



# Operator's Manual

## System Overview



# Content

1	General	3
2	General Nomenclature	4
2.1	Batch Processing	4
2.2	Continuous Processing	4
3	System Structure	4
3.1	The Logic Controller	4
3.2	Operation Station	4
3.3	Field Devices	5
3.4	Diagram	5
4	The Operating Stations	6
4.1	Visualization of processes	6
4.2	Control Modules	6
4.3	Sequences	6
5	Configurations	8
5.1	Area Batch (Batch Area)	8
5.2	Clase (Class)	8
5.3	Step	8
5.4	Parameter	8
5.5	Recipe	9
6	Historical	10
6.1	Batch	10
6.2	Complete production log to analyze errors	10
6.3	Summary Production Report	10
6.4	Recording Manual Operations	11
6.5	Timeline Analysis	11
6.6	Batch traceability	12
6.7	Trends & Alarms	13
7	The Programmable Logic Controller (PLC)	14
7.1	Features in the BatchXpert System	14
7.2	Modifications	14
8	Safety Logic Controllers	15
9	Devices in the field	16
10	Software Architecture	17
10.1	VisXpert	17
10.2	BatchXpert	17

10.3	SQL Database .....	17
10.4	Scheme.....	18

# 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®" **work system**, please refer to the page [www.Mlogics-Automation.com](http://www.Mlogics-Automation.com)



## 2 General Nomenclature

### 2.1 Batch Processing

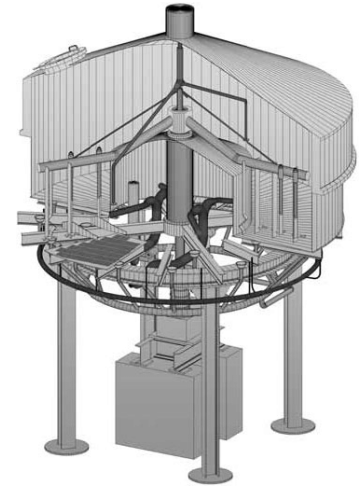
A batch process involves a set of ingredients and a sequence of one or more production steps that follow a predefined order. A set amount of products are produced at the end of each sequence to form a single batch. Subsequent batch processing will only begin once all set quantities of products have been produced.

All raw materials are introduced at the beginning of the production process, and finished products are completed after a certain period.

### 2.2 Continuous Processing

The continuous process moves the raw material from the beginning of the process through each production step to the final product. Instead of waiting until the unit of product is complete, the raw material is continuously fed and processed to produce additional units of product.

Continuous has a constant flow of raw materials in production, generating a constant flow of products, and is also known as a continuous production cycle.



## 3 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.

### 3.1 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.



### 3.2 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.





## 4 The Operating Stations

Operating stations are the computers that are used by the system operation, supervision, and maintenance personnel. Each station can operate independently, but maintain communication with the other stations to synchronize configuration data. This means that recipes can be edited from any of the stations and distributed to the other stations. All stations have access to all processes and all histories.



If the logic controller requests a recipe, one of the stations sends the requested recipe data to the controller, where the line is executed. Historical data is recorded on all computers based on the data generated in the logic controller.

### 4.1 Visualization of processes

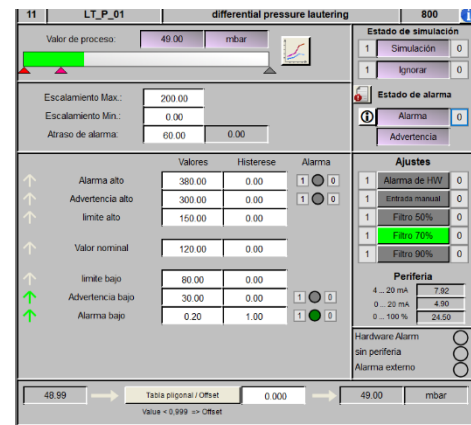
One part of an operating station, though one of the most important, is the Process Visualization. This allows the operator to visualize the data from the logic controller and interact with it to perform manual operations, or start new processes.

The Operating Station only sends "requests" to the controller, which evaluates permissible events, or releases to execute them. The operating station does not carry out a direct control over the implements on the ground, it only functions as a "Machine and Human interface".

