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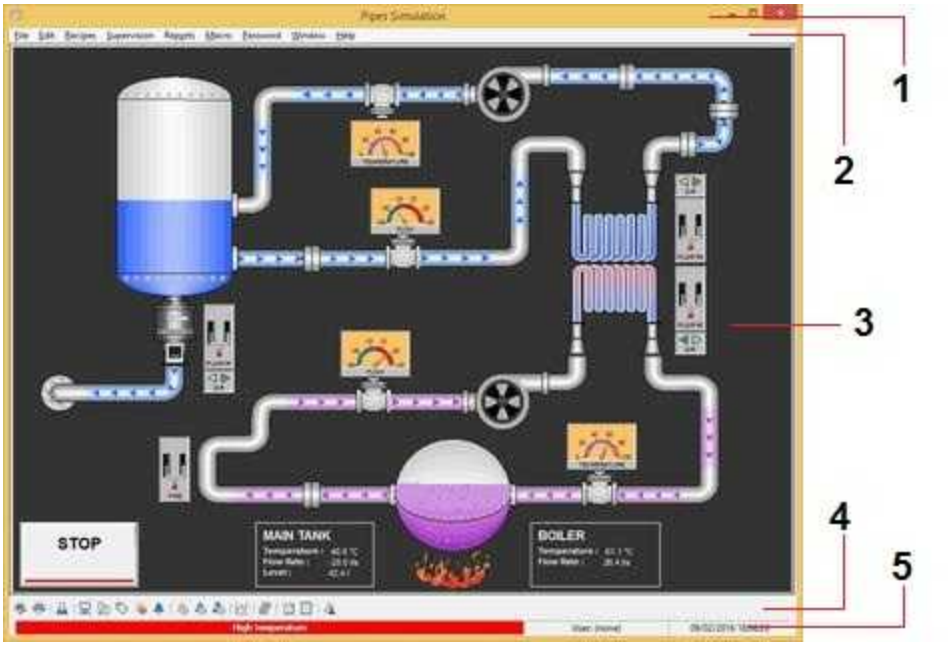
1 Introduction

A supervision project is a software product that allows you to monitor and interact with a particular process in industrial and civil environment; eg. control processing steps of an industrial product, management of a home automation system, monitoring of the water levels of a water pipeline, supervision of a photovoltaic system, etc.

Runtime manages the execution of a supervision project.
Runtime can be started by *Project Manager* by selecting the *Project* | *Run* menu item or by clicking directly on the icon:

in this case the default project will be executed, if there is one defined (refer to *Project Manager* help for more details about default project).

2 Runtime

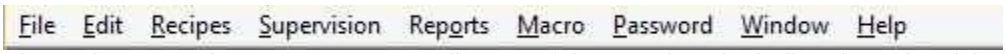


The figure above shows an example of a main window with the parts that compose it.
In details:

1 *Window caption*

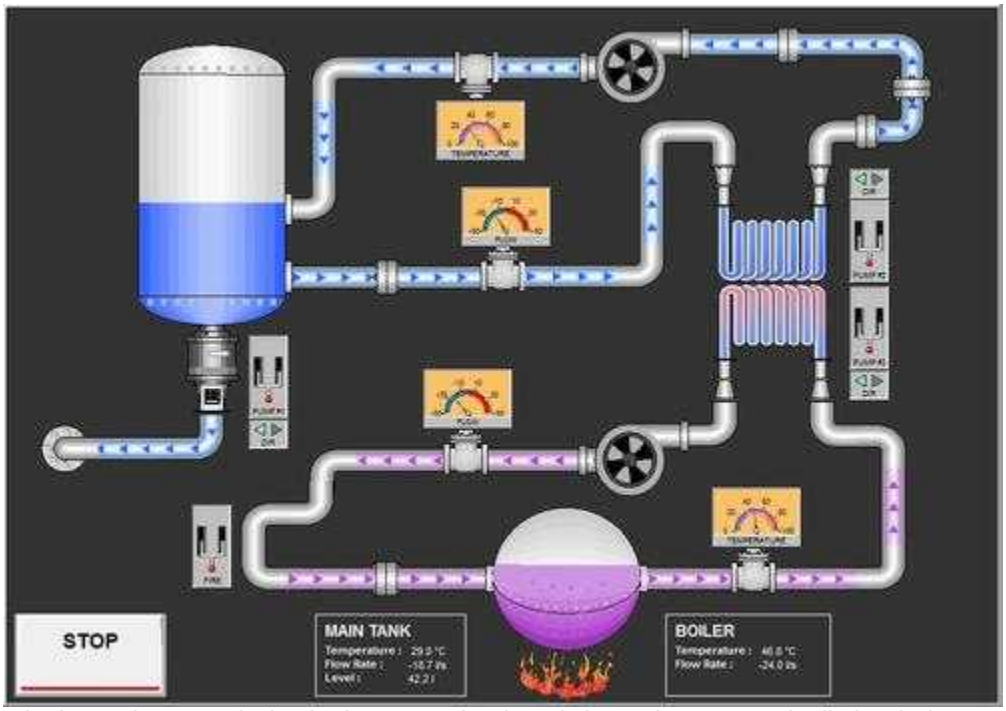
It displays the application title and icons to minimize, maximize it, or exit the program. The title bar can be hidden by the *Project Manager* option *Configuration* | *Options* | *Main Window* | *Window elements* | *Hide window caption*.

2 *Main menu*



The main menu gives you access to all parts of the *Runtime*, including those involving diagnostics such as supervision of gates status: it is therefore useful during application testing, but tends not recommended in the final application. It can be hidden by the *Project Manager* option *Configuration* | *options* | *Main Window* | *Window elements* | *Hide main menu.*

3 *Main template*



It is the main synoptic (as in the example above): it can be automatically loaded at *Runtime* startup if it has been selected in *Project Manager - Configuration* | *Templates* option
Runtime opens up to a maximum of 8 templates simultaneously. All open pages are updated continuously based on the current process status.

4 *Toolbar*

It has the same functions as the Main menu and can be hidden by the *Project Manager* option *Configuration* | *options* | *Main Window* | *Window elements* | *Toolbar position*
The toolbar buttons provide direct access to the relevant pages with a simple click. The meaning of the icons is the following :

printer setup: allows to specify the printer to use

print: print the page currently shown

recipe: opens the page for the recipe management

system status: shows the system status

device status: shows the devices status

gate status: shows the gates status

alarms status: shows the status of the alarms

events status: shows the status of the events

historical alarms: shows the page with the history of the alarms

historical events: shows the page with the history of the events

 user changes: shows the page with the operations done by users

 chart: shows the page for the chart management

 multilanguage: allows to change the language of the application

 make report: allows to create a report

 view report: allows to open a report

 user access: allows to change user

A red exclamation mark beside the icon indicates an anomaly.

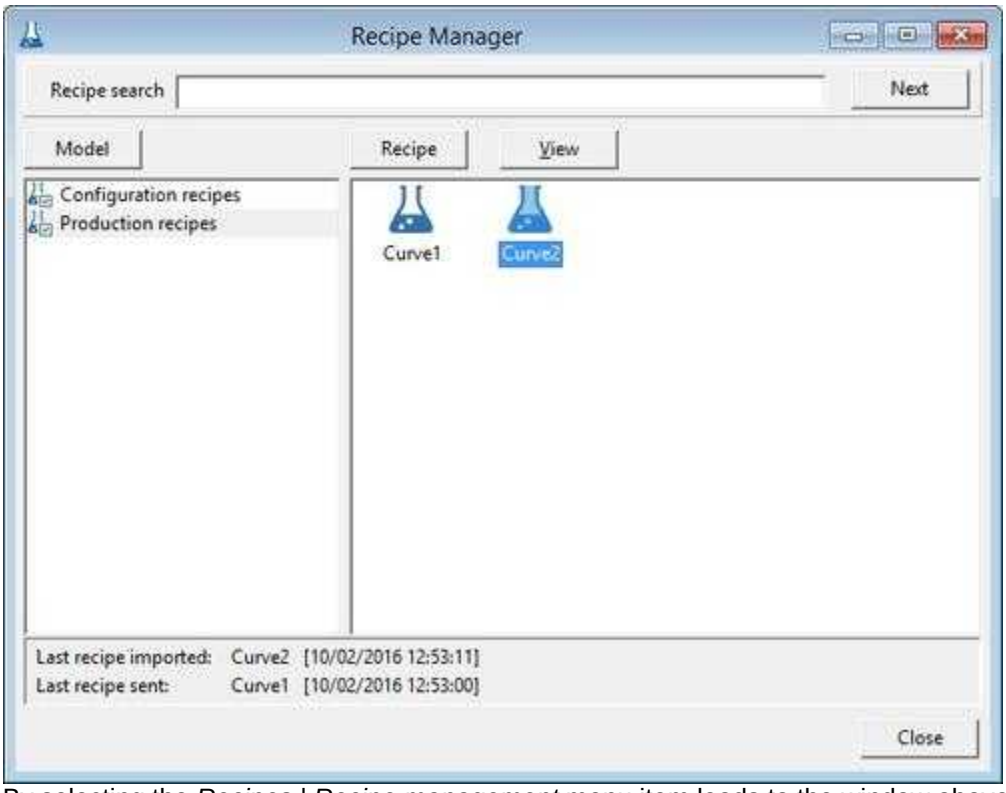
5 *Alarms bar*

The alarms bar shows the message of the last activated alarm. To eliminate these messages you have to confirm active or awaiting confirmation alarms, by opening the corresponding window.
At the bottom right there are the present date and time, and the name of the last logged operator (current operator). All the operations involving some changes in the status of the supervised process, will be recorded with this name.

3 Recipes

3.1 Recipe Introduction

One of the main features of *Runtime* consists of the recipe management.
The recipes are a set of process variables (gates); they may represent a type of production or a particular configuration of the supervised process.
The first step for the construction of a recipe is the creation of a model. It is the set of all the variables that comprise the recipe.
These variables can be divided in groups.
After defining the recipes models needed to manage the process, you can create different recipes for each model in order to obtain different types of process operation.



By selecting the *Recipes* | *Recipe management* menu item leads to the window above.
This window shows the list of models on the left and on the right the recipe files belonging to the selected model.
At the top you can do a quick search for a particular recipe within the archive.

Pressing the *Model* button you have access to a popup menu showing all functions applicable to the recipe models, namely:

- **New**: creates a new model
- **Delete**: delete the selected recipe model and its recipes.
- **Copy**: make a copy of the selected model and the related recipes.
- **Rename**: rename the selected recipe model.
- **Edit**: opens the recipe model editing window (called also by double-clicking on the model name) .

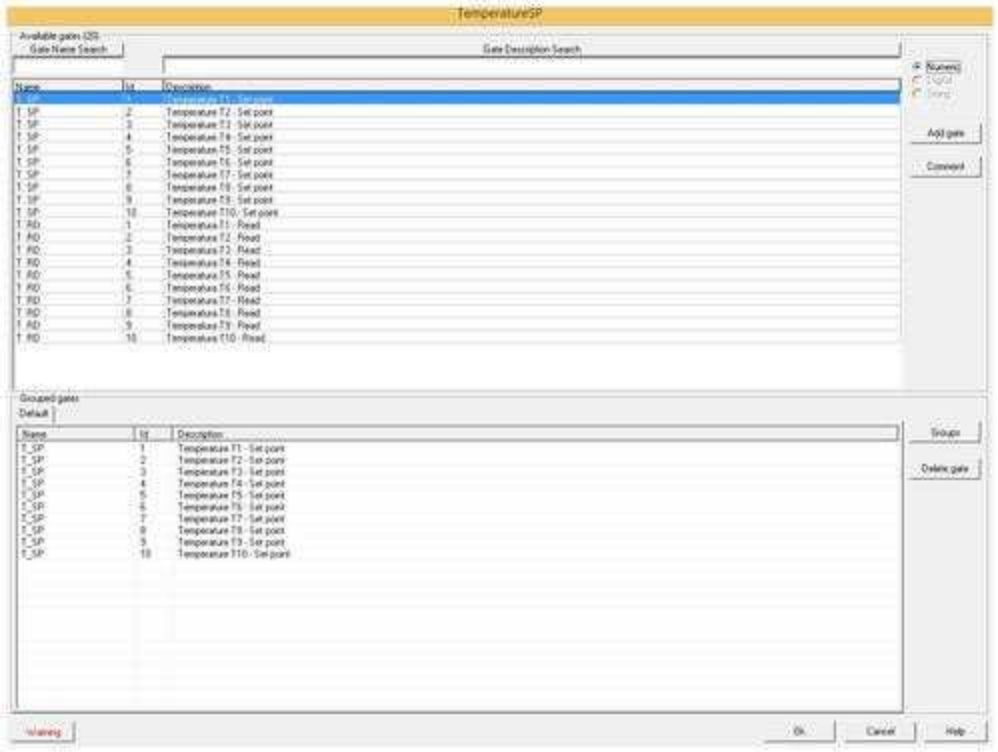
Pressing the *Recipe* button you have access to a popup menu that shows all the functions applicable to the recipes, namely:

- **New**: creates a new recipe based on the gates list contained in the selected model.
- **Delete**: delete the selected recipe.
- **Copy**: make a copy of the recipe.
- **Rename**: rename the recipe.
- **Edit**: opens the recipe edit window (also called by double click on the name of the recipe).
- Startup : specifies that the selected recipe must be sent automatically when you start the *Runtime*.

