Process Expert System 4.3

Selection Guide

Schneider Electric

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1 Introduction

1.1 Description

Process Expert System (PES) is the innovative process automation system from Schneider Electric. It brings together the best of the PLC/SCADA and DCS worlds to meet the demands of today's production facilities while delivering on growing energy management requirements.

- PES offers integrated energy management features to deliver superior value throughout the lifecycle of a plant
- PES also offered advanced process control and preventive maintenance capability to address to the growing demand for improved operational efficiency and sustainability in today's market.
- The tight integration of the system ensures efficiency from design engineering through to operation – engineers can develop the configuration faster and more accurately, operators will have all data at their fingertips for better insights and process optimization, and maintenance teams can diagnose and solve problems faster to reduce downtime
- PES helps our customers make the right decision at the right time, leading to increased uptime for the whole plant, and a more productive enterprise

1.2 Process Expert System is a key pillar of the EcoStruxure Platform

EcoStruxture Platform is Schneider Electric's collaborative and integrated automation architecture for industrial and infrastructure applications. It brings together our Telemetry, PLC/SCADA and DCS offerings with complete lifecycle services to help make your operations more efficient. From initial design to modernization, EcoStruxure Platform transparently connects control, operation and enterprise levels of your business. Also contributing to your energy efficiency goals, EcoStruxure Platform helps you measure, analyze and improve the energy consumption of your process so you can produce efficiently with minimum waste, effort and cost.

EcoStruxure Plant is built on an Ethernet network – it's open and flexible architecture and network topologies offer transparent access to the information you need, from the plant floor up to the enterprise level. In addition, it is a key building block of Schneider Electric's comprehensive energy management portfolio, EcoStruxure, and complementary to our software suites.

As one of the three pillars of the EcoStruxure Platform, PES shares these key values.

Figure 1 shows an overview of an automation system. All elements that are located inside the dotted line are part of PES. PES covers the needs of an automation system from the field devices all the way up to the control room. In addition, PES is open so other components can be added to ti – either as devices, other controllers or IT level applications like batch, MES, historian or asset management.

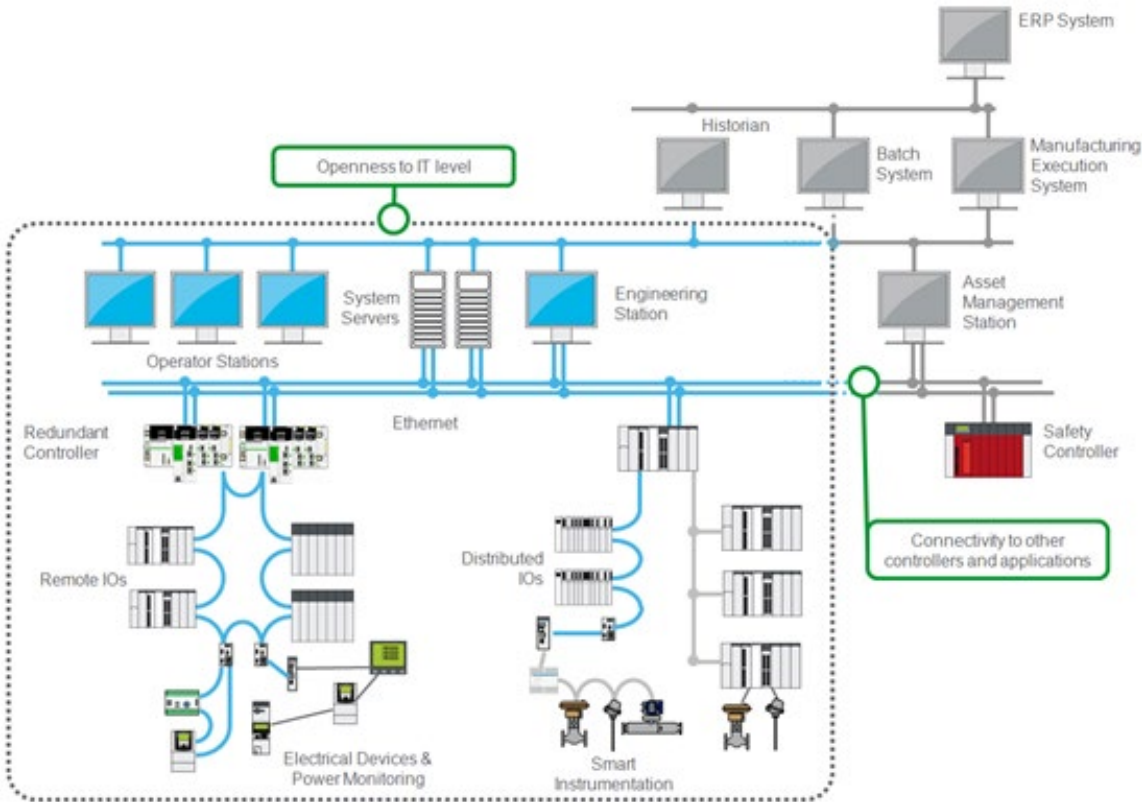


Figure 1: Positioning of PES within the EcoStruxure Platform

1.3 Process Expert System Overview

PES is based on three key elements, all of which are delivered within a single environment that integrates all its key engineering and operation functionalities:

1. **A system-wide, Ethernet based energy-aware architecture** – transparent and standardized Ethernet technology ensures connectivity, flexibility, scalability and performance

2. **A powerful and scalable controller platform** – PES supports a range of controllers to meet different process needs: the controller platforms are modular, scalable and redundant, with the ability to add or remove hardware online. In addition, they support a full range of input and output modules, along with dedicated communication and fieldbus modules, regulatory control, sequencing, motor control, power devices and instrumentation.

3. **Integrated functionalities in a single environment** – PES integrates functionalities to efficiently manage a process and its energy use in a single environment for engineering, operation and maintenance. This includes a single, object-oriented database to engineer and maintain systems more quickly and easily, a powerful operations and navigation environment for real-time monitoring and control of the plant, including alarms, events and trend data, and standard interfaces with historian, MES and other business systems for fast and easy information exchange.

2 Process Expert System Key Features

2.1 Engineering

PES improves efficiency throughout the engineering phase of a plant, accelerating start-up and minimizing project risk with five key features:

1. Intuitive and modern user interface – PES embeds all the software tools needed to design a process application:

- The Library Manager contains extensive object templates organized into libraries
- The Application Manager describes the equivalent plant hierarchy
- The Topology Manager describes the overall topology of the system
- The Project Manager defines the project that runs in the topology

2. All-in-one configuration – PES offers an all-in-one configuration functionality, allowing faster system design from a single point of data entry. Via the Application Manager, a replication of the application can be seen as it is in real life, using any model, the ISA88 or ISA95 standards, or any other model of choice. In addition, the design can be based on a hierarchical organization according to the P&ID definition, allowing easier evolution of the installation.

3. Object model approach – an object is composed of different facets that contain internal information about the software participant. These facets offer different points of view of the same object. Interfaces allow connections between object instances, enabling collaboration between the software participants embedded in PES, even while they remain de-coupled.

Figure 2: The Object Model based on facets that give several point of view

Figure 2 shows (with the example of a pump) the concept of object modelling. Several points of view are represented through the facets: control and the command of the pump at the bottom, monitoring of the pump through a graphic display and faceplate on top, and other information such as alarms, data history, user guides and so on. When an instance of an object is created, all facets are created as well, along with all the links between those facets.

4. Sustainable engineering – PES remains adaptable to different business needs at every stage of the application lifecycle. The original design of the process application can be adjusted at any time, and the system will execute the modifications by propagating the required changes across the plant. Modifications of an object facet can be applied to all objects or to the selected instances only. System libraries support versioning, and the system always verifies any discrepancy between the object model and its instances.

5. Standard and reusable application data – PES includes a set of object libraries that help kick-start the design process. The ready-to-use libraries can be modified to address specific preferences. Optional libraries focus specifically on applications for different segments, with embedded expertise like energy management functionalities to help with the reduction of energy waste at the source of overconsumption.

2.2 Operation and Maintenance

PES provides a consistent control and operational interface with a real-time view of the process. The system delivers operators all the data they need to make timely and accurate decisions and all the standard DCS functionalities are available in the PES operator interface, including:

1. Trending – trends are a seamless combination of real-time and historical data. When users view a trend page they can monitor the current activity as it happens and simply scroll back through time to view the trend history. The distributed trending system handles a large number of variables without compromising system performance or data integrity. Operators can choose from a selection of pre-configured trend pages that provide clear data representation with customizable views for quick and simple trend analysis.

2. Advanced alarms and events – the PES alarm system is fast and reliable, providing detailed information about the status of the plant. Alarms are displayed on dedicated alarm pages, with the most recent alarms visible at all times in the alarm banner on every page. Working in conjunction with the controller, alarms are time stamped with precision.

3. From any operator station, monitor the process and identify the root cause of any disturbance – from any animated symbol on the display the object faceplates can be directly opened. Each faceplate provides the basic object information (also indicated by the status icon on the object) along with a wealth of other data, such as monitoring parameters, interlocks, alarms and others. This advanced diagnostic is performed through the Runtime Navigation Services.

2 Process Expert System Key Features

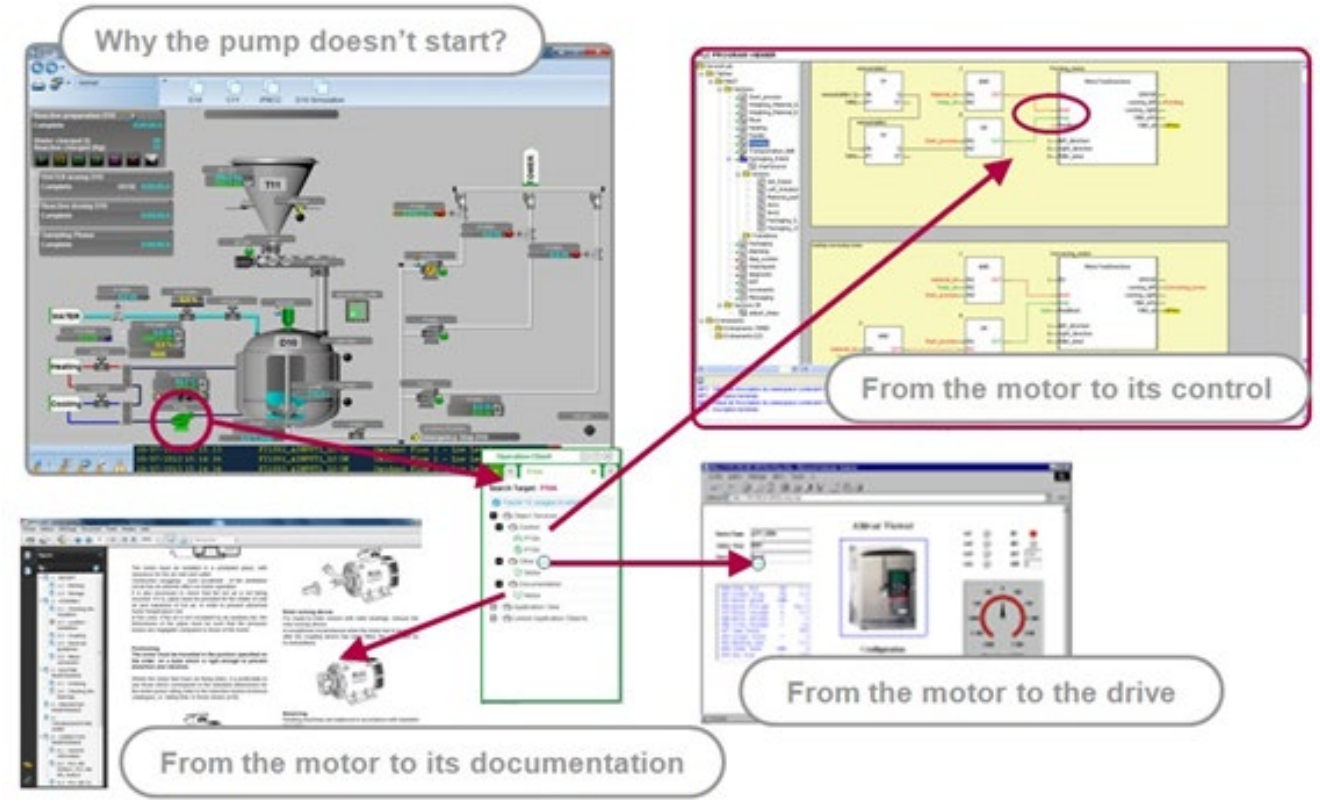


Figure 3: Navigation using the Application Manager to speed up diagnostics

2.3
Process Expert System capabilities in some key numbers

PES offers the capabilities to engineer and monitor processes having the following characteristics:

- Engineering from one to ten engineering stations
- Design of applications with 20 000 object instances, with one object instance managing a control module
- Configure a topology with 50 controllers with local and remote racks; each controller can manage devices on various networks and field busses (Ethernet Modbus/TCP, Modbus Serial, Profibus)
- Monitoring of the process from 20 station nodes

3 Architectures Overview

3.1 System Presentation

3.1.1 System deployed on site

The PES architecture is fully flexible and its infrastructure can be deployed on one single machine that hosts all the needed functions, or on a set of multiple machines. This choice will be based mainly on the size of the project, its topology and the expected performance of the application. The functions needed to execute a PES project are:

1. PES System Server – this server hosts the global database and centralizes and synchronizes all the information throughout the system infrastructure. The engineering software to configure, monitor, diagnose and maintain the deployed application is also embedded on the System Server. The engineering software suites are embedded on a virtual machine, which is installed with the PES System Server. There is only one System Server for any PES configuration.

2. PES Engineering Clients – these clients house all the editors that are needed to configure and build the project. One engineering client can be located on the same workstation as the system server, or on another workstation. It is possible to distribute several engineering clients across workstations, enabling engineers to work concurrently on different applications or even on the same application located on the system server.

3. PES Operation Servers – these servers offer a set of services such as I/O servers, alarms servers, trend servers and report servers. A minimum of one Operation Server is required when deploying a PES configuration. In order to improve the scalability and the performance of PES the Operation Servers can be split into several machines that can be stand alone or redundant. Each operation server embeds a local PES Operation Client. In addition, it is possible to set up a redundant configuration of the PES Operation Servers to ensure the monitoring of the automation system at any time.

4. PES Operation Clients – the number of Operation Clients needed depends on from where the Control System Application is monitored, and how many client stations are required. There are two types of operation clients – the Control Client enables modifications to be made like set points; the View Only client doesn't allow any kind of modification to be made to the running system. Both the Control and View Only Clients can be used remotely as Web Clients. In addition, each Operator Server embeds a local Operation Client, which can run exclusively on the server. PES Operation Clients is embedded with two main functionalities: supervision services and advanced diagnostics through the Runtime Navigation Services.

All these machines are interconnected through the Ethernet Network architecture (refer to the ***figure 4***). To get access to the controllers from the Engineering Client, the client must be connected to the control network or get access from the supervision network to the control network through a router. To avoid connecting all the workstations on the same network, which may affect the response time, the choice of keeping two separate networks is taken, with routing capabilities between networks. For this reason, all figures representing architectures include a router between the networks.

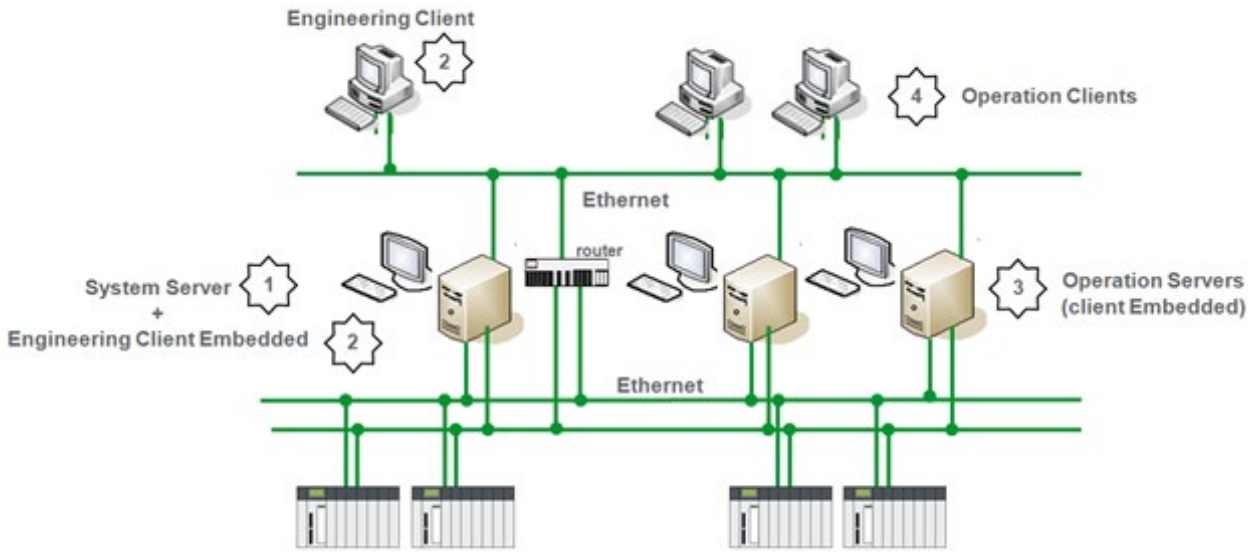


Figure 4: PES infrastructure deployed on site

3.1.2 Licensing for Process Expert System infrastructure deployed on site

All the software components that are described above require licenses to run permanently on site.
These licenses are not system size dependent. The scalability of the infrastructure is managed through the Application License where one Application License is required for the overall PES infrastructure deployed on site.

Management of licenses is done by one or more a floating license managers, which can be located on any machine. In most cases, the license server is located on the same workstation as the PES System Server for a non redundant configuration, but an alternative is to install it on a dedicated machine. In the case of redundant Operation Servers, the licenses and the Operation Client licenses must be installed on the servers to ensure the availability of one Operation Server and Operation Client at any time, and to avoid a single point of failure.

PES uses virtualization technologies to provide some of its functions and features. However, from a user perspective, this is completed transparently. Depending on the PES infrastructure, one or more virtual machines need to be installed with PES software components. The location on the workstations and the licensing of the virtual machines are covered in a later section within this chapter.

3 Architectures Overview

3.1.2 .1 Non-redundant Configuration: how to define the licenses to be ordered

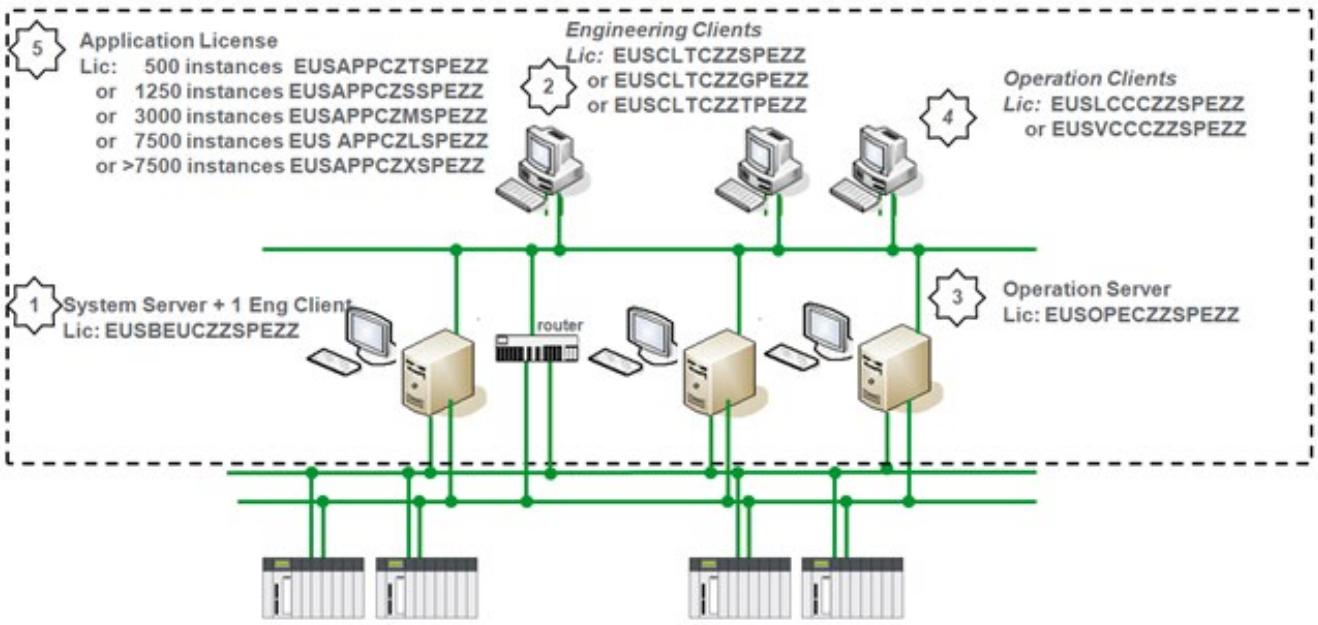


Figure 5: Non-redundant configuration: PES licenses deployed on site

1. One PES Server license is mandatory. Only one is required in a PES configuration. It includes the engineering client license. The client can be installed on the same workstation or remotely on another machine.
License to be ordered: **EUSBEUCZZSPEZZ** SW PE ENG SINGLE LIC

2. An optional extension with additional engineering clients licenses. Three possibilities of licenses, depending on the number of seats (clients) to be added in the configuration.
License to be ordered: **EUSCLTCZZSPEZZ** SW PE ENG CLIENT SINGLE LIC
EUSCLTCZZGPEZZ SW PE ENG CLIENT GROUP LIC
EUSCLTCZZGPEZZ SW PE ENG CLIENT TEAM LIC

3. One PES Operation Server license is mandatory. Each Operation Server includes a local Operation Client license. Depending on the system size and topology the system may have more than one Operation Server.
License to be ordered: **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC

4. At least one PES Operation Client license is mandatory. The client embedded with the Operation Server license can be used. Otherwise, add at least one license, plus the number of other licenses required for the

clients installed throughout the system infrastructure. Two kinds of licenses are available: Control Client or View Only Client. Both can be used as Web Clients. The PES Operation Client license enables the supervision services and the Runtime Navigation Services.

Licenses to be ordered: **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC
EUSVCCCZZSPEZZ SW PE VIEW CLIENT LIC

5. One Application License must be ordered for the whole configuration. Five sizes are available, depending on the automation system size. The size is defined according to the maximum number of object instances that can be included within the system.

Possible licenses to be ordered (one of these possibilities):

500 instances	**EUSAPPCZTSPEZZ**	SW PE APPL LIC EXTRA SMALL
1250 instances	**EUSAPPCZSSPEZZ**	SW PE APPL LIC SMALL
3000 instances	**EUSAPPCZMSPEZZ**	SW PE APPL LIC MEDIUM
7500 instances	**EUS APPCZLSPEZZ**	SW PE APPL LIC LARGE
>7500 instances	**EUSAPPCZXSPEZZ**	SW PE APPL LIC EXTRA LARGE

It is possible to upgrade the application license in order to increase the number of object instances.

Possible licenses to be ordered:

500 to 1250 instances	**EUSAPPGZASPEZZ**SW PE UPG XS TO S APP LIC
1250 to 3000 instances	**EUSAPPGZESPEZZ**SW PE UPG S TO M APP LIC
3000 to 7500 instances	**EUSAPPGZHSPEZZ**SW PE UPG M TO L APP LIC
7500 to >7500 instances	**EUSAPPGZKSPEZZ**SW PE UPG L TO XL APP LIC

More than one license may be necessary to upgrade to a larger system.

For example: to upgrade from 500 instances to 3000 instances, two licenses must be ordered:

EUSAPPGZASPEZZ SW PE UPG XS TO S APP LIC
EUSAPPGZESPEZZ SW PE UPG S TO M APP LIC

3 Architectures Overview

3.1.2 .2 Redundant Configuration: how to define the licenses to be ordered

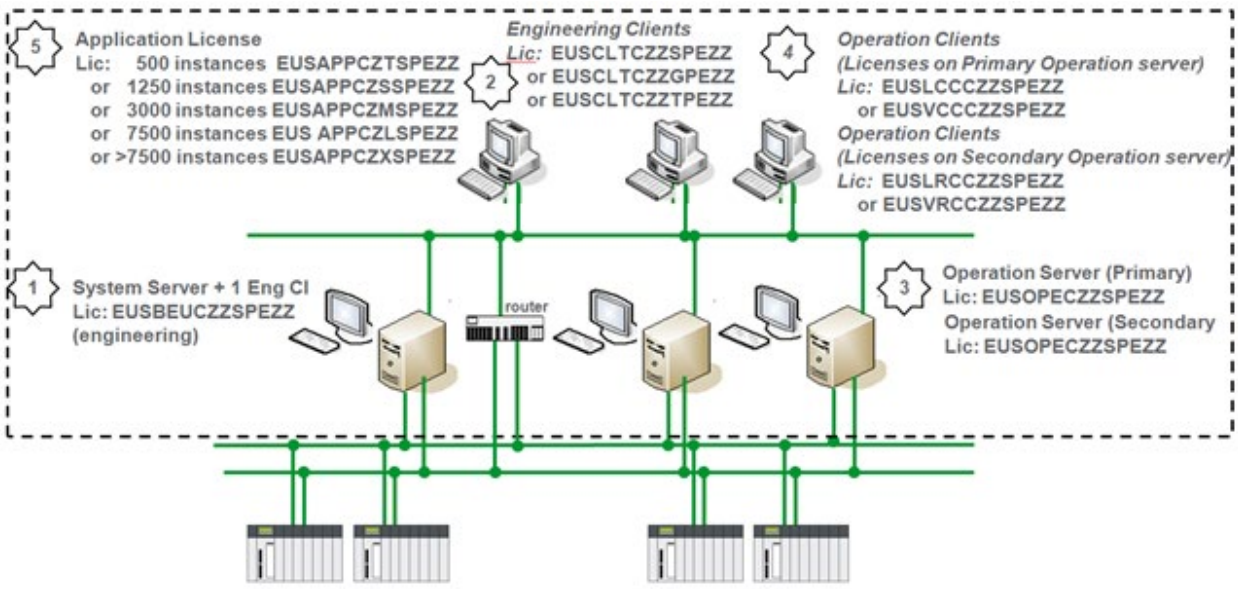


Figure 6: Redundant configuration: PES licenses deployed on site

1. One PES Server license is mandatory. Only one is required in a PES configuration. It includes the engineering client license. The client can be installed on the same workstation or remotely on another machine. Redundancy of the PES System Server is not possible and in the case of System Server failure, engineering and advanced diagnostic services in operation (like navigation within the control system) are not possible, however, operation from the supervision system will remain available.
License to be ordered: **EUSBEUCZZSPEZZ** SW PE ENG SINGLE LIC

2. An optional extension with additional engineering clients licenses. Three possibilities of licenses, depending on the number of seats (clients) to be added in the configuration.
License to be ordered: **EUSCLTCZZSPEZZ** SW PE ENG CLIENT SINGLE LIC
EUSCLTCZZGPEZZ SW PE ENG CLIENT GROUP LIC
EUSCLTCZZTPEZZ SW PE ENG CLIENT TEAM LIC

3. One PES Operation Server license is mandatory. Each Operation Server includes a local Operation Client license. Depending on the size and topology of the system it may have more than one Operation Server. For redundancy, the number of PES Operation Servers must be doubled.
License to be ordered: **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC

4. At least one PES Operation Client license is mandatory. The client embedded with the Operation Server license can be used. Otherwise, add at least one license, plus the number of other licenses required for the clients installed on the system infrastructure. All Operation Client licenses enable access to the runtime navigation services. To maintain control of the automation system when an Operation Server fails, it is required to double the Operation Client licenses to ensure each Operation Client recovers a license from the Operation Server that is available when the other fails. For each Operation Client license, it is recommended to order a corresponding Redundant Operation Client license and install them on a secondary server.
Two kinds of licenses are available: Control Client or View Only client. Both can be used as Web Clients.
Licenses to be ordered:

EUSLCCCZZSPEZZ	SW PE CTRL CLIENT LIC
EUSVCCCZZSPEZZ	SW PE VIEW CLIENT LIC
EUSLRCCZZSPEZZ	SW PE REDUNDANT CTRL CLIENT LIC
EUSVRCCZZSPEZZ	SW PE REDUNDANT VIEW CLIENT LIC

Note: Same part numbers need to be ordered for Web Clients. But Web Clients don't allow access to the runtime navigation services.

5. One Application license must be ordered for the whole configuration. Five sizes are available, depending on the automation system size. The size is defined according to the maximum number of object instances that can be included within the system.
Possible licenses to be ordered (one of these possibilities):

500 instances	**EUSAPPCZTSPEZZ**	SW PE APPL LIC EXTRA SMALL
1250 instances	**EUSAPPCZSSPEZZ**	SW PE APPL LIC SMALL
3000 instances	**EUSAPPCZMSPEZZ**	SW PE APPL LIC MEDIUM
7500 instances	**EUS APPCZLSPEZZ**	SW PE APPL LIC LARGE
>7500 instances	**EUSAPPCZXSPEZZ**	SW PE APPL LIC EXTRA LARGE

It is possible to upgrade the application license in order to increase the number of object instances.
Possible licenses to be ordered:

500 to 1250 instances	**EUSAPPGZASPEZZ**	SW PE UPG XS TO S APP LIC
1250 to 3000 instances	**EUSAPPGZESPEZZ**	SW PE UPG S TO M APP LIC
3000 to 7500 instances	**EUSAPPGZHSPEZZ**	SW PE UPG M TO L APP LIC
7500 to >7500 instances	**EUSAPPGZKSPEZZ**	SW PE UPG L TO XL APP LIC

More than one license may be necessary to upgrade to a larger system. For example, to upgrade from 500 instances to 3000 instances, two parts must be ordered:

EUSAPPGZASPEZZ	SW PE UPG XS TO S APP LIC
EUSAPPGZESPEZZ	SW PE UPG S TO M APP LIC

3 Architectures Overview

3.1.3 System deployed on site: very small "all-in-one" configuration

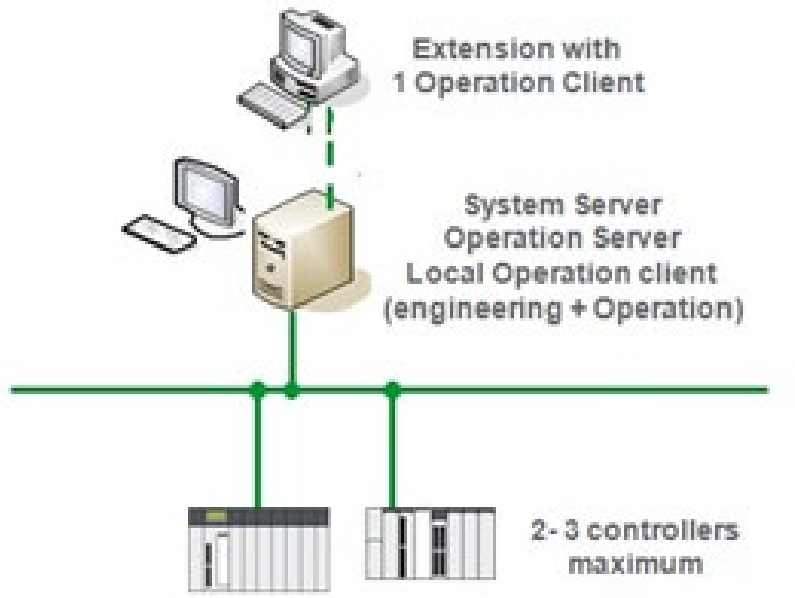


Figure 7: Very small configuration: PES Mini

For very small automation systems which don't require redundancy, an "all-in-one" license called PES Mini enables all the software components to be installed on a single machine at a cost effective price. This alternative has some parameters which include:

1. The control system doesn't require more than 200 object instances; however the system can be upgraded to 500 object instances at a maximum

2. The System Server, the Operation Server and the Operation Client are installed on the same workstation

3. The configuration cannot be extended to a second Operation Server so a redundant operation configuration is not supported by PES Mini

4. The number of Operation Clients can be extended with additional licenses
License to be ordered: **EUSMINCZTSPEZZ** SW PE MINI CONF WITH 200 OBJ INST LIC

To add Operation Clients, use the following licenses:
Licenses to be ordered: **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC
EUSVCCCZZSPEZZ SW PE VIEW CLIENT LIC

It is possible to upgrade PES Mini to a maximum of 500 object instances. The limitations mentioned above remain the same when upgrading PES Mini.
License to be ordered: **EUSMINGZASPEZZ** SW PE UPG MINI TO 500 OBJ INST LIC

3.1.4 Engineering

Depending on the status of the designer of the Process Expert System project, there are four possibilities for the license of the engineering configuration:

1. When the PES project is executed by Schneider Electric staff, Schneider Electric owns the license and it is not transferable to the end user. In this case there are three part numbers, depending on the number of users. A Multiple Users license (e.g: “Group” license for three users) includes the rights to run PES on many computers that are defined for this license (e.g: running PES on three computers). Various configurations are available to fit the user needs: from a single system server with many engineering clients to many standalone systems including a system server and one engineering client only. The picture below gives some examples of possible configurations with a “Team” license (10 seats).

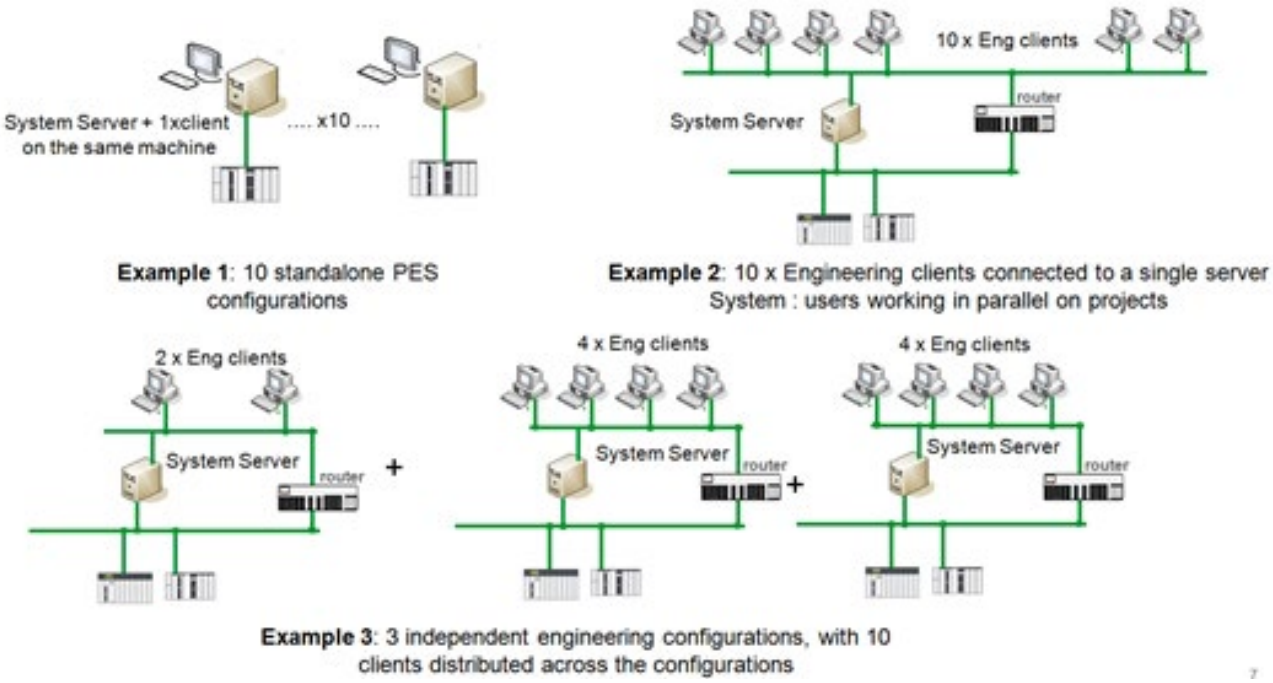


Figure 8: Examples of engineering configurations with a "Team"license

A “Team” license is embedded with 10 license rights for the System Server and 10 license rights for the engineering clients. Many configurations can be set up; the rule is not to exceed the number of system server licenses and the number of engineering client licenses allowed by the part number. There is a possibility to add additional Engineering clients (to be ordered separately).
The features and benefits of this license are:

- All engineering services to design the control system (editors from Unity Pro) and the supervision (graphic builder of Vijeo Citect) and the controller simulator are embedded
- Application license with unlimited number of object instances to design any size project
- 1 x Operation Server (one local control client embedded)
- Possibility to run seven Control Clients/View Only clients connected to the Operation Server with access to the runtime navigation services from 4 clients.

