Engineering
Part 1: Overview

English Version 3.0

Content

About this Manual

BatchXpert is a control system for managing and visualizing batch processes. It supports recipe execution, batch tracking (including material handling), alarm and event management, trend recording, and batch reporting via BatchXpert stations and HMI clients.
The system is modular and can be scaled from single units (for example, CIP or pasteurization skids) to complete production lines. In a typical automation project, BatchXpert integrates three layers—PLC control, SCADA/HMI visualization, and the engineering/database toolchain—that operate together as one system.

This manual is organized into three parts: **Part 1** provides a general overview of BatchXpert, **Part 2** focuses mainly on PLC-related topics and engineering in SIMATIC TIA Portal, and **Part 3** explains how to create the HMI and Operating Station. **Part 4** contains information about additional modules that can be used in the BatchXpert system.

Target Audience of this Manual

This manual is intended for project engineers and automation specialists who implement or maintain BatchXpert projects. It assumes familiarity with batch/process automation concepts and general commissioning practices. This document explains how BatchXpert applies these concepts; it is not an introduction to PLC programming. Working knowledge of Siemens SIMATIC S7 programming and the associated engineering tools (SIMATIC Manager and/or TIA Portal) is required.

AI-assisted editing notice:

This manual was produced with the support of AI tools. AI was used primarily to assist with grammar and spelling corrections and to improve readability. The technical content, procedures, and engineering guidance are based on the author's expertise and project knowledge, not generated by AI.

Version of this Manual

Version 3.0	Reworked completely Separated into multiple Parts

Overview

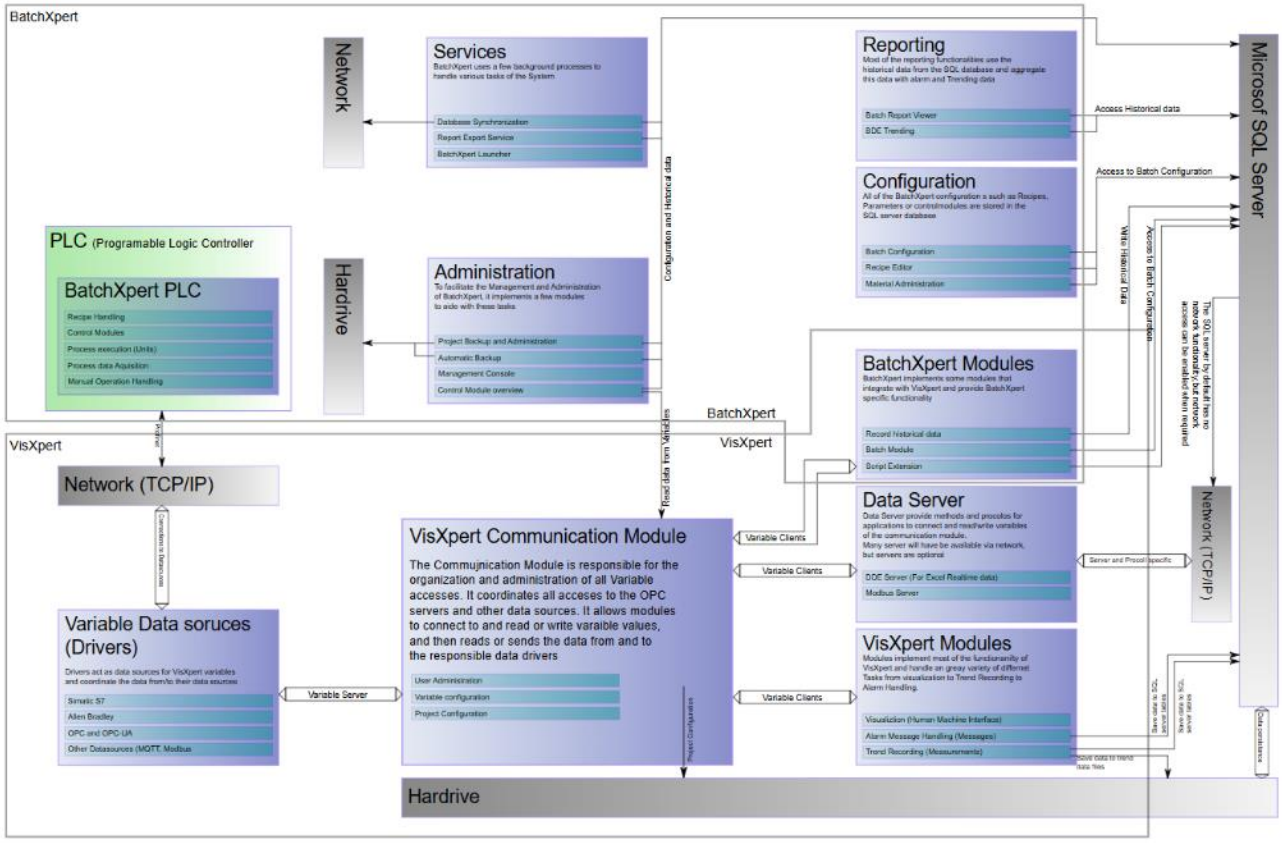
VisXpert Scada

BatchXpert is built on the VisXpert SCADA platform, which provides the core runtime environment. VisXpert manages PLC communication, process visualization, alarm handling, trend recording, recipe deployment, and historical data capture—functions that are required for BatchXpert to operate reliably.

VisXpert includes a preconfigured HMI library that covers the standard BatchXpert functionality and enables rapid creation of consistent process graphics. The symbol library supports library-based updates, allowing projects to adopt newer symbol versions and bug fixes with minimal rework.

Software Architecture

VisXpert is a modular SCADA system that can be extended through plug-in modules. BatchXpert delivers its batch-specific functionality (for example, recipe handling, reporting, and engineering utilities) as VisXpert modules that integrate into the runtime, access the configured variables, and interact with standard services such as alarms, trends, and data logging.



Overview of BatchXpert Software Architecture

MLogics Chile Ltda.
76.239.183-K

The Database

BatchXpert stores configuration data and historical records in a Microsoft SQL Server database. By default, BatchXpert uses SQL Server Express, which is installed via the Installation Center and accessed by the engineering and runtime tools.

Be aware that database files may be upgraded automatically when opened with a newer BatchXpert release or a newer SQL Server instance. After an upgrade, the database might no longer be compatible with older BatchXpert versions or older SQL Server releases.

In practice, incompatibilities typically occur in the following scenarios:

1. Opening a project with a newer BatchXpert version can trigger a database schema upgrade to enable new features. Once upgraded, the project database may no longer open with older BatchXpert versions (for example, upgrading a project from V1.8 to V1.10).
2. Attaching or restoring a database to a newer SQL Server release can upgrade the database format, which can prevent use on older SQL Server versions (for example, moving a database from SQL Server 2019 to 2022).

When an upgrade is required, BatchXpert prompts you with a warning and allows you to cancel or proceed. As a best practice, create a verified project backup before approving any database upgrade—especially when working on systems that are already deployed.

To avoid version conflicts, align your engineering environment with the deployed environment (BatchXpert version and SQL Server version). If you must engineer with a newer release, plan the corresponding on-site update before commissioning changes.

If you need to maintain multiple SQL Server versions for engineering and support, see the next section on installing and selecting parallel SQL Server instances.

PLC

BatchXpert's PLC framework targets the Siemens SIMATIC S7 platform and is designed to run on supported S7 controller families. It applies to a standardized, modular programming approach with consistent interfaces to reduce engineering effort, support reusable logic, and achieve predictable cycle times.

The framework supports an imperative/declarative style, and you can apply additional engineering conventions as required by your project.

Tia Portal and Simatic Manager

BatchXpert PLC examples are written in AWL/STL (Statement List). Both SIMATIC Manager and TIA Portal support STL, so you can choose the engineering environment that matches your PLC platform and project standards. Many examples in this manual use SIMATIC Manager screenshots, but the concepts and code apply equally in TIA Portal.
For new projects, we recommend TIA Portal. For existing installations, avoid upgrading the engineering environment unless the PLC project and on-site software are updated in a controlled manner.

By default, SQL Server is always Local

By default, each BatchXpert station runs its own local SQL Server instance and uses it for all database access. Network access to the SQL instance is typically disabled, because configuration and runtime data are read locally.

This architecture improves availability by avoiding a single centralized database as a point of failure. To keep project data consistent across multiple stations, BatchXpert provides a synchronization service that replicates the project database between stations.

As a result, normal operation does not require database connectivity over the network.

A centralized SQL Server can be configured in special cases (for example, specific IT constraints or integration requirements). However, it is not the default design assumption and should be evaluated carefully for availability, performance, and network dependency.

Overview for Advanced programmers

This chapter provides a high-level orientation for engineers who already work with established batch/process control systems (for example Braumat, Botec, BrewMax, or PCS 7) and want to understand the main BatchXpert concepts and engineering approach.

General

From a PLC engineering perspective, BatchXpert follows familiar patterns used in other batch frameworks: standardized modules, consistent interfaces, and clear separation between unit logic and reusable library functionality. Engineers with prior batch-system experience can typically transfer their workflow and design principles directly.

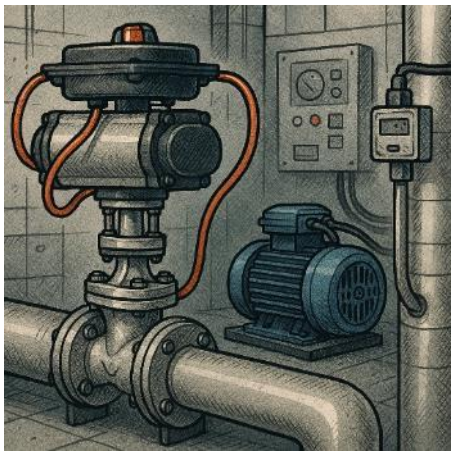
BatchXpert uses VisXpert as its SCADA/HMI platform. VisXpert provides the runtime services required for operation (PLC communication, visualization, alarms, trends, historical data, and recipe deployment), while BatchXpert adds the batch-specific engineering model and execution components.

Recipe execution

Phases, parameters, and recipes are stored in the SQL Server project database. When a unit requests a recipe, the HMI/SCADA runtime retrieves the required configuration, compiles the recipe into an execution dataset (steps and setpoints), and downloads it to the unit. The PLC then executes the recipe sequentially by running the corresponding phase logic step by step. As with other batch systems, it is good practice to control recipe changes using versioning and to validate updates before deployment to production.

PLC Control modules

In BatchXpert, control modules (actuators, inputs, regulators, etc.) are executed cyclically by the PLC framework. You do not call individual module functions in your user code; instead, the framework scans the configured module data blocks, processes each configured instance, and updates commands and statuses automatically. This allows engineers to focus on unit/phase logic while using control modules as standardized building blocks.



All modules of the same type are stored in a single, shared data block (for example, all actuators in one actuator data block). Modules can be assigned to units for reporting, grouping, and HMI organization; however, the modules themselves remain globally available. In practice, a module is typically used by its primary unit, but other units may request control when required by the process design (subject to interlocks and operating mode).

SCADA Control modules

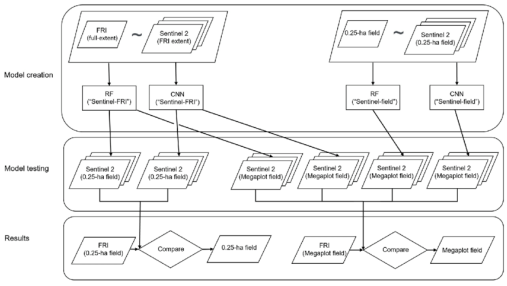
A similar principle applies on the SCADA/HMI side. Because the PLC framework processes all configured control modules, VisXpert projects typically include a consistent, preconfigured tag model for these modules. As a result, adding a new module is primarily an engineering/configuration task: the PLC module instance is configured, and the corresponding HMI objects can use the existing tag structure without redefining each variable. To keep projects maintainable, apply consistent naming conventions and avoid ad-hoc tag structures that break standard faceplates and diagnostics.

Unit Execution in the PLC

During unit execution, the PLC framework maps the active unit's dedicated unit data block to a generic "current unit" data block (Bx Uxx). Within unit function code, you should reference Bx Uxx rather than hard-coding unit-specific DB numbers. This approach supports reusable unit logic and simplifies testing and commissioning across multiple units.

Because the framework performs the mapping automatically before and after execution, the same unit code can be reused without adjusting data block numbers. This reduces duplication and helps ensure consistent behavior across units. You can find further information here [The "Current Unit Data block" (DB100)]

Unit to Unit Communication



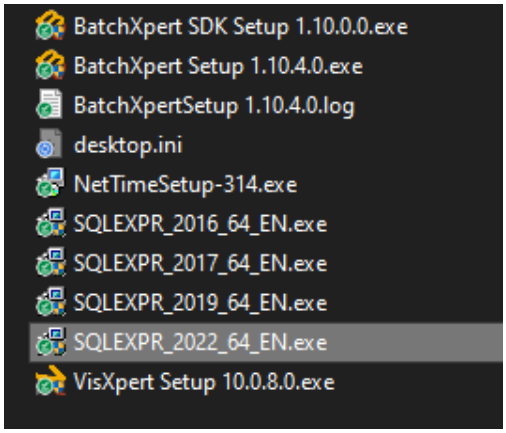
BatchXpert Includes a concept for communication between multiple units in a standardized way. This system allows you to select a communication partner, send signals to this communication partner, receive signal from the selected communication partner and allocate the communication partner for exclusive use. This system automatically handles unit allocation, and thus eliminates problems caused by multiple units trying to communicate with the same unit. More information here [Unit-to-Unit Communication].

