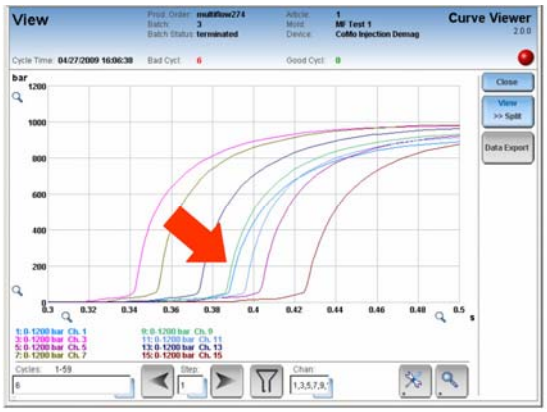
MultiFlow determines the moment of increase of the cavity pressure in each cavity. For that purpose, the time of break-through t_i of a previously determined reference threshold p_k is considered. The time t_i is determined separately for each cavity.



On the basis of the determined times t_i MultiFlow calculates the average value and the deviation of each cavity pressure curve. An algorithm calculates by means of these values new temperatures for each hot-runner tip. If the cavity pressure increases too early, the temperature of the corresponding hot-runner tip is lowered. If the cavity pressure increases too late, the temperature is raised. In the following graph this is shown for one step, namely the temperature increase by 11° C for channel 3.

5.5.2





Operation of MultiFlow

Since MultiFlow is optionally available with the CoMo Injection, it has to be activated for use. In addition, the mold has to be set up accordingly, as described in the chapter MultiFlow-Setup.

If all requirements are met, the screen for the MultiFlow automatic hot runner balancing system can be opened with the **MultiFlow** button. On this screen, all information relevant to MultiFlow is displayed.



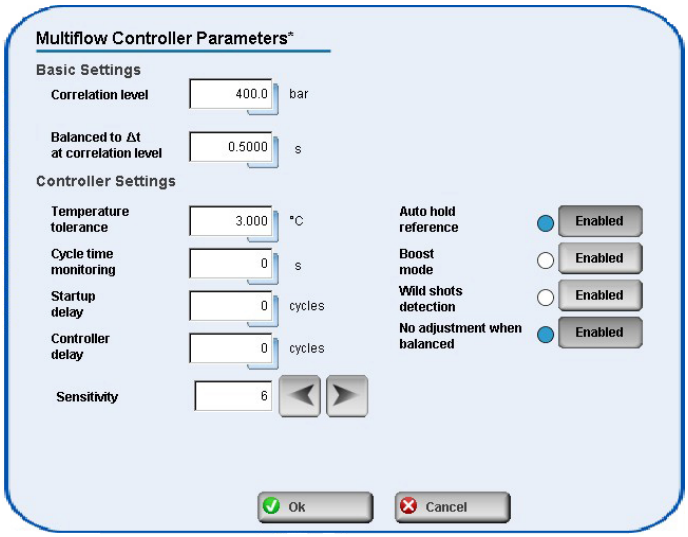
Note: The **MultiFlow** button is only visible if the MultiFlow option is activated and set up for this mold.

5.5.3 MultiFlow Overview



On the left side of the screen, the current set point and actual temperatures are displayed. The diagram above shows the trend of the preset tip temperatures of all zones. Below is a table with all assigned hot-runner zones with the limits (T_{min}, T_{max}), the currently set temperature (T_{set}) and the currently measured actual temperature (T_{act}). In the last column, an arrow pointing up or down indicates if and in which direction a set temperature was changed. If a temperature was changed manually, an additional icon showing a small person is displayed. If the temperature of a channel is set, this is signalized with this symbol.
On the right side of the screen the process data are shown. The diagram with the current process curves also shows the reference threshold (pressure value) which MultiFlow uses for regulation as a horizontal blue line. Two vertical red lines show the calculated time difference of the curve increase at the correlation level.

The curve on the left shows the breaching of the correlation level through the first cavity pressure curve. The calculated time difference Δt between the first and the last increase is displayed below the diagram.
The MultiFlow parameters may be changed by the Job Setter Article or the Supervisor respectively. Pressing the button **MultiFlow Controller Parameters** opens a dialog box, in which the parameters for the control algorithm can be entered.



This includes the following parameters:

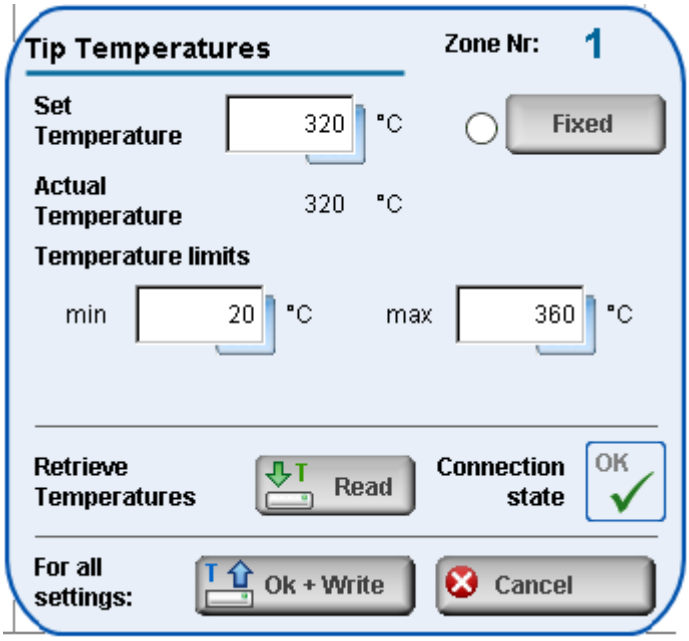
- Correlation level:
  In this box, the cavity pressure for the hot-runner balancing is determined. The reference threshold is indicated in "bar". MultiFlow uses this value to determine the distance between the cavity pressure curves and to calculate on that basis the correction value for the hot-runner tip temperatures. Approximately half of the measured cavity pressure value should be entered in this box
- Balanced to Δt at correlation level:
  The time difference to be achieved between the cavity pressure curves at the reference threshold is entered in this box. If all curves increase within this period of time, the mold is considered to be balanced. This value is necessary exclusively for the automatic balancing detection and can vary from component to component.
- Temperature tolerance:
  This value shows the maximally allowed deviation from the set temperature. If the temperature deviation of a hot runner zone exceeds this value, MultiFlow does not intervene in the process, but waits for another cycle.

- Cycle time monitoring:
  You can define a time that can be used as a reference for the cycle time. Once a cycle has started, a new cycle must begin before the defined reference time elapses. Should this not happen, the machine displays a message that a downtime of the machine has been detected. If a downtime of the machine is detected, then on starting the machine, it continues from the next cycle with the defined startup delay.
- Startup delay:
  This delay is defined in terms of cycles. The objective is to wait until the process is initiated before it is begun with the set controls.
  Example: A delay of 3 cycles means that after activation of Multiflow (or after a machine downtime has been detected) the machine waits for 3 cycles before beginning with the controller.
- Controller delay:
  If the temperature sensors of the hot runner tips respond faster to a change of the set temperature than the melt can be influenced, a time delay can be entered in this box. When the hot runner temperature is reached, MultiFlow waits during the number of cycles entered in this box before starting the next control step.
- Auto hold reference:
  In this box, it can be defined whether MultiFlow should automatically detect that the hot runner is balanced. If this function is selected and the balancing criterion is reached, the point of time to which the cavity pressure curves are shifted, is fixed. This helps to avoid process variations.
- No adjustment when balanced:
  If the process is balanced, i.e. the balancing criterion Δt is below the limit value entered, the temperatures of the hot runner tips are not adjusted. If the temperatures are also to be adjusted under balanced conditions, this option has to be activated.
- Detection of Wild Shots:
  If this function is active, outliers should be detected. The detection follows a temporal criterion. Should a curve be positioned far away from the rest of the curves, it is considered as an Wild Shot and no attempts would be made to readjust it during the next two cycles. Only if it is found after several cycles that this curve is about the same distance away from the rest of the curves, readjustment is begun.
- Boost Mode:
  The first balancing of a mold can be accelerated, if MultiFlow changes several parameters simultaneously.
- Sensitivity:
  Not every mold reacts identically. The change of the hot runner temperature has a varying influence on the balancing. The controller sensitivity takes this behavior into account. It can assume values between 1 and 20.



Tip: For most of the molds, a controller sensitivity of 5 to 10 is sufficient. In case MultiFlow repeatedly adapts the cavity temperature in the same direction, the controller sensitivity may be increased. This speeds up the balancing process during mold start-up. If the cavity pressure curves overreact, the value should be reduced.

Pressing the button temperature settings allows setting of the temperature for the channel currently selected in the table. To this end, control for that channel can be deactivated completely, which is indicated in the table by the symbol .



- Set temperature:
  The set temperature can be manually adjusted. If MultiFlow is deactivated for this channel, the temperature is used as the new input parameter for control. This input has the same effect as a change of the tip temperature at the hot-runner controller.
- Fixed:
  In this box, the currently selected hot-runner tip can be excluded from control, e.g. if a problem occurs with a hot-runner tip.
- Temperature limits min max:
  The temperature limits can be adjusted by authorized users (job setter article) during production.

6. Production Setup

The CoMo Injection can save up to 30 mold configurations and 60 article configurations. The *Mold and Article* screen offers an overview.

Preparation of the CoMo Injection for measurement involves the following steps:

1. Create a new mold record with an associated article
2. Set up the mold with the sensor configuration (sensor type, sensitivity and measuring range)
3. Match the article configuration with measuring time, monitoring functions and/or real-time switching thresholds to the associated mold

As the technical requirements are very different for the different steps, the various user levels have different access authorizations. The dialog boxes are designed to reflect this.

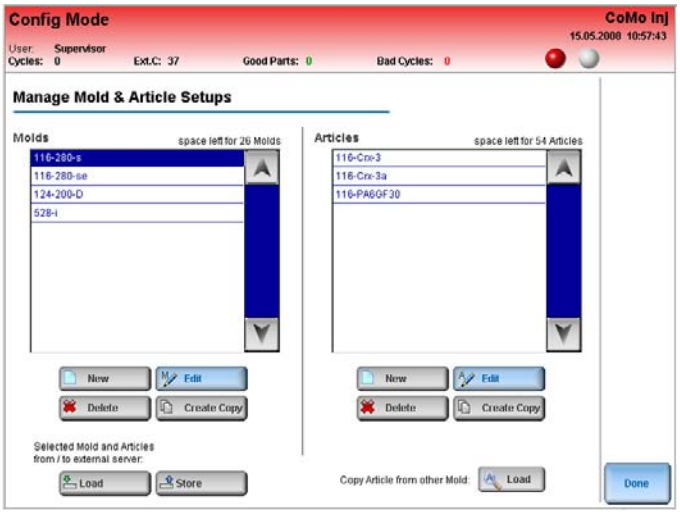
- The Job Setter Mold can only edit the mold setup
- The Job Setter Article is only in a position to enter settings related to the article
- The Job Setter Mold and Article can modify both mold and article
- In addition to the possibilities available to the Job Setter M+A, the Supervisor is authorized to change the system setup

Changes to the mold or article and creation of new configuration data are available under **Production Setup** on the menu or on the Control screen of the small touch screen display.

6.1 Managing Molds and Articles

To create a new mold and article configuration or change existing configurations it is necessary to be logged onto the CoMo Injection as a correspondingly authorized user. The necessary settings are entered on the **Production Setup** screen.

The **Manage M&A** command on the menu opens a screen on which all of the locally saved molds and articles can be chosen and edited.



The *Manage Mold & Article Setups* screen is split into two halves. Mold data is displayed and edited on the left. The right half contains the article data available for this mold. Both sides have buttons for changing the records, for the molds on the left, and for the articles on the right.

- **New** creates a blank record for a mold or an article. The mold or article ID and corresponding description are then entered
- **Create Copy** creates a copy of an existing record. You will also be prompted for ID and description in this case.
- **Delete** removes the chosen record
- **Load** and **Store** can be used to exchange records with a PC provided the Backup/Restore Service has been installed (see also Installation Manual)
- **Edit** displays the *Edit Mold* or *Edit Article* screen, on which the chosen mold or article can be changed

Server-based Data management

CoMo Injection Firmware version 2.4 and all subsequent versions enable a server-based data management. This means that all records of mold and articles can be stored on a data server. Only the data of mold and the related articles currently loaded can be found on the CoMo Injection. This prevents multiple records with the same connector-ID from being stored on different CoMo Injection systems. The following section describes how this function is activated and used.