- Runtime services (supervision) are limited to eight continuous hours; and are re-launchable
- Permanent licensing

Each part includes all the required services to engineer and test the design and it includes an Application license with an unlimited number of process objects to enable the design of any size of control system.
Licenses to be ordered: **EUSBASCZZSPEZZ** SW PE ENG ASC SINGLE LIC (single user)
EUSBASCZZGPEZZ SW PE ENG ASC GROUP LIC (3 users)
EUSBASCZZTPEZZ SW PE ENG ASC TEAM LIC (10 users)

2. For project execution by a System Integrator who joined the Schneider Electric Alliance Partner Program, a one year license is available. This license is not transferable to the end user. The partner must have already joined the program and he can optionally access to the PlantStuxure PES offer with an additional fee. There is one part number including the license for a “Group” of users (seats). Each seat includes one System Server, one engineering client and an application license with unlimited number of object instances to enable the design any size of control system. Various configurations are available to fit the user needs: from a single system server with 3 engineering clients to 3 standalone systems including a system server and one engineering client.
The features and benefits of this license are:

- All engineering services to design the control system (editors from Unity Pro) and the supervision (graphic builder of Vijeo Citect) and the controller simulator are embedded
- Application license with unlimited number of object instances to design any size project
- 1 x Operation Server (one local control client embedded)
- Possibility to run two Control Clients + two View Only clients connected to the Operation Server, with runtime navigation services from any client.
- Runtime services (supervision) are limited to eight continuous hours; and are re-launch able
- One year license reserved for a System Integrator who is part of the SI Alliance Partner Program

This part includes all the required services to engineer and test the design. It includes an Application license with an unlimited number of process objects to enable the design of any size control system.
License to be ordered: **EUSBALCZZGXEZZ** SW PE ENG ALL GROUP LIC (3 users)

3. For project execution by a System Integrator who has not joined the Schneider Electric Alliance Partner Program, the SI has the possibility to order one of the three part numbers, depending on the number of users that are dedicated for this use. A Multiple Users license (e.g: “Group” license for three users) includes the rights to run PES on many computers that are defined for this license (e.g: running PES on three computers). Various configurations are available to fit the user needs: from a single system server with many engineering clients to many standalone systems including a system server and one engineering client only.
The features and benefits of this license are:

- All engineering services to design the control system (editors from Unity Pro) and the supervision (graphic builder of Vijeo Citect) and the controller simulator are embedded
- Application license with unlimited number of object instances to design any size project
- 1 x Operation Server (one local control client embedded)
- Possibility to run seven Control Clients/View Only clients connected to the Operation Server with access to the runtime navigation services from 4 clients.
- Runtime services (supervision) are limited to eight continuous hours; and are re-launchable
- Permanent licensing

Each part includes all the required services to engineer and test the design and it includes an Application license with an unlimited number of process objects to enable the design of any size of control system.
Licenses to be ordered: **EUSSISCZZSPEZZ** SW PE ENG SYS INT SINGLE LIC (1 user)
EUSSISCZZGPEZZ SW PE ENG SYS INT GROUP LIC (3 users)
EUSSISCZZTPEZZ SW PE ENG SYS INT TEAM LIC (10 users)

4. For other cases, the core configuration is based on a section of the PES configuration described above – the PES System Server, PES Application License and PES Operation Server will be used to design the project. This configuration is transferable to the end user and can be part of the deployed configuration on site. The features and benefits of this license are:

- All engineering services to design the control system (editors from Unity Pro) and the supervision (graphic builder of Vijeo Citect) and the controller simulator are embedded
- Maximum number of object instances is defined by the Application license that is ordered; there are five sizes

License to be ordered: **EUSBEUCZZSPEZZ** SW PE ENG SINGLE LIC
Possible licenses to be ordered (one of these possibilities):

500 instances	**EUSAPPCZTSPEZZ**	SW PE APPL LIC EXTRA SMALL
1250 instances	**EUSAPPCZSSPEZZ**	SW PE APPL LIC SMALL
3000 instances	**EUSAPPCZMSPEZZ**	SW PE APPL LIC MEDIUM
7500 instances	**EUS APPCZLSPEZZ**	SW PE APPL LIC LARGE
>7500 instances	**EUSAPPCZXSPEZZ**	SW PE APPL LIC EXTRA LARGE

To be able to test the system design using the supervision system the configuration above needs to be enhanced. It is possible to run the supervision system without the PES Operation Server license for only 15 minutes so to obtain permanent runtime services provided by the supervision system an Operation Server license minimum must be added. This license enables a local Control Client on the server.
License to be ordered: **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC

This configuration can be reused for the deployed configuration on site. It may be enhanced with other software components, depending on the automation system requirements – refer to chapter 3.1.1.

PES Mini can be used for project engineering within its limitation of 200 objects.
License to be ordered: **EUSMINZTSPEZZ** SW PE MINI CONF WITH 200 OBJ INST LIC

Except for PES Mini, all the engineering configurations can be extended with additional engineering client licenses. Three possibilities of licenses, depending on the number of seats (clients) to be added in the configuration.
Licenses to be ordered: **EUSCLTCZZSPEZZ** SW PE ENG CLIENT SINGLE LIC
EUSCLTCZZGPEZZ SW PE ENG CLIENT GROUP LIC
EUSCLTCZZTPEZZ SW PE ENG CLIENT TEAM LIC

3.1.5 Process Expert System for Educational entities

This license is dedicated to Educational entities (professional schools, universities,...) to manage courses for professors and students. The configuration is based on a single server and a maximum of ten engineering clients connected to this server. This configuration allows the creation of projects with a total amount of 3000 process object instances.
This license cannot be sold or transferred to system integrators or end users even for training purposes.

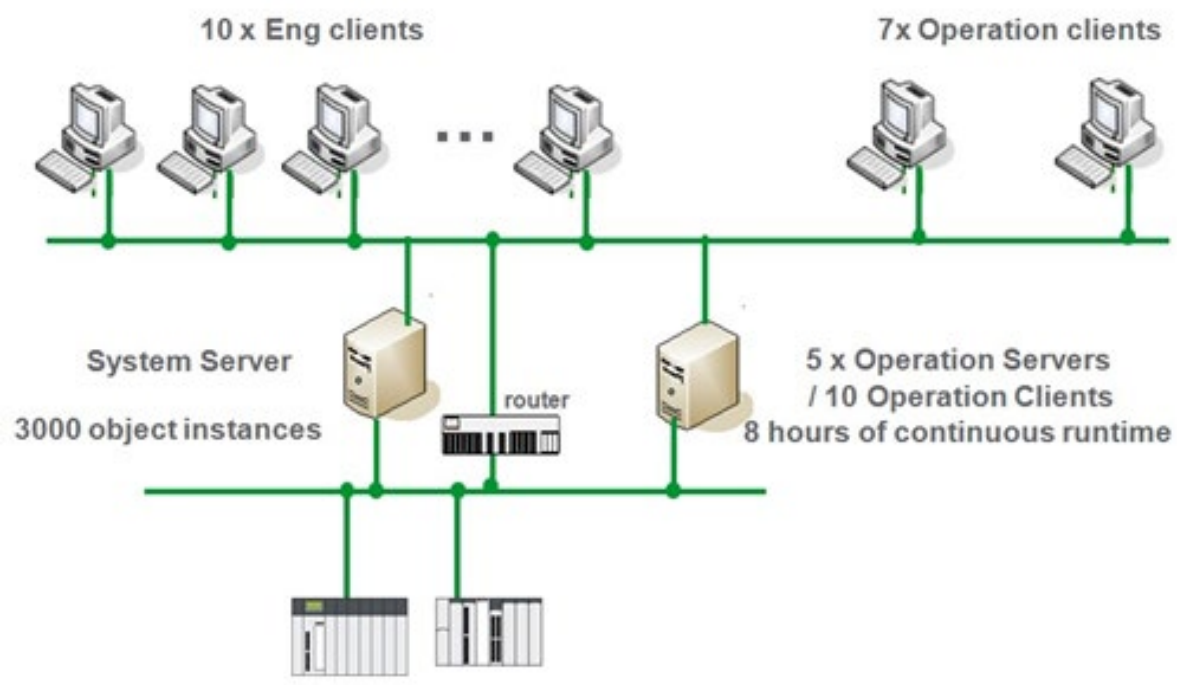


Figure 9: PES for Educational entities

In addition, this license enables the runtime services with 8 hours of continuous use (re launch able) for a supervisory configuration of:

- 5 Operation servers
- 10 Control clients / view only clients
- Access to Runtime Navigation Services from 10 control clients maximum

License to be ordered: **EUSBASEZMSPEZZ** SW PE EDUC ENG SINGLE LIC

3.1.6 Promotion

For promotion of PES by Schneider Electric staff, a demo software license is available. This license is not transferable to anyone outside of Schneider Electric. This license is dedicated to demonstrations and must not be used for customer project design. In addition it features:

- All engineering services to design the control system (editors from Unity Pro) and the supervision (graphic builder of Vijeo Citect) and the controller simulator are embedded

- Application license with the number of object instances limited to 500
- 1 x Operation Server (one local control client embedded)
- Possibility to run seven Control Clients/View-Only Clients connected to the Operation Server with access to the runtime navigation services from 1 client
- Runtime services (supervision) are limited to eight continuous hours; and are re-launchable
- Permanent license

License to be ordered: **EUSSSVZZSPEZZ** SW PE SALES LICENSE (single user)

3.1.7 Licensing Windows embedded in the virtual machines

3.1.7 .1 Installation rules for the virtual machines in a Process Expert System configuration

Each PES configuration embeds at least one virtual machine, which runs the software participants required to design the control system. During operation, it enables advanced diagnostics through the runtime navigation services. The various configurations that are possible for a distributed system lead to require one or more virtual machines:

- All-in one configuration requires only one virtual machine.
- Distributed configurations across several machines require the number of virtual machines according to the following rules:
  > Each Engineering Client needs a virtual machine running on the workstation
  > Neither Operation Server, nor Operation Client requires any virtual machine on its workstation
  > When a workstation embeds an Engineering Client plus an Operation Client, one virtual machine must be installed on the workstation. This virtual machine is used for engineering and runtime navigation services from the local Operation Client
  > The runtime navigation services issued from one Operation Client uses an instance of a virtual machine when the user wants to access to the controller program contextually on-line. Except for Operation Clients running on the same machine as an Engineering client, the system server requires a virtual machine. Only one virtual machine is installed on the system server with several instances of the virtual machine that can run in parallel.

  The virtual machine embeds a Microsoft Windows operating system. Each operation client that uses the service of an instance of the virtual machine requires a license. The number of licenses required for the virtual machine depends on the number of simultaneous access to the virtual machine from the operation clients running on operation workstations, meaning that several instances are running at the same time. To get the simultaneous access from all the operation clients at the same time, a license for the VM is required for all the operation clients. In theory, all operation clients may need an access to the virtual machine to access to the controller program on-line. However, only one access for 4 operation clients will be sufficient in most applications.

The drawings in this document show the difference between the virtual machine (only one per machine) and the number of licences required to run the advanced diagnostics.

Show the virtual machine installed on the computer

Identifies a license to enable Windows operating system in the virtual machine

3 Architectures Overview

Figure 10 shows an example of the location of the virtual machines in a PES configuration, according to the rules defined above.

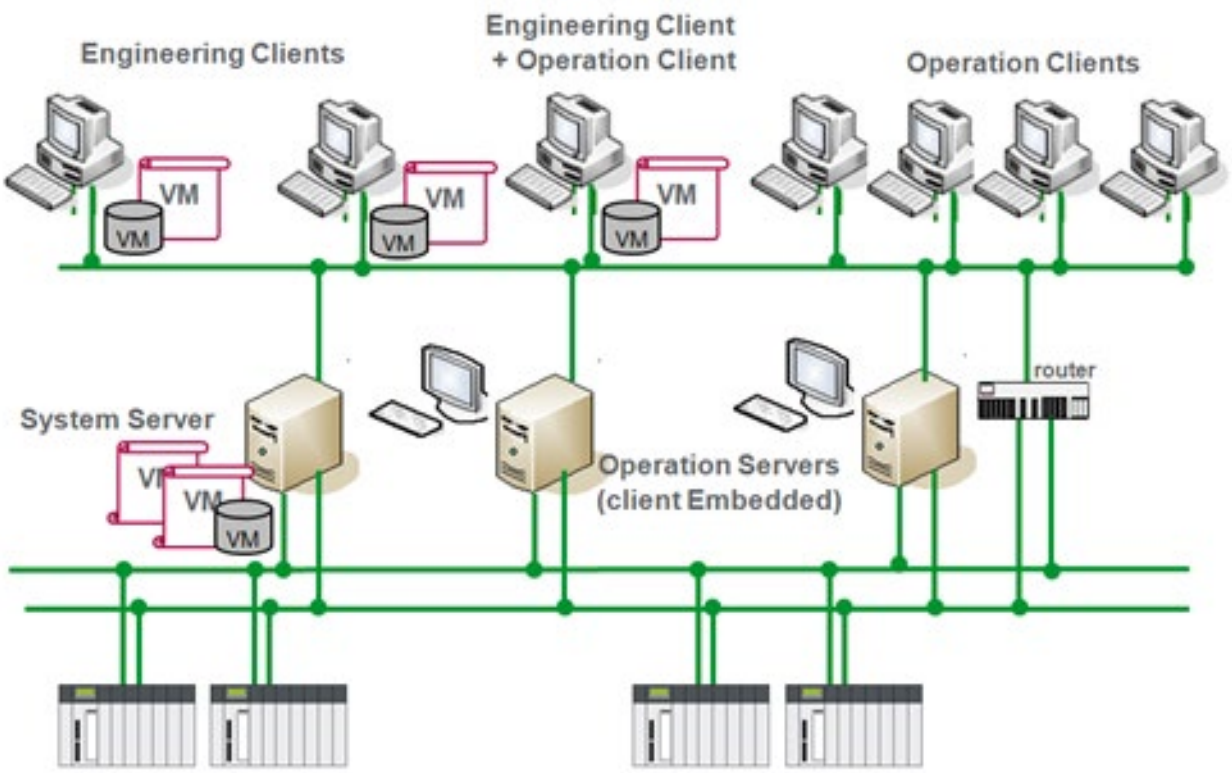


Figure 10: Installation of virtual machines in PES infrastructure

In this example, three workstations are embedded with an Engineering Client, so a virtual machine has to be installed on all of them and must be licensed. The system server requires a virtual machine to launch the advanced diagnostics through the runtime navigation services from the Operation Clients. One license is required as a minimum on the server to enable the navigation within the controller program from one operation client. In the case of multiple clients accessing a controller, additional licenses according to the number of simultaneous access must be added (maximum six in that case, considering that each Operation Server is embedded with an Operation Client and the Operation Client installed on the same machine as the Engineering Client uses the local virtual machine). In a nominal usage of this configuration, two licenses for the virtual machine will be sufficient for the six operation clients.

3.1.7 .2 Licensing Windows in the virtual machines

Each virtual machine is embedded with Microsoft Windows 7 Pro as the operating system. Each virtual machine requires a license. A trial period without a license is available.

To cover the licensing of virtual machine, Microsoft recommends subscribing the “Software Assurance”, with Windows Pro as software included in the contract. The user has to order the number of “CAL VDA” that is required for his configuration. Software Assurance includes the maintenance service. This solution generally suits medium / large companies that have already contracted with Microsoft for various software and the licenses required for the VMs can be added in their volume contract.

Microsoft proposes an alternative to subscribe to a contract called MPSA (Microsoft Products and Services Agreement), which enables subscription to for a set of “CAL VDA” for Windows Pro.

4 Process Expert System Configuration: Examples

Through four examples, this chapter provides the information to define a PES configuration in terms of topology and lists the required part numbers that need to be ordered. For each configuration, the location of the virtual machines is described. Also the associated number of Windows licences for the virtual machines is mentioned. Note: For one example, many other configurations are possible to locate the software pieces and the software licenses. The location of licenses is guided by three main rules:

1. All software licenses related to engineering are stored on the system server

2. To avoid a single point of failure, software licenses for operation (server and clients) are located on one operation server, which is on another machine than the system server.

3. In case of redundant configuration for supervision, the licenses are distributed in order to ensure the availability of the primary or secondary server(s) and client(s) at any time.

4.1 Example 1

4.1.1 Configuration without redundancy of Operation Servers

This example is an automation system with

- 400 object instances
- A dedicated station for the system server and a remote engineering client on another workstation
- Two workstations set up as Operation Clients to monitor the process
- One server to collect process data; with the same machine used as an Operation Client
- No supervision redundancy

Four workstations are used in this configuration

- Workstation 1 – dedicated for the PES System Server
- Workstation 2 – dedicated for operations and embeds the server and one Operation Client
- Workstation 3 – dedicated as an operator workstation as it embeds one Operation Client
- Workstation 4 – dedicated as an operator workstation as it embeds one Operation Client
- Workstation 5 – dedicated as an Engineering Client that will be used for maintenance of the automation system

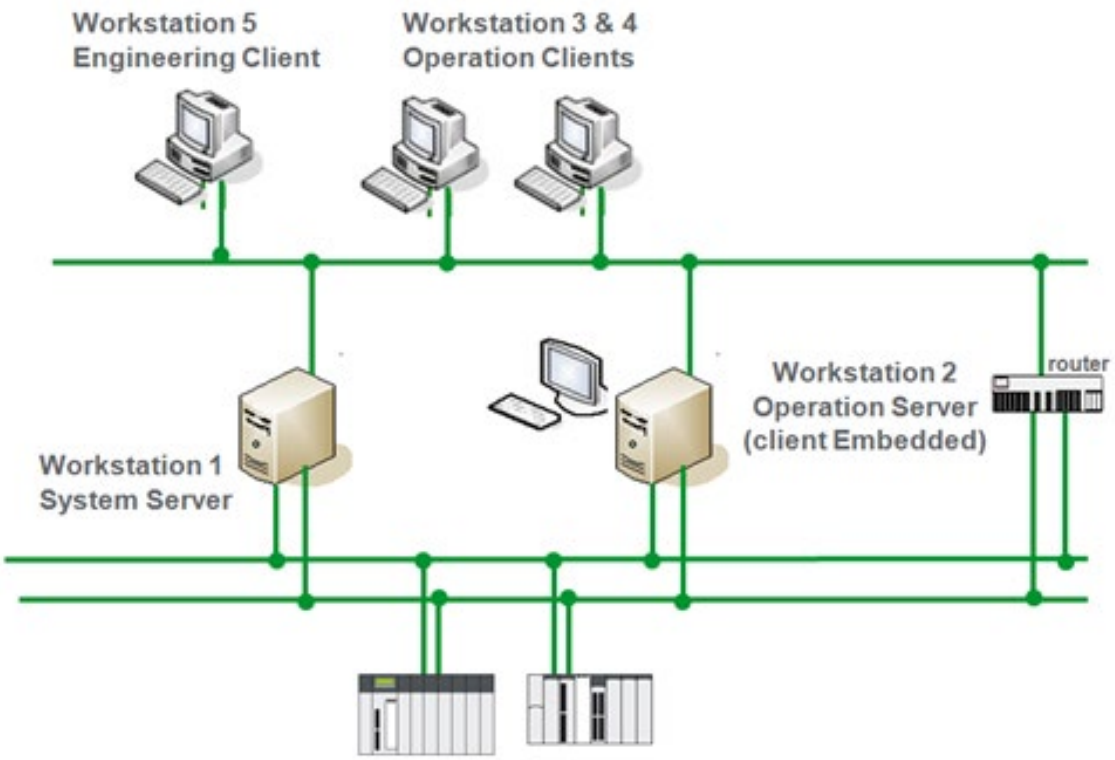


Figure 11: Example 1 - PES configuration without redundancy of Operation Servers

Licenses installed on the workstations

- Workstation 1

1 x **EUSBEUCZZSPEZZ** SW PE ENG SINGLE LIC
1 x **EUSAPPCZTSPEZZ** SW PE APPL LIC EXTRA SMALL (500 object instances)

- Workstation 2

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (embeds one client)
2 x **EUSLCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 3

No license installed; the Operation Client gets its license from the Operation Server

- Workstation 4

No license installed; the Operation Client gets its license from the Operation Server

- Workstation 5

No license installed; the Engineering Client gets its license from the System Server

Note: if the Operation Client must be located on another machine than the machine hosting the Operation Server, another Operation Client license must be ordered and in this case this additional license should be installed on Workstation 2.

4 Process Expert System Configuration: Examples

4.1.2 Configuration with redundancy of Operation Servers

This example is an automation system with

- 400 object instances
- A dedicated station for the system server and a remote engineering client on another workstation
- Two workstations set up as Operation Clients to monitor the process
- One server with redundancy to collect process data; with the same machine used as an Operation Client

Five workstations are used in this configuration

- Workstation 1 – dedicated for the PES System Server
- Workstation 2 – dedicated for operations as it embeds the primary server and one Operation Client
- Workstation 3 – dedicated for operations as it embeds the secondary server and one Operation Client
- Workstation 4 – dedicated as an operator workstation as it embeds one Operation Client
- Workstation 5 – dedicated as an operator workstation as it embeds one Operation Client
- Workstation 6 – dedicated as an Engineering Client that will be used for maintenance of the automation system

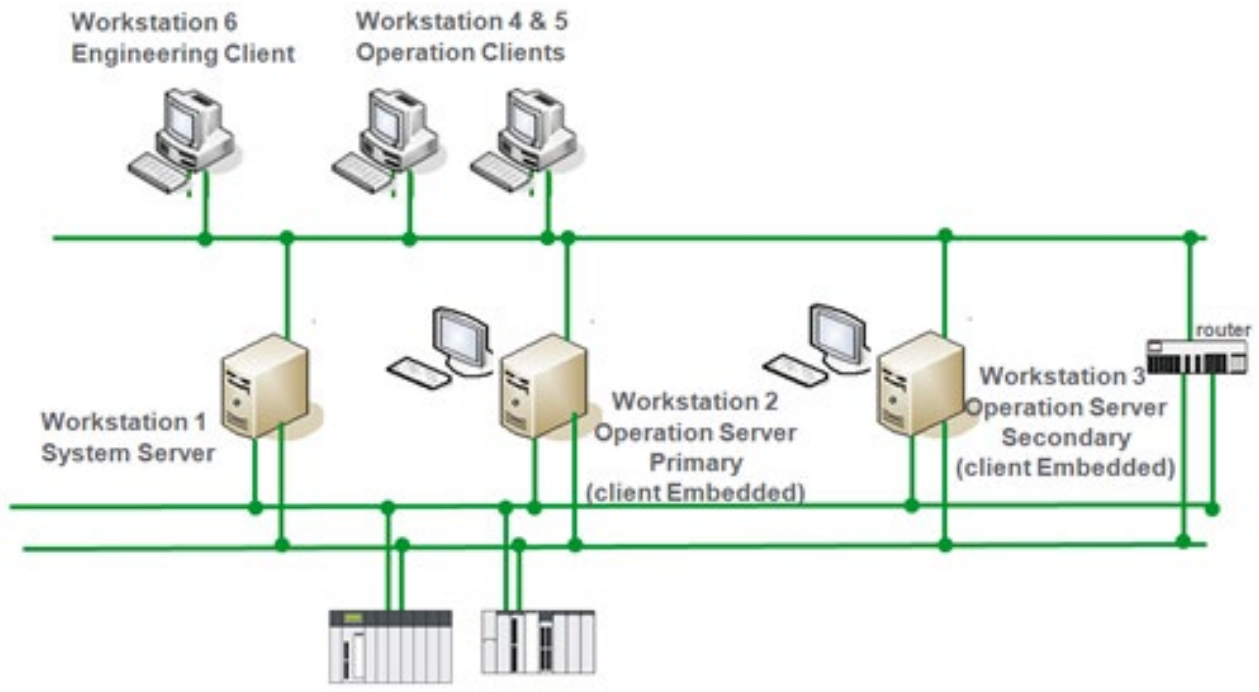


Figure 12: Example 1 - PES configuration with redundancy of Operation Servers

Licenses installed on the workstations

- Workstation 1

1 x **EUSBEUCZZSPEZZ** SW PE ENG SINGLE LIC
1 x **EUSAPPCZTSPEZZ** SW PE APPL LIC EXTRA SMALL (500 object instances)

- Workstation 2:

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (primary server with client)
2 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 3

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (secondary server with client)
2 x **EUSLRCCZZSPEZZ** SW PE REDUNDANT CTRL CLIENT LIC

- Workstation 4

No license installed; the Operation Client gets its license from the Operation Servers on workstations 2 or 3 (Primary or Secondary)

- Workstation 5

No license installed; the Operation Client gets its license from the Operation Servers on workstations 2 or 3 (Primary or Secondary)

- Workstation 6

No license installed; the Engineering Client gets its license from the System Server

Note: if the configuration requires Operation Clients instead of the Operation Clients on the Operation Server, then four additional Operation Client licenses must be ordered. They must be distributed on the primary and the secondary Operation Servers:
2 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC
2 x **EUSLRCCZZSPEZZ** SW PE REDUNDANT CTRL CLIENT LIC

2 x **EUSLCCCZZSPEZZ** must be installed on Workstation 2 and 2 x EUSLRCCZZSPEZZ must be installed on Workstation 3.

4.1.3 Installation and licensing the virtual machines

As virtual machines are not installed either on operation servers or operation clients, the location of the virtual machines is the same in both cases.

Two virtual machines are required for this configuration:
- x1 on the workstation embedding the Engineering Client
- x1 on the System Server

Minimum two licenses (CAL VDA) are required to enable Windows to be embedded in the virtual machines, which can be extended with two other rights for the system server that will enable 3 concurrent accesses to the virtual machine for runtime navigation services.

4 Process Expert System Configuration: Examples

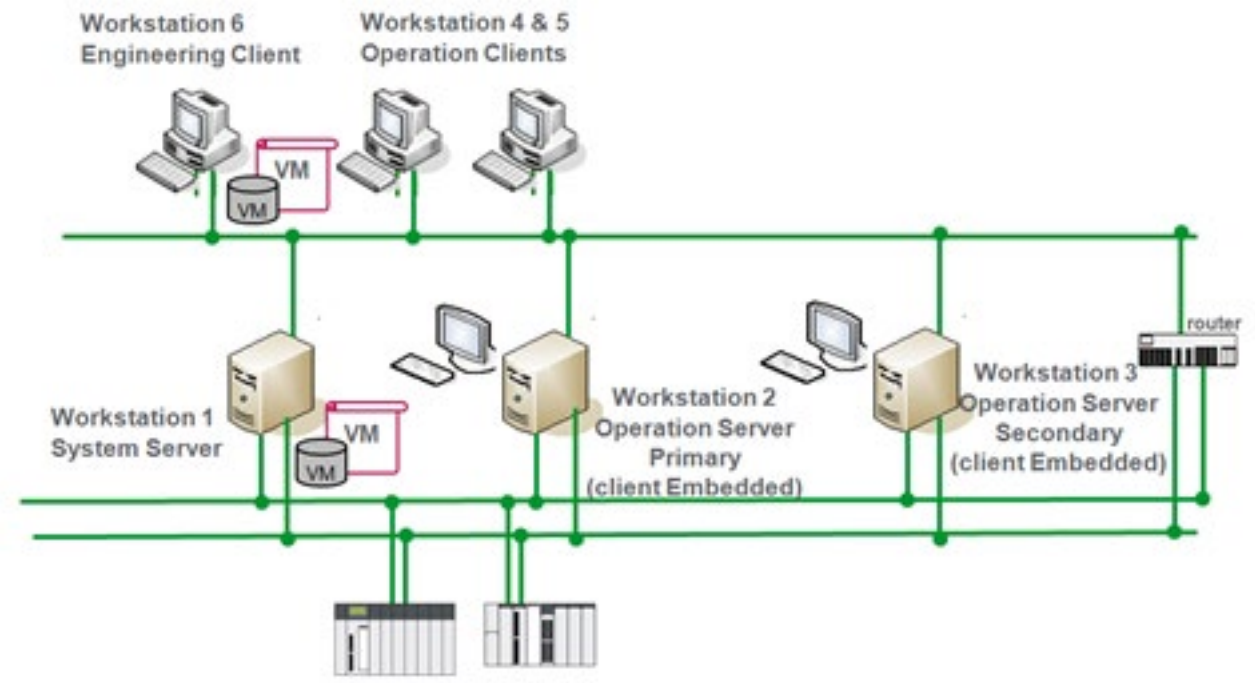


Figure 13: Example 1 - Location of the virtual machines in PES configuration

4.2 Example 2

4.2.1 Configuration without redundancy of Operation Servers

This example is an automation system with

- 1000 object instances
- Two distributed areas with access for two operators only in each area
- Each area requires a local engineering client to maintain the process. One workstation in each area is shared for engineering and operation.
- Monitoring from four locations
- Two workstations set up as Operation Clients to monitor the process
- Two servers to collect process data; with each machine used as an Operation Client
- No supervision redundancy

Five workstations are used in this configuration

- Workstation 1 – dedicated as a PES System Server
- Workstation 2 – dedicated for operations as it embeds Server_1 and one Operation Client
- Workstation 3 – dedicated for operations as it embeds Server_2 and one Operation Client
- Workstation 4 – dedicated as an engineering and operator workstation as it embeds one Engineering Client and one Operation Client
- Workstation 5 – dedicated as an engineering and operator workstation as it embeds one Engineering Client and one Operation Client

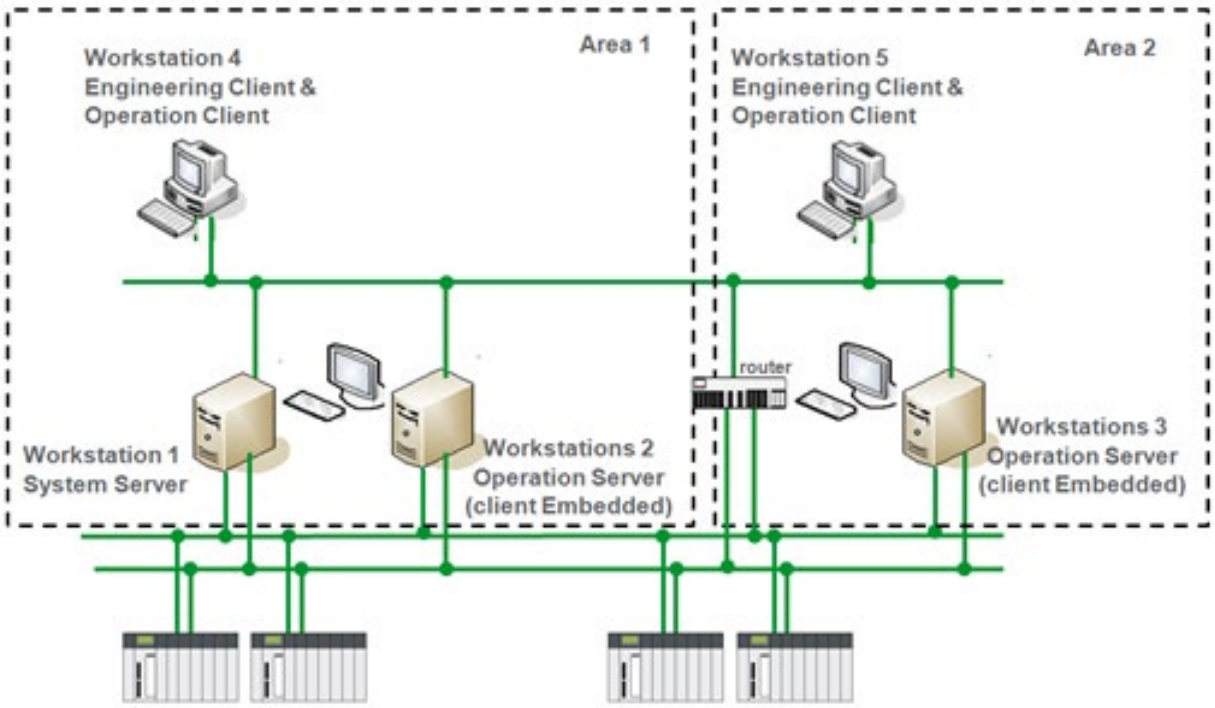


Figure 14: Example 2 - PES configuration without redundancy of Operation Servers

Licenses installed on the workstations

- Workstation 1

1 x **EUSBEUCZZSPEZZ** SW PE ENG SINGLE LIC
1 x **EUSAPPCZSSPEZZ** SW PE APPL LIC SMALL (1250 object instances)
1 x **EUSCLTCZZSPEZZ** SW PE ENG CLIENT SINGLE LIC

- Workstation 2

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (each embeds one client)
1 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 3

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (each embeds one client)
1 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 4

No license installed as the Engineering client get its license from the system server on Workstation 1 and the Operation Client gets its license from the Operation Server on workstation 2

- Workstation 5

No license installed as the Engineering client get its license from the system server on Workstation 1 and the Operation Client gets its license from the Operation Server on workstation 3.

Note: if the configuration requires remote Operation Clients instead of the local Operation Clients on the Operation Servers, two other Operation Client licenses must be ordered and in this case this additional license should be installed on Workstation 2 and Workstation 3.