Installation of Multiple SQL Server Versions in Parallel

BatchXpert projects use Microsoft SQL Server database files that may be upgraded automatically when opened with a newer SQL Server version (there is a warning before upgrading). Once a database has been upgraded, it may no longer be compatible with older SQL Server releases. For this reason, engineering and commissioning should be performed using the same SQL Server major version that is deployed on site.
If you support multiple customer sites or maintain legacy systems, you may need more than one SQL Server version on an engineering workstation. Installing multiple SQL Server instances in parallel allows you to keep projects isolated by version while avoiding unintended database upgrades.
If BatchXpert displays an SQL Server upgrade warning when you open a project, stop and verify that the configured SQL Server instance matches the version used on site. Only proceed with an upgrade after you have created a verified project backup and have an approved plan to update the deployed environment accordingly.

Manual Installation (Parallel Instances)

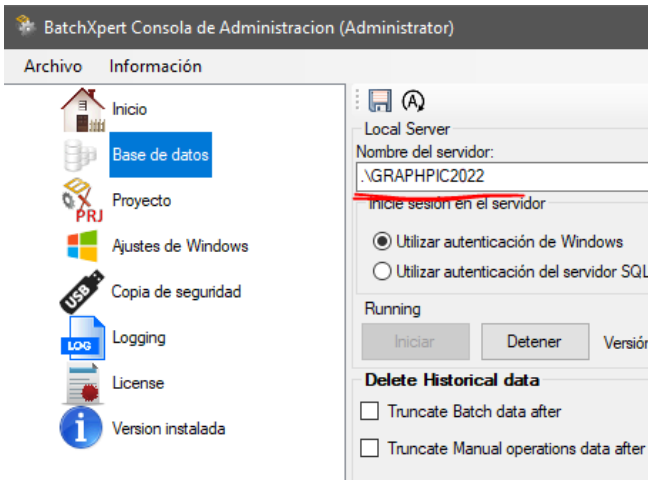
The BatchXpert Installation Center installs SQL Server using a fixed instance name (**GraphPic**). To run multiple SQL Server versions side by side, install additional SQL Server instances manually and assign a unique instance name for each version (for example, **GraphPic2019**, **GraphPic2022**). Each instance name must be unique on the workstation.



1. **Obtain the installer.** Download the required SQL Server installer package (same major version as the target site). If you use the BatchXpert Installation Center to download prerequisites, the SQL Server setup files are typically located under its **Setups** subfolder.
2. **Run setup with administrative rights.** Start *setup.exe* and choose a **New SQL Server stand-alone installation**.
3. **Set a named instance.** On *Instance Configuration*, select **Named instance** and enter a unique instance name (for example, **GraphPic2022**).
4. **Install core features only.** For engineering workstations, the **Database Engine Services** feature is typically sufficient unless your IT standard requires additional components.
5. **Authentication and service account.** Use Windows authentication where possible. If SQL authentication is required, store credentials securely and avoid using shared “sa” credentials across machines.
6. **Confirm service startup.** After installation, verify the SQL Server service for the new instance is running (for example, *SQL Server (GraphPic2022)*).

Select the Active SQL Server Instance for BatchXpert

After installing multiple SQL Server instances, you must configure BatchXpert to use the correct instance for the project you are engineering. BatchXpert reads this setting from the Management Console and uses it across BatchXpert applications on the workstation.



To change the active SQL Server instance, open the **BatchXpert Management Console**, navigate to **Database** settings, and update the **Server Name** to the required instance (for example, **GraphPic** or **GraphPic2022**). Restart the BatchXpert project (or the affected applications) to ensure the new setting is applied.

- **Validate before opening projects:** Confirm the SQL Server service for the selected instance is running and that you can connect to it locally.
- **Use the same version as the site:** If the project database was created on SQL Server 2019, point BatchXpert to the SQL Server 2019 instance before opening the project to avoid upgrade prompts.
- **If you see an upgrade prompt:** Cancel, re-check the selected instance, and verify you opened the correct project directory/backup.
- **Permissions:** If database attach/detach fails, run BatchXpert tools with sufficient rights and ensure antivirus or endpoint protection is not locking database files in the project *Data* folder.

Global Communication View

This chapter provides an overview of the standard communication paths used in a BatchXpert system and the recommended network design principles when integrating Siemens SIMATIC S7 controllers and field devices. The intent is to achieve reliable real-time control, predictable SCADA performance, and maintainable remote access without compromising availability or security.

BatchXpert stations, engineering workstations, and HMI clients are typically connected via Industrial Ethernet (TCP/IP). This network carries SCADA traffic (PLC read/write), station-to-station synchronization, and engineering access. Use managed switches to implement VLANs, quality-of-service (QoS), and diagnostics (SNMP/port mirroring) where required by your plant standards.

Wireless access (Wi-Fi) can be used for service laptops or mobile devices, but it should be treated as an external access path. If Wi-Fi is required, terminate it in a dedicated VLAN/DMZ and restrict routing to only the necessary systems and ports. Do not place PLCs or field devices directly on a wireless segment.

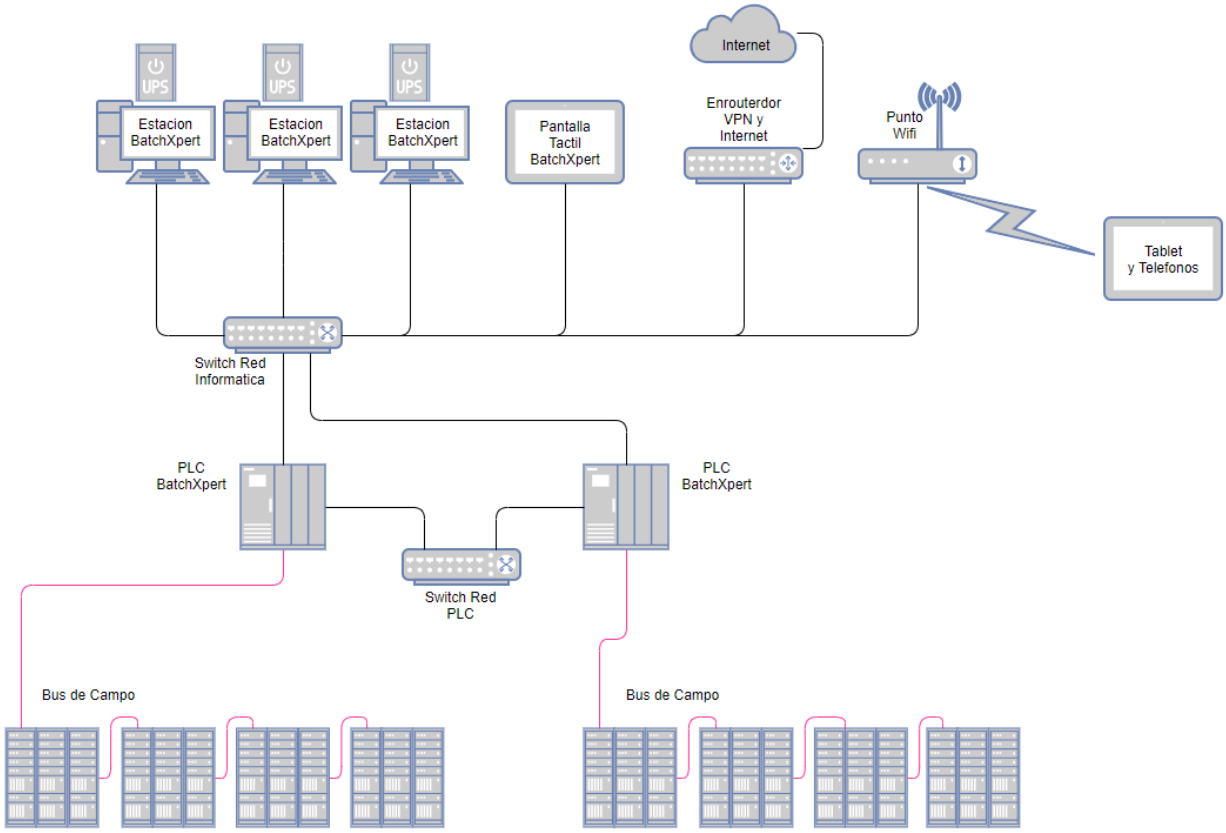
For SIMATIC S7 systems, separate controller-to-controller traffic from SCADA/HMI traffic whenever possible. If the CPU provides two Ethernet interfaces (or an additional CP), use one interface for the BatchXpert/SCADA network and the other for PLC-to-PLC or machine networks. This reduces contention and helps prevent broadcast storms or heavy HMI polling from impacting deterministic controller communications.

Connection to the corporate network and/or internet must be implemented via an approved security architecture (for example, firewall + DMZ + VPN/jump host). If remote service is required, prefer client-approved remote access mechanisms and ensure multi-factor authentication, logging, and time-limited access. Tools such as TeamViewer should only be used if explicitly permitted by site IT/OT policy and configured according to the site's hardening guidelines.

Field-level communication is typically implemented using **PROFINET** (recommended for new designs) or **PROFIBUS DP** (common in legacy installations). These networks connect distributed I/O, drives, valve islands, instrumentation gateways (for example HART gateways), and other automation devices. Select the field bus based on the installed base, performance requirements, and spare-part strategy.

Example Simple Network Layout

The diagram below illustrates a simplified network. It does not include firewalls, DMZs, redundant rings, or advanced segmentation. Use it as a conceptual starting point and adapt it to your site's IT/OT security requirements and availability targets.



Default Communication Interfaces

The following interfaces are typically used in BatchXpert projects with SIMATIC S7 controllers:

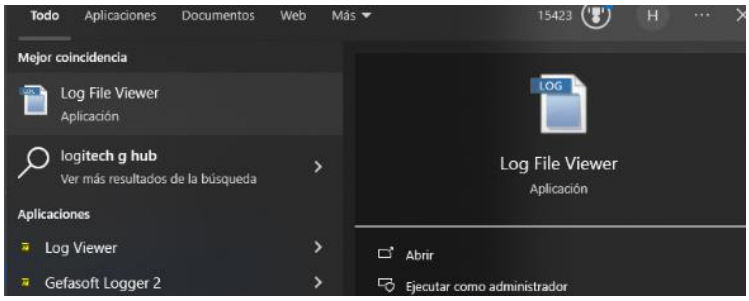
- **PLC ↔ Operating Station (SCADA/HMI)**: Communication is typically based on classic S7 read/write mechanisms via the SCADA SIMATIC driver (S7 communication / ISO-on-TCP depending on driver configuration). For S7-1500/S7-1200, ensure that the PLC is configured to permit the required access (for example, "Full access" for HMI applications) and note that **optimized** data blocks are not readable via classic S7 addressing—use non-optimized blocks for all data exchanged with BatchXpert.
- **Fieldbus / Device Networks**: PROFINET and PROFIBUS DP are the primary field networks. Additional protocols (HART, AS-i, IO-Link) are typically integrated through gateways or appropriate I/O modules. Keep field network load within vendor recommendations and document device names, station names, and bus parameters.
- **PLC ↔ PLC**: Use the mechanism best aligned with the installed base (S7 connections, PUT/GET, or ISO-on-TCP). Prefer consistent engineering patterns across the project and allocate sufficient communication resources (connection IDs, S7 resources) during design. Where deterministic exchange is required, consider dedicated interfaces or a dedicated VLAN.
- **Operating Station ↔ Operating Station**: BatchXpert stations synchronize configuration and runtime data using a proprietary TCP/IP-based protocol. Ensure stable IP addressing (or DNS with fixed hostnames), consistent system time, and that required ports are permitted between stations by any host firewall or network firewall.

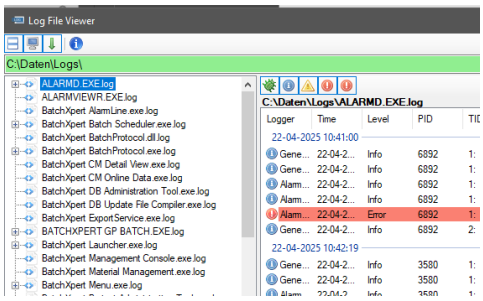
Recommended Network Segmentation for SIMATIC S7

- **Define OT zones.** At minimum, separate (1) the **SCADA/BatchXpert station network**, (2) the **PLC/controller network**, and (3) **field device networks** (PROFINET/PROFIBUS). Where possible, place remote access and corporate connectivity in a **DMZ** between IT and OT.
- **Use consistent IP planning.** Assign static IP addresses for PLCs, stations, and infrastructure. Reserve ranges for temporary engineering laptops. Document hostnames, IPs, and roles (BX01/BX02, PLC01, etc.) in the project documentation.
- **Plan for redundancy.** For higher availability, consider redundant switches, ring topologies (MRP), and redundant links where supported. Validate that redundancy behavior does not interfere with time synchronization and station discovery.
- **Time synchronization.** Keep all BatchXpert stations synchronized via NTP and ensure the PLC time synchronization approach is defined (NTP in PLC hardware configuration or the BatchXpert/HMI time sync mechanism). Consistent time is critical for alarms, trends, and database synchronization.