To be able to use the "Server-based data management" option, certain prerequisites need to be fulfilled.

- Installation Backup/Restore Service (CoMo CD or by downloading from the website www.kistler.com) on the server or PC
- CoMo Injection machines must be linked to the server or the PC over a network

- Enter the IP-address of the server or the PC in the CoMo injection system (→System settings → Backup/Restore → IP-Address)
- Activate the option "Data storage only on the server" (→System settings → Backup/Restore)

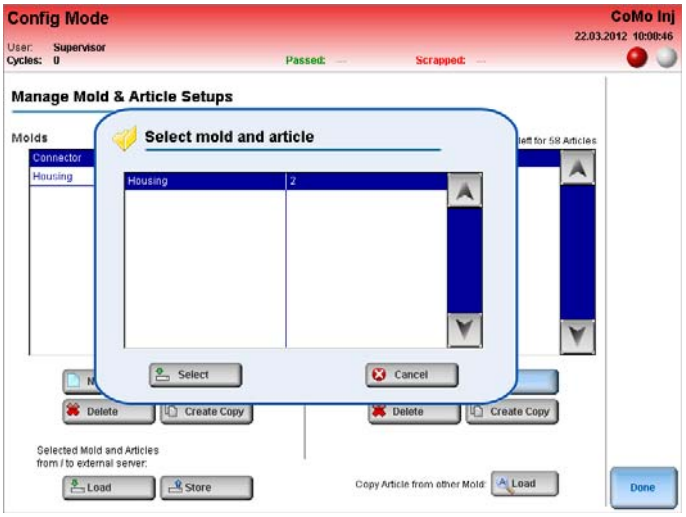
Once the aforementioned steps have been completed, the data is stored automatically on the server or the PC.
The mold and associated articles currently loaded on the machine can be viewed under the menu "Manage molds and articles" A continuous network connection to the server is absolutely essential. Should the mold be changed, the mold data available on the server can be displayed using the "Load" button. Then a new mold data record can be created using "New". The data of the current mold is then automatically moved to the server.
The user "Shift Supervisor" cannot create any new mold or article data. His rights are restricted to loading the existing data.

Automatic Mold Identification
From CoMo Injection firmware version V 2.3, the CoMo Injection is able to identify connected molds, provided they have been set up, assigned and saved beforehand (this procedure is described in the next section: "Mold Configuration").

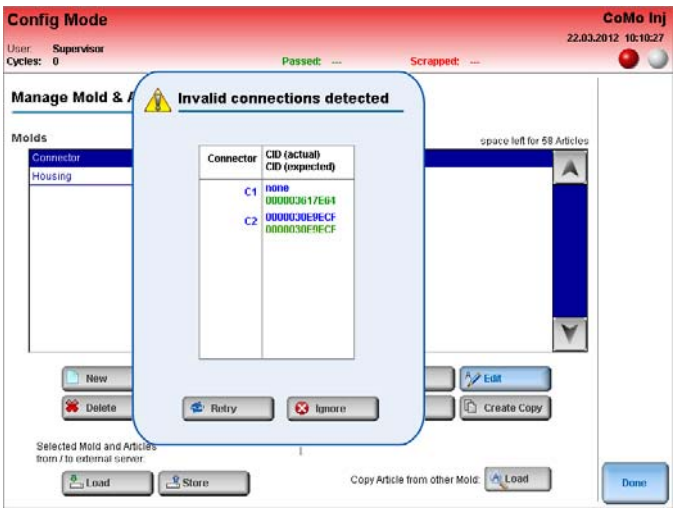


The automatic mold Identification of the CoMo Injection only works in conjunction with the multichannel connectors Type 1708**A1** and 1710**A1**.

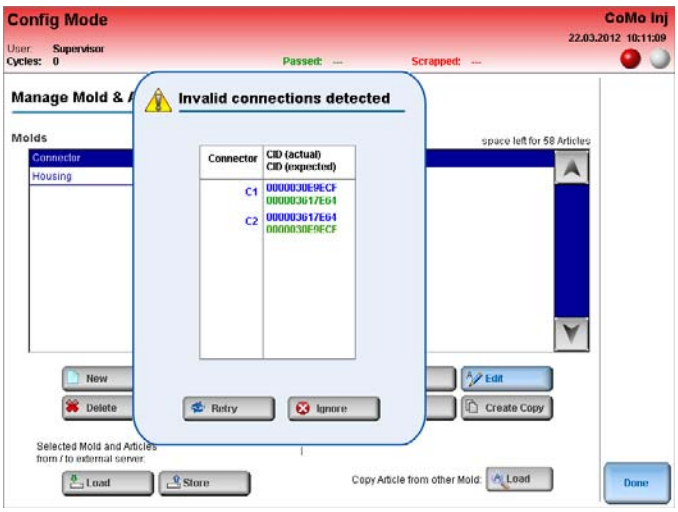
If an allocated mold is connected, it is immediately Identified by the CoMo Injection and a pop-up window displayed (see screenshot) on the menu "Manage Mold and Article Setups".



The pop-up window shows which mold has been Identified and which articles belong to the mold. Clicking the "Select" button loads the corresponding mold and article setups. If the status of the currently connected mold differs from that saved (e.g. invalid connections, not fully connected), this is detected and also shown in a pop-up window. The following screenshots show examples of error detection and are intended to indicate how you should proceed. As soon as the connection errors have been remedied the error message disappears and you can select the mold.

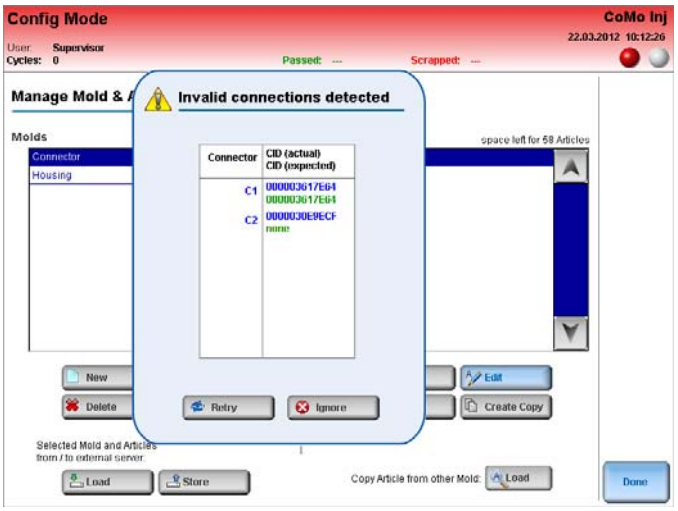


In this example (see above) two multichannel connectors C1 and C2 have been saved, but C1 has not been connected.
Solution: connect C1, possibly check cable for break.



In the above figure it can be seen that two multichannel connectors have been both saved and connected. However, the two connections C1 and C2 have been swapped.

Solution: Swap connecting cables on the CoMo Injection.



The above screenshot shows that again two connectors have been Identified. C2 is, however, unknown to the saved mold. Hence, instead of C2 either the wrong multichannel connector has been connected, or the multichannel connector has not been assigned to the mold.

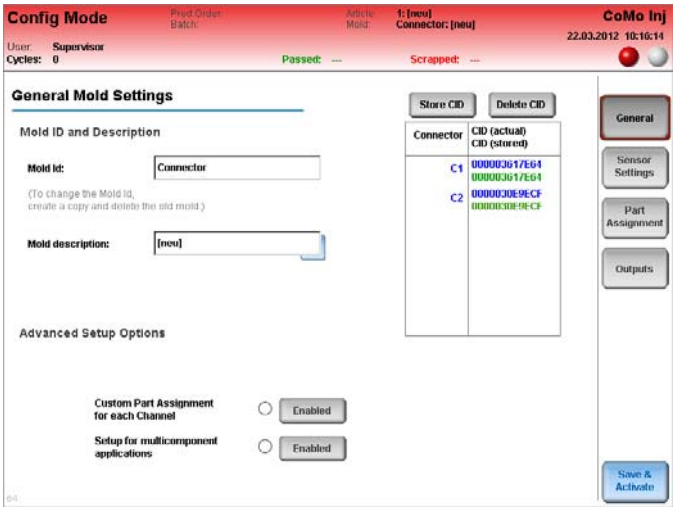
Solution:
A) Connect correct multichannel connector.
B) "Ignore" error message and assign C2 to the mold in the mold setup (see Section 6.2).



Records from all of the CoMo Injections can be identified, provided the CoMos have access to the Backup/Restore Service (Ethernet connection). Mold identification therefore also works across the entire system.

6.2 Mold Configuration

All of the data relating to the mold is displayed or changed on the *Mold Configuration* screen. It is displayed either with the **Edit** button on the *Manage Mold and Article Setups* screen, or with *Mold Setup* on the main screen's *Production Setup* menu.



Four screens are available for mold information. Mold ID and mold description are specified on the first. If this information has already been provided when the mold record was created, no entries are needed here. The CoMo Injection then skips this screen. The description can even be changed subsequently by pressing the **Mold ID/Description** button on the function bar on the right. The mold ID can, however, no longer be changed.

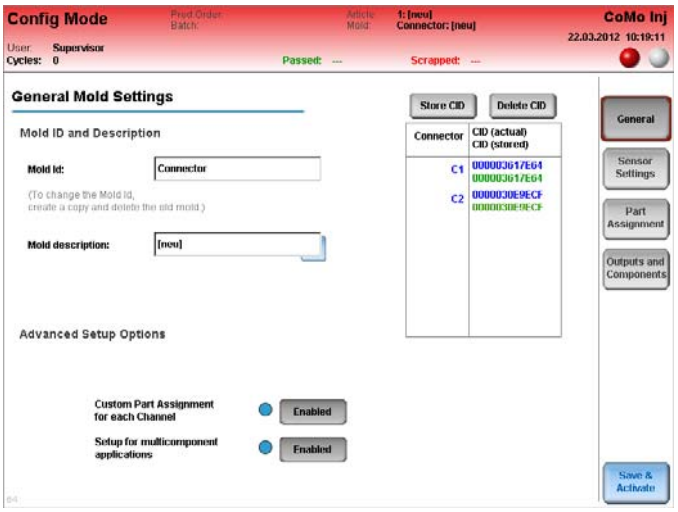
Moreover, the mold record can be assigned here to one or more connected multichannel connectors. This is necessary if automatic mold Identification is to be used. The assignment is made by clicking the button "Store CID". This links all of the connected (multichannel) connectors to the mold. The link can be cancelled with "Delete CID".
The table lists all of the connected multichannel connectors with CID numbers. Each multichannel connector is uniquely identifiable by means of the connector ID numbers. The CIDs of the currently connected multi-channel connectors are indicated in blue. The CIDs being assigned to the loaded mold record can be seen in green. "none" indicates nothing has been assigned yet.



The automatic "mold Identification" of the CoMo Injection only works in conjunction with the multichannel connectors Type 1708**A1** and 1710**A1**.

Under "Advanced Setup Options", "User-defined Part Assignment for Each Channel" and "Setup for Multi-component Applications" can be activated or deactivated.

When the ID and description have been specified, the mold configuration has to be supplemented with the sensor system mounted in the mold. This must include description of the channel (sensor), and specification of its sensitivity and its physical unit of measurement, as well as the assignment of the digital outputs.



The top section of the screen consists of a table showing information about settings for each channel and the fields for switching the individual channels on and off. Also available is a Copy button for transferring identical settings to other channels. Pressing this button displays another button immediately underneath for pasting the copied information. The bottom part of the screen contains the entry fields that can be used to change the settings of the selected channel.

6.2.1 Channel Number

The channel number is permanently assigned to the electrical connection of the CoMo Injection and therefore cannot be modified by the user. The type of channel involved must also be specified here alongside the actual number. "Q" signifies a charge input for cavity pressure sensors and "U" a voltage input.

6.2.2 Description

A fully editable text can be assigned to each channel as a description. This is indicated in the key.

6.2.3 Unit

A wide variety of sensors can be connected to the CoMo Injection in addition to pressure and force sensors. It is therefore necessary to specify the unit measured by the sensor. "Bar" is generally used for cavity pressure sensors.