4 Process Expert System Configuration: Examples

4.2.2 Configuration with redundancy of Operation Servers

This example is an automation system with:

- 1000 object instances
- Two distributed areas with access for two operators only in each area
- Each area requires a local engineering client to maintain the process. One workstation in each area is shared for engineering and operation.
- Monitoring from four locations
- Two workstations set up as Operation Clients to monitor the process
- Redundancy of the supervision
- Two redundant servers to collect process data; each used as an Operation Client

Seven workstations are used in this configuration

- Workstation 1 – dedicated for the PES System Server
- Workstation 2 – dedicated for operations as it embeds Primary Server_1 and one Operation Client
- Workstation 3 – dedicated for operations as it embeds Primary Server_2 and one Operation Client
- Workstation 4 – dedicated for operations as it embeds Secondary Server_1 and one client
- Workstation 5 – dedicated for operations as it embeds Secondary Server_2 and one client
- Workstation 6 – dedicated as engineering and an operator workstation as it embeds one Engineering Client and one Operation Client
- Workstation 7 – dedicated as engineering and an operator workstation as it embeds one Engineering Client and one Operation Client

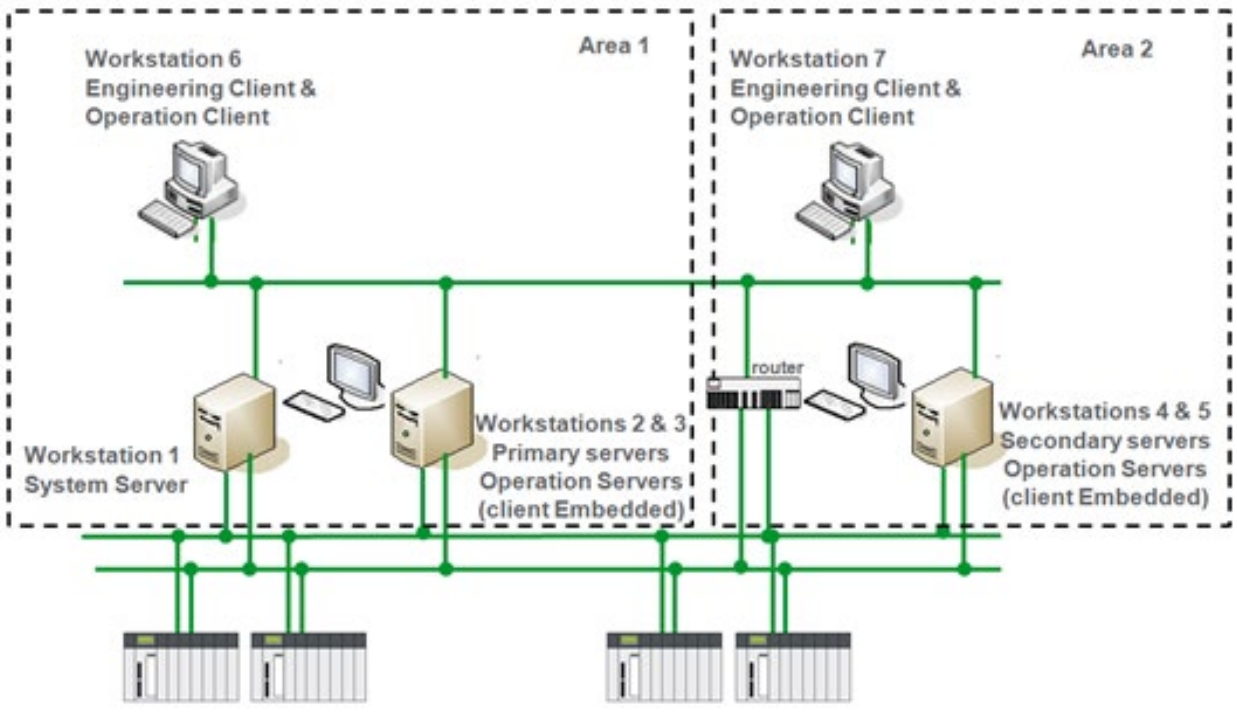


Figure 15: Example 2 - PES configuration with redundancy of Operation Servers

Licenses installed on the workstations

- Workstation 1

1 x **EUSBEUCZZSPEZZ** SW PE ENG SINGLE LIC
1 x **EUSAPPCZSSPEZZ** SW PE APPL LIC SMALL (1250 object instances)
1x **EUSCLTCZZSPEZZ** SW PE ENG CLIENT SINGLE LIC

- Workstation 2

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (primary server_1 with client)
1 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 3

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (primary server_2 with client)
1 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 4

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (secondary server_1 with client)
1 x **EUSLRCCZZSPEZZ** SW PE REDUNDANT CTRL CLIENT LIC

- Workstation 5

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (secondary server_2 with client)
1 x **EUSLRCCZZSPEZZ** SW PE REDUNDANT CTRL CLIENT LIC

- Workstation 6

No license installed as the Engineering client get its license from the system server on Workstation 1 and the Operation Client gets its license from the Operation Servers on workstations 2 or 4.

- Workstation 7

No license installed as the Engineering client get its license from the system server on Workstation 1 and the Operation Client gets its license from the Operation Servers on workstations 3 or 5.

Note: if the configuration requires remote Operation Clients instead of the local Operation Clients on the Operation servers, then four additional Operation Client licenses must be ordered. They must be installed on the primary servers on Workstations 2 & 3 and the redundant licenses on Workstations 4 & 5.

2 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC
2 x **EUSLRCCZZSPEZZ** SW PE REDUNDANT CTRL CLIENT LIC

4.2.3 Installation and licensing the virtual machines

As virtual machines are not installed either on Operation Servers or on Operation Clients, the location of the virtual machines is the same in both cases.

Three virtual machines are required for this configuration:

- x2 on the workstation embedding an Engineering Client+ an Operation Client
- x1 on the System Server

Minimum three licenses (CAL VDA) are required to enable Windows to be embedded in the virtual machines, which can be extended with another right for the System Server to enable up to open 4 concurrent access to the virtual machine (When an Operation Client is installed with an Engineering client, the local VM is used for the runtime navigation services).

4 Process Expert System Configuration: Examples

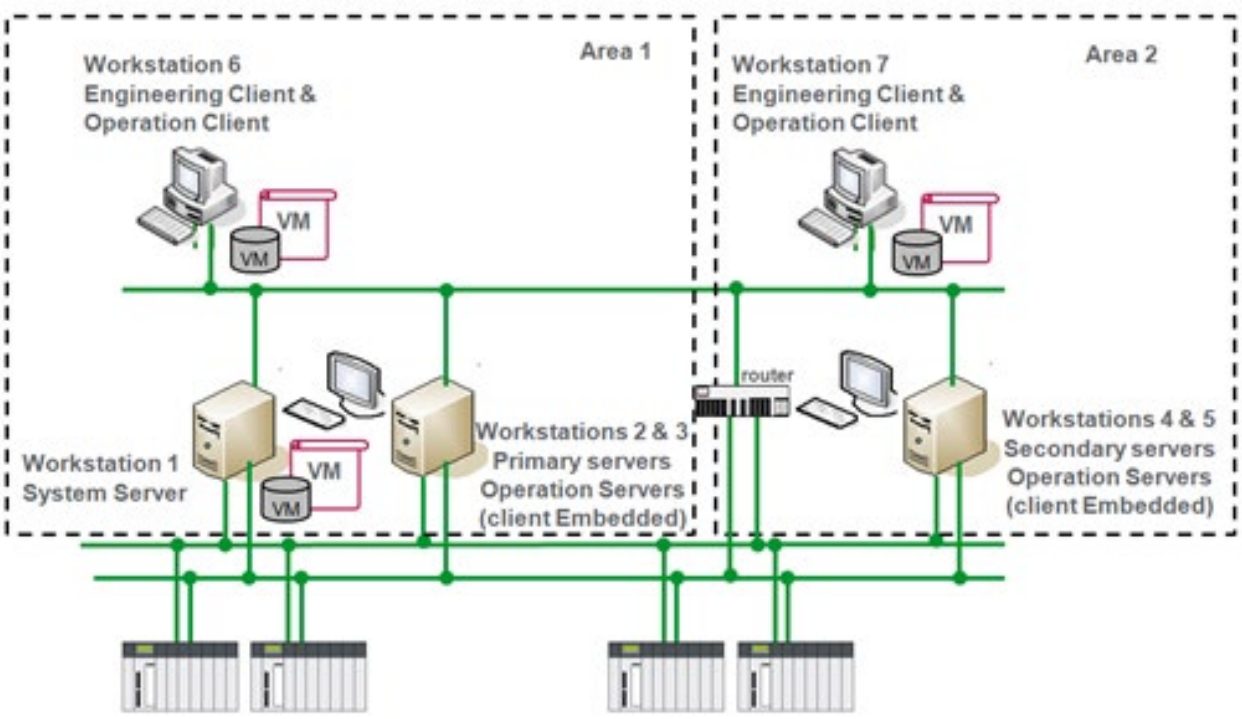


Figure 16: Example 2 - Location of the virtual machines in PES configuration

4.3 Example 3

4.3.1 Large configuration with many servers and clients

This example is an automation system distributed in 3 areas with

- 4000 object instances
- Maintenance of the automation system is possible from the 3 areas. To optimize the number of workstations, two Engineering clients are grouped with two Operation Clients and the last one is located on the system server.
- Monitoring of the process from 11 workstations distributed in the 3 areas
- Five workstations set up as Operation Clients to monitor the process in the control room; two of them are also embedded with an Engineering client.
- Two additional workstations which are remote and used as Web Clients, with View Only features
- Four servers to collect process data; with each machine used as an Operation Client
- No redundancy of the Operation Servers

Twelve workstations are used in this configuration

- Workstation 1 – dedicated as the PES System Server and Engineering client and will be used for maintenance of the automation system
- Workstation 2 – dedicated for operations as it is embedded with Server_1 and one client
- Workstation 3 – dedicated for operations as it is embedded with Server_2 and one client
- Workstation 4 – dedicated for operations as it is embedded with Server_3 and one client
- Workstation 5 – dedicated for operations as it is embedded with Server_4 and one client
- Workstation 6 – dedicated as an operator workstation in area 1 as it is embedded with one Operation Client
- Workstation 7 – dedicated as an operator workstation in area 1 as it is embedded with one Operation Client
- Workstation 8 – dedicated as an operator workstation in area 2 as it is embedded with one Operation Client
- Workstation 9 – dedicated as an engineering and operator workstation in area 2 as it is embedded with one Engineering Client and one Operation Client
- Workstation 10 – dedicated as an engineering and operator workstation in area 3 as it is embedded with one Engineering Client and one Operation Client
- Workstation 11 – dedicated as a remote operator workstation as it is embedded with one Operation Client (View Only)
- Workstation 12 – dedicated as a remote operator workstation as it is embedded with one Operation Client (View Only)

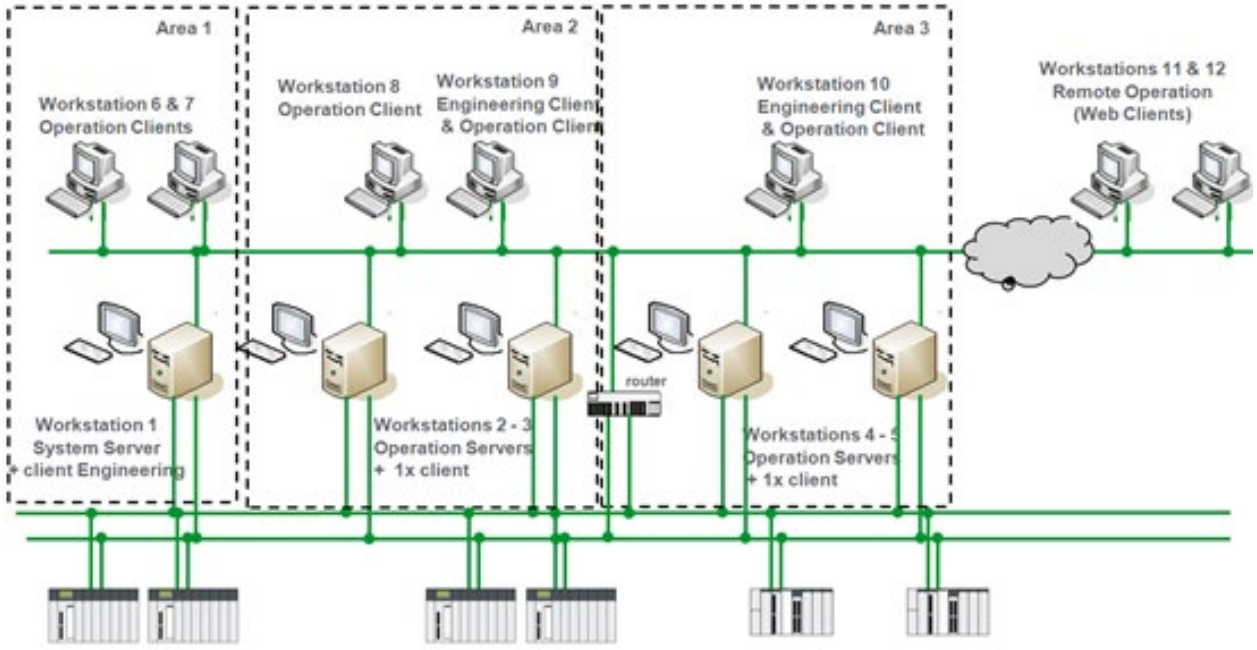


Figure 17: Example 3 - PES large configuration with many servers and clients

4 Process Expert System Configuration: Examples

Licenses installed on the workstations

- Workstation 1

1 x **EUSBEUCZZSPEZZ** SW PE ENG SINGLE LIC
1 x **EUSAPPCZLSPEZZ** SW PE APPL LIC LARGE (7500 object instances)
2 x **EUSCLTCZZSPEZZ** SW PE ENG CLIENT SINGLE LIC

- Workstation 2

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (embeds one client)
2 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 3

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (embeds one client)
1 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 4

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (embeds one client)
1 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 5

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (embeds one client)
1 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 6

No license installed; the Operation Client gets its license from the Operation Server on workstation 2

- Workstation 7

No license installed; the Operation Client gets its license from the Operation Server on workstation 2

- Workstation 8

No license installed; the Operation Client gets its license from the Operation Server on workstation 3

- Workstation 9

No license installed; the Engineering client get its license from the system server on Workstation 1 and the Operation Client gets its license from the Operation Server on workstation 4

- Workstation 10

No license installed; the Engineering client get its license from the system server on Workstation 1 and the Operation Client gets its license from the Operation Server on workstation 5

- Workstation 11

1 x **EUSVCCCZZSPEZZ** SW PE VIEW CLIENT LIC

- Workstation 12

1 x **EUSVCCCZZSPEZZ** SW PE VIEW CLIENT LIC

4.3.2 Installation and licensing the virtual machines

Three virtual machines are required for this configuration:

- x1 on the system server, to be used from the local engineering Client
- x2 on the workstation embedding an Engineering Client + an Operation Client

Minimum three licenses (CAL VDA) are required to enable Windows to be embedded in the virtual machines, which can be extended with five other rights for the System Server to enable up to open 4 concurrent access to the virtual machine (when an Operation client is installed with an Engineering client, the local VM is used for the runtime navigation services).

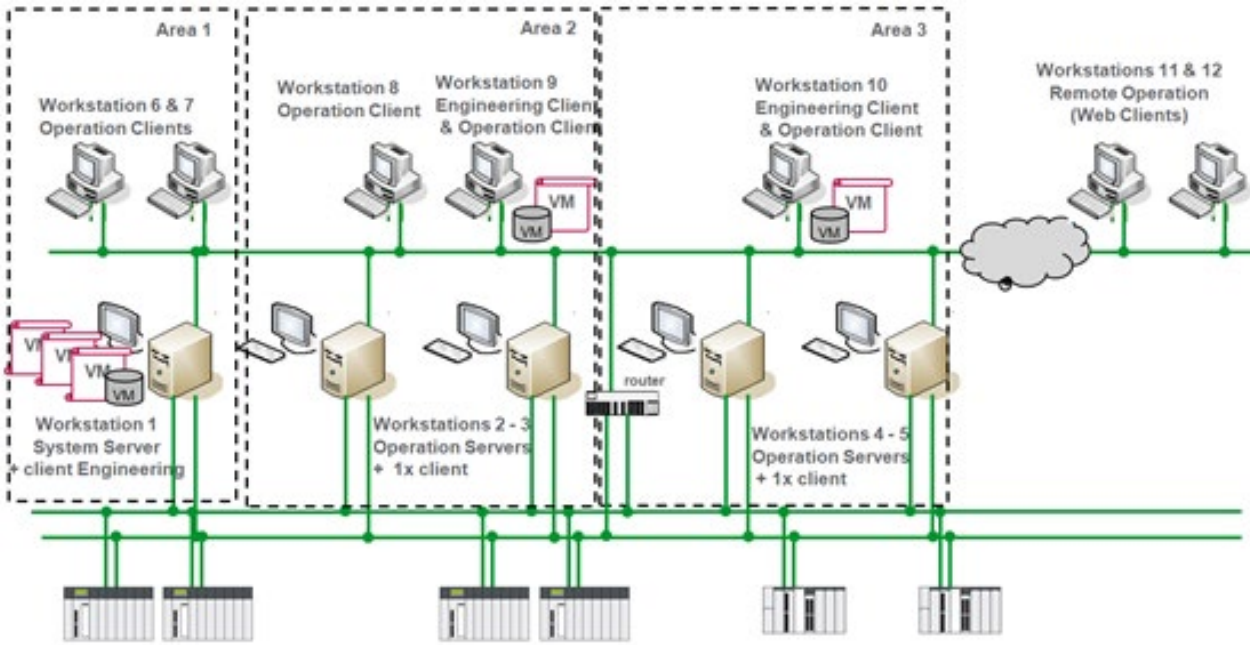


Figure 18: Example 3 - Location of the virtual machines in PES configuration

4.4 Example 4

4.4.1 Extension of an existing application

In this example a PES configuration has already been deployed on site. The parameters of this example automation system are:

- 1000 object instances
- One area with access for two operators only in this area
- The area requires a local engineering client to maintain the process. One workstation is shared for engineering and operation
- One workstation installed as an Operation Server to collect process data; and also used as an Operation Client

The following list of licenses has been deployed on site

- Workstation 1

1 x **EUSBEUCZZSPEZZ** SW PE ENG SINGLE LIC
1 x **EUSAPPCZSSPEZZ** SW PE APPL LIC SMALL (1250 object instances)
1 x **EUSCLTCZZSPEZZ** SW PE ENG CLIENT SINGLE LIC

- Workstation 2

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (embeds one client)
1 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 3

No license installed; the Engineering Client get its license from the system server on Workstation 1 and the Operation Client gets its license from the Operation Server on workstation 2

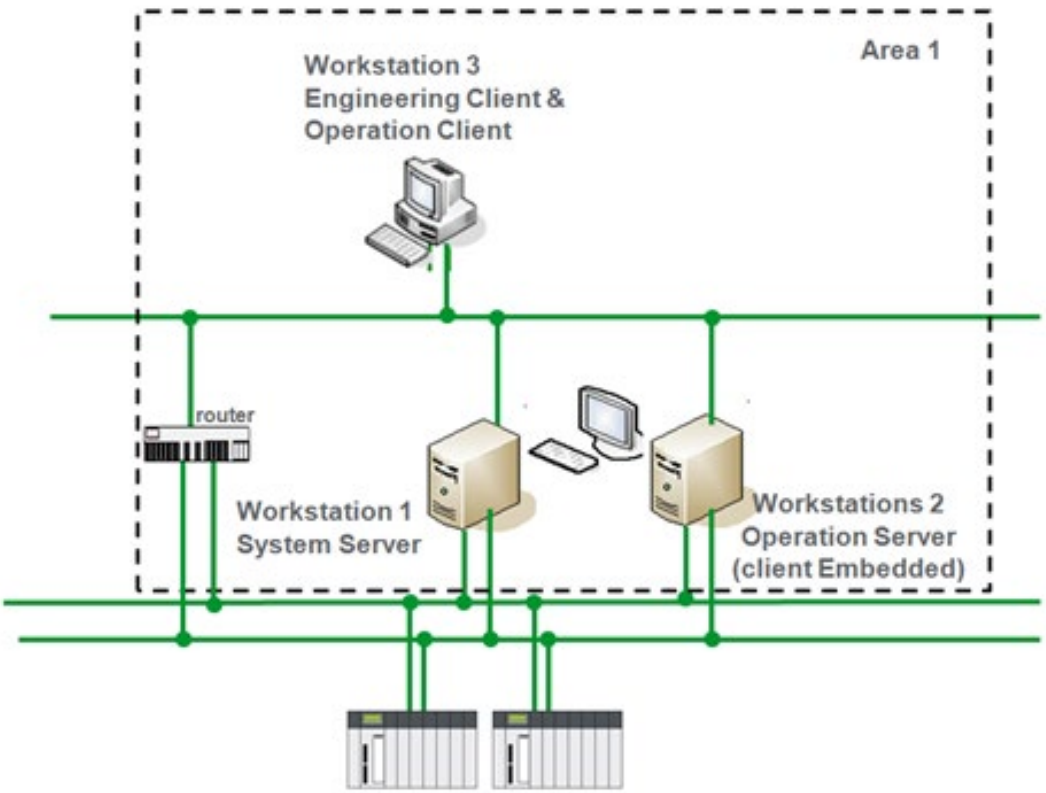


Figure 19: Example 4 - PES before extension

The Plant Manager now needs to extend the automation system into another area, which leads to the addition of many object instances and also an Operation Client in the control room to control this new area. In addition, it must be possible to maintain the automation system through an engineering client from this area. The number of object instances is now 1500.

To achieve this upgrade there are three additional licenses needed:
1 x **EUSAPPGZESPEZZ** SW PE UPG S TO M APP LIC (to upgrade from 1250 to 3000 object instances)
1 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC
1 x **EUSCLTCZZSPEZZ** SW PE ENG CLIENT SINGLE LIC

Note: Upgrading the application license will mean this example now has the equivalent of the Medium Application license. To enable this upgrade the user has to return the Small Application license and upgrade it to the Medium Application license using the Software Licensing Web Portal.

These licenses are deployed on site as follows

- Workstation 1

1 x **EUSBEUCZZSPEZZ** SW PE ENG SINGLE LIC
1 x **EUSAPPCZSMPEZZ** SW PE APPL LIC MEDIUM (3000 object instances)
1 x **EUSCLTCZZSPEZZ** SW PE ENG CLIENT SINGLE LIC

- Workstation 2

1 x **EUSOPECZZSPEZZ** SW PE OPER SERVER LIC (embeds one client)
2 x **EUSLCCCZZSPEZZ** SW PE CTRL CLIENT LIC

- Workstation 3

No license installed; the Engineering Client get its license from the system server on Workstation 1 and the Operation Client gets its license from the Operation Server on workstation 2

- Workstation 4

No license installed; the Engineering Client get its license from the system server on Workstation 1 and the Operation Client gets its license from the Operation Server on workstation 2

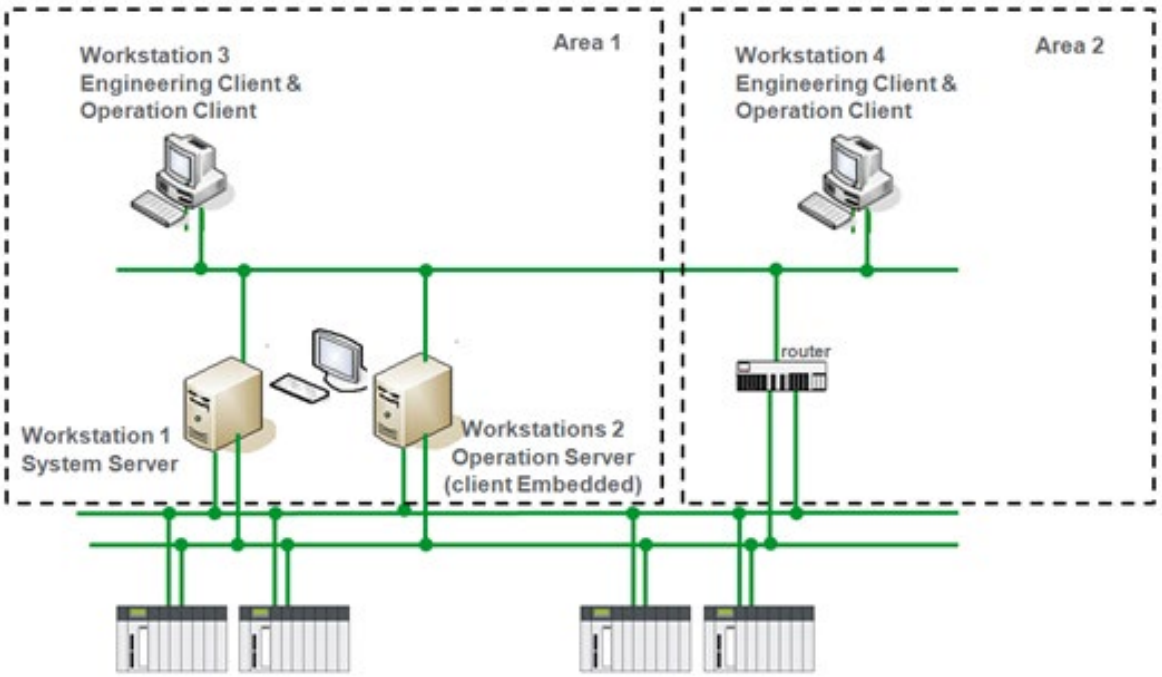


Figure 20: Example 4 - PES after extension

4.4.2 Installation and licensing the virtual machines

Before the extension, two virtual machines were required for this configuration:

- x1 on the System Server, to be used from the local Engineering Client
- x1 on the workstation 3 embedding an Engineering Client+ an Operation Client

Two licenses (CAL VDA) are required to enable Windows to be embedded in the virtual machines.

After the extension, three virtual machines are required for this configuration. To be added:

- x1 on the workstation 4 embedding the additional Engineering Client + an Operation Client

Three licenses (CAL VDA) in total are required to enable Windows to be embedded in the virtual machines.

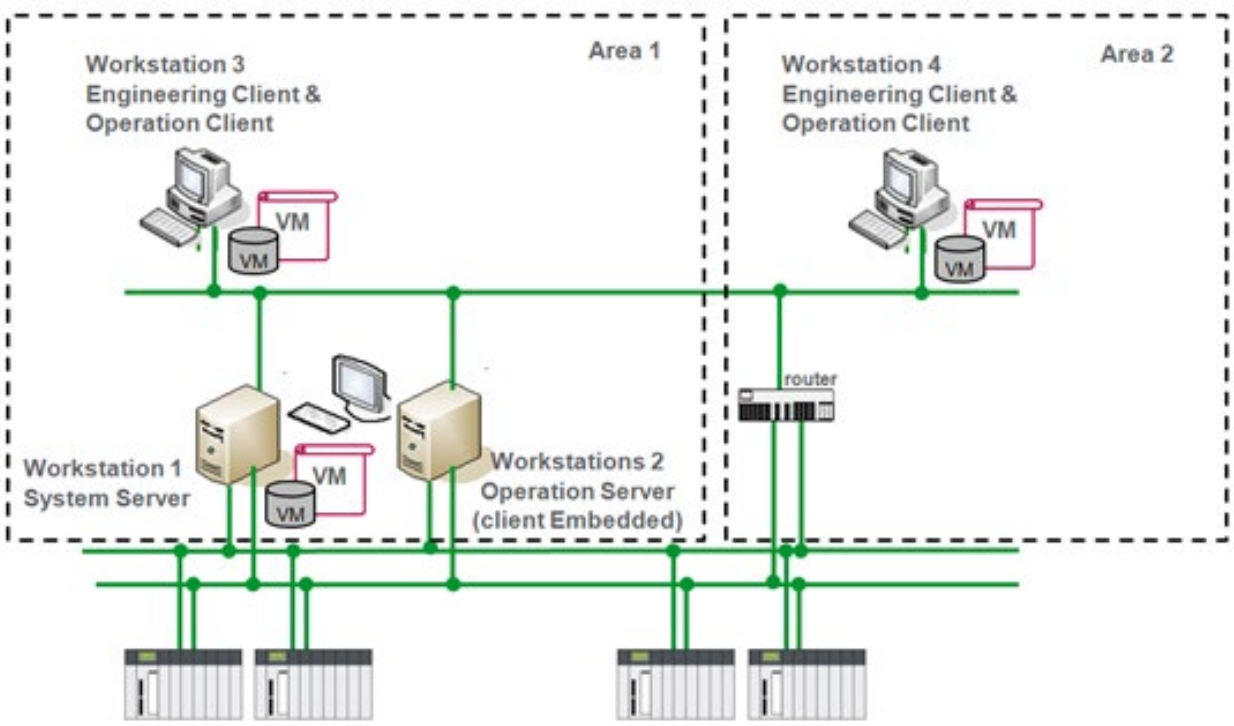


Figure 21: Example 4 - Location of the virtual machines in PES configuration

5.1 Overview

PES version V4.3 requires an update of the licenses that are installed on site to run this new version. Two possibilities are offered to get the license updates:
1. The Customer has contracted a service, which includes software update (Gold or Gold Plus service). In that case, he can update the licenses that are attached to this service contract without additional fee. He can proceed through the license generator that is hosted in the PES Support Web portal. Refer to the corresponding chapter for details about the service offer.

2. The Customer has not contracted a service that includes updates (Silver service), or he didn't contract any service. A set of part numbers enables him to update each license installed on site. All licenses must be updated on a PES configuration.

5.2 How to select the update part numbers?

The table below gives the correspondence between the part for licenses and the part for the updates:

License V4.2	Update to V4.3 to be ordered
EUSMINCZTSPEZZ	EUSMINDZTSPEZZ
EUSMINCZTSPEZZ + EUSMINGZASPEZZ	EUSMINDZSSPEZZ
EUSBEUCZZSPEZZ	EUSBEUDZZSPEZZ
EUSCLTCZZSPEZZ	EUSCLTDZZSPEZZ
EUSCLTCZZGPEZZ	EUSCLTDZZGPEZZ
EUSCLTCZZTPEZZ	EUSCLTDZZTPEZZ
EUSAPPCZTSPEZZ	EUSAPPDZTSPEZZ
EUSAPPCZSSPEZZ	EUSAPPDZSSPEZZ
EUSAPPCZMSPEZZ	EUSAPPDZMSPEZZ
EUSAPPCZLSPEZZ	EUSAPPDZLSPEZZ
EUSAPPCZXSPEZZ	EUSAPPDZXSPEZZ
EUSOPECZZSPEZZ	EUSOPEDZZSPEZZ
EUSLCCCZZSPEZZ	EUSLCCDZZSPEZZ
EUSLRCCZZSPEZZ	EUSLRCDZZSPEZZ
EUSVCCCZZSPEZZ	EUSVCCDZZSPEZZ
EUSVRCCZZSPEZZ	EUSVRCDZZSPEZZ
EUSSISCZZSPEZZ	EUSSISDZZSPEZZ
EUSSISCZZGPEZZ	EUSSISDZZGPEZZ
EUSSISCZZTPEZZ	EUSSISDZZTPEZZ

In the specific case of ordering an update or an upgrade, it is necessary to provide the activation ID of the license that needs to be updated. With this information, a new code will be sent that will enable the user to update the existing license:
Step 1: the customer provides the activation ID of the license he wants to update. The license activation ID must be filled-in when placing the order.
Step 2: A new activation ID is sent to the customer (email) when the order is processed.
Step3: through the license manager installed on the computer, the customer opens the update menu. He will be asked to enter the activation ID he received by email. The licensing system updates the original license for V4.3.

Update orders cannot be grouped and must be managed as individual orders. It is imperative to not mix activation IDs in the same order.

Note: this ordering process is used also to order upgrade licenses. Ordering updates and upgrades follows the same workflow as new licenses. Refer to the chapter "Ordering PES".

6 List of References

6.1 List of References

Process Expert System MINI	
EUSMINZTSPEZZ	SW PE MINI CONF WITH 200 OBJ INST LIC
EUSMINGZASPEZZ	SW PE UPG MINI TO 500 OBJ INST LIC
Process Expert System for End Users	
EUSBEUCZZSPEZZ	SW PE ENG SINGLE LIC
EUSCLTCZZSPEZZ	SW PE ENG CLIENT SINGLE LIC
EUSCLTCZZGPEZZ	SW PE ENG CLIENT GROUP LIC
EUSCLTCZZTPEZZ	SW PE ENG CLIENT TEAM LIC
EUSAPPCZTSPEZZ	SW PE APPL LIC EXTRA SMALL
EUSAPPCZSSPEZZ	SW PE APPL LIC SMALL
EUSAPPCZMSPEZZ	SW PE APPL LIC MEDIUM
EUS APPCZLSPEZZ	SW PE APPL LIC LARGE
EUSAPPCZXSPEZZ	SW PE APPL LIC EXTRA LARGE
EUSOPECZZSPEZZ	SW PE OPER SERVER LIC
EUSLCCCZZSPEZZ	SW PE CTRL CLIENT LIC
EUSVCCCZZSPEZZ	SW PE VIEW CLIENT LIC
EUSLRCCZZSPEZZ	SW PE REDUNDANT CTRL CLIENT LIC
EUSVRCCZZSPEZZ	SW PE REDUNDANT VIEW CLIENT LIC
EUSAPPGZASPEZZ	SW PE UPG XS TO S APP LIC
EUSAPPGZESPEZZ	SW PE UPG S TO M APP LIC
EUSAPPGZHSPEZZ	SW PE UPG M TO L APP LIC
EUSAPPGZKSPEZZ	SW PE UPG L TO XL APP LIC
Upgrading a license leads to a delivery for the same version as the original one.	
Process Expert System Engineering for ASC	
EUSBASCZZSPEZZ	SW PE ENG ASC SINGLE LIC
EUSBASCZZGPEZZ	SW PE ENG ASC GROUP LIC
EUSBASCZZTPEZZ	SW PE ENG ASC TEAM LIC
Process Expert System Engineering for System Integrators	
EUSSISCZZSPEZZ	SW PE ENG SYS INT SINGLE LIC (1 user)
EUSSISCZZGPEZZ	SW PE ENG SYS INT GROUP LIC (3 users)
EUSSISCZZTPEZZ	SW PE ENG SYS INT TEAM LIC (10 users)

Process Expert System Engineering for Alliance Partners	
(as an option for SIs who joined the Schneider Electric Alliance Partner Program)	
EUSBALCZZGXEZZ	SW PE ENG ALL GROUP LIC
Process Expert System for Educational entities	
EUSBASEZMSPEZZ	SW PE EDUC ENG SINGLE LIC
Process Expert System for demonstration (Sales)	
EUSSSVZZSPEZZ	SW PE SALES LICENSE
License updates from former version to V4.3	
EUSMINDZTSPEZZ	UPDATE SW PE MINI 200 OBJ LIC
EUSMINDZSSPEZZ	UPDATE SW PE MINI 500 OBJ LIC
EUSBEUDZZSPEZZ	UPDATE SW PE ENG SINGLE LIC
EUSCLTDZZSPEZZ	UPDATE SW PE ENG CLIENT SINGLE LIC
EUSCLTDZZGPEZZ	UPDATE SW PE ENG CLIENT GROUP LIC
EUSCLTDZZTPEZZ	UPDATE SW PE ENG CLIENT TEAM LIC
EUSAPPDZTSPEZZ	UPDATE SW PE APPL LIC EXTRA SMALL
EUSAPPDZSSPEZZ	UPDATE SW PE APPL LIC SMALL
EUSAPPDZMSPEZZ	UPDATE SW PE APPL LIC MEDIUM
EUSAPPDZLSPEZZ	UPDATE SW PE APPL LIC LARGE
EUSAPPDZXSPEZZ	UPDATE SW PE APPL LIC EXTRA LARGE
EUSOPEDZZSPEZZ	UPDATE SW PE OPER SERVER LIC
EUSLCCDZZSPEZZ	UPDATE SW PE CTRL CLIENT LIC
EUSLRCDZZSPEZZ	UPDATE SW PE REDUNDANT CTRL CLIENT LIC
EUSVCCDZZSPEZZ	UPDATE SW PE VIEW CLIENT LIC
EUSVRCDZZSPEZZ	UPDATE SW PE REDUNDANT VIEW CLIENT LIC
EUSSISDZZSPEZZ	UPDATE SW PE ENG SYS INT SINGLE LIC
EUSSISDZZGPEZZ	UPDATE SW PE ENG SYS INT GROUP LIC
EUSSISDZZTPEZZ	UPDATE SW PE ENG SYS INT TEAM LIC

The software is downloadable from the Schneider Electric portal (no hardware media supplied).
Registration is required to access to the website (**www.pes.schneider-electric.com**).