Log Files and How to View Them

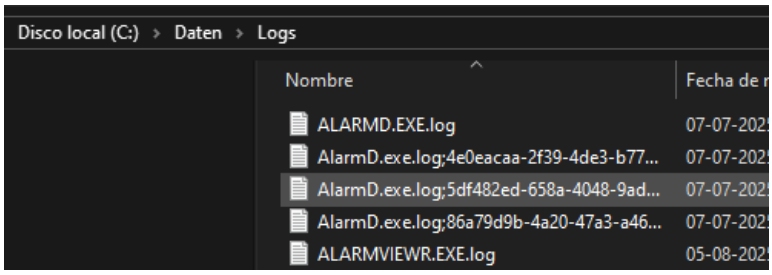
All BatchXpert components write diagnostic log files that help you analyze errors, warnings, and runtime behavior. Logs are the primary source for troubleshooting communication issues, database problems, and application start-up failures. You can review log files either with the **Log File Viewer** (recommended) or with any standard text editor.





Location on Disk

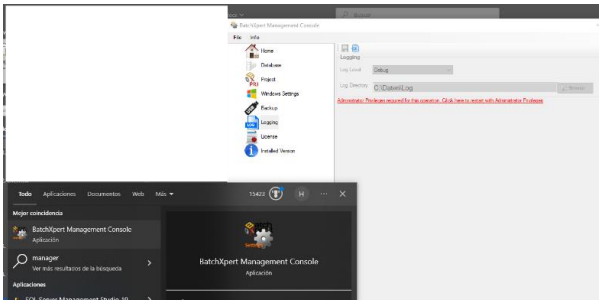
By default, BatchXpert log files are stored in **C:\Daten\Logs**. Each application typically creates its own log file (and may roll files over by date or size). While logs can be opened with any text editor, the Log File Viewer provides filtering and easier navigation—especially on systems with high log volume.



Setting the Log Level

The amount of information written to the log files depends on the configured **log level**. Higher log levels provide more detail for troubleshooting but can increase disk usage. You can change the log level in the **BatchXpert Management Console** under the **Logging** section.

Most BatchXpert applications read the log level only during start-up. After changing the log level, restart the affected application(s) or restart the entire project to ensure the new setting is applied. **Recommendation:** Use higher log levels only for limited periods during diagnostics and return to the normal level afterwards to reduce noise and storage consumption.



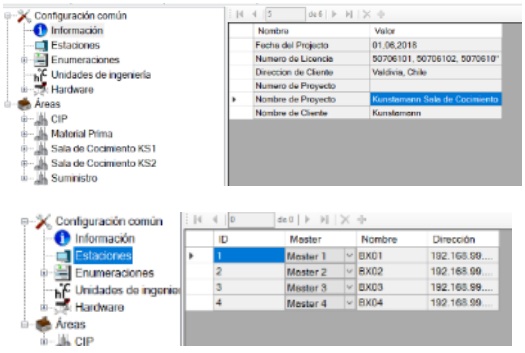
Database Synchronization

Because each BatchXpert station uses its own **local** SQL Server instance and project database, BatchXpert provides a synchronization service to keep all stations aligned. Synchronization ensures that configuration changes (recipes, phases, parameters, users, etc.) are propagated to the other stations participating in the same project.

Synchronization is performed by the **BatchXpert Synchronization Service** and follows a **peer-to-peer** model. Each station connects to the other stations on the network, compares the version/state of the project database, and—if needed—downloads the most recent data from the station that currently holds the newest version. This approach avoids dependence on a single central database during normal operation.
To prevent accidental cross-synchronization, each running project has an **identifier** (typically the **Project Name**). Only stations that are running a project with the **same identifier** are allowed to exchange data. This enables multiple independent BatchXpert projects to operate on the same network without mixing databases.

For a detailed description of the synchronization mechanism, troubleshooting steps, and port requirements, refer to the "Manual BatchXpert Data Synchronization".

How Stations Discover Each Other



Each station attempts to establish communication with the stations defined in the project's **Computer list** (Batch Configuration database), including their hostnames and IP addresses. After connecting to the configured stations, the service may also perform a network discovery to identify compatible stations that are reachable but not yet listed in the database. If a station is discovered and meets the compatibility requirements, a connection is established and synchronization can begin.
When a connection is established, the station verifies that synchronization is allowed. If the stations are not compatible, the connection is rejected and a message is provided to the user/operator. The following criteria are checked:

- The system time difference between both stations is **less than 1 minute**.
- Both stations use the **same SQL Server major version**.
- Both stations are running a project with the **same Project Name / identifier**.

By default, the discovery mechanism uses **UDP port 3702**. Ensure this port is permitted between stations by any host firewall or network firewall; otherwise, automatic discovery may fail and only explicitly configured stations will connect.

System Time

Accurate and consistent system time is critical on BatchXpert stations because timestamps are used for alarms, events, historical data, and synchronization conflict resolution. During synchronization, stations continuously monitor the time difference. If a station deviates by more than **1 minute**, it is rejected by other stations and can no longer participate in synchronization. In that case, the system raises a message to alert the operator to the time mismatch.
For this reason, keep all BatchXpert stations synchronized using a reliable time source (typically **NTP**) and ensure the same approach is documented for the project. Verify time synchronization early during commissioning to avoid intermittent synchronization and logging issues.

To set up the time synchronization you should view the "Manual BatchXpert Time Synchronization" manual, which describes the process in more detail. The manual can be found on our Knowledgebase (www.docu.mlogics-automation.com/batchxpert-2/engineering-2/)

For more information about how to adjust the Time in the PLC please review PLC Time Synchronization

Default Usernames and Passwords

BatchXpert ships with default credentials for some components. **You should change all default passwords before commissioning or handing the system over to production**, and align credential handling with the site's security policy (unique passwords, least privilege, and controlled storage). If a component does not require a password by default, evaluate whether the site requires one and document the decision.

Application	Username	Password
VisXpert	Admin	<no password, leave empty>
VisXpert	Admin	MLogics
PLC	None	None
Database (old)	sa	Delphi
Database (new)	sa	GraphPic2023
S7-1500 Web Server	Admin	BatchXpert1

Station Settings and Projects

BatchXpert distinguishes between **station settings** (machine-specific settings that apply to a single workstation/server) and **project settings** (configuration that belongs to a specific BatchXpert project). Station settings are managed through the **BatchXpert Management Console** and typically include items such as the station role (master/slave), master number assignment, database/SQL instance selection, logging level, time synchronization settings, backup configuration, and service-related parameters.

A **project** contains the complete application configuration required to run BatchXpert, including the SCADA/HMI project (graphics and scripts), database files (configuration and historical data), PLC program sources, generated engineering artifacts, and report templates. For commissioning and long-term maintainability, treat the project directory as the single source of truth and back it up as a whole (not only the PLC or only the database).

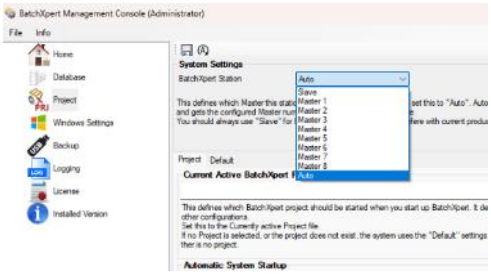
Master and Slave Stations

BatchXpert stations are organized into up to **eight master channels** (Master 1 to Master 8). Each operating station is assigned either a **master number** (and therefore a channel) or the role **slave**. The master number defines which communication channel the station uses for certain runtime services (for example, recipe requests, historical data recording, and coordination tasks) and helps avoid address and channel conflicts in multi-station systems.
In many installations, all BatchXpert operating stations are configured as masters, and the slave role is only required when the system contains **more than eight** operating stations. In that case, additional stations must be configured as slaves to remain within the available master channels.

Each master station uses its assigned channel to interact with the BatchXpert runtime services. From an engineering perspective, you should ensure that each on-site operating station has a unique master number (or uses automatic assignment) and that channel assignments match the project's station list.

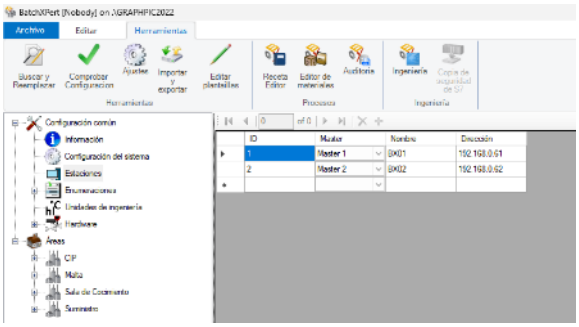
Best practice: Configure engineering workstations and commissioning laptops as **Slave** stations whenever possible. This prevents accidental channel collisions with production stations and reduces the risk of interfering with runtime services. You can set the station role to **Slave** in the **BatchXpert Management Console**. Before going online or starting a project, verify the role and master number to avoid unexpected communication behavior.

Setting the Master Number



In the **BatchXpert Management Console**, you can either assign a fixed **Master number** to the station or enable **Auto** assignment. Auto assignment is recommended in most projects because it reduces manual configuration effort and avoids duplicate master numbers.
When set to **Auto**, BatchXpert determines the master number based on the station's **hostname** and the entries defined in the project's **Computer list** (Batch Configuration). The station must therefore use the correct Windows computer name, and that name must be present in the project configuration.
Recommended approach: Keep the setting on **Auto** and maintain the **Computers** list in **Batch Configuration** as part of normal project engineering. This ensures that station identification and channel assignment remain consistent across backups, restores, and station replacements.

Many BatchXpert projects use a simple, standardized hostname convention for operating stations. Align the Windows computer name, the Batch Configuration computer list, and the physical station label to the same naming scheme to simplify commissioning and support.



- **BX01** – first server / primary operating station
- **BX02** – second server / secondary operating station
- **BX03** – third server (if used)
- **BXSlave1** – first slave station
- …

Important Directories

BatchXpert relies on several standard directories for logs, backups, installed binaries, templates, and engineering artifacts. Understanding these locations helps with troubleshooting, project handover, and backup/restore procedures. The paths below reflect the default installation; your environment may differ if your IT department uses custom drive layouts or software distribution mechanisms.

C:\Daten is the primary data directory used by BatchXpert for operational files. It typically contains logs and backup data and is often included in station-level backup routines.

- **Backup**: Stores automatic and manual station backups (if enabled).
- **Logs**: Stores application and service log files used for diagnostics and troubleshooting.

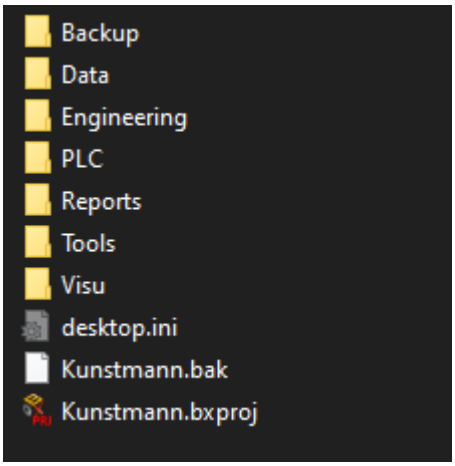
C:\Program Files (x86)\BatchXpert contains the installed BatchXpert applications, shared libraries, and supporting resources. This folder is typically managed by the installer and should not be modified manually.

- **Documentation**: Manuals for engineers and operators (often in multiple languages) and license-related information.
- **Reports**: Standard report templates used by BatchXpert (for example, batch summary and recipe reports).
- **Tools**: Additional utilities, including command-line tools and service/support helpers.

C:\Program Files (x86)\BatchXpert SDK contains engineering templates and tools used to accelerate project implementation and ensure compatibility between PLC code, database configuration, and visualization. Installation of the SDK is required for engineering workstations that perform code generation, tag list handling, or project creation.

- **Documentation**: Engineering manuals for BatchXpert, HMI/SCADA tools, and PLC framework usage.
- **PLC**: PLC templates and framework projects (including compatible variants, such as VIPA where applicable).
- **Tools**: Templates for project documentation (for example, tag list and project information) and engineering utilities (Installation Center, command-line tools).
- **Visu**: Visualization templates for supported HMI systems (for example, GraphPic/VisXpert, Movicon, WinCC Flexible).

The Project Directory



Each BatchXpert project follows a consistent directory structure. Keeping all project artifacts within this structure simplifies backup/restore, supports traceability, and reduces the risk of missing dependencies during commissioning or handover.

- **Backup**: Project backup files created manually or by automated routines.
- **Data**: SQL Server database files (*.mdf* and *.ldf*) for configuration and historical data.
- **Engineering**: Generated engineering output (for example, code generation results) and tag lists imported into BatchXpert.
- **PLC**: PLC project(s) for the installation. Keep the active engineering project here so it is included in project backups.
- **Reports**: Report templates created or customized for the project (used for printouts and data exports).
- **Tools**: Project-specific tools and utilities (preferably including source code and build instructions).
- **Visu**: HMI/SCADA project files (for example, the VisXpert project directory).

Command-line Tools

BatchXpert includes command-line utilities that support common engineering and service tasks (for example, automation of maintenance steps or diagnostics). These tools are installed in:
C:\Program Files (x86)\BatchXpert\Tools

Most command-line tools provide built-in help. Run a tool with the **-?** parameter to display supported arguments and usage examples. Where possible, execute these tools from an elevated command prompt if the operation requires administrative permissions (for example, service configuration or protected file access).