### 4.2 Control Modules

Each Device in the field is represented as a "Control Module". There are different types of control modules, with different parameters and functions, but among one type of control module, all modules have the same functions and settings.

There are, for example, the "Control Module" or "Actuator" which allows activations for valves or motors in the field. Another module is the "Analog Input" which receives a measured value from the ground and displays it on the display.



Each control module has a "Faceplate" (accessible by right-clicking on the module symbol), which allows you to observe and perform the functions of the module.

### 4.3 Sequences

A sequence is a set of equipment, or "Control Modules", that form a stage or a part of the process that can execute an action in the process. When this sequence or unit receives a prescription, it begins to perform the "actions" defined in this recipe.

A Recipe for 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.





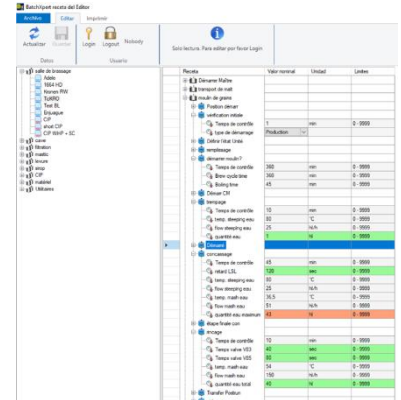
# 5 Configurations

The configurations are mainly separated into two areas.

- 1. Process Configurations
- 2. Computer Configurations

Computer settings are relevant only to maintenance personnel and are omitted from this description.

Setting up the Process essentially allows you to model the process with the system tools. Configurations are made with the "Batch Configuration" program, where configurations are made, for example, recipes.



The Batch Configuration defines the structure and relationships of the Processes that were defined in the Project Layout. The configuration is strictly hierarchical according to the ISA88 standard and Annexes.

## 5.1 Area Batch (Batch Area)

A Batch Area defines a closed Production Area, where raw materials enter and a defined product comes out. A Batch can occupy all the computers defined in the Area, and contains a unique identification number that is shared throughout the Batch Area.

In the Batch Area, the Recipes (Products) that are executed in the Area are defined, which are the same for all the teams defined in it. If a Batch is transferred from one Batch area to another, a new Batch must be created. Batches within an Area cannot be mixed with each other.

Examples of Batch Areas are: Brewhouse, Filtration, Fermentation, Syrup Room,...

## 5.2 Clase (Class)

A Class defines a type of equipment that can be used by a Batch, within an area. A Class defines the sequence and parameters of the team. Each Class defines the Actions of the team and thus the operation of the team.

Configurations made on a Class will run on the drives assigned to a Class. A Class can contain several Units, which share the same configuration, but can be run independently. A Unit can only be assigned to one Class.

## 5.3 Step

A step defines a defined, closed action that can be executed on a unit assigned to a class. In each unit only one step can be active at a time. All steps are independent of each other, allowing for flexible configuration of one-class/unit recipes.

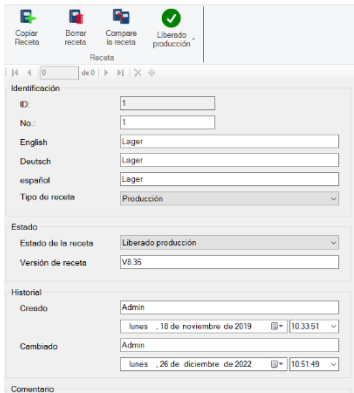
## 5.4 Parameter

Each Step can contain parameters that define the adjustable ratings in the recipes. Parameters are values that are directly related to the process, depending on the step to which the parameter is being assigned.

A Parameter can be set to "Final Condition" or "Alarm Condition", which affects the visual display of the parameter list during the execution of a Recipe.

For example, for line rinsing, the water quantity parameter is assigned a value, for example 10 hl, and the minimum and maximum value that can be assigned is adjusted, as well as the engineering unit, etc. (This value of 10 hl is a default value that will be taken by the recipe, but can be modified according to the recipe, but the minimum and maximum values are maintained for all recipes) and the flow parameter is assigned 20 hl/h.