6.2.4 Sensor Sensitivity

The sensitivity of the particular sensor has to be entered in one of the three ways offered by the dialog:

- The sensitivity of direct measuring Kistler cavity pressure sensors can be entered as a numerical value.
- Indirect measuring Kistler mold cavity pressure sensors, which measure the force on an ejector pin, need additional information: From the diameter of a round ejector pin and the sensitivity of the force sensor the CoMo Injection calculates the resultant sensitivity. For sensors mounted behind an ejector pin that is not round, the area and sensitivity of the force sensor are used to calculate the resultant pressure sensitivity.

In the case of Kistler cavity pressure sensors you will find the sensitivity on the included calibration certificate or on the blue sticker on the mold.



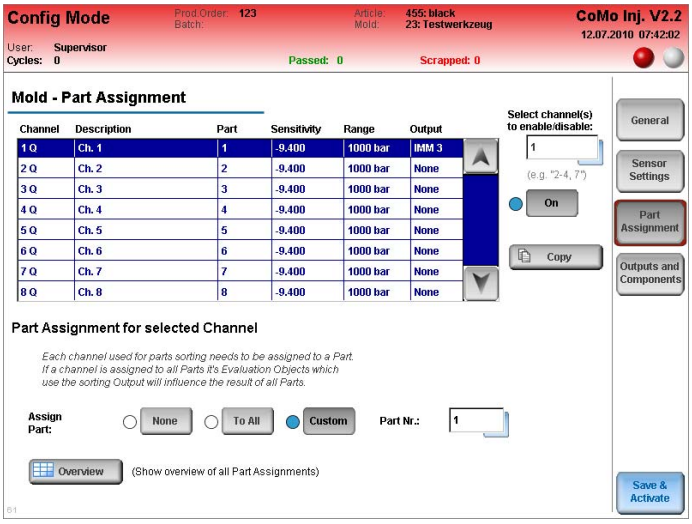
Kistler offers Multi Sensor Set Type 6831B... . This contains sensors that all have the same sensitivity in order to make it much easier to enter the value for multicavity molds.

6.2.5 Measuring Range

The maximum measuring range is specified in this box. It depends on the maximum pressure arising in the injection molding process.

6.2.6 Part Assignment

The top section of the "Part Assignment" screen again shows the table giving an overview of the channels. The parts are assigned below.



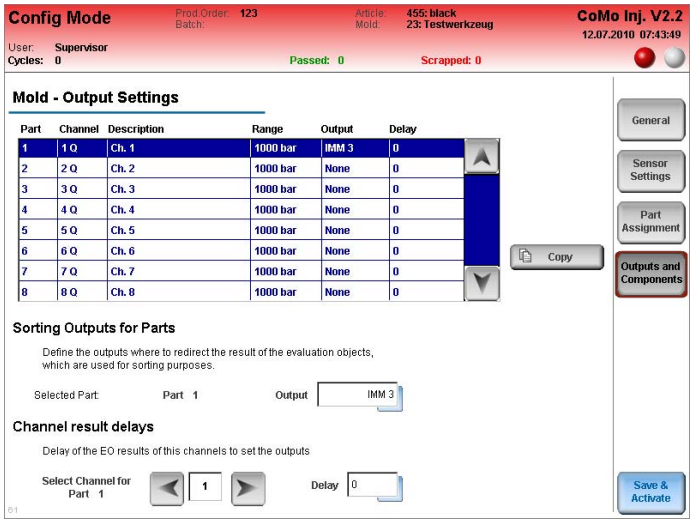
Each channel to be used for sorting **must** have a part assigned here. This involves either specifying the part number under "Not used" or assigning channels to all parts with "To All". The associated EOs with sorting output then affect the balance of all active sorting outputs.
Any channel to which no part is assigned cannot be used for sorting. For this reason it is also not possible to set a sorting output for the channel concerned. "Overview" can be used to have the relationships displayed in tabular form as a more effective summary of the part assignments entered.



If part assignment is not activated in the general mold setup, the "Part Assignment" menu cannot be displayed!

6.2.7 Outputs

On the basis of the defined evaluation objects and the mold cavity pressure curve, the CoMo Injection can determine whether a part is good or bad. In order to then be able to separate parts correctly it requires assignment of an output to each of the channels (or cavities).



The top section of the screen in the screenshot corresponds exactly to that for the sensor setup (see 6.2). In the bottom section, next to the indication of the selected channel there is an entry field for specifying the digital output. Clicking in this field opens a box with the selection of available outputs. The selection includes exactly the same outputs as correspondingly defined beforehand in the System Setup (see Installation Manual, Doc. No. 2869B_002-399).

For multicomponent applications, delayed supplying of the output signals (evaluation of the EOs) is possible. The arrow buttons can be used to change between the channels and the delay in cycles specified in the entry field.

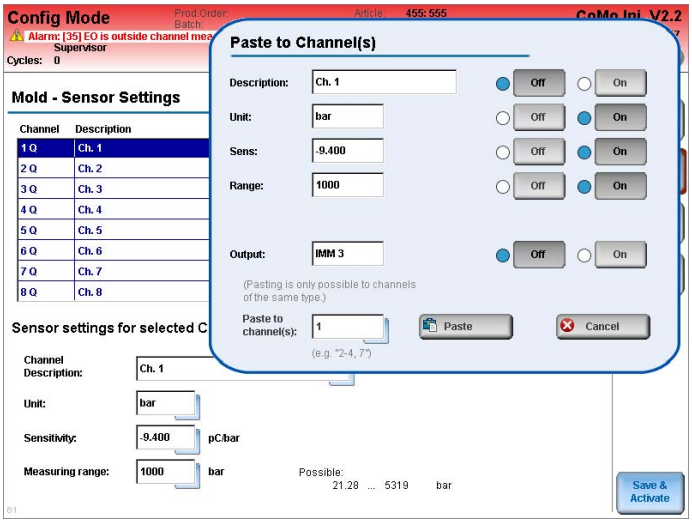
Example:
A delay of "1" is entered for a 2-component part. The "good"/"bad" evaluation signal for the part is then output after the end of the second injection cycle and therefore contains the EO evaluation of both cycles.



The delay settings for the channel results are only displayed if the settings for multicomponent applications have been activated on the General Mold Menu!

6.2.8 Copying Channels

Pressing the **Copy** button copies the settings of the chosen channel. The **Paste** button is shown, and in turn displays a selection dialog.



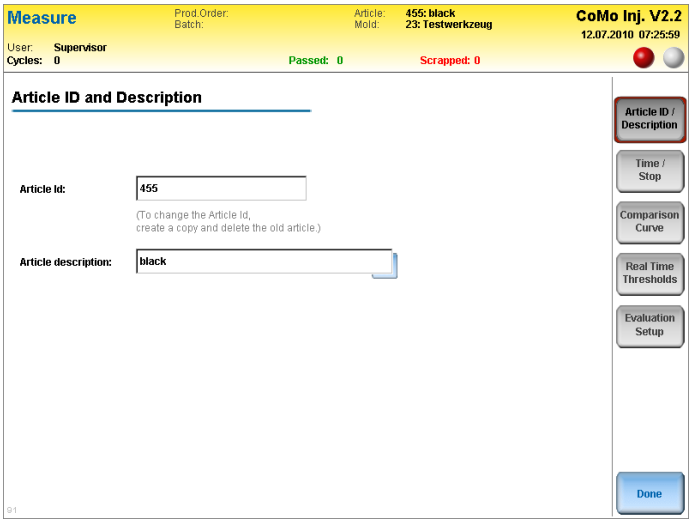
This dialog box makes it possible to choose the settings to be copied. Alongside the different boxes are selection (On) and deselection (Off) buttons. When the required boxes for copying have been chosen, the settings are copied to the previously chosen channels of the same type with **Paste**. **Cancel** closes the dialog without copying.

6.3 Article Configuration

All of the settings related to the article are set up on the *Article Setup* screen, which is accessed by choosing **Article Setup** from the **Production setup** menu on the function bar to the right of the main screen. Alternatively, the **Edit** button in the Article section of the *Manage Mold & Article Setups* screen can be used.

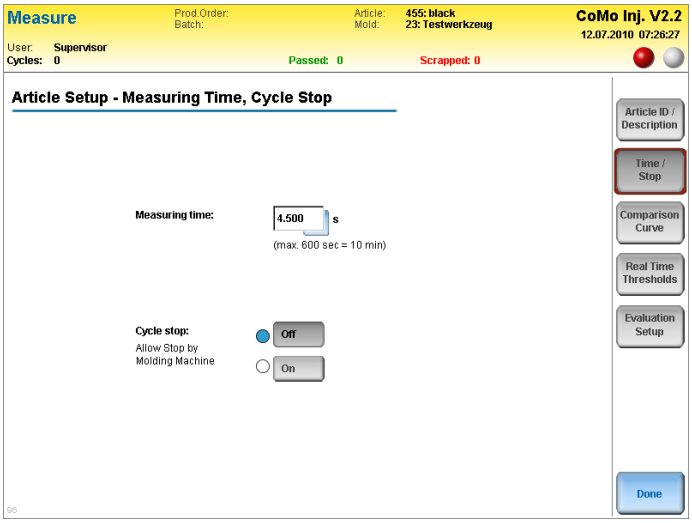
6.3.1 Article ID/Description

The Article ID is displayed here. If no article has yet been loaded, the Article ID can be entered. The article description can be changed at any time.



6.3.2 Measuring Time/End of Cycle

The time at which the CoMo stops measurement is specified on the **Measuring Time/Cycle Control** subscreen. The measuring time is entered in seconds. The maximum measuring time is 10 min, or 600 s.

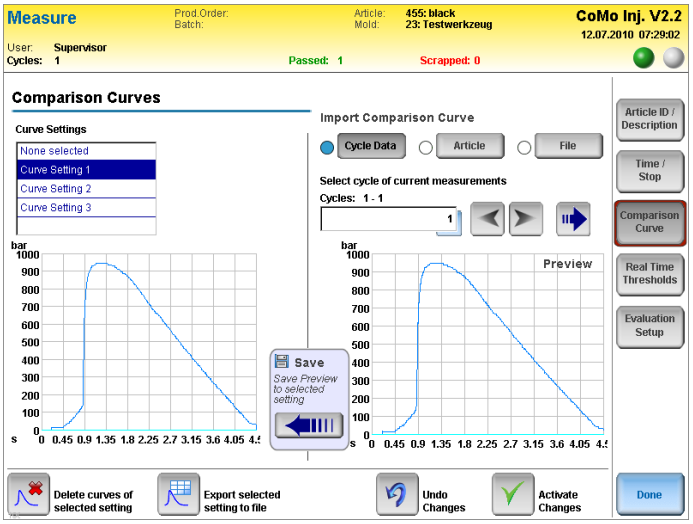


If the injection molding machine outputs the trigger signal at any stage during the measuring time, end of cycle can be detected prematurely with the falling edge of this signal. To achieve this the **Allow stop by Molding Machine** option is switched on. However, this method is not possible with the majority of injection molding machines.
The end of the measuring time is reached no later than the time entered under *Measuring Time* has elapsed.