7 Process Expert System Libraries

7.1 Introduction

Process Expert System provides resources:

- That have been pre-configured and tested by Schneider Electric.
- That were specifically designed for automating a large variety of processes.

The control resources for the Control and monitoring resources for Operator Interface provide the commonly required functions to facilitate the development of the DCS application.

StruxureWare PE includes global templates organized through the Foundation and General Purpose libraries. Optional libraries to address specific needs in markets and applications can be installed as options on top of StruxureWare PE.

Figure 22 shows an overview of the General Purpose and optional libraries available with PES V4.3:

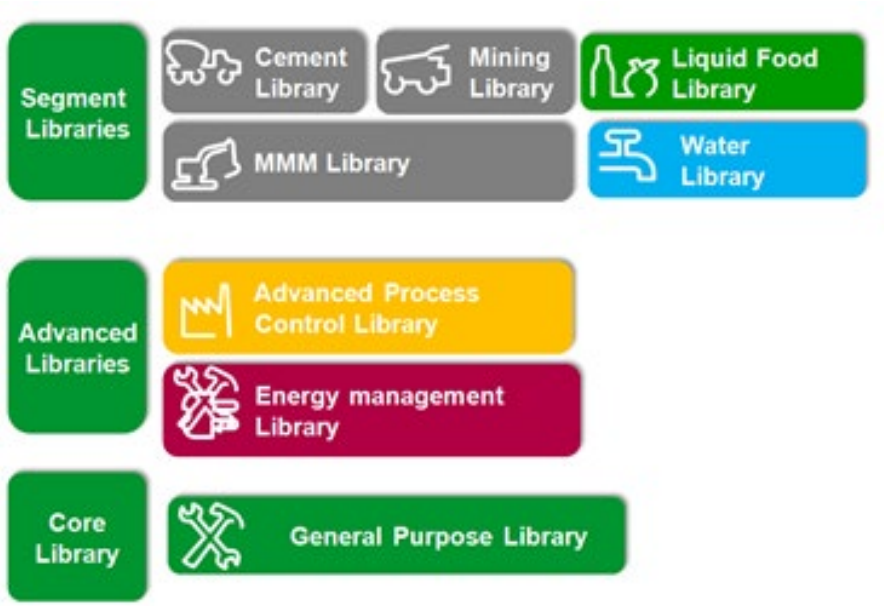


Figure 22: PES General Purpose and Market/Application Libraries

The system provides Control function blocks (DFB) at the control level, and dynamic representations (Genies) at the supervision level. In addition, ready to-use faceplates (implemented through windows with Super Genies syntax) enable the users to get the status and interact with the process at the monitoring level.

To automate and simplify the implementation of automation systems, project designers can use these resources together for massive code generation and for the synchronization of control and supervision.

7.2 Global templates libraries

Global templates include two libraries:

- Foundation library, which includes elementary object templates. Generally, these templates are not used as single templates, but combined with others as composites with more value-added features. This library is required to design home-made templates.
- General Purpose library (GPL), which embeds composite templates corresponding to a process feature, as a control module. Automation systems are designed with object templates from the GPL, and objects may also be used from the optional libraries and home-made templates

The General Purpose Library is organized in categories according to their purpose.

7.2.1 Four main categories of templates

1. Process templates
- Signal conditioning and processing
- On/off device control
- Analog device control
- Process control
- Sequential control
- Auxiliary functions

2. Devices
- Circuit breakers
- Digital protective relays
- Motor control and starters
- Power monitoring devices
- Progressive starters
- Variable speed drives

3. Communication
- Ethernet Modbus TCP
- Modbus serial

4. Diagnostics
- Modicon M340 CPU
- Modicon Quantum CPU
- Modicon M580 CPU

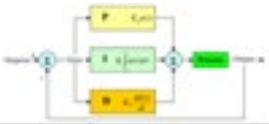
Figure 23 gives an overview of these object templates. Most of them embed graphical representations as there could be many representations of the same object that can be used in the Operator Interface. Some examples are given as follows.

Signal processing / calculation

	Function family	Sub- Function	Template	Graphical representation
	Signal processing	Digital input acquisition	$DigitalInput	
		Digital output signal	$DigitalOutput	
		Digital calculation	$DigitalCalc	
		Analog input calculation	$AnalogInput	
		Analog input calculation with conversion	$AnalogInput1	
		Multiple Analog Input Acquisition	$MAnalogInput1	
		Analog output signal	$AnalogOutput	
	Analog calculation	Derivative rate of change, totalizing, average, minimum, maximum	$AnalogCalc	
		Analog Signal Linearization	$AnalogLinear	

Figure 23: GPL Library: signal processing / calculation

Process control



Function family	Sub- Function	Template	Graphical representation
Controllers	**Internal Model Controller (IMC)**	$IMC	
	PID Controller (to condition the signals associated with the control of a PID with optional Feed forward)	$PID	
	PID closed loop circuit (to condition the signals associated with the control of a PID with optional Feed forward. It also include analog input and output management)	$PIDLoop	
	Ratio Controller (to condition the signals associated with the control of a Ratio Controller)	$RatioCtl	
	Split Range Controller (to condition a PID signal into split range signal)	$SplitRange	
	Pulse with Modulation Controller (to condition an analog signal into modulated pulses)	$PMWController	
	Step3 Controller (to condition the signals associated with the control of a step 3 controller)	$Step3Ctl	
	Lead Lag calculation	$LeadLag	
Sequential control	**Advanced Sequence control** (Monitor and manage a control sequence)	$SequenceDFB	

Figure 24: GPL Library: process control

Device control management / PLC Diag

	Function family	Sub- Function	Template	Graphical representation
	On/Off device control; Valve	Hand Valve management	$HandValve	
		Mvalve: Motorized valve	$MValve	
		On/Off Valve	$Valve	
		On/Off Valve with 2 outputs	$Valve2	
	On/Off device control; Motor	On-Off motor 1 speed, 1 rotation direction	$Motor	
		On-Off motor 2 speed, 2 rotation direction	$Motor2	
	Analog devices Control; Valve	Control valve with optional position feedback (analog position and/or limit switches)	$ControlValve	
		Motorized valve, or a gate with analog position feedback and 2 rotational direction	$MValveWithPos	
	Analog devices Control; Motor	Motor management with Variable Speed Drive	$MotorVS	
	Diagnostic	M340 PLC Diagnostic	$M340Diag	
		Quantum PLC Diagnostic	$QuantumDiag	

Figure 25: GPL Library: device control management / controller diagnostics

	Family of devices	Device name	Ethernet	Modbus Serial	Advantys local bus (CANopen)	Profibus DP
	Progressive starters	ATS22, ATS48		☑		
	Variable speed drives	ATV12 , ATV312, ATV212		☑		
		ATV31		☑	☑	
		ATV32	☑			
		ATV61, ATV71	☑	☑	☑	☑
	Process variable speed drives for demanding applications	ATV6xx (fluids management)	☑			
		ATV9xx (Mechanical movements)	☑			
	Motor controllers and starters	TesysU,		☑	☑	
		TesysT	☑	☑	☑	☑
Others						
	Generic devices		☑			☑

Figure 26: GPL Library: automation and generic devices

7 Process Expert System Libraries

	Family of devices	Device name	Ethernet	Modbus Serial
	Digital protective relays	Sepam20C, Sepam40		☑
		Sepam80	☑	☑
	Circuit breakers	Compact NSX, Masterpact, MasterpactC	☑	☑
	Power monitoring devices	PM9, PM710, PM1200, PM5350		☑
		PM800	☑	☑
		PM53xx	☑	
		PM82xx	☑	
	Harmonic filter and power compensation	Accusine	☑	
	Uniterruptible power supply	SmartUPS		☑
Others				
	Safety module	XPSMC		☑

Figure 27: GPL Library: power and misc. devices

7.2.2 Configuration to edit and create instances of templates

Even if it is recommended to minimize the development time to use pre-defined template, any configuration of PES for engineering enables the design of templates. This design can be done from scratch, or following a copy of an existing template of the GPL library and its customization to fulfill the project requirements. Refer to the paragraph “Engineering” to discover the software licenses enabling the engineering.

7.3 Advanced Process Control Library

7.3.1 Presentation

Advanced Process Control Library consists of 18 functions blocks for monitoring and controlling complex processes in the plant.

The APC Library for the PES offer includes:

- APC Standard Library
- PCR Library
- IMC Library

The APC Standard Library includes the following functions:

PID Block - Standard PID function with the ability manage the complete loop from a single place. Data from transmitter and positioner (value, status and mode) are seamless in the loop and used for calculations. Upstream object information transfers to the downstream objects.

Enhanced PID Block - This is an enhanced and completed PID block with feed forward gain for disturbance compensation and override function by copying the actuator current status (RCPY). Auto tuning functionality is embedded in this block.

Analog Acquisition Block - Analog input with signal filtering, square root extraction and process analyst.

Analog Positioner Block - Analog output with ability to loop back the output data (value, status and mode) with upstream object to downstream objects information transfer feature.

De-multiplexer Block - Auxiliary block; transfers single control output to 4 positioners. Upstream object to downstream objects information transfer feature.

Choice Block - Auxiliary block; select 1 of 4 input signals by PLC logic and manual. Selection is bump-less. Priority management is also possible.

Set Point Block - Auxiliary block, used to create a filtered set point with upstream object to downstream objects information transfer feature.

Ratio Block - Auxiliary block; ratio control function with filtering, tracking mode and alarm detection. Generally used in cascade mode, it supports a loop back from the connected actuators. Error mode or manual mode operation of actuators is used in ratio control & PID calculations to prevent saturation.

Split Block - Auxiliary block; split range function with transforms an analog input value into 2 analog outputs using the coordinate values, and checks for threshold overruns. The values and status of the downstream actuators are used to initialize the loop and to prevent integral saturation.

Selection Block - Auxiliary block; this block is used to select one of 3 transmitter signals based on logical decisions, where status of the analog output is looped back and manages different modes. It checks for threshold overruns.

Vote Block - Auxiliary block; this object is used to calculate a mean value of 3 process variables. A deviation alarm occurs if the deviation between 1 input and the 2 others is greater than the set limit.

Wrapper Block – Auxiliary block; this block is used for using/linking the analog actuators of other libraries(e.g. General Purpose Library, Water Library etc.) with APC library blocks without losing the APC library's key feature of upstream object status transfer to the downstream object (i.e. back-in / back-out feature).

The model based predictive control library includes the following functions:

AP_PSF1 Block - Predictive controller for 1st order simple process. (Model: Km,Tm & Dm) : simple, and convenient for long time delays.

AP_PIF1 Block - Predictive controller for 1st order integrative process.

AP_PZTR Block - Zone control with non-linear time response. This block is used for automatically changing the closed-loop time-response when the process variable (PV) is inside or outside a zone.

The internal model based control library includes the following functions:

AP_MSF1 Block - Internal model based controller for 1st order simple processes. It identifies a first order system with pure delay (the transfer function of the process and the transfer function of closed loop (controller + process)). The controller AP_MSF1 allows a static gain unit and acceleration of the time constant by a factor 'n', where n is the gain speed.

AP_MIF1 Block - Internal model based controller for 1st order integrative process.

AP_MRAMP Block - An intelligent ramp management block. It is used with IMC controllers and allows both the AP_MSF1 block and APMIF1 block to follow a parallel path to ramp the setpoint and to join and follow it precisely. Tracking a reference trajectory, and in particular a setpoint ramp is necessary in many applications.

7 Process Expert System Libraries

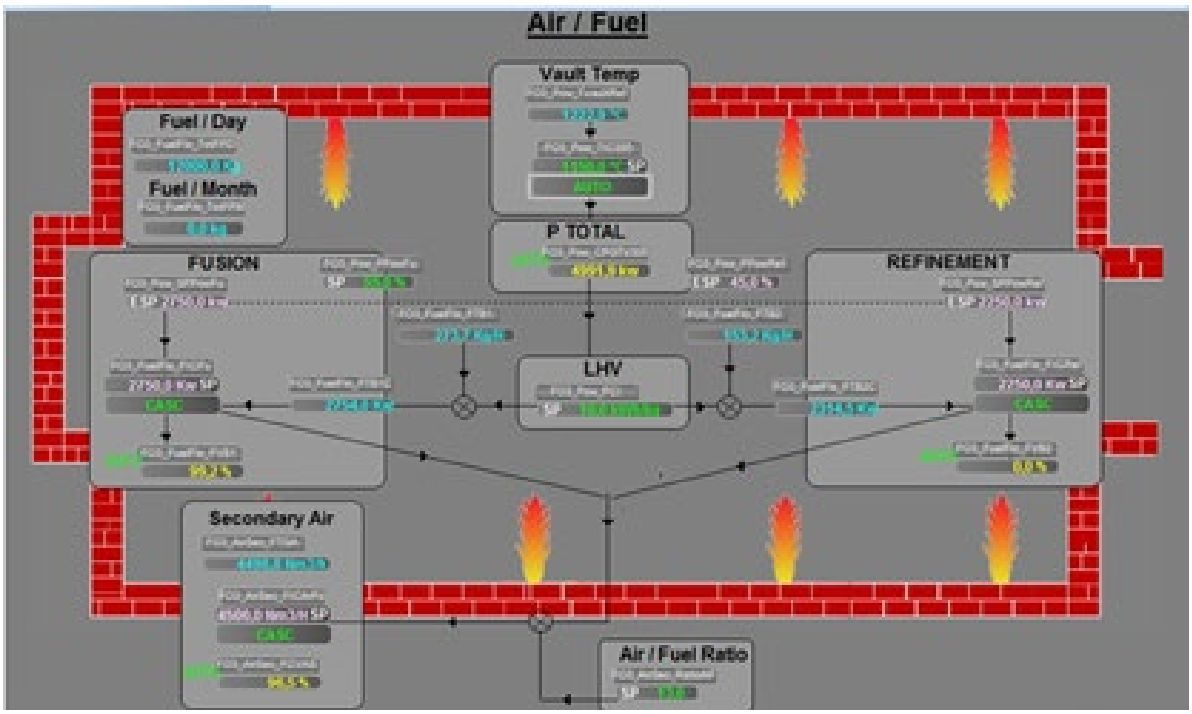


Figure 28: APC Library: example of use in a glass furnace

7.3.2 Reference

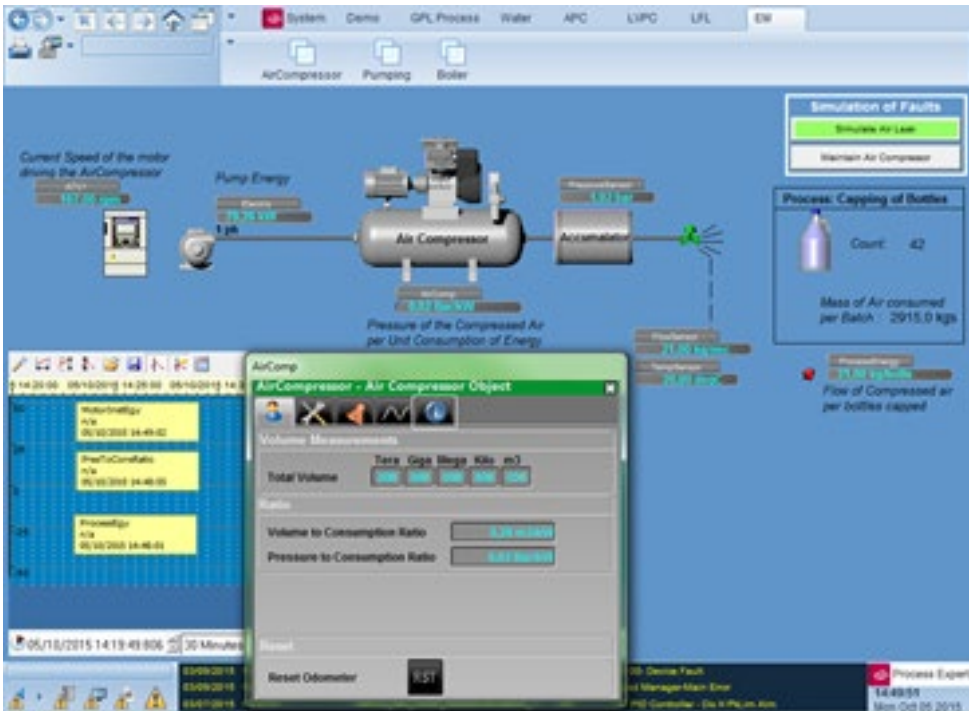
License to be ordered: **EUSAPCCZMSPEZZ** SWPE APC Library - Std + Model

Note: the maximum number of object instances allowed with the application license of a PES system configuration includes the number of instances created with library.
Only one Advanced Process Control Library license is required for the PES project deployed on site.

7.4 Energy Management Library

7.4.1 Presentation

The Energy Management Library offers monitoring and measurement of electrical and non – electrical process objects. It takes into account WAGES (Water, Air, Gas, Electricity and Steam) inputs. These blocks are capable of providing aggregated energy at each level, by giving information to users about the energy consumption data. The Energy Measurement Library offers library blocks which convert process measurement values (flows, temperature, pressure, current, voltage) into energy measurement values (kW/kWh). These values are formatted to comply with the ODVA energy object standards. The energy measurement library also allows these blocks to be added and subtracted, providing an approximate energy measurement for higher levels within the process hierarchy. This enables the energy consumption and the process to be compared to alarm conditions and for energy to be monitored constantly but only alarmed when issues occur. The energy measurement libraries act as enablers for both the energy performance architectures used by Schneider Electric to perform overall energy management and also the energy performance services which provide Schneider Electric's expertise to customers as a service.



The Energy Management library contains following functions:

Aggregator - it aggregates the energy values from the energy objects connected to this object. It provides the instantaneous energy and the total energy in local units.

Gas – it calculates the energy produced/consumed by gas fuel.

Electric – it calculates the energy produced/consumed by an electrical circuit. It is able to calculate energy for single phase and three-phase circuits.

Boiler – it calculates the amount of energy that is consumed to produce superheated steam from water.

Aircomp - it calculates the ratios of pressure and volume flow rate to energy consumption. These values are key performance indicators (KPIs) of the air compressor and give an indication of its efficiency.

Liquid - it calculates the energy produced/consumed by liquid fuel.

CO2 - it calculates the CO2 equivalent in kg for an amount of energy.

ProcessEnergy - it compares the actual energy with the modelled process energy template for a particular production period. This function can determine if the plant/area/section is consuming more or less energy than planned.

ProcessEnergyAdv – it compares the actual energy with the modelled process energy advanced template for a particular production period. This function can determine if the plant/area/section is consuming more or less energy than planned during this period.

Solid – it calculates the energy produced/consumed by solid fuel.

The Energy Management library includes the following services:

A standard way of communicating energy data

- Energy library is capable of providing energy data in standardized form (kwh) which can be accessed across the platform from device level. It is capable of providing energy equivalent information even in local units to users.

The energy consumption information at each level

- The calculated energy values can be aggregated at upper levels, by giving user information about total energy consumption at various levels in a plant. With this value information, users would able to take appropriate action based on the total consumed energy.

The energy data for electrical and non electrical energy objects

- The library supports measurement of energy consumption for electrical energy, gas consumption and virtual measurement of energy. This can help the user in implementing a measurement solution for both electrical and non electrical plant components.

Energy monitoring

- Data obtained from the energy library helps users to know the total energy consumption of the plant and therefore analyse and monitor the key areas.

A data representation aligned to ODVA standards

- Energy information displayed by the library is in line with ODVA data format.

A set of energy blocks for parameter measurement

- Energy library has also non-energy related blocks for measurement of CO2 emissions, pressure, and volume flow consumption.

7.4.2 Reference

License to be ordered: **EUSEMLCZSSPEZZ** SWPE Energy library
Note: the maximum number of object instances allowed with the application license of a PES system configuration includes the number of instances created with library.
Only one Energy Management Library license is required for the PES project deployed on site.

7.5 Mining, Metals and Minerals Library

7.5.1 Presentation

The Mining Metals & Minerals library offers all the common functions required by most of the MMM segment industries.

This library can be enhanced with the Cement and Mining Libraries, which offer additional objects specific to this segment's applications.

The MMM library includes the following services:

Group Management

- A set of functions used in a process circuit are combined to form a group. The various functions or Control modules (motors, actuators, etc…) in a group are administered and controlled globally as a single entity (the group). For example, the transportation of material from pile to hopper is done by using many conveyors and many actuators, motors, sensors.

- Ability to group equipment
- Manage start, stop of a group, with a single management of interlocks
- Alarm management of a group: first device failure alarming, alarm inhibition and alarm and warning masking

Route Management

- Different sets of devices that belong to same operational group, performing similar functionality and that are mutually exclusive are called “routes”. For example, the transportation of different grade of cement to silos involving different sets of equipment (motors/actuators)
- Management of the routing: selection between routes and to control the start and stop of devices on a selected route
- Possibility to manage 5 routes with an instance of the object in the library
- During initialization, the pre-defined default route is selected. Later, the route can be selected by the operator from HMI popup or by process logic in the controllers.

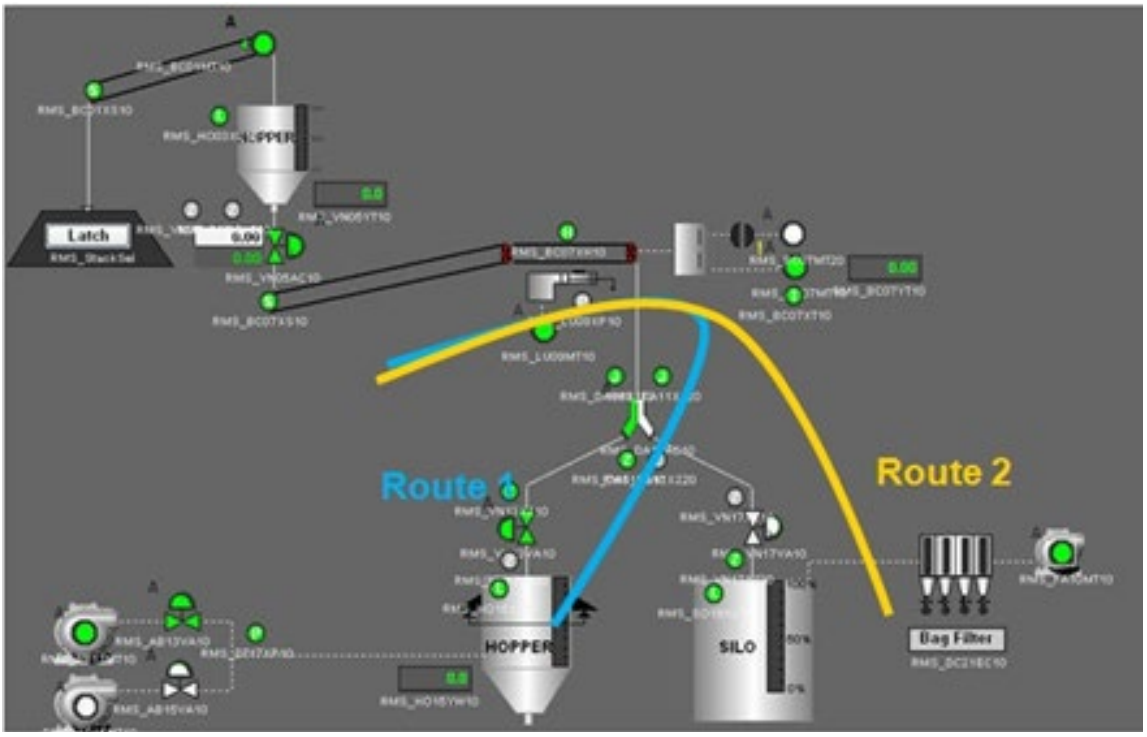


Figure 29: MM Library: route management

Bag filter

- Bag filter is a custom built sequencer block for supervision and control of the bag filter purging operation. This block supports 18 bags (18 outputs to solenoid valves). This block supports the auto mode of operation.

Belt conveyor

- The belt conveyor object is the customized management of a motor with 1 direction 1 speed, specifically used for conveyor belts that include inoperable conditions like belt sway and pull chord. In addition, it also checks the process feedback, such as zero speed switches, belt running empty. This block supports 3 modes of operation: Auto, Manual, and Local.

In addition to these process objects, the library includes:

- A set of objects for equipment control: digital / analog sensors and actuators, and several kinds of motors.
- Generic objects which are useful in process applications: Totaliser, RatioControl, PID, and Scheduler for energy

7.5.2 Reference

License to be ordered: **EUSMMMCZMSPEZZ** MMM Library for PES
Note: the maximum number of object instances allowed with the application license of a PES system configuration includes the number of instances created with library.
Only one MMM Library license is required for the PES project deployed on site.

7.6 Cement Library

7.6.1 Presentation

The Cement library offers specific functions that are commonly required in cement plants. Cement works are process applications that require a huge amount of energy and produce combustion gas from burners. In addition, equipment is running in a dusty environment and so it needs to be monitored carefully to ensure its availability.
The Cement library contributes to better efficiency of these processes thanks to:

- The energy efficiency by managing multi fuel control
- Supervision and control of the gas with a gas analyzer operation
- Girth gear lubrication control with monitoring and warning of the lubrication oil tank levels

The Cement Library includes the following services:
Multi Fuel Controller

- Control the ratio of ingredients of a continuous process
- Designed to increase the energy efficiency by increasing the secondary fuel throughput
- Possibility to control up to 6 fuels: 6 set points are managed for individual actuators and to maintain a ratio between 6 different fuels.
- Single set point entry by operator in GJ/h to increase the ease of operation
- Monitoring of the process feedback value continuously
- Bump-less transfer and unaffected by Online start/stop of actuators

The main application is to manage a Kiln Burner Fuel Ratio.

Gas Analyzer

- Supervision and control of the gas analyser
- Supports 8 analyser types
- Supports 4 gas parameters (O2,CO,NOx,SOx)
- Processes the input parameters and holds the value during Purging

Main applications: Kiln inlet Gas, Pre Heater Outlet Gas…

Girth Gear Lubrication control

- Lubrication Valve status monitoring
- Lubrication nozzle position status
- Monitoring and warnings for lubricator oil level in tank, Air Pressure, Grease Flow, Line differential Pressure

The Mining Metals & Minerals (MMM) library is also delivered with the Cement library. The MMM Library provides three categories of functional services:

- Equipment Control
- A set of objects for equipment control
- Generic objects which are useful in process applications

7.6.2 Reference

License to be ordered: **EUSCEMCZMSPEZZ** Cement Library for PES
Note: the maximum number of object instances allowed with the application license of a PES system configuration includes the number of instances created with library.
Only one Cement Library license is required for the PES project deployed on site.

7.7 Mining Library

7.7.1 Presentation

The Mining library offers specific functions that are commonly required in mining plants. It reduces engineering & deployment time with tested and validated functions for ore routing, separation, grinding and drying processes.
The Mining library leverages the operational efficiency with functions designed to efficiently operate conveyors, hydro cyclones, thickeners, grinding mills and dryers. It provides operational and diagnostic data with advanced alarm monitoring to better manage the process.

The Mining library includes the following services:

Belt Conveyor – This function block is used to control the solid feed flow on the conveyor belt by maintaining the speed of the belt conveyor motor. It monitors the speed, the total mass flow, the material height and material weight on the belt. It totalizes the material flow on the belt.

Wet Grinding Mill – This function block is used to control the wet grinding process using a tubular type mill (Ball mill, AG mill, and SAG mill). The aim of the Wet Grinding Mill block is to maximize the grinding to a specified product size.

HydroCyclone - This function block is used to control the process of classification or separation of coarse and fine particles. It can be used for a single hydro cyclone to control the separation process or for a hydro cyclone bank to control the separation in a series of cyclones. It monitors the mass balance.

Thickener - This function block is used to control sedimentation separation of solid and liquid mixture in mining industry. The control objective is to maintain the overflow clarity (low solid content is required) and the underflow concentration (high solid content is required) at predefined set points.

Rotary Dryer - This function block is used to control the drying process using a rotary dryer. Rotary drum dryers are used, not only in mining, but also in a vast range of drying applications across a number of industries. The block controls the moisture content in a pre-determined desired range and maximizes throughput. Also, the temperature of the exhaust gas is controlled when it is used as a feed in another process.

Spiral - This function block is used to control the process of classification or separation of coarse and fine particles in a vertical spiral concentrator. It monitors the input and output densities. It calculates the differential mass flow, the input mass flow and the output mass flow

PID Advanced Block – This function block is used to have a proportional, integral, and derivative control over an actuator to maintain a process value close to a given target.

Two Loop PID Control Block – This function block is a generic control block. It can be used when two PIDs are required, either in individual control or in cascaded control.

Four Loop PID Control Block – This function block is a generic control block. It can be used when four PIDs are required, either in individual control or in two cascaded control loops.

7 Process Expert System Libraries

The Mining Metals & Minerals (MMM) library is also delivered with the Mining library. The MMM Library provides three categories of functional services:

- Equipment Control
- A set of objects for equipment control
- Generic objects which are useful in process applications

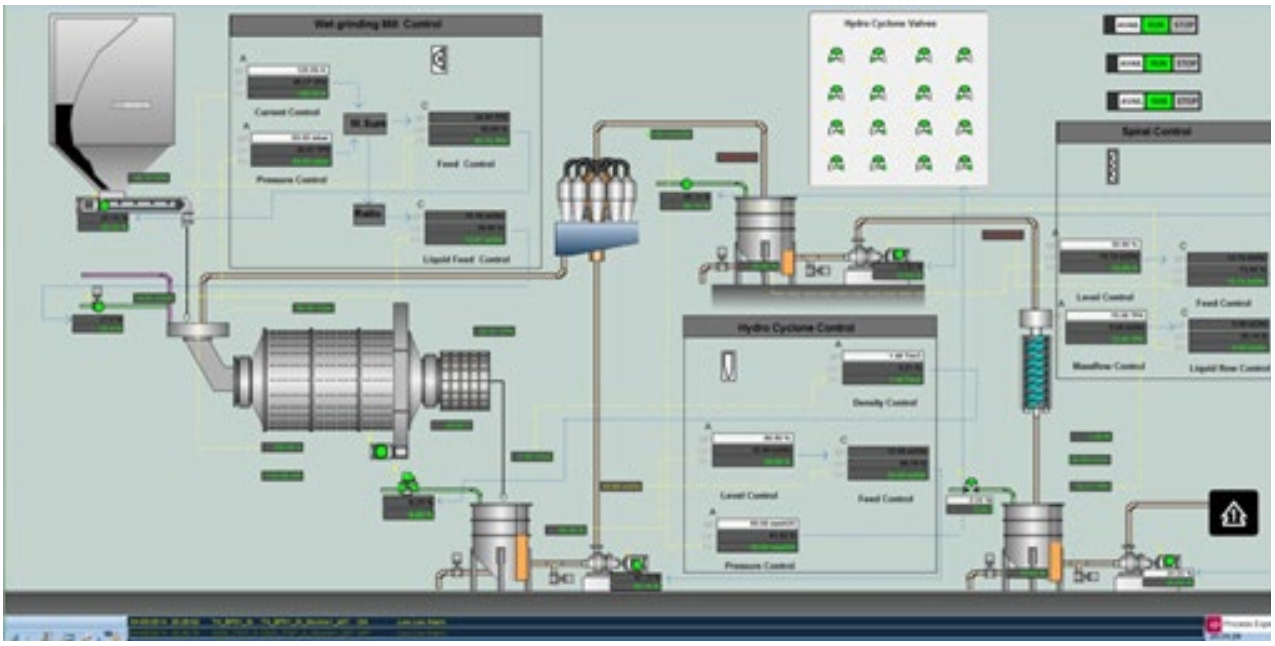


Figure 30: Mining Library: example of wet grinding mill

7.7.2 Reference

License to be ordered: **EUSMNGCZMSPEZZ** Mining Library for PES
Note: the maximum number of object instances allowed with the application license of a PES system configuration includes the number of instances created with the library.
Only one Mining Library license is required for the PES project deployed on site

7.8 Liquid Food Library

7.8.1 Presentation

The Liquid Food Library (LFL) provides a set of objects, which are designed to perform device functions on specialized devices used in the Food and Beverage industry and process functions to operate the process operations in the plant. These objects help to design automation systems to comply with the ISA S88 batch process engineering model. Liquid Food Library objects can be combined with the General Purpose Library to design a liquid food application solution. This association provides a cost effective and high value-add process automation solution for liquid food producers.
The library includes two sets of objects: the device objects and the process monitoring /control objects

The liquid food library contains following device objects:

VLVCTL - 2-way, 3-way, 4-way On-Off Valve Pneumatic Load Manager.

PLGCTL - Leakage Chamber Seat Lifting Actuator

VLV1PLGCTL - 3-way mix proof valve with one leakage chamber

VLV2PLGCTL - 4-way Mix proof valve with one / two leakage chambers

MOTORCYC - Cyclic Motor operation

ENODE4T, ENODE4T_LIGHT - Weighing Module - Scaime weight modules

The liquid food library contains the following process monitoring and control objects:

EQUIP - Provides the supervision and the status information of the equipment.

SELPRESEL - is used for selection or pre-selection of the process equipment to carry out operations on it

SEQCTL2 - The block implements the sequence status management and processes the commands received from the monitoring subsystem or by other control sequences in program mode.

SEQFCT - The function block executes a sequence function for a process operation as per the guidelines followed in SEQCTL2. The SEQFCT supports the process functions such as transfer of the material from one item of equipment to another, agitation, and others.