Pressing the *Display* button you have access to a popup menu showing the various display options of recipe files.

3.2 Recipe Models

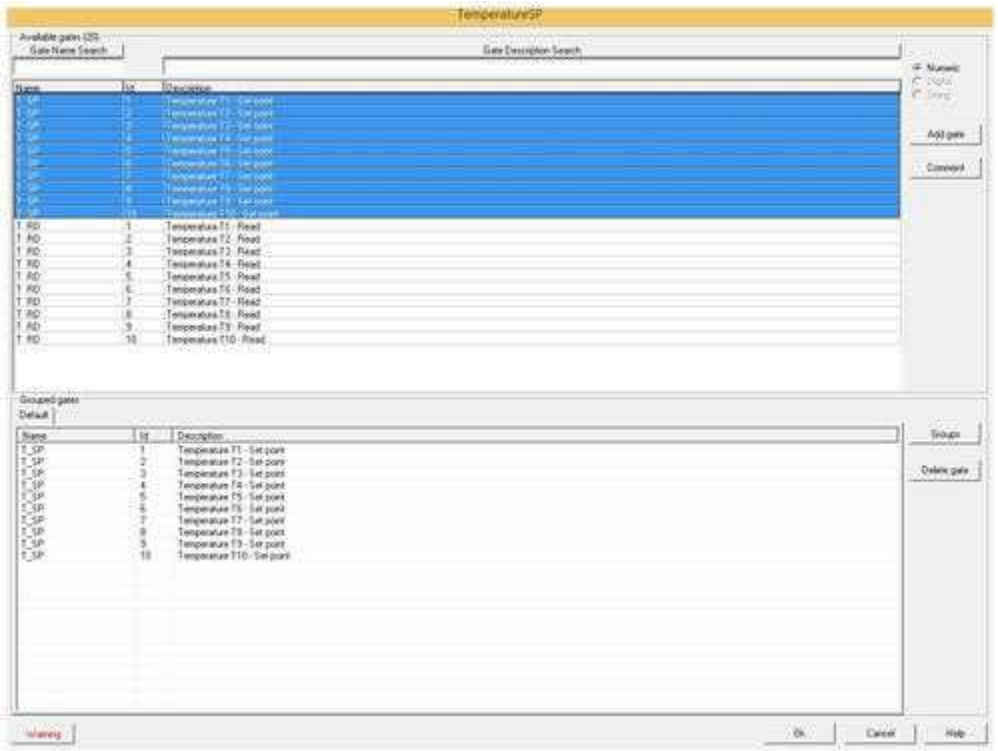
This is the window that allows you to build a recipe model:



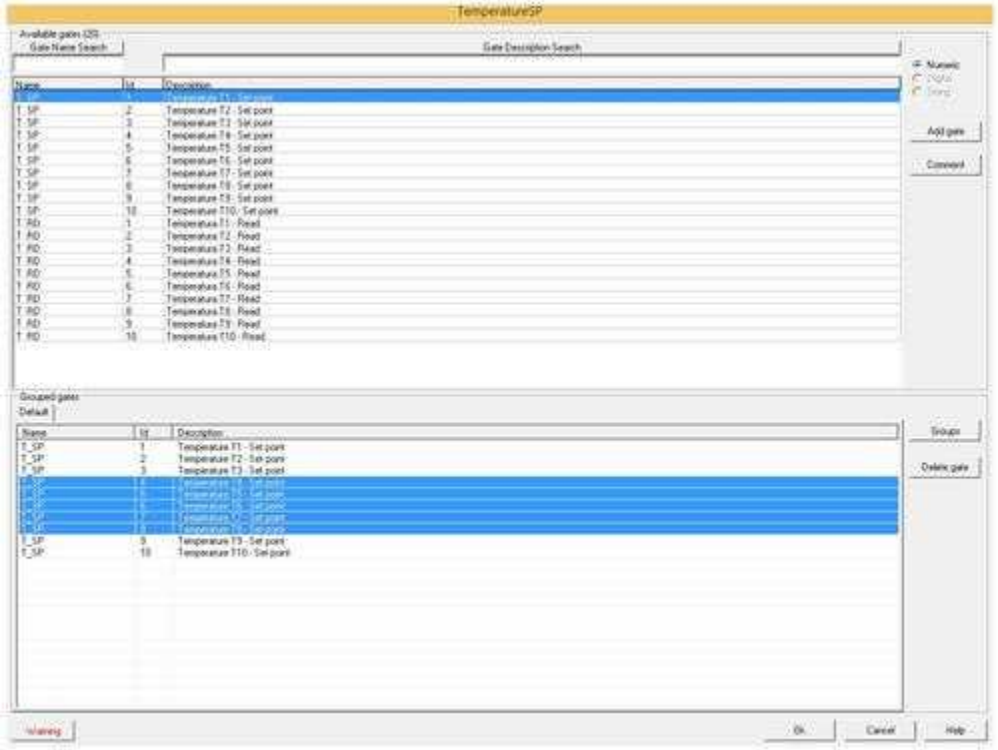
At the top you can see the list of all gates that belong to the application selected gate type (Numeric, Digital or String).
In the lower part shows the list of gates that have been associated with the selected recipe model.

In the case where in the recipe model are inserted gates that are not enabled to writing to the devices, a notice button will appear; pressing it will be shown the list of non-enabled write gates: however this is only a warning of a probable failure (usually the gates of a recipe should send the Set Points directly to the devices to which they refer), you can still insert in recipe model gates sampled "*Never*".

In order to allow greater clarity inside of a recipe model, gates can be organized in groups, in relation to their function, to the device with which they communicate, to the part of the plant on which they operate, etc..
The "*Groups*" button provides a popup menu with all the possible actions of the groups (create, delete, copy and rename).



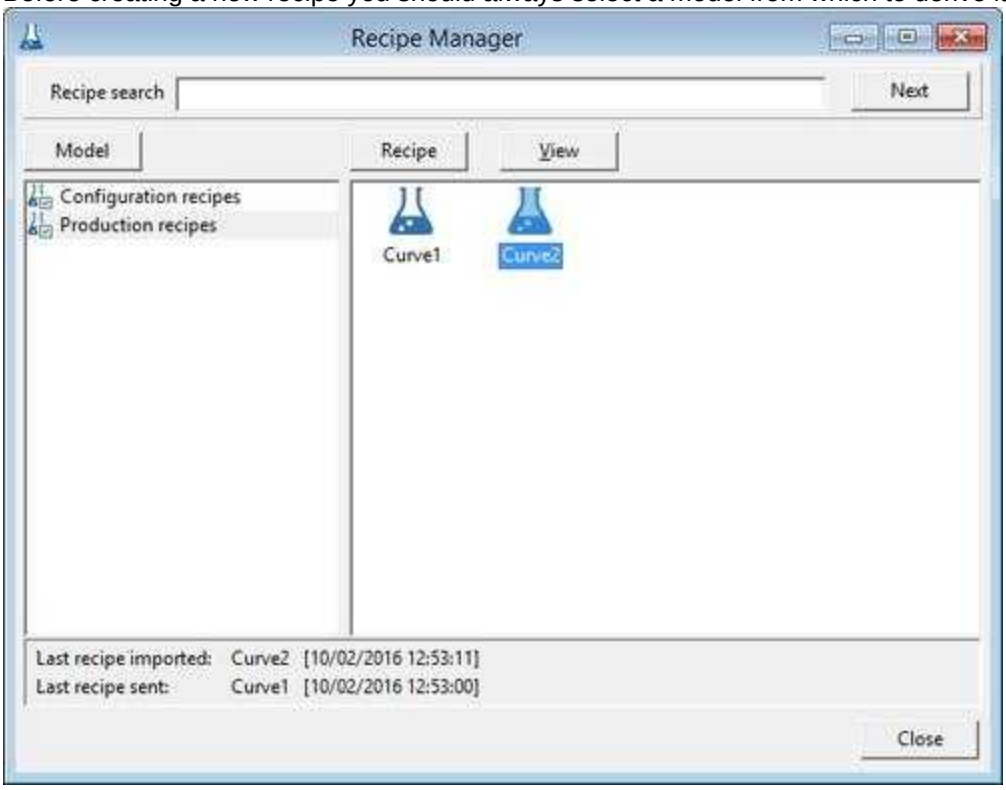
To add gates to the group, just select the top and click the "*Add gates*" button: the selected gates will thus added to the current group.



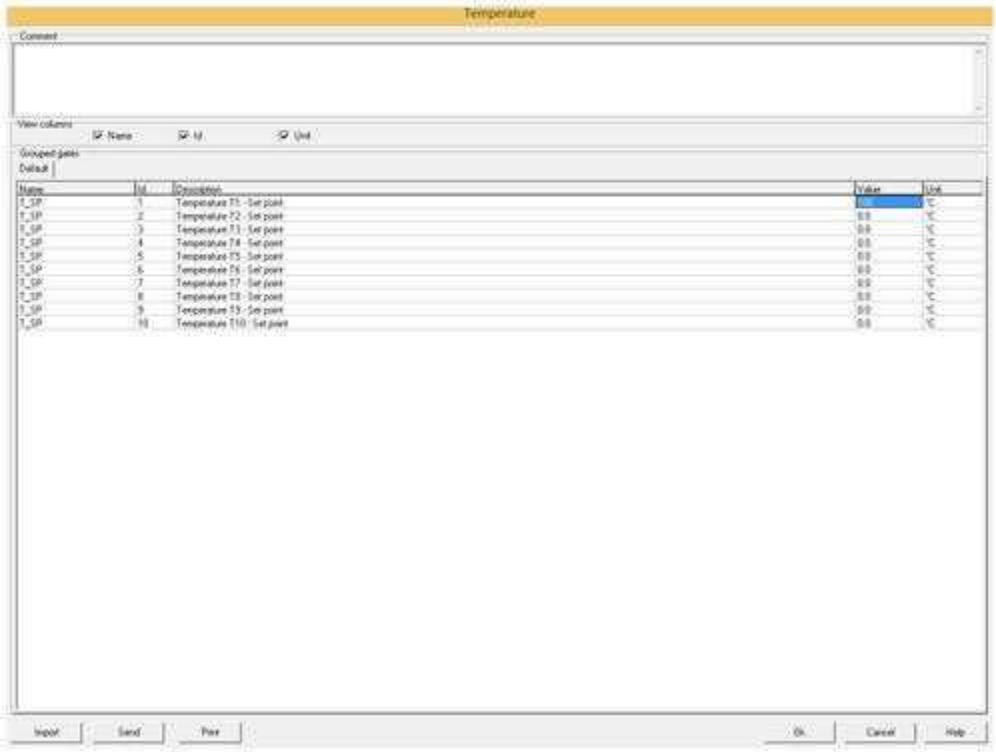
To delete the gates included in the group, shall be selected and then press the "*Delete gate*" button.

3.3 Recipes Management

You can create a new recipe from both the menu from the popup menu that appears when you click the right mouse button (in the right, the one containing the recipes) you can create a new recipe.
This creates a recipe with a default name (new recipe) which can be immediately changed.
The structure of the new recipe is derived from that of the parent model and can not be changed.
Before creating a new recipe you should always select a model from which to derive it.



Once you create a new recipe, it can be opened by double clicking the left mouse button or by selecting the "*Edit*" option from the Recipes menu or Popup menu that appears by right-clicking the mouse.
The changes allowed concerning the gates values (by importing them or modifying them manually) and remark.



Gates values (fourth column) can also be entered manually by simply double clicking on the value.

"*Import*" button: import in the recipe the current values of the gates that compose it, and save them to disk.

"*Send*" button lets you to set as current gates values, the values stored in the recipe. If the gates to which are assigned the new values have the "*Enable writing to device*" option enabled then the assigned value will be automatically sent to the paired device.

The "*Print*" button makes printing of the recipe gates list.

4 Supervision

4.1 Introduction

The supervision section allows to monitor the present status of the process, change its variables and analyse its historical data.

More in details:

Template : it allows opening of all the synoptics of the application.

Status: functions relating to the current state of the process.

- Alarms status
- Events status
- Gates status
- System status
- Devices status

Historical: functions relating to the historical data of the process.

- Historical alarms
- Historical events
- Historical user changes

Charts: online tracking and historical graphs.