6.3.3 Reference Curves

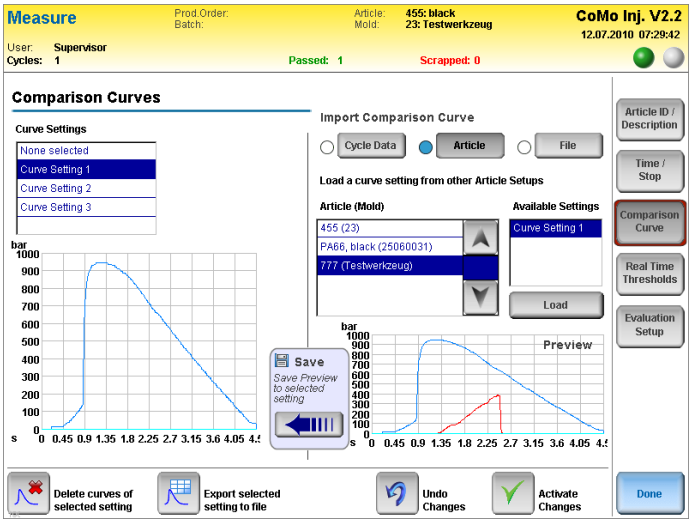
The CoMo Injection offers the possibility of saving curves as reference curves and having them displayed dotted for use in analysis. The "Reference Curve" screen is used to define and save up to three reference curves. There are basically three ways of defining reference curves:

- Data from Cycle
- Articles
- File



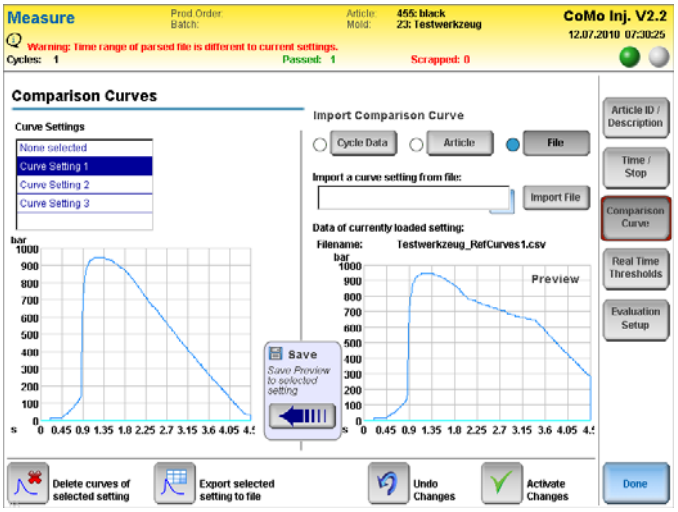
Data from Cycle
The entry field above the diagram can be used to specify the number of the cycle whose curve is to be shown on the diagram. As with curve superimposition, it is possible to scroll through the individual cycles or use the Update button to switch to the last cycle measured.  has to be pressed to save the preview from the right diagram as a reference curve.

Articles



This screen enables loading of a reference curve already recorded for a different article. The "Articles" list shows all of the articles assigned to the current mold record. Choosing one displays its saved reference curves. "Load" gives a preview of the curve, which can then be saved with  .

File



Someone wanting to import reference curves, for example from a second CoMo Injection, can do this with the help of this screen (Note: See below for Exporting Reference Curve). Clicking in the entry field opens a box for selecting a (.csv) file for import. The selected file is confirmed with "Open" and then loaded into the preview with "Import File".  has to be pressed to save the preview from the right window as reference curve.

Once stored, a reference curve is displayed on the left diagram and saved as 1,2 or 3 as required. The table above allows selection of the particular saved curve to be used as reference curve or that no reference curve is required. It is also possible to delete  or export  a saved curve as a .csv file.



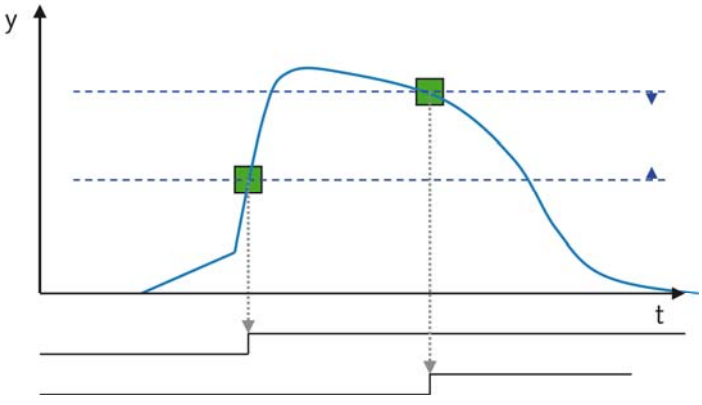
The function "import comparison curve from file" is not available in the standard version. The function could certainly be installed per software update. Depending on the used typ of display the installation has the following effects:

➔ Visualization via Display Type 5629B3
- Acknowledgement of a Java-Advice after each reboot
- This can be avoided by updating the Display-Software (Update to Version 2.0.6)

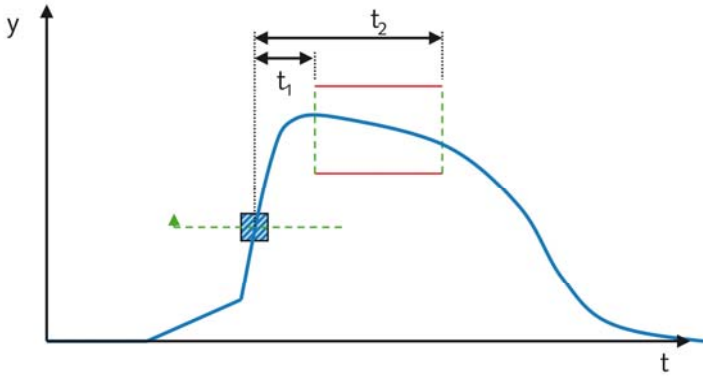
➔ Visualization via Display Type 5629B3
- No problem should appear.

6.3.4 Real Time Functions and Thresholds

The CoMo Injection has two real-time switching functions for each measuring channel (CoMo Injection Basic: Option Type 2806A0010). These trigger an event immediately a defined limit is breached. Whether the threshold is to be breached from below or from above is also specified. The event is signaled to the connected machine via a digital output. One example could be switching between injection and holding pressure. The facility can also be used for monitoring overload or triggering other operations during the process. The events of the real-time thresholds can be assigned to the digital outputs of the CoMo Injection. To allow this, during installation these have to be set up for the use of real-time thresholds. The procedure is detailed in the Installation Manual.

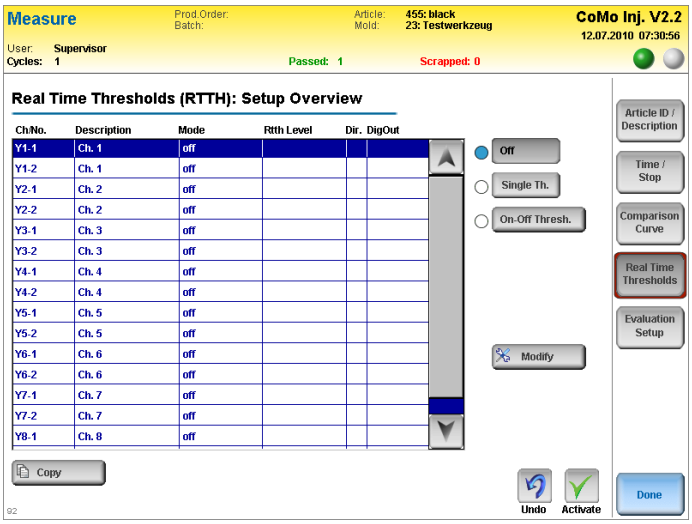


The event can be used in turn internally as a trigger for the monitoring functions, by specifying the real-time threshold as a reference in the definition of the corresponding monitoring function.

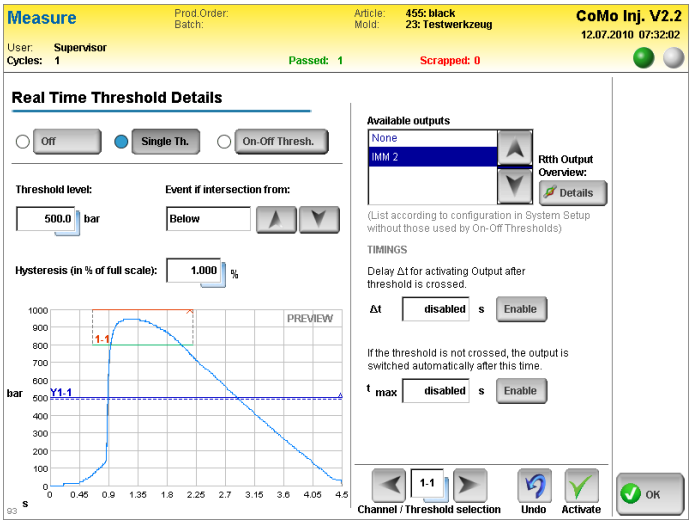


6.3.5 Setting Up Real Time Thresholds

The **Real Time Thresholds** button on the menu displays a table providing an overview of all of the real-time thresholds that can be chosen.



Pressing the **Modify** button accesses the Setup screen.



The top section of the screen shows the particular real-time threshold being edited. The display consists of two numbers; the first number indicating the channel and the second threshold 1 or 2. The arrow buttons can be used to toggle to and fro between the individual real-time thresholds. The type of threshold is shown alongside. There are three possibilities:

- **Off**: No switching function
- **Thresholds:** Definition of one or two independent real-time thresholds for each channel
- **On/Off Threshold:** Control of needle valve nozzles (see Section 0

- On/Off Threshold)

The bottom section is used to specify the individual parameters for the real-time thresholds. At the same time, it provides a preview bottom left. A real-time threshold has the following setting parameters:

- **Threshold value (y-level):**
  The measurand value triggering switching is entered in this box
- **Switching when breached from:**
  The direction in which the threshold has to be breached to trigger switching is entered in this box
- **Hysteresis (% of measuring range):**
  The Hysteresis function allows the signal to briefly breach the threshold and fall below it again without a switching operation being triggered. (see Section 6.3.7 Hysteresis)
- **Set Digital Output:**
  This box is used to choose the output activated by the real-time threshold. Only those outputs that have been configured for real-time thresholds in the system setup may be chosen. Any output already used with an On/Off threshold is not available for other functions
- **Δt:**
  This entry contains the delay between the threshold value being reached and the output activated
- **t_{max}:**
  A time after which for safety reasons the output is switched even if the threshold is not reached

The settings are applied with the **Apply Changes** button



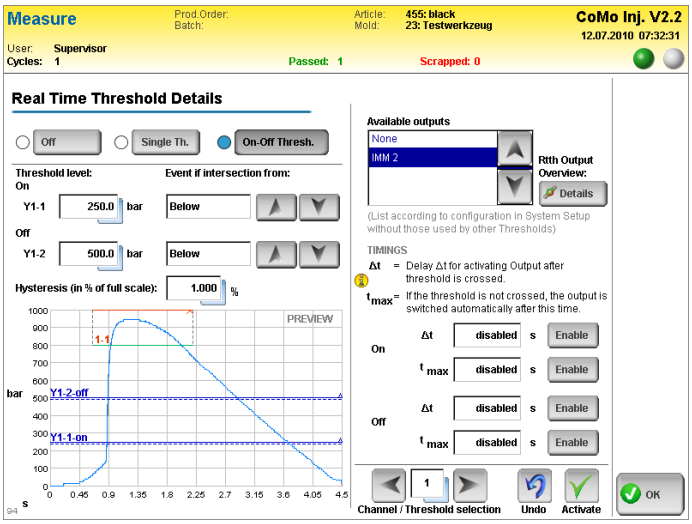
If several real-time thresholds are assigned to one digital output, an OR configuration is used to ensure the first threshold breached activates the digital output.

6.3.6 On/Off Threshold

There is a special *On/Off Threshold* function for controlling needle valve nozzles. It is a combination of two real-time thresholds on one channel that makes it possible to switch a digital output on and off again.



Any output assigned to an On/Off threshold is no longer available for other functions.



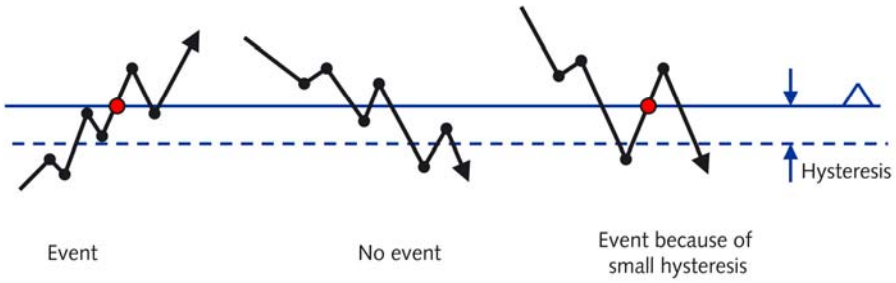
Choosing this option displays additional boxes used to specify the threshold for deactivation of the digital output:

- **Threshold value (y-level)**
- **Switching when breached from**
- **Δt**
- **t_{max}**

The hysteresis and the digital output naturally remain the same.

6.3.7 Hysteresis

Specification of the hysteresis allows the signal to briefly breach a threshold and fall back below it again without triggering an event. This can be necessary because all analog measurement signals contain a lesser or greater amount of noise. The event (real-time thresholds or monitoring function) is only activated if the measurement signal has breached the (invisible) hysteresis threshold beforehand.



The diagram plots this situation for the example of a threshold set to be breached from below.

