



Operator's Manual

Basic Operation



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1 General

This manual attempts to explain the basic operation of the "BatchXpert" process management system and the "BatchXpert Compact" system. The difference between the two systems is basically that the "BatchXpert Compact" system does not incorporate process management and does not incorporate advanced historical records. This chapter can be omitted if it is a "BatchXpert Compact" system.

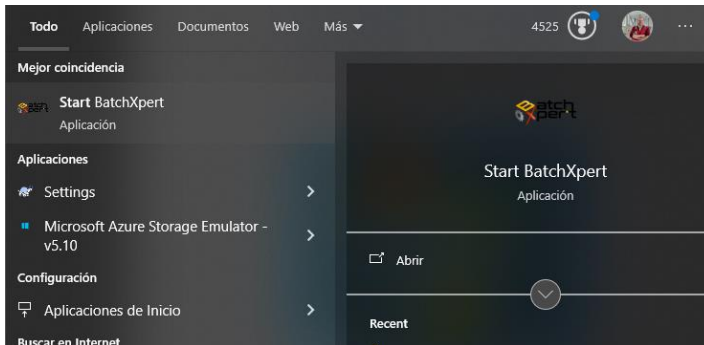
The BatchXpert system is a process management system that incorporates standardized modules to form process images. These modules always incorporate certain features that are available to the user. The modules and their functions will be described later in the document.

The "BatchXpert" system also incorporates a process configuration and management system with its respective historical data. The functions of the configuration editor and the historical data viewer are described in the respective manuals. This manual is focused on the general handling of the HMI, the process images and its control modules

For more information on the "**BatchXpert**[®]" system , please refer to the page www.Mlogics-Automation.com

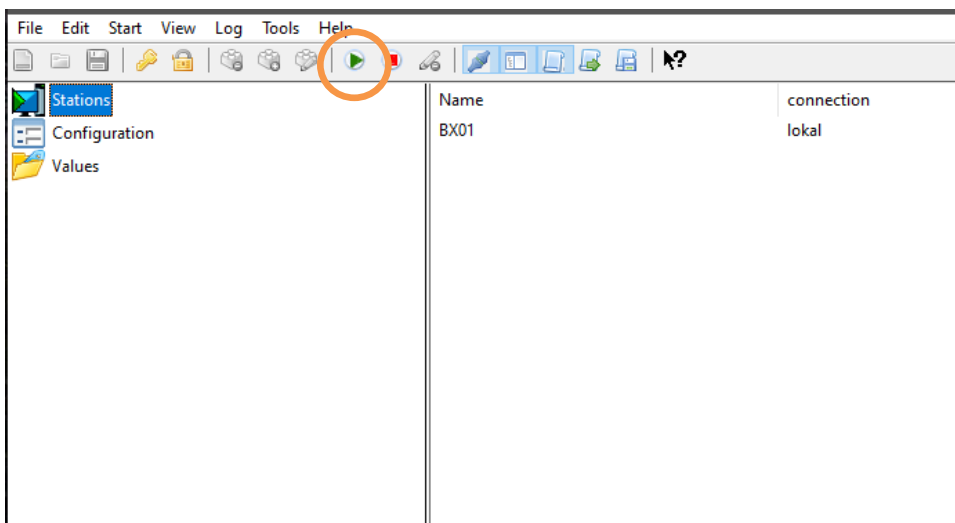
2 Boot the system

When you start your computer and Windows, you can start the BatchXpert system with the icon on the Desktop or with the Windows Start Menu with the "Start BatchXpert" option.



Normally, the system is installed in such a way that the BatchXpert system automatically starts. If this does not happen, you can boot the system by clicking on this icon;

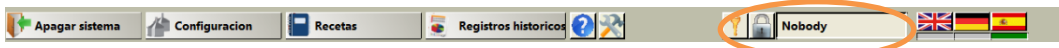
That opens the "GraphPic" program where you can boot the system by clicking the Green Traffic Light button on the toolbar.



If the main system screen appears, the system is fully booted.

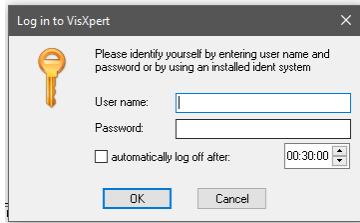
3 Operations & General Control

3.1 System login bar



This bar shows the user who is currently logged into the system, and also allows you to change the user logged into the system.

A click on the key button opens the "Login" window where the user must enter their username and password. After this authentication, the user can use the system within the usage rights that are previously set by the system administrator



The "Lock" button "logouts" the system, and leaves everything locked. To use the system again, the new user must enter their credentials with the "key" button

3.2 The Alarm Bar



The alarm bar always shows the most recent alarm in the system. The information displayed is (from left to right):

1. Alarm Time
2. Alarm Number
3. Alarm Tag
4. Alarm Description
5. Alarm Class
6. Total number of alarms in the list

By clicking on the list of alarms or the "MeldeSys" button, the historical alarm reader opens. In this reader you can see all active alarms and historical files. For more information, please refer to the respective manual.

Since each alarm in the system also triggers an acoustic "Horn" signal, this acoustic alarm can be switched off and confirmed with a click on the "Horn" button.

3.3 Main Menu Bar



From all windows of the system you can access the "System" menu, which allows you to perform several general actions of the BatchXpert system.



This menu allows you to shut down the system, open the process configurator, and open the historical process data reader. For more information on these applications please see the respective manuals.

3.4 PLC Clock & Connection Status



On the right side of the system menu bar, you can see the connection status of all PLCs connected to the system. In the event that a PLC loses connection to the system, this status is indicated in this menu bar.

In case of loss of communication with a PLC, please contact the Maintenance department, because in many circumstances this error is caused by the failure of a network device.

3.5 Help Menu

The help menu explains the general meaning of symbols and colors. This menu is integrated into the project and is accessible in the menu bar at the bottom of the HMI.



This opens the help menu, where you can access the system manuals.

4 General Operation in Process Images

4.1 Symbols in process images

All modules are represented by symbols in the process images. These symbols indicate the current status of the module with different colors. Although some modules have certain states that are represented by other colors in images, all images follow a basic scheme. Generally, states are represented by the color of the symbol box and the symbol within the box.

The colors of the standard modules are:

- **Active Alarm (Red)**

An active alarm is represented by tango red in the symbol, as well as in the box



- **Alarm Not Active (Orange)**

This state is represented by red in the box. The symbol color may show a different state.



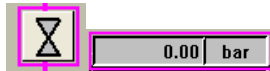
- **Simulate and Ignore (Yellow)**

Simulation mode and ignore mode are represented in the tableau's and symbol's color frames.



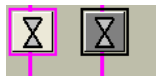
- **Warning Situation (Pink)**

Situations that require the operator's attention, but are not outright faults, are represented with pink color in the symbol box. Those situations can be warnings, status notices, ...



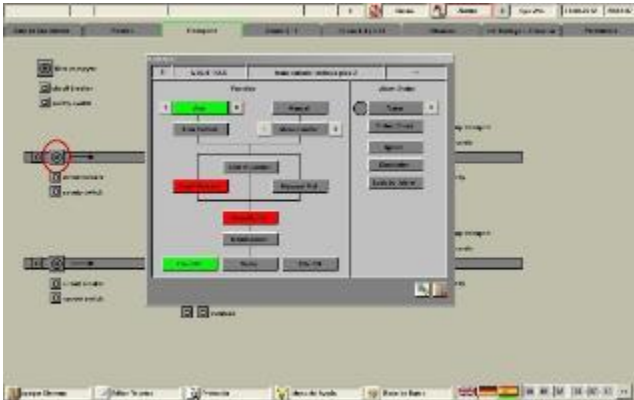
- **Status: Automatic or Manual (Gloss Grey/Dark Grey)**

If a module is in a manual or automatic state, it is represented by different background colors of the modules

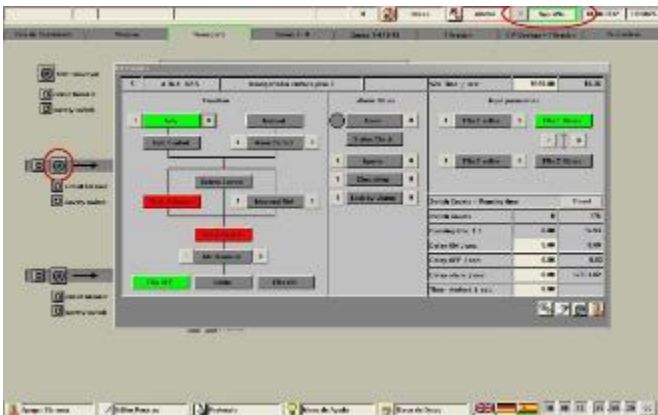


4.2 General

Each type of control module has two windows with details regarding this module. One window with general details and one with advanced details. To open the detail window, simply right-click on the module you want to view. A window opens with details about the selected module.



At the top of the menu bar, there is a "Detail" option that allows you to open the advanced detail sales of these modules. When the "Detail" mode is enabled (Green), and a right-click is made, the Advanced Details window opens instead of the sale with the general details.



The advanced details window is intended for system administrators and maintenance teams. To open this window you will need power user rights, and usually operators do not own this right.

The Advanced Details window generally allows you to adjust settings, limits, and special functions, depending on the type of module.

The following chapter describes the modules, their detail windows, and the functions they have.

4.3 Enter Nominal Values

Each numeric value that can be adjusted by the operator is entered through numeric input boxes . Generally nominal values (values that can be adjusted) are represented by a white or very bright background color. The current values (the ones that can't be adjusted, that represent some system value) are instead represented with darker background colors, so that the nominal values of the current values are more easily targeted.

If a face value is tampered with, its value changes to red, indicating that it is tampered with. At this moment the stock is NOT active yet! With the "Enter" key, all the values that are manipulated (the red ones) are sent to the PLC and thus activate them. The "ESC" key aborts this action and all nominal values return to the value they had before the manipulation. You can manipulate several nominal values and activate them at the same time with the "Enter" key.

In this image you can see two values (the red ones) that are manipulated to zero, a value that is being edited (the one marked with blue) and a value that is still not being manipulated (the black one).


0.00	0.00
0.00	0.00

5 Modules

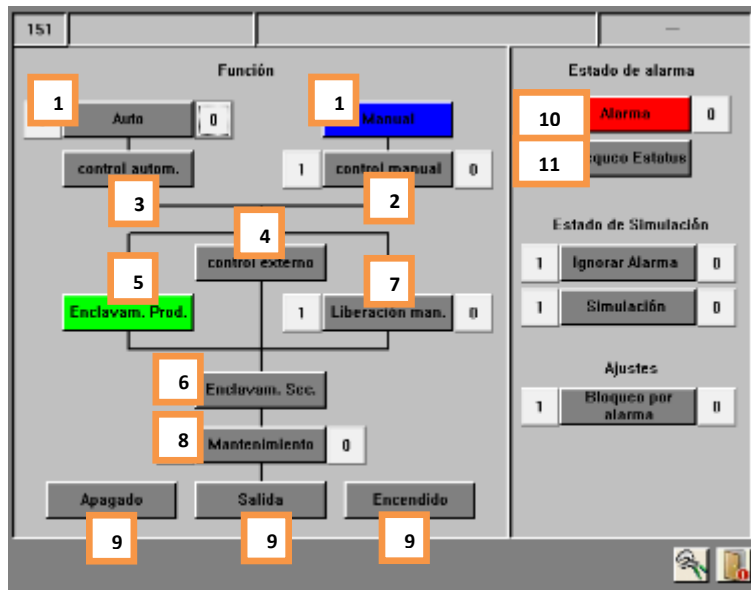
5.1 Actuators

Actuators represent all the elements that can be controlled in the field from the System. Usually this includes valves, motors, pumps, lamps, etc.

Actuators have several different representations in the process images, usually representing valves, motors, pumps, or the like.

Here are some examples: 

5.1.1 General Details



In this window, you can examine the current status of an actuator. The controls for the various functions are only available if the user has sufficient rights to perform this action.

Actuator states:

- 1. Auto/Manual (Green/Blue)**
This displays the actuator control mode. In "Automatic" mode, the actuator acts according to the control of the "Auto Control" signal. In "Manual" mode, the operator can activate "Manual Control" to control the actuator manually.
- 2. Manual Control (Blue/Grey)**
The signal status to control the actuator in "Manual" mode. If the actuator is on it will act, if it is in "Manual" mode. In "Automatic" mode this signal has no effect.
- 3. Automatic Control (Green/Grey)**
This indicates the status of the PLC's internal control. If the process requires that actuator to be activated, this signal will be on. This signal only takes effect if the actuator is in "Auto" mode.
- 4. External Control (Green/Grey)**
This represents control that comes from a third "external" source. Generally this signal comes from a form of local control in the field such as keypads or similar. This signal

operates independently of the "Automatic" signal status, and also ignores the "Production Interlock".

5. Interlocking Production (Green/Red)

This displays the status of the production interlock of this actuator. Generally this interlock includes locks to prevent damage to the product produced, or start sequences, when the process has to follow a power-on sequence to avoid problems in the process. This interlock can be disabled with the "Manual Release" option.

6. Safety Interlock (Green/Red)

This interlock only includes blocks that have to do with safety for people and with the safety of the equipment. It generally includes blocks such as buffers, absolute limits, emergency stops, etc. This interlock cannot be ignored with any option. This interlock is always active.

7. Manual Release (Blue/Grey)

This option allows the program to ignore the "production interlock", this is a function for maintenance. In this way, actuators can be tested without the entire process being in motion. However, this function should not be activated permanently, as the production interlocks that are supposed to secure the product are not active, so the process is not safe! If this mode is activated, the actuator turns blue in the process images.

8. Maintenance (Red/Grey)

This mode allows you to lock an actuator so that it cannot be activated with any form of control. This mode is intended to lock a piece of equipment when it is undergoing maintenance. When this mode is activated, the actuator turns black in the process images.

THIS ACTION DOES NOT REPLACE OR FREE THE OPERATOR FROM THE ELECTRICAL AND/OR MECHANICAL LOCKOUTS NECESSARY FOR THE EQUIPMENT!

9. State of the Periphery (Green/Grey)

This shows the current status of the actuator. There you can see if the actuator has its On Confirmation, the Off Confirmation and if it tries to activate the actuator with its "Output".

10. Alarm (Red/Grey)

This indicates whether the actuator has the alarm status or if the alarm is not confirmed. Each actuator always monitors the status of its acknowledgments and drops an alarm if the acknowledgment is not as expected.