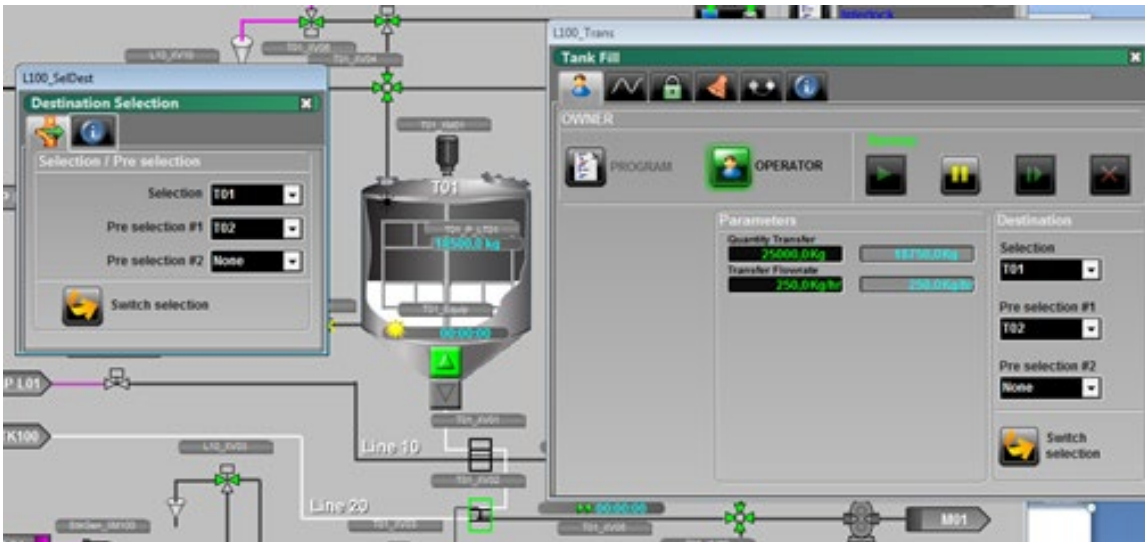
SEQFCTRECIPELINE - is based on SEQCTL2 function block, with enhanced features, to execute a sequence of functions based on a predefined recipe.

SEQCTL3_PLI - the control object implements the sequence status management and processes the commands received from the batch control subsystem (the subsystem sends the commands and checks the status of the sequence to determine what action has to be taken). This block implements the phase logic interface (PLI) to interface with the batch control system software.

SEQCTL3FCTBATCH - combined with the SEQCTL3_PLI control object, it can manage 30 initial conditions, 30 failure conditions, 16 process input parameters and 16 process output parameters

CIP Recipe Management - CIP Recipe Management is an assembly function used for configuring CIP recipes and corresponding recipe parameters to clean equipment or a process line.

Parameter Management - The Parameter Management function is normally used to transfer a single or set of parameters from SCADA to PLC or vice versa.



Library: example of use (transfer in tanks)

7.8.2 Reference

License to be ordered: **EUSLFLCZSSPEZZ** LFL Library for PES
Note: the maximum number of object instances allowed with the application license of a PES system configuration includes the number of instances created with library.
Only one Liquid Food Library license is required for the PES project deployed on site.

7.9 Water and Waste Water Library

7.9.1 Presentation

The Water & Waste Water library provides a set of generic functions that are commonly used in water and waste water applications. The library helps in the management of multiple pumps and time-based scheduling of operations on equipment and devices to simplify remote operations. Local mode operation of equipment on remote pumping stations is possible. Objects in the water library provide the capability to manage energy by load shedding.

The water library contains following device objects:

WPENSTOCK (Penstock Valve Control) - The WPENSTOCK function block is used to manage the operation and control of a motor operated penstock valve / gate in an Open-Stop-Close operation.

WPUMPSEL1 (Pump Selection) - The WPUMPSEL1 block is used for checking status and for controlling operations of a maximum five pumps on demand basis.

WDFMCTL (Dual Media Filter Control) - The function block represents individual DMF filters and selects various operations performed by the filter

WFLOWCALC (Flow Calculation) - This function will calculate the discharge flow in the open channel for various constructions like weirs, flumes, notches

WFLOWCTL (Flow Control) - This block is to allow chemical feed control based on flow, but allow fine tuning based on Streaming Current. The flow based portion of the formula will be based on a ratio that compares the maximum the pump can produce to a desired concentration.

WAERACTL (Aeration Control) - The WAERACTL function block is used to manage the operation and control of an aeration control valve. It gives a command to the valve which controls the amount of oxygen supplied to an aeration control basin.

WPUMPSEL (Pump Selection) - It checks the status and controls the operations of a maximum of 5 pumps. It calculates the number of operational hours for each pump. After completion of a maximum of operational hours, the object switches operation to another pump in standby. It checks the health of each pump and to ignore it when it is not ready for operation. It is possible to switch between pumps by using the buttons in the faceplate when in manual mode.

WSCHEDULER (Scheduler) – It allows the mode of operation of equipment to be scheduled. The output can be used to set a PID value, a control valve output or the speed of a motor. The scheduler is capable of holding information for up to 10 events.

WMOTOR - To control a motor with 1 direction and 1 speed.

WMOT1D2S - To control a motor with 1 direction and 2 speeds.

WMOT2D1S – To control a motor with 2 directions and 1 speed.

WMOTORVS - To control a motor with a variable speed drive, whether the speed driver is switched through communications, I/O wiring, or a mixture of both.

WVALVE – To control an on-off a device as an on-off valve with 2 limit switches (e.g. electro-pneumatic valve).

WMVALVE - To control a motorized valve with a positioner.

WMVALVED - To control an on-off motorized valve as a gate with 2 limit switches.

The water library includes the following functions:

- Management of multiple pumps (up to 5 pumps)
- Time-based scheduling of operations on equipment and devices to simplify remote operations
- Alarms and interlock messages can be sent via SMS through a 3rd party system
- Local Mode operation of equipment in remote pumping stations
- Energy Management by load shedding functionalities embedded in objects

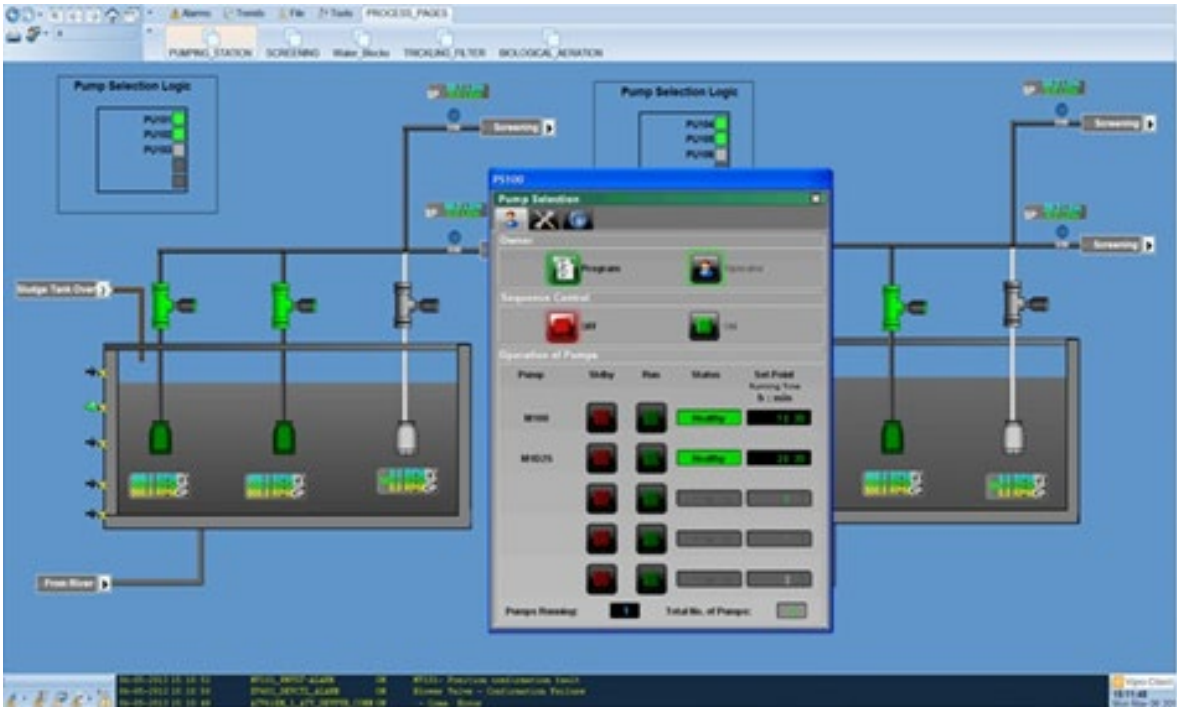


Figure 32: Water Library: example of use (pumping station)

7.9.2 Reference

License to be ordered: **EUSWWWCZSSPEZZ** WWW Library for PES
Note: the maximum number of object instances allowed with the application license of a PES system configuration includes the number of instances created with library.
Only one Water Library license is required for the PES project deployed on site.

8 Managing Licenses

This chapter addresses the management of licenses, covering the following areas:

- Activation of a license
- Management of licenses; use of the Software Licensing Portal
- Policy applicable for the licenses

8.1 Activation of a license

Ordering a PES license provides an entitlement containing one or several activation IDs corresponding to the software licenses ordered. This entitlement is sent to the user through an email (refer to the ordering chapter for more information).
The license must be activated on the Schneider Electric Software Licensing server to be operational. Take note that it is not possible to use PES without having activated the licenses (no trial period is allowed). Three methods are available to activate the licenses. This is done through the floating license manager that is installed on the computer with PES:

1. Through Web. It requires an Internet connection on the workstation. This is the easiest way and it is immediate.

2. Through the Software Licensing Portal. This method allows licenses to be activated on a workstation that is not connected to the Internet. Activation takes a few minutes. The following steps are required:
   - From the workstation that embeds the licenses, invoke the registration via “Web Portal”. It leads to creating a file that needs to be stored on a removable media, as a USB key.
   - From another computer that has access to the Internet; go to the Software Licensing Portal. The licensing service in the portal allows the file to be transferred from the original workstation and the creation of a new file that will be restored on the workstation.
   - Complete the activation of the license with this new file on the workstation through the floating license manager.

3. Through Email. This method requires 1 or 2 days to activate the license. Activation is done in two steps:
   - From the workstation that embeds the licenses, invoke the registration via “Email”. It leads to create a file that has to be sent by email from this machine or another one to a Software Registration Center.
   - The file received as response to the email from the Software Registration Center must be copied on the workstation prior to activate the license with this file through the floating license manager.

8.2 Management of licenses with the Software Licensing Portal

The Software Licensing Portal enables the users to administer their licenses. Any customer can create his own private working space following the registration to the Software Licensing Portal (www.schneider-electric.com / tab: Support / menu: Software Licensing).
From his space, the user can gain access to the list of his licenses and get the status for each of them.
Without any login, it is also possible to get the status of one license, simply enter the activation ID to get the information.
The Software Licensing Portal is also the place to activate a license through the Web Portal.

Figure 33: Software Licensing Portal on schneider-electric.com

8.3 Policy applicable for the licenses

Following the activation of a license, the status of this license can be checked on the Software Licensing Portal. The user may have to do the following activities for a license:

- "Rehost": Return the license back from the workstation to the Software Licensing Portal. The license is no longer active on the computer. It can be activated on another computer. This is the usual way to move a license from one machine to another one.
- "Repair": Following the crash of the workstation, it allows the license to be recovered on the same machine. In that specific case, PES is re-installed on the same machine. Through the "Repair" service in the license manager, it enables the license to be recovered on the machine, after entering the activation ID. This activity doesn't need any external support.
- "Reinstall": Following the crash of the workstation, it allows the license to be recovered on another machine after re-installation of PES. When the machine has changed, the licensing system cannot rely on machine information to activate the license, because the machine has changed. Reinstallation of the license requires the assistance of the Software Registration Center.

Figure 34 below gives the policy applicable for each type of activity. The number of actions is defined per year and it depends on the number of seats that are attached to this license.

Floating license	Single	Group	Team
Nb of Rehost / year	7	9	20
Nb of Repairs / year	3	4	5
Nb of Reinstalls / year	3	4	5

Figure 34: Policy applicable to the software licenses

9 Hardware requirements to run Process Expert System

Due to various criteria to know the CPU performance, the required processor is defined according to an average CPU mark given by PassMark(R) Software.

To check a CPU performance, for example for a Core i3 CPU, type “passmark Core i3” in the search engine of your Internet navigator to get the list of known processors and get the average CPU mark for a selected one.

Workstation embedded with the System Server

System: processor with average CPU Mark: 5000 minimum

RAM memory: 8 GB minimum, 16 GB recommended

Hard disk: 250 GB / Fast disk 7200 rpm; format: NTFS file system and not FAT32

40 GB of free memory space on the hard disk is required to install and run the software

Recommended display: SVGA (1024-768 or more) with high color 24 bits

Pointing device: mouse or compatible device

Operating system on the physical machine

- Windows server 2012 R2 (recommended)
- Windows 10 Pro, Windows 7 Pro or Windows 8.1 Pro 64-bit

Workstation embedded with an Operation Server

System: processor with average CPU Mark: 3000 minimum

RAM memory: 4 GB minimum, 8 GB recommended

Hard disk: 80 GB (SSD recommended) / Fast disk 7200 rpm

Operating system on the physical machine

- Windows server 2012 R2
- Windows 10 Pro, Windows 7 Pro or Windows 8.1 Pro 64-bit

Hardware requirements to run Process Expert System 9

Workstation embedded with an Engineering Client

System: processor with average CPU Mark: 3000 minimum

RAM memory: 8 GB minimum

Hard disk: 250 GB / Fast disk 7200 rpm; format: NTFS file system

Operating system on the physical machine

- Windows 10 Pro, Windows 7 Pro or Windows 8.1 Pro 64-bit

Workstation embedded with an Engineering & Operation Client

System: processor with average CPU Mark: 3000 minimum

RAM memory: 8GB minimum

Hard disk: 250 GB / Fast disk 7200 rpm; format: NTFS file system

A mouse and a keyboard

Operating system on the physical machine

- Windows 10 Pro, Windows 7 Pro or Windows 8.1 Pro 64-bit

Workstation embedded with an Operation Client

System: processor with average CPU Mark: 2000 minimum

RAM memory: 3GB minimum

Hard disk: 250 GB / Fast disk 7200 rpm

A mouse and a keyboard

Operating system on the physical machine

- Windows 10 Pro, Windows 7 Pro or Windows 8.1 Pro 64-bit

10 Service Support associated with Process Expert System

10.1 Introduction

Selling services associated with PES combines benefits either for Customers and Schneider Electric for different reasons that are explained below:

Benefits for the customer:

- Major cost savings
- Improved production performance
- Expert and professional support - receive fast and accurate answers
- Access to version upgrades (1+ release per year)
- Protect their automation investment

Benefits for Schneider Electric:

- Increased revenue
- Customer contact opportunities
- Increased customer satisfaction
- More support sales tools than ever before

The Service Support is part of an overall set of services that are deployed progressively for Process Expert System.

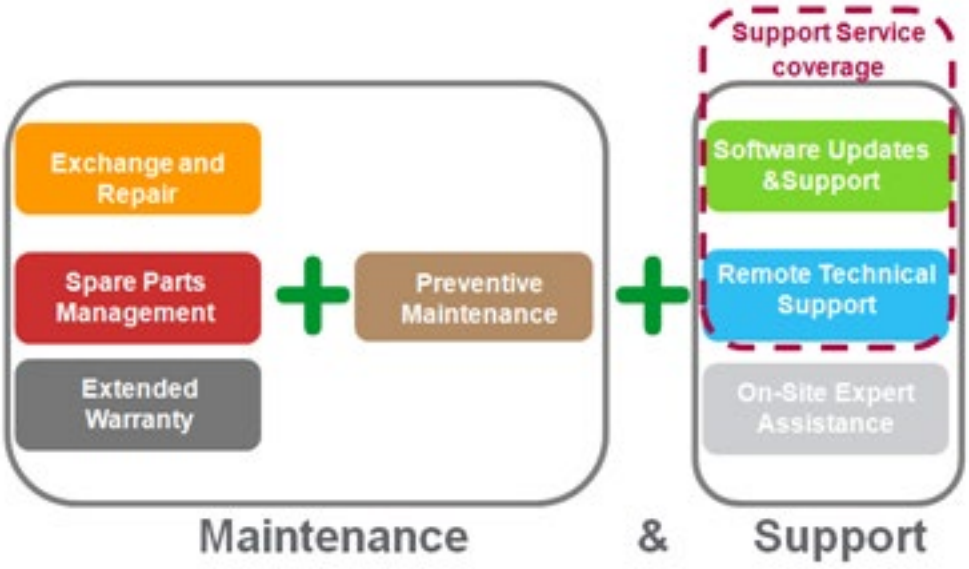


Figure 35: Maintenance and Support Services overview

10.2
Service Support definition

Three levels of support are available as options to the software offer. There are presented from the highest value, combining support and software upgrades, to the lowest including only support.
In the specific case of PES, it is mandatory to combine the selling of licenses with a support service. Silver Support is the minimum required.

GoldPlus Support

- Level 3 Support – 24 x 7 access
- On line technical information
- Version upgrades
- Priced approximately as 20% of the total amount of the software list price.

This premium support offer is attractive to customers with high availability systems in which downtime is expensive. It covers the support to a 24x7.

Gold Support

- Level 3 Support - Local Business Hours (MON-FRI)
- On line technical information
- Version upgrades
- Priced approximately as 15% of the total amount of the software list price.

This is the standard service offer, which combines software upgrades and support during business hours. This is the common choice that should be proposed to customers by default.

Silver Support

- Level 3 Support - Local Business Hours (MON-FRI)
- On line technical information
- Priced approximately as 10% of the total amount of the software list price.

This is a light support offer aimed at customers who want to be able to receive assistance for their installed applications but do not intend to upgrade. This is the minimum support to be combined with PES licenses.

Support to Process Expert System is managed via our central call centers and is only available in certain languages.

10 Service Support associated with Process Expert System

10.3 Contents of the Support Services

Silver, Gold and Gold Plus supports include the following services:

1. Direct Access Support

The service provides access to technical assistance via telephone, live chat, and email. The customer gets fast access to experienced Support Engineers based in dedicated labs where they can replicate the customer configuration and reproduce issues experienced onsite. The support service is not expected to engineer a Customer's project or resolve issues specific to the Customer's application implementation.

2. Online Support Tools

Use of a dedicated PES Global Support portal (www.pes.schneider-electric.com) to access a range of support tools including live chat and case manager for easy online case monitoring.

3. Emergency Support

Customer obtains emergency software hot fixes via an intensified escalation process in situations where critical issues are impacting upon business operations.

4. Customer Service Request (CSR) Resolution Workflow

A rigid framework of issue prioritization and severity ensures that an appropriate management process is applied to all the customer issues until resolution. The prioritization depends on the level of Support service the Customer has contracted. Silver and Gold Support services are managed with the same priorities. The technical resolution workflow is described in ***Figure 36***:

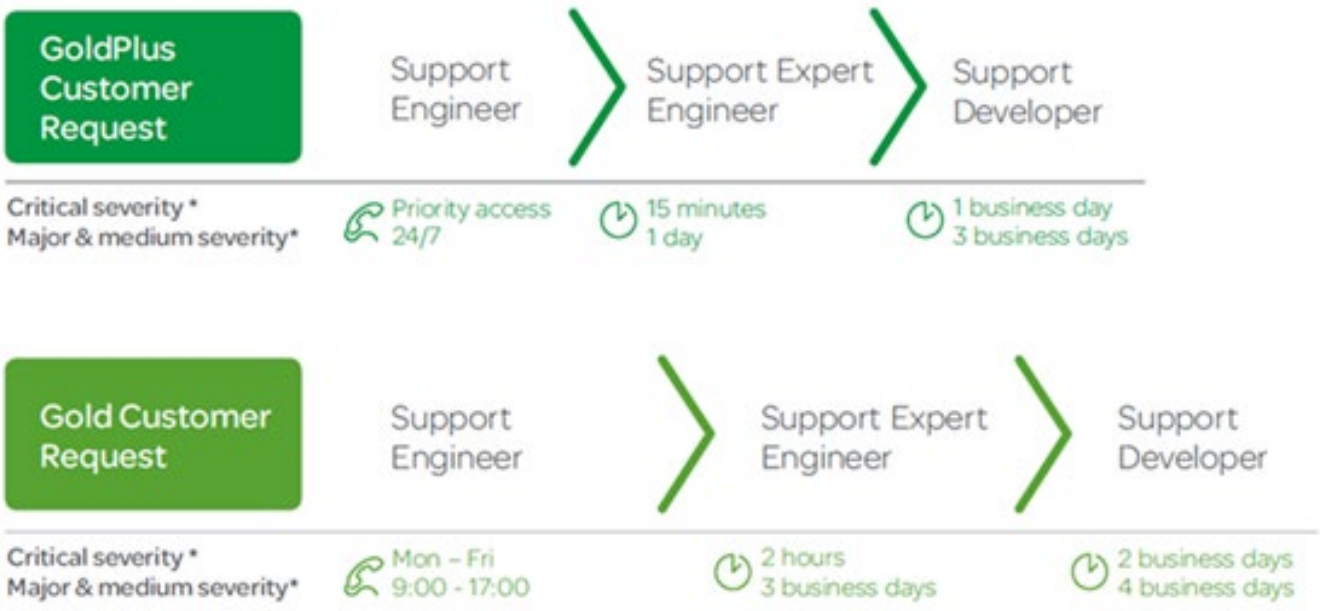


Figure 36: Escalation process to manage customer requests

5. Online Knowledge Base

Access the knowledge base anytime for expert know-how and information that sustain the Customer's return on investment.

6. Real-Time News

The Customer stays informed about the latest news and receives support updates, product tips, and other information through the PES Global Support portal.

Accessing Remote technical support

A Support Services certificate will be awarded on purchase of Support. This certificate provides information that will be required when the customer wants to raise a Customer Service Request (CSR) or wishes to log onto in-support Customers dedicated areas of the PES Global Support website.

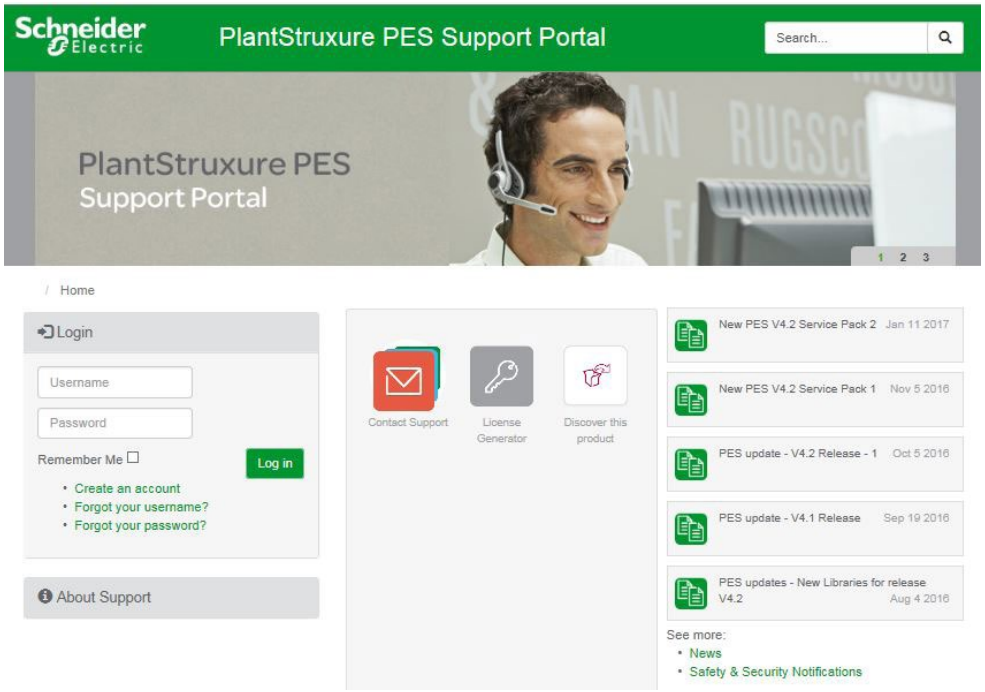


Figure 37: Access and services from the Support Portal

10.4 Support fees calculation

The calculation of support is applicable to a customer site. The definition of a site is important to ensure support can be correctly calculated. A site contains all the System Server, Engineering clients, Operation Servers and Operation Clients which communicate together to access the application database which is located on the System Server. So a standalone machine including the System Server, an Operation Server and an Operation Client can be considered as a site.
The definition of a site is regardless how the software pieces are distributed in one or several locations, for example in control rooms.

In order to take in account the complexity and various possibilities in configurations while having a sliding fee that depends on the site, the calculation is based on the pricing of the software pieces that are running and a price depending on the value of the service.

10 Service Support associated with Process Expert System

To do this the cost of support is broken up into individual Support Units. Each software license has a value in term of Support Units. The Unit Price depends on the level of support purchased (GoldPlus, Gold, Silver).
It is applied the following calculation rule for software service:

Support Fee (for 12 months) = Unit Price x Quantity

Where:

Unit Price = Unit Price of the Support Level purchased

Quantity = Total Support Units of the software licenses

Important note: taking orders for mixed levels of services is not allowed for a site. In case of a mix of levels in a site, the minimum level of support will be provided.
To renew support on a site, the support price is calculated based on the level of support purchased (GoldPlus, Gold, Silver) and the software licenses on the customer site.

10.4.1 Table of units (quantity) for each license (part number)

The table below lists the software license part numbers and gives the equivalent in quantities of units to calculate the support.

PES system

Software License		Quantity (Units)
Part number	Description	
EUSMINCZTSPEZZ	SW PE MINI CONF WITH 200 OBJ INST LIC	91
EUSMINGZASPEZZ	SW PE UPG MINI TO 500 OBJ INST LIC	47
EUSBEUCZZSPEZZ	SW PE ENG SINGLE LIC	117
EUSCLTCZZSPEZZ	SW PE ENG CLIENT SINGLE LIC	31
EUSCLTCZZGPEZZ	SW PE ENG CLIENT GROUP LIC	63
EUSCLTCZZTPEZZ	SW PE ENG CLIENT TEAM LIC	94
EUSAPPCZTSPEZZ	SW PE APPL LIC EXTRA SMALL	47
EUSAPPCZSSPEZZ	SW PE APPL LIC SMALL	94
EUSAPPCZMSPEZZ	SW PE APPL LIC MEDIUM	188
EUSAPPCZLSPEZZ	SW PE APPL LIC LARGE	313
EUSAPPCZXSPEZZ	SW PE APPL LIC EXTRA LARGE	469
EUSOPECZZSPEZZ	SW PE OPER SERVER LIC	63
EUSLCCCZZSPEZZ	SW PE CTRL CLIENT LIC	55
EUSLRCCZZSPEZZ	SW PE REDUNDANT CTRL CLIENT LIC	0
EUSVCCCZZSPEZZ	SW PE VIEW CLIENT LIC	19
EUSVRCCZZSPEZZ	SW PE REDUNDANT VIEW CLIENT LIC	0
EUSBASCZZSPEZZ	SW PE ENG ASC SINGLE LIC	7
EUSBASCZZGPEZZ	SW PE ENG ASC GROUP LIC	14
EUSSBASCZZTPEZZ	SW PE ENG ASC TEAM LIC	33
EUSSISCZZSPEZZ	SW PE ENG SYS INT SINGLE LIC	47
EUSSISCZZGPEZZ	SW PE ENG SYS INT GROUP LIC	94
EUSSISCZZTPEZZ	SW PE ENG SYS INT TEAM LIC	188
EUSBASEZMSPEZZ	SW PE EDUC ENG SINGLE LIC	31

Market / Application libraries for PES

Software License		Quantity (Units)
Part number	Description	
EUSAPCCZMSPEZZ	SWPE APC Library - Std + Model	47
EUSWWWCZSSPEZZ	WWW Library for PES	31
EUSMMMCZMSPEZZ	MMM Library for PES	47
EUSCEMCZMSPEZZ	Cement Library for PES	55
EUSMNGCZMSPEZZ	SWPE MINING LIBRARY	64
EUSLFLCZSSPEZZ	LFL Library for PES	16
EUSEMLCZSSPEZZ	SWPE ENERGY LIBRARY	16

10.4.2 List of references for Support Service

EUSPES001 Silver support (Unit Price)

EUSPES011 Gold support (Unit Price)

EUSPES012 Gold Plus support (Unit Price)

10.4.3 Quote the Support fees - example

A PES configuration on a customer site requires the following licenses:

- An engineering configuration + an additional engineering client
- An Application license allowing a project to be run with 3000 object instances maximum (Medium license)
- One Operation Server plus 3 remote Control Clients

Note: A local client is embedded in the Operation Server

Bill of material and calculation of Units for service fees:

Part number	Description	QTY PN	Unit value	QTY Units
EUSBEUCZZSPEZZ	SW PE ENG SINGLE LIC	1	117	117
EUSCLTCZZSPEZZ	SW PE ENG CLIENT SINGLE LIC	1	31	31
EUSAPPCZMSPEZZ	SW PE APPL LIC MEDIUM	1	188	188
EUSOPECZZSPEZZ	SW PE OPER SERVER LIC	1	63	63
EUSLCCZZSPEZZ	SW PE CTRL CLIENT LIC	3	55	165
	Total number of units			595

The sales representative would quote the service support for this configuration (Silver service).
The Unit Price for Silver support (EUSPES001) is 7 €.

Support Fee (for 12 months) = Unit Price x Quantity

Support fee (Silver) : 7x 595 = 4165 €

11 Ordering Process Expert System

PES offer includes three kinds of part numbers:

- Software licenses
- Physical products (pack Windows, Magelis Rack PCs, hardware as controllers,...)
- Support services

Each type of offer needs to be handled differently. This paragraph describes the ordering procedure for each kind of part numbers

11.1 Software licenses

All orders concerning the licenses for PES must be placed to the local country ordering system with MRO Carros as a supplier. In addition, the Country must fill-in additional information concerning the license itself in the License Ordering Portal (LOP). One important point is to provide the mail address (WUM@), which will be used to automatically send the entitlement concerning the licenses to this address.
Figure 38 below shows the main steps of this workflow:

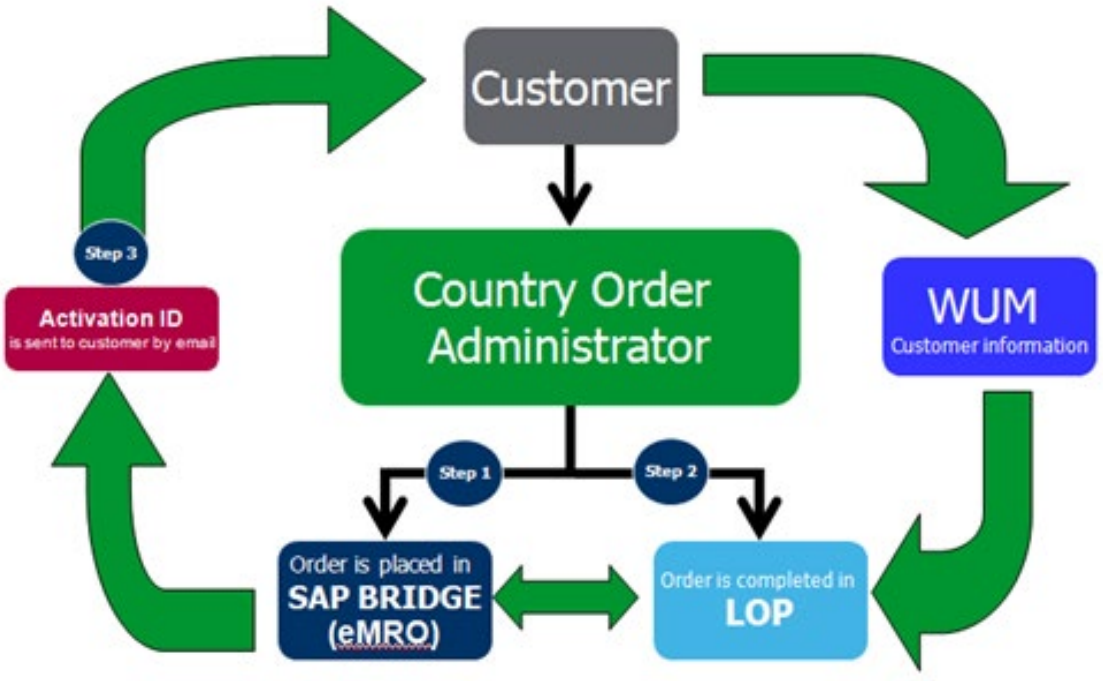


Figure 38: Ordering process for the PES licenses

11.2
Ordering physical products

It is applicable to any physical product. This is the standard procedure applicable for any standard product. The orders will be placed in the local country ordering system (Bridge)

11.3
Ordering the Support for PES

Support service must be ordered through the Sales Order Configuration tool (SOC).
To access the Sales Order Configurator simply go to **www.soc.schneider-electric.com**

SOC includes an assistant that enables the services to be quoted corresponding to a PES configuration. It calculates the number of units of a PES configuration entered in SOC and it creates a quote for the licenses and the associated services. The quote can be transformed into a purchase order for the service only. The Purchase Order doesn't cover the licenses, which must be ordered separately through eMRO.

Important note:
Software licenses must be ordered prior to the Support Service through eMRO.
Later on, when the Support Service associated with the licenses is ordered, it is necessary to mention the eMRO purchase order in the "special instruction field" of the order details in SOC.

12 Industrial PC for Process Expert System

12.1 Introduction

Magelis HMI Rack PC offers one-stop shopping for a complete plant solution that has been tested and validated by Schneider Electric, along with Plant Struxure software Vijeo Citect and PES Engineering. Magelis HMI Rack PCs can be easily installed in 19" enclosures and connected to Magelis iDisplay for display screen.
The Magelis Rack PC particularly addresses customer needs in control rooms where the replacement costs and environment constraints (Temperature, dust, EMC…) are limited.

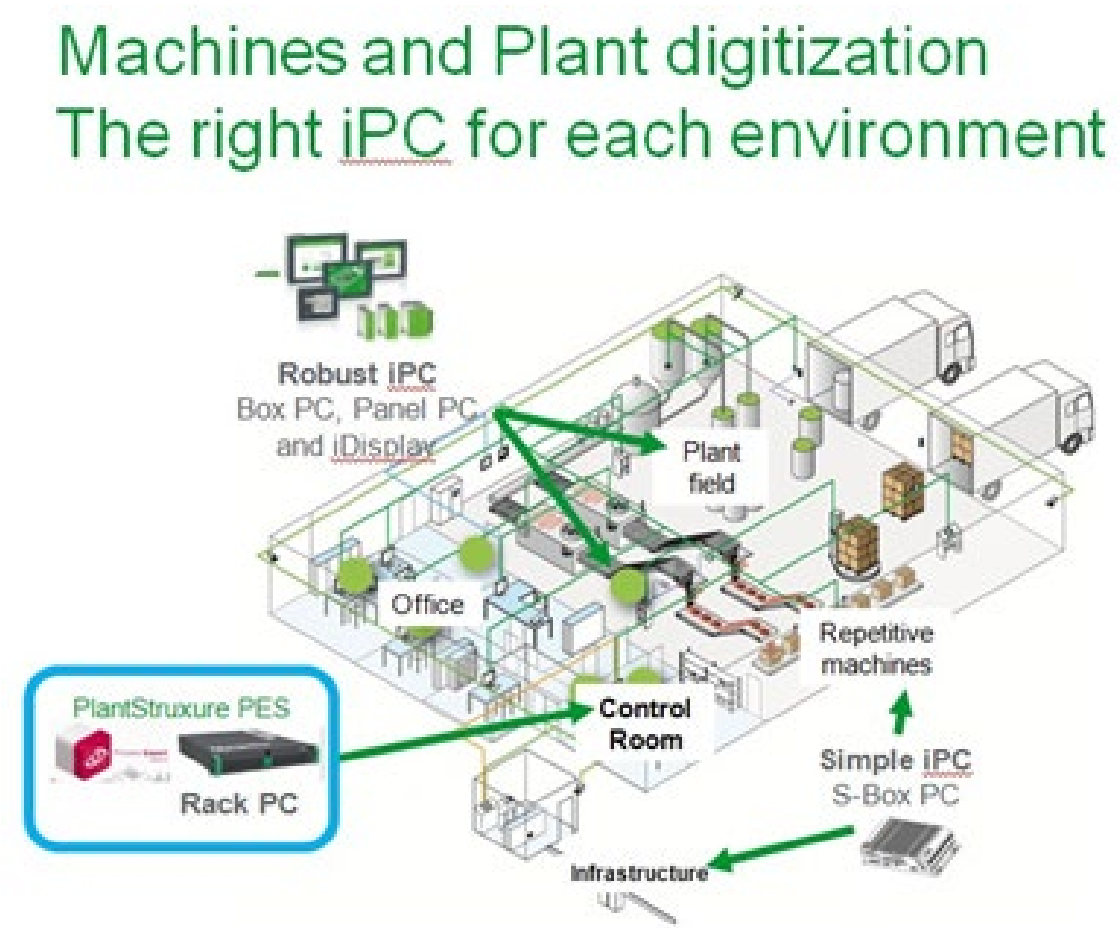


Figure 39: The rack PC is located in the plant control room

The offer Rack PC + PES deliver the following unique value propositions: Consistent Magelis range, to operate the different needs of EcoStruxure architectures:

- High performance model for engineering (PES System Server)
- Intermediate performance model for SCADA servers, with a high duty hard drive.