- Case 1: The signal breaches the threshold from below. It has passed through the hysteresis range beforehand. The event is indicated as having occurred.
- Case 2: The signal is falling from above. After being passed, the threshold is briefly breached from below. As the signal does not pass right through the hysteresis range no event is indicated.
- Case 3: As in case 2 the signal is falling from above. It falls below the hysteresis range and then breaches the threshold from below. In this case, because the signal has passed through the hysteresis range, the event is indicated as having occurred. The reason for this is that the chosen hysteresis range was too narrow.

The hysteresis is specified as a percentage of the threshold value.



Hysteresis of 1 % is specified as the default. This value is generally sufficient for measurement of mold cavity pressure with Kistler sensors.

6.3.8 Monitoring Functions/Evaluation Objects

The CoMo Injection supports different evaluation objects designed specifically for the injection molding process. An evaluation object consists of a monitoring function and tolerance limits. The following monitoring functions are available in the CoMo Injection:

1. Box functions:
   - Entry-Exit
   - No Entry
   - Trapezoid
2. Vertical threshold
3. Numerical functions:
   - Maximum
   - Minimum
   - Mean
   - Max-Min
4. Integral



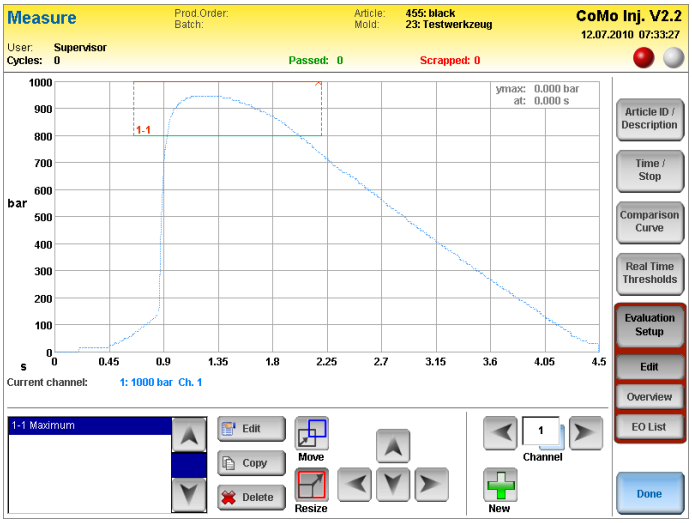
The CoMo Injection Basic has the "Maximum" monitoring function as standard. All other monitoring functions can be enabled with option Type 2806A1000.

A detailed description of the individual monitoring functions is to be found in Section 6.3.11.
Evaluation objects are shown on the graph in different colors:

- The *green line* always shows the limit line the measurement signal must breach.
- The *green direction arrows* are the direction in which the measurement signal is required to breach the limit line
- The *red line* shows a limit line that must not be breached by the measurement curve.

6.3.9 Creating and Editing Monitoring Functions

Evaluation objects are defined under Article Setup on the *OE Setup* screen. The menu can also be displayed with the "Quick-Link" .



In addition to the graph of the measurements this screen offers various ways of creating and changing the monitoring functions. The function bar has the buttons for editing the evaluation objects.

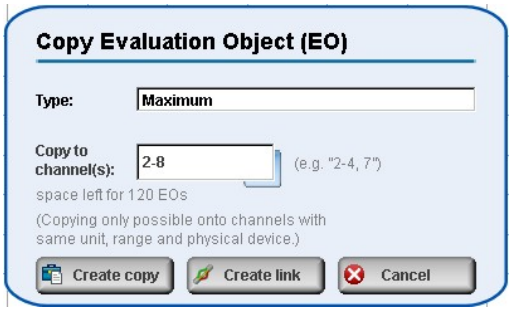
On the left a toolbox allows an overview of the evaluation objects created and allows selection of OEs for application of the "Edit", "Copy" and "Delete" functions. The function buttons are on its immediate right.

The controls for manipulating the evaluation objects are to the right of the toolbox:

1. The **Edit** button 

opens the dialog for editing the evaluation objects for the particular object chosen (see Section 6.3.10: Dialog for Properties of Evaluation Object).
2. Operating the 

button opens the dialog "Copy EO".



There are three options in this dialog. 

creates a copy of the earlier selected EOs. Retrospective changes made to the properties of the EOs used as a template would not affect the properties of the newly created EOs. For example EO1-1 (property t1=2s) of channel 1 is copied and pasted onto the channels 2 and 3. Immediately after copying, the property of EO2-1 and 3-1 are defined as t1=2s. Now if EO1-1 is changed from t1=2s to t1=4s, it would not affect EO2-1 and 3-1 and their value of t1=2s would remain unchanged.
Likewise 

creates a copy of the selected EOs and now the properties are linked consistently. For example EO1-1 (property t_1=2s) of channel 1 is copied and linked to the channels 2 and 3. Immediately after copying, the properties of EO2-1 and 3-1 are also defined as t_1=2s. Now if EO1-1 is changed from t1=2s to t1=4s, it would also change the properties of EO2-1 and 3-1 to t1=4s.
It is of course possible to again remove this link later. To achieve this, the desired EO is selected, 

is chosen and the "Delete link" button is operated.


closes the "Copy EO" dialog without executing any action.
An object can only be copied to channels with the same range and same unit.

3. The **Delete** button 

deletes the chosen evaluation object.

It is also possible to move an 

OE selected in the left toolbox or resize it 

. Both of these actions are carried out using the arrow buttons in the middle toolbox.



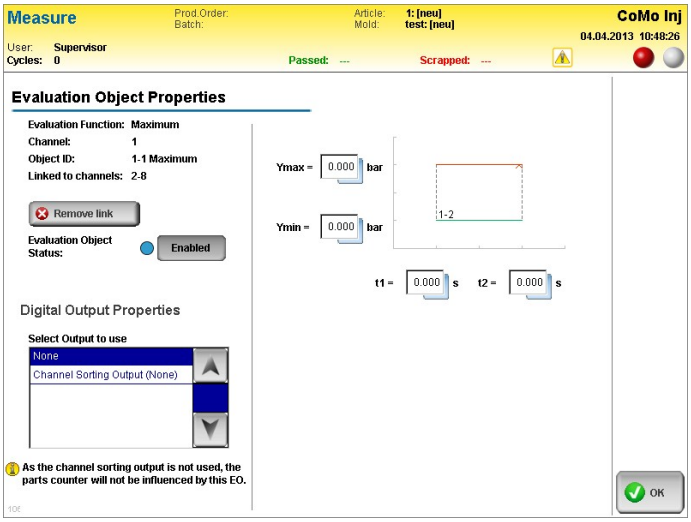
If the Trapezium monitoring function is chosen, the Move and Resize buttons are given an additional function in that they can be pressed twice to allow the right limit to be changed. This is indicated visually by the description being displayed on the right rather than the left side of the evaluation object.



The right toolbox has the additional functions "Undo" (to return to the last command) "Activate" and channel selection. It also has the "New" button, which creates a new evaluation object and opens the dialog box for editing the evaluation objects.

6.3.10 Dialog for Properties of Evaluation Object

The dialog for configuring the evaluation object is opened with the **New** or **Edit** button.



- The type of evaluation object is specified on the top left.

This is associated with "Channel", which specifies the measurement channel with which the evaluation object is linked.

- The **Object ID** contains the exact description of the OE (for example, 1-2 Maximum: maximum function of second EO on channel 1)
- Displaying the EOs linked to the EO (see 6.3.9)
- Deleting the link again makes the linked EO independent of the other EOs
- The **Evaluation Object Status** switch can be used can be used to switch calculation of the monitoring function on or off. **Off** = no evaluation carried out, **On** = evaluation carried out
- The **Digital Output** setting is used to specify the output with which the result is linked. To ensure the digital output is activated "Evaluation Object Status" must be set to "On"



Only those digital outputs defined for the corresponding channel in the Mold Setup (see 6.2.6) are available.

- The limits and the position of the monitoring function are defined on the right of the screen. These are usually the upper and lower limits for y- and t-values
- The reference of monitoring functions can be either absolute or relative to a threshold. "Absolute" means the evaluation object is always in the same position. All of the evaluation objects apart from *Threshold* offer the choice of *Relative to Threshold*. You can choose:
  - whether the object is to have an absolute relation to the origin of coordinates: **Absolute** button
  - whether the object is to be positioned relative to the point at which a threshold is breached: **Relative to Threshold** button

  A predefined real-time threshold on any channel or a vertical threshold on the same channel can be chosen here. Evaluation objects without absolute reference are shown in orange on the screen if no reference point is identified.

- The Hysteresis function prevents incorrect evaluation of measurement signals with superimposed noise. The way in which the Hysteresis function works is explained in Section 6.3.7.



If several monitoring functions are linked to one digital output, an OR configuration is used. These means that a bad part is signaled to the digital output if just one monitoring function is not fulfilled.



If the small touch screen display Type 5629A1 is being used for operation, the display is split into a succession of individual screens. The graphical representation is similar.

6.3.11 Overview of Monitoring Functions/Evaluation Objects

6.3.11.1 Box Function

The Box function is a monitoring function that can be used very universally. There are three different types: "Entry-Exit", "No Entry" and "Trapezium".

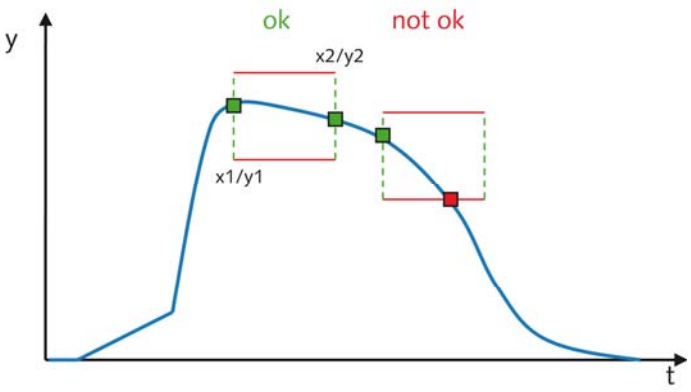
Function
The box is an evaluation object in the form of a rectangle or trapezoid. It defines an area that the curve either absolutely must pass through, with entry and exit, or that the curve is not allowed to touch. The box can stand relative to another evaluation object or event.

6.3.11.2 Box with Entry and Exit

The curve must pass through this box. In addition to the limits, the entry side and exit side are specified.

Definition
The box is defined by its four side lengths:
- Left limit: t1 on the time axis (in s)
- Right limit: t2 on the time axis (in s)
- Lower limit: y1 (in bar or units of measurement)
- Upper limit: y2 (in bar or units of measurement)
- Definition of the permissible entry side and exit side of the box

Results
- Digital outputs good/bad
- Point of entry and point of exit of the measurement curve (time or y-value)

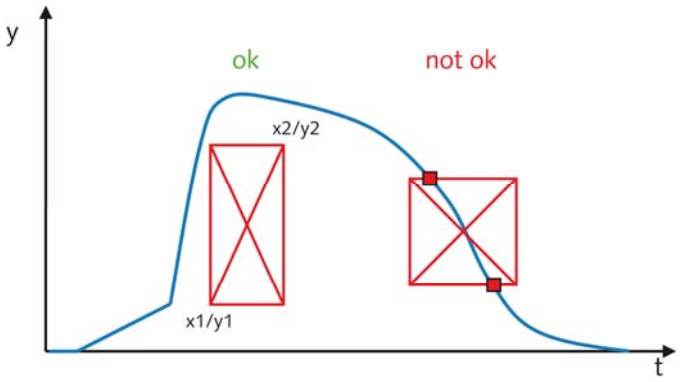


6.3.11.3 "No Entry" Box

The function of the "No Entry" box consists in the measurement curve not being allowed to pass through the box.

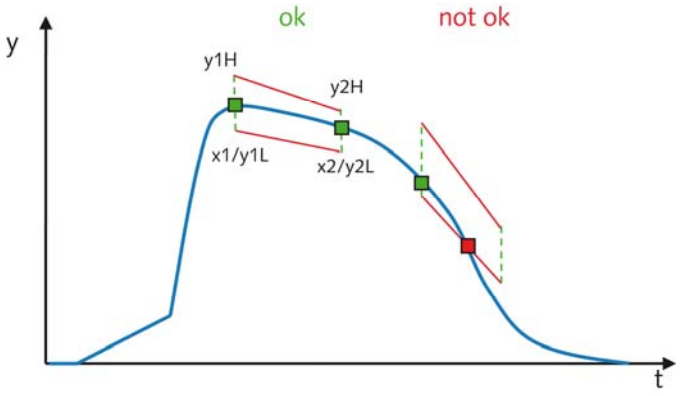
Definition
The box is defined by its four side lengths:
- Left limit: t1 on the time axis (in s)
- Right limit: t2 on the time axis (in s)
- Lower limit: y1 (in bar or units of measurement)
- Upper limit: y2 (in bar or units of measurement)

Results
- Digital outputs good/bad



6.3.11.4 Trapezium Box

The trapezium is used to monitor the area of a curve. Whether the measurement signal passes through the trapezium as defined is evaluated: entry to a trapezium is always on the left side and exit always on the right.