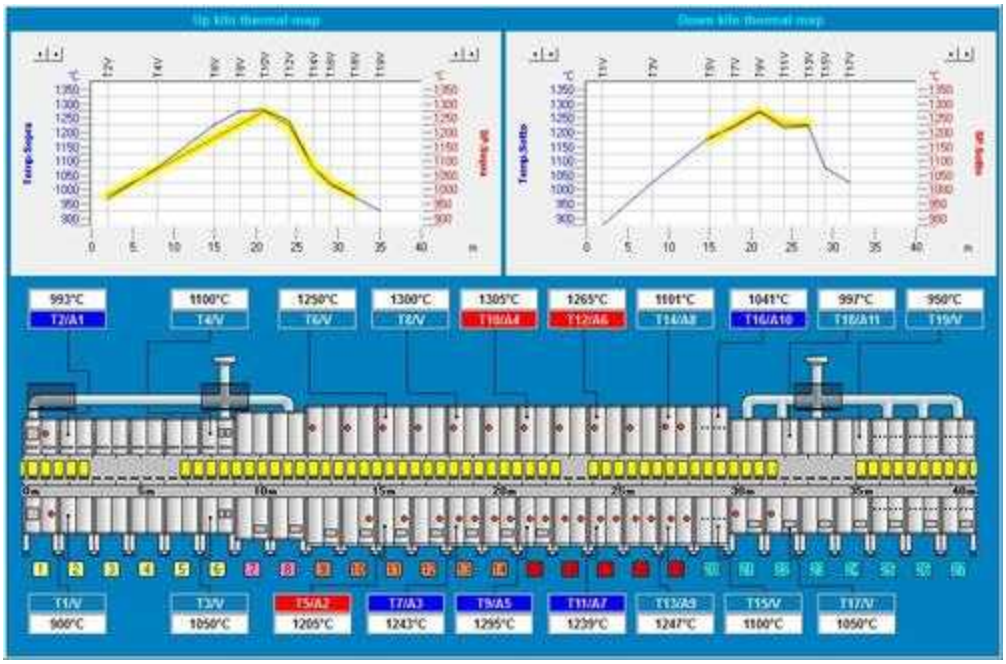
4.2 Template

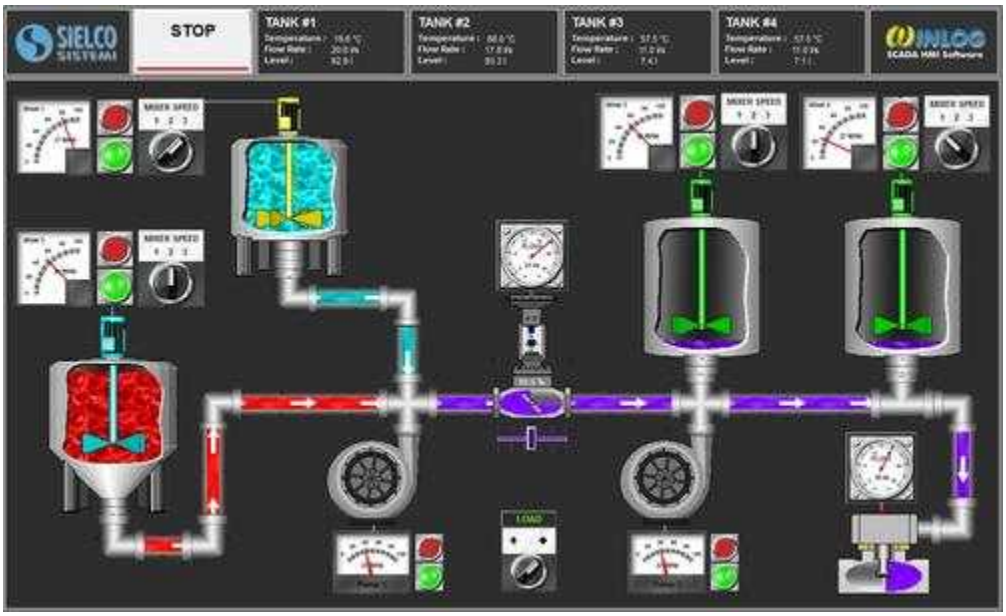
The template is the information exchange interface between the operator and the system. Template can then show a schematic drawing of the system or part of it, showing the status of the process variables and the possible alarm situations, or may represent a data entry window to allow the operator to act directly on the process variables .

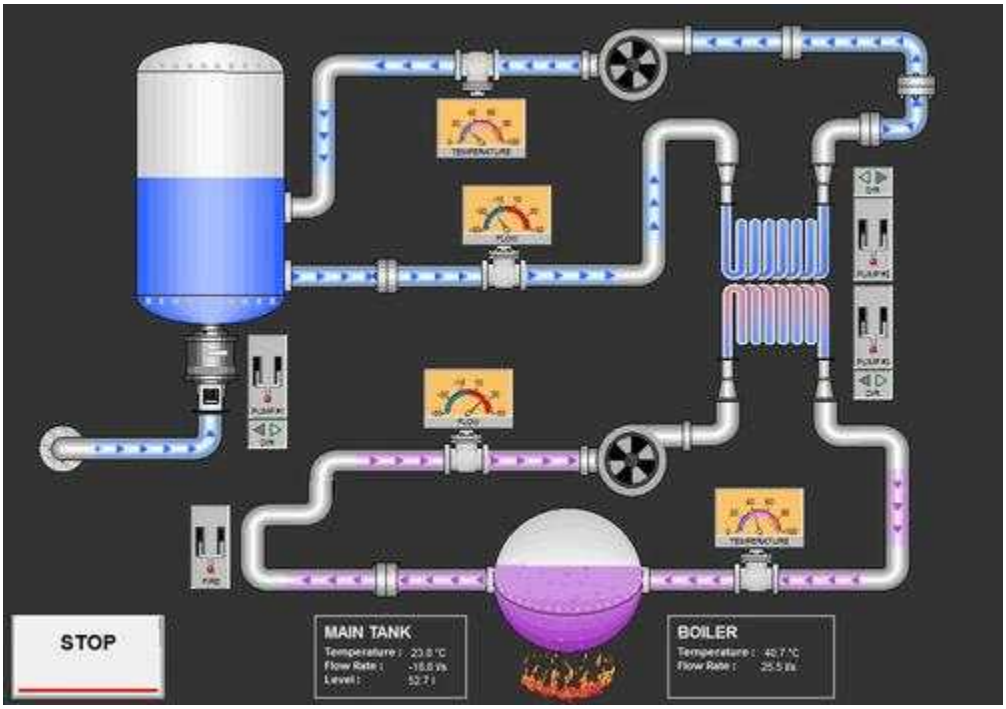
Each application can have one or more templates, built by the application developer by using *Template Builder* tool.

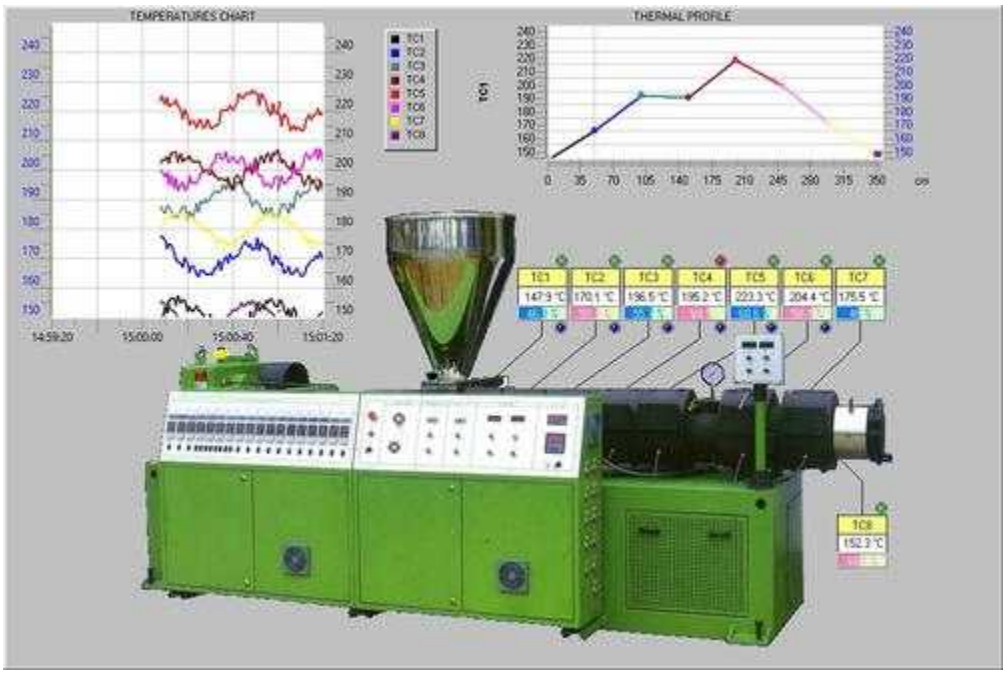
In *Runtime* can be active simultaneously up to 8 templates and you can open a template via the menu item *Supervision* | *Template.*

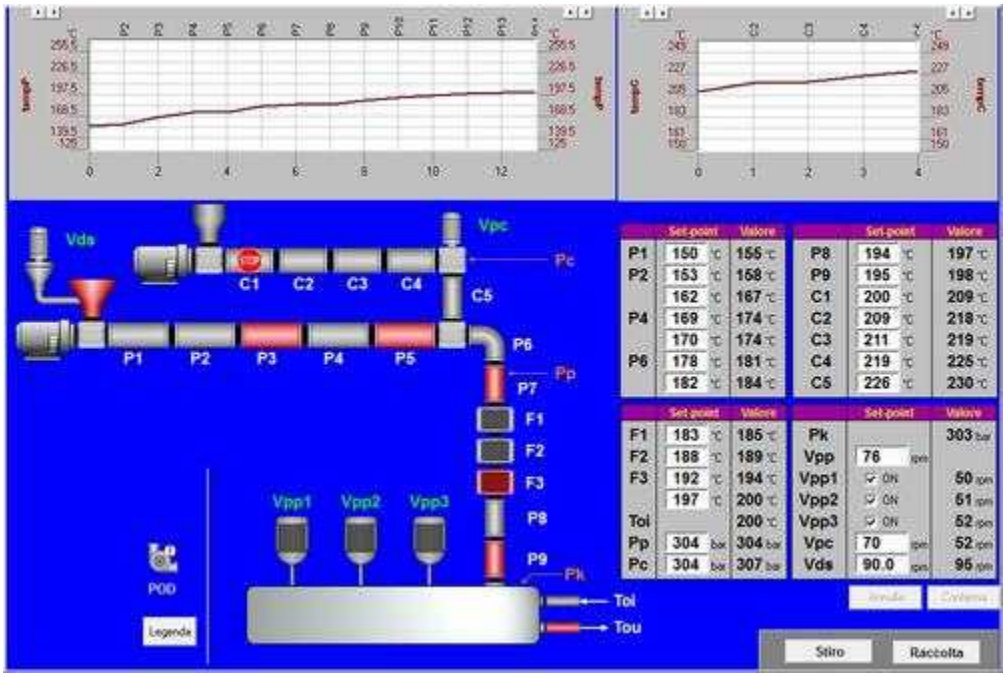
Here are some examples:

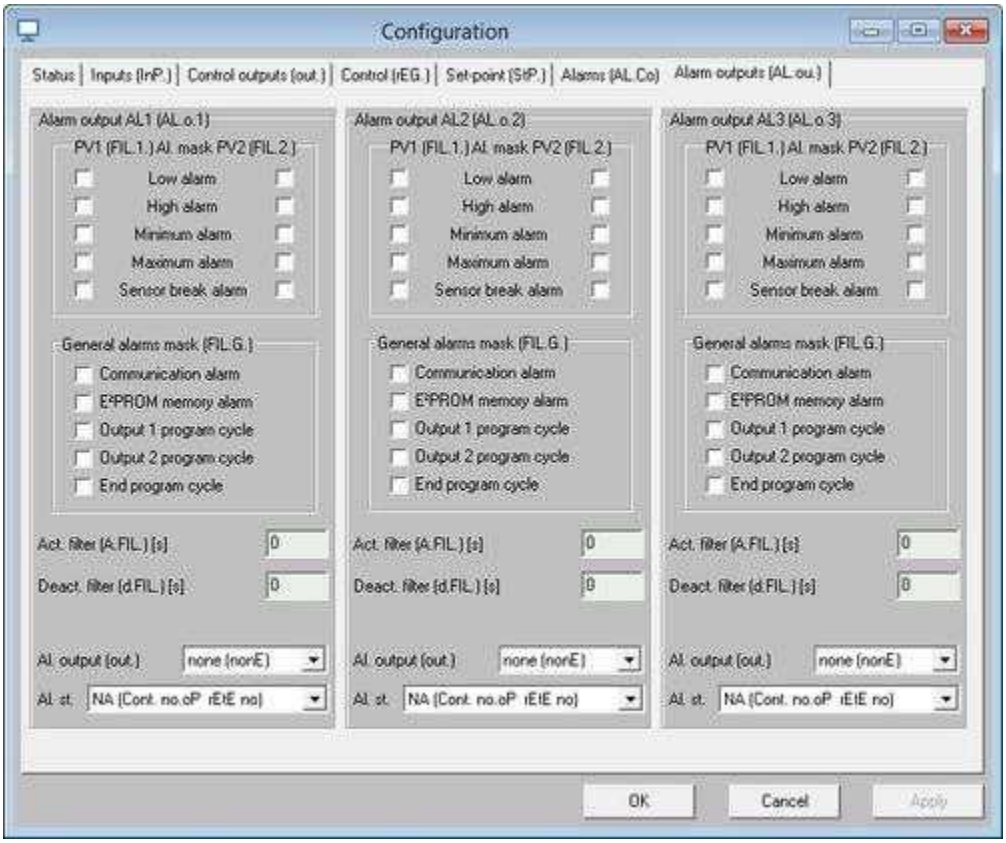












4.3 Alarms Status

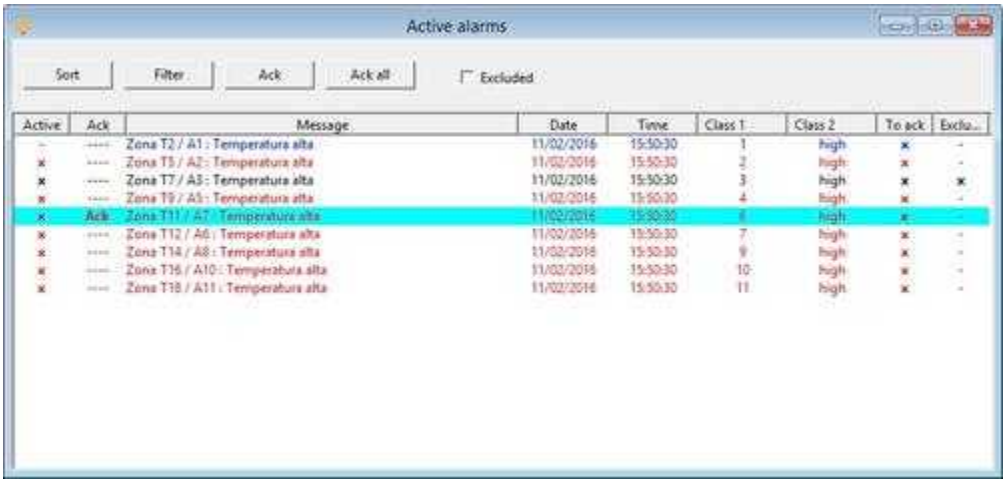
The "*Event and Alarm*" is a particular gate to which it is associated a message to display or record each time the condition associated with it is verified.