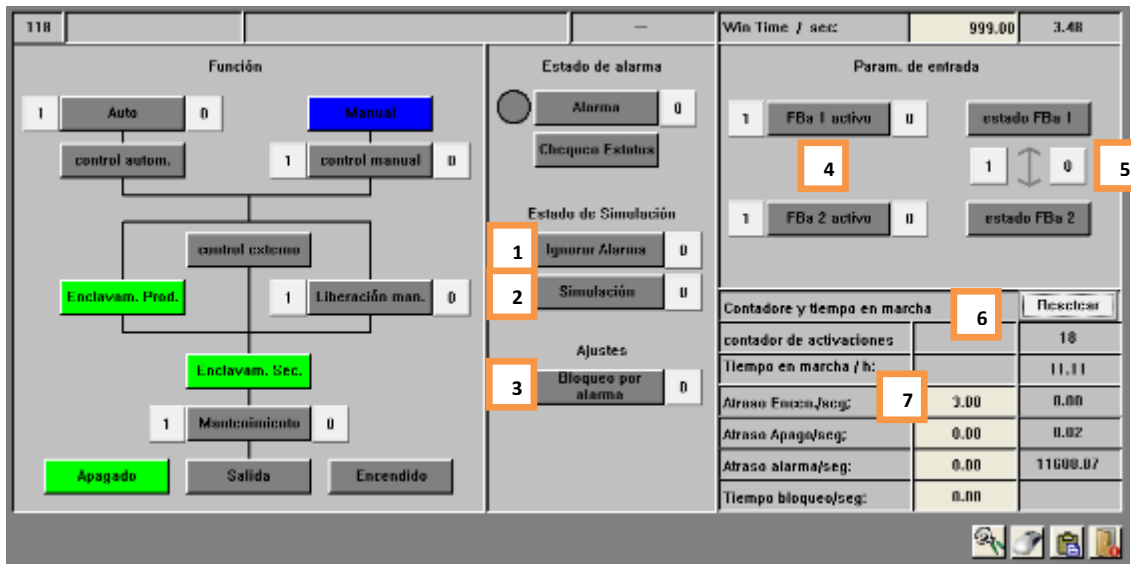
If the alarm still persists on the actuator, the circle to the left of the indicator is red; This means that the actuator is still in a faulty state, and the problem still persists. Thus the actuator alarm could not be confirmed.

If the circle is gray, it means that there was an alarm, which is already resolved but not confirmed. The alarm can be confirmed with a click on the alarm indicator.

11. Status Check (Lilac/Grey)

This indicates that the program detects a fault in the status of this actuator. Usually this happens during the process in the "Check Start Position" step, when an actuator is not in the spectator state.

5.1.2 Advanced Parameters



In this window you can change the actuator settings. This window is only accessible with a high user level, and is not accessible to operators. Delay times, alarm times can be set and the periphery of the actuator can be configured

1. Ignore Alarm

If this function is activated, the module will not trigger any alarms. The module continues to work with all its functions activated, but without triggering alarms. If ignore mode is enabled, the module turns yellow in the process image.

2. Simulation

This function allows the entire periphery of the actuator to be simulated. That means that the actuator completely ignores the status of its feedbacks and always assumes that the feedbacks are in the correct state. This mode is used if a feedback is lost, but the process has to continue to work. Thus the process can operate regardless of the condition of this actuator. The output of the Actuator is not affected by the simulation. If activated, the actuator turns yellow in the process image.

3. Alarm Pro Lock

This feature allows the safety interlock to be activated if the actuator has detected an alarm. Generally this function is used for motors, so that they are stopped if there is a failure in the motor.

4. Enable Feedbacks

Each Actuator can have up to two Feedbacks that it monitors. Feedbacks 1 is assigned to the "off" or "closed" state of the actuator, and Feedbacks 2 to the "on" or "open" state. Depending on which feedbacks exist for the actuator, they can be activated.

5. Status Feedbacks and Change Feedbacks

There you can observe the status of the signals from the periphery of the feedbacks. There is also the option of exchanging the peripheral signals of the feedbacks, in case the wiring requires it.

6. Gear values

The "Activation Counter" value shows how many times the actuator was activated since the last reset

The "Running Time" is the running hours of this actuator and counts the time the actuator was on.

With the Reset button you can reset these two values to Zero.

7. Actuator Timers

The actuator has three internal timers that can be adjusted by the user.

The "Off Delay" is the time that the actuator is still activated, even though the program no longer gives it the activation signal.

The "Delay On" is the time the actuator waits to activate when it receives the control signal.

The "Alarm Delay" is the time that the actuator waits until its feedbacks are in the expected state, before triggering an alarm.

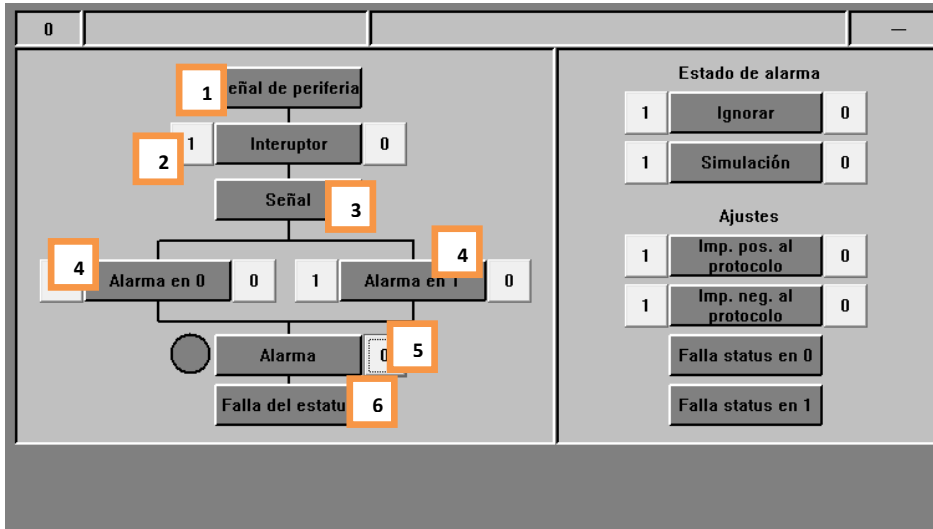
5.2 Digital Inputs

A digital entry represents all inputs that can have only two states. Sensors such as level sensors, proximity sensors, buttons, etc. fall into this category.

In the process images, the digital input is represented by the following symbol:



5.2.1 General Details



This window represents the status and basic settings of the digital input.

Digital Input Status:

1. Periphery Signal (Green/Grey)

This directly indicates, without considering delays or simulations, the signal status of the periphery of the digital input. This value is used for maintenance purposes only. If the operator wants to know the status of the digital input, he should refer to the "Signal" indicator

2. Switch (Green/Grey)

This is an adjustment that can be made on the digital input. This setting is only available to system administrators. The operator could see that the setting is on, but I couldn't turn it off, or turn this setting on.

The setting makes the digital input a retained "Switch", this means that, if the peripheral input is turned on, the input is set its "Signal" to the on state (Green). The digital input will maintain this state, even though the signal from the periphery has already been turned off, until the second pulse of the signal from the periphery is detected. The signal is retained (stays on, even if the signal from the periphery is off)

This function can be used, for example, for button panels that operate pumps with a single button. When the operator pushes the button, a pump ignites until the operator pushes the button again.

3. Signal (Green/Grey)

This represents the state of the signal with which the internal program works. Usually this signal depends directly on the signal from the periphery, but there too delays that can be adjusted at the input are applied, and the mode of the simulation is also considered.

4. Alarm at 0 or 1 (Green/Grey)

This is an adjustment that can be made on the digital input. This setting is only available to system administrators. The operator could see that the setting is on, but I couldn't turn it off, or turn this setting on.

These two settings indicate when the entry enters the Alarm state. Depending on the setting, the input has an Alarm if the "Signal" is off or on, or both; Of course, the alarm delay is applied before the module alarm is triggered.

5. Alarm (Red/Grey)

This indicates whether the entry has the alarm status or if the alarm is not confirmed. Each digital input triggers its alarm based on the "Alarm at 0" and "Alarm at 1" setting.

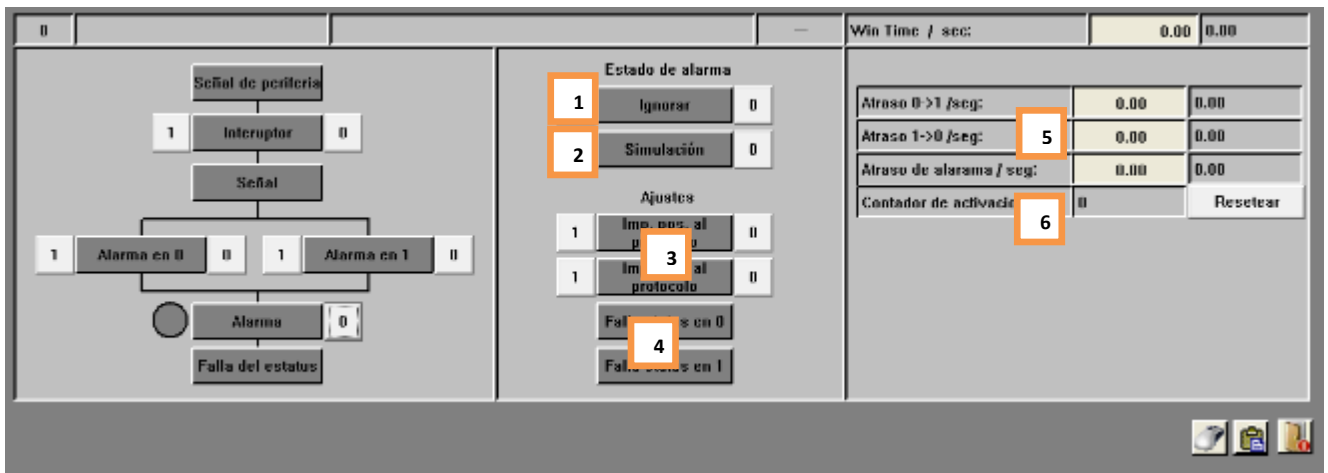
If the alarm still persists at the entrance, the circle to the left of the indicator is red. This means that the input is still in a failed state, and the problem still persists. Thus the entrance alarm could not be confirmed.

If the circle is grey, it means that there was an alarm, which is already resolved but not confirmed. The alarm can be confirmed with a click on the alarm indicator.

6. State Failure (Lilac/Grey)

This indicates that the program detects that the module is not in the correct state to continue its process. This usually does not indicate a glitch but rather a warning that a module is misadjusted, and that the program has to wait until this problem is resolved in order to proceed with the process.

5.2.2 Advanced Parameters



In this window you can change the settings of the digital input. This window is only accessible with a high user level, and is not accessible to operators. You can adjust delay times, times and types of alarms.

1. Ignore Alarm (Yellow/Grey)

If this function is activated, the module will not trigger any alarms. The module continues to work with all its functions activated, but without triggering alarms. If ignore mode is enabled, the module turns yellow in the process image.

2. Simulation (Yellow/Grey)

This function allows the entire periphery of the module to be fully simulated. This means that the "Signal" used by the program to react to the state of the digital input no longer depends on the "Periphery Signal", but can be adjusted by the operator according to the requirements of the process. This allows the process to continue working, even though a sensor is failing.

3. Positive Momentum to Protocol and Negative Boost to Protocol (Green/Gray)

This function only applies to the "BatchXpert" system, as the "BatchXpert Compact" system does not incorporate historical records. If one of these functions is activated, the module makes a record to the historical system each time, when the sensor switches from "on" to "off" or reverse (depending on the setting). This makes it possible to record changes in process signals in the historical system.

4. State Fault at 1 and State Fault at 0 (Green/Gray)

This indicator shows what status is expected from the program that has the digital input. If the digital input does not meet the status required by this setting, the module will trigger its "Status Failure" message.

This is not a setting, which can be changed by the operator, nor by the administrator. This is a function that can only be used by the PLC program.

5. Timers

The module has three internal timers that can be adjusted by the user.

"Delay Off" is the time the sensor is still activated, even though the periphery is no longer on.

The "Delay On" is the time the module waits to activate its internal "Signal" when the "Periphery Signal" is on.

The "Alarm Delay" is the time that the module waits to trigger the alarm when the module meets its "Alarm at 1" or "Alarm at 0" alarm condition.

6. Gear values

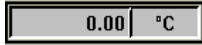
The value of the "Activation Counter" shows how many times the module has been activated since the last reset.

With the Reset button you can reset these two values to Zero.

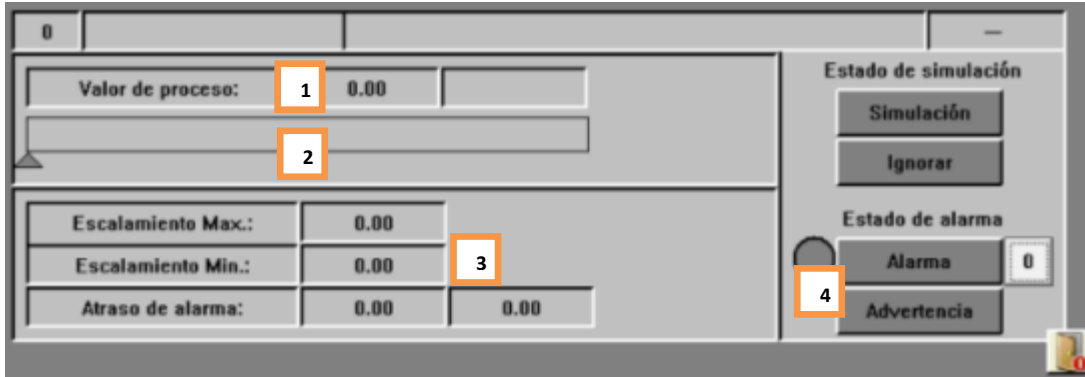
5.3 Analog Inputs

An analog input represents all measurements that are connected to the system. An analog input represents this measurement and displays the value of this measurement. You can also set various warning limits and alarms that trigger certain functions and alarms.

In the process images, the analog input is represented by the following symbol:



5.3.1 General Details



1. Process Value (Gray/White/Yellow)

In this box, the module shows its current process value and its engineering unit. This value represents the instantaneous value of this measurement already incorporating all scalings, polygons, and filters.