Ease of integration in control room with 19” rack format

- Ready to include rack in a standard cabinet in control rooms

12.2
Offer description

12.2.1 Selection guide of Magelis Rack PC

Type of Magelis iPC (1)		Magelis HMIRSU Universal PC 2U		Magelis HMIRSP Performance PC 4U			
Industrial environments		Control rooms and labs					
							
CPU	3rd generation Processor	Intel Core i3-2120 processor (3.3 GHz), dual-core		Intel Xeon™ E3-1225 processor (3.1 GHz), quad-core			
	Micro ATX/ATX Motherboard	Micro ATX		ATX			
	PCI Express® slot/PCI	2 PCI Express (x16) + 1 PCI		Up to 7 slots: 4 PCI Express (x16) + 3 PCI (including 1 PCI slot used for default removable audio connections)			
	Storage Slots	4 front hot-swap trays (2 SATA2 + 2 SATA3)		1 internal slot (SATA3) + 4 hot-swap trays (SATA2)			
	Drives	1 HDD ≥ 500 GB Enterprise 24/7, in front tray with OS	1 SSD ≥ 80 GB in internal slot with OS (4)	1 HDD ≥ 500 GB Enterprise 24/7, in front tray with OS		1 SSD ≥ 80 GB in internal slot with OS (4)	2 HDD RAID ≥ 500 GB 24/7 in front trays with OS
	RAM (max. 32 GB) (2)	4 GB DDR3 in 2 slots			16 GB DDR3 in 2 slots	4 GB DDR3 in 2 slots	8 GB ECC in 2 slots
Operating system		Windows 7 64-bit (Ultimate Multi language)					Windows Server R2 (5 clients)
Supply voltage		100...240 V∿ (300 W single power supply)				100...240 V∿ (500 W redundant power supply)	
Cooling method		3 fans, user-exchangeable with fan speed control to reduce noise		2 fans, user-exchangeable with fan speed control to reduce noise			
Interface	Ethernet	2 Ethernet 10/100/1,000 Mbps					
	Serial ports	2 RS-232 (+ 3 RS-232 + 1 RS-485 optional with additional HMIYRINSL21)		2 RS-232 (+ 4 optional with additional HMIYRINSL41)			
	USB ports	2 USB 2.0, 4 USB 3.0		4 USB 2.0, 2 USB 3.0			
	Audio	2 (Mic, line-out)		2 (Mic, line-out), default in 1 PCI slot			
	Video Interface	1 VGA + 1 DVI					
	Resolution	VGA: Up to 2048 x 1536 at 60 Hz, DVI: Up to 1920 x 1200 at 60 Hz					
	DVD-RW drive	1 DVD-RW drive					
	Watchdog timer	System reset output, programmable 1...255 s/min					
	Reset button, buzzer, Case-open switch	Yes					
Mounting		2U in 19" HMIR enclosure (1)		4U in 19" HMIR enclosure (1)			
Overall dimensions (W x H x D)		482 x 88.4 x 523.8 mm/18.98 x 3.48 x 20.68 in.		482 x 172.7 x 601.4 mm/18.98 x 6.8 x 23.68 in.			
Degree of protection		IP 40					
Temperature	During operation	Conforming to IEC 60068-2-2: 0...40 °C/32...104 °F					
	During storage	Conforming to IEC 60068-2-2: –40...70 °C/–40...158 °F					
Humidity	During operation	Conforming to IEC 60068-2-78: 10...95% at 40 °C/104 °F, non-condensing					
	During storage	Conforming to IEC 60068-2-78: 10...95% at 60 °C/140 °F, non-condensing					
Vibration resistance	During operation	Conforming to IEC 60068-2-6: 1 g from 5...500 Hz (except for HDD drive)					
Shock resistance	During operation	Conforming to IEC 60068-2-27: 10 g/11 ms, half sine wave (except for HDD drive)					
Standards and certifications		CE, cULus (UL 60950-1, CSA 22.2 No. 60950-1-07), CCC, RMC					
Compatible screens		Complete range of Magelis iDisplay screens (see page 6/5)					
Software	Vijeo Designer (3) and Vijeo XD Run Time Demo	□ Vijeo Designer Run Time Demo (21-day trial version) to be installed from Software DVD. Unlimited license to be ordered separately (3). □ Vijeo XD Run Time demo to be installed and activated by unlimited license HMIRTMCZLSPAZZ.					
	Bundle (validated and supported) (5)	–	Vijeo Citect DVD for SCADA applications	–	PES leaflet	Vijeo Citect DVD for SCADA applications	PES leaflet with Windows Server 2012 R2 only
References		HMIRSUH3A3701	HMIRSUS3A3701	HMIRSPHXA6701	HMIRSPHXA67P1	HMIRSPFXA6701	HMIRSPFXR6702 – HMIRSPSXR6S01 HMIRSPSXR6T01
	Windows Server 2008 Standard R2						
	Windows Server 2012 R2						

HMIRSPHXA67P1 and HMIRSPSXR6T01 are specifically addressing the requirements for PES system server.
HMIRSUS3A3701, HMIRSPFXA6701 & HMIRSPFXR6702 are specifically addressing the requirements for the supervision (operation server and operation clients)

13 Automation Platforms selection guide

13.1 Overview

This section gives an overview of the automation platforms that are supported in PES: Modicon M580, Quantum, and M340. This is a summary of the key features, based on a presentation of the platform and modules' description from selection guides.

Elements of the automation platform architectures that are common to all platforms are described after the platforms.

For more details about the automation platforms, please refer to the following catalogs:

- Modicon M580 Automation Platform
- Modicon Quantum Automation Platform
- Modicon M340 Automation Platform
- Modicon X80 I/O Platform

Some architectures, hardware modules, or features embedded in an automation platform are not supported in control systems designed with PES. These limitations are identified in this document with an "(*)" in the module's description, with an explanatory note at the bottom of the module description tables.

In addition, the last section of this chapter provides a summary of all unsupported modules for each automation platform.

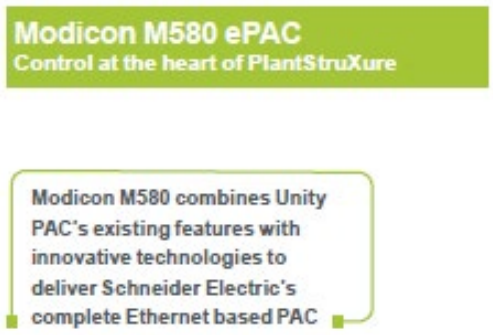
13.2 Modicon M580 automation platform

Limitations in the support of architectures or hardware modules in the scope of application designed for Process Expert System architectures are identified in this document with an "(*)" in the module's description, with a note at the bottom of the module description tables.

The last section of chapter section provides a summary of all unsupported modules for the automation platform.

13.2.1 General presentation

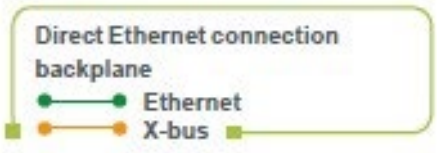
The Modicon M580 ePAC (Programmable Automation Controller) features openness, flexibility, robustness, and sustainability. The M580 is designed with an Ethernet backbone to optimize connectivity and communications. It supports X80 I/O modules which can be easily integrated into its architecture. The powerful processors offer high levels of computation for complex networked communication, display, and control applications.

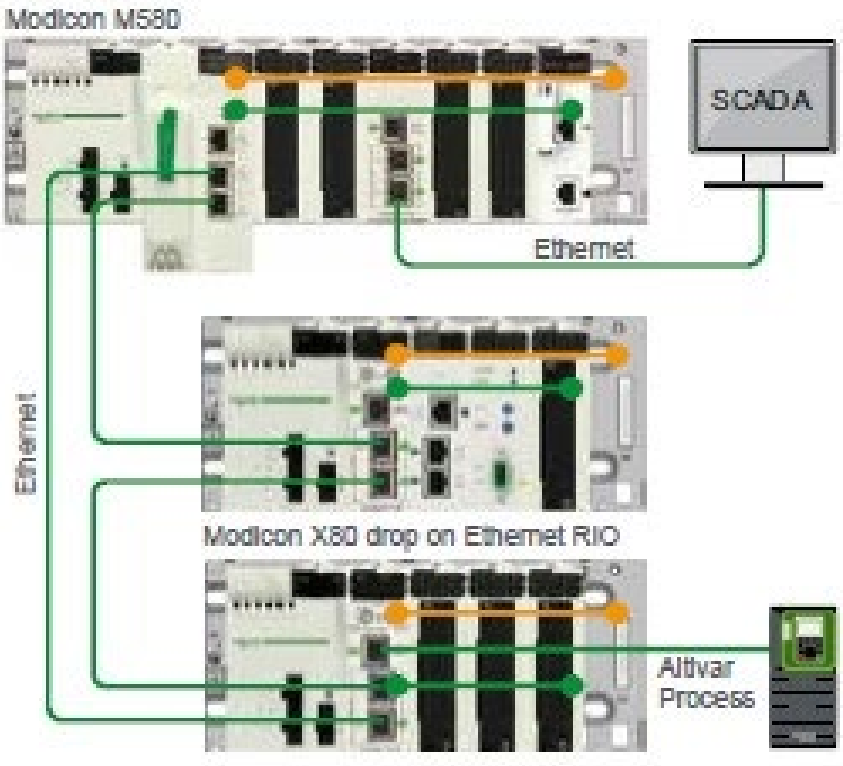


Innovative

ePAC concept

- Top-to-bottom standard Ethernet network
- Open architecture with direct Ethernet connection on the backplane





Cybersecurity ready

Cybersecurity ready, with Achilles Level 2 certification and advanced, built-in cybersecurity features

- Embedded security features as defined by standard IEC 62443

Innovative (continued)

Advanced technologies

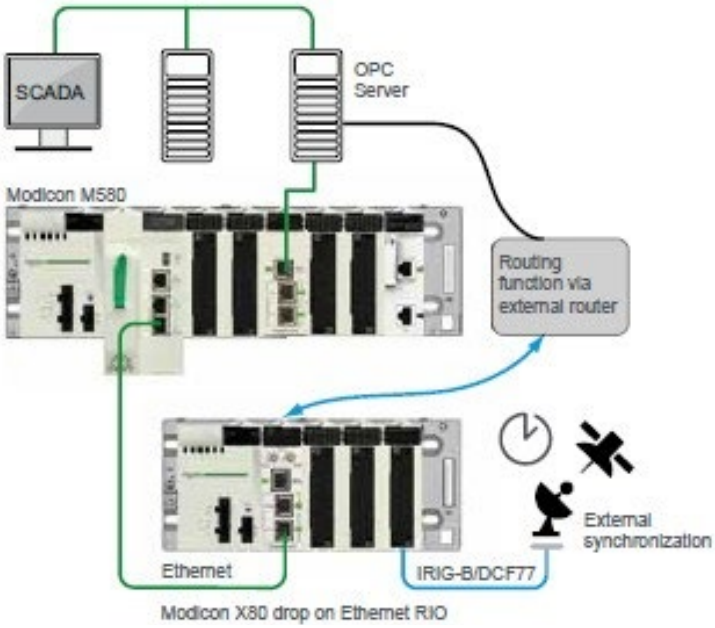
- Based on high-speed dual-core processor (ARM® type)
- High-speed communication, application, and execution
- Innovative mechanical and electronic design for high EMC immunity and ruggedness that is superior to the required IEC standards
- Supports extended temperature range from −25°C to +70°C/ - 13 °F to + 158 °F

Modicon M580 design is compliant with automation standards

High precision

- Ability to deliver 1 ms I/O resolution through native time-stamping at the source, with specific time-stamping modules via OPC server
- Applications include functions such as:
- Sequence of Events recording (SER)
- Utility substation automation
- Protective relay trip history
- Alarm / event logs
- Time-stamping of power monitoring data logs

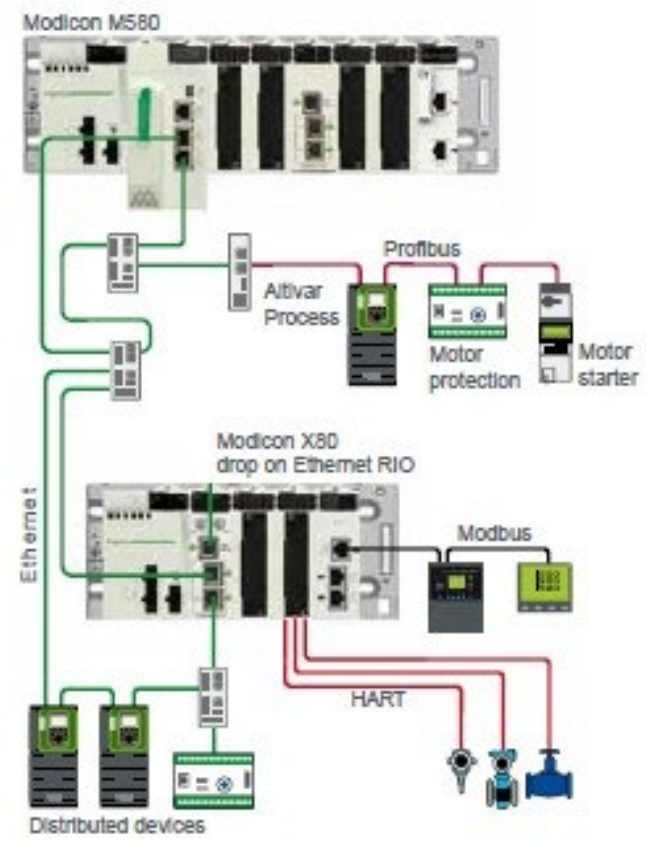
No program required with time-stamping solution mode



Simple and flexible

Flexibility in design

- Flexible topology allows simple integration of devices
- Ability to mix remote equipment, distributed equipment, and other devices on the same Ethernet field network with complete software integration
- Transparent access to data through Ethernet backbone
- Simple HMI integration via third port on remote I/O head
- Interface to other popular fieldbus and device networks, including AS-Interface (*), Modbus, Profibus, and HART (*)

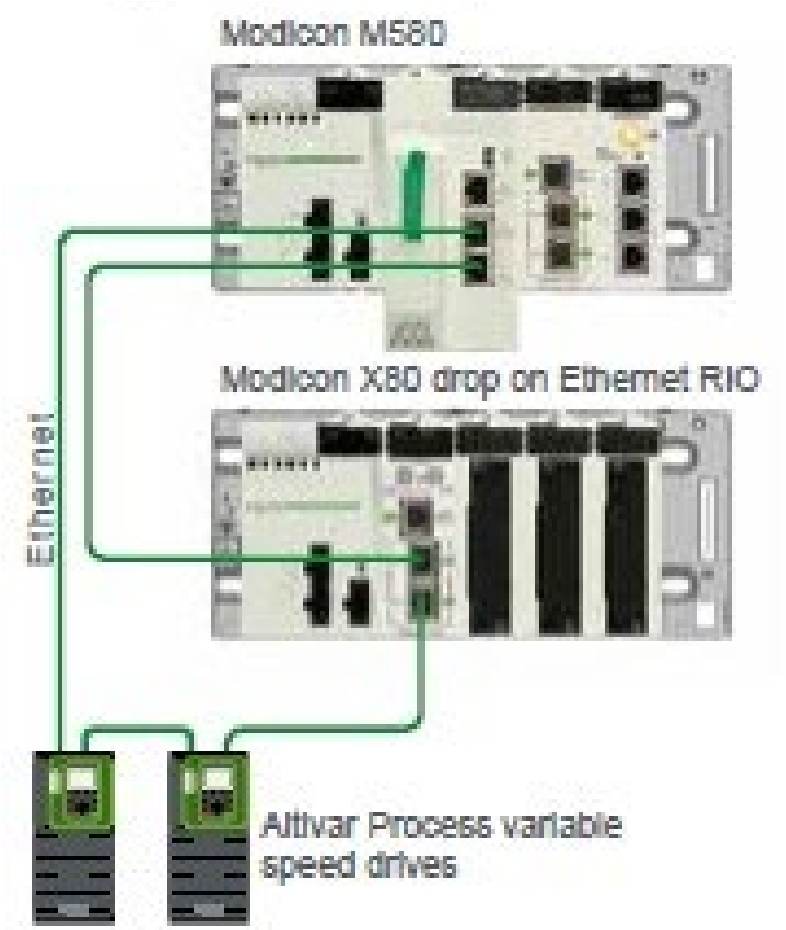


Extend your process or application easily with flexible Modicon M580 topology

(*) Management of AS-Interface and HART in PES applications requires programming in addition to the hardware configuration and objects instantiation.

Optimized architecture

- Simple daisy chain loop

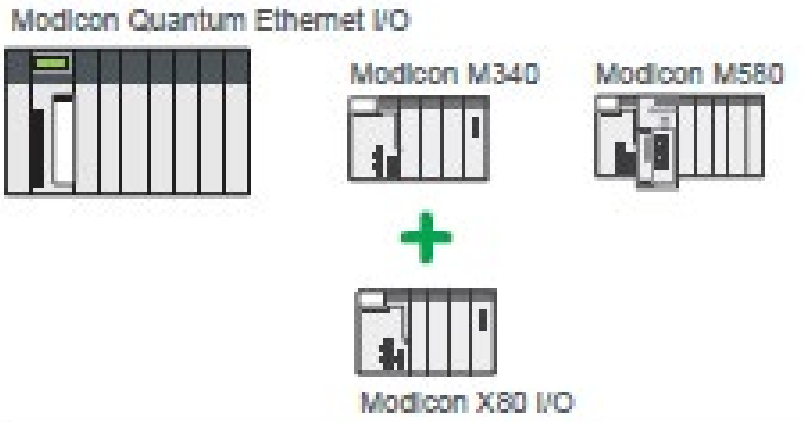


No switches required for simple main loop

Sustainable

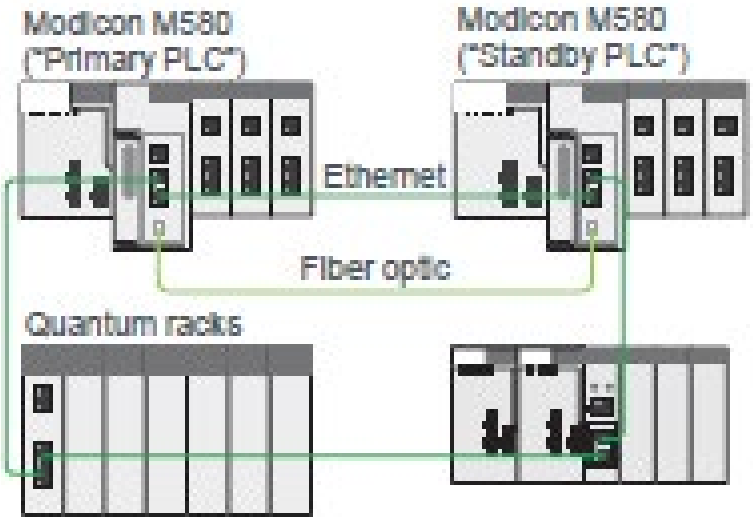
Helping to protect investments

- Standardize on the Modicon family with common X80 modules and reduce training and maintenance costs



Modicon family with common X80 modules

- Keep your existing Quantum I/O and wiring
- Smooth migration paths for both hardware (quick wiring adapter) and software (SW converters).



Installed base migration: keep your existing Modicon Quantum I/O and wiring

13.2.2 Architectures

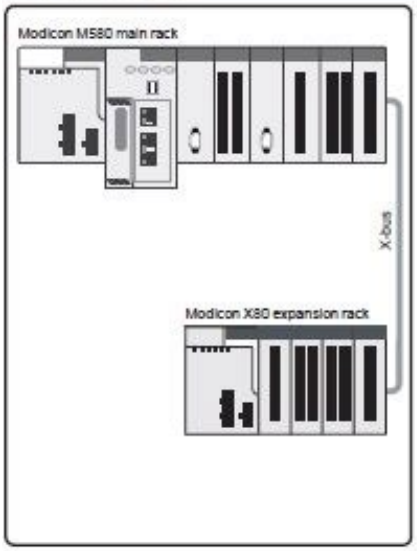
13.2.2.1 Overview

Different architectures

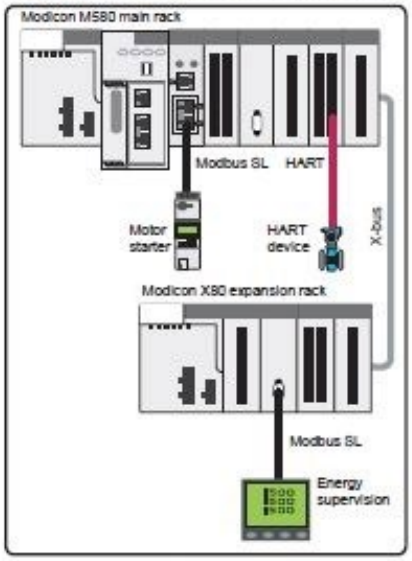
The Modicon M580 ePAC offers different embedded networks to meet various architecture needs:

- Standard Ethernet DIO ports on BMEP58xx20 processors for local I/O architecture, integrated fieldbus architecture, and distributed I/O
- Dual Ethernet RIO ports on BMEP58xx40 for remote I/O architecture

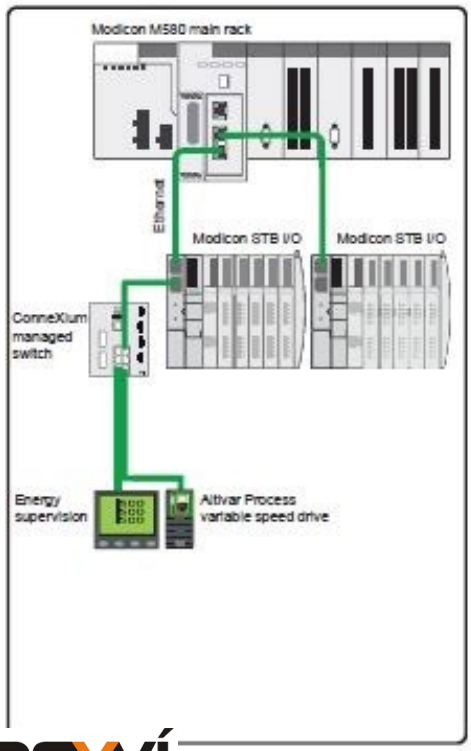
Local I/O architecture: Composed of hard-wired I/O; mainly compact topology



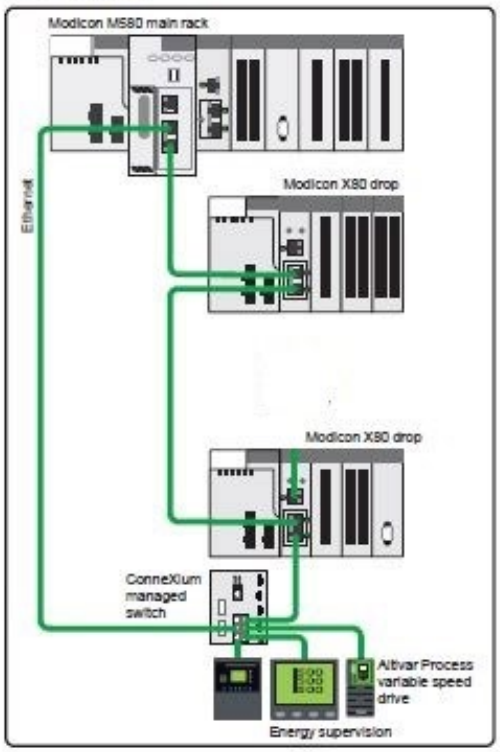
Integrated fieldbus architecture: Composed of devices distributed over fieldbuses; mainly compact topology



Distributed I/O architecture: Composed of devices distributed over Ethernet; ideal for mainly distributed topologies



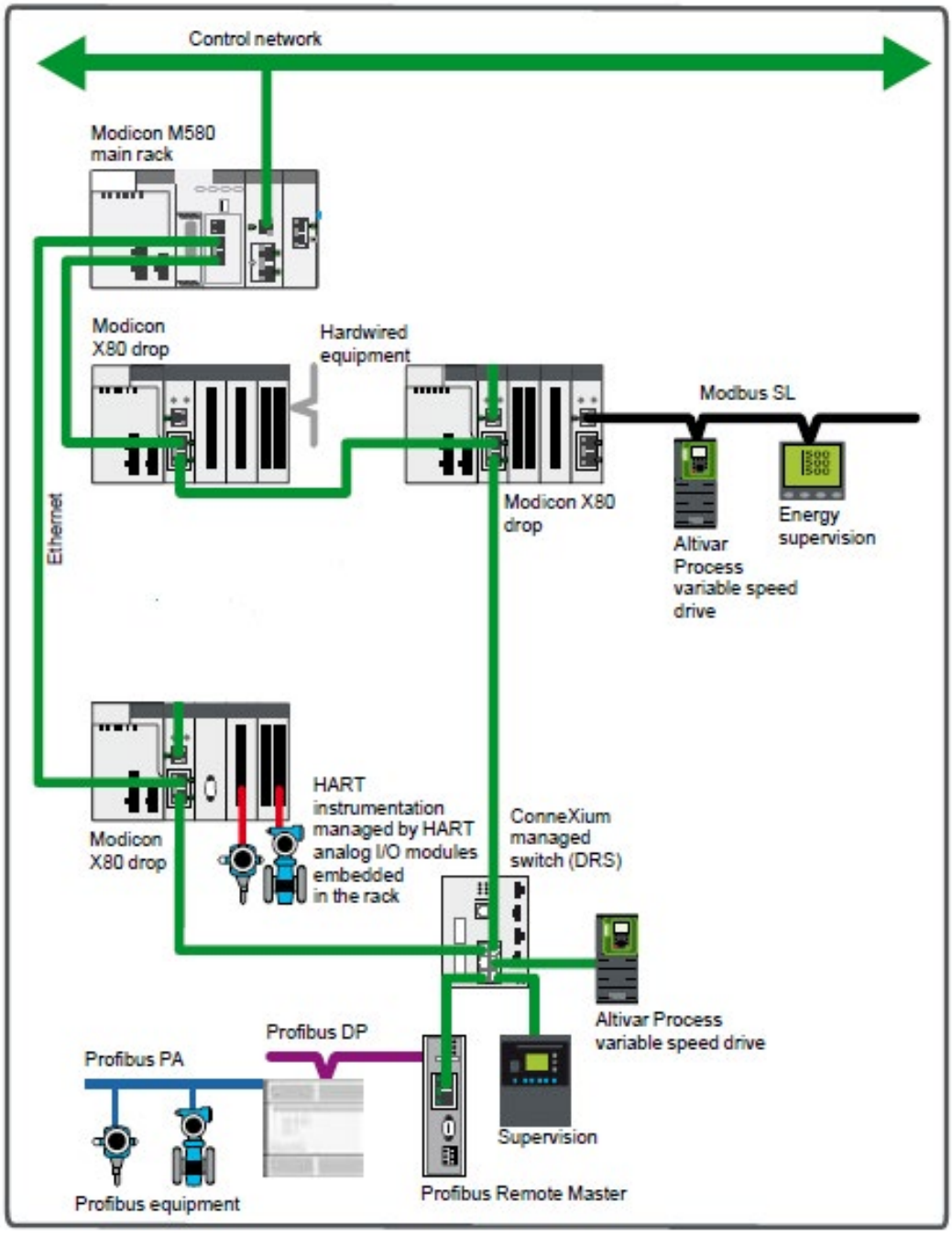
Remote I/O architecture: Uses Ethernet racks. Composed of remote devices and features remote functions, such as fieldbus master



13.2.2.2 Examples of architectures

This hardware architecture is based on M380 with X80 drops embedding the I/Os, combined with remote devices on Ethernet.

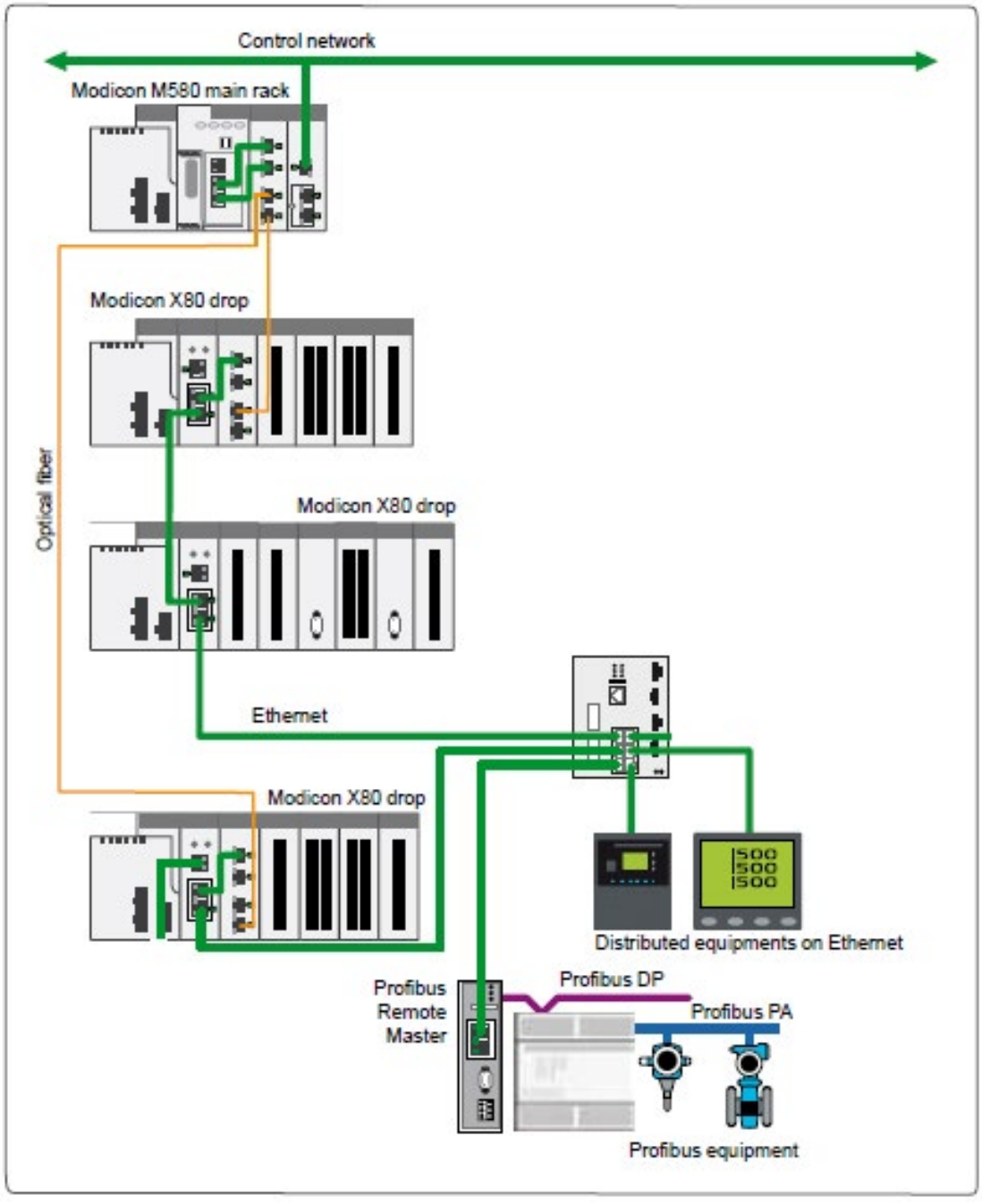
Instruments are connected on Hart I/O modules in a remote rack or through a Profibus DP remote master.



Management of HART in PES applications requires programming in addition to the hardware configuration and objects instantiation

13 Automation Platforms selection guide

This hardware architecture targets a wide control system with X80 remote racks connected through optical repeaters to an M380 main rack. In addition, there are distributed equipment on Ethernet, combined with instruments on Profibus connected through a remote master.