## 5.5 Recipe



The screenshot shows a software interface for recipe management. At the top, there are four buttons: 'Copiar Receta', 'Borrar receta', 'Compara la receta', and 'Liberado producción'. Below these is a search bar and navigation icons. The main area is divided into sections: 'Identificación' with fields for ID (1), No. (1), English (Lager), Deutsch (Lager), español (Lager), and Tipo de receta (Producción); 'Estado' with 'Estado de la receta' (Liberado producción) and 'Versión de receta' (V0.35); and 'Historial' with 'Creado' (Admin, lunes .18 de noviembre de 2019, 10:33:51) and 'Cambiado' (Admin, lunes .26 de diciembre de 2022, 10:51:49). A 'Comentario' field is at the bottom.

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.

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.

# 6 Historical

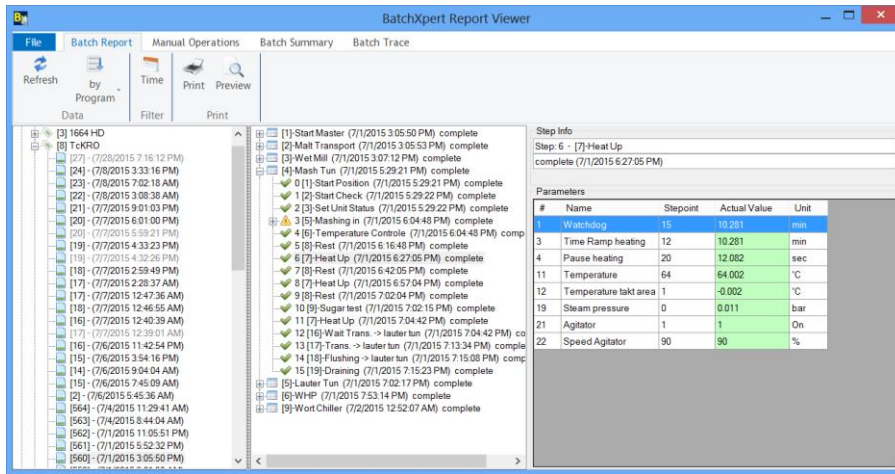
The system records a large amount of historical data for each batch run in the system.

## 6.1 Batch

A batch is a recipe that has been run in the system. Essentially, it is a recipe with a process identifier (Prid) with which all the historical data belonging to this batch can be identified. Each batch has its own unique "Prid", i.e. even though the same recipe is run twice, this results in two different batches with strictly separate histories.

## 6.2 Complete production log to analyze errors.

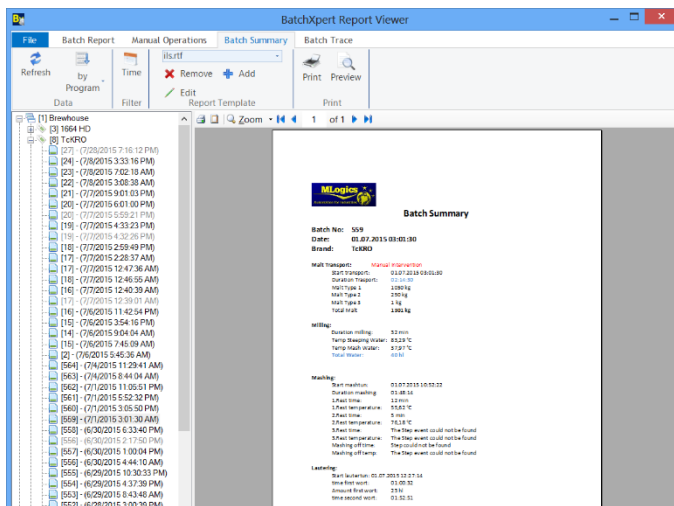
Indicates all executed steps with nominal and current values. It also indicates whether the step was completed automatically or aborted manually. Provides a detailed view of all events within an executed batch.



The print format is fully configurable. You can change logos, fonts, colors. Etc.

## 6.3 Summary Production Report

To replace the "batch sheets" or "Brew Sheets", the system incorporates a type of report that



allows you to summarize the most important values and events in a process in one or more sheets.