2. Value Range Bar

This bar shows the ratio of the process value to its high and low limits. It also indicates the limits with its arrows below the process value bar, to display the relationship of the limits of the module's process value.

3. Alarm escalation and backlog

Indicates the scaling values and the current backlog of the module alarm. Please see the "Advanced Details" section of this module for more details.

4. Alarm & Warning

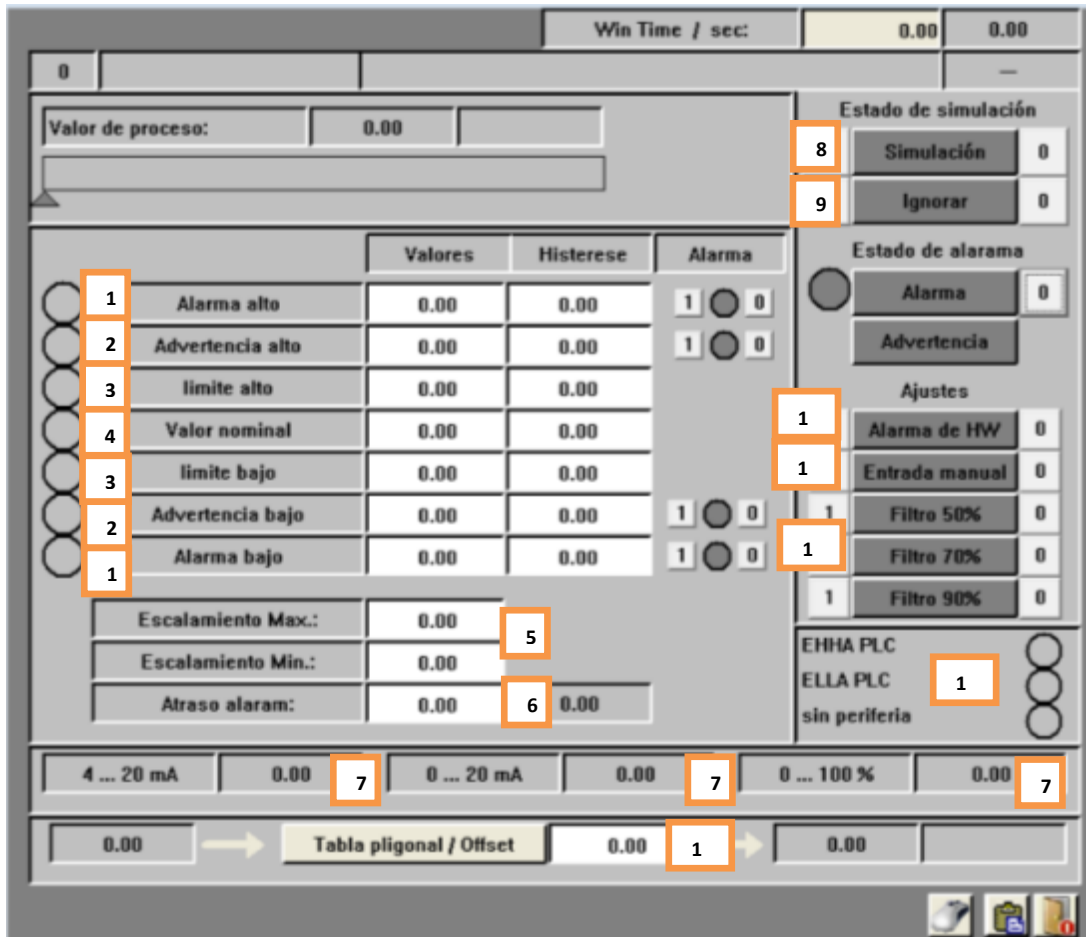
This indicates whether the module is currently in alarm status or if the alarm is not confirmed. Each module triggers its alarm based on the setting of its high and low alarm limits.

If the alarm still persists in the module, the circle to the left of the indicator is red. This means that the module is still in a failed state, and the problem still persists. Thus the entrance alarm could not be confirmed.

If the circle is gray, it means that there was an alarm, which is now resolved, but not confirmed. The alarm can be confirmed with a click on the alarm indicator.

The "Warning" indicator shows that the module's process value is either above its high warning limit, or below its low limit. This is a visual indication for the operator, to warn about this extraordinary state.

5.3.2 Advanced Parameters



In this window you can change the settings of the analog input. This window is only accessible with a high user level, and is not accessible to operators. You can set delay times, times and process value limits.

The hysteresis of the values generates a "dead band" to prevent the corresponding signal from fluctuating too much. The hysteresis function with all limit values and always above and below the set value. If the process value becomes less than the value set at the minus hysteresis limit, the corresponding limit signal is deactivated. The limit signal is lit again, if the process value becomes more than the limit value plus hysteresis.

For example: If the limit value is set to 90 with a hysteresis of 30.

The Limit Signal is turned off when the process value is below $90 - 30 = 60$.

If the process value goes up again, the Limit Signal turns back on when the value reaches $90 + 30 = 120$.

The current status of the boundary signals can be observed on the left side of each boundary in the circles. If this circle is **green**, the module detected that the process value is above the set limit value, also considering hysteresis. If it is **gray**, the process value is below the limit, also considering hysteresis.

1. High/Low Alarm

If the process value exceeds or lowers these limits, no matter how much hysteresis triggers, the "High Value" or "Low Value" signal in the program. The status of these signals is indicated by the circles on the left side of the setting.

If the option to trigger an alarm is enabled, these signals initiate the alarm delay. If this delay ends, the module triggers its general alarm, indicated by the color red.

2. High/Low Warning

In the same way as the alarm limit, this limit triggers its "Warning". But instead of initiating the alarm delay, with this limit the module directly activates the "Warning" mode, indicated by the purple color.

3. High/Low Limit

These two values are available for use by the user. The operation of these values depends only on the implementation in the project. By default, these two values have no effect.

4. Face value

This value is available for use by the user. The operation of this value depends only on the implementation in the project. By default, this value has no effect.

5. Scaling

These values adjust the scaling of this analog input. Since almost all analog measurements are connected to some standardized interface such as 0-20mA, 4-20mA, 0-10V, ...

In order to evaluate these values, the system must know the value of the minimum value of the interface and the maximum value of the interface. These values depend entirely on the measuring equipment that is connected to the analog input card of the PLC. The scaling value of the interface of the connected computer, and the scaling value of the module interface should always be the same.

For example:

If a temperature sensor emitting a 4-20mA signal is connected, where 4mA corresponds to 20°C and 20mA corresponds to 120°C, the scaling should be adjusted in the module to 20°C-120°C.

6. Alarm Delay

If the "High Value" or "Low Value" signal has been activated and the corresponding alarm position is activated, this delay begins to count. If the timer runs out, the module enters Alarm mode.

7. Periphery Values

These values are for maintenance. These values indicate the value of the interface that is currently connected.

8. Simulation (Yellow/Grey)

This function allows the entire periphery of the module to be fully simulated. This means that the "Process Value" used by the program no longer depends on the "Periphery Value", but can be adjusted by the operator according to the requirement of the process. This allows the process to continue working, even if a sensor is failing.

If this mode is enabled, the process value turns yellow, indicating the simulation mode.

9. Ignore Alarm (Yellow/Grey)

If this function is activated, the module will not trigger any alarms. The module continues to work with all its functions activated, but without triggering alarms. If ignore mode is enabled, the module turns yellow in the process image.

10. Alarm Hardware

If this setting is activated, the system monitors the status of the peripheral signal. If the module detects a fault in the interface, such as a cut cable or a dead sensor, the module activates its Alarm state and indicates the periphery fault in the "Periphery Status" box.

11. Manual Entry

This option is a setting that should only be set by the system programmer. This setting indicates that, instead of being a value of a measurement, the value is an input for some nominal value to the system. When this mode is enabled, the process value and the process module change to white.

12. Filters

If you try to measure values with a lot of fluctuation, such as currents or flows with a peristaltic pump, the measurement value will be very unstable and can affect regulators in a negative way. If these filters are activated, the process value is "smoothed" with an algorithm built into the system. To get more "smoothing" of the system, you can activate several filters at the same time.

13. Periphery State

This indicates the status of the periphery interface that is connected to the PLC. If the "Hardware Alarm" setting is enabled in the module, and the module detects a fault in the interface, this box indicates that the fault is active.

14. Polygonal table

Since some measurement values are not linear values, the module allows you to incorporate a polygon table to linearize these values. The value in this box indicates the number in the table that the module is currently applying to linearize its process value. If the value is set to 0, the module works without applying the polygon table directly.

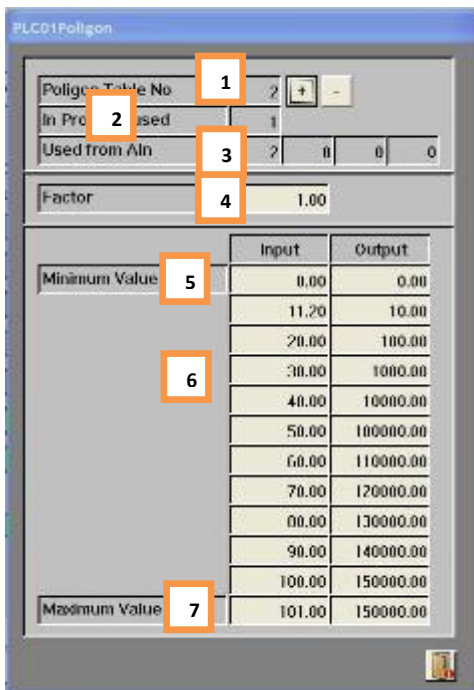
5.3.3 Polygonal table

If the dependence of the analog value and the process value is not linear, a polygon table can be activated to linearize the value.

This system is used, for example, when trying to measure the volumetric content in a non-cylindrical tank, through a water column measurement (pressure measurement). In this case, the pressure value (the measurement value) must be linearized, so that it corresponds to the volumetric content of the tank (the process value).

Example tank level with a pressure probe:

- 11.2 mbar 10.0 liters
- 20.0 mbar 100.0 liters
-



1. Polygon Table No.

This number indicates the number of the polygon table being edited in the current window. To change the table, you can use the two "+" and "-" buttons to change the table you edit.

2. Used in the program

This number indicates how many analog "Ainu" inputs are using the polygon table that is currently selected.

3. Used analog input "Ainu"

These four indicators indicate the numbers of the first four analog inputs used by the polygonal table. With this indication, you can easily identify the analog inputs that are currently being used by the selected polygonal table.

4. Factor

This factor is applied to all output values at the end of the polygon calculation. With this value it is possible, for example, to correct the error that is introduced if a polygonal table

is configured with water, but the product medium has another density (e.g. syrup, wort, ...), which would result in a false measurement.

5. Minimum Value

This represents the minimum value that can be calculated by the polygon table. It is recommended that this value corresponds to the Minimum Scaling of the analog input, where the polygon table is used. In the example above, if a measurement of 0-1 bar is used to measure the volume of a tank, the minimum value in the table should be 0 bar. If it is not possible to make the actual adjustment, this value must be calculated according to a linear formula.

6. Table Values

These values represent the values in the polygonal table. The input values correspond to the actual measurement of the measurement, and the output values correspond to the corresponding process values of these values. The traverse calculates the values continuously between the values entered into the traverse.

7. Maximum Value

This represents the maximum value that can be calculated by the polygonal table. It is recommended that this value corresponds to the Maximum Scaling of the analog input, where the polygon table is used. In the example above, if a measurement of 0-1 bar is used to measure the volume of a tank, the maximum value in the table should be 1 bar. If it is not possible to make the actual adjustment, this value must be calculated according to a linear formula.

5.4 Analog Output (PID Regulator)

An analog output represents all equipment that can be controlled with an analog output signal. This module also implements the full operation of a PID regulator, with all its settings and limit values. If the operation of a regulator is not required, the operation of the regulator can be disabled and the analog output can be operated directly as a value to an external computer. This module is used for all types of regulations, such as regulating valves, flow regulations, etc. It is also used directly, without regulation, such as nominal values to variable frequency drives, or other equipment

In the process images, the regulator is represented by the following symbol:

48.00	°C
0.00	%

5.4.1 General Details

1	01.10.V01	regulador de calentador de CIP		—					
1	Valor del proceso	0.10	°C	1	Simulación	0	6	Alarma	0
2	Valor nominal	48.00	°C	2	4	Val. nominal en manual	0	6	Advertencia
3	Valor de salida	0.00	%	3	5	Salida en manual	0	7	falla estado
8									

1. Process Value

This represents the current value of the process that the regulator uses for its regulation algorithm. This value usually comes from an analog input. This value can be simulated when the "Simulation" mode is activated.

2. Face value

This represents the nominal value of the regulator. The throttling algorithm will try to adjust its output in such a way that the process value comes as close as possible, as quickly as possible to the nominal value. Generally, this value comes from processes and their sequences. If the "Manual Nominal Value" mode is activated, the value can be adjusted without the process intervening. In this mode, the nominal value can be adjusted directly to the regulator. This is the operation corresponding to the manual control of an actuator.

3. Output Value

This represents the current output value of the slider. Depending on the regulated equipment, this corresponds to an opening angle, a speed, etc. If the "Manual Output" mode is activated, this value can be adjusted directly, without the control algorithm intervening in this value.

4. Nominal value in manual (Green/Grey)

This mode allows the operator to input a nominal value directly into the regulator. The dimming algorithm is still active in this mode, so the dimmer will try to adjust its output according to the dimming algorithm.

5. Output Value in Manual

This mode allows the output value to be adjusted directly, without the intervention of the control algorithm.

6. Alarm & Warning

This indicates whether the module is currently in alarm status or if the alarm is not confirmed. Each module triggers its alarm based on the setting of its high and low alarm limits.

If the alarm still persists in the module, the circle to the left of the indicator will be red. This means that the module is still in a failed state, and the problem still persists. Thus the entrance alarm could not be confirmed.

If the circle is gray, it means that there was an alarm, which is already resolved but not confirmed. The alarm can be confirmed with a click on the alarm indicator.

The "Warning" indicator shows that the module's process value is either above its high warning limit or below its low limit. This is a visual indication to the operator, to warn them of this extraordinary state.

7. State Failure (Lilac/Grey)

This indicates that the program detects that the module is in the wrong state to continue its process. That usually doesn't indicate a glitch but a warning that a module is misadjusted, and the program has to wait until this problem is resolved before they can continue with the process.