Simply by specifying the "*Alarm type*" in the "*General*" tab you can define whether the gate is kind of event or alarm. Regardless of whether it is of type event or alarm, management is almost similar: both you can specify a trigger condition, a time filter, a mode to withholding and file saving history. For both it is also possible to obtain the situation of events and alarms that are currently active through the use of the "*Alarms / Event View*" object of the *Template Builder* and view the historic via the "*HistAlarmsView*" object.

The only difference is that when a gate defined as "*Alarm Type*" became active, its message will be shown on a red background in the status bar at the bottom of the screen to inform the operator as soon as possible, regardless from the page of supervising shown at that time.

Some examples of events can be: "Machine start", "Machine stop", "Start production", "End production", while some examples of alarms can be: "Overtemperature alarm", "Emergency", "Alarm inverter protection" , etc.

This window shows the list of active alarms, to be confirmed and excluded.
This window can also be inserted into a template through the *Template Builder* tool and selecting the *AlarmsView* object.

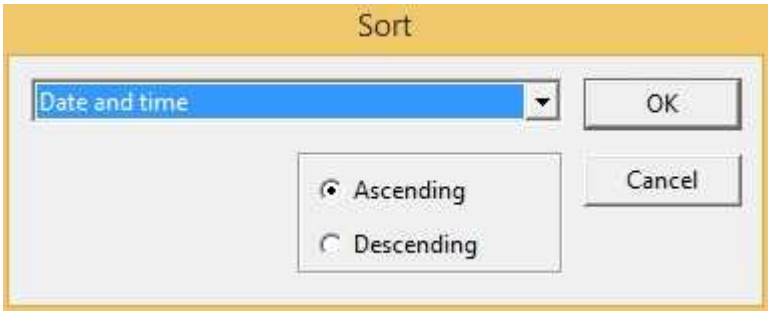


If Toolbar is enabled, the presence of active alarms or active events will be indicated by a red exclamation mark on the alarm status icon ( ) or event status icon ( ) that, when pressed, will open the window above.

Each line of the list is an alarm or an event; the columns have the following meaning:
Active: an X indicates that the alarm is still active.
Ack: an X indicates that the alarm has been acknowledged by the operator.
Message: show the message associated to the alarm.
Date and **Time**: date and time from the activation of the alarm.
Class 1, 2, 3, 4, 5, 6, 7: alarm membership classes.
To ack: is marked by an X if the alarm requires a confirmation by the operator to be deleted from the list once it is no longer active.
Excluded: it is marked with an X if the alarm has been ruled out by the operator. The alarms remain excluded in the list until they are enabled. This attribute is lost when you exit the current session of *Runtime*.

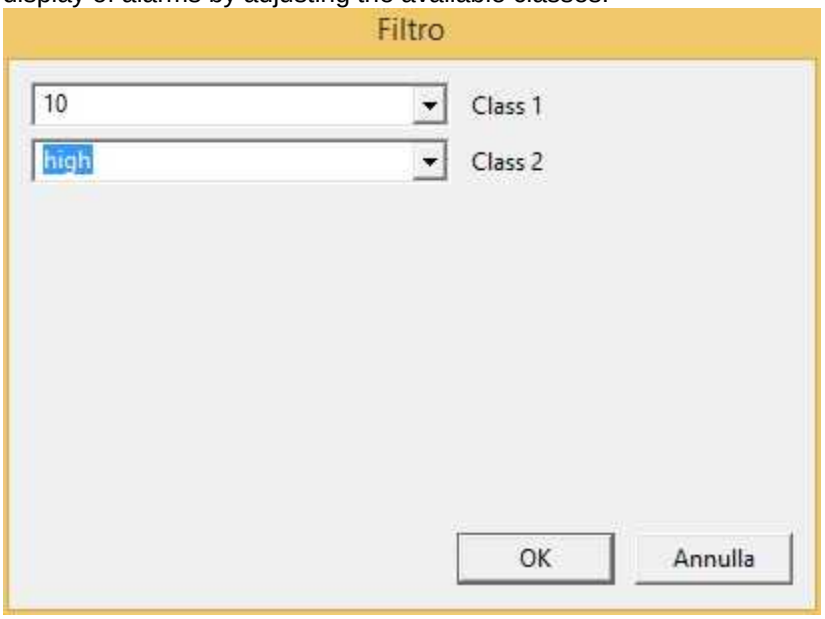
Each line can have one of the following colors:
Red: the alarm is still active
Blue: the alarm is no longer active but needs confirmation
Black: the alarm was excluded

After pressing the "Sort" button, the window below will open, where you can choose a criterion by which to order the alarm list.



The selectable criteria are: Date & Time, Class 1, Class 2, Class 3, Class 4, Class 5, Class 6, Class 7 and Message.

If you hit the "*Filter*" button the following window will open, in which you can specify filters on the display of alarms by adjusting the available classes.



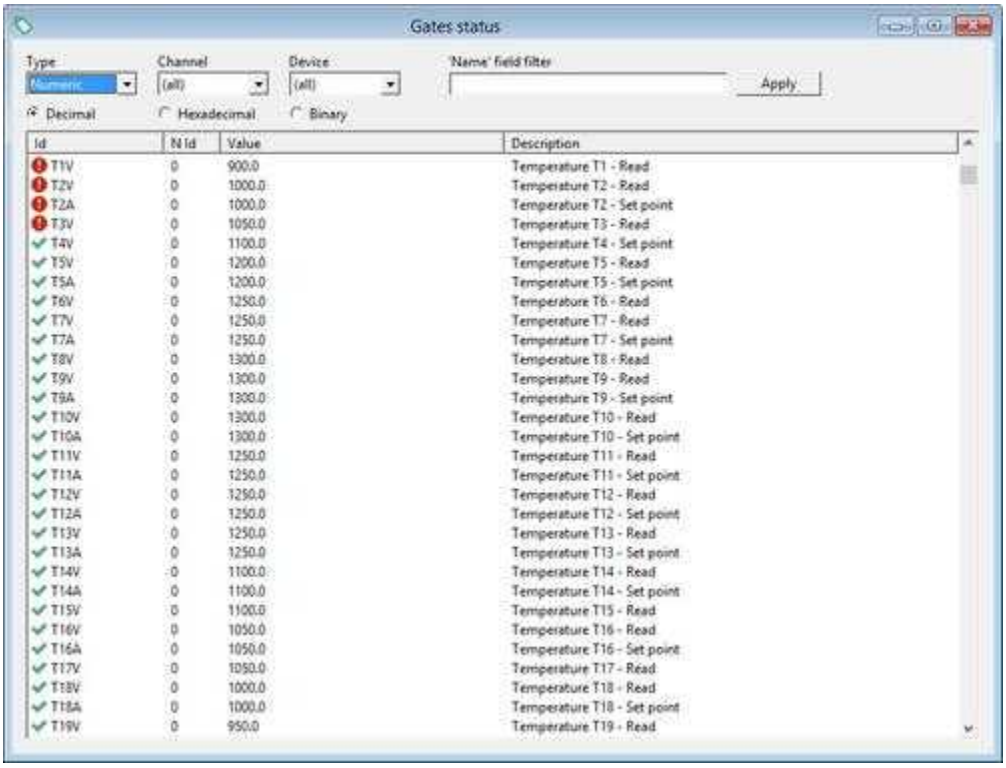
If you hit the "Confirm" button, the selected alarm will be confirmed. It is also possible to confirm it by double clicking on the row.

4.4 Events status

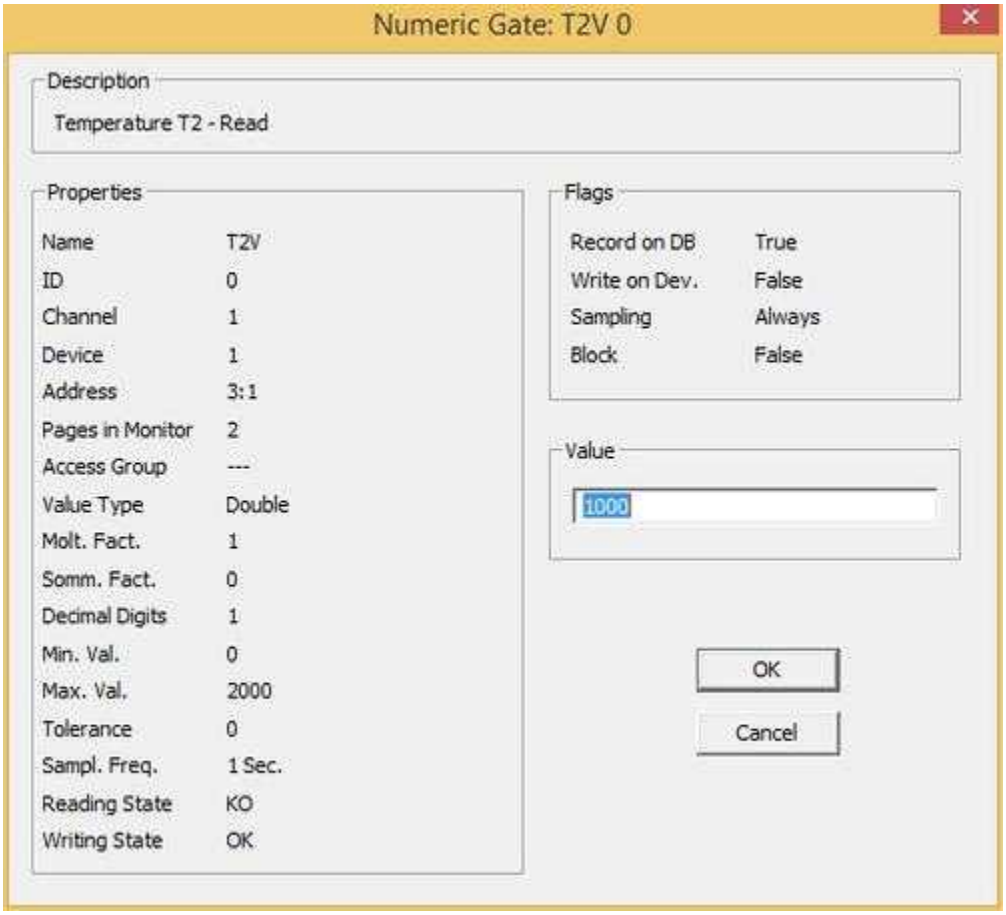
Refer to *Alarms status* for more details.

4.5 Gates Status

By selecting this item it is possible to show the status of the gates. It will be shown the window in figure.