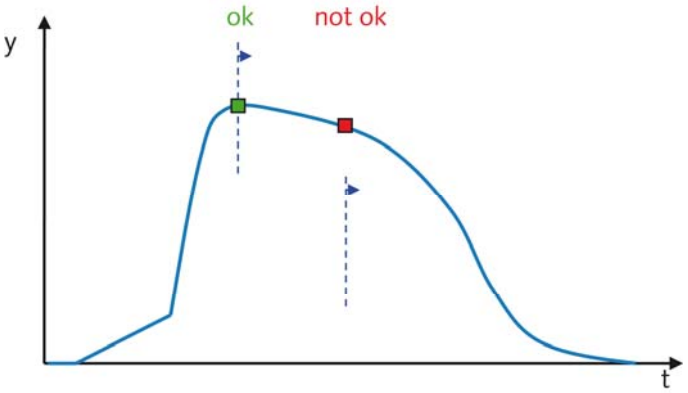
Due to its different side lengths the trapezium requires more information than the simple box functions. In addition to the two time values t1 and t2, four Y-values are necessary. The values can be set relative to a threshold.

Definition
- Left limit: t1 on the time axis (in s)
- Right limit: t2 on the time axis (in s)
- Bottom left value: y1L (Low in bar or units of measurement)
- Top left value: y1H (High in bar or units of measurement)
- Bottom right value: y2L (Low in bar or units of measurement)
- Top right value: y2H (High in bar or units of measurement)

Results
- Digital outputs good/bad.
- Point of entry and point of exit of the measurement curve (y-value)

6.3.11.5 Vertical Threshold

The vertical threshold allows the range of values of the measurement signal to be monitored at a certain point in time.



Function
The vertical threshold represents a vertical line that the curve must pass through. It therefore corresponds to a one-dimensional window in a certain position on the time axis.

Definition
The vertical threshold is defined by its positioning on the time axis, and its extent on the Y-axis with a minimum and a maximum value. The threshold cannot be reset relative to another evaluation object or event.
- Position: t1 on the time axis (in s)
- Lower limit: y1 (in bar or units of measurement)
- Upper limit: y2 (in bar or units of measurement)

Result
- Digital outputs good/bad
- Point of intersection of the measurement curve (y-value)

6.3.11.6 Maximum, Minimum, Mean and Min./Max. Difference

The numerical functions monitor the highest and/or lowest value and the mean within a defined period of time.

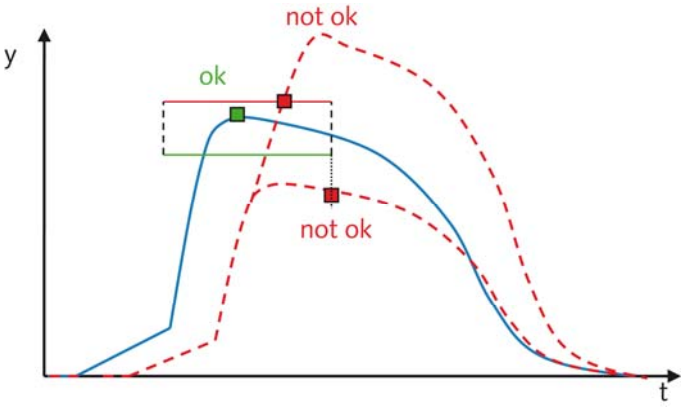
The numerical functions are all defined identically:

Definition
The time limit during measurement and the limit of the permissible values (in bar or units of measurement) are required for these functions. The limit values can be set relative to a threshold.

- Left limit: t1 on the time axis (in s)
- Right limit: t2 on the time axis (in s)
- Lower limit: Min (in bar or units of measurement)
- Upper limit: Max (in bar or units of measurement)

6.3.11.7 Maximum

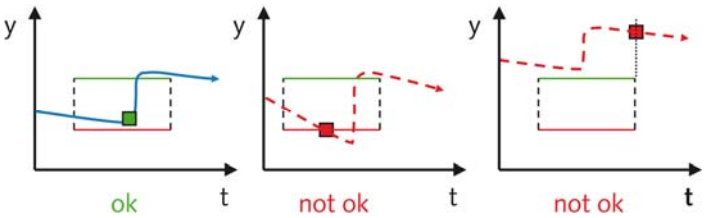
The Maximum function determines the maximum value of the measurement signal during a defined period of time. For evaluation as good the maximum must lie within the limits of the box.



Result
- Digital outputs good/bad
- Coordinates of the maximum value (maximum and point in time)

6.3.11.8 Minimum

The minimum determines the minimum value of the measurement signal within the defined period of time. For evaluation as good the minimum must lie within the limits of the box.



Result

- Digital outputs good/bad
- Coordinates of the minimum value (minimum and point in time)

6.3.11.9 Max-Min

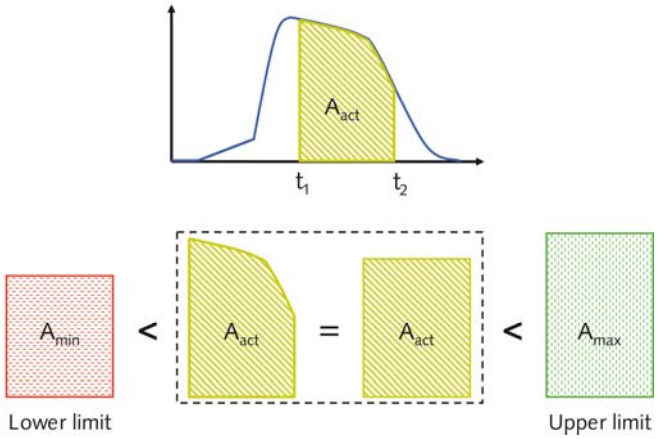
The Max-Min function monitors a relative maximum within a box. The difference is saved as a process value. The minimum within the limits of the box is determined dynamically for each cycle and forms the basis for monitoring the difference.

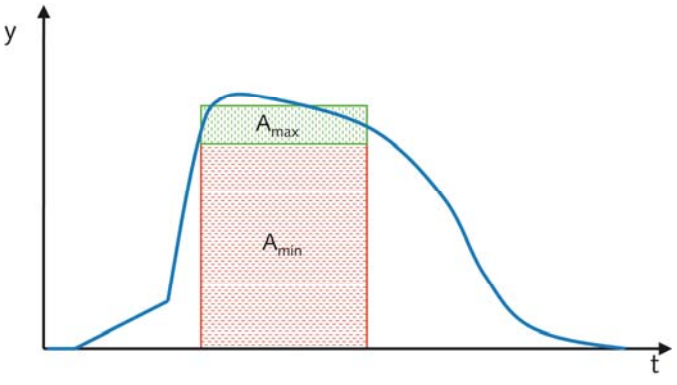
Results

- Digital outputs good/bad
- Difference between relative maximum and relative minimum, time of the relative maximum value

6.3.11.10 Integral

This evaluation object calculates the area under a measurement curve. The calculation interval (start and end on the time axis) can be chosen absolutely or relative to a threshold or an event. The entered times and the upper and lower limits are shown in the form of rectangular areas on the graphical display. The lower (red) area corresponds to the minimum value. Together with the upper (green) area it forms the maximum value of the integral. The area under the curve must be within the green area.





Result
- Digital outputs good/bad
- Value calculated from mechanical unit and time (integral)

Definition
The integral is defined by its time limits during measurement and by its value, which is calculated from time and the unit of measurement (for example, bar*s).

- There are three ways of defining the start time:
  - Absolute (entering a time in seconds)
  - Start from the highest measured value (maximum)
  - Start relative to when the curve passes through a vertical threshold
- The end time is defined in the same way. In this case there is also the option of calculating the integral until the end of the cycle
- A lower and an upper limit are required for the integral



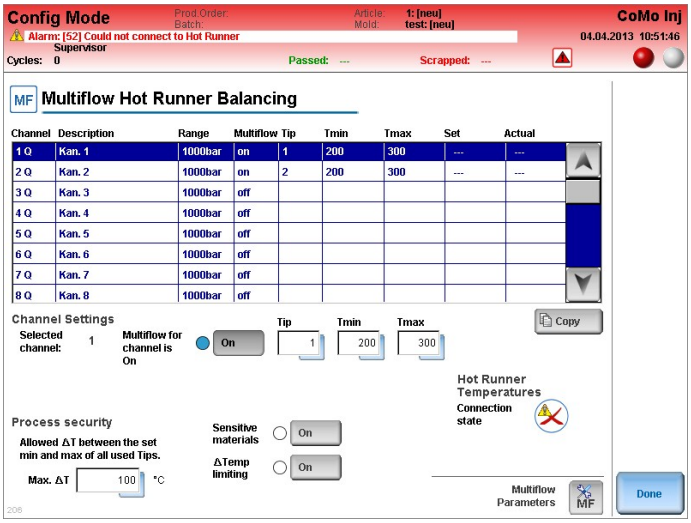
If you have difficulties setting the correct limits of the integral, you can read off the process values under Analysis/Numerical and use them as an aid.

6.4 MultiFlow Setup

If the MultiFlow option is activated, the button **MultiFlow settings** is displayed in the menu **Production Setup**. Pressing the button **MultiFlow Setup** sets up the MultiFlow automatic hot-runner balancing system, if this option is activated in the CoMo Injection and for this mold.



MultiFlow setup is done in the configuration mode. No measurements may be carried out in this mode. After confirming switching to the configuration mode, the setup screen for MultiFlow is displayed.



The measuring channels for cavity pressure can be assigned to each hot-runner tip. Communication with the hot-runner controller can be checked with the buttons **Read** and **Write** by exchanging the current set and actual temperature values with the hot-runner controller.
In addition, the options "Sensitive Materials" and "Restrict temp variation" can also be activated or deactivated.
The functions of both these options are defined as under:
Sensitive Materials
This control has been developed for materials that react strongly even to minor variations in temperature. If this option is activated, it will be taken into consideration and Multiflow will carry out temperature changes in much smaller steps.
Restrict Temp variation
This control has been developed for materials that react strongly even to minor variations in temperature. If this option is activated, a maximum permissible variation in temperature can be specified.
Example: A maximum permissible variation of 2°C in temperature has been specified. As a result Multiflow never regulates in steps greater than 2°C. This would be the case even if the MF-Algo calculates a change of 4°C. Every change that is less than 2°C is executed as calculated.

6.4.1 Channel assignment

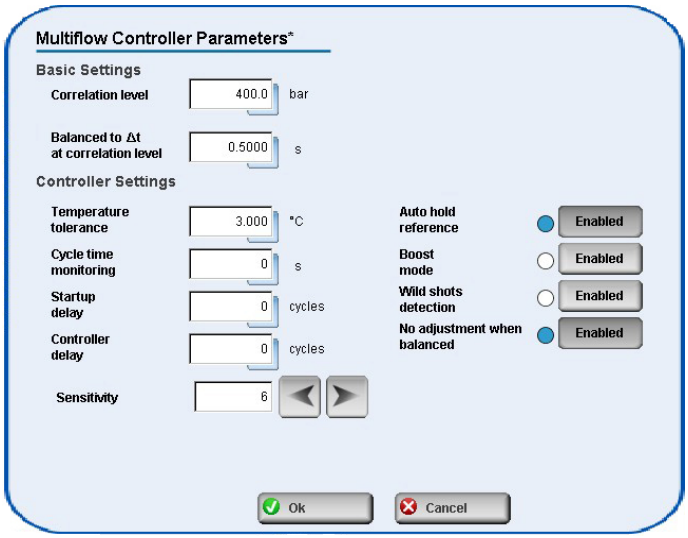
A table on the upper half of the screen shows all measuring channels that are activated. The table includes the channel number, the channel description entered by the Job Setter and the measuring range. The subsequent columns contain information about MultiFlow. Below the table, these values can be changed for the selected channel:

- MultiFlow:
  In this box it is defined if this measuring channel is used for control. Control can be activated or deactivated

- Hot-runner tip:
  In this box the hot-runner tip to be controlled is determined. Only one tip can be chosen for each measuring channel. However, it is possible to assign several measuring channels to one hot-runner tip. For that purpose, the same hot-runner tip is chosen for several measuring channels. MultiFlow then uses the mean value of these channels for control
- T_{min}/T_{max}:
  The upper and lower temperature limits restrict control to that effect, that MultiFlow does not control the hot-runner temperatures above or below these values. If a hot-runner tip reaches this value, crossing the limit can be prevented by controlling another channel. The limiting values can also be automatically determined on the basis of the set temperatures. To this end, the maximum deviation is entered in the box *temperature deviation*. The button *Calculating limits* then determines the upper and lower limits of all hot-runner zones depending on the set temperatures
- T_{set}/T_{actual}:
  The set and actual temperatures adjusted at the machine are displayed. Thus it can be identified if the hot-runner zones of the machine correspond with the hot-runner tips set in the CoMo. The set temperatures can be changed manually in order to check the assignment

6.4.2 MultiFlow Parameters

The button **MultiFlow Controller Parameters** opens a dialog, in which the parameters for the control algorithm can be entered. The dialog is identical to the one in the MultiFlow status screen.