8. Regulator Trend

This button opens the slider trend window. This trend displays the values of the regulator, and allows you to optimize the regulator.

5.4.2 Advanced Parameters

The screenshot shows the 'regulador de calentador de CIP' control interface. The interface is divided into several sections:

- 1 Regulador:** Control reverse (1), Proportional (4.00), Integral (0.25 1/sec), Differential (0.04 sec), Banda muerte (0.00 °C), Output Ramp (0.00 %).
- 2 Inicio y Salida:** Salida estatica (50.00 %), Valor de inicio (25.00 %), Tiempo de inicio (5.00 sec).
- 3 Fuzzy logic:** Fuzzy Control 1 (0.00 %), Fuzzy Control 2 (0.00 %).
- 4 Alarmas y Advertencias:** Atraso Chequeo (30.00 sec), limite alarma alto (72.00 °C), limite alarma bajo (0.00 °C), atraso limites (15.00 sec), Histeres alarma (10.00 °C), atraso Histerese (30.00 sec), histerese Advertencia (10.00 °C), atraso advertencia (20.00 sec).
- 5 Escalamiento:** Parametros de entrada (0.00, 100.00 °C), Parametros de salida (0.00, 100.00 %).
- 6 Opciones:** desactivar salida (0), activar (0), ignorar (0), Filtro 1 (0), Filtro 2 (0), Filtro 3 (0).
- 7 Estado:** Enable Alarm, Status Check, Salida estatica, Inicio, Mov Max, Mov Min, PID activo.

In this window you can change the settings of the slider. This window is only accessible with a high user level, and is not accessible to operators. It can adjust regulation algorithm values, alarm values and other functions.

1. Parameters of the PID algorithm

This table sets all the parameters required for the PID algorithm.

- The "**Control Reverse**" function indicates in which direction the PID algorithm acts.
- The **Proportional, Integral, and Differential** values indicate the basic parameters of the regulation algorithm. These values directly affect the behavior of the regulator and should only be adjusted by regulatory experts. For more information, please review the "http://en.wikipedia.org/wiki/PID_controller" articles on PID control.
- "**Banda Muerte**". This sets a dimming range where the regulator does not change its output value.
- "**Output Rampa**". This value limits the modification of the output to a value in %/sec. If the slider modifies its output value faster than this value, the algorithm limits this and only modifies the output with the maximum ramp set. This value can be used for valves or pumps, to avoid damage from abrupt regulation. With the value 0.0, the ramp is disabled and allows instant changes of the output.

2. Start and Departure.

In this box, you can adjust the start behavior of the slider. There are mainly two ways to start the regulator:

- **Start with fixed value per time**
With this option, the slider starts with a fixed value for a certain amount of time. The start value can be set to the "Start Value" and the time you keep this value without adjusting the regulation can be set to the "Start Time" value
- **Immediate Start with Proportional Value (Kp)**
If the start time value is set to a value of 0 or negative, the slider starts with a starting value corresponding to the proportional factor.

3. Fuzzy Logic

When required, the programmer can supply up to two "Fuzzy Logic" values to the control algorithm. A factor can be set in the parameters, which indicates how much effect this value has on the output of the slider.

4. Alarms & Limits

Alarm limits can be set for the controller. The "Check Delay" value indicates a length of time for which boundary monitoring is delayed. This time starts when the regulator starts. In this way, a time can be set within which the regulator must have regulated its process value.

In the first category, you can set the absolute limits, which the process value cannot exceed. When the process value exceeds these values after the "Backlog Check" was met, the regulator generates a failure.

In addition, a **hysteresis can be set**, which indicates the maximum allowable deviation from the process value to its nominal value. This value will only be activated when the "Checkup Delay" time has expired.

Similar to the hysteresis alarm, a hysteresis "Warning" can be triggered. The operation is the same, only it generates a warning instead of an alarm.

5. Scaling

After the PID algorithm the output can be scaled to the required value. With this function you can also limit the output to a certain maximum or minimum. The "Input" value corresponds to the internal output value of the slider that corresponds to a value between 0-100% and the "Output" value corresponds to the output value for the user.

6. Operations

The regulator has several settings and functions that can be activated, when needed.

- When the **"Disable Output" option** is activated, the controller will not write its output to the periphery of the terrain. In this case it is an internal regulator, which has no equipment connected in the field.
- The **"Enable Warning" option** activates the Hysteresis Warning feature of the Regulator.
- The **"Filters"** work in the same way as the filters on the analog inputs and allow you to "smooth" the process value before entering it into the PID.

7. States

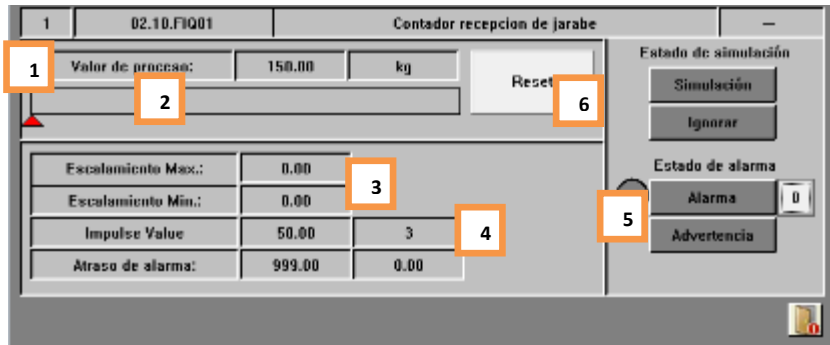
In this table you can see the various current statuses of the internal PID. The states are:

- **"Enable Alarm"**: This indicates that the PLC is triggering the regulator's alarm evaluation
- **"Status Check"**: This indicates that the program detects that the module has the wrong state to continue its process. That usually doesn't indicate a glitch but a warning that a module is misadjusted, and the program has to wait until this problem is resolved before they can continue with the process.
- **"Static Value"**: This indicates that the PLC requires the Regulator to function statically, without activating its PID algorithm.
- **"Start"**: Indicates that the PLC is activating the PID
- **"Active PID"**: indicates that the PLC is activating the PID and its throttling algorithm is activated and working
- **"MovMin"** and **"MovMax"**: Indicates that the PLC requires the PID to assume its maximum or minimum output value.

5.5 Counters

A counter represents a module that counts the pulses of a digital input. Generally, this module is used for (for example), counting the quantity of a meter flow through a quantity pulse.

5.5.1 Basic Parameters



1. Process Value (Gray/White/Yellow)

In this chart, the module shows its current process value and its engineering unit. This value represents the instantaneous value of this measurement already incorporating all scalings, polygon tables, and filters.

2. Value Range Bar

This bar shows the ratio of the process value to its high and low limits. It also indicates the limits with its arrows below the process value bar, to display the relationship of the limits of the module's process value.

3. Alarm escalation and backlog

Indicates the scaling values and the current backlog of the module alarm. Please see the "Advanced Details" section of this module for more details.

4. Pulse Value and Pulse Counter

These two values indicate the value that each pulse has to the process value, and the counter shows the number of pulses that have been recorded on the counter since the last reset

5. Alarm & Warning

This indicates whether the module is currently in alarm status or if the alarm is not confirmed. Each module triggers its alarm based on the setting of its high and low alarm limits.

If the alarm still persists in the module, the circle to the left of the indicator is red. This means that the module is still in a failed state, and the problem still persists. Thus the entrance alarm could not be confirmed.

If the circle is gray, it means that there was an alarm, which is already resolved but not confirmed. The alarm can be confirmed with a click on the alarm indicator.

The "Warning" indicator shows that the module's process value is either above its high warning limit or below its low limit. This is a visual indication for the operator, to warn about this extraordinary state.

6. Reset

This button resets the current value of the counter to zero. This button is only released if the counter does not have its "Reset Lock" option enabled

5.5.2 Advanced Parameters

The screenshot displays the 'Advanced Parameters' configuration window. At the top, it shows 'Win Time / sec:' with values 999.00 and 2.18. Below this, a 'Valor de proceso:' field is set to 0.00, with a 'Resetear' button. The main area contains a table of alarm and warning parameters:

	Valores	Alarma
1 Alarma alto	0.00	1 0
2 Advertencia alto	0.00	1 0
3 limite alto	0.00	
4 Valor nominal	0.00	
3 limite bajo	0.00	
2 Advertencia bajo	0.00	1 0
1 Alarma bajo	0.00	1 0
Escalamiento Max.:	0.00	5
Escalamiento Min.:	0.00	
Valor de impulso	0.00	0 6
Atraso alarm:	0.00	0.00 7

On the right side, there are sections for 'Estado de simulación' (Simulation Status) with buttons for 'Simulación' (0) and 'Ignorar' (0), and 'Estado de alarma' (Alarm Status) with buttons for 'Alarma' (0) and 'Advertencia'. Below these are 'Ajustes' (Adjustments) including 'Alarma de HW', 'Generar alarma max.', 'Generar alarm min.', 'Alarma externo', 'Bloquear resetear', and 'Impulso'. A 'Resetear' button is also present in the top right.

In this window you can change the counter settings. This window is only accessible with a high user level, and is not accessible to operators. You can adjust limit values, and the values that each pulse has.

1. High/Low Alarm

If the process value exceeds or lowers this limit, even if hysteresis, the "High Value" or "Low Value" signal is activated in the program. The status of these signals is indicated by the circles on the left side of the setting.

If the option to trigger an alarm is enabled, these signals initiate the alarm delay. If this delay ends, the module triggers its general alarm, indicated by the color red.

2. High/Low Warning

In the same way as the alarm limit, this limit activates its "Warning". But instead of initiating the alarm delay, with this limit the module directly activates the "Warning" mode, indicated by the purple color.

3. High/Low Limit

These two values are available for use by the user. The operation of these values depends only on the implementation in the project. By default, these two values have no effect.

4. Face value

This value is available for use by the user. The operation of this value depends only on the implementation in the project. By default, this value has no effect.

5. Scaling

These values adjust the scaling of this analog input. Since almost all analog measurements are connected to some standardized interface such as 0-20mA, 4-20mA, 0-10V, ...

In order to evaluate these values, the system must know the value of the minimum value of the interface and the maximum value of the interface. These values depend entirely on the measuring equipment that is connected to the analog input card of the PLC. The scaling value of the connected computer interface and the scaling value of the module interface should always be the same.

For example:

If a temperature sensor emitting a 4-20mA signal is connected, where 4mA corresponds to 20°C and 20mA corresponds to 120°C, the scaling should be adjusted in the module to 20°C-120°C.

6. Pulse Value and Pulse Counter

These two values indicate the value that each pulse has to the process value, and the counter shows the number of pulses that have been recorded on the counter since the last reset.

7. Alarm Delay

If the "High Value" or "Low Value" signal has been activated and the corresponding alarm option is activated, this delay starts counting. If the timer runs out, the module enters Alarm mode.

8. Simulation (Yellow/Grey)

This function allows the entire periphery of the module to be fully simulated. This means that the "Process Value" used by the program no longer depends on the "Periphery Value", but can be adjusted by the operator according to the requirement of the process. This allows the process to continue working, even if a sensor is failing.

If this mode is enabled, the process value turns yellow, indicating the simulation mode.

9. Ignore Alarm (Yellow/Grey)

If this function is activated, the module will not trigger any alarms. The module continues to work with all its functions activated, but without triggering alarms. If ignore mode is enabled, the module turns yellow in the process image.

10. Hardware Alarm (Red/Grey)

This alarm indicates if the signal from the "Boost" counter did not arrive within your backlog of pulse alarms. If no impulse has arrived within this time period, the alarm is triggered.

11. Minimum & Maximum Alarms (Green/Grey)

These indications indicate whether the minimum and maximum alarms are activated for this module.

12. External Alarm (Red/Grey)

This signal indicates an alarm coming from outside the module (external). Generally, this is used to represent alarms from external equipment that emit pulses that the meter is counting.

13. Lock Reset (Green/Grey)

If this option is initiated, the counter cannot be manually reset. This signal cannot be activated by the operator, as it is a signal that is used during the process. This feature prevents you from manually resetting the counter by accident.

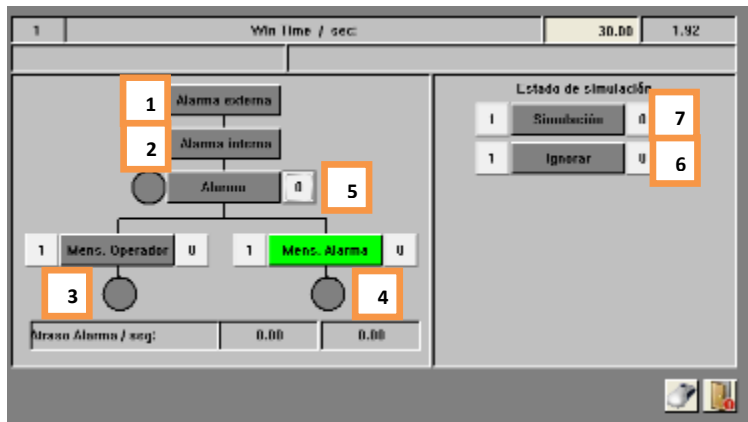
14. Impulse (Green/Grey)

This box indicates the current status of the momentum signal that the counter is counting. In a sense, this can be thought of as the periphery signal of the meter. Usually this signal comes from a digital input module.

5.6 Messages

The messages represent process information to the operator. A message can act as an operator message or an alarm message. The difference between the two message types is that the operator message represents a notification (such as a prompt to make a manual operation) and an alarm message represents an alarm state (such as "Deviation too high"). The meaning of the messages depends solely on the implementation of the processes.

In the process images, a message is represented by the following symbol:



In this window, you can change the message settings. Since the message module does not have the complexity of other modules, this type of control module only has one window where you can change all the settings.

1. Alarm/External Status(Green/Grey)

This directly indicates, without considering delays or simulations, the status of the message from the message process. This value is used for maintenance purposes only. This signal mainly indicates whether the process is triggering the message at that moment. But since simulations can change the state, the operator should always refer to the "Alarm/Internal Status" signal to know if a message is triggered or not.

2. Alarm/Internal Status (Green/Grey)

This represents the state of the signal with which the internal program works. Generally this signal depends directly on the process signal, but there too are the delays that can be adjusted in the input, and the simulation mode is also considered.

3. Operator Message (Blue/Grey)

This setting makes the message considered as a notification and not as an alarm. If the process triggers the message, the circle below the setting turns blue, alerting you to the status of the notification. Generally, these notifications are used for information or procedures that are not critical for the operator. It is usually only used for actions that the operator has to do manually.