This report (Batch Summary) is completely flexible and can be adapted by the operator according to the needs of the processes. There are reports for Microsoft Word and Microsoft Excel (with this you can perform complex calculations on top of the data)

## 6.4 Recording Manual Operations

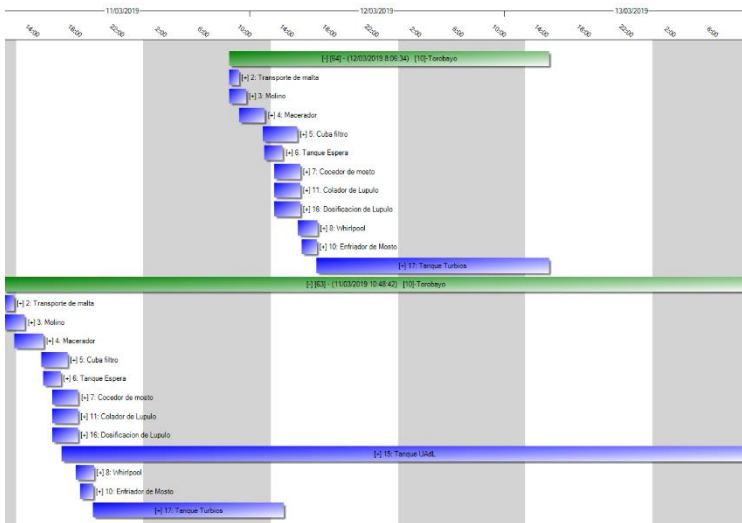
The BatchXpert system **records all manual operations and interventions**, which are presented as a "Manual Operations Report". There are many possibilities to filter and sort the data, making it very easy to find the event you are looking for. All events are recorded as:

- Manual Valve Openings
- Parameter changes such as: alarm delays, PID settings, ...
- Recipe Target Value Changes
- Material Modifications and Dosages

Time	PLC	Obj. Type	Obj. No.	Tag	Description	Event	EventInfo	Value	Batch	Step	Phase	User	Station
4/19/2016 8:31:38 PM	1	ACT	44	BFM0801	WHP density - pump measurement	Alarm delay Sp	5 >> 6					3: mlogics	1: BX1
7/9/2015 4:30:53 PM	1	ACT	44	BFM0801	WHP density - pump measurement	Manual Off						11: Kevin	2: BX2
7/9/2015 4:30:41 PM	1	ACT	44	BFM0801	WHP density - pump measurement	Auto Off						11: Kevin	2: BX2
7/9/2015 4:30:41 PM	1	ACT	44	BFM0801	WHP density - pump measurement	Manual On						11: Kevin	2: BX2
7/9/2015 10:59:48 AM	1	ACT	44	BFM0801	WHP density - pump measurement	Manual Off						3: mlogics	3: BX3
7/9/2015 10:57:29 AM	1	ACT	44	BFM0801	WHP density - pump measurement	Auto Off						3: mlogics	3: BX3
7/9/2015 10:57:29 AM	1	ACT	44	BFM0801	WHP density - pump measurement	Manual On						3: mlogics	3: BX3
7/9/2015 8:19:14 AM	1	ACT	44	BFM0801	WHP density - pump measurement	Manual Off						3: mlogics	3: BX3
7/9/2015 8:19:05 AM	1	ACT	44	BFM0801	WHP density - pump measurement	Manual On						3: mlogics	3: BX3
7/9/2015 7:47:58 AM	1	ACT	44	BFM0801	WHP density - pump measurement	EmRel Off						11: Kevin	4: BX4
7/9/2015 7:47:15 AM	1	ACT	44	BFM0801	WHP density - pump measurement	Manual Off						11: Kevin	4: BX4
7/9/2015 7:30:09 AM	1	ACT	44	BFM0801	WHP density - pump measurement	Auto Off						11: Kevin	4: BX4
7/9/2015 7:30:09 AM	1	ACT	44	BFM0801	WHP density - pump measurement	Manual On						11: Kevin	4: BX4
7/9/2015 7:30:07 AM	1	ACT	44	BFM0801	WHP density - pump measurement	EmRel On						11: Kevin	4: BX4

### 1 Manual Operations Viewer with Adjustable Filters

## 6.5 Timeline Analysis



The BatchXpert system includes a report that allows the user to review the execution of the learning process unit and the phase of the process in a "Gantt chart" style report. This allows for the easy identification of possible "bottlenecks" and allows the optimization of the plant's efficiency.