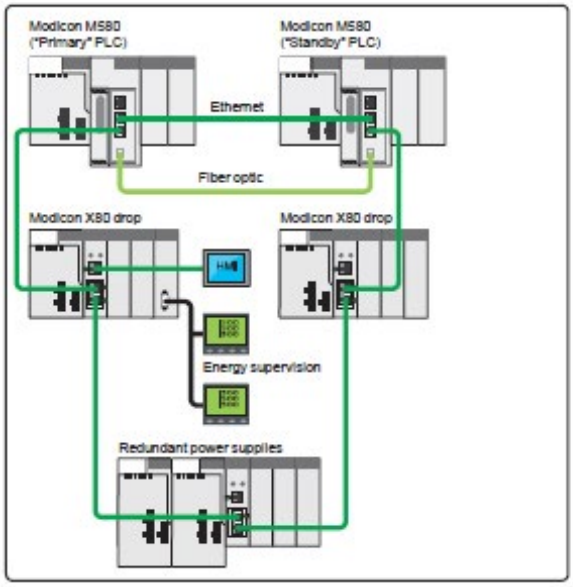


Redundant architectures

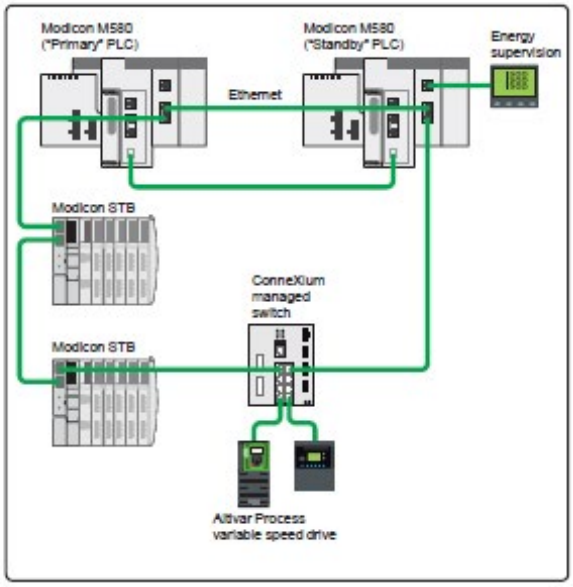
With BEMH58xx40 processors dedicated to the redundant system, redundant architectures are used for more demanding applications:

- Remote I/O
- Distributed I/O
- Mixed RIO/DIO

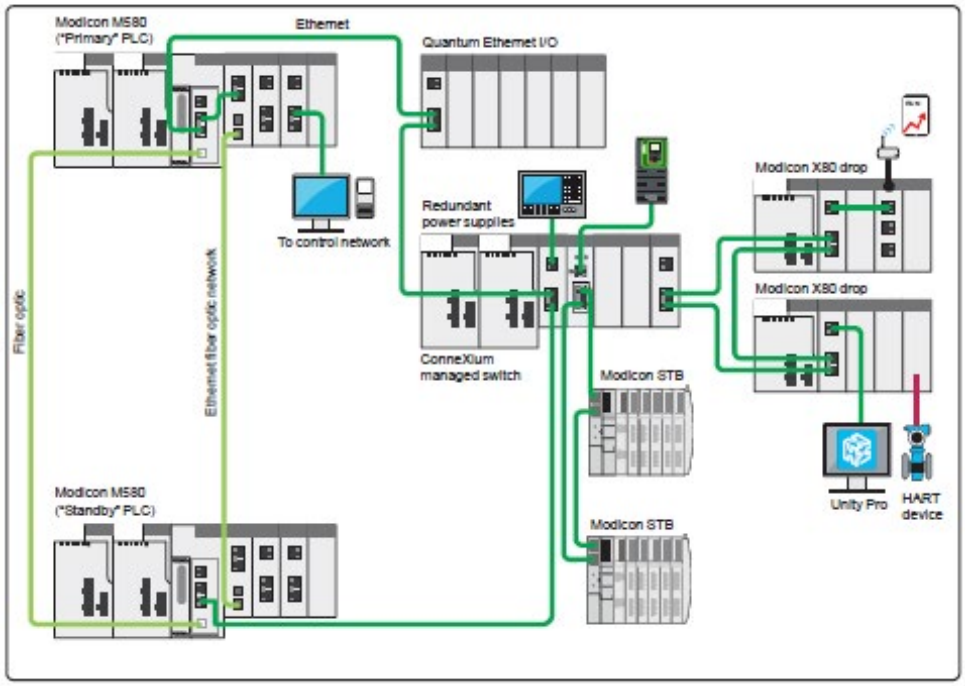
Remote I/O architecture: Composed of remote devices and features remote functions



Distributed I/O architecture: Composed of distributed devices under HSBY structure



Mixed RIO/DIO architecture: Composed of a complex architecture with remote IO and distributed IO, making it a particularly flexible solution for connection to a wider range of devices



13.2.2.3 I/O architectures

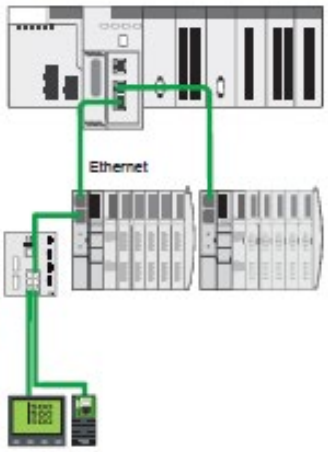
The following two pages give an overview of I/O architectures. The list of modules that can be installed in a Modicon X80 rack is provided in a dedicated section later in this document.

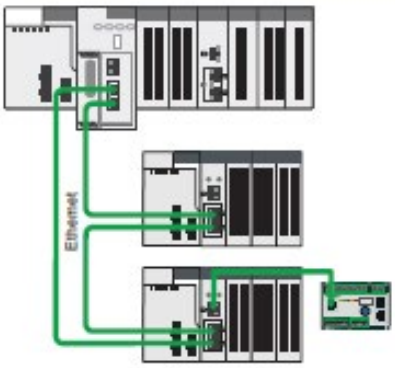
Modicon M580 type of architecture *Note: These architectures can be combined with each other*	Architectures with local racks (main rack and expansion racks)	
	Hardwired	Distributed peripherals over fieldbuses
	Compact topology with devices hardwired on local I/O	Compact topology with devices distributed over fieldbuses
	Local I/O architecture	Fieldbuses integrated architecture

Expanded rack (with X-bus rack expansion module)		Main local rack with up to 7 local expansion racks on X-bus (Modicon Premium or Modicon X80 racks)
Backplane compatibility	BMEXBP••00 Ethernet + X-bus racks	Compatible for main racks (local or remote)
	BMXXBP••00 X-bus racks PV02 (or later)	Mandatory for expansion racks (main or remote) Compatible with any rack provided that no Modicon X80 I/O Ethernet modules (such as weighing, HART, and BMECRA31210 modules), are used in the racks
Compatible CPU types		All standalone processors are compatible *(1)*
CPU Ethernet ports	SERVICE port	One SERVICE port for HMI, Unity, control network, variable speed drive, etc.
	Dual port	Dual ports are not used
RIO drops		–
Communication	AS-interface and serial link modules**	Yes
	BMXNOR0200H RTU module	Yes
	Ethernet modules	Yes
Expert functions	PTO (Pulse Train Output) modules*	Yes
	Other expert modules: counter, SSI encoder, etc.*	Yes
Time stamping	1 ms max. BMXERT1604T module integrated in the ERT module	Yes
	10 ms with BMECRA31210 combined with discrete I/O modules in the RIO drop	–

(*) PTO, SSI encoders modules are not supported in PES architectures
(**) Management of HART and AS-Interface in PES applications requires programming in addition to the hardware configuration and objects Instantiation
(1) BMEP58xx40 CPUs are not mandatory
(2) BMXCRA31210 modules are also compatible

Architecture with local racks (main rack and expansion racks)	Architecture with racks in remote drops
Distributed peripherals and I/O over Ethernet	Remote over Ethernet
Distributed devices and I/O topology over Ethernet	Remote I/O + remote functions (including fieldbus master)
Distributed I/O architecture	Remote I/O architecture





Main local rack with up to 7 local expansion racks on X-bus (Modicon Premium or Modicon X80 racks)	Main local rack with up to 7 local expansion racks on X-bus (Modicon Premium or Modicon X80 racks), RIO drop with up to 1 remote expanded rack on X-bus (only Modicon X80 racks)
Compatible for main racks (local or remote)	
Mandatory for expansion racks (main or remote) Compatible with any rack provided that no Modicon X80 I/O Ethernet modules (such as weighing, HART, and BMECRA31210 modules), are used in the racks	
All standalone processors compatible *(1)*	BMEP58●●40 CPUs are required to manage RIO
One SERVICE port for HMI, Unity, control network, variable speed drive, etc.	
Dual ports are used for distributed equipment (DIO scanner)	Dual ports are used for remote equipment (RIO scanner), BMECRA31210 Ethernet drop adapter is mandatory in RIO drop *(2)*
–	A maximum of 16 RIO drops can be supported in an M580 network
Yes	Yes, in a local rack or in a RIO drop
Yes	Yes, only in a local rack
Yes	Yes, only in a local rack
Yes	Yes, only in a local rack
Yes	Yes, in a local rack or in a RIO drop
Yes	Yes, in a local rack or in a RIO drop
–	Yes, only in the RIO drop, system mode with OFS *(2)*

13.2.3 Modicon M580 processors

The following two pages give an overview of I/O architectures. The list of modules that can be installed in a Modicon X80 rack is provided in a dedicated section later in this document

Modicon M580 platform for Unity Pro software offer			BMEP5810 model	BMEP5820 models	
					
Racks	Maximum number of local racks		4		
	Remote I/O drop of 2 racks		–	–	6
I/O	Maximum number of discrete local I/O channels *(1)*		1,024	2,048	
	Maximum number of analog local I/O channels *(1)*		256	512	
	Maximum number of Ethernet DIO devices		61	125	61
In-rack application-specific channels	Maximum number of application-specific channels		24	32	
	Counter *(1)*		**BMXEHC0200** 2-channel (60 kHz) or **BMXEHC0800** 8-channel (10 kHz) modules		
	Motion control *(1)* *		**BMXMSP0200** 2-channel PTO (Pulse Train Output) module for servo drives		
	Serial link (process or RTU) *(1)*		**BMXNOM0200** 2-channel module or **BMXNOR0200H** module with 1 RTU serial channel		
	HART*(1)***		**BMEAHI0812** 8-channel HART analog input (4–20 mA) module or **BMEAHO0412** 4-channel HART analog output (4–20 mA) module		
	SSI encoder *(1)**		**BMXEAE0300** 3-channel module (SSI)		
	Time stamping *(1)*		**BMXERT1604T** 16-channel discrete input (with 1 ms resolution) module		
	Process control, programmable loops		Process control EFB library		
Integrated communication ports	Ethernet service port (RJ45)		1 port for DIO devices, Unity, CNM, HMI, SCADA, diagnosis & external tools		
	Ethernet device network dual ports (RJ45)		2 ports support DIO scanner		2 ports support both RIO and DIO scanner
	USB port		1 programming port (PC terminal)		
Communication modules *(1)*	Ethernet network	Maximum number	2		
		Type of module	**BMENOC03•1** network modules with 1 EtherNet/IP channel or Modbus TCP communication protocol		
	AS-Interface *	Maximum number	8		
		Type of module	**BMXEIA0100** master module		
Internal memory capacity	Program (MB)		4	8	
	Data (KB)		384	768	
	Data storage (GB)		4		
Application structure	Master task		2 processing modes (cyclic, periodic)		
	Fast task		1 processing mode (periodic)		
	Auxiliary tasks (AUX 0, AUX 1)		1 processing mode (periodic)		
	Event tasks	I/O event	64		
		Timer event	16		
		Total I/O and Timer event	64		
No. of K instructions executed per ms	100% Boolean (Kinstr/ms)		10		
	65% Boolean + 35% fixed arithmetic (Kinstr/ms)		7.5		
Product compatibility with Quantum	Support of Ethernet remote I/O		–		
	LL984 Editor***		–		
Rack power supply			24 V ⎓ isolated, 24…48 V ⎓ isolated, or 100…240 V ∿ power supply module		
Modicon M580 processor			BMEP581020	BMEP582020	BMEP582040

(1) The maximum values for the number of I/O, application-specific channels, and the number of networks are not cumulative (they are limited by the maximum number of slots in the configuration, 1 rack: 11, 2 racks: 23, 3 racks: 35, and 4 racks: 47).
(2) Data and program share a maximum of 64 MB memory capacity. 4 MB configurable retained data can be saved upon power cycle.
(*) Motion control (PTO),SSI encoders, are not supported in PES architectures
(**) Management of HART and AS-Interface in PES applications requires programming in addition to the hardware configuration and objects Instantiation
(***) Program with LL984 is not supported in PES applications

BMEP5830 models		BMEP5840 models		BMEP5850 model	BMEP5860 model
					
8				8	
–	16	–	16	31	
3,072		4,096		5,120	6,144
768		1,024		1,280	1,536
125	61	125	61	61	61
64				180	216
BMXEHC0200 2-channel (60 kHz) or **BMXEHC0800** 8-channel (10 kHz) modules					
BMXMSP0200 2-channel PTO (Pulse Train Output) modules for servo drives					
BMXNOM0200 2-channel module or **BMXNOR0200H** module with 1 RTU serial channel					
BMEAHI0812 8-channel HART analog input (4–20 mA) or **BMEAHO0412** 4-channel HART analog output (4–20 mA) module					
BMXEAE0300 3-channel module (SSI)					
BMXERT1604T 16-channel discrete output (with 1 ms resolution) module					
Process control EFB library					
1 port for DIO devices, Unity, CNM, HMI, SCADA, diagnosis & external tools					
2 ports support DIO scanner	2 ports support both RIO and DIO scanner	2 ports support DIO scanner	2 ports support both RIO and DIO scanner		
1 programming port (PC terminal)					
3		4		6	
BMENOC03●1 network modules with 1 EtherNet/IP channel or Modbus TCP communication protocol					
8					24
BMXEIA0100 master module					
12		16		24	64
1,024		2,048		4,096	Up to 64 MB *(2)*
4				4	4
2 processing modes (cyclic, periodic)					
1 processing mode (periodic)					
1 processing mode (periodic)					
128					
32					
128					
20		40		50	
15		30		40	
–			Yes		
–			Yes		
24 V ⎓ isolated, 24…48 V ⎓ isolated, or 100…240 V ∿ power supply module					
BMEP583020	**BMEP583040**	**BMEP584020**	**BMEP584040**	**BMEP585040**	**BMEP586040**

13.2.4 Communication, integrated ports and modules

Applications		Ethernet communication		
Type of device		Processors with integrated Modbus/TCP port		
				
Network protocols		◀ EtherNet/IP and Modbus/TCP*		
Structure	Physical interface	10BASE-T/100BASE-TX		
	Type of connector	RJ45		
	Access method	CSMA-CD		
	Data rate	10/100 Mbps		
Medium		Double twisted pair copper cable, category CAT 5E		
Configuration	Maximum number of devices	128 DIO *(3)*	31 RIO drops and 64 DIO *(3)*	64 DIO *(3)*
	Maximum length	100 m/*328.08 ft* (copper cable), 4,000 m/*13,123.32 ft* (multimode optical fiber), 32,500 m/*106,627 ft* (single-mode optical fiber) *(1)*		
	Number of modules of the same type per station	1		
Standard services		Modbus/TCP messaging and EtherNet/IP services		
Embedded web server services	Standard services	Status Summary, Performance, Port Statistics, I/O Scanner, Quality of Service (QoS), Messaging, Network Time Service, Redundancy, and Alarm Viewer *(2)*		
	Advanced services	–		
Transparent Ready communication services	I/O Scanning service	Yes		
	Global Data service	–		
	NTP time synchronization	Yes		
	FDR service	Yes (server)		
	SMTP e-mail notification service	–		
	SOAP/XML web service	–		
	SNMP network management service	Yes		
	RSTP redundancy service	Yes		
	QoS (Quality of Service) service	Yes		
RTU communication services IEC 60870-5-104, DNP3 IP or IEC 60870-5-101, DNP3 serial	Master or Slave configuration	–		
	Time and date stamped data exchange	–		
	RTU time synchronization	–		
	Management and buffering of time and date stamped events	–		
	Automatic transfer of time and date stamped events to the Master/SCADA	–		
Data Logging service		Yes		
Compatibility with processor		–		
Processor or module references depending on other type of integrated port *(5)*	None			
	Serial link			
	Ethernet Modbus/TCP			
	CANopen			
	DIO service	BMEP58•020		
	DIO and RIO services		BMEP58•040	BMEH58•040

(1) Fiber requires use of other products (for example, an Ethernet switch or the BMXNRP020p module) to convert from the twisted pair connectors (RJ45) that these products have

(2) For BMx584040/5040/6040 processors, Rack Viewer is now available

s/TCP for implicit and explicit messaging in PES architectures

Ethernet communication		RTU communication**	
Ethernet modules		RTU module	
			
◀ EtherNet/IP and Modbus/TCP *		◀ Modbus/TCP, IEC 60870-5-104, DNP3 (subset level 3)	◀ Serial link, external modem link, IEC 60870-5-101, DNP3 (subset level 3)
10BASE-T/100BASE-TX		10BASE-T/100BASE-TX (Modbus/TCP), PPPoE (Point-to-Point Protocol over Ethernet) for ADSL external modem link	Non-isolated RS 232/485 (serial link), non-isolated RS 232 (Radio, PSTN, GSM, GPRS/3G external modem link)
3 RJ45 connectors (2 connectors for a ring topology) plus Ethernet backplane connection		RJ45	RJ45
CSMA-CD		CSMA-CD (Modbus/TCP), Master/slave (IEC 104/DNP3)	Master/slave (IEC 101/DNP3)
10/100 Mbps		10/100 Mbps (Modbus/TCP)	0.3…38.4 Kbps (serial link)
Double twisted pair copper cable, category CAT 5E			Double shielded twisted pair copper cable, crossover serial cable (serial link), direct serial cable (external modem link)
128 (EtherNet/IP or Modbus/TCP) *(4)*		128 (Modbus/TCP), 64 slaves/servers (IEC 104/DNP3)	32 max.
100 m/*328.08 ft* (copper cable), 4,000 m/*13,123.32 ft* (multimode optical fiber), 32,500 m/*106,627 ft* (single-mode optical fiber)			1,000 m/*3,280.83 ft* (serial link with insulating case)
Up to 6 Ethernet modules per station depending on processor		Up to 8 RTU modules per station depending on processor	Depending on application-specific channels (20/36 application-specific channels with BMEP58•0•0)
Modbus/TCP messaging and EtherNet/IP services		Modbus/TCP messaging	Reading/writing discrete and analog I/O, counters
Standard level PLC web diagnostics		Status Summary, Performance, Port Statistics, I/O Scanner, Quality of Service (QoS), Network Time Service, Messaging	–
–	Custom web pages, Rack Viewer, ePAC Program Viewer, Customizable dashboard, and Trend Viewer	Hosting and display of user web pages	–
Yes		–	
–		–	
–		Yes	
Yes (server)		Yes (client)	–
–		Yes	–
–		Server	–
Yes		Yes (agent)	–
Yes		–	
Yes		–	
–		Yes, IEC101/104 and DNP3	
–		Interrogation via polling and exchanges on change of status (RBE), unsolicited messaging	
–		Yes, IEC101/104 and DNP3	
–		Yes, IEC101/104 and DNP3	
–		Yes, IEC101/104 and DNP3 Buffer holding 10,000 events (per connected client, 4 clients max.)	
–		Yes, on SD 128 MB memory card, in CSV files, access via FTP or sent by e-mail	
All Modicon M580 processors		All Modicon M580 BMP58•••• standalone processors	
BMENOC0301	**BMENOC0311**		
		BMXNOR0200H	
			BMXNOR0200H

(3) Including 3 connections reserved for Peer-to-Peer communications (“local slaves” function)
(*) Use only Modbus/TCP for implicit and explicit messaging in PES architectures
(**) Management of communication with the RTU module requires programming in refinement

Applications		AS-Interface communication*	Serial link communication
Type of device		AS-Interface actuator/sensor bus module	2-channel serial link module
			
Network protocols		AS-Interface	Modbus and Character mode
Structure	Physical interface	AS-Interface V3 standard	Non-isolated RS 232, 8-wire Isolated RS 485, 2-wire
	Type of connector	3-way SUB-D	2 RJ45 and 1 RJ45
	Access method	Master/slave	
	Data rate	167 Kbps	0.3...115.2 Kbps in RS 232 0.3...57.6 Kbps in RS 485
Medium		Two-wire AS-Interface cable	Shielded twisted pair copper cable
Configuration	Maximum number of devices	62 slaves	2 per drop, 16 per Ethernet remote I/O (RIO) network max.
	Max. length	100 m/*328.08 ft*, 500 m/*1,640.42 ft* max. with 2 repeaters	15 m/*48.21 ft* with non-isolated RS 232, 1,000 m/3,280.83 ft with non-isolated RS 485
	Number of links of the same type per station	All M580 processors: 4 AS-Interface modules	All M580 processors: 36 application-specific channels (1 application-specific channel = 1 counter, motion control module or serial link channel)
		BMECRA31210 Ethernet drop adapter: 2 AS-Interface modules	36 application specific channels max. 2 **BMXNOM0200** modules per **BMECRA31210** Ethernet drop adapter
Standard services		Transparent exchanges with the sensors/actuators	Read/write bits and words, diagnostics in Modbus mode Send and receive character string in Character mode
Conformity class		M4 profile	–
Embedded Web server service	Standard service	–	–
	Advanced services	–	–
Communication services		–	–
		–	–
		–	–
		–	–
		–	–
		–	–
24 V ⎓ external power supply		–	–
Type of processor or module depending on other integrated port	None	**BMXEIA0100**	
	Serial link		**BMXNOM0200**
	Ethernet Modbus/TCP		
	CANopen		

(4) Including 16 connections reserved for Peer-to-Peer communications ("local slaves" function).
(5) CANopen can be used, but it is necessary to use Modicon STB I/O. Please consult the "IP 20 distributed inputs/outputs – Modicon STB" catalog available on our website www.schneider-electric.com
(*) Management of AS-Interface in PES applications requires programming in addition to the hardware configuration and objects

13.3
Modicon Quantum automation platform

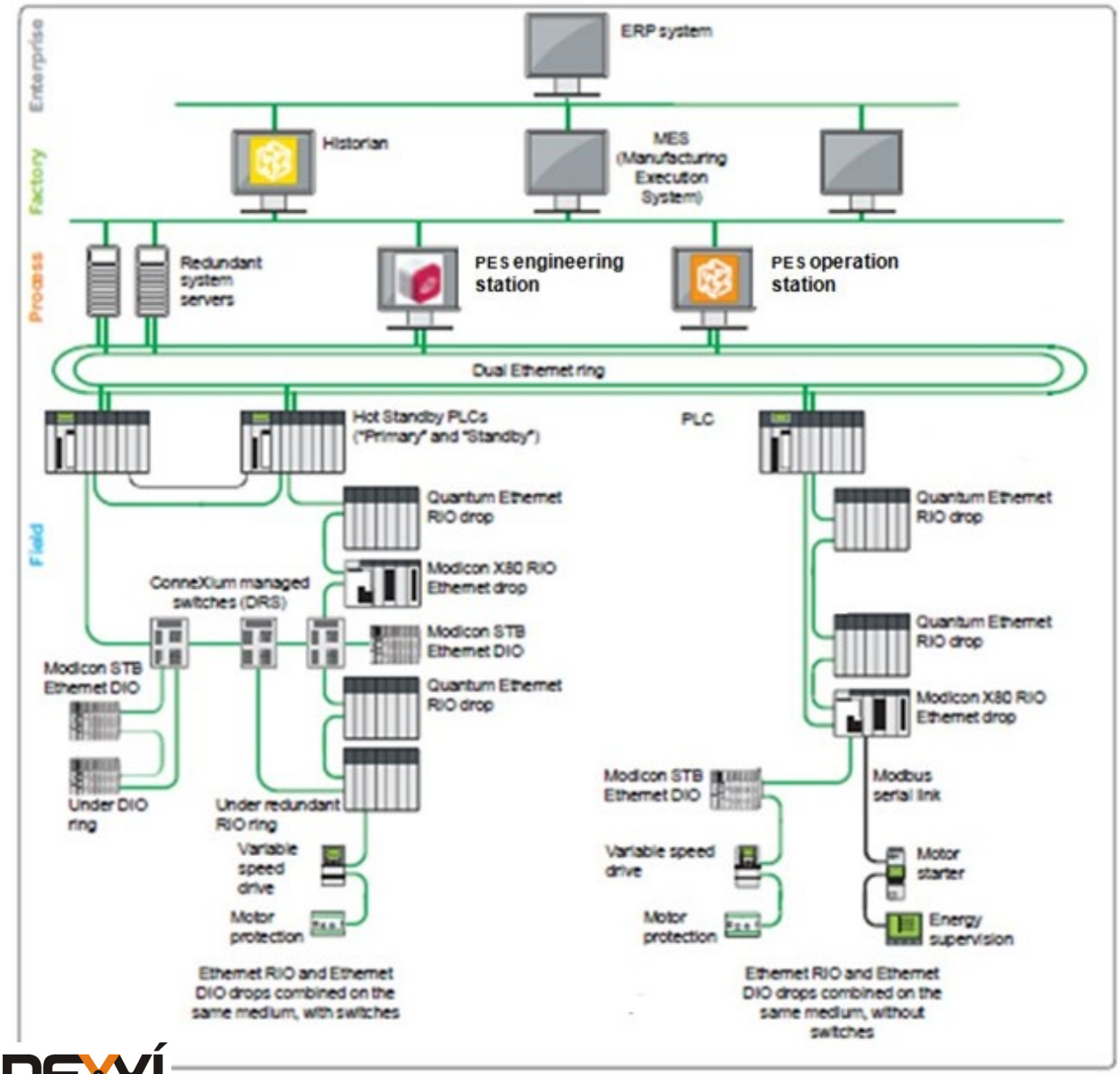
Limitations in support of architectures or hardware modules in the scope of application designed for Process Expert System architectures are identified in this document with an “(*)” in the module description, with a note at the bottom of the module description tables.

The last chapter of this section gives a summary of all unsupported modules for the automation platform.

13.3.1 Architectures

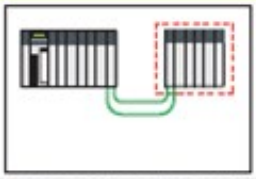
Different architectures based on the Quantum automation platform are possible, such as:

- S908 bus for Quantum drops
- Ethernet RIO drops and X80 I/O architectures, with or without ConneXium managed switches
- Architectures with separate or combined Ethernet RIO and Ethernet DIO devices on the same physical medium
- Hot Standby (HSBY) architectures

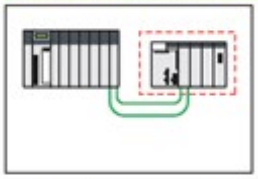
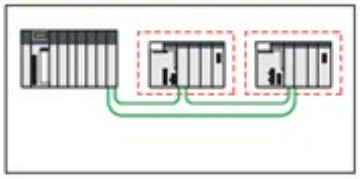
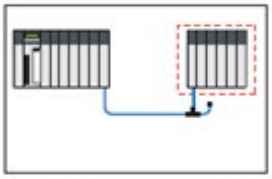


I/O Architectures

The following two pages give an overview of I/O architectures. The list of modules that can be installed in a Modicon X80 rack is provided in a dedicated section later in this document.

Modicon Quantum type of architecture		Local I/O	Ethernet I/O
			Quantum Ethernet RIO drop
			
Drop type		Primary rack with Quantum secondary rack	Primary rack and Ethernet RIO rack Option of adding a secondary rack to the primary rack
Capacity per drop *(1)*	I/O	No limit (max. 27 slots)	No limit (max. 26 slots)
	Function	–	
	Communication	–	
Time stamping *(2)*	1 ms max. with BMX ERT 1604T module with I/O integrated in the ERT module	–	
	10 ms max with BMX CRA 31210 module combined with discrete I/O modules	–	
	1 ms max with 140 ERT 85420 module with I/O integrated in to the ERT module	Applications	
Redundant/summable power supply		Yes	Yes
Dual port		–	Yes
Electrical/fibre optic converter in the rack		–	–
I/O services (DDT, forcing)		–	–
Dimensions	Width x height in mm for a 6-slot rack (overall)	265 x 290	
Certifications *(3)*		CEI/EN 61131-2, CSA 22.2 N° 142, UL 508, CE (see page 10/10) ATEX Zone 2/22 *(4)* (see pages 10/2 and 10/20)	
Compatible CPU types		All CPUs	Double-slot CPUs 140 CPU 6●●●●

(1) The maximum values for the number of discrete I/O and analog I/O are not cumulative
(2) "Solution mode" allows time and date-stamped events to be formatted in the OPC Factory server without having to program the controller
(3) Updated certifications shown on our website: www.schneider-electric.com
(4) Please refer to the specific user guide supplied with each product
umber of NOM serial link modules is limited to 4 per project

Ethernet I/O		S908 bus RIO
Modicon X80 RIO drop with CRA drop adaptor type		Quantum S908 RIO drop
BMX CRA 31200 standard	BMX CRA 31210 high performance	
		
Primary rack and secondary rack + a Modicon X80 I/O rack and secondary rack	Primary rack and secondary rack + two Modicon X80 I/O racks and secondary rack	Primary rack and S908 bus RIO rack
Discrete I/O: 128 I/128 O Analog I/O: 16 I/16 O	Discrete I/O: 1024 I/1024 O Analog I/O: 256 I/256 O	Discrete I/O: 1024 I/1024 O Analog I/O: 64 I/64 O
–	36 modules: ERT multifunction, EHC counter modules	–
–	2 NOM serial link communication modules *(5)*	–
–	Application or "Solution mode" *(2)*	–
–	Application or "Solution mode" *(2)*	–
–		Applications
–		Yes
Yes		With 140 CRA 932 00 module
Yes		–
Yes		–
307.6 x 100		265 x 290
CEI/EN 61131-2, CSA 22.2 N° 142, UL 508, CE (see page 10/10) ATEX Zone 2/22 *(4)* (see pages 10/2 and 10/20)		CEI/EN 61131-2, CSA 22.2 N° 142, UL 508, CE (see page 10/10) ATEX Zone 2/22 *(4)* (see pages 10/2 and 10/20)
Double slot CPUs 140 CPU 6●●●●		All CPUs

13.3.2 Modicon Quantum processors

Automation platform for Unity Pro software offer			Simple applications*	Simple and complex applications*
				
Number of racks 3/4/6/10/16 slots	Local I/O		2 racks (1 main + 1 expansion)	
	Remote I/O (RIO)		31 drops of 2 racks	
Maximum discrete I/O	Local I/O		No limit (max. 27 slots)	
	Remote I/O (RIO) on S908 bus *(1)*		31,000 input channels and 31,000 output channels	
	Remote Ethernet I/O (RIO)		–	
Maximum analog I/O	Local I/O		No limit (max. 27 slots)	
	Remote I/O (RIO) on S908 bus *(1)*		230 input channels and 230 output channels	
	Remote Ethernet I/O (RIO)		–	
Application-specific modules			High-speed counter, interrupt inputs, serial link, accurate time stamping	
Number of communication modules and axes (in local rack)	Ethernet TCP/IP, Modbus Plus, Profibus DP, Sy/Max Ethernet, SERCOS, all combinations**		2	6
Bus connections	Modbus**		2 integrated RS 232 Modbus RTU/ASCII ports	
	AS-Interface actuator/sensor bus****		Limited number: 4 on local rack, 4 on remote rack (RIO)	
	Profibus DP *(2)***		2 "option" modules on local rack	6 "option" modules on local rack
Network connections	Modbus Plus		1 integrated port, 2 "option" modules on local rack	1 integrated port, 6 "option" modules on local rack *(3)*
	Ethernet TCP/IP		2 "option" modules on local rack	6 "option" modules on local rack
	USB		–	
Redundancy			Power supplies, remote I/O network, Modbus Plus modules, Ethernet TCP/IP modules, Profibus module	
Hot Standby			–	
Application structure	Master task		1 cyclic/periodic	
	Fast task		1 periodic	
	Auxiliary tasks		0	
	Interrupt tasks	Max. number	128	
		I/O interrupt	64	
		Timer interrupt	16	
Number of Kinstructions executed per ms	100% Boolean		1.86 Kinst/ms	
	65% Boolean and 35% numerical		2.49 Kinst/ms	
Memory capacity without PCMCIA card	IEC program and data		548 KB	1056 KB
Memory expansion with PCMCIA card	Program		–	
	Data		–	
	File storage		–	
Bus current required			1800 mA	
Functional safety certification			–	
Approvals			UL 508, CSA 22.2-142, FM Class 1 Div 2, CE, ATEX Zone 2/22 *(7)*	
Type of Quantum CPU			140 CPU 311 10	140 CPU 434 12 U

1) The maximum values for the number of discrete I/O and analog I/O are not cumulative
(2) Profibus DP module by our Technology Partner, Prosoft (Collaborative Automation Partner Program)
(3) Modbus Plus modules: Only the first 2 of the 6 modules feature the full range of functions
(4) Max.distance between the 2 Hot Standby CPUs: up to 4 k
(*) Single slot CPUs should be exceptionally considered for PES applications due to their limited capabilities
(**) Sercos, Symax Ethernet, and Modbus Plus are not supported in PES architectures
(***) Management of AS-Interface in PES applications requires programming in addition to the hardware configuration and objects instantiation
…le from Prosoft is not known in PES, but can be used in projects with complementary designs

Complex applications			Applications with redundancy (Hot Standby)		
					
2 racks (1 main + 1 expansion)			–		
31 drops of 2 racks (1 main + 1 expansion)					
No limit (max. 26 slots)					
31,000 input channels and 31,000 output channels					
82,000 input channels and 82,000 output channels per network					
No limit (max. 26 slots)					
230 input channels and 230 output channels					
6900 input channels and 6900 output channels per network					
High-speed counter, interrupt inputs, serial link, accurate time stamping					
6					
1 integrated RS 232/485 Modbus RTU/ASCII port					
Limited number: 4 on local rack, 4 on remote rack (RIO)					
6 "option" modules on local rack					
1 integrated port, 6 "option" modules on local rack *(3)*					
1 integrated port (10BASE-T/100BASE-TX), 6 "option" modules on local rack *(6)*			1 integrated 100BASE-FX Hot Standby multimode port *(4)*, 6 "option" modules on local rack *(6)*		1 integrated 100BASE-FX Hot Standby single mode port *(5)*, 6 "option" modules on local rack *(6)*
1 port reserved for programming PC					
Power supplies, remote I/O network, Modbus Plus modules, Ethernet TCP/IP modules, Profibus module					
–			Yes		
1 cyclic/periodic					
1 periodic					
4					
128					
128					
32					
10.28 Klnst/ms					
10.07 Klnst/ms					
768 KB	1024 KB	3072 KB	1024 KB	3072 KB	
Up to 7168 KB					
512 KB	1024 KB	3072 KB	1024 KB	3072 KB	
8 MB (PCMCIA expansion in CPU slot no. 0 and/or no. 1)					
2160 mA	2760 mA		2500 mA		
–					
UL 508, CSA 22.2-142, FM Class 1 Div 2, CE, ATEX Zone 2/22 *(7)*					
140 CPU 651 50	**140 CPU 651 60**	**140 CPU 652 60**	**140 CPU 671 60**	**140 CPU 672 60**	**140 CPU 672 61**

13.3.3 Power supply modules

Applications	Standalone			Summable
				
Input voltage	100…276 V ∿	20…30 V ⎓	100…150 V ⎓	93…138 V ∿ or 170…276 V ∿
Input frequency	47…63 Hz	–		47…63 Hz
Input current	0.4 A at 115 V ∿ 0.2 A at 230 V ∿	1.6 A	0.4 A	1.3 A at 115 V ∿ 0.75 A at 230 V ∿
External fuse	1.5 A slow-blow	2.5 A slow-blow	0.7 A slow-blow	2.0 A slow-blow
Maximum power interruption	1/2 cycle at full load	1 ms at 20 V ⎓	1 ms max.	1/2 cycle at full load
Output voltage to bus	5.1 V ⎓			
Output current	3.0 A max.			Standalone: 11 A at 60°C Summable: 20 A at 60°C
Output protection	Overcurrent, overvoltage			
Power dissipation in the module	2.0 + (3 x I_{out}) in W, where I_{out} is in A			6.0 + (1.5 x I_{out}) in W, where I_{out} is in A
Alarm relay	No			Yes
Functional safety certification	–			
Approvals	UL 508, CSA 22.2-142, cUL, FM Class 1 Div. 2, CE			
Type of module	140 CPS 111 00	140 CPS 211 00	140 CPS 511 00	140 CPS 114 20