4. Alarm Message (Red/Grey)

This setting causes the message to be considered as an alarm. If the process triggers the message, the module triggers an alarm and alerts the operator in red about the situation.

This type of setting is generally used for alarms that are not covered by default by standard module alarms.

5. Alarm (Red/Grey)

This indicates whether the Message has the alarm status or if the alarm is not confirmed. Each input in the process message triggers its alarm based on the "Alarm Message".

If the alarm still persists in the message, the circle to the left of the indicator is red. This means that the input is still in a failed state, and the problem still persists. Thus the entrance alarm could not be confirmed.

If the circle is gray, it means that there was an alarm, which is already resolved but not confirmed. The alarm can be confirmed with a click on the alarm indicator.

6. Ignore Alarm (Yellow/Grey)

If this function is activated, the module will not trigger any alarms. The module continues to work with all its functions activated, but without triggering alarms. If ignore mode is enabled, the module turns yellow in the process image.

7. Simulation (Yellow/Grey)

This function allows the entire periphery of the module to be fully simulated. This means that the "internal state" that the program uses to react to the state of the message no longer depends on the "external state", but can be adjusted by the operator according to the requirements of the process.

5.7 Switches

Switches represent digital system settings or confirmations that can be adjusted by the operator. These modules can only have two states. On (Green) and Off (Gray). Depending on the use of the switch, it can have several uses. Switches are usually used for optional adjustments that the operator can make (such as "Refill Tank in Automatic" or "Restart Automatic Processes",)

The process images represent the switches with the following symbol:



6 Units (Unit)

Units form the integral part of process management and represent process cells that can execute a process. A Unit can execute a recipe, which represents the technological procedure for producing a product or for fulfilling a certain function of the machinery.

Each unit can execute a sequence of steps, which is defined by recipes. A recipe represents the order of the steps to be executed and their respective nominal values. Each Unit can run one recipe at a time. A recipe can define the sequence of steps for several sequences that work together during the process. These sequences that work together during the process are called "BatchArea" or "Área de Batch" in Spanish. Each recipe belongs to a Batch area, and thus defines the sequence of steps and their nominal values for all sequences in a Batch area.

6.1 Symbol in the process images

A unit is represented by the following symbol in the process images



1. Sequence Operation Status

The current operating state of the sequence. More details in the chapter "[Operating Status](#)"

2. Move forward or backward one step in the sequence

These buttons allow you to skip or rewind one step in the unit's current step sequence. These buttons are only available if the unit is not set to "Automatic" and if a recipe is running. **WARNING! Using this feature can have unintended effects on the process, and should only be used by trained and skilled personnel.**

3. Sequence Name

This box shows the current name of the sequence. The two numbers in the parentheses are equivalent to the "PLC Number/Unit Number". If you click your mouse on this box, a window opens showing the steps that are set up in the recipe. More details in the chapter "[The View of the Process Steps](#)"

4. Recipe Name & Batch Number

This box shows the name of the recipe that is currently running. In order to identify the process, each process also has a batch number. This number also appears in this chart. Clicking on this box opens the window where you can start a new recipe on the respective unit.

5. Sequence Step

This indicates the step that the drive is currently running. The step number indicates the step within the recipe configured, and the action number indicates the type of action that is configured for this step in the recipe.

6. Process Details

On these buttons you can open a window to observe the nominal values and a window for the internal status of the unit. It also includes charts indicating whether the unit currently has a fault or message to alert the operator about this. For more details read the chapter "[The Details of the Process](#)" and "[The Details of the Unit](#)".

6.2 Operating Status

Each sequence has a state of operation. A sequence can have three general states of operation. These states have an effect on the execution of the processes (the steps that are defined in the recipe) and the control modules that belong to this process. The status of the sequence can be manipulated by the operator with a click on the respective status button.



1. "Automatic"

The execution of the process steps works completely automatically. If a step ends, the sequence automatically continues to the next step that is set up in the recipe. Manual operations are not possible on the unit's control modules. It is generally not possible to operate valves or actuators manually when the sequence is in this state.

2. "Pause"

The execution of the current step works completely automatically, but if the current step ends, the sequence changes the status to "Stop". In this state, it is possible to activate control modules manually. It is possible to open valves and actuators manually. **Warning!** Since the sequence continues to execute the process, the process will also activate actuators according to the logic of your process! That can lead to potentially dangerous situations!

3. "Stop"

In this state, the unit stops its automatic execution of the configured processes and leaves all control modules fully available to the operator. **Warning!** Depending on the type of process, it may be possible to produce non-optimal situations for the product if the process does not follow automatically!

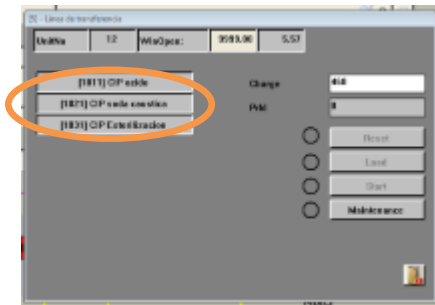
In general, all modules are assigned to one or more process units. This assignment is made in the PLC programming and is usually not manipulable by the operator. Depending on the status of the unit, the control modules of the respective unit are either released or locked for manual manipulation.

6.3 Start a program

To start a recipe or program on a drive, you must click your mouse on the recipe name box in the drive symbol.



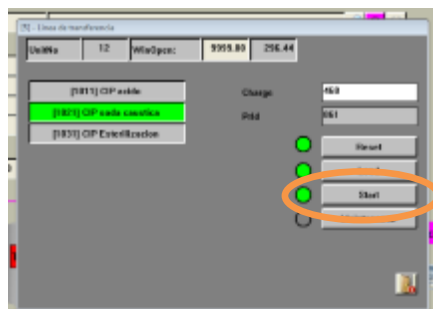
This opens the recipe start window, where you can choose the recipe you want to start. In order for a prescription to be initiated, the unit must be in the "Automatic" state.



When the program is selected, the program can be loaded to the drive



When the program is loaded, the sequence can be started. "Start" is only available if the sequence is in automatic mode.



With a click on the "start" button, the sequence starts to boot and run the selected program.

6.4 The details of the process

When a process is running and you are running a recipe (program), you can open the process details window. In this window you can see the current status of the parameters of the current step that the unit is executing.

Each unit has a button with a "Magnifying Glass" symbol with which you can open the process details window.

4

UnitNo	I	WinOpen:	999.00	5.67			
[1]	Tiempo de supervisión / min:	0.00	420.16				
[30]	Conductividad / mS:		0.00				
[32]	Temperatura retorno / °C:		0.00				
[34]	Temperatura avance / °C:		0.00				
[37]	Retorno:	Drenaje					
[38]	Avance:	Parado					

In this window you can see all the parameters of the current step of the unit.

1. Name and current step of the unit

At the top of the window is
You can see the name of the unit,
The Current Step and Recipe for Unity
That belongs to the open window.

2. Name and engineering unit of the Parameter

In this box you can read the name
And the engineering unit of the
Respective parameter. The Background
Color

Change the type of
Parameter and thus helps the operator

to

Visualize the process. Parameters can have the following colors:

- Red**
 This color indicates that this is a parameter that controls an alarm condition such as deviations or maximum and minimum limits
- Green**
 This color indicates that this is a parameter that controls the completion of the step to initiate the transition to the next step. Examples of such parameters are: Fill level, mixing time,...
- Blue**
 This indicates a parameter that requires operator intervention. This type is generally used for confirmations that have to be made by the operator.
- Grey**
 If the background color is gray, this is a normal parameter with no additional functionality

3. Parameter Nominal Value

In these two tables you can see the nominal value and the current value of the processes of the respective parameter. If the parameter allows it, you can change the parameter's nominal value by clicking to the nominal value box.

If it is an "Enumeration" instead of a numeric value, the window displays the current enumeration selection instead of the nominal and current values. Clicking on this enumeration opens a new window, where you can select the new nominal value from a predefined list of options.

4. Button to open Global Parameter List

This button opens a window, where you can set global values for the respective unit. In exchange for the parameters in the process details window, these values are independent of the action being executed on the drive.

6.5 Unit Details

Each Unit of the system incorporates certain internal states, which can be observed with a click on the "Unit State" button.



Unit No. 1234		WtrOpen: 01234567 1234	
Process Status			
Unit Active	<input type="checkbox"/>		
CIP Active	<input type="checkbox"/>		
Startposition	<input type="checkbox"/>		
Alarm Status			
alarm active	<input type="checkbox"/>		
Watchdog Alarm	<input type="checkbox"/>		
Emergency Hold	<input type="checkbox"/>		
Maintenance	<input type="checkbox"/>		
Message Status			
Startposition Error	<input type="checkbox"/>		
Operator Request	<input type="checkbox"/>		
Hygienic Status		Product Status	
Steril	<input type="checkbox"/>	Product 1	<input type="checkbox"/>
Clean	<input type="checkbox"/>	Product 2	<input type="checkbox"/>
not Clean	<input type="checkbox"/>	Product 3	<input type="checkbox"/>
Request CIP	<input type="checkbox"/>	Product 4	<input type="checkbox"/>
Time/Cycles without CIP			
Cycles without CIP maximum		0123456789 0	
Cycles without CIP actual		1234	
Time maximum for steril		0123456789 0	
Time maximum for clean		0123456789 0	
Time without CIP		1234	
Active Time		1234	

1. Process Status

Basic of the current unit. The unit can run a CIP program, a Production Program, or it can be in the "Start Position". Process status indicates activity

2. Alarm Status

This indicates the status of the unit's Alarm. The cause of the alarm is indicated in this table.

- A **"WatchDog Alarm"** means that the monitoring time has been met, but the current step is still underway. The process takes longer than normal.
- **"Emergency Hold"** is active if the unit is failing due to an emergency shutdown or emergency situation.
- **"Maintenance"** is indicated if "Maintenance" mode is enabled on this unit.

3. Message Status

This chart indicates the cause because the unit is indicating a situation that requires the operator's attention. **"Startposition Error"** indicates that there is a problem with a control module that the unit must use during processing, which is in failure mode or unavailable. In this case, the process image should be reviewed to find out the claimed module and correct the status.

4. Hygienic Status

The "Hygienic Status" indicates the cleanliness status of the current unit. The unit internally maintains a state of its hygiene, so the operator can always observe if the unit requires a deep cleaning, sterilization or if it is available for the process. If the user has sufficient access privileges, you can also push the current state to the required state of hygiene.

5. Time/Cycle without CIP

In this table you can set cycles or maximum times, starting from when the unit automatically reduces its hygiene status. This time must be adjusted according to the requirements of the plant.

A possible application would be that the maximum time a tank is considered sterile will be two days. In this case, the "Maximum Sterile Time" is set to 48 hours. When this time is up, the tank automatically changes its state from sterile to clean. It works with the other adjustable times.

6.6 The view of the process steps

In this window you can see the steps that are defined in the recipe of the current recipe program. The current step that the PLC is executing is marked with green. To open this window, right-click on the name of the corresponding unit

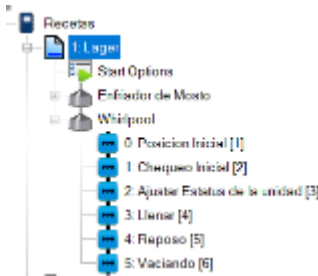


7 Recipes



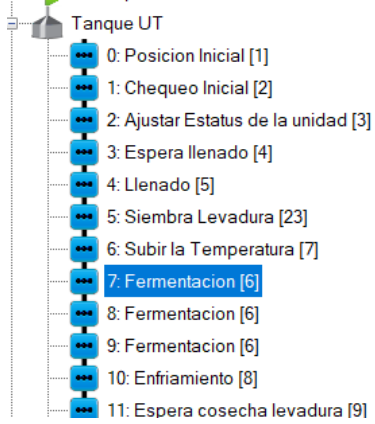
The BatchXpert system incorporates a large and adjustable system for managing recipes and parameters of the different areas and units of the process. This guide is intended for non-supervisory operating personnel who wish to manage system prescriptions. The focus of the tutorial is on the straightforward operations that must be performed to administer the recipes, rather than an explanation of how the recipes work. The manual tries to keep it "neutral", i.e. it does not focus on any particular project, and tries to function as a guide to convey the functioning of the administration in general.

7.1 Structure of a recipe



A recipe in BatchXpert is represented as a collection of "Units" that are composed of actions that run sequentially. That is, each recipe is composed of one or more Units. A unit, in turn, is composed of a sequential list of actions to be executed. Each stage, or action, has its own set of parameters unique to the stage.

7.2 Important Nomenclature



As mentioned above, a sequence is made up of several sequential actions. It is important to distinguish between the term "Step" and "Action". In a recipe, the "Step" refers to the progress that the sequence has within the line and the "action" refers to the functionality that is being executed at the moment.

The distinction is important, because within a Recipe, an "Action" may appear several times, but each time in another "Step", because the steps are a number traveled within the recipe.

For example, in the image, you can see that steps 7, 8 and 9 all have the same "Action" which is "Fermentation". This means that the sequence performs the "Action" "Fermentation" three times, but since it has another step number each time, it performs it each time with other parameters.

7.3 The Units (Sequences)

A unit is composed of a sequential list of actions to be executed. Each stage, or action, has its own set of parameters unique to the stage. When a new "Action" is deleted, inserted, or added, the stages are always remapped to be "Sequential". That is, the "Step" number can be changed by modifying the recipe structure. This is not a problem because the step number is only a visual aid to better describe the recipe.

7.4 Parameters

<input type="checkbox"/>	1	Tiempo Supervision	240	h
<input type="checkbox"/>	2	Tiempo	120	h
<input type="checkbox"/>	3	Fin del paso	Grado Fermentacion	enumeración
<input checked="" type="checkbox"/>	9	Grado de Fermentacion	80	%
<input type="checkbox"/>	10	Extracto	3	°P
<input type="checkbox"/>	11	Temperatura	13.5	°C
<input type="checkbox"/>	12	Adaptacion Temperatura	Apagado	enumeración
<input type="checkbox"/>	20	Sensor de Temperatura	Automatico	enumeración
<input type="checkbox"/>	21	Zona Enf. superior	Activado	enumeración
<input type="checkbox"/>	24	Zona Enf. cono	Apagado	enumeración

Each Step has its own set of individual parameters. That is, if an action exists multiple times in the recipe, each "Step" has its own parameters. For example, in the example above. Each "action" of "fermentation" has its own parameters.