## 6.6 Batch traceability

For batch and material traceability, there is a "Batch Trace". All transfers between the different batches are recorded, as well as all manually consumed, produced or dosed materials.

This record makes it easy and intuitive to evaluate product transfers. The report allows us to answer, for example, the following question: **To which Cookies has the yeast that was harvested from tank X been dosed.**

BatchXpert Report Viewer

File Batch Report Manual Operations Batch Summary Batch Trace

Refresh by Program Data Filter Print Preview Group All View

Tabular View Graphical View

Inbound Transfers

Source	Material	Amount	Start Time	End Time
Batch				
[545] - (6/28/2015 9:10:36 ...	Intern products: Green Beer	171.992	7/3/2015 2...	7/3/2015 ...
POLYCLAR 10				
[531536] - (7/3/2015 2:17:19 PM)	POLYCLAR 10: Polyclar 10, ...	0.7425...	7/3/2015 2...	7/3/2015 ...

Selected Batch

[531536] - (7/3/2015 2:17:19 PM) [8]-TcKRO Detail

Outbound Transfers

Destination	Material	Amount	Start Time	End Time
Batch				
[536] - (7/3/2015 2:17:55 P...	Intern products: Green Beer	171.995	7/3/2015 2...	7/3/2015 ...

BatchXpert Report Viewer

File Batch Report Manual Operations Batch Summary Batch Trace

Refresh by Program Data Filter Print Preview Group All View

Tabular View Graphical View

0.83x

1.1

Fill

Houblon Magnum 300, alpha  
Houblon 300, 3407/2014

Sure Blanc BRASSAGE  
Sure Blanc, Brassage, 01/06/2015

Sure Blanc BRASSAGE  
Sure Blanc, Brassage, 01/06/2015

Houblon Magnum 300, alpha  
Houblon 300, 2407/2014

Malt Caramel C&SIL 150  
Malt caramel, 05/08/2013

Malt Pilzen 28P OCEANIC  
Malt, Océane, ???