Summable		Redundant				
						
20…30 V ⎓	40…60 V ⎓	93…138 V ∿ or 170…276 V ∿		20… 30 V ⎓	40…60 V ⎓	100…150 V ⎓
–		47…63 Hz		–	47…63 Hz	
3.8 A max.	1.2 A at 48 V ⎓	1.1 A at 115 V ∿ 0.6 A at 230 V ∿		3.8 A max.	1.3 A at 48 V ⎓	0.5 A at 125 V ⎓
5.0 A slow-blow	2.5 A slow-blow	2.0 A slow-blow		5.0 A slow-blow	2.5 A slow-blow	2.0 A slow-blow
1 ms at 24 V ⎓	13 ms at 40 V ⎓	1/2 cycle at full load		1 ms at 24V ⎓	13 ms at 40 V ⎓	1 ms max.
5.1 V ⎓						
8.0 A at 50°C 7.0 A at 60°C		8.0 A at 60°C	11 A at 60°C	8.0 A at 40°C 6.0 A at 60°C	11 A at 60°C	8 A
Overcurrent, overvoltage						
6.0 + (1.8 x I_{out}) In W, where I_{out} is in A	15.6 W at 8 A	6.0 + (1.5 x I_{out}) In W, where I_{out} is in A		6.0 + (1.8 x I_{out}) In W, where I_{out} is in A	17.2 W at 8 A	6.0 + (1.5 x I_{out}) In W, where I_{out} is in A
Yes		No	Yes			No
–		–	Non-interfering		–	
UL 508, CSA 22.2-142, cUL, FM Class 1 Div. 2, CE, ATEX Zone 2/22 *(1)*						
140 CPS 214 00 *(1)*	**140 CPS 414 00**	**140 CPS 124 00**	**140 CPS 124 20**	**140 CPS 224 00** *(1)*	**140 CPS 424 00**	**140 CPS 524 00**

13.3.4 Discrete I/O modules: DC inputs

Type		32-channel discrete input modules		
				
Input voltage		5 V ⎓ TTL	24 V ⎓	
Modularity	Number of channels	32		
	Number of groups	4		
	Number of channels per common	8		
Isolation		By group		
Logic		Negative *(source)*	Positive *(sink)*	Negative *(source)*
I/O addresses		2 input words		
Protection of inputs		Resistor-limited		
Bus current required		170 mA	330 mA	
Power dissipation		5 W	1.7 + (0.36 x no. of channels at state 1) in W	1.5 + (0.26 x no. of channels at state 1) in W
External power supply (U_p)		4.5...5.5 V ⎓	–	19.2...30 V ⎓
External fuses		Depending on use		
Online modification of configuration *(1)*		Yes		
Functional safety certification		–	Non-interfering	–
Approvals		UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2, ATEX Zone 2/22 *(3)*		
Type of module		**140 DDI 153 10**	**140 DDI 353 00**	**140 DDI 353 10**

(1) For online modification of configuration, refer to the catalog
iires the Modicon Telefast ABE 7 pre-wired system

96-channel discrete input module	32-channel discrete input module	16-channel discrete input module	32-channel discrete input module	24-channel discrete input module
				
24 V ⎓		10..0.60 V ⎓		125 V ⎓
96	32	16	32	24
6	4	8	4	3
16	8	2	8	
Per group				
Positive *(sink)*				
6 input words	4 input words	1 input word	2 input words	
–				
270 mA	250 mA	200 mA	300 mA	200 mA
1.35 + (0.13 x no. of channels at state 1) in W	–	1 + (0.62 x no. of channels at state 1) in W		
19.2...30 V ⎓	20...30 V ⎓ at 20 mA per group	10...60 V ⎓ (group power supply)		
–		Depending on use		
Yes				
–				
UL 508, CSA 22.2-142, cUL, FM Class 1 Div. 2, CE, ATEX Zone 2/22 *(3)*				
140 DDI 364 00 *(2)*	**140 DSI 353 00** *(3)*	**140 DDI 841 00**	**140 DDI 853 00**	**140 DDI 673 00**

(3) Only Conformal Coating versions, depending on the model, are ATEX Zone 2/22 certified

13.3.5 Discrete I/O modules: AC inputs

Type		16-channel discrete input modules	32-channel discrete input modules	16-channel discrete input modules	32-channel discrete input modules
					
Input voltage		24 V ~		48 V ~	
Input frequency		47...63 Hz			
Modularity	Number of channels	16	32	16	32
	Number of groups	16	4	16	4
	Number of channels per common	1	8	1	8
Isolation		No common point	By group	No common point	By group
I/O addresses		1 input word	2 input words	1 input word	2 input words
Bus current required		180 mA	250 mA	180 mA	250 mA
Maximum dissipated power		5.5 W	10.9 W	5.5 W	10.9 W
External power supply		–			
External fuses		Depending on use			
Online modification of configuration *(1)*		Yes			
Functional safety certification		–			
Approvals		UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2, ATEX Zone 2/22 *(2)*			
Type of module		140 DAI 340 00	140 DAI 353 00	140 DAI 440 00	140 DAI 453 00

(1) For online modification of configuration, refer to the catalog

Coating versions, depending on the model, are ATEX Zone 2/22 certified

16-channel discrete input module		32-channel discrete input module	16-channel discrete input module	32-channel discrete input module
				
115 V ~			230 V ~	
47...63 Hz				
16		32	16	32
16	2	4	16	4
1	8		1	8
No common point	By group		No common point	By group
1 input word		2 input words	1 input word	2 input words
180 mA		250 mA	180 mA	250 mA
5.5 W		10.9 W	5.5 W	5 W
–				
Depending on use				
Yes				
–				
UL 508, CSA 22.2-142, cUL, FM Class 1 Div. 2, CE, ATEX Zone 2/22 *(2)*				
140 DAI 540 00	**140 DAI 543 00**	**140 DAI 553 00**	**140 DAI 740 00**	**140 DAI 753 00**

13.3.6 Discrete I/O modules: DC and relay outputs

Type		32-channel discrete output modules			96-channel discrete output modules
					
Output voltage		5 V ⎓ TTL	24 V ⎓		
Modularity	Number of channels	32			96
	Number of groups	4			6
	Number of channels per common	8			16
Logic		Negative *(sink)*	Positive *(source)*	Negative *(sink)*	Positive *(source)*
Maximum load	Current per channel	75 mA	0.5 A		0.5 A
	Current per group	600 mA	4 A		3.2 A
	Current per module	2.4 A	16 A		19.2 A
I/O addresses		2 output words			6 output words
Bus current required		350 mA	330 mA		250 mA
Power dissipation		4 W	*(2)*	2.0 + (0.4 x total module load current) in W	7 W (all outputs at state 1)
External power supply (U_p)		4.5...5.5 V ⎓	19.2...30 V ⎓		
External fuses		–	Per group: 5 A Per point: 3 A recommended		Depending on use
Online modification of configuration *(1)*		Yes			
Functional safety certification		–	*(3)*	–	
Approvals		UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2, ATEX Zone 2/22 *(5)*			
Module type		140 DDO 153 10	140 DDO 353 00 140 DDO 353 01 *(2)*	140 DDO 353 10	140 DDO 364 00 *(4)*

(1) For online modification of configuration, refer to the catalog
(2) 140 DDO 353 00 module: 1.75 + (0.4 x total module load current) in W140 DDO 353 01 module: 5 W, with all outputs at state 1
(3) DDO 353 00 is non-interfering

16-channel discrete output module	12-channel discrete output module	32-channel discrete output module	16-channel discrete relay output module	8-channel discrete relay output module
				
10...0.60 V ⎓	24...0.125 V ⎓	10...30 V ⎓ controlled outputs	NO contacts	NO/NC contacts
16	12	32	16	8
2		4	16	8
8	6	8	1	
Positive *(source)*			–	
2 A	0.75 A	0.5 A	2 A	5 A
6 A	3 A	4 A	–	–
12 A	6 A	16 A	–	40 A at 40°C 20 A at 60°C
1 output word	1 output word and 1 input word	2 output words and 2 input words	1 output word	0.5 output word
160 mA	375 mA at 6 points 650 mA at 12 points	500 mA	1100 mA	560 mA
1 + (1 x total module load current) in W	1 + (0.77 x no. of outputs at state 1) in W	2.5 + (0.1 x no. of outputs at state 1) + (0.4 x total load current) in W	5.5 + (0.5 x N) in W (where N = number of channels at state 1)	2.75 + (0.5 x N) in W (where N = number of channels at state 1)
10...0.60 V ⎓	–	10...30 V ⎓	–	
Per group: 8 A Per point: 2 A recommended	–		Depending on use	
Yes				
–				
UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2, ATEX Zone 2/22 *(5)*				
140 DDO 843 00	**140 DDO 885 00**	**140 DVO 853 00**	**140 DRA 840 00**	**140 DRC 830 00**

(4) Connection requires the Modicon Telefast ABE 7 pre-wired system
(5) Only Conformal Coating versions, depending on the model, are ATEX Zone 2/22 certified

13.3.7 Discrete I/O modules: AC outputs

Type		16-channel discrete output modules	
			
Output voltage		24...230 V ~	24..0.115 V ~
Output frequency		47...63 Hz	
Modularity	Number of channels	16	
	Number of groups	16	
	Number of channels per common	1	
Maximum load	Current per channel	4 A at 24...115 V ∿, 3 A at 200...230 V ∿	4 A at 20...132 V ∿
	Current per group	–	
	Current per module	16 A	
I/O addresses		1 output word	
Bus current required		350 mA	
Power dissipation		1.85 + (1.1 x total module load current) in W	1.85 + (1.1 x total module load current) in W
External power supply (U_s)		–	
External fuses		Per point: 5 A recommended	
Online modification of configuration *(1)*		Yes	
Functional safety certification		–	
Approvals		UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2	
Type of module		140 DAO 840 00	140 DAO 840 10

(1) For online modification of configuration, refer to the catalog

16-channel discrete output module		32-channel discrete output module
		
100...230 V ~	24...0.48 V ~	24...230 V ~
47...63 Hz		
16		32
4		
4		8
4 A at 85...132 V ~, 3 A at 170...253 V ~	4 A at 20...56 V	1 A at 20...253 V
4 A		
16 A		
1 output word		2 output words
350 mA		320 mA
1.85 + (1.1 x total module load current) in W		1.60 + (1 x total module load current) in W
85...253 V ~	20...56 V ~	–
Depending on use		
Yes		
–		
UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2		
140 DAO 842 10	**140 DAO 842 20**	**140 DAO 853 00**

Type		Mixed discrete I/O modules, 16 input channels and 8 output channels	
			
Voltage	Inputs	115 V ~	24 V ⎓
	Outputs	115 V ~	24 V ⎓
Frequency	Inputs/outputs	47...63 Hz	–
Modularity	Number of channels	16 inputs and 8 outputs	
	Number of groups	2 groups of 8 input channels 2 groups of 4 output channels	
Logic	Inputs	–	Positive *(sink)*
	Outputs	–	Positive *(source)*
Maximum load on outputs	Current per channel	4 A	0.5 A
	Current per group	4 A	2 A
	Current per module	8 A	4 A
I/O addresses		1 input word/0.5 output word	
Bus current required		250 mA	330 mA
Power dissipation		5.5 + (1.1 x total module load current) in W	1.75 + (0.36 x no. of inputs at state 1 + 1.1 x total output current) in W
External power supply (U_a)		85...132 V ~ per group of outputs	–
External fuses		Depending on use	Inputs: depending on use Outputs: 1.25 A recommended per point
Online modification of configuration *(1)*		Yes	
Functional safety certification		–	
Approvals		UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2, ATEX Zone 2/22 *(2)*	
Type of module		**140 DAM 590 00**	**140 DDM 390 00**

(1) For modification of configuration, refer to the catalog

Mixed discrete I/O modules, 4 input channels and 4 output channels

125 V ⎓
24..0.125 V ⎓
–
4 inputs and 4 isolated outputs
1 group of 4 input channels 4 isolated output channels
Positive *(sink)*
Positive *(source)* or negative *(sink)*
4 A
–
16 A
1 input word/1 output word
350 mA
0.4 + (1.0 x no. of inputs at state 1 + 0.75 x total output current) in W
–
Inputs: depending on use
Yes
–
UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2
140 DDM 690 00

13.3.8 Analog I/O modules: Current/voltage, temperature probe, thermocouple inputs

Type	Analog output module, 4 channels and 8 channels		
			
Number of channels	4	8	4
Input range	4...20 mA	0...25 mA 0...20 mA 4...20 mA	0...10 V 0...5 V ± 10 V ± 5 V
Resolution	12 bits	0...25 mA: 0...25,000 points 0...20 mA: 0...20,000 points 4...20 mA: 0...16,000 points (default) 4...20 mA: 0...4095 points	12 bits
I/O addresses	4 output words	8 output words	4 output words
Isolation between channels	500 V ∿ at 47...63 Hz or 750 V ⎓ for 1 minute	None	500 V ∿ at 47...63 Hz for 1 minute
Bus current required	480 mA	550 mA	700 mA
Maximum dissipated power	5.3 W	5.0 W	4.5 W
External power supply (U_s)	12...30 V ⎓	6...30 V ⎓ max.	–
External fuse	–		0.063 mA, 250 V 3AG fast-blow *(2)*
Online modification of configuration *(1)*	Yes		
Functional safety certification	Non-interfering	–	
Approvals	UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2, ATEX Zone 2/22 *(3)*		
Type of module	140 ACO 020 00	140 ACO 130 00	140 AVO 020 00

(1) For online modification of configuration, refer to the catalog

) be used on the "Master Override" signal when it is connected to an external source

Mixed analog I/O module

4 Inputs and 2 Isolated outputs
Inputs: 0…10 V, 0…5 V, 0…20 mA ± 10 V, ± 5 V, ± 20 mA 1…5 V, 4…20 mA Outputs: 4…20 mA
Inputs: 16 bits max. Outputs: 12 bits
5 Input words and 2 output words
Inputs: ± 40 V ⎓ max.
350 mA
–
–
Depending on use
Yes
–
UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2, ATEX Zone 2/22 (3)
140 AMM 090 00

(3) Only Conformal Coating versions, depending on the model, are ATEX Zone 2/22 certified

13.3.9 Analog I/O modules: Current/voltage outputs, mixed I/O

Type	Analog input modules, 8 channels and 16 channels		
			
Number of channels	8 differential	16 differential or 16 with common point	8 differential
Input range	4...20 mA 1...5 V	0...25 mA 0...20 mA 4...20 mA	0...20 mA, ± 20 mA, 4...20 mA 0...10 V, ± 10 V 0...5 V, ± 5 V 1...5 V
Resolution	12 bits	0...25 mA: 0...25,000 points 0...20 mA: 0...20,000 points 4...20 mA: 0...16,000 points (default) 4...20 mA: 0...4095 points	14/15/16 bits depending on range
I/O addresses	9 input words	17 input words	9 input words
Isolation between channels (max.)	30 V ⎓		200 V ⎓ 135 V ∿ rms
Bus current required	240 mA	360 mA	280 mA
Maximum dissipated power	2 W	5 W	2.2 W
External power supply (U_s)	Not required		
External fuse	–		
Online modification of configuration *(1)*	Yes		
Functional safety certification	–	Non-interfering	–
Approvals	UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2, ATEX Zone 2/22 *(2)*		
Type of module	140 ACI 030 00	140 ACI 040 00	140 AVI 030 00

(1) For online modification of configuration, refer to the catalog

(2) Coating versions, depending on the model, are ATEX Zone 2/22 certified

RTD analog input modules, 8 channels	TC analog input modules, 8 channels
	
8	8
2, 3 or 4-wire RTD temperature probe, types: ■ IEC platinum: □ Pt 100, Pt 200, Pt 500, Pt 1000: - 200...+ 850°C ■ US platinum: □ Pt 100, Pt 200, Pt 500, Pt 1000: - 100...+ 450°C ■ Nickel: □ Ni 100, Ni 200, Ni 500, Ni 1000: - 60...+ 180°C	TC thermocouple types: ■ J: - 210...+ 760°C ■ K: - 270...+ 1370°C ■ E: - 270...+ 1000°C ■ T: - 270...+ 400°C ■ S: - 50...+ 1665°C ■ R: - 50...+ 1665°C ■ B: - 130...+ 1820°C ■ mV: - 100...+ 100 mV, - 25...+ 25 mV
0.1°C	1°C (default) 0.1°C 1°F 0.1°F
9 input words	10 input words
300 V peak	220 V ∿ at 47...63 Hz or 300 V ⎓ max.
200 mA	280 mA
1 W	1.5 W
–	
–	
Yes	
–	
UL 508, CSA 22.2-142, CE, FM Class 1 Div. 2	
140 ARI 030 10	**140 ATI 030 00**

13.3.10 Counter and special-purpose modules

Type		High-speed counter modules	
			
Number of channels		5 counter inputs 8 discrete inputs 8 discrete outputs	2 counter inputs 4 discrete outputs (2 outputs per counter channel)
I/O	Counter inputs	Frequency: 100 kHz (5 V ⎓) or 20 kHz (24 V ⎓) Cyclic ratio: 1/1 Input current: 8 mA (5 V ⎓) or 7 mA (24 V ⎓)	Single-ended or differential inputs Frequency: 500 kHz (5/12/24 V ⎓)
	Discrete inputs	24 V ⎓ Input current (typical): 5 mA	–
	Discrete outputs	24 V ⎓ (FET output) Load current per output: 210 mA max.	24 V ⎓ (FET output) Load current per output: 500 mA max.
	Clock signal input	–	
Functions		5-channel counter for incremental encoder inputs 16-bit counter (65,635 points) or 32-bit counters (2,147,483,647 points)	2-channel counter for incremental encoder or quadrature inputs 16-bit counter (65,635 points) or 32-bit counters (2,147,483,647 points)
Unity Pro software compatibility		Yes	
I/O addresses		13 input words/13 output words	6 input words/6 output words
Bus current required		250 mA	650 mA
Maximum dissipated power		6 W	4 + (0.4 x total module load current) in W
External power supply (U_a)		19.2...30 V ⎓	
External fuse		Depending on use	
Support rack		Local, remote (RIO)	
Functional safety certification		–	
Module type		140 EHC 105 00	140 EHC 202 00

High-speed input interrupt module *	Accurate time stamping Multifunction input modules
	
16 isolated discrete inputs	32 discrete inputs, divided into 2 groups of 16 inputs 3 clock signal inputs
–	
24 V ⎓ State 1: 15... 30 V ⎓ State 0: - 3...+ 5 V ⎓	24...125 V ⎓ State 1: Nominal 100% of the reference input voltage for the group, max. 125%, min. 75% State 0: Nominal 0% of the reference input voltage for the group, max. +15%, min. -5% Maximum cable length: 400 m unshielded, 600 m shielded
–	
–	Data format: Compliant with standards DCF 77, IRIG-B, TSXNTP100 Input power supply: 24 V ⎓, 5 VDC on RS485
3 operating modes: - Interrupt handling mode on rising edge or falling edge (order of priority, depending on module addressing and channel no. in the module) - Automatic latch/unlatch mode on rising edge (30 µs min.) or falling edge (130 µs min.) - High-speed input mode on rising edge (30 µs min.) or falling edge (130 µs min.)	5 operating modes: - Discrete inputs processed cyclically - Event inputs (4096 time-stamped events/module) - Counter inputs (32-bit, 500 Hz) - Periodic time stamping - Time-delayed switching
Yes	
1 input word	–
400 mA	300 mA
2 + (0.3 x number of active points) in W	7.5 W (maximum power dissipated by the discrete inputs)
Not needed for this module	24...125 V ⎓
Depending on use	
Local only	Local, remote (RIO) and distributed (DIO)
–	
140 HLI 340 00	**140 ERT 854 20**

(*): 140 HLI 340 00 module is not supported in PES architecture

13.3.11 Networks and buses

Type of network and bus			Ethernet Modbus/TCP	EtherNet/IP and Modbus/TCP**	
					
Structure	Physical interface		10BASE-T/100BASE-TX (copper cable)		
	Access method		CSMA-CD		
	Data rate		10/100 Mbps with automatic recognition	10/100 Mbps	
	Medium		Double shielded twisted pair cable		
Transparent Ready services	Class		B30	–	–
	Standard Web server		Rack Viewer access to the product description and status and to the PLC diagnostics Data Editor access to the configuration functions and variables		
	FactoryCast configurable Web server	Web page editor	–		
		Hosting of user Web pages	–		
	FactoryCast HMI active Web server		–		
	Ethernet TCP/IP standard communication services *		Modbus TCP messaging (reading/writing of data words)	EtherNet/IP and Modbus TCP messaging	
	Ethernet TCP/IP advanced communication services	I/O Scanning	Yes (between 128 stations)	Yes	
		Global Data	Yes	–	
		FDR client/server	FDR client *(2)*	FDR server *(2)*	
		NTP time synchronization	–	–	Yes
		SMTP e-mail notification	Yes	–	
		SNMP network management	Yes		
		Bandwidth management	Yes	–	Yes
		Quality Of Service (QoS)	–	Yes	
		IP routing function	–		
Redundancy service (compatible with Hot Standby redundant architecture)			–	–	Yes
Compatibility	CPU		–	Unity Pro CPU	140 CPU 6●● ●●
	Software		Unity Pro	Unity Pro	Unity Pro
Bus current required			*(3)*	500 mA	425 mA
Functional safety certification			–		
Module type			140 CPU 651 50/60 140 CPU 652 60 1 integrated port	140 NOC 771 01	140 NOC 780 00

(1) Only one Ethernet port can be used at a time
(2) Automatic assignment of IP address and network parameters
(*): Ethernet/IP is not supported in PES architectures
(3) I module is not supported in PES architecture

EtherNet/IP and Modbus/TCP	Ethernet Modbus/TCP*		
			
10BASE-T/100BASE-TX/1000BASE-T	10BASE-T/100BASE-TX (copper cable) and 10BASE-FX (optical fibre cable) *(1)*		
CSMA-CD			
10/100/1000 Mbps	10/100 Mbps (copper cable) 100 Mbps (optical fibre cable)		
Double shielded twisted pair cable	Double shielded twisted pair cable Optical fibre cable		
–	B30	C30	D10
Rack Viewer access to the product description and status and to the PLC diagnostics Data Editor access to the configuration functions and variables			
–		Yes	
–		Yes (8 MB)	
–			Yes
EtherNet/IP and Modbus TCP messaging	Modbus TCP messaging (reading/writing of data words)		
Yes	Yes (between 128 stations)		–
–	Yes		–
FDR server *(2)*			–
Yes	–	Yes	–
Yes			–
Yes			SNMP agent
Yes			–
Yes	–		
Yes	–		
Yes			–
140 CPU 6●● ●●	All CPUs		
Unity Pro	Unity Pro, Concept, ProWORX 32		
600 mA	750 mA		900 mA
	–	Non-interfering	–
140 NOC 781 00	**140 NOE 771 01**	**140 NOE 771 11**	**140 NWM 100 00**

(*): 140 NWM 100 00 module is not supported in PES architecture

13 Automation Platforms selection guide

Type of network and bus		**Modbus Plus network ***	**AS-Interface actuator/ sensor bus**	**Modbus SL bus***
				
Structure	Physical interface	Single or redundant copper cable Optical fibre	2-wire unshielded cable	Single copper cable
	Access method	Token ring	Master/slave, M2 profile (AS-Interface V1)	Master/slave
	Data rate	1 Mbps	167 Kbps	19.2 Kbps
	Medium	Twisted pair	Ribbon cable	Shielded twisted pair
Conformity class		–		
Transparent Ready services	Standard Web server	–		
	Ethernet TCP/IP standard communication services	–		
Communication services		■ Reading/writing of variables ■ Global Data service ■ Peer Cop service ■ Distributed I/O (DIO) service	■ Standard addressing with 31 slaves (4 discrete inputs/ 4 discrete outputs) ■ Local diagnostics (slave devices, channel status, etc.)	Slave Modbus protocol: ■ Reading/writing of PLC variables ■ Programming ■ Download ■ 1 or 2 RS 232/485 ports depending on the model Modbus master protocol: ■ Max. 247 slaves
Compatibility	CPU	All CPUs		
	Software	Unity Pro, Concept, ProWORX 32		
Bus current required		1300…3800 mA depending on 140 CPU model 780 mA for 140 NOM	250 mA	1300…3800 mA depending on 140 CPU model 780 mA for 140 NOM
External power supply		–		
Functional safety certification		–		
Module type		**140 CPU** **1 integrated port** **140 NOM 2●● 00**	**140 EIA 921 00**	**140 CPU** **1 or 2 integrated ports** **140 NOM 2●● 00**

) and 140 EIA 921 00 are not supported in PES architecture

Asynchronous serial links *

2 non-isolated RS 232 channels
–
19.2 Kbps
Shielded cable
–
–
–
■ Reading/writing of ASCII sequences, 7 or 8 bits, controlled by PLC application program ■ Application of message formats to character strings ■ Integrated command interpreter
All CPUs
Unity Pro, Concept V2.2 (min.) ProWORX 32
300 mA
–
–
140 ESI 062 10

DEXYI® is not supported in PES architecture

13.3.12 EtherNet/IP and Modbus/TCP: Module communication capability and performance

Feature			Capacity *
			
EtherNet/IP (CIP Implicit Messaging) *			
Scanner	Maximum number of devices		128 devices (125 devices as scanner + 3 devices as adapter) shared with Modbus TCP
	Maximum Message size		511 bytes
Adapter	Maximum number of instances		3 adapter instances
	Maxium number of connections		2 connections per instance
	Maximum Message size		511 bytes
		Inputs	507 bytes excluding header
		Outputs	509 bytes excluding header
Modbus TCP (Modbus Scanner)			
Maximum number of registers	Read		125
	Write		120
Maximum number of devices			128 devices shared with EtherNet/IP
Maximum message size	Read		250 bytes (125 words) excluding header
	Write		240 bytes (120 words) excluding header
EtherNet/IP (CIP explicit messaging) *			
Client	Maximum number of simultaneous connections		16 connections
	Maximum number of concurrent requests		16 requests, shared with Modbus TCP
Server	Maximum number of simultaneous connections		32 connections
Maximum message size			1023 bytes
Modbus TCP (Modbus explicit messaging)			
Client	Maximum number of simultaneous connections		16 connections
	Maximum number of concurrent requests		16 requests, shared with EtherNet/IP
Server	Maximim number of request that can be transferred to the CPU per scan		8 connections
	Maximum number of simultaneous connections		32 connections
Maximum message size	Read		250 bytes (125 words) excluding header
	Write		240 bytes (120 words) excluding header
Performance	EtherNet/IP traffic only		12000 packets per second
	Modbus TCP traffic only		6000 packets per second
	EtherNet/IP & Modbus TCP traffic		8000 packets per second
IP routing service			–
Module type			**140 NOC 771 01**

Note: The performance capacity listed here is affected by certain test conditions including input/output size, RPI (Request Packet Interval), CPU scan time
Customers may experience different results under different conditions
(*) 140 NOC 771 01 is not supported in PES architecture
explicit messaging) is not supported in PES architecture

Capacity	Capacity
	
128 devices (125 devices as scanner + 3 devices as adapter) shared with Modbus TCP	64 devices (61 devices as scanner + 3 devices as adapter) shared with Modbus TCP
511 bytes	
3 adapter instances	
2 connections per instance	
511 bytes	
505 bytes excluding header	
509 bytes excluding header	
125	
120	
128 devices shared with EtherNet/IP	64 devices shared with EtherNet/IP
250 bytes (125 words) excluding header	
240 bytes (120 words) excluding header	
16 connections	
16 requests, shared with Modbus TCP	
32 connections	
1023 bytes	
16 connections	
16 requests, shared with EtherNet/IP	
12 connections	
32 connections	
250 bytes (125 words) excluding header	
240 bytes (120 words) excluding header	
9600 packets per second	4500 packets per second
12000 packets per second	5500 packets per second
9100 packets per second	4500 packets per second
–	1300 packets per second
140 NOC 780 00	**140 NOC 781 00**

13.4 Modicon M340 automation platform

Limitations in support of architectures or hardware modules in the scope of application designed for Process Expert System architectures are identified in this document with an “(*)” in the module description, with a note at the bottom of the module description tables.

The last section of this chapter provides a summary of all unsupported modules for the automation platform.

13.4.1 Architectures

Different architectures based on the M340 automation platform are possible, such as:

- Multi-rack configurations
- Ethernet X80 I/O drops
- Distributed I/Os
- Architectures with separate or combined Ethernet RIO and Ethernet DIO devices on the same physical medium

The following two pages give an overview of I/O architectures. The list of modules that can be installed in a Modicon X80 rack is provided in a dedicated section later in this document.

Product type		Reference	Local rack Modicon M340 Single-rack or multi-rack
			
Racks	X-bus	BMXXBE1000/BMXXBE1000H	
		BMXXBE2005	
		BMXXBP0400/BMXXBP0400H	
		BMXXBP0600/BMXXBP0600H	
		BMXXBP0800/BMXXBP0800H	
		BMXXBP1200	
		BMXXEM010	
	Ethernet + X-bus	BMEXBP0400/BMEXBP0400H	
		BMEXBP0800/BMEXBP0800H	
		BMEXBP1200/BMEXBP1200H	
Power supply modules		BMXCPS2000	
		BMXCPS2010	
		BMXCPS3020/BMXCPS3020H	
		BMXCPS3500/BMXCPS3500H	
		BMXCPS3540T	
I/Os	Analog	BMXAMI0410/BMXAMI0410H	
		BMXAMI0800	
		BMXAMI0810/BMXAMI0810H	
		BMXAMM0600/BMXAMM0600H	
		BMXAMO0210/BMXAMO0210H	
		BMXAMO0410/BMXAMO0410H	
		BMXAMO0802	
		BMXART0414/BMXART0414H	
		BMXART0814/BMXART0814H	
	Discrete	BMXDAI0805	
		BMXDAI1602/BMXDAI1602H	
		BMXDAI1603/BMXDAI1603H	
		BMXDAI1604/BMXDAI1604H	
		BMXDAI0814	
		BMXDAO1605/BMXDAO1605H	
		BMXDDI1602/BMXDDI1602H	
		BMXDDI1603/BMXDDI1603H	
		BMXDDI1604T	
		BMXDDI3202K	
		BMXDDI6402K	
		BMXDDM16022/BMXDDM16022H	
		BMXDDM16025/BMXDDM16025H	
		BMXDDM3202K	
		BMXDDO1602/BMXDDO1602H	
		BMXDDO1612/BMXDDO1612H	
		BMXDDO3202K	
		BMXDDO6402K	
		BMXDRA0804T	
		BMXDRA0805/BMXDRA0805H	
		BMXDRA1605/BMXDRA1605H	
	HART	BMEAHI0812	
		BMEAHO0412	
Application-specific modules	SSI encoder *	BMXEAE0300/BMXEAE0300H	
	Counter	BMXEHC0200/BMXEHC0200H	
		BMXEHC0800/BMXEHC0800H	
	Time stamping	BMXERT1604T	
	PTO (Pulse Train Output) *	BMXMSP0200	
	Weighing *	PMESWT0100	
Communication modules	Ethernet	BMXNOC0401	
		BMENOC03•1	
		BMXNOE0100/BMXNOE0100H	
		BMXNOE0110/BMXNOE0110H	
	Serial link **	BMXNOM0200/BMXNOM0200H	
	RTU	BMXNOR0200H	
	AS-Interface	BMXEIA0100	
	Optical fibre	BMXNRP0200	
		BMXNRP0201	
	Wi-Fi ***	BMXNOW0300	

Compatible | Not compatible

(*): These modules are not supported in PES architecture

(**): AS-Interface in PES applications requires programming in addition to the hardware configuration and objects instantiation

(***): Is supported in PES architectures, but it is not configured in the PES topology

13.4.2 Modicon M340 processors

Type of Modicon M340 processor			Standard processor	Performance processors with or without memory card
				
Racks	Number of racks		2 (with 4, 6, 8 or 12 slots)	4 (with 4, 6, 8 or 12 slots)
	Max. number of slots (excluding power supply module)		24	48
I/O	In-rack discrete I/O *(1)*		512 channels (modules with 8, 16, 32 or 64 channels)	1024 channels (modules with 8, 16, 32 or 64 channels)
	In-rack I/O *(1)*		128 channels (modules with 2, 4, 6 or 8 channels)	256 channels (modules with 2, 4, 6 or 8 channels)
	Distributed I/O (limited depending on the type of medium)		- On Ethernet Modbus/TCP via network module (63 devices with I/O Scanning function) - On Modbus link (32 devices)	
In-rack application-specific channels	No. of channels (counter, motion control, serial link)		20 max.	36 max.
	Counter *(1)*		BMXEHC0200 2-channel (60 kHz) or BMXEHC0800 8-channel (10 kHz) modules	
	Motion control *(1)**		BMXMSP0200 2-channel (200 kHz) PTO *(Pulse Train Output)* modules for servo drives	
			–	
	Serial link (process or RTU) *(1)*		BMXNOM0200 2-channel module or BMXNOR0200H module with 1 RTU serial channel	
	Process control, programmable loops		Process control EFB library	
Integrated communication ports	Ethernet Modbus/TCP network		–	
	CANopen master bus *		–	
	Serial link (process or RTU)		1 in RTU/ASCII Modbus master/slave mode or in Character mode (non-isolated RS232/RS485, 0.3…38.4 Kbps)	
	USB port		1 programming port (PC terminal) or HMI connection port	
Communication modules *(1)*	Ethernet network	Max. no.	2	
		Type of module*	BMXNOE0100/0110 or BMXNOC0401 network modules or BMXNOR0200H module with 1 Ethernet RTU channel	
	AS-Interface bus	Max. no.	2	4
		Type of module**	BMXEIA0100 master module	
Internal memory capacity	Internal user RAM		2048 KB	4096 KB
	Program, constants and symbols		1792 KB	3584 KB
	Located/unlocated data		128 KB	256 KB
Memory card capacity (on processor)	Backup of program, constants and symbols		8 MB as standard	
	Hosting and display of user Web pages		*(2)*	
	File storage		–	8 or 128 MB (according to BMXRMS●●8MPF option card)
Application structure	Master task		1	
	Fast task		1	
	Event tasks		32	64
No. of K instructions executed per ms	100% Boolean		5.4 Kinstructions/ms	8.1 Kinstructions/ms
	65% Boolean + 35% fixed arithmetic		4.2 Kinstructions/ms	6.4 Kinstructions/ms
Rack power supply			24 V ⎓ isolated, 24…48 V ⎓ isolated or 100…240 V ∿ power supply module	
References			**BMXP341000**	**BMXP342000**

(1) The maximum values for the number of discrete I/O, analog I/O, counter/motion control/serial link channels and the number of networks are not cumulative (they are limited by the maximum number of slots in the configuration, 1 rack: 11; 2 racks: 23; 3 racks: 35; 4 racks: 47
(2) User web pages with BMXNOE0110 Ethernet FactoryCast module (12 MB available)
(3) BMXP3420102/20102CL/20302/20302CL processors can be used to customize configuration of the device Boot Up procedure compatible with all CANopen third-party products
(*) BMXMSP0200, BMXNOC0401 are not supported in PES architecture
(*) CANopen bus is not supported in PES architecture
(**) BMXEIA0100 (AS-Interface) is supported; management of AS-Interface in PES applications requires programming in addition to the hardware configuration ation

Performance processors with or without memory card *(continued)*

4 (with 4, 6, 8 or 12 slots)				
48				
1024 channels (modules with 8, 16, 32 or 64 channels)				
256 channels (modules with 2, 4, 6 or 8 channels)				
- On CANopen bus (63 devices), - On Ethernet Modbus/TCP via network module (63 devices with I/O Scanning function), - On Modbus link (