The following parameters can be changed:

- Correlation level
- Balanced to Δt at correlation level
- Temperature tolerance
- Cycle time monitoring
- Startup delay
- Controller delay
- Auto hold reference
- No adjustment when balanced
- Boost Mode
- Wild Shot detection
- Sensitivity



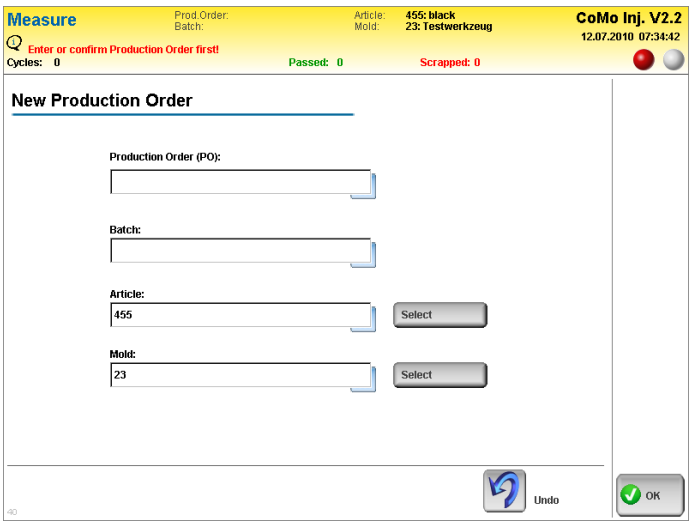
Tip: The settings are described in detail in chapter 5.4.2 “Operation of MultiFlow”. For most of the molds, a controller sensitivity of 5 to 10 is sufficient. In case MultiFlow repeatedly adapts the cavity temperature in the same direction, the controller sensitivity may be increased. This speeds up the balancing process during mold start-up. If the cavity pressure curves overreact, the value should be reduced.

7. Starting a Production Order

To start production you have to be logged on as *Shift Supervisor* or *Supervisor*. Both types of user will find the **Start Production** button on the bottom right of the Measuring screen (or on in the control screen of the small screen).

7.1 Start Production

The **Start Production** button displays a dialog box in which the data of the production order can be edited.



A new or existing production order can be entered in the *Production Order* box. If allowed by the system setup the *Batch Number* can be entered. If an existing production order has been chosen, *Mold* and *Article* are specified automatically. For new production orders they can be entered either directly, or from the existing records if they have been entered in the CoMo MIS.

If the CoMo Injection is connected to CoMo DataCenter, production order, batch, article and mold number can also be loaded from this system using the **Choose from MIS** button.

The dialog is closed with the **OK** button. The **Production** button starts production immediately. If production monitoring for "good parts" is activated on the "System Setup" ➔ "Quality Control" menu, when production is started a dialog box for entering the required number opens (see Installation Manual, Doc. No. 2869B_002-399).

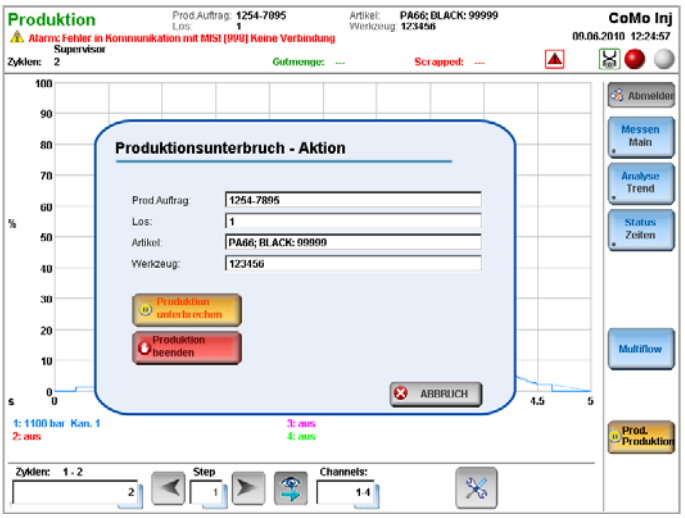
While the CoMo Injection is in the Production mode scrap separation is always active. At the same time the recorded data is transferred to any CoMo DataCenter that is present and installed in the system setup. In the Production mode data is displayed in exactly the same way as in the Measuring mode, but it is not possible to change settings on the CoMo Injection.

7.2 Interrupting, Resuming and Ending Production

When required, production is interrupted or ended with the **Interrupt Production** button. A dialog for confirming the command is displayed. This makes it possible to choose whether production is to be briefly interrupted (**Interrupt Production** button) or ended (**Terminate Production/-Terminate Production Order** buttons). As soon as production is interrupted or ended the digital outputs on the CoMo Injection are set to *bad*.

7.2.1 Ending Production

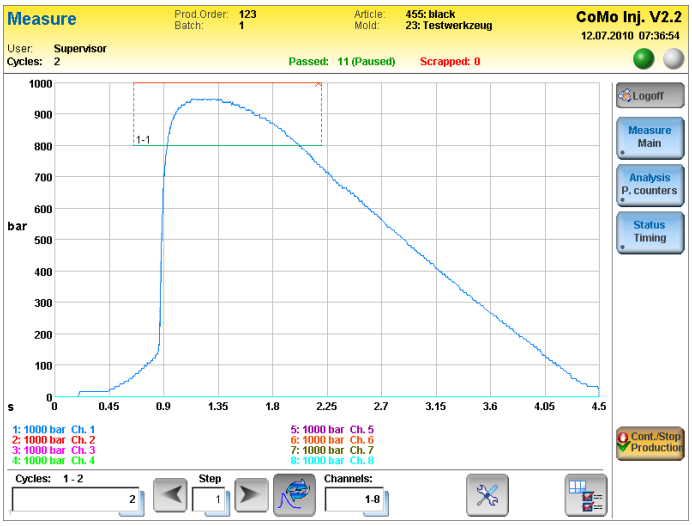
Choosing the **Terminate Production** function closes the current batch. However, the status of the production order in CoMo DataCente remains *In Production*. It is possible to continue this production order with a new batch.



The **Terminate Production** button ends production and closes the production order in CoMo DataCenter, which is therefore given the status of *Closed*.

7.2.2 Interrupting Production and Switching off Channels

If production is only to be interrupted briefly, **Interrupt Production** is used. The CoMo Injection changes to the Measuring mode.



Two buttons are displayed on the bottom left:

- **"Prod. Production"** resumes production immediately. A dialog is displayed in which the data of the production order are re-confirmed. It also provides the option of ending production directly
- **Enable/Disable Channel** allows individual channels to be switched off temporarily

The *Switch Channel Off* screen contains a list of all measuring channels. Choosing a channel on the list allows it to be de-/activated with the **On** or **Off** button. The chosen setting is retained until another change is made or a new record of setup data is loaded.
It has to be ensured that no parts can be produced from these mold cavities and mixed with good parts. If the channel to be switched off is used for quality assurance, a security check level can therefore be entered. If this threshold is exceeded a bad signal is then given.
Basically, only channels on which no real-time thresholds have been defined can be switched off. Any continuation of production with one channel switched off is signaled with an alarm message.

8. Quick Start Guide

This guide simply describes the individual steps involved in quickly setting up a CoMo. More detailed instructions are to be found in the "Commissioning" section of the Instruction Manual 2869B_002-399.

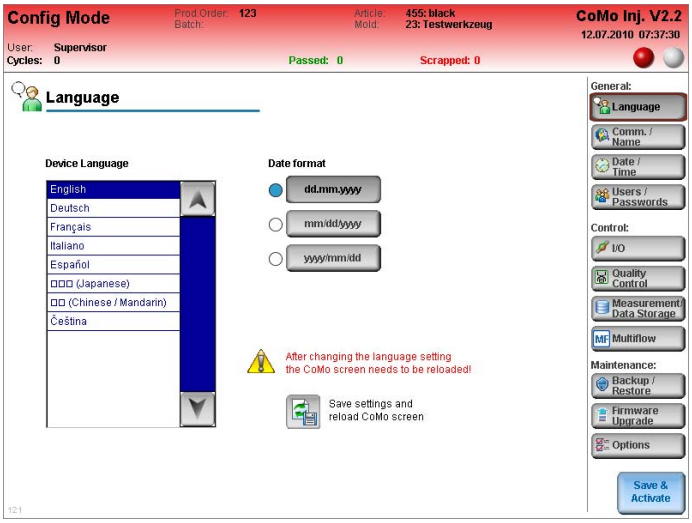
Step 1: Connecting CoMo Injection

The terminal (touch screen display) Type 5629B3 is normally connected to the CoMo Injection with the cable Type 1200A103A....

If you are using a PC, connect it to the CoMo Injection with the included Ethernet cable. In this case you have to start a web browser and enter the address http://192.168.101.64. Please note that the IP address on the PC must be set to 192.168.101.xxx. The method of setting the IP address on a PC or laptop is described in the *Installation Instructions* in the section entitled *Detailed Commissioning Instructions*.

Step 2: Basic Setup of the CoMo Injection (Commissioning)

A user logged on as a Supervisor is authorized to access the System Setup screen with the **System Setup** button.



Commissioning steps:

1. Define ***language***: Choice of language for the graphical user interface. When the language has been set the display or the browser must be restarted to fully apply the change.

2. Specify ***Communication/Name***: Definition of the IP address, the network interface and the name of the CoMo (obtain IP addresses from your network administrator). If several CoMos are to be installed simultaneously, it is advantageous to perform this step first for all of them, then connect them all into the IT network and handle all of the other steps via the network.



You have to tell the touch screen display or the PC about any change in the IP address, otherwise the CoMo Injection will not be found. See Installation Manual 2869B_002-399, section entitled *Setting Up Network Address*.

3. Set ***Date/Time:*** This is used to enter the date and the time or activation of the time server. To ensure worldwide synchronization the time difference from GMT must also be set.
4. Enter ***User/Password:*** Allocation of passwords at user level (form user groups).
5. Specify ***Dig IO*** (inputs/outputs): Definition of the digital inputs and outputs which are hardwired to the machine or additional peripherals. If possible, this setting should be identical for all machine/CoMo configurations. Outputs that are not required should be de-activated with "off".
6. ***Production/Export:*** Specification of the storage location of process data (obtain information from your network administrator).
7. ***Save and Apply:*** Saves the settings in the internal memory.
8. Disconnect CoMo briefly from the power supply and reconnect (new IP address is now applied).
9. Redisplay the ***System Setup*** menu as described at the start.
10. Perform ***Backup/Restore:*** Backup of the system setup of the measuring unit on the data server.
11. Perform ***I/O Test*** if the CoMo Injection is connected to the machine: signal test with which all inputs and outputs of the system can be tested for correct operation.
12. ***Backup and Apply:*** save and apply the system setup.



If the system setup has already been entered with a different CoMo and saved on a PC on the network, it can be copied to any new CoMo Injection with Backup/Load and Restore. This makes it possible to omit all of the configuration steps apart from Backup/Restore Server and Communication/Name.