Malt Pilzen 28P  
Malt 28P, 27/05/2015

BrewHouse  
[536] - (7/3/2015 2:17:55 PM) [8]-TcKRO

BrewHouse  
[536] - (7/3/2015 2:17:55 PM) [8]-TcKRO

Celer  
[57] - (7/1/2015 4:32:56 AM) [8]-TcKRO

## 6.7 Trends & Alarms

MessageView 1 - GraphXpert MolecSystem-Andaeg

File Message View Help

Current Archive

Stat	Reset	Operand	Symbol	Text	Class
07.07.15 22:18:50	07.07.15 22:18:50	17184	Unit (I:4)	Mesh Fun	Operator
07.07.15 22:18:50	07.07.15 22:18:50	17188	Unit (I:4)	ValvP	Operator
07.07.15 22:18:01	07.07.15 22:18:03	17188	Unit (I:4)	ValvP	Operator
07.07.15 22:26:03	07.07.15 22:26:14	17231	Unit (I:7)	BBT 1	Operator
07.07.15 22:28:42	07.07.15 22:30:39	12076	13.0V13.03	ValvP ready signal	Alarm
07.07.15 22:28:42	07.07.15 22:30:39	17006	Unit (I:6)	ValvP	Alarm
07.07.15 22:31:00	08.07.15 17:40:41	17211	Unit (I:5)	Fremander 11	Operator
07.07.15 22:26:46	07.07.15 22:26:39	17183	Unit (I:5)	ValvP Chlde	Operator
07.07.15 23:24:48	08.07.15 00:24:16	17002	Unit (I:2)	High Pressure	Alarm
07.07.15 23:43:26	07.07.15 23:43:53	17184	Unit (I:4)	Mesh Fun	Operator
07.07.15 23:44:37	07.07.15 23:46:22	16011	23.08V11	ice water pump - temp. melt cooler	Alarm
07.07.15 23:44:37	07.07.15 23:46:26	17003	Unit (I:2)	ValvP Chlde	Alarm
07.07.15 23:46:15	07.07.15 23:46:35	17183	Unit (I:5)	ValvP Chlde	Operator
07.07.15 23:46:52	08.07.15 04:24:22	17417	Alarm Smp	Smp - Alarm Crossing	Alarm
07.07.15 23:46:26	07.07.15 23:45:03	17006	Unit (I:6)	ValvP	Alarm
07.07.15 23:52:45	07.07.15 23:52:57	10123	15.0V12.0	ValvP - valve outlet below	Alarm
07.07.15 23:55:37	07.07.15 23:56:10	14158	EA_P1000	pressure Winstrakt	Alarm
07.07.15 23:58:52	07.07.15 23:59:00	17006	Unit (I:6)	ValvP	Alarm
07.07.15 23:59:02	07.07.15 23:59:13	17006	Unit (I:6)	ValvP	Alarm
07.07.15 23:59:02	07.07.15 23:59:18	10123	15.0V12.0	ValvP - valve outlet below	Alarm
08.07.15 00:02:39	08.07.15 02:38:96	17001	Unit (I:1)	Start Module	Alarm
08.07.15 00:10:05	08.07.15 00:14:16	16045	44.00V11	car filter - pressure low	Alarm
08.07.15 00:17:07	08.07.15 00:17:23	17026	Unit (I:2)	Filter K5	Alarm
08.07.15 00:17:10	08.07.15 00:17:18	17188	Unit (I:2)	Filter K5	Operator
08.07.15 00:20:00	08.07.15 00:25:56	16045	44.00V11	car filter - pressure low	Alarm
08.07.15 01:20:39	08.07.15 00:57:24	14115	44.00V10	low BBT to car filter	Alarm
08.07.15 01:43:59	08.07.15 01:44:04	17026	Unit (I:2)	Filter K5	Alarm
08.07.15 01:44:34	08.07.15 01:45:59	17026	Unit (I:2)	Filter K5	Alarm
08.07.15 02:16:18	08.07.15 02:16:44	16041	13.05V21	CIP hot temperature	Alarm

Like all control systems, the BatchXpert incorporates a sophisticated alarm and trend recording system. The system records alarms for each control module and trends for each analog value, which can be evaluated by its built-in tools.

In addition, there is the possibility (Optional) of sending emails and/or SMS to cell phones, if certain alarms are registered in the system during different periods of time.



## 7 The Programmable Logic Controller (PLC)

A programmable logic controller (PLC) is a computer used in automatic engineering or industrial automation, to automate electromechanical, electro-pneumatic, electro-hydraulic processes, such as the control of factory machinery on assembly lines or other production processes

PLCs are used in many industries and machines. Unlike general-purpose computers, the PLC is designed for multiple input and output signals, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs for controlling the operation of the machine are usually stored in batteries, backups or non-volatile memories. A PLC is an example of a real-time system, where output results must be produced in response to input conditions within a limited time, otherwise it will not produce the desired result.<sup>1</sup>



### 7.1 Features in the BatchXpert System

In the BatchXpert system, the logic controller is the entity that effectively controls the devices in the field. It is the entity that eventually gives the order to open a valve or start a pump. Several times per second, it evaluates the ground conditions to determine if the blockades in the field are met to give the opening permit or process and alarm conditions.

The Controller receives a recipe from the computer and executes the etpas with the parameters defined in it.

### 7.2 Modifications

The controller is not modifiable by the user, only by automation personnel.

## 8 Safety Logic Controllers

Safety PLCs are special controllers built and certified to meet international safety requirements such as NFPA 79, IEC 62061, IEC 13849-1 or IEC 61508. All of these safety standards define the levels of risk reduction.

That is, they are controllers that exclusively handle safety-relevant devices and do so in a way that prevents malfunctions.

A security PLC does not always exist in BatchXpert systems, but it is often used to ensure better "reliability" for safety systems such as "Emergency Stops", "Man Doors" etc.