BatchXpert SDK

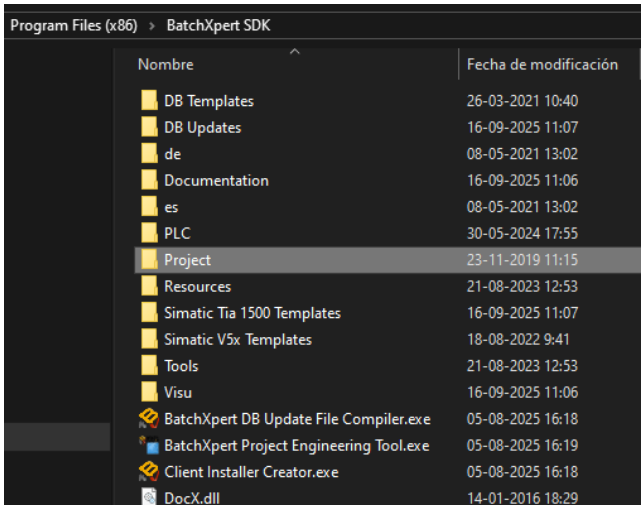
To facilitate the generation and execution of an automated project with BatchXpert, there is the "BatchXpert Software development Kit" also called "SDK". This package installs all the engineering tools and templates for both the controllers and the display systems.

The most recent version of the SDK can be obtained from the following link:
[MLogics Documentation – VisXpert and BatchXpert (mlogics-automation.com)]

It is recommended that you use the same version of the SDK with the same version of BatchXpert that is used in your project. For new projects, it is recommended to use the latest versions, to take advantage of system improvements.

Installation directory

Once installed, you will find the following folders inside the installation folder:

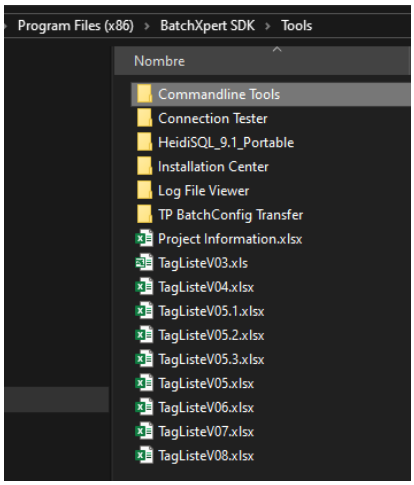


- **Visu**: This folder contains the project templates for all supported visualization systems of the BatchXpert system. The appropriate file should be copied to the engineering folder, extracted, and adjusted to suit the needs of the project.
- **PLC**: Contains the templates of the supported PLCs of the BatchXpert system. As with the visu, you need to copy it to the engineering folder, extract it, and adjust it.
- **Tools**: Contains useful engineering tools, such as Taglist Templates, a SQL Database Management Tool, and several other tools
- **Documentation**: Contains many Manuals, which are not included in the normal installation of BatchXpert, as they are intended for an Engineer and not for Operators.

Tools

Several tools will also be installed, such as the "BatchXpert Project Engineering Tool" that allows importing, exporting, and generating data for PLCs and HMIs based on the system's current engineering database. This tool can generate alarm messages for the HMIs, data blocks for the PLC and others.
Here you can find more information about the Project Engineering Tool.

In the “Tools” directory you can find other tools that can be helpful when engineering projects.



Project Engineering Tool

One of the main tools of the “BatchXpert SDK” is its “Project engineering tool.” This application incorporates many functionalities that help you to solve many engineering problems that you will face when implementing projects with BatchXpert.

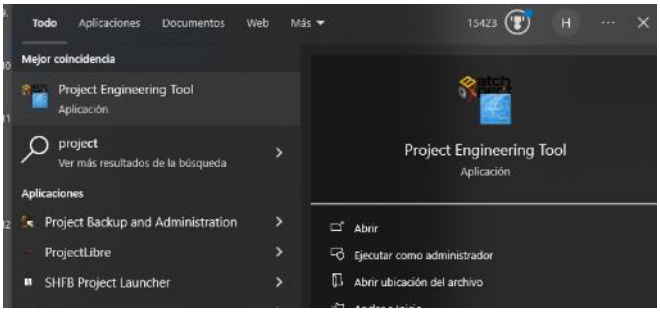
The functions include:

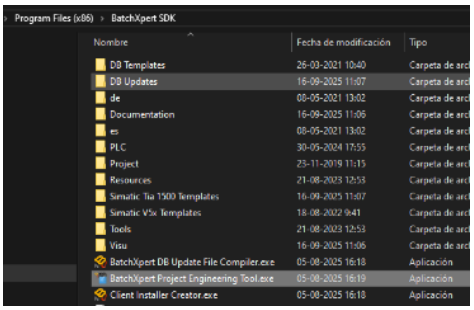
- Import Taglist
- Export and generate Taglist from current configuration.
- Generate IO Symbols for your PLC programming.
- Create IO Transfer blocks.
- Create Alarm groups.
- Create Tag variable files for many HMI systems, such as WinCC Comfort, Movicon, etc.

Where to find the “Project Engineering Tools”

After installation of the BatchXpert SDK. You can directly type project engineering tools into your windows and start menu to start deep project engineering tools. To be able to use most of the code generation functionality, you must open a project's pet project first. If you don't have a project yet you can create a new one Creating a New Project, and then opening or starting it.

You can also find the tool inside the “BatchXpert SDK” installation directory which usually is: C:\Program Files (x86)\BatchXpert SDK





What data does the Project Engineering tools use

Most if not all code generation and other utilities that the project engineering tools provides, are based on the data configured in your configuration database. You can use the “Batch Configuration” to edit your database, create classes, phases, recipes etcetera.

All operations that the project engineering tool provides are based around this configuration database. There are tools to efficiently update this configuration, such as importing tag lists, or deleting all controller modules of a PLC.

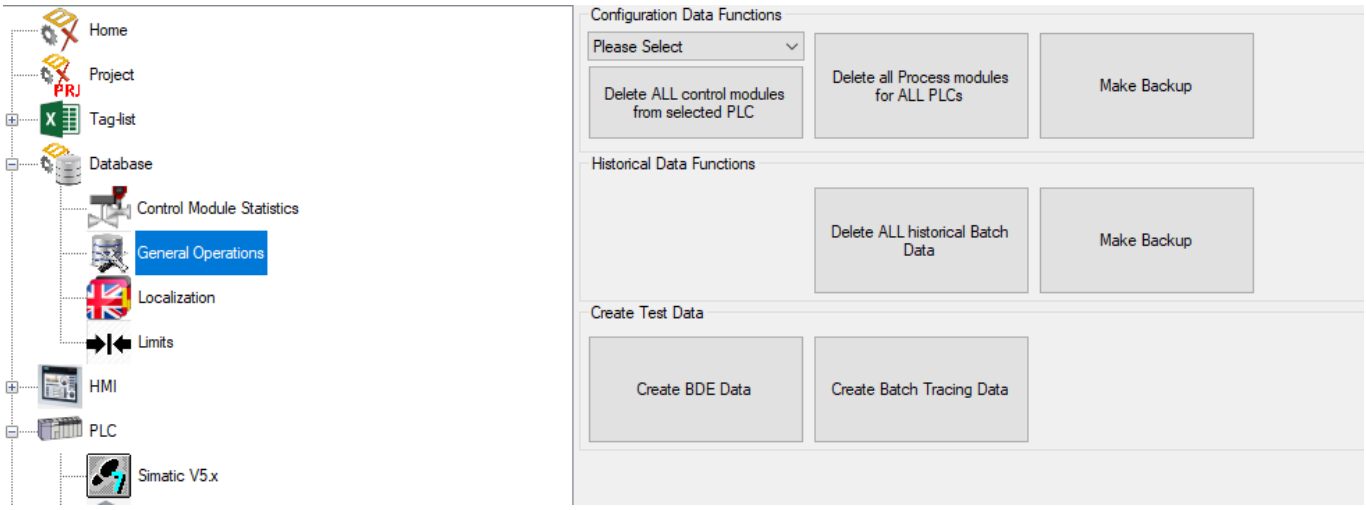
General Database Operations

One of the most useful functions can be found in the database general operations section of project engineering tools. There you can find useful actions that should only be activated during engineering of a project, since they

can delete all configured process modules, such as phases, recipes and classes, and they can also delete all configured control modules.

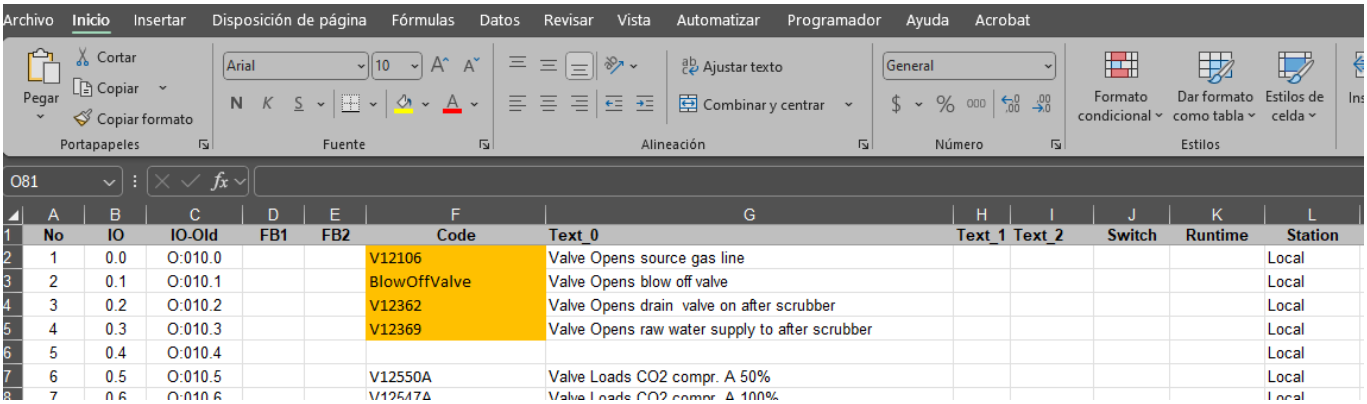
These functions are useful when starting a new project where you must delete all the existing configuration, or when you want to delete all control models of PLC, to import them again by using the tag list import function.

There's also an option to delete all the historical recorded data, which should always be done before starting commissioning on new project, so that all recorded historical data that you have recorded during testing it's not going to be deployed to the client. Of course you should never delete historical data on site.



Taglist and importing

A Taglist is an Excel file that contains the configuration of each of the control modules of a project. This Taglist can be imported, exported or an existing one can be updated. A Taglist allows you to efficiently modify existing control modules, or add new modules to a PLC. All Taglist belong to one single PLC and have one “Worksheet” for each Control module type. Each “Worksheet” has one column per property, and each row represents one single control module of a type.



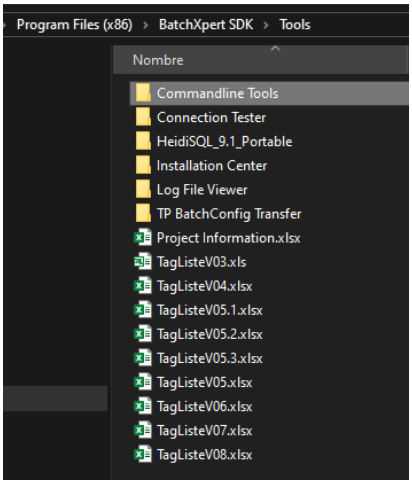
	A	B	C	D	E	F	G	H	I	J	K	L
1	No	IO	IO-Old	FB1	FB2	Code	Text_0	Text_1	Text_2	Switch	Runtime	Station
2	1	0.0	O:010.0			V12106	Valve Opens source gas line					Local
3	2	0.1	O:010.1			BlowOffValve	Valve Opens blow off valve					Local
4	3	0.2	O:010.2			V12362	Valve Opens drain valve on after scrubber					Local
5	4	0.3	O:010.3			V12369	Valve Opens raw water supply to after scrubber					Local
6	5	0.4	O:010.4									Local
7	6	0.5	O:010.5			V12550A	Valve Loads CO2 compr. A 50%					Local
8	7	0.6	O:010.6			V12547A	Valve Loads CO2 compr. A 100%					Local

New Tag lists

And the template for Taglist is included in the BatchXpert SDK. You can find it in the following directory of your BatchXpert SDK installation:

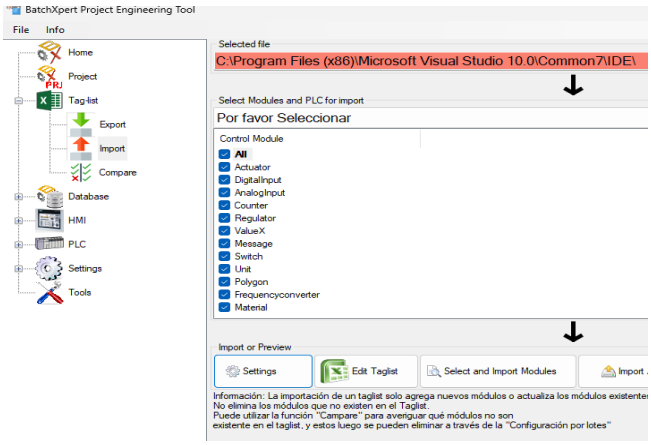
`D:\Program Files (x86)\BatchXpert SDK\Tools`

Alternatively, you can also create a new tag list, from an existing project by using the project engineering tools (Taglist Export). This allows you to create new tag lists in case they are lost or update existing tag lists in case they may not be up to date. In the case of an export the provided tag list will be updated with the current information stored in the database, but custom data is still retained in the existing Taglist. This way you can update existing lists without the fear of losing existing data.