Step 3: Connect CoMo Injection to Machine

- Power supply
- Digital Inputs and Outputs Auxiliary: for handling or similar systems
- Digital Inputs and Outputs Molding Machine: for connection to the injection molding machine
- Proximity Switch: If the start of measurement cannot be taken off the digital outputs of the machine, the proximity switch Type 2231A1 can be used

Step 4: Functional Test

- Perform functional test of the inputs/outputs on the CoMo with ***I/O Test*** on the *System Setup* menu
- Server test for the *Backup/Restore* function of the system, mold and article setups
- Data transfer test: Select *Production/Export* then *Check connection* (if a data transfer has been set up)

9. Views on 5,7" Control Unit Type 5629A1

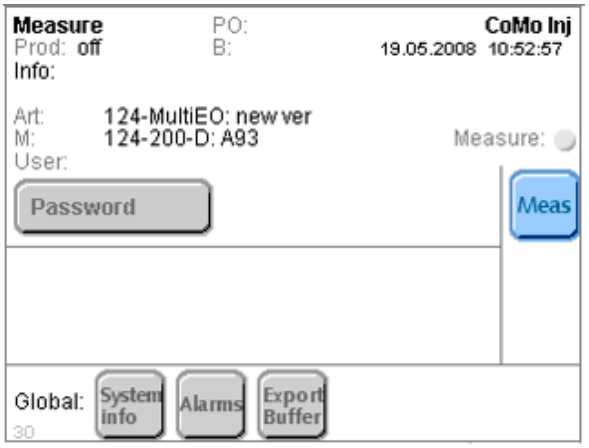
The CoMo Injection is also available with a 5,7" control unit Type 5629A1, which is likewise designed as a touch screen display. As a result of its smaller viewable diagonal and lower resolution the views on the 5,7" monitor are different. For technical reasons not all of the functions of the CoMo Injection are possible with this small monitor. A detailed description of operation with the 5,7" monitor is to be found on the included CD.
The small view can be displayed on the large touch screen display Type 5629B3 and on the PC using the following URL:

http://192.168.101.64/small

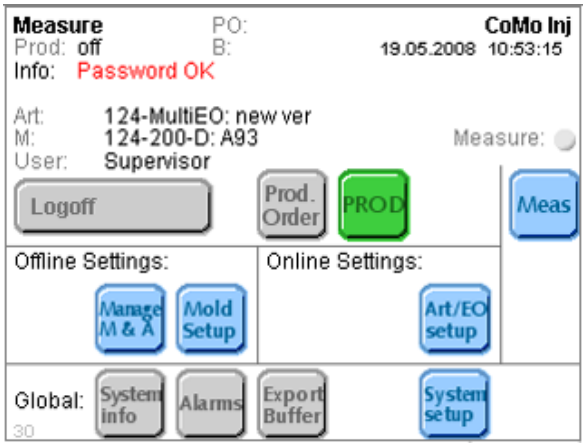
When the system has started the *Measuring View* with all of the process curves are shown on one screen. The **Setup** button is pressed to access the Control screen.

9.1 Control Screen

All of the functions of the CoMo Injection are available on the Control screen. Without any user logged on only information can be displayed.



The **Password** button is used to log onto the system. The selection of functions available on the particular Control screen displayed depend on the user. The user logged on as Supervisor can choose all options.

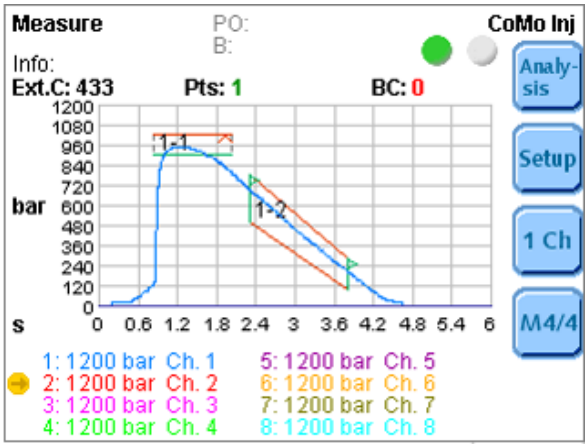


The Control screen contains the following buttons:

- **Logoff**
  This button logs the current user out.
- **Prod. Order**
  This can be used to create a new production order.
- **PROD**
  When the production order has been created it can be started.
- **Meas**
  This button changes to the Measuring view with curve display.
- **Manage M&A:**
  Used to create new molds and articles or manage existing ones.
- **Mold Setup**
  The mold record contains information about the sensors and the measuring range.
- **Art/EO Setup**
  The article configuration contains information specific to the process: measuring time, monitoring functions, real-time thresholds and comparison curve.
- **System Info**
  The system information can only be displayed with a web browser. The button is hidden when using the 5,7" touch screen display.
- **Alarms**
  Displays a list of triggered alarms.
- **Export Buffer**
  This screen contains information about the internal memory of the CoMo Injection and the external cycle counter.
- **System Setup**
  The system setup is divided into several screens.

9.2 Data Display (Meas.)

The *Measuring view* shows all of the process curves on one screen.



The (measuring) time is shown on the X-axis in seconds. The Y-axis shows the measurements in the preset unit, provided this is identical for all of the displayed curves. If measurements are displayed with different units they are shown as a percentage of the measuring range defined in the hardware configuration.
During measurement a progress bar is displayed under the graph. This bar shows the current point in time in the cycle. Underneath this is the key. Above the graph is a section with information about the CoMo, cycle and production. The production order and batch can be read next to the name of the CoMo here.
Two LEDs show the current status. The left one is green if the last cycle met the requirements of the monitoring functions, otherwise it is red. The right LED is yellow while the CoMo is measuring.

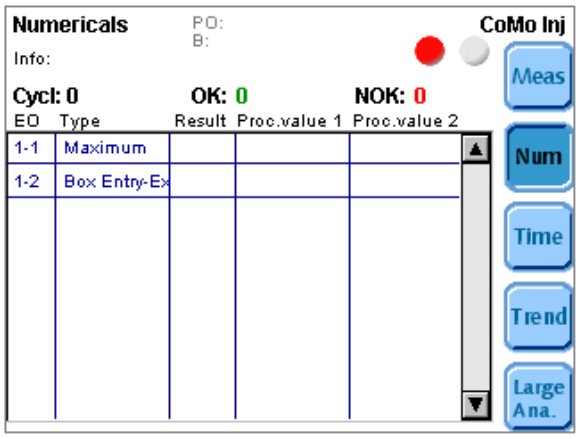
Three counters are displayed:
- **Ext.C**: external cycle counter
- **Pcs**: good parts produced
- **BC**: bad cycles

The buttons in the right display further views:
- **Analysis** can be used to switch to the *Analysis view*.
- **Setup** opens the *Control screen*.
- **1 Ch** shows just one curve.
- The bottom button splits the graph into two separate diagrams.

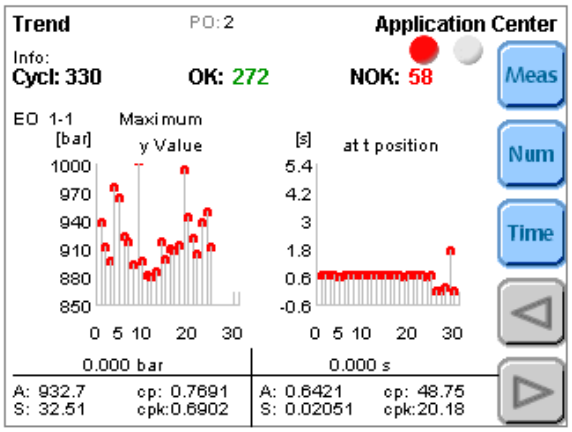
9.3 Analysis View

Analysis offers two other ways of representing process data:

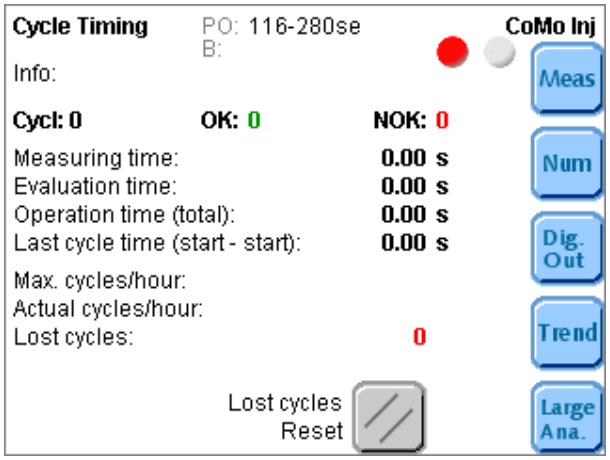
- **Num:**
  Numerical representation of the evaluation results

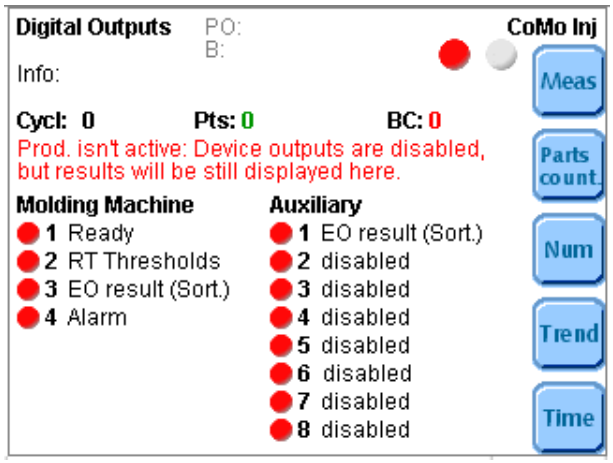


- **Trend:**
  Graphical representation of the curve of the evaluation results over the last 30 cycles. The results of one monitoring function are always shown. The arrow buttons can be used to switch between the monitoring functions. Under the trend graph the current actual values of the monitoring function with associated statistical parameters are shown (M = mean, S = standard deviation, Cp/Cpk = process capability indices)



- **Time/Dig.:**
  This button displays a table of the cycle statistics. Pressing it again shows the status of the digital outputs


Cycle Timing
PO: 116-280se
B:
CoMo Inj
Info:
Meas
Cycl: 0
OK: 0
NOK: 0
Num
Measuring time: 0.00 s
Evaluation time: 0.00 s
Operation time (total): 0.00 s
Last cycle time (start - start): 0.00 s
Dig. Out
Max. cycles/hour:
Actual cycles/hour:
Lost cycles: 0
Trend
Lost cycles Reset
Large Ana.


Digital Outputs
PO:
B:
CoMo Inj
Info:
Meas
Cycl: 0
Pts: 0
BC: 0
Prod. isn't active: Device outputs are disabled, but results will be still displayed here.
Parts count
Molding Machine
1 Ready
2 RT Thresholds
3 EO result (Sort.)
4 Alarm
Auxiliary
1 EO result (Sort.)
2 disabled
3 disabled
4 disabled
5 disabled
6 disabled
7 disabled
8 disabled
Num
Trend
Time

10. Declaration of Conformity

DECLARATION OF CONFORMITY
According to EC Directive

WE; Manufacturer : **Kistler Instrumente AG**
Address: **Eulachstrasse 22**
CH-8408 Winterthur
Phone: +41 52 2241111 Fax : +41 52 224 15 49 e-mail: sales.export@kistler.com

Product Name : Control Monitor CoMo Injection
Brand Name : Kistler
Model No : 2869B, 5865B, 5629B3, GBACS70-24-C14

Has been designed and manufactured in accordance to the following technical regulation:

Directive Device :

Electromagnetic Compatibility 2004/108/EC
Low Voltage Equipment 2006/95/EC

Conformity with the following standards:

The measurements made in accordance with the procedures according to the European Council Directive and EN standards.

LVD : EN : EN 60950-1:2006+A11:2009+A1:2010+A12:2011

EMC : EN : 61326-1:2006
EN : 61000-6-4 :2007 +A1:2011
EN : 61000-6-3 :2007 +A1:2011
EN : 61000-6-2:2005
EN : 61000-6-1:2007
EN : 55022 :2006 + A1:2007
EN : 55011 :2009 + A1:2010

CE mark was affixed on the product: 18.12.2007

This product(s) which are defined herein was (were) manufactured under the conditions of the European Union directive and standards. Also, this product(s) responsibility is under our firm's guarantee

Manufacturer
Stamp / signature

Kistler Instrumente AG
Eulachstrasse 22
Postfach
CH-8408 Winterthur

Name surname: Rolf Hensel
Title: Head of Electronics Product Lines
Date: 15.03.2013