The parameters available in each "Step" depend on the "action" of the step. These parameters are set by an

Automation Engineer during commissioning and cannot be modified by the user, because they require programming in the logic controller. The user can only modify the "Nominal Values" of the parameters of each "Step".

7.5 Limitations and Considerations

The system does not incorporate any type of limitation, apart from the fact that each recipe must have a unique number within the same "Batch Area".

Each Sequence can execute only one "action" of a single Batch at a time. It is not possible to execute "Actions" of the same sequence in parallel. Different sequences, yes they can execute "Actions" in parallel, but each "Sequence" only one "action" at a time.

8 System Windows

8.1 "Tools" window

You can open the "Tools" window with the Tools button at the bottom of the menu bar.



This button opens the Basic Tools window. They have the following options



1. Calculator

Open the standard calculator for your operating system (Windows)

2. Windows Explorer

Open the operating system's file explorer (Windows)

3. Webreport, Printreport, Excel Report

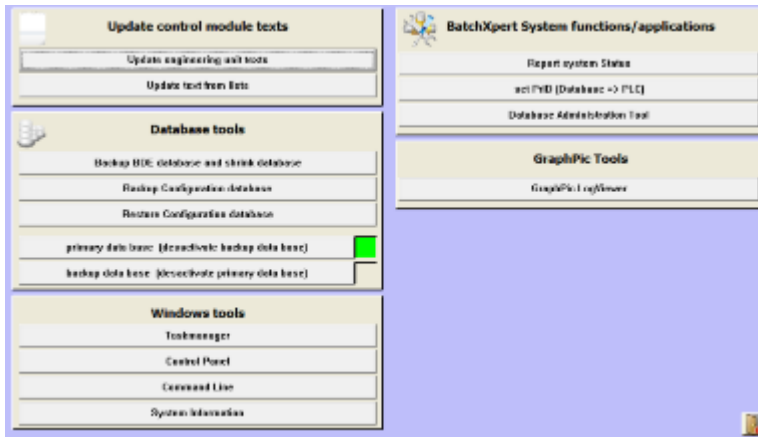
This opens the reports of the respective system, if they are installed and activated in the system. If a report is not activated, the button is disabled.

4. Documentation

This opens a window with manuals for the BatchXpert system and its subsystems.

8.2 "Advanced Tools" Window

This allows you to change settings, and view "BatchXpert" system statuses. This window is only accessible by system administrators. Since these are advanced options and features, not all of them will be mentioned in this manual.



8.2.1 Update control module texts

This category allows you to update the texts of the HMI with the texts saved in the system database. Normally, these texts and units of measurement are updated when the system starts. With this function it is possible to update the texts of the control modules, when the database has been changed, without the need to reboot the system completely.

8.2.2 Database tools

These tools allow you to perform maintenance tasks on the system's databases.

The "**Backup BDE and shrink databases**" runs an automatic backup of the historical database and then deletes the old data (more than 6 months) from this database to save space on the hard drive.

The primary and secondary database **selector** allows you to manually activate the second database. This feature is only available if this feature is enabled and set in the system.

8.2.3 Windows Tools

This category allows you to launch basic and common operating system tools.

8.2.4 BatchXpert System functions/Application

This category allows you to perform special system maintenance tasks.

With the "**Report System Status**" button you can obtain an in-depth diagnosis of the operation of the reporting system and the system's protocolization. Please see the "[Communication View](#)" chapter for more details.

The "**Set Prid (Database => PLC)**" button allows you to synchronize the PRID (Process identifier) of the database with the identifier of the PLC. The PRID is a number that identifies each of the processes, and is unique to each process running on the system. When a PLC backup is restored, it may happen that the PRID saved in the PLC is not the current one, and the PLC would assign the

PRIDs incorrectly. In this case, you can manually adjust the PRID to the last PRID that was saved in the database.

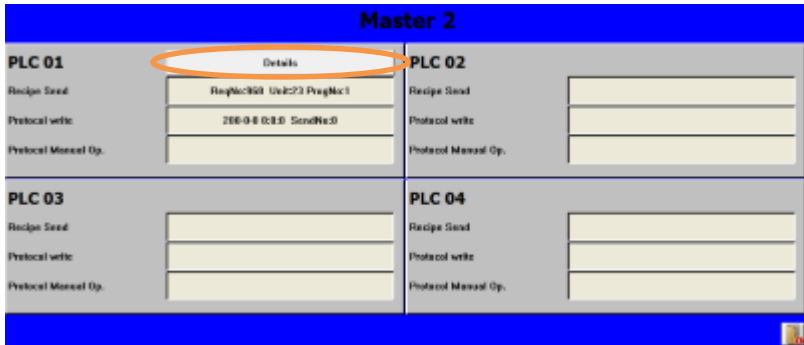
8.2.5 GraphPic Tools

This category allows you to launch useful tools from the GraphPic SCADA system.

8.3 Communication View

The "Advanced Tools" option in the "Report System Status" opens the Reporting System and Recipe window. In this sale, you can see the status of the historical data recording systems for each PLC, and the system for downloading programs to the PLC. Records, for PLCs that do not exist in the system, are always empty. In the tables of the respective PLC you can see the last activity that was executed by the protocols.

The "Recipe Send" box always shows the last prescription that was sent to the PLC. And in "Protocol write" and "Protocol Manual Op." The most recent records remembered to the database are always displayed. These values help to check the correct functioning of the prescription submission system and the recall of historical records.



For more details, you can open more details about the systems with the "Details" button.



1. Recipe Request Information

In this section you can find more information about the mechanism for sending prescriptions to the PLC. You can the last unit that asked for a prescription, for which PRID and what type of program it was. When a unit that requires a recipe does not exist in the database, that unit will be marked as "Error by Unit". In this case, it is possible to verify the correct functioning of the recipe shipments.

2. Telegram infos

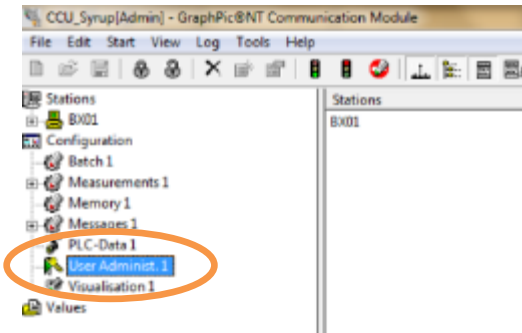
In these two large boxes, you can see the statuses of the two buffers of the process logs and also of the manual operations. You can see the full status of the buffer and how many records are currently inside it. Since each server in the system has its own buffer, you can select the server to watch with the numerical buttons above the data. If a server does not exist, the buffer level will fill up and be marked as a failure.

3. Alive Signal Communication

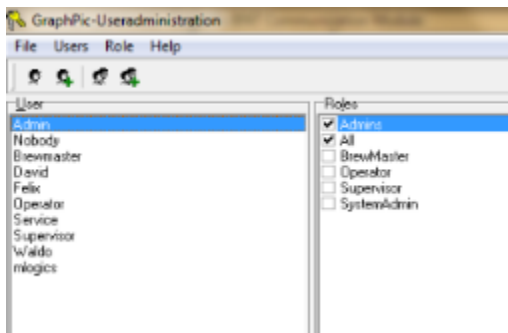
In this section you can see the live signals from all the servers connected to the system. To demonstrate its correct operation to the PLC, each Server in the BatchXpert system permanently sends a counter to the PLC. The PLC evaluates this counter to know which servers are available in the system.

9 User Management

To access User Administration, open the communication module and in the Settings section open the "User Administration".

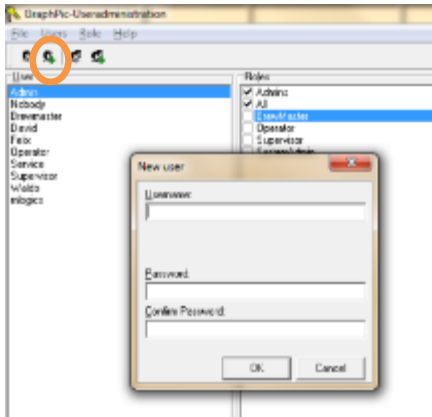


With user management, you can limit the number of users who have access to certain features of the modules contained in the project. User groups are created for this purpose, which receive certain authorizations. Individual users can be admitted to one of these groups. This gives them all the rights of the groups that were assigned.

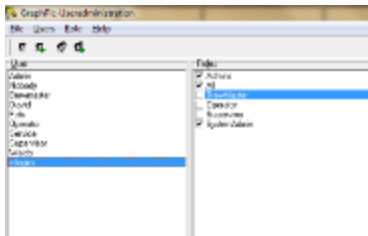


9.1 Create a new user

To create a new user, a "New User" must be clicked at the top of the user manager. In the pop-up window, the new user's name and password can be entered.

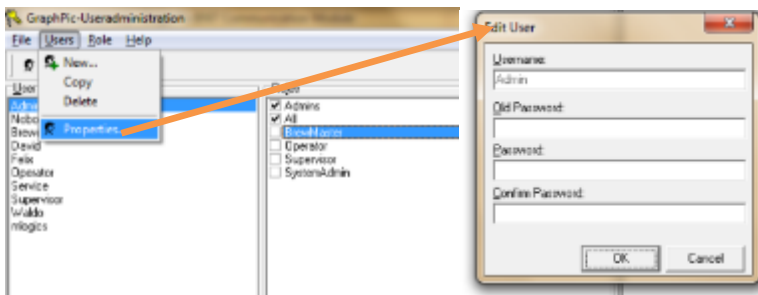


The new user then appears in the list of users where you can assign them the roles required for their role.



9.2 Change an existing user's key

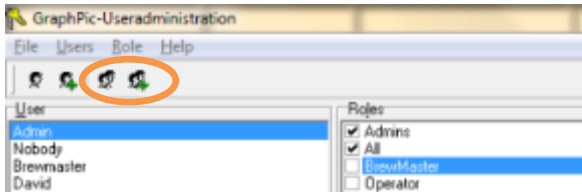
To change the user's password, select the corresponding user from the list on the left and then open this user's properties.



In the window that opens, you can enter the user's new password.

9.3 Create a new Role

Access rights are always granted for a specific function (group). The standard roles are Admin and All. The administrator role has full rights and cannot be edited or deleted. All users belong to the Everyone group and this group cannot also be deleted. This group defines the minimum rights that each user has.



In addition to these two functions, you can create any number of additional functions (menu item Role | New). To edit Role, double-click on the respective record in the list (corresponds to the menu item Role | Properties) or the corresponding button in the toolbar. The window's "Role Edit" appears, allowing you to rename the role and activate entitlements. The left side shows all the modules and stations listed in the project. By selecting an entry, the available rights appear on the right.

You can delete functions using the menu under "Role | Delete."

10 Software Architecture

The BatchXpert system is made up of three fundamental components that interact with each other to provide all the functionality of a process control system.

10.1 VisXpert

VisXpert is the SCADA platform on which the entire platform is based. It is responsible for managing the data from the logic controller in the form of a "Tag" and allows the "Modules" to access the values of these "Tags". Apart from the variables, it also implements alarm logging and trend graphs.

SCADA, an acronym for Supervisory Control And Data Acquisition, is a concept used to create computer software that allows industrial processes to be controlled and monitored remotely. It provides real-time feedback with field devices (sensors and actuators), and controls the process automatically. It provides all the information generated in the production process (supervision, quality control, production control, data storage, etc.) and allows its management and intervention.

One of the most important features of VisXpert is the "**Visualization**". These are the graphics that allow the user to interact with the machinery and visualize the process variables. It is the main interface with which the user interacts with the system.

10.2 BatchXpert

The BatchXpert implements all the functionalities related to the production of Batches. Part of the BatchXpert are the "Process Configurator", "Recipe Editor", but also the log and viewer of reports and historical data.

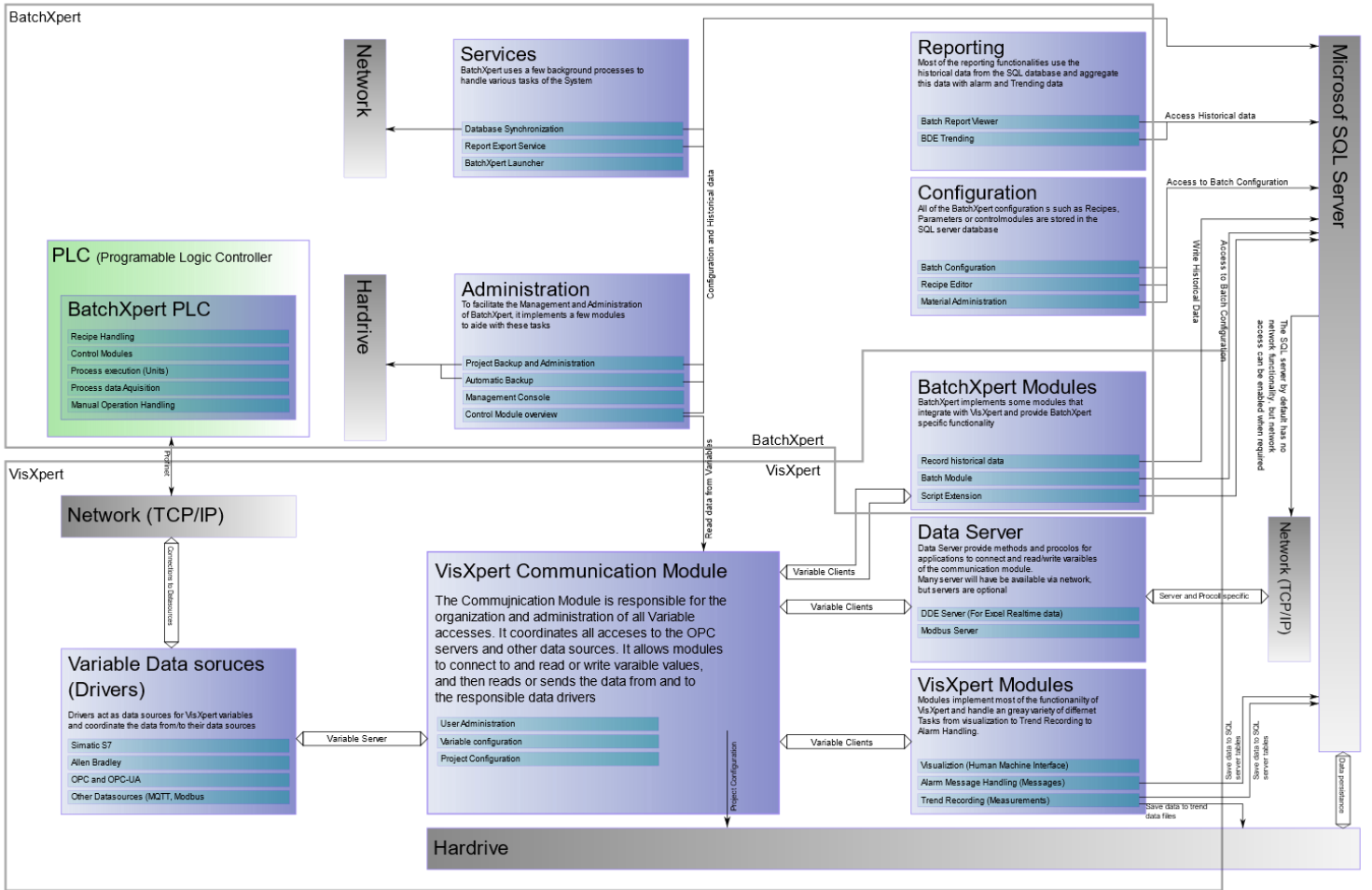
It also implements many management tools for users, so that they can better perform operations, maintenance, and optimizations on the system.