Taglist import

When importing, the" Project engineering Tool" will go through each column of each worksheet and look up the data for specifically named columns. This means that you must follow the following rules when working with Taglist :Rules to follow when working with tag lists



To import a file, select the file to import, select the PLC where the data should be imported into, Check the modules types you want to import and then click "Import." The import starts by creating a backup and placing it in the backup directory. After that It will import each row with the following rules:

- If a Control module with the same "Number" of a Type already exists, the information will be overwritten with the information from the Taglist.
- If no control module with the same "Number" of a Type already exists, a new module will be created with the information defined in the Taglist.
- No Module will ever be deleted from the database. So, if some modules are missing from the Taglist, they will NOT be deleted from the project. Since they do not appear in the Taglist, they will simply remain untouched.
- If you want to remove modules, this must always be done manually by using the "Batch Configuration."

Taglist Export

Exporting works similarly to importing, except it transfers data form the project into the Taglist. It allows you to select an existing Taglist, which will be updated, instead of overwritten. This allows you to "Update" Taglist from the Taglist, without losing cell styling or additional columns. The export functionality will go through all project control modules, try to find a corresponding row in the excel Taglist, and update the corresponding columns, without removing or changing custom columns, that you might have added.
One of the first tasks when engineering and BatchXpert system, is the creation of a so-called tag list. A tech list is a Microsoft Excel file that contains definitions for all control modules of a single PLC. It defines the control modules number, IO assignment, names and descriptions. Checklists can easily be imported, exported and even be updated by using project engineering tools. For more information about how to import Tag lists: Taglist import.

NOTE: Creating A tag list should always be the first step when starting a new batch expert project, since it forms the basis of all further work on the HMI and the PLC. Most importantly, the data that you define in Tag lists, sill form the basis for further code generation particularly the generation of trans IO blocks.

General Structure

Taglists are designed to be easy to work with and contain one “Excel Work Sheet” per control module type, which defines all control models of a specific type. These control module specific work sheets contain one column for each metadata of a module, and one row per control module of the specific type.

No	IO	FB1	FB2	Code	Text_0	Text_1	Text_2
125	90.5	85.7		LT_AK_02	valve CIP lauter tun	Valvula CIP Cuba filtro	Ventil CIP Läuterbottich
126	90.6	86.0		LT_AK_03	valve cloudy wort to lauter tun	Válvula de mosto turbio a cuba de filtración	Ventil Trubwürze im Läuterbottich
127	94.0	86.1		LT_AK_04	valve weak wort to weak wort tank	Valvula de mosto debil hacia Tanque	Ventil Glattwasser zum Tank

One of the most important metadata information of the control modules is there I assignment generally done in the IO column, of each control module type.

Rules to follow when working with tag lists

Detect lists are designed to be extendable and easy to work with. You can add custom columns and even reorder existing columns, however you should follow the following rules when working with tag lists, to be able to import Tag lists using the project engineering tool.

- **The default Column names cannot be changed and must remain as they are**. If they are changed, the Engineering tool cannot identify the column, and the import will fail.
- **The first row of each “Worksheet” must contain the column names**, and all subsequent rows will be imported.
- “Empty” rows can exist. If the Import detects that there is no “Symbol” (also known as Tag name or Code) defined for this control module row, it will simply ignore it. Your Taglist is not required to be contiguous.
- You can reorder the Columns if the names stay the same.
- You can add custom Columns to your Taglist. These columns will simply be ignored. The columns can have a name if they do not collide with an existing columns name. This function is particularly useful to add an “Tests” column, so you can keep track of tested columns during IO testing.
- You can apply any “Cell Style,” font, size, border, or any other style you like. As said before, only the names of the first-row matter.
- The Taglist can be if you like. However, keep in mind that you will not be able to have 50.000 Actuators in your Plc.

The Unit Assignment Column of all Control Modules

All control modules allow you to assign them to a specific Unit. This assignment is used to automatically generate Alarm groups and for reporting errors to specific Units. All control modules can be assigned to a Unit, by inputting the unit number into the “Unit Assignment” column of a tag list.

K	L	M
tation	Station Address	Unit Assignment
		1
		1
		1

To be able to assign a control module to multiple units, you can write the values as a list, separated by a Coma.

L	M
tation Address	Unit Assignment
	2,3
	2,3
	4

In the Above example, the control module will be assigned to both, unit 2 and unit 3 of the PLC of the control module.

All Unit numbers in the Unit Assignment field, always refer to the same PLC where the Control module lives in. However, BatchXpert supports assignments of Control modules to Units in different PLC's, for reporting purposes, but currently you cannot use the Tag list to make these assignments to Units in different PLCs than the Module. To assign Modules to Units in different PLCs, you must assign them from the "Batch configuration".

Class definitions of Units

The tag list contains an excel worksheet for units, which allows you to define the corresponding processing class that is defined in a batch configuration tools. In this column you can input the class identifier that you can obtain from the batch configuration utility, or the literal name of the class that you want your unit to be assigned to. If any class name is ambiguous, you can optionally add the Batch area name separated by period.

Class identified by its Class name:

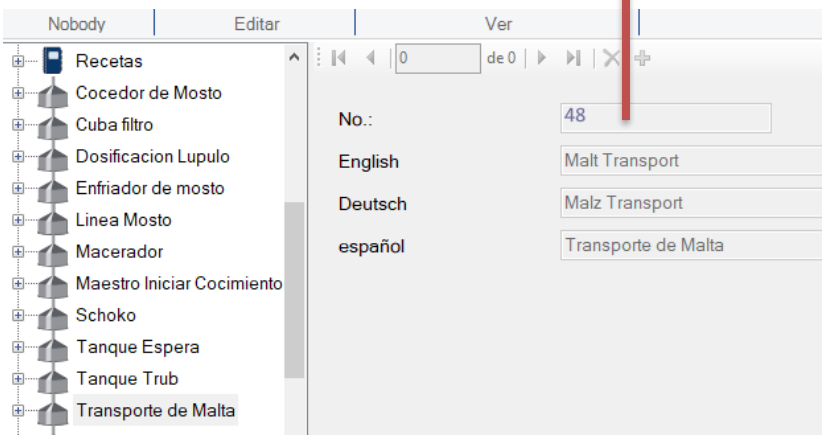
No	Code	Class	Text_0
28	UT59	Unittank	Tanque CC UT59
29	UT60	Unittank	Tanque CC UT60
30	DT11	Tanque Druck	TK Cerveza filtrado DT11
31	DT12	Tanque Druck	TK Cerveza filtrado DT12

Class identified by its Batch Area and Class Name:

41	WLKS2	Sala de Cocimiento KS2.Linea Mosto	Linea Mosto KS2
42	WLKS1	Sala de Cocimiento KS1.Linea Mosto	Linea Mosto KS1

Class Identified by its Class ID

No	Code	Class	Text_0
1	Unit [2/1]	44	Start Master
2	Unit [2/2]	48	Malt Transport

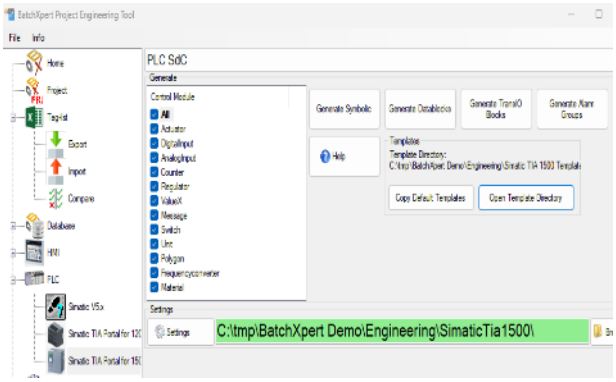


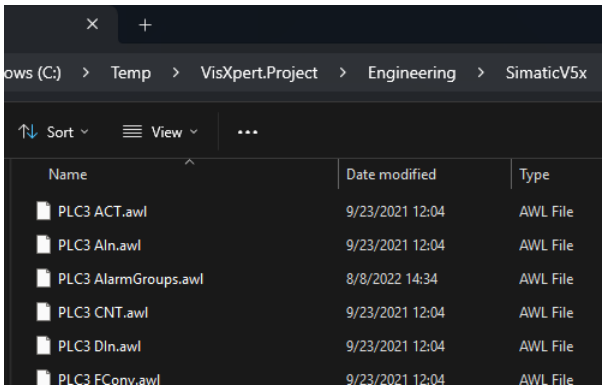
PLC code generation

This option allows you to generate a variety of code blocks, which can be imported into either Simatic manager or Tia Portal. The data block and function block code generation is based around applying data to templates. You can customize these templates and Project engineering tool will use these templates for their code generation. The generated files can then be imported easily into your PLC programming software, usually Tia-portal.

All generated code files are being stored in the engineering subdirectory of your project. From this directory you can import them into your engineering software. The process of importing and compilation of these files depends on the type of software used for your PLC programming.

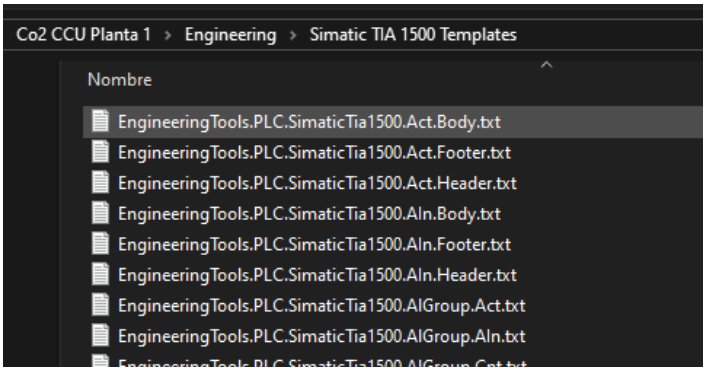
You should read TIA-Portal on a guide on how to import files into “TIA-Portal”.





Customizing Templates

The tool supports custom “Plc code templates” that are being used to generate the data blocks with. This allows you to customize the code being generated. The template is stored in the “Engineering” directory of your Project. If no templates exist, the system will use the system default templates, which should be good for about 99% of all cases. If you want to customize them, you must copy the default templates by clicking “Copy default templates” to the Project’s Engineering directory. After that you can customize them.



Generate symbolic.

This will generate IO and block Symbolic files that can be imported into either Simatic Manager or Tia Portal. It generates all symbolics for Inputs, Outputs of all used control modules. It allows you to assign symbols to all your Inputs and outputs.

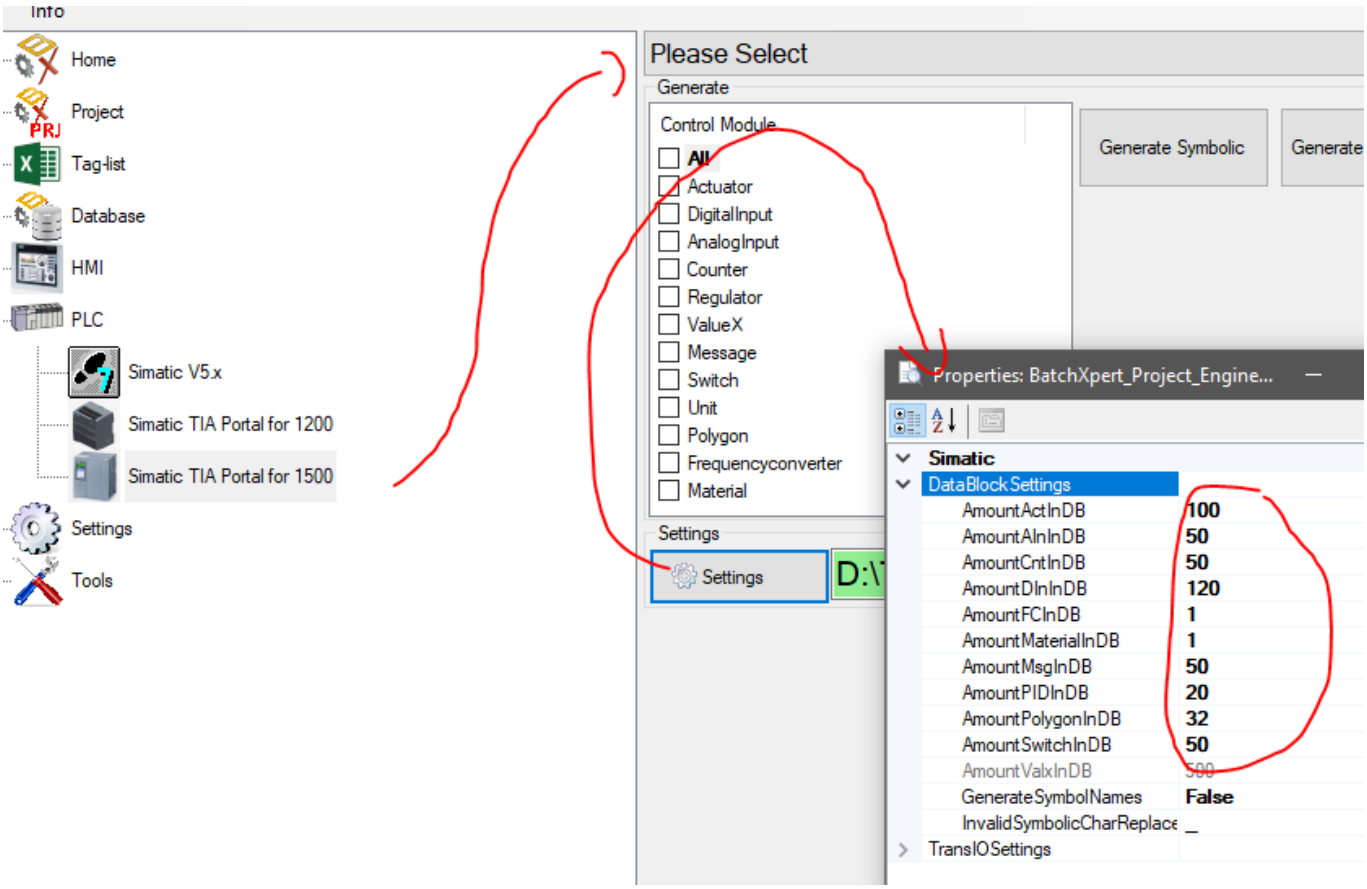
You should read TIA-Portal for recommendations about import settings for “TIA Portal”

Generate Data block.