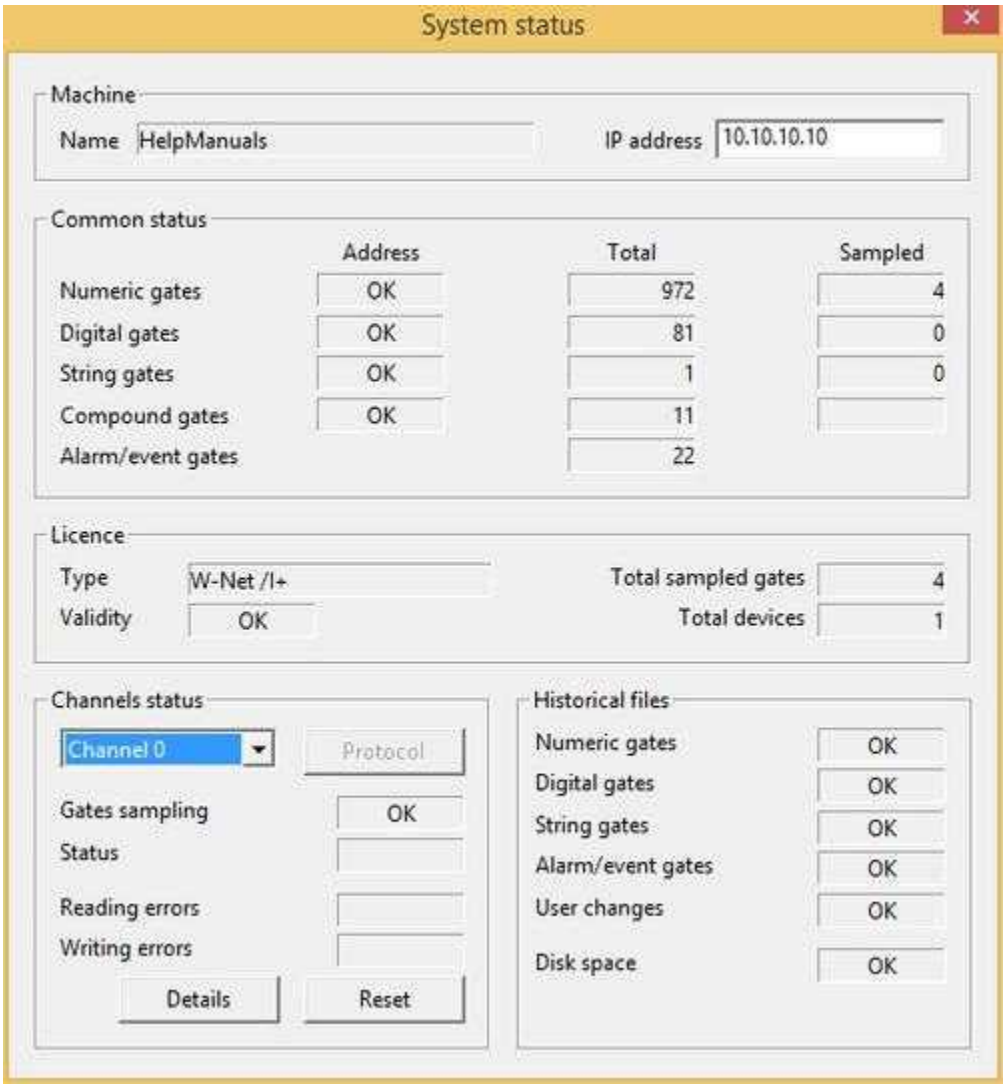


The dialog box allows to select: the type of gates to show, the channel and the device. The sampling status is indicated by the icon ✔ or ❗ beside every gate. To have more details on the status and properties of every single gate you just need to select the corresponding row and press the *Gate Property* button or double click on the row of the gate: it will be shown the window in next figure.



If Toolbar is enabled, the presence of at least one gate communication alarm will be indicated by a red exclamation mark on the Gates status icon .

4.6 System status



In this window are shown some general information about the application; more in details:

Station - Name : name associated to the computer.

Station IP address: IP address associated to the computer.

Common status - Address : if it is **KO** means that there is almost a numeric,digital or string sampled gate with a wrong address (not congruent with the communication protocol selected).

Common status - Total : total number of numeric,digital,string,event or compound gates.

Common status - Sampled : total number of numeric,digital,string sampled gates.

Licence - Type : Name of the software licence

Licence - Validity : if it is **KO** means that the application it is not enabled to run with the current licence type.

Total sampled gates : total number sampled gates in the application.

Total devices: total number of devices in the application.

Channel - Protocol : show the configuration parameters of the communication protocol selected.

Channel - Gates sampling : if it is **KO** means that no sampling is active on that channel. it can be due to the fact that there are some sampled gates with wrong address, or the application it is not congruent with the current licence type.

Channel - Channel status : if it is **KO** means that communication channel it it not opened. Usually it is due to the fact that the hardware is not ready or is already in use from another application.

Channel - Writing errors : number of writing errors on the selected channel.

Channel - Reading errors: number of reading errors on the selected channel.

Channel - Detail : additional details about errors (available only for particulars protocols).

Channel - Reset: reset writing and reading errors on the selected channel.

Historical files - Numeric gates : if it is **KO** means that can't open the numeric gates historical file.

Historical files - Digital gates : if it is **KO** means that can't open the digital gates historical file.

Historical files - String gates : if it is **KO** means that can't open the string gates historical file.

Historical files - Event gates : if it is **KO** means that can't open the event gates historical file.

Historical files - User changes : if it is **KO** means that can't open the user changes historical file.

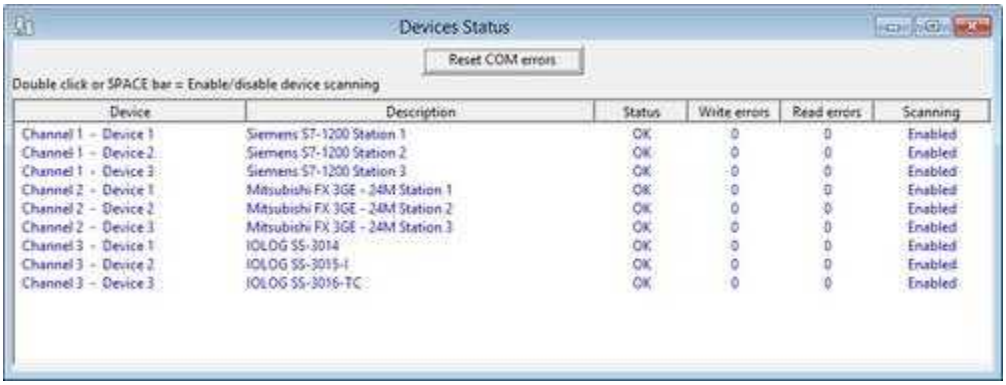
Historical files - Disk space : if it is **KO** means that is active the Disk full alarm.

If Toolbar is enabled, then the presence of some anomalies is indicated by a red exclamation mark on the *System status* icon ().

4.7 Devices Status

RunTime allows to show the communication status of every device, in fact, any writing or reading errors by everyone of them are shown. When the device is not answering any demand, its status is considered KO and the corresponding row will be displayed in red. It is also possible to reset any errors.

The presence of some anomalies is indicated by a red exclamation mark on the status icon of the devices on the bottom left ().



4.8 Historical Alarms

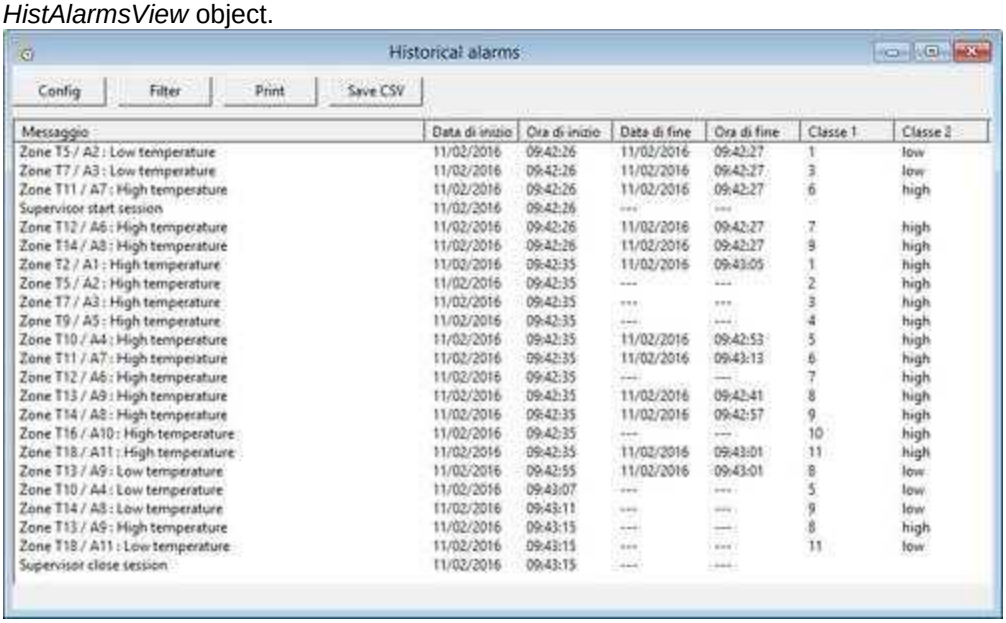
The "*Event and Alarm*" is a particular gate to which it is associated a message to display or record each time the condition associated with it is verified.

Simply by specifying the "*Alarm type*" in the "*General*" tab you can define whether the gate is kind of event or alarm. Regardless of whether it is of type event or alarm, management is almost similar: both you can specify a trigger condition, a time filter, a mode to withholding and file saving history. For both it is also possible to view the historic via the "*HistAlarmsView*" object.

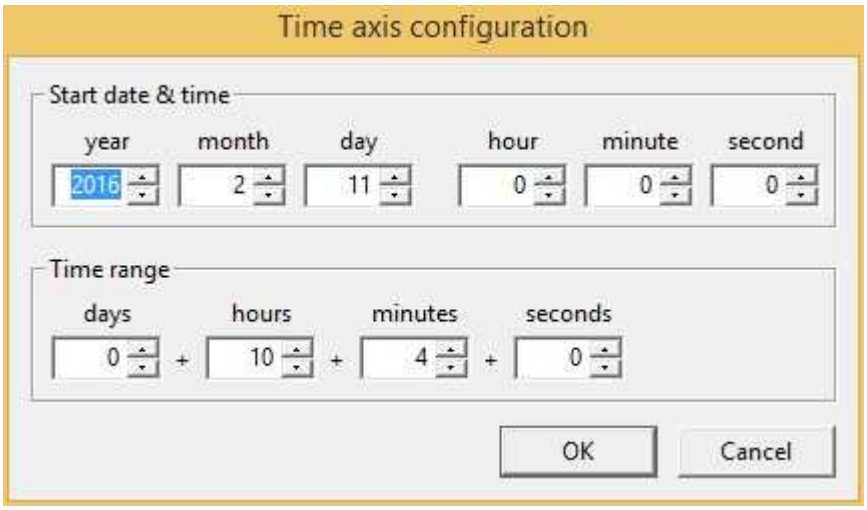
The only difference is that when a gate defined as "*Alarm Type*" became active, its message will be shown on a red background in the status bar at the bottom of the screen to inform the operator as soon as possible, regardless from the page of supervising shown at that time.

Some examples of events can be: "Machine start", "Machine stop", "Start production", "End production", while some examples of alarms can be: "Overtemperature alarm", "Emergency", "Alarm inverter protection" , etc.

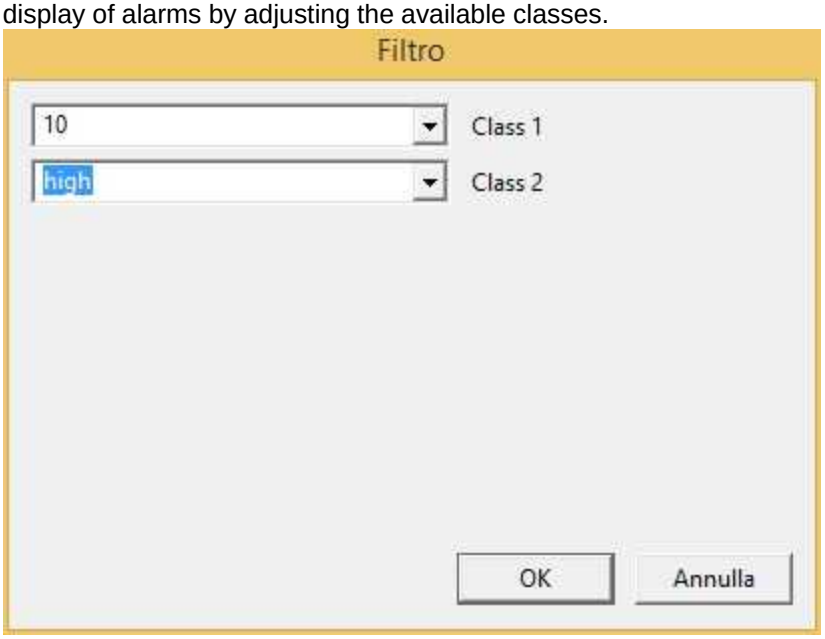
Through the following window you can see the alarm history.
This window can also be inserted into a template through the *Template Builder* tool and selecting the *HistAlarmsView* object.



Pressing the "*Configure*" button, you can set the time interval for which you want to see the alarm log.



If you hit the "*Filter*" button the following window will open, in which you can specify filters on the display of alarms by adjusting the available classes.



The "*Print*" button makes printing of the alarms included in the specified time.

The button "*Save CSV*" saves a CSV file of the alarms included in the specified time.

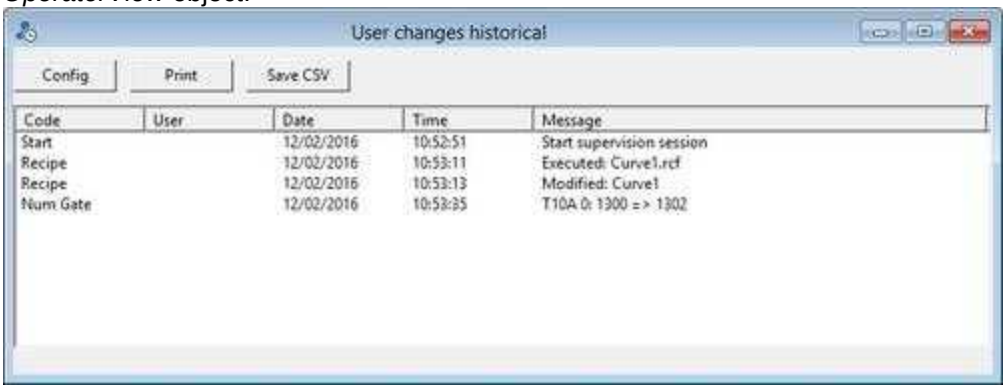
4.9 Historical Events

Refer to *Historical Alarms* for more details.