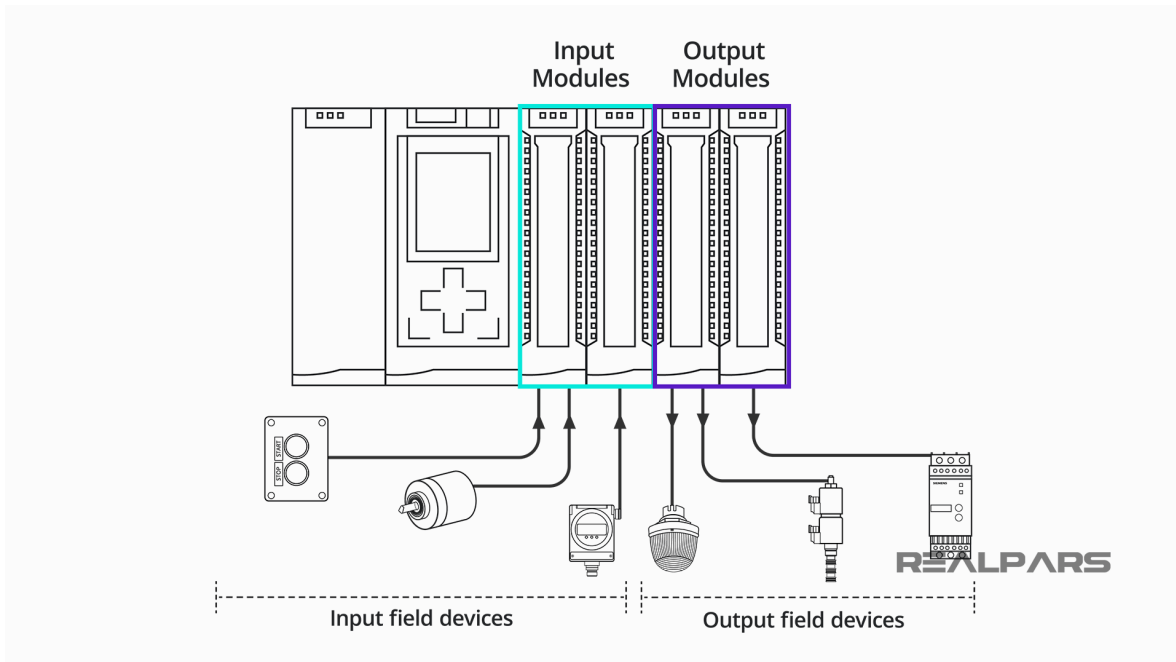
These controllers generally operate completely independently and have minimal interaction with the main PLC. They only have logic to handle safety-critical functions and nothing else. All other functionalities are implemented in the main PLC.





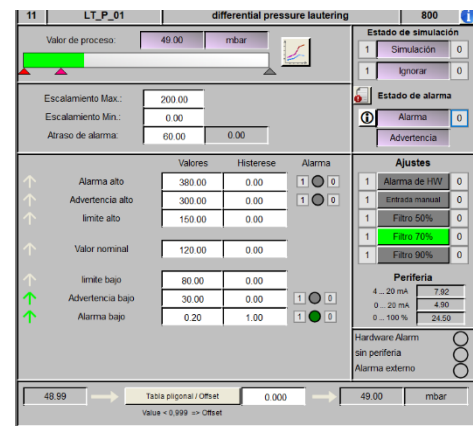
## 9 Devices in the field

A device in the field is the valves, sensor pumps or measurements that are eventually connected to the control system. Commonly, panels are installed in the field which communicate with "Profinet" (an industrial fieldbus) with the logic controller to which they send their data and from which they receive the activation commands.



Each Device in the field is represented as a "Control Module". There are different types of control modules, with different parameters and functions, but among one type of control module, all modules have the same functions and settings.

There are, for example, the "Control Module" or "Actuator" which allows activations for valves or motors in the field. Another module is the "Analog Input" which receives a measured value from the ground and displays it on the display.



Each control module has a "Faceplate" (accessible by right-clicking on the module symbol), which allows you to observe and perform the functions of the module.