10.3 SQL Database

The database forms the foundation where all the configuration and historical data of the system are stored. The database is a product of the company "Microsoft" and is considered "Industry Standard".

Microsoft SQL Server is a relational database management system (RDBMS) produced by Microsoft. Its main query language is Transact-SQL, a application of ANSI/ISO Structured Query Language (SQL) standard used by both Microsoft

10.4 Scheme



<p>Overview of BatchXpert Software Architecture</p>	<p>MLOGICS GERMAN AUTOMATION PARTNER</p>
<p>© 2011 Messuring GmbH</p>	<p>MLogics Chile Ltda. 76.236.183-K</p>

11 System Structure

BatchXpert is a control system for batch processes and incorporates tools to manage batches, recipes, and machinery for these types of processes. However, continuous processes can also be implemented in the system, the focus of the BatchXpert system is on batch production.

The system incorporates several implements that work together to perform batch control, historical recording and equipment handling in the field.

11.1 The Logic Controller

All field control is performed by an industrial logic controller. This controller performs all interactions with the ground, activates pumps, valves and monitors the status of the implements.



11.2 Operation Station

The stations allow the operating staff to interact with the system. A Visualization runs in the station, which allows you to interact with the logic controller in an intuitive way. The visualization allows you to monitor the process, and execute manual operations.

The Operating Station also functions as a Configuration and History Storage. It also allows you to edit recipes, settings and view recorded historical data. When a process is executed, the Logic Controller requests a recipe from a computer, which sends the configuration parameters to it.

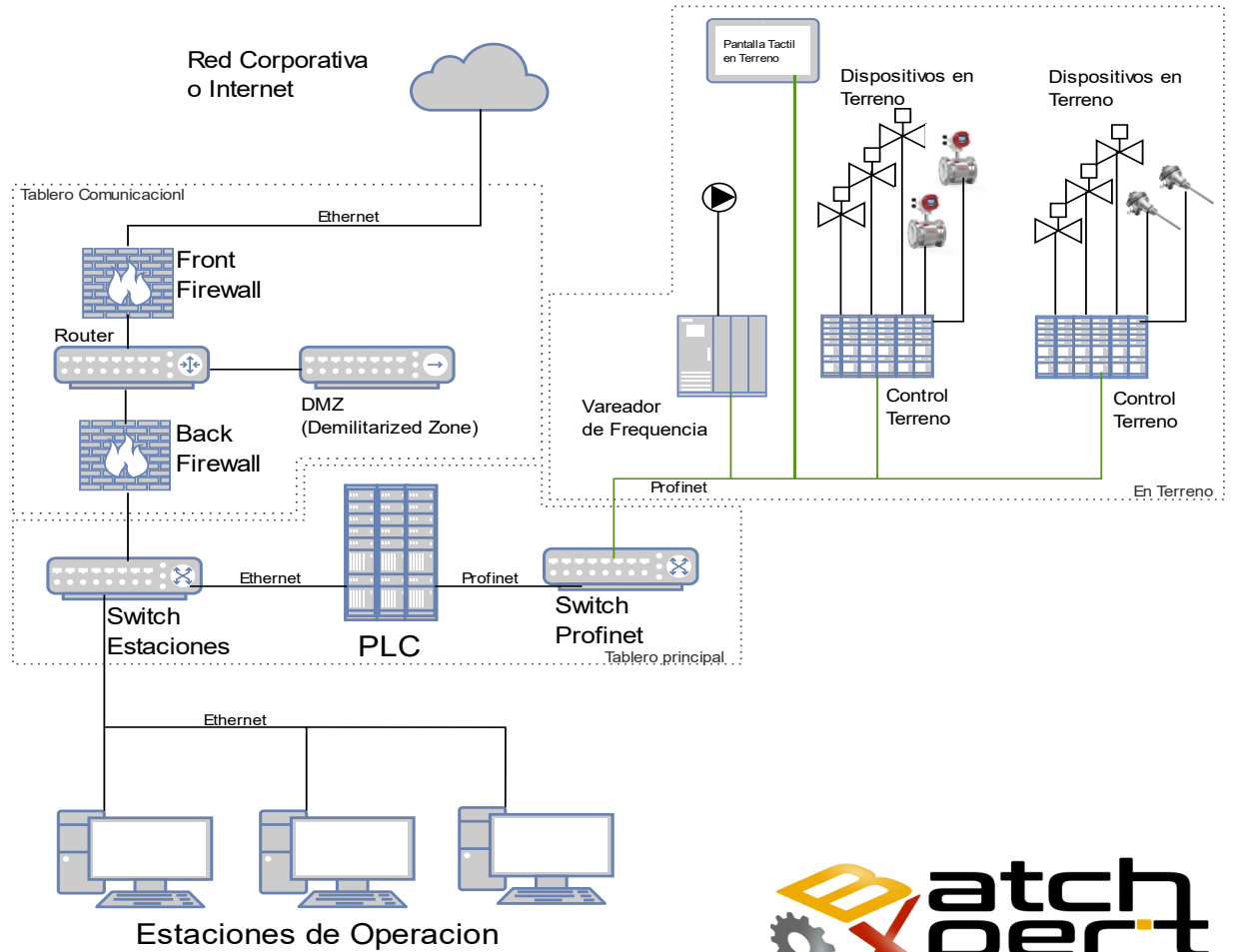


11.3 Field Devices

In the field, there are devices that record measured values, or allow activation, such as temperature sensors, flowmeters, valves and pumps. These devices have a communication link with the logic controller, records the measured values or activates them.



11.4 Diagram



12 Hardware (PLC)

The BatchXpert Control System typically runs on SIMATIC S7 compatible PLCs such as the "Vipa Speed 7" series, the Siemens S7-300 series or the Siemens S7-400 series. All of these automatons are generally similar, but they have some differences. For more details, see the manuals for the corresponding CPU installed in the Project. However, there are some general considerations common to all S7 compatible CPUs.

12.1 Operating Mode Switch

The default mode of operation for BatchXpert is "Run" or "RUN-P" (where available). "Stop" can only be active for specific maintenance tasks where a trained Technician is required.



- With the operating mode switch you can switch the CPU between STOP and RUN.
- During the transition from STOP to RUN, the START-UP mode of operation is initiated by the CPU.
- By setting the switch to MRES (Clear), it requests a full CPU wipe with the next MMC load, if a project exists.

12.2 Memory Reset (Factory Reset)

A "Memory Reset" of the PLC will delete all the data stored in the PLC's memory! This includes all data, such as process logic and parameters. **After a complete deletion, a subsequent download of the program to the PLC is always necessary!** For guidance on how to restore a PLC backup, please read the manual "PLC Restore Manual".

It is NOT recommended to perform "Memory Reset" without prior clarification from a trained technician. Please note the following:

- All logic will be cleared until you download it back into the driver, which should be done by a trained technician! This means that there won't be any logic at all running on the controller. There are no functionalities of any Valve or Motors, not even Manual; No HMI will be able to connect.
- The parameters and settings of all control modules (such as: regulators, valves, etc.) will be reset to the values that the cases indicated at the time the backup was taken.
- When uploading a backup to the PLC, ALL data and processes are reset to the moment the backup was made. This means that ALL sequences of ALL Processes lose their state and are reset, making it impossible to continue with a process that was in progress!
- After loading, the statuses of the processes must be reset, when the corresponding recipes are started, and the steps of the Units must be advanced to the corresponding Steps.

12.3 Backup battery for RAM and clock in a "Vipa Speed 7"

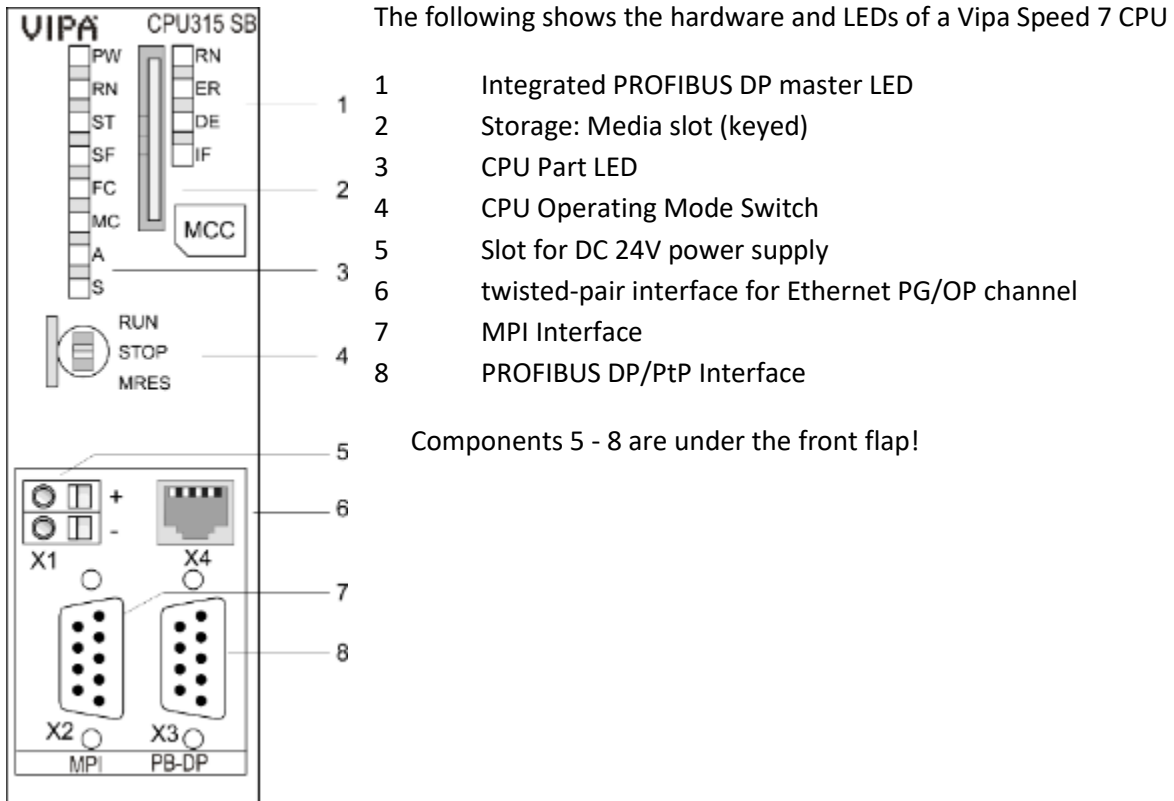
A rechargeable battery is installed in each 31xS CPU to protect the contents of the RAM when the power is disconnected. This battery is also used to buffer the internal clock. The rechargeable

battery is maintained by a charging circuit that receives its power from the internal power supply and which holds the clock and RAM for a maximum period of 30 days.

Warning!

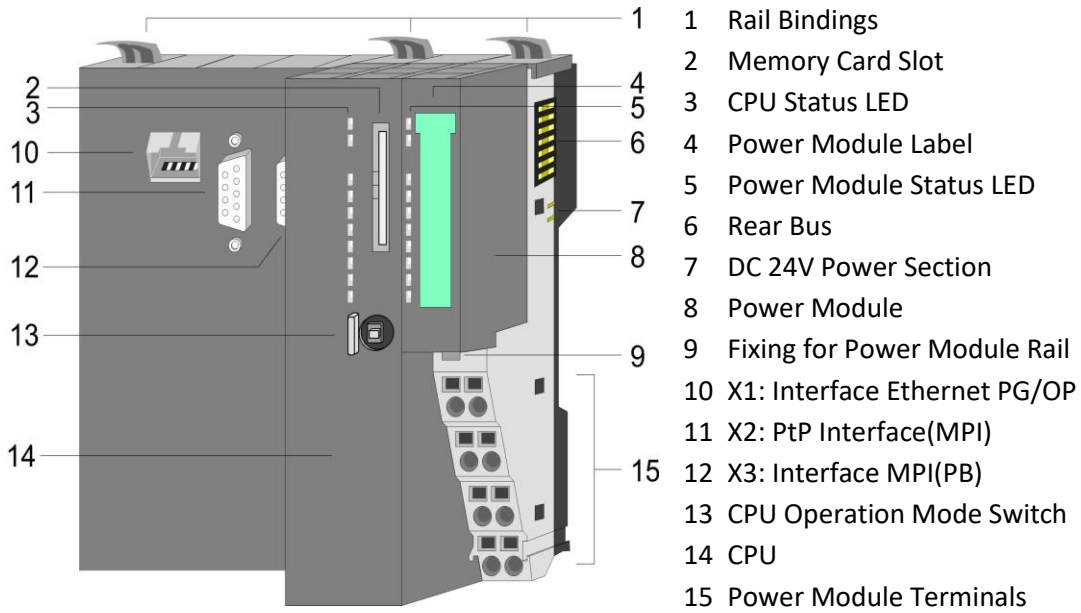
Please connect the CPU for at least 24 hours to the power supply, so that the internal accumulator/battery is charged accordingly. After a power reset and with an empty battery, the CPU starts with a BAT error and executes a hard wipe. The loading procedure is not influenced by the BAT error. The BAT error can be cleared again, if once during an on cycle the time between turning on and off the power supply is at least 30 sec. and the battery is fully charged. Otherwise, with a short power cycle the MTD error still exists and a hard wipe is executed.