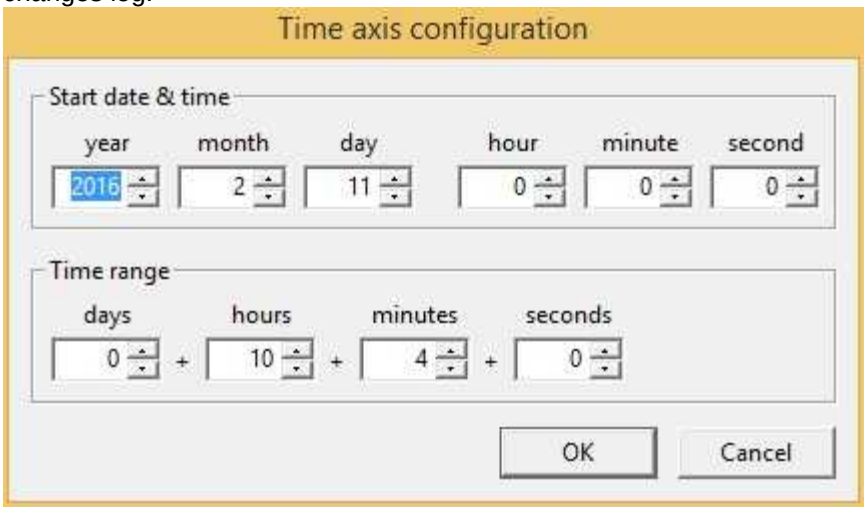
4.10 User changes

All operator interaction with the system of supervision, such as password authentication, sending recipes or modifying individual set point values are recorded by the system itself.
Through the following window you can see the list of these interventions.

This window can also be inserted into a template through the Template Builder tool and selecting the *OperatorView* object.



Pressing the "*Configure*" button, you can set the time interval for which you want to see the user changes log.



The "*Print*" button makes printing of the user changes log included in the specified time.

The button "*Save CSV*" saves a CSV file of the user changes log included in the specified time.

4.11 Multilanguage

4.11.1 Introduction

Often presents the need of having to develop the same application in different languages, for ease of use by the end user. However it is not necessary to generate multiple copies of the same application and then proceed with the translation for each of them; through the instrument *Multilanguage Editor* is possible to equip a single application of the multilanguage support and then associate it up to a maximum of 10 languages.

Via the *Supervision* | *Language ...* menu item you can select the real-time language in which to display your application without the need to restart it.

Refers to Multilanguage Editor guide for help about translations creation process in the various languages.

4.12 Charts

4.12.1 Introduction

This page allows you to view as a graph tracing the trend of process variables versus time.

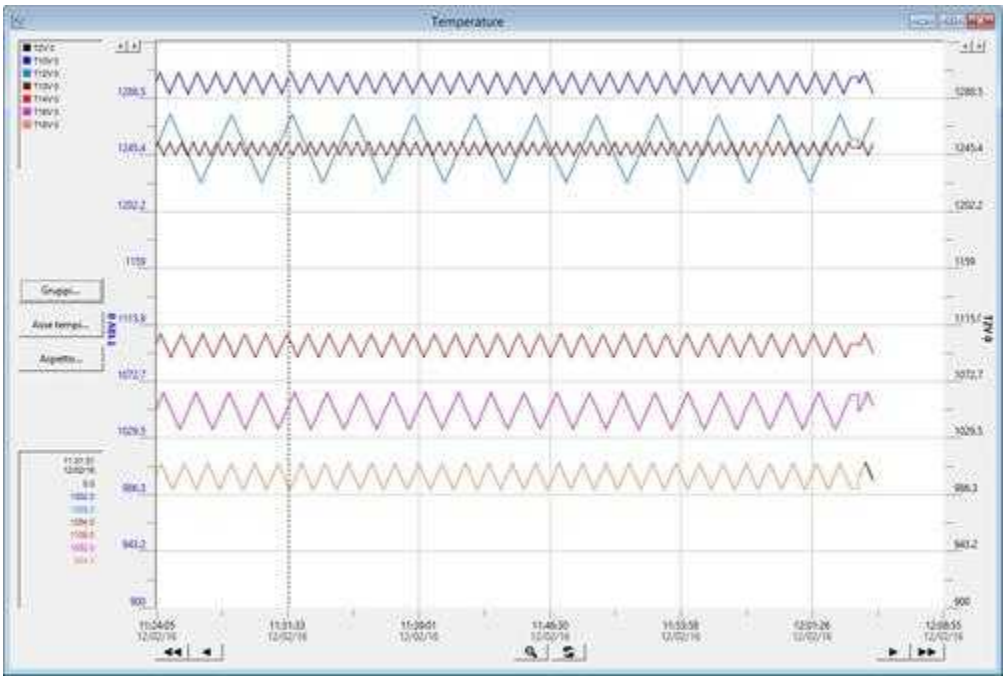
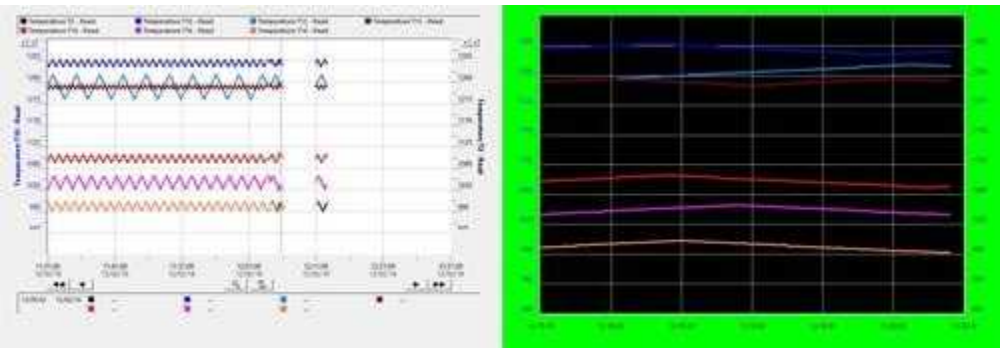


Figure 1

This window can also be inserted into a template through the *Template Builder* tool and selecting the *Chart* object: the object's extended configurability allows you to reach the most graphic result close to the developer's requirements. Here are some examples of Chart items included in Templates.

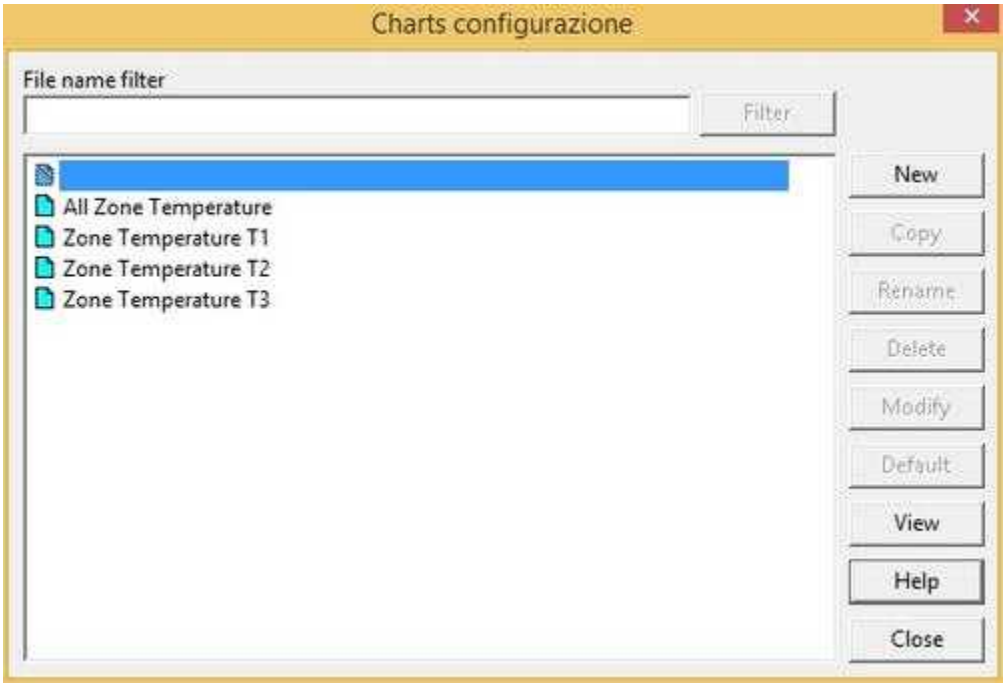


Referring to figure 1, we can notice the presence of:

- A legend, in the top left, which shows the color and the name of the gate of each track. By double-clicking on it you can change the current group (this change is not permanent).
- A cursor window, showing the value of the Y coordinate of each curve at the vertical line positioned by the mouse on the chart plot.
- The buttons  that let you move the time axis.
- The button  lets you undo the graph zoom performed by holding down the left mouse button and moving the cursor to define a rectangular area to be magnified.
- The button  that takes you back to the current date time display.
- The button "*Groups*" which allows the creation or selection of a graphic group.
- The button "*Time axis*" that allows you to set the time interval for which you want to see the graphic pattern
- The button "*Aspect*" that allows you to configure the appearance of the plotted curves.

4.12.2 Groups

A **chart group** is a list of maximum 10 gates that will be drawn together in the same **Chart** object.
It can be composed of numerical, digital or composed gates.
Trough the following window it is possible to manage the the chart groups list.



: select no chart group.
: default chart group - this group will be automatically showed in the chart object if it has no group defined.

File name filter : apply a filter to the chart groups list showing only files that verify the filter rule.

New : create a new empty chart group

Copy : copy an existing chart group

Rename : rename an existing chart group

Delete : delete an existing chart group

Modify : add or modify chart group gates list (Group definition)

Default : set or reset the default chart group

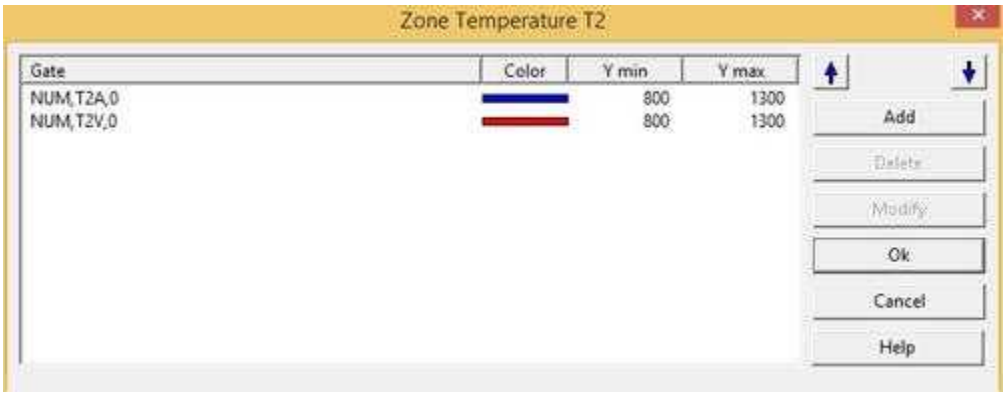
Select : close the window and return the selected chart group to the caller window.

View : close the window and tell to the chart object to trace the selected chart group.

Close: close the window

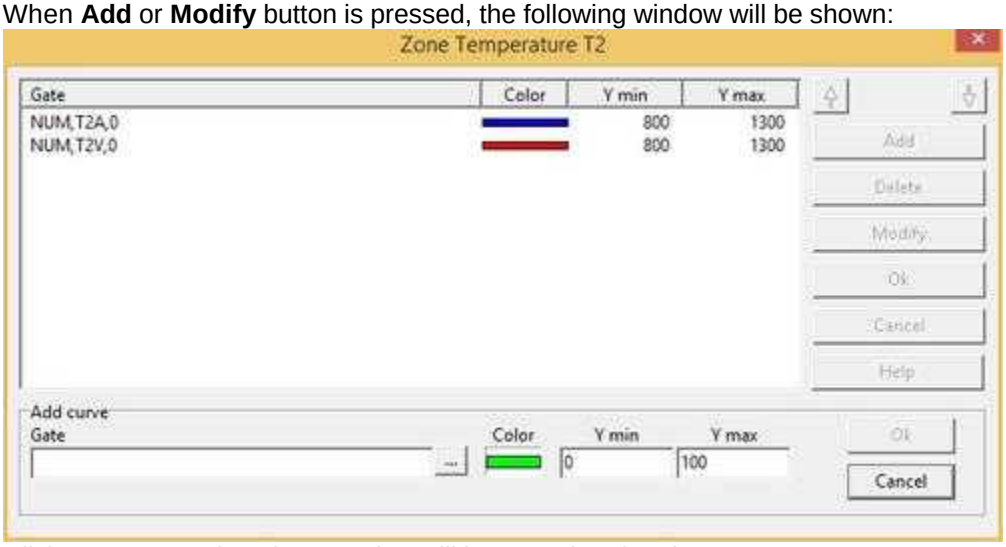
4.12.3 Group definition

A **chart group** is a list of maximum 10 gates that will be drawn together in the same **Chart** object.
It can be composed of numerical, digital or composed gates.
The following dialog box allows to add or remove gates, choose curve colors and the minimum and maximum values of the vertical axis.