# 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.

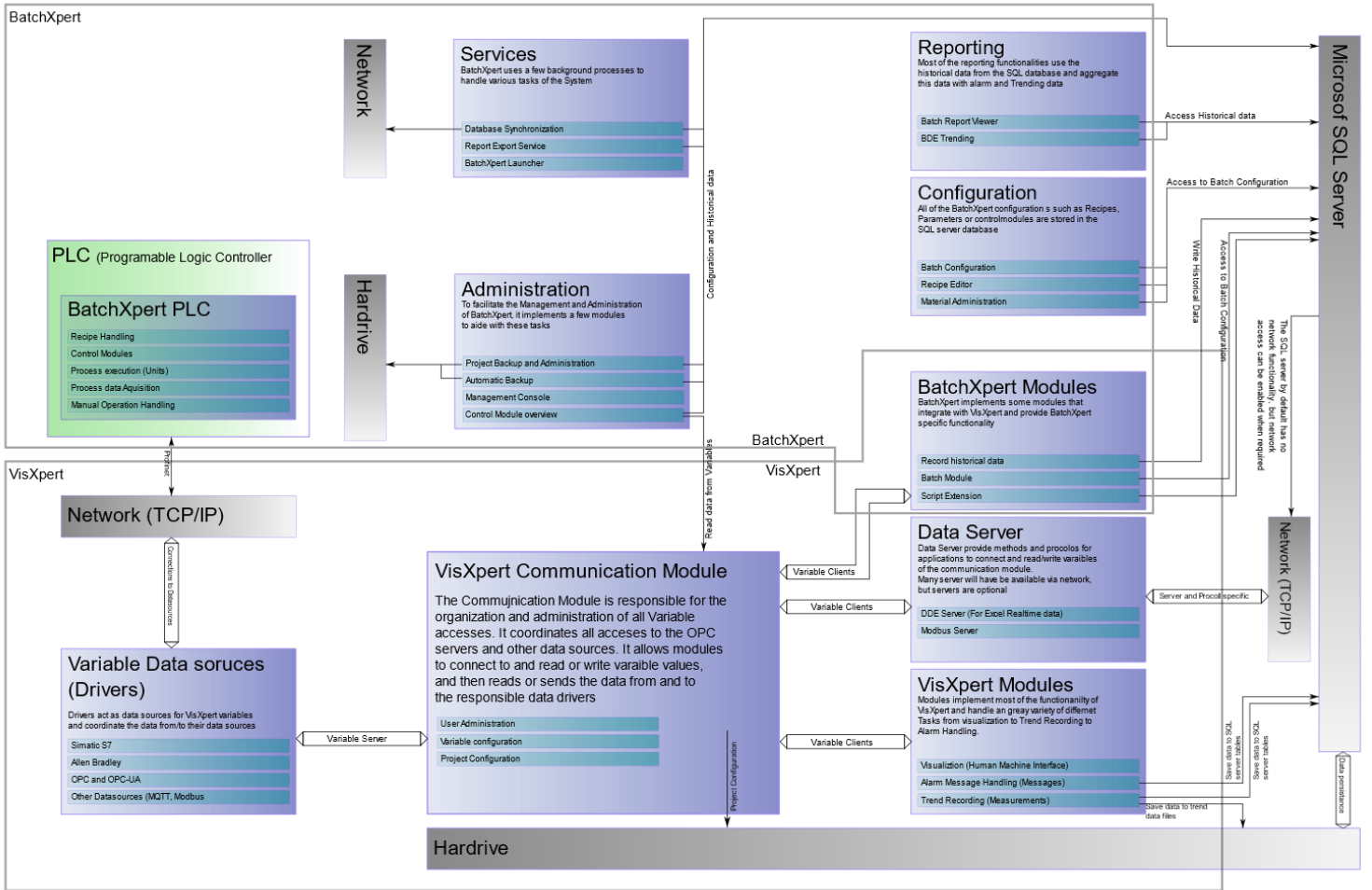
It also implements many management tools for users, so that they can better perform operations, maintenance, and optimizations on the system.

## 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><b>MLOGICS</b> GERMAN AUTOMATION PARTNER</p>
<p>© 2011 Messuring GmbH</p>	<p>MLogics Chile Ltda. 76.236.183-K</p> 