12.4 Hardware of a "VIPA Speed 7"

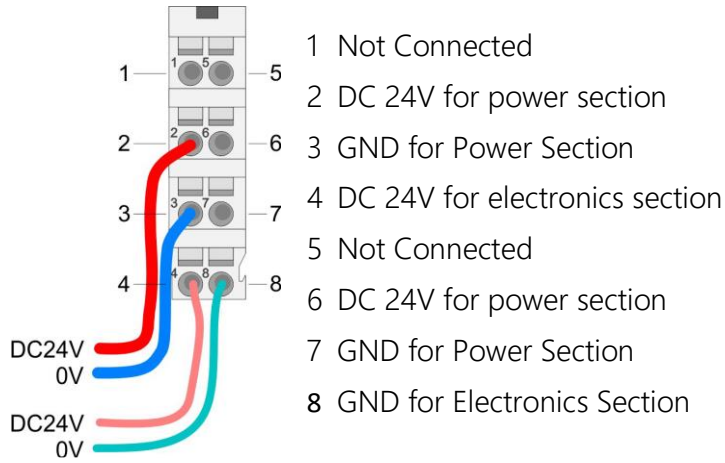


12.5 Hardware of a "VIPA Speed 7 SLIO"

The following shows the hardware and LEDs of a Vipa Speed 7 SLIO CPU



Power Module



12.6 General LED of a "Vipa Speed 7" and "Vipa Speed 7 SLIO"

The following table shows the LED statuses of a Vipa speed 7 CPU. The default status is marked in green.

** Flashes at 10 Hz: Settings are loaded.*

RN (RUN)	ST (STOP)	SF (SFAIL)	FC (FRCE)	MC (MMC)	Significado
verde	amarillo	rojo	amarillo	amarillo	
Iniciando después de PowerON					
●	BB*	●	●	●	* Parpadea con 10 Hz: El firmware es cargado.
●	●	●	●	●	Inicialización: Fase 1
●	●	●	●	○	Inicialización: Fase 2
●	●	●	○	○	Inicialización: Fase 3
○	●	●	○	○	Inicialización: Fase 4
Operación					
○	●	X	X	X	CPU en modo "Stop". CPU detenido
BB	○	X	X	X	CPU se encuentra en estado de puesta en marcha, el RUN parpadea durante operativo del OB100 al menos durante 3 segundos.
●	○	○	X	X	CPU en modo "Run" sin error.
X	X	●	X	X	Hay un fallo en el sistema. Más información se puede encontrar en el búfer de diagnóstico de la CPU.
X	X	X	●	X	Un variable este forcado
X	X	X	X	●	Acceso a la tarjeta "memory card".
X	BB*	○	○	○	* Parpadea con 10 Hz: La configuración está cargado.

on: ● | Off: ○ | blinking (2Hz): BB | not relevant: X

12.7 LED Ethernet of a "Vipa Speed 7" and "Vipa Speed 7 SLIO"

Green L/A-LED (Link/Activity) indicates the physical connection of the PG/OP Ethernet to Ethernet channel. Irregular flashing of the L/A-LED indicates PG/OP Ethernet channel communication via Ethernet.

If the green S-LED (speed) is enabled, the Ethernet PG/OP has a communication rate of 100 Mbit/s otherwise 10 MBit/s.

12.8 Profibus LED of a "Vipa Speed 7" and "Vipa Speed 7 SLIO"

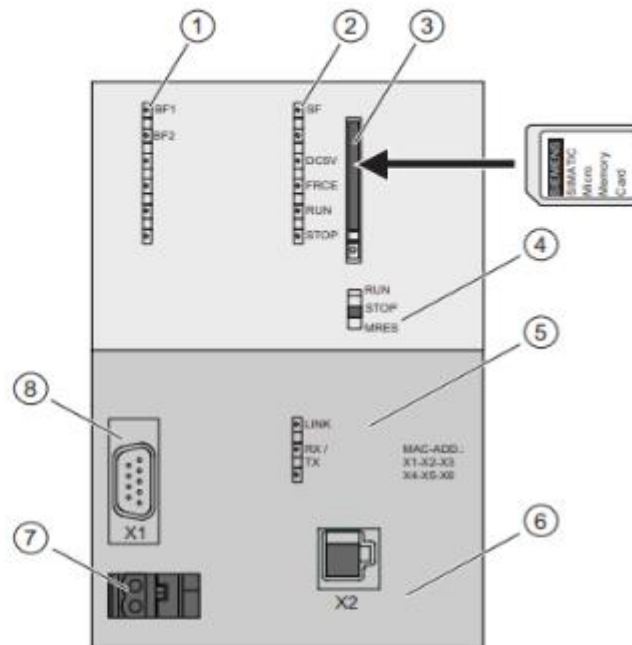
Waiting for the CPU

RN (RUN)	ER (ERR)	DE	IF	Significado
verde	rojo	verde	rojo	
○	○	○	○	El Maestro tiene ningún proyecto, esto significa que la interfaz se desactiva respectivamente PtP está activo.
●	○	○	○	Maestro tiene parámetros de bus y está en RUN sin esclavos.
●	○	B B	○	Maestro está en "clear" estado (estado de seguridad). Las entradas de los esclavos pueden ser leídas. Las salidas están desactivadas.
●	○	●	○	Maestro está en estado de "operar", esto significa que el intercambio de datos entre el maestro y los esclavos. Se puede acceder a las salidas.
●	●	●	○	CPU en "run" pero al menos un esclavo está faltando
●	●	B B	○	CPU en "stop" pero al menos un esclavo está faltando
○	○	○	●	Falla de inicialización. Parámetros inválidos
○	●	○	●	Esperando al CPU

on: ● | Off: ○ | blinking (2Hz): BB

12.9 Hardware of a Simatic 31x

Elementos de manejo y visualización



Cifra	Descripción
①	Indicador de error de bus
②	Indicadores de estado y error
③	Ranura de la Micro Memory Card SIMATIC con expulsor
④	Selector de modo
⑤	Indicador de estado de la 2ª interfaz (X2)
⑥	2. interfaz X2 (PN)
⑦	Conexión para la fuente de alimentación
⑧	1. interfaz X1 (MPI/DP)

12.10 General LED of a Simatic 31x

Status and error displays

The CPU is equipped with following LED displays:

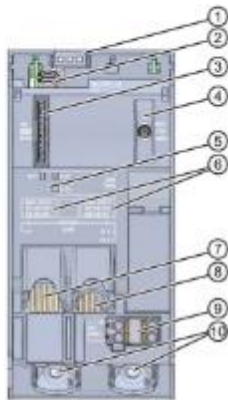
CPU LEDs:

○	SF	(red)	Hardware or software error
○	BF	(red)	Bus error (only CPUs with DP interface)
○	DC5V	(green)	The 5 V power supply for the CPU and S7-300 bus is ok.
○	FRCE	(yellow)	Force job is active.
○	RUN	(green)	CPU in RUN; LED flashes during startup with with 2 Hz; in HOLD with 0.5 Hz.
○	STOP	(yellow)	CPU is in STOP or HOLD or startup; LED flashes during memory reset with 0.5 Hz, during memory reset with 2 Hz.

12.11 Hardware of a Simatic 151x

Vista frontal del módulo sin tapa frontal

La siguiente figura muestra los elementos de mando y de conexión de la CPU 1515-2

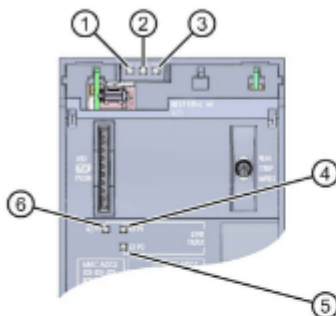


- ① Indicadores LED del estado operativo actual y el estado de diagnóstico de la CPU
- ② Conexión del display
- ③ Ranura para la SIMATIC Memory Card
- ④ Selector de modo
- ⑤ Indicadores LED para los 3 puertos de las interfaces PROFINET X1 y X2
- ⑥ Direcciones MAC de las interfaces
- ⑦ Interfaz PROFINET (X2) con 1 puerto
- ⑧ Interfaz PROFINET IO (X1) con 2 puertos
- ⑨ Conexión para alimentación eléctrica
- ⑩ Tornillos de fijación

Figura 2-4 Vista de la CPU 1515-2 PN (sin tapa frontal), lado anterior

12.12 General LED of a Simatic 151x





































La figura siguiente muestra los indicadores LED de la CPU 1515-2 PN.



- ① LED RUN/STOP (LED amarillo/verde)
- ② LED ERROR (LED rojo)
- ③ LED MAINT (LED amarillo)
- ④ LED LINK RX/TX para puerto X1 P1 (LED amarillo/verde)
- ⑤ LED LINK RX/TX para puerto X1 P2 (LED amarillo/verde)
- ⑥ LED LINK RX/TX para puerto X2 P1 (LED amarillo/verde)





Figura 4-1 Indicadores LED de la CPU 1515-2 PN (sin tapa frontal)

The 1515-2 PN CPU has three LEDs to indicate the current operating status and diagnostic status. The table below shows the meaning of the different color combinations of the RUN/STOP, ERROR, and MAINT LEDs.

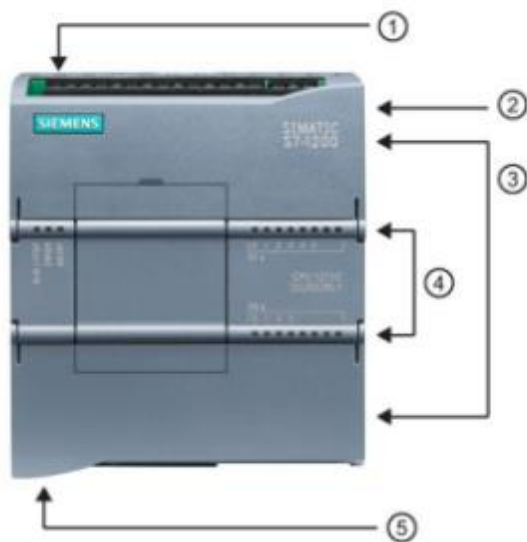
LED RUN/STOP	LED ERROR	LED MAINT	Significado
 LED apagado	 LED apagado	 LED apagado	Tensión de alimentación nula o muy baja en la CPU.
 LED apagado	 LED parpadea en rojo	 LED apagado	Se ha producido un error.
 LED encendido en verde	 LED apagado	 LED apagado	La CPU se encuentra en estado operativo RUN.
 LED encendido en verde	 LED parpadea en rojo	 LED apagado	Hay un evento de diagnóstico.
 LED encendido en verde	 LED apagado	 LED encendido en amarillo	Se ha solicitado mantenimiento para la instalación. En un breve período de tiempo debe realizarse una comprobación/sustitución del hardware afectado.
			Petición de forzado activa
			Pausa PROFIenergy
 LED encendido en verde	 LED apagado	 LED parpadea en amarillo	Existe necesidad de mantenimiento de la instalación. En un período de tiempo previsible debe realizarse una comprobación/sustitución del hardware afectado.
			Configuración incorrecta
 LED encendido en amarillo	 LED apagado	 LED parpadea en amarillo	La actualización del firmware ha finalizado correctamente.
 LED encendido en amarillo	 LED apagado	 LED apagado	La CPU se encuentra en estado operativo STOP.
 LED encendido en amarillo	 LED parpadea en rojo	 LED parpadea en amarillo	El programa de la SIMATIC Memory Card causa un error.
			CPU defectuosa
 LED parpadea en amarillo	 LED apagado	 LED apagado	La CPU realiza actividades internas mientras está en STOP, p. ej. arranque después de STOP.
			Carga del programa de usuario de la SIMATIC Memory Card
 LED parpadea en amarillo/verde	 LED apagado	 LED apagado	Arranque (cambio de RUN → STOP)
 LED parpadea en amarillo/verde	 LED parpadea en rojo	 LED parpadea en amarillo	Arranque (boot de la CPU)
			Test de LED al arrancar, enchufar un módulo.
			Test de intermitencia de LED

12.13 LED Communication of a Simatic 151x

Each port is provided with a LINK RX/TX LED. The following table shows the different LED configurations of the 1515-2 PN CPU ports.

LED LINK TX/RX	Significado
 LED apagado	No existe conexión Ethernet entre la interfaz PROFINET del dispositivo PROFINET y su interlocutor. En estos momentos no se están recibiendo/enviando datos a través de la interfaz PROFINET. Conexión LINK no establecida.
 LED parpadea en verde	Se realiza el "test de intermitencia de LED".
 LED encendido en verde	No existe conexión Ethernet entre la interfaz PROFINET del dispositivo PROFINET y un interlocutor.
 LED titila en amarillo	En estos momentos se están recibiendo/enviando datos desde un interlocutor de la Ethernet a través de la interfaz PROFINET del dispositivo PROFINET.

12.14 Hardware of a Simatic 121x



- ① Conector de corriente
- ② Ranura para Memory Card (debajo de la tapa superior)
- ③ Conectores extraíbles para el cableado de usuario (detrás de las tapas)
- ④ LEDs de estado para las E/S integradas
- ⑤ Conector PROFINET (en el lado inferior de la CPU)

12.15 Simatic 121x Status LED

Tabla 15- 1 LEDs de estado de la CPU

Descripción	STOP/RUN Amarillo / Verde	ERROR Rojo	MAINT Amarillo
Alimentación desconectada	Off	Off	Off
Arranque, autotest o actualización de firmware	Parpadeo (alternando entre amarillo y verde)	-	Off
Estado operativo STOP	On (amarillo)	-	-
Estado operativo RUN	On (verde)	-	-
Extracción de la Memory Card	On (amarillo)	-	Parpadeo
Error	On (amarillo o verde)	Parpadeo	-
Mantenimiento solicitado <ul style="list-style-type: none"> • E/S forzadas • Es necesario sustituir las baterías (si se ha instalado la Battery Board) 	On (amarillo o verde)	-	On
Hardware averiado	On (amarillo)	On	Off
Test de LEDs o firmware de la CPU defectuoso	Parpadeo (alternando entre amarillo y verde)	Parpadeo	Parpadeo
Versión desconocida o incompatible de configuración de CPU	On (amarillo)	Parpadeo	Parpadeo

13 Legal

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