Add : add a new curve to the group.
Delete : remove the selected curve from the group.
Modify : modify the selected curve

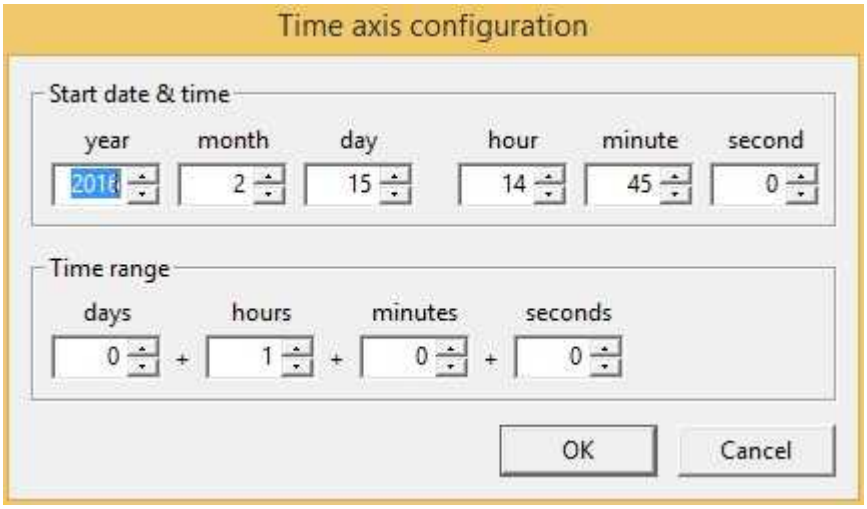
When **Add** or **Modify** button is pressed, the following window will be shown:



Click on **"..."** to select the gate that will be associated to the curve.
Click on curve **color** to select the color that will be associated to the curve.
Y min : specify the minimum value of the vertical axis for this curve.
Y max : specify the maximum value of the vertical axis for this curve.

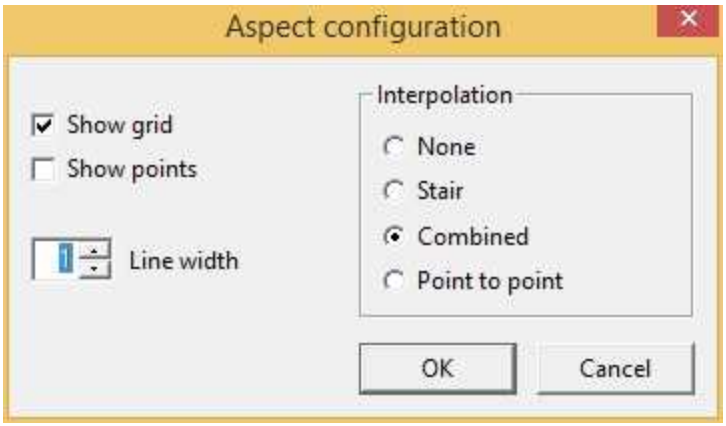
4.12.4 Time Axis

Through the window in figure, it is possible to indicate the start date and time, and the time interval (minimum 6 seconds) that will form the times axis in the chart.



4.12.5 Aspect

Through the window in figure, you can display a grid, highlight the sampled dots, change the thickness of the stroke and the type of interpolation between sampled dots:

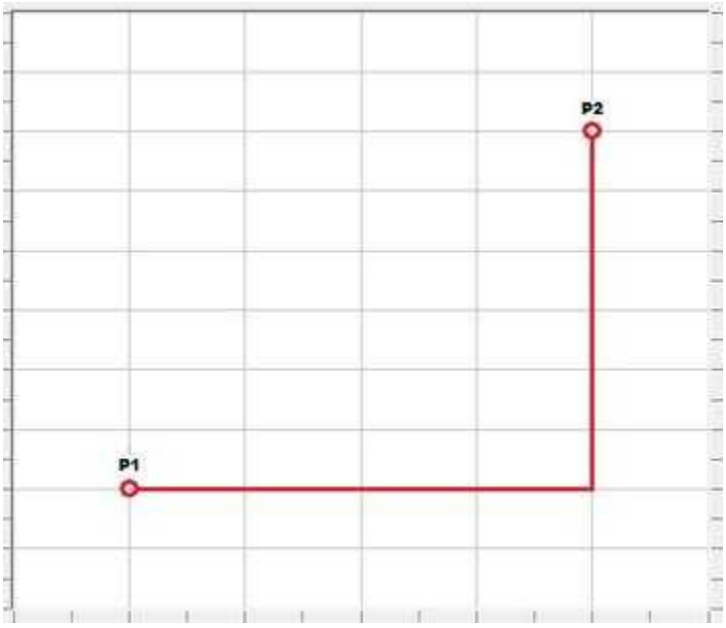


It is also possible to set the type of interpolation between dots.

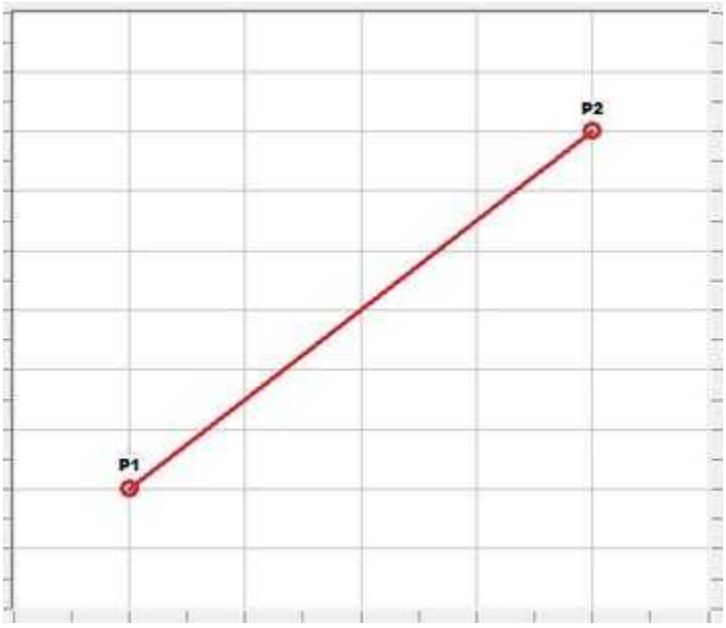
More in details:

Interpolation - None: only the sampled dots are shown

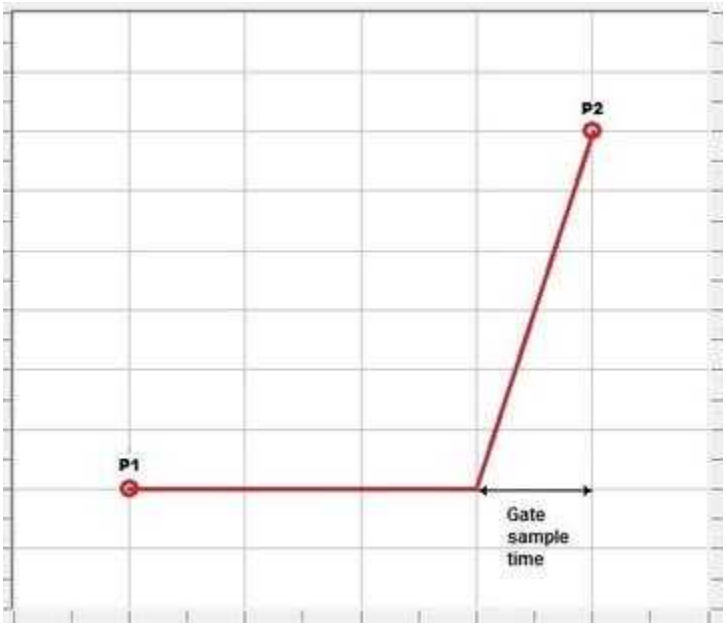
Interpolation - Stair: the dots are connected by a vertical and a horizontal line



Interpolation - Point to point: the dots are connected by an oblique line



Interpolation - Combined: The points are joined with one or more lines taking account of the sampling time of the gate.



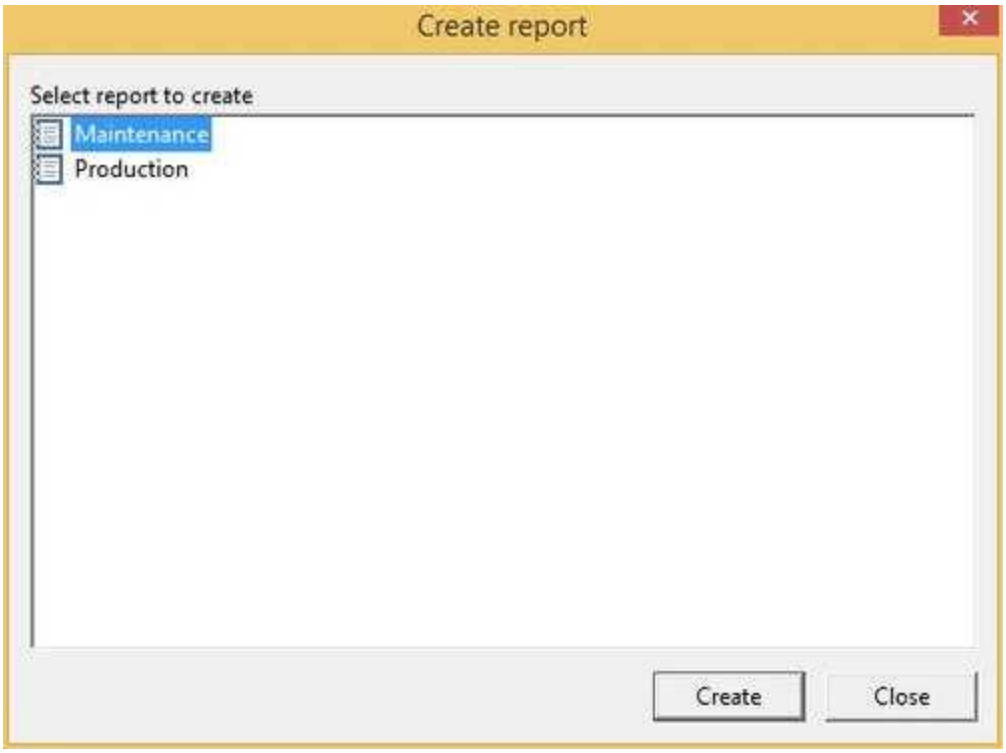
5 Reports

5.1 Introduction

Runtime allows to draw up, display and print reports configured with *Project Manager*. Every time there is a need for a new report, *Runtime* interprets the basic file and creates a new file containing the assessment of all the expressions in the report.

5.2 How to Draw up a Report

The operator can create a report whenever he wants by simply selecting his name and pressing the *Ok* button.



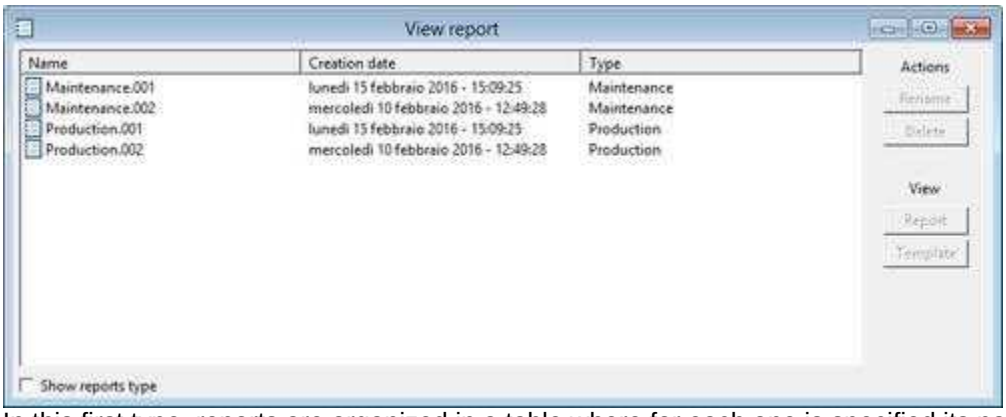
Runtime, according to the current status, creates a new file, displays it and automatically prints it, if the configuration contemplates for this.

Runtime, will create a disk file based on the selected report template and substituting the fields specified with the current gates values. This report can also be automatically displayed or sent to the printer.

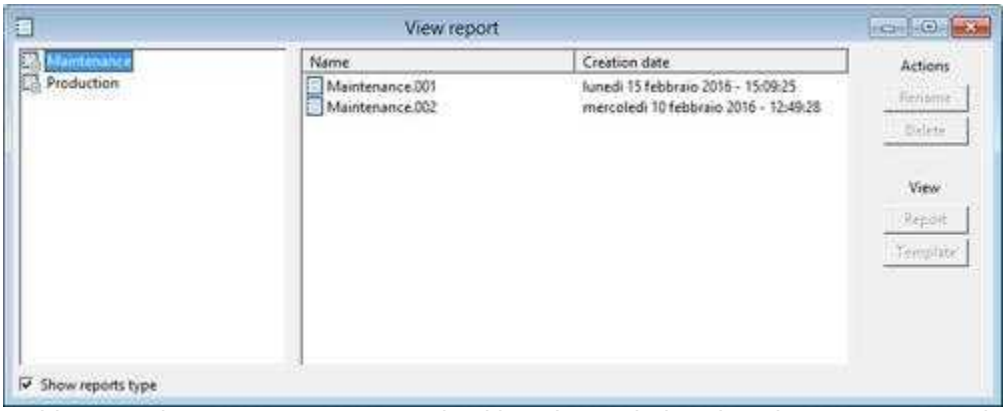
5.3 How to Show a Historical Report

Every type of report can have a certain number of historical files defined in the configuration (See: *Project Manager*). It is possible to save particular reports in order to keep them, avoiding the overwriting from new generated reports.