This will create the initial Control module data blocks with the configured module description from the database. This is usually done only at the beginning of a project, since later updates of the data blocks are non-trivial since they require a data block download, which should not be performed.
As a rule, you should use this functionality only at the beginning of a project, and then update the data blocks manually, or carefully plan a data block download.

When generating data blocks for control modules you can set the amount of control models to be created in these data blocks in the settings of your project engineering tool. This setting basically allows you to set the number of spare modules to be created in your data blocks. You should evaluate a tradeoff between memory consumption of your control module data blocks against already existing spares that can be easily used in your PLC application without downloading the control module data block.

D data block generator will always create all your configured control modules in your current project and then will append spare modules until reaching is set number of modules to create. You should choose these values according to your project needs and available memory in your PLC.



Generate TransIO Blocks

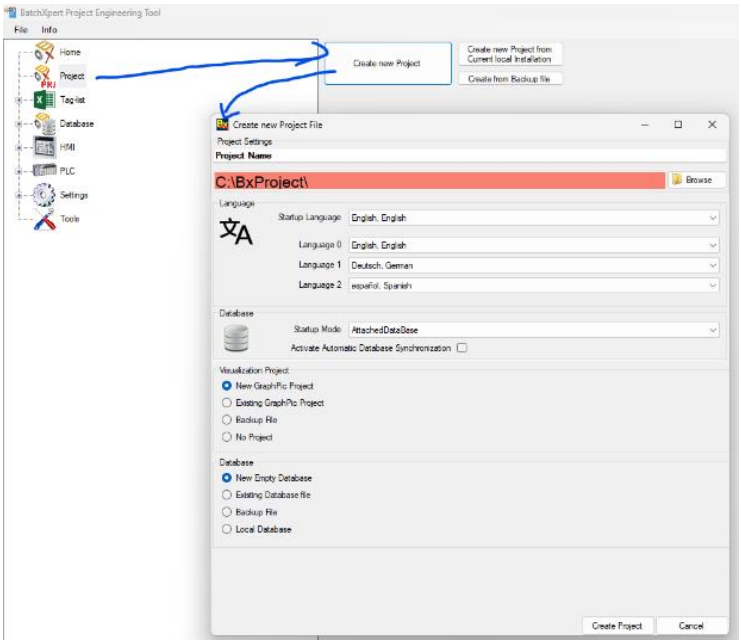
This generates all IO assignment blocks, which will link your control modules to the configured Inputs and outputs of your PLC. How this works is described in more detail in the “Trans xx” blocks for IO signal transfer” section of this Manual.

Generate Alarm Groups

BatchXpert allows you to assign control modules to units. Keep in mind that you can assign one control module to multiple units, in which case it belongs to all the configured units. Based on this information, this option will automatically generate the function block that assigns all these control modules to the “Unit Alarm Group,” so the alarm group can be used in the HMI system.

Creating a New Project

When starting the implementation of a BatchXpert application, you first must create a new Project. This can be done easily by using the “Project Engineering Tool.”



When opening the Engineering tool, you may encounter an error related to a nonexistent server, project, or database. This is because you have not started any BatchXpert project yet, so there is no database yet.

Create new projects.

“Create new Project” is the easiest way to create a new Project. The other two options “Create from backup file” and “Create from current installation” are meant for legacy project conversion and not relevant for new projects.

When creating a new project, you can create it based on existing databases and Hmi projects, use default Hmi and database or none. You should choose the default “Empty” options. This will create a project with a default database and HMI Project for you. The default database already contains some example configurations which you can easily remove if needed.

Clear existing database (Optional)

If you want to remove all configurations from a database, for example to remove the whole example configuration, you can use the “Project Engineering Tool” for this. In the ”Database/Database operations” you will find options to clear several parts or all the configuration from your database.

There is also an option to remove all historical data, which of course should never be done on site, but always be done before commissioning begins.

Plc Template

After creating a project, you must prepare your plc application. The BatchXpert SDK distinct options of Projects for you in the “**C:\Program Files (x86)\BatchXpert SDK\PLC”** directory.

You must choose your project based on the Project architecture and programming environment you want to use. There are projects for:

- S7-300/400 in Simatic Manager
- S7-300/400 in Tia Portal
- S7-1500 in Tia Portal
- S7-1200 in Tia Portal

After selecting an appropriate solution for you, you must copy and extract the template folder into the “PLC” directory of your project.

Hmi Template

This step is only necessary if you are using other HMI systems apart from the integrated VisXpert SCADA. If you are using for example a WinCC Comfort panel, you must extract the appropriate project from the HMI Template folder located in:

"**C:\Program Files (x86)\BatchXpert SDK\Visu."**

This project should also be copied into a sub directory of your "Visu" directory in your Project directory.

If you are only using the integrated VisXpert SCADA, this is already done by the project creation itself and no further action is required.

Database

The database lives in the "Data" directory inside your project directory. BatchXpert uses "Attached" Sql server databases, which means that the files will be attached to the selected database server when the project is opened. If no project is open, there is no database since no file is attached to the server. When BatchXpert is shut down, the database will be automatically detached from the server.

This methodology makes it easier to create backups from projects, since all the data of a project is always contained in the project directory, including the database, plc, and auxiliary information.

For example, if you need to restore the database manually, you can simply shut down BatchXpert, replace the "Data" directory of your project from a backup and start it up again with the database from the backup.

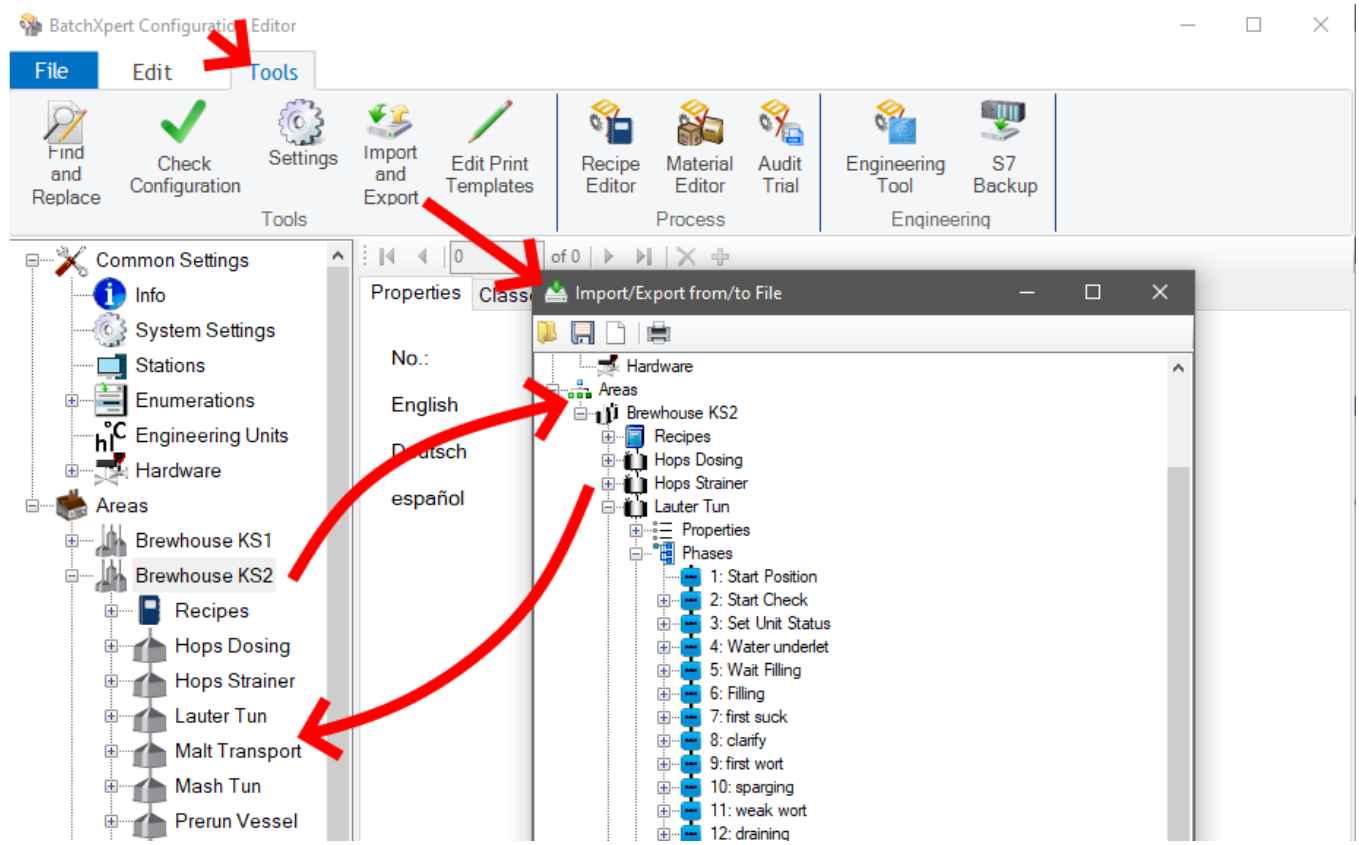
Copy data from another Project's database.

After creating a new project, you may want to copy data from an existing project into this project's batch configuration. This works by utilizing the "Import/Export" functionality of the Batch Configuration utility of BatchXpert.

In the Batch Configuration, you can create an "Import Export" file onto which you can "Drag" batch areas that you want to export. After saving these can be loaded into another project by opening and "Dragging" them back into the main configuration window.

You should always export the whole Batch Area, but you can import only fractions of this into your project. You can import only a single phase, parameter, or whole classes and even batch areas.

Overview



Procedure

To copy data from one project into another, you should follow the following procedure:

1. Open your Source Project and open the Batch Configuration
2. Open the Import/Export window as shown above and click "New" in this window to create a new file.
3. Drag all batch Areas you wish to export into this window. You need to be logged in to BatchXpert with your username to do this. Info. If you export large Batch Areas, this may take up to 30 seconds and the application may appear "hung" for a short amount of time.
4. Save the Import/Export file to disk, using its save functionality.
5. Close your source BatchXpert project.

6. Open your destination BatchXpert project and open Batch Configuration
7. Open the Import/Export window and open the file that you just saved to disk.
8. Drag the parts of the exported file into your configuration that you wish to import.

Tips for handling Projects

Keep the plc program in project directory.

Maintain the PLC project inside the project folder (Project\PLC) and work directly from that location. This ensures the PLC code remains synchronized with the database, HMI project, and generated engineering artifacts.

Prefer full project backups over standalone PLC backups. A complete project backup captures all dependencies (PLC, database files, HMI/SCADA, reports, and engineering outputs) and is therefore the most reliable restore point.

This way you will always have a consistent project and the plc project, and all other engineering material is always included in all manual and automatic backups.

Keep tag lists in the project directory.

Store tag lists in the project's Engineering folder and keep them under the same version control/backup regime as the PLC project. Treat the tag list as a controlled source because it drives code generation and IO mapping.

Create "Project information" files.

Create a Project Information file for each project to capture the baseline configuration (BatchXpert/VisXpert version, SQL Server version/instance name, PLC type/firmware, network addresses, and commissioning notes). Keeping this information current significantly reduces troubleshooting time and simplifies handover to maintenance.

If credentials must be documented, do not store them in plain text inside the project folder. Use an approved password manager or an encrypted file, restrict access to authorized personnel, and record only what is necessary (for example, the account name and where the secret is stored).

Keep Tools source code in the project directory.

Keep the complete source code for any project-specific tools in the project's Tools folder (or in the linked repository), including build instructions and dependencies. Avoid storing only executables—without source and version information, long-term support becomes difficult.

Additional practical tips

- **Version and change tracking:** Maintain a shortchange log (what/why/who/when) and tag major milestones (commissioning, FAT/SAT, releases).
- **Environment parity:** Keep engineering and site environments aligned (BatchXpert, SQL Server instance/version, PLC firmware). Test upgrades on a copy before applying to production.
- **Structured naming:** Use consistent naming for PLCs, stations, and projects (e.g., BX01/BX02) and document the mapping between hostnames, IPs, and master numbers.
- **Security hygiene:** Limit write access to project folders on site, and separate engineering laptops from production networks unless required for commissioning.

Event recording

One of the main functions of BatchXpert is its ability to record historical events from batches, but also events and operations that were executed on any Control module of the system. It must be noted that all historical events are created by the PLC, not the operating stations, so they do not depend on any operating station. This way HMI touch panels, which do not execute VisXpert SCADA, can operate modules and since the plc creates all historical events, these are still recorded.

What is being recorded for Batches?

Every Batch creates a batch event when one of the following events occur.

- Status Changed, wither switched to Run, pause or Hold, by either the Operator or internally in the PLC.
- The step was finished automatically.
- The step was aborted by Step+ or Step- from the operator.
- The PLC triggered an event by sending the “ProtWrite M4.3” from a Unit function.

Every time an Event is created, the status of all 16 parameters is being sent to the operating stations master’s so they can record all the data into the database.

This creates an “Event Timeline” of all events that happened in relation to a single batch and allows the “Batch Report Viewer” to visualize this information so the operator can reproduce what happened in a single batch.

What is being recorded for Control Modules?

All control modules will create an “Manual Operation” event whenever one of the following events happens.

- A Control modules Status such as “Simulation”, “Ignore” or “Auto” or any other status is changed.
- A control modules Parameters such as “On Dealy”, “Off Delay” or “Alarm Delay” or any other parameter is changed.
- A control module’s alarm is confirmed.

Every time a control module observes a status or parameter change, it will record this change with the following data is recorded:

- Event Type
- Old Value and New Value
- Control Module Type
- Control Module Number
- Operating Station on which the operation happened.
- User who executed the operation

Master to Operating station communication channels

All recording is being done in the plc by the BatchXpert system. Every time and module or unit registers an event, it will be enlisted into the communication buffers for each of the connected “BatchXpert” operating stations configured as Masters. The buffers are independent to each BatchXpert master and designed to be “First in First out”. The BatchXpert operating station master’s will periodically read their own buffer status and upload events if they exist. The buffers in the PLC can typically hold about 1000 events, which depending on your process and size of the implementation is good for about a few days’ worth of data.

If an BatchXpert Master is not able to empty the buffer in time, for example it is turned off, a buffer overflow happens, and the oldest events get overwritten. However, this will only affect the Master that was turned off, as each master has its own independent buffer.

Each BatchXpert Master station has its own Communication channel that includes its own independent Event buffer in the PLC. So that faults of one operating station can never affect other operating stations.

How is the historical data being stored?

All historical data is uploaded from the event buffers of each of the BatchXpert masters through the Masters communication channel. It is then sent to the SQL server, where the raw data is resolved, and the resolved usable data is stored in the appropriate tables.

The SQL server will resolve data in real time when it receives a new event from the PLC. This data resolution and recording usually takes less than a second, which means that recorded data is available in the database in near real time on the SQL server. It should be noted that the timestamp of the event is put on the event in the plc when the events happened, not when the SQL server observed the event.

What Time resolution do the events have?

The events have a maximum Time resolution of 1 second.

Batch Configuration Audit trail.

Whenever some value in the Configuration database is changed either from the Batch Configuration application or by other means, an historical record is created that stores what was changed, and what the original value was. These recordings extend to configuration changes, Recipe changes, recipe parameter changes and changes in the configuration of control modules.
The “Batch Configuration Auditing Trail” is doing all of this. This system is described in depth in the manual “Manual BatchXpert Database Audit trail”.

Recipe Downloading

General Recipe Download Process

When a process unit within the PLC requests a new recipe, it writes a recipe request into a global recipe request data block. This block is continuously monitored by all operating stations. The currently active master station detects the request, compiles the corresponding recipe into a binary format, and downloads it into the PLC. Once downloaded, the recipe request data block transfers the recipe data to the specific process unit that initiated the request.

Active Master Selection

Recipe requests are always handled exclusively by the active master station. The PLC determines which master is active by monitoring communication signals exchanged between each master and the PLC. These signals confirm whether a master is operational (“alive”). Based on this monitoring, the PLC designates one master as the valid recipe download handler.

Recipe Download Monitoring

The PLC supervises the recipe download process and automatically retries the request if no response is received within a defined timeout period. If the recipe cannot be successfully downloaded after a fixed number of retries, or if the active master reports an error, the requesting process unit is placed on hold. In this state:

- An error flag is activated.
- The unit is marked as having a non-existent recipe.
- The unit is prevented from starting for a defined cooldown period (typically several minutes).
- This mechanism prevents endless retry loops and ensures system stability.

Error Handling During Recipe Downloads

Recipe download blocking is primarily designed to avoid repetitive loops caused by invalid or missing recipes. The most common error occurs when the requested recipe does not exist in the recipe database. In such cases:

- The active master cannot generate the recipe data.
- The master reports an error back to the PLC.
- An error dialog is displayed on the active master’s operator interface, notifying the operator of the issue.

This situation typically arises only when the PLC itself initiates a recipe request (e.g., during automatic recipe start). Since operators cannot manually select non-existent recipes, such errors usually indicate a PLC programming issue rather than operator error.

Recipe Consistency Monitoring

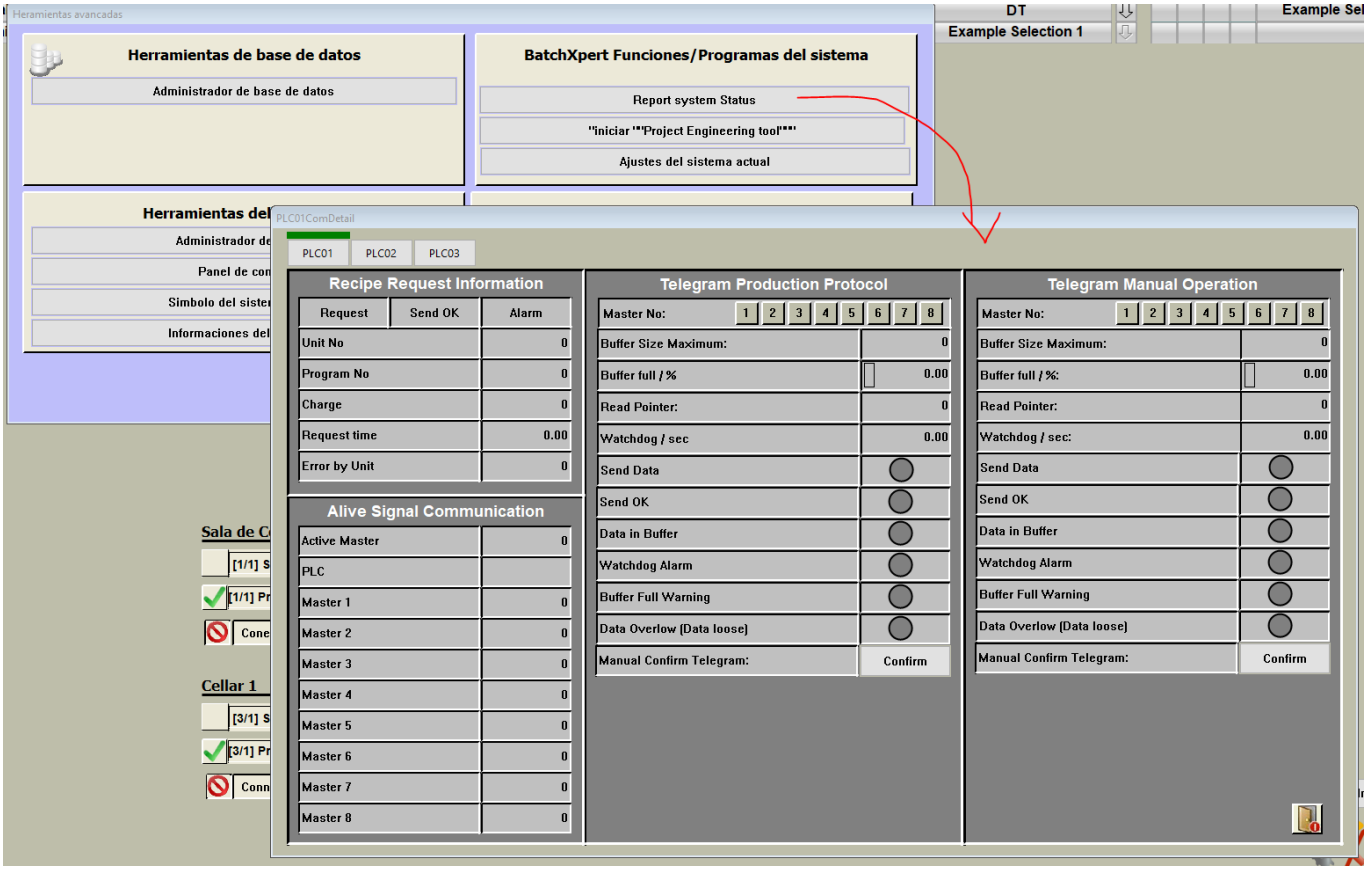
To ensure that only complete and valid recipes are downloaded, the PLC performs a validity check on each recipe. When a recipe request is initiated:

- The PLC pre-fills the recipe data block with a sentinel value.
- The active master overwrites this block with the actual recipe data.
- The PLC verifies that the sentinel value has been fully replaced.
- Only if the recipe passes this integrity check is it accepted and forwarded to the requesting process unit.

This safeguard ensures that incomplete or corrupted recipes are rejected, maintaining consistency and reliability across all process units.

Event Recording and Recipe Download Diagnostics

To ensure proper operation of recipe downloads and event recording, as well as to diagnose potential issues, operators can access detailed monitoring tools within the Advanced Tools section of the BatchXpert operating station.



Active Master and Alive Signals

In the lower-left section of the interface, you will find communication life counters for all connected masters in the network.

- The PLC automatically designates one of these masters as the Active Master.
- Only the Active Master is authorized to respond to recipe download requests from the PLC.
- The Alive signals provide continuous feedback on the communication status of each master, ensuring that the system can detect connectivity issues promptly.

Recipe Request Information

In the upper-left section, the system displays all relevant information regarding recipe requests from the PLC. This includes:

- The last unit that initiated a recipe request.
- The duration of ongoing recipe downloads.
- Any error states, which indicate that a requested recipe could not be successfully downloaded.

This information allows operators to quickly identify bottlenecks or failures in recipe distribution across the network.

Event Recording

On the right-hand side of the interface, operators can monitor event recording for each of the eight masters.

Select a Master:
Select a master by clicking one of the eight master buttons located at the top of each telegram type.
The system then displays the current status of the event sending buffer for the selected master.

Operational Notes:

- For each Active Master, the event buffer should remain empty under normal conditions.
- If the buffer begins to fill, this indicates that the corresponding master is not uploading events of the selected telegram type to the PLC.
- The buffer operates as a circular buffer. Once full, the oldest telegrams are overwritten, resulting in event data loss.
- Maintaining empty buffers is critical to ensuring that all events are acknowledged and successfully uploaded to the PLC without loss of historical data.

Best Practice

Regularly monitor both recipe request information and event recording buffers. Immediate investigation is recommended if buffers begin to fill or if recipe errors are reported, as these conditions may indicate communication failures, misconfigured masters, or PLC-side issues.

PLC backup

Backup for S7-300 and S7-400 series

BatchXpert includes the "S7 Backup" utility for creating backups of your PLC data blocks. "S7 Backup" is a small tool for creating **Manual and Automated Backups** of all your online controller data of your **"Simatic S7" compatible controllers**. This tool connects to the specified Controllers, uploads all available online data, and saves them in Backup files. These file can be archived and restored when required.

The Tool supports the following CPU:

- Siemens S7-300
- Siemens S7-400
- Vipa Speed 7, 100V. 200V and 300S series
- Vipa Speed 7 Slio series

The application can be downloaded by using the "BatchXpert installation Center" or from "S7 Backup – MLogics Documentation"

Backup for S7-1200 and S7-1500 series

The "S7 Backup" utility unfortunately does not support the newer Simatic PLC series. For these series of PLC's, there is the "S7 Backup 1500" utility. This utility serves the same purpose as the old "S7 Backup" utility and can make backups of your online data blocks.
However, this new utility requires you to Activate Web Server on your PLC. Without the Web Server this utility does not work.