There are two possible windows to show generated reports:



In this first type, reports are organized in a table where for each one is specified its name, the creation time and the type.



In this second type, reports are organized in a three window that shows report type (on the left) and a table where for each one is specified its name and the creation time.

To simplify the search, it is possible to sort the table according to one of the properties of a report: just click on the corresponding column header. Name and type sorting are increasing, while the time sort is decreasing, so the last created report will be in the first line.
In the first column are shown the name of the reports: the names that have an extension such as .001, .002, … are belonging to the circular list of the historical. When a new report is created, this will be named with the extension .001, the others will shift of one position and the last (the older one) will be lost. To avoid the loss of a report with the creation of new one, it is possible to rename it: the report will be kept also when the list is full. To rename just select it and use press the *Rename* button. By pressing the *Delete* button it is possible to delete the selected reports.
By pressing the *Report* button, will be shown the selected report.
Using the *Template* button, the template with the name equal to the type of the report selected in the table will be shown (if exists). If the report has in the first two lines a date and time of start and a date and time of end (e.g. to be meant as a start and end of a production lot), just before the template opens, automatically, will be called up the functions *ChartSetTimeRange* and *HistViewSetTimeRange* (see). Doing so it is possible to show in the template the graph variables and the alarms' historical both related to the temporal window defined in the report.
The format of the date and time of start and end of the report is (they must be in the first two lines of the report):

```
gg/mm/aaaa – hh:mm:ss          date and time of start
gg/mm/aaaa – hh:mm:ss          date and time of end
```

For the two lines, after the specification of the seconds, it is possible to write whatever you like, e.g.:

```
15/02/2000 – 08:42:10          Start lot
15/02/2000 – 10:12:22          End lot
```

To easily write dates and times, it is possible to use the *Code Builder* function *ReportLotTime* (see *Code Builder*).

6 Macros

6.1 Introduction

Often, in a supervision project, comes the need to carry out special operations to the fulfillment of certain conditions or upon user request. Some examples may be the perform a calculation of a complex formula, send mail or SMS, read or write text files, operate directly on the port values, manipulate some of the synoptic objects currently in view, etc.
By *Code Builder*, the application developer can create these functions and they will have the following structure:

```
Function void MyTestFunction()
   ...
   ...
   ...
end
```

If in the next line the name of the function, you enter the #Macro directive, as in the examples below,

```
Function void MyTestFunction()
   #Macro
   ...
   ...
   ...
end
```

then this function will appear, during *Runtime*, in the list of functions available in the *Macros* menu item.
These functions can then be called up directly by the operator and does not support the use of the input parameters.

7 User access

7.1 Introduction

Runtime allows to limit the access and the changes in the pages to the authorized operators only, thanks to its own protection system. In fact, it's possible to associate with each operator a name, a password, and give to him a certain set of authorizations (groups); so you can define the groups that can access and modify the *Runtime* pages.

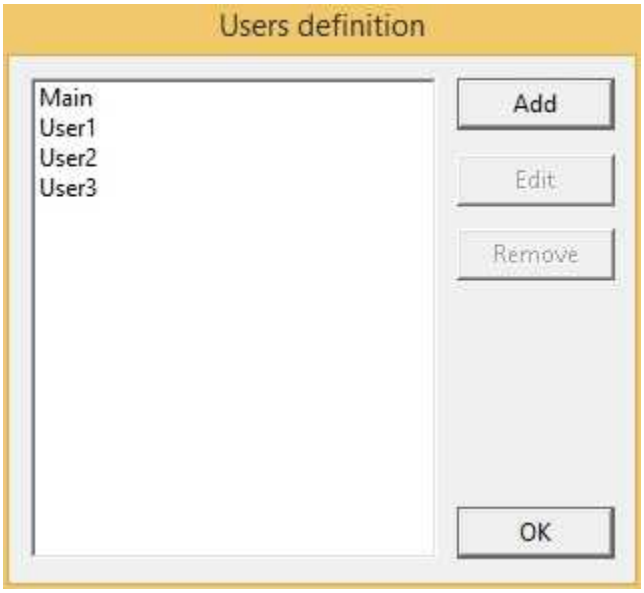
7.2 Insertion of the Access Code

By selecting the item *User access* | *Login...* menu item you can insert the user name and his password. This way all the rights concerning the use of *supervisor software* will be available.

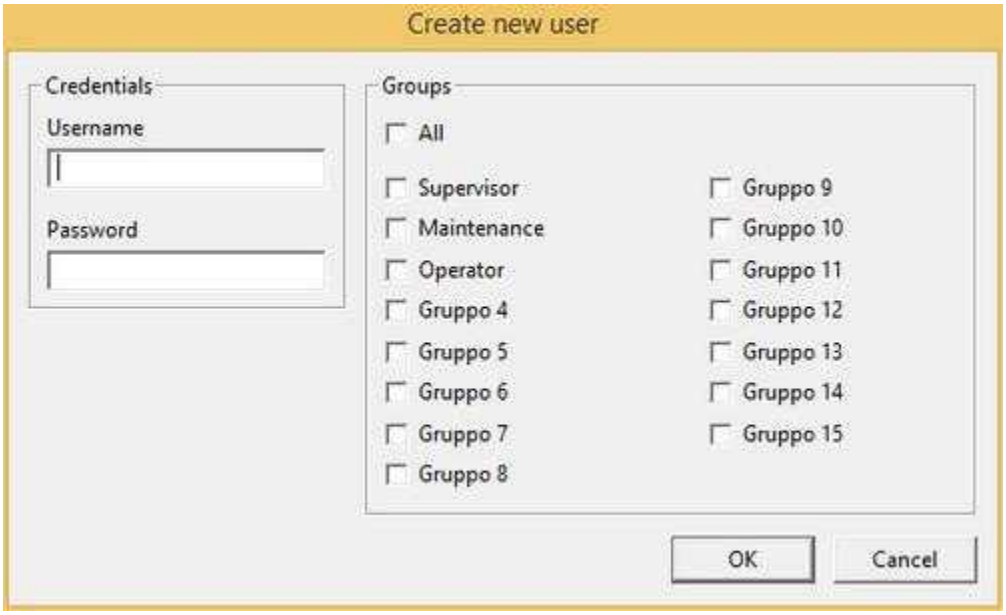
To disconnect the current user and come back to operator = *"None",* you just need to select the item *User access* | *Logout...*

7.3 Users definition

By selecting *User access* | *Definition* | *Operators* menu item the following window appears where you can add, edit or delete an operator to / from the list of those that are allowed to access the system.



You can define an unlimited number of operators with their passwords and membership groups. To do this, the dialog in the next figure will be used.

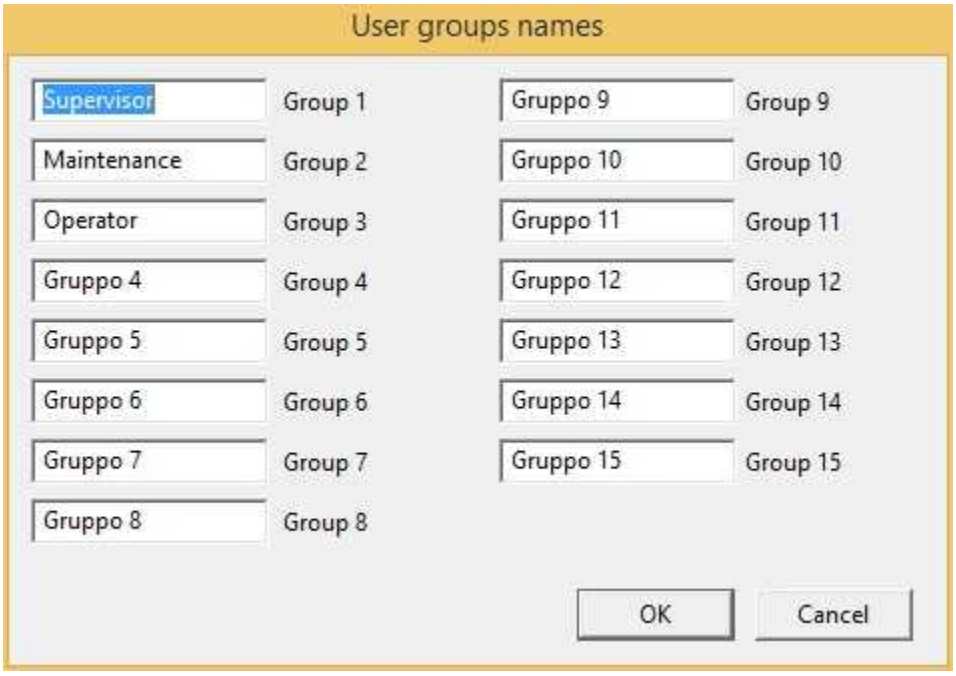


Simply plug in their respective fields: the name of the operator, his personal password and select groups.

Once entered the data, by pressing the OK button, the operator will be added to the list of *Runtime* operators. For the name and password does not differentiate between upper and lower case letters, and you can not have more operators with the same name.

7.4 Groups definition

By selecting *User access* | *Definition* | *Groups names...* menu item the following window appears where you can personalize the groups by giving them some names (maximum12 characters). This way their management will be easier and more intuitive.



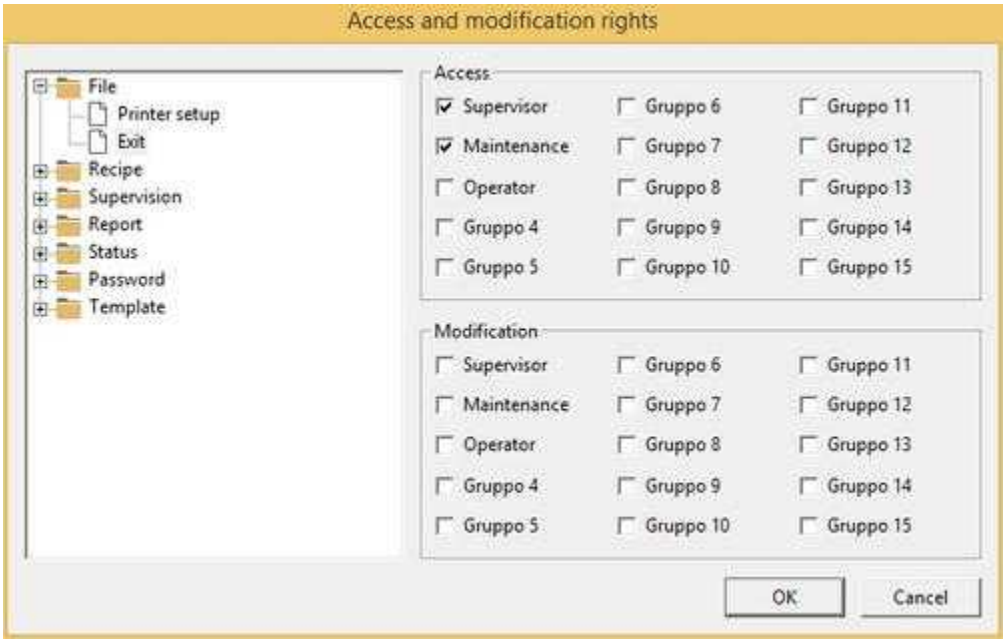
For example, it is possible to give the groups a geographic or functional meaning of the supervised process, indicate whether the various operators can or cannot access only the parts they are skilled in, award the groups a professional figure such as: *Engineer*, *Technologist*, *Operator* etc., each of them with different change and access rights.

Press the *OK* button to save your choices; *Cancel*, on the contrary, closes the dialog box without updating it with the changes.

The 15 groups are independent and there is no hierarchy between them: if an operator belongs to the group 13, it NOT inherit the authorizations of the following groups 14 and 15.

7.5 Definition of the Access rights to Pages

By selecting the menu item *User access* | *Definition* | *Access pages* ... the following window appears in which you can assign to different groups the ability to access and / or modify the *Runtime* pages.



On the left side there are the *Runtime* menu items. Selecting an item, on the right side will appear the respective access groups and authorized change or not; if the page has not selected groups, it will be accessible and / or editable by everyone.

To close the window confirming the changes, press the *OK* button, or press *Cancel* to cancel the changes.

8 Windows Management

8.1 Introduction

During *Runtime* you can open up to eight windows at once.

You can arrange the windows using the commands in the *Window* menu item. This menu also contains the list of all templates opened so as to facilitate their activation (for example return templates in the foreground that are no longer visible).

The *Window* | *Cascade* menu item has windows on top of each other with a certain offset from the upper left side; This allows you to see all open windows titles at the time.

The *Window* | *Tile* menu item has the windows next to each other resizing them, if possible, in a timely manner.

The *Window* | *Arrange* icons menu item has all the icons of the minimized windows in an orderly manner at the bottom left.