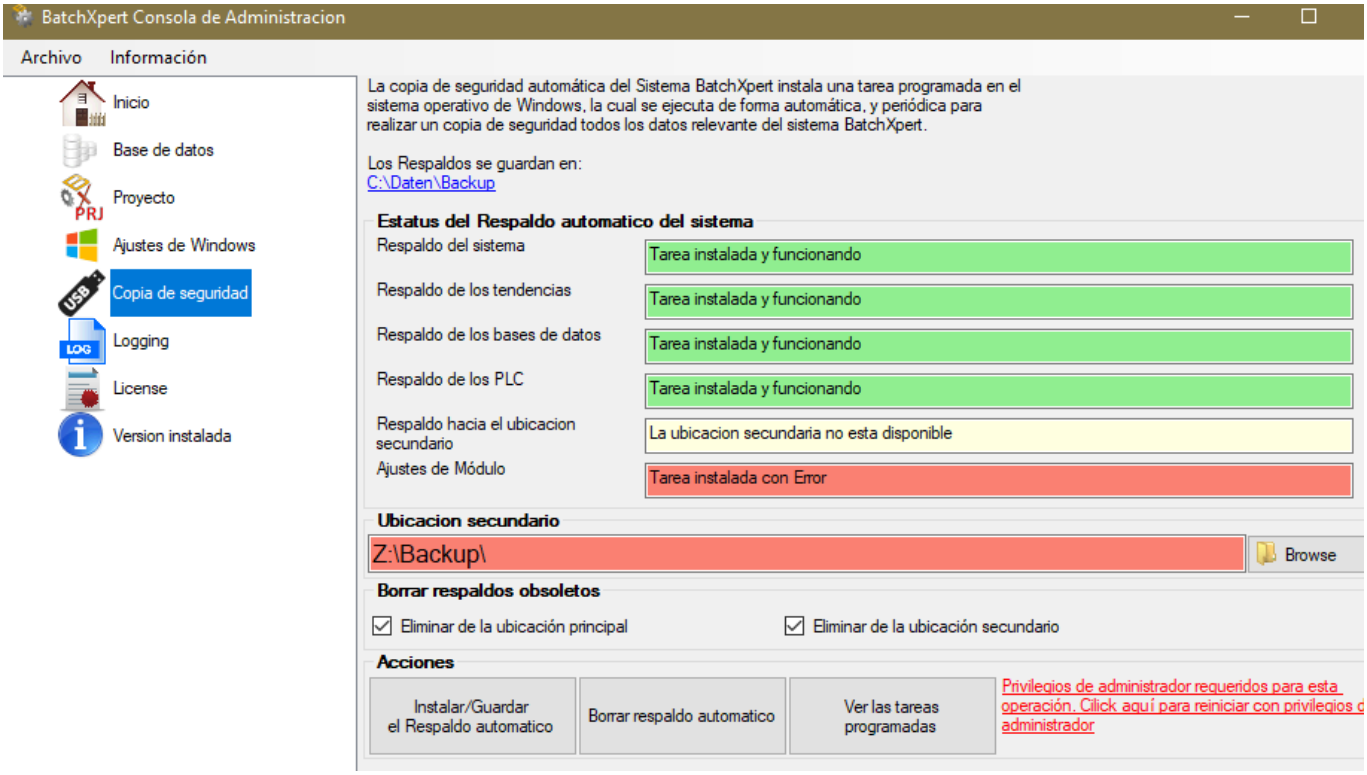
The Tool supports the following CPU:

- Siemens S7-1200
- Siemens S7-1500

The application can be downloaded by using the "BatchXpert installation Center" or from "S7 Backup 1500 – MLogics Documentation"

Operating Station Backup

The BatchXpert system incorporates a "project management tool", which allows you to run backups of the entire system. This application is part of BatchXpert and can be launched either manually or by installing the automatic backup tasks from the “BatchXpert Management Console”. You can find mor information about this tool in the “Manual BatchXpert System Backup” manual.



The “BatchXpert Management Console” Allows you to install automatic backup tasks, which will run on set times and Backup different parts of your project. These automatic backups are implemented as scheduled tasks in the Windows operating system and can be adjusted manually to the needs of your installation.

By default, its backups the full system every three months, trending data also every three months, the database every month and PLC every week. If you are in a different schedules you can just open the scheduled task and adjust them as needed.

There is also a scheduled task that allows you to copy the backups to a secondary backup location, which usually is a pen drive or a network share where you can offload your backups. It is recommended that you always offload your backups from the local drives of the computer and even replicate them to all other PCs to create multiple redundancy of your backups.

To avoid filling up the system with backups there's also utility to remove old and obsolete backups. This utility not simply removes by age but applies some heuristics and some smarts, so that it always maintains at least 3 backup archives, and only deletes the oldest ones.

System Hardening and Operating system Security

What is the Built-in Administrator Account?

In the Windows operating system, the built-in Administrator account is created automatically during installation. This account has the highest level of system privileges, allowing unrestricted access to all files, settings, and configurations without requiring confirmation prompts.

It is comparable to the “root” or “superuser” accounts found in other operating systems. Originally, its purpose was to support system setup and disaster recovery, and it can also be used to run programs before any user accounts are created. While powerful, this account should be used sparingly. Best practice is to enable it only when necessary for troubleshooting deep system-level issues, and to disable it immediately afterward to minimize security risks.

Best Practices for BatchXpert User Accounts

When configuring a BatchXpert operating station, it is essential to separate administrative tasks from daily operations:

Administrator Account

Create a dedicated Windows administrator account for system maintenance and configuration. This account should **not** be used for routine operation of BatchXpert.

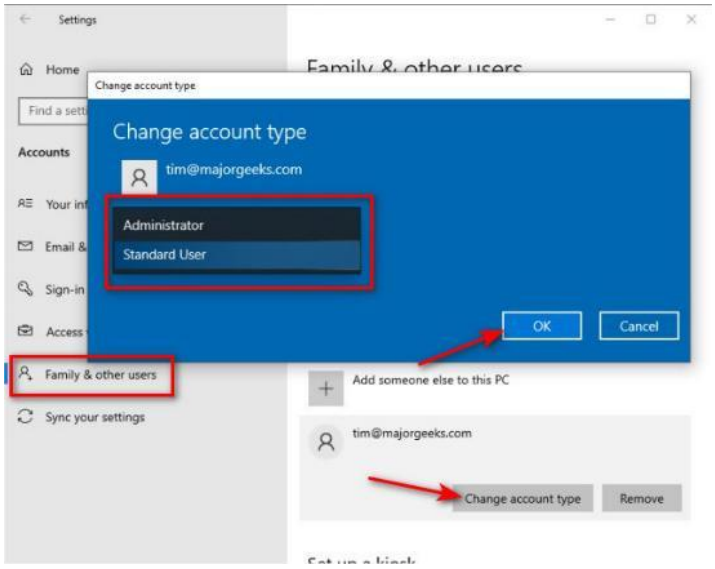
Operator Account

Create at least one non-administrator Windows User account for operators. Operators should always use this account to run BatchXpert. BatchXpert is specifically designed to function in non-administrative environments and does not require elevated privileges.

Security and Reliability Benefits

Using non-administrative accounts for BatchXpert operations provides several advantages:

- Reduced Attack Surface: Prevents operators from unintentionally or maliciously changing system-level settings (e.g., IP addresses, system clock).
- System Stability: Ensures that critical configurations remain protected from accidental modification.
- Compliance with Best Practices: Aligns with industry standards for process control systems, where separation of duties is a key principle.



For more information about how to set up your operating stations, you should read the installation manual “Manual BatchXpert Installation in Windows”, found in your installation directory, or on our knowledge base www.Docu.MLogics-Automation.com.

Windows Firewall

BatchXpert is specifically designed to operate with the integrated Windows Firewall. For this reason, all operating stations must run with the firewall enabled at all times. Disabling the Windows Firewall is neither necessary nor recommended, as it compromises both security and system integrity.

Configuration during Installation

During installation, BatchXpert automatically configures the Windows Firewall to allow required communication between system components. The installer runs a dedicated firewall configuration utility located in the Command Line Tools subdirectory of the BatchXpert installation directory.

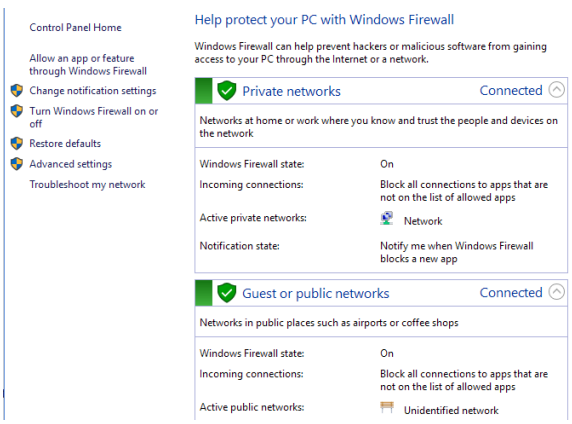
This ensures that all necessary rules and exceptions are applied without requiring manual intervention. After installation, your system should already be correctly configured for BatchXpert operation.

Manual Configuration Utility

In rare cases where firewall adjustments are required (e.g., custom network environments or troubleshooting), administrators can use the BatchXpert Firewall Utility found in the installation directory.
This tool provides a controlled way to update firewall rules without disabling the firewall. Manual configuration should only be performed by qualified personnel, as incorrect changes may affect communication between operating stations and the PLC.

Best Practice

- Never disable the Windows Firewall on BatchXpert operating stations.
- Use the provided utility only when adjustments are necessary.
- Verify firewall rules after installation to ensure proper communication across the distributed control system.



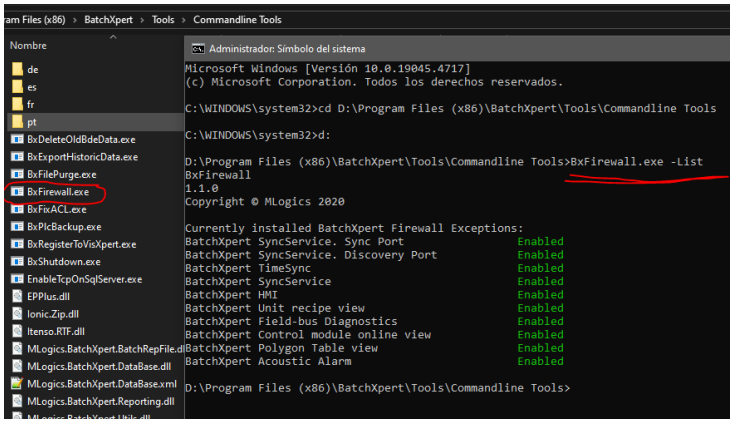


Figure 1 Firewall Utility of BatchXpert, to check and set firewall settings

Figure 2 Windows Firewall settings

Antivirus Software

We recommend that you use antivirus software on all operating stations to protect the operating system from virus infections caused by USB drives or Internet connections. We do not recommend any antivirus in particular, but we have good experience with the following antivirus software:

- AntiVir
- Windows Defender
- Avast

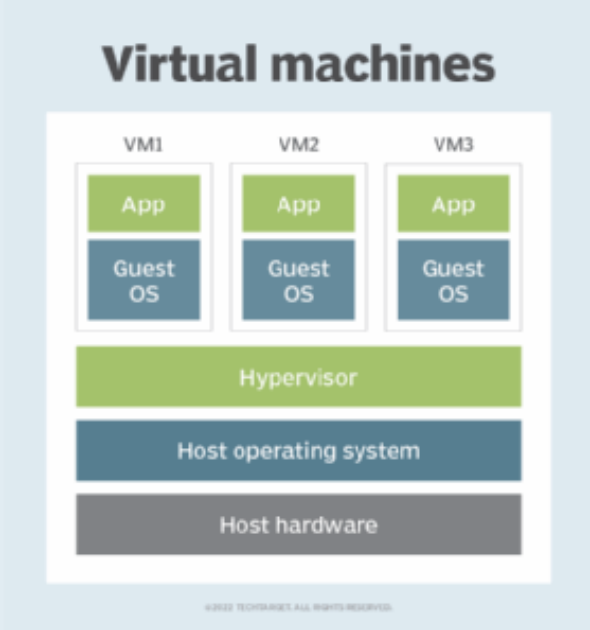
If you implement antivirus software on your operating stations, you must make sure that these software is compatible with BatchXpert by setting scanning exceptions and appropriate settings.

Endpoint Protection

To further enhance security of your operating stations you can also use "endpoint protection" software, which allows you to lock down your operating station and only allow certain applications, scripts end user actions on the operating station.
There are multiple vendors for Endpoint protection software, from which we recommend:

- OS Armor from "No Virus Thanks". (https://www.novirusthanks.com/)

BatchXpert in Virtualized Environments



BatchXpert is primarily designed to operate on dedicated physical hardware rather than in virtualization platforms such as VMware or Proxmox. While installation and operation in virtualized environments is technically possible, **we strongly discourage this approach for production process control systems**. Virtualization reduces the inherent redundancy of a distributed control system, which is a core design principle of BatchXpert.

Redundancy Considerations

BatchXpert is engineered to run multiple independent operating stations, each capable of executing all process control tasks autonomously. This architecture ensures system-wide redundancy: if one station fails, others continue to operate without interruption.

In a virtualized environment, however:

- All operating stations run on the same physical host.
- his introduces a single point of failure—the virtualization server itself.
- A hardware or hypervisor failure can simultaneously disable all operating stations, undermining the redundancy and reliability of the control system.

Configuration Adjustments for Virtualization

If BatchXpert must be deployed in a virtualized environment, certain project settings require modification, particularly for trend recording and related data-handling functions. These adjustments are necessary to ensure stable performance under virtualization. We recommend contacting MLogics to review your project configuration and apply the required changes.

Virtualization may be appropriate in non-production scenarios, such as:

- Testing environments
- Staging setups
- Training systems

For these purposes, BatchXpert has been successfully operated on platforms such as VMware, which has demonstrated general compatibility with the control system.

Licensing in Virtualized Environments

Licensing requirements remain unchanged when using virtualization:

- Each virtual machine is treated as a separate operating station.
- A valid license is required for every operating station, whether physical or virtual.
- No special licensing options are available for virtualized environments, reflecting our recommendation against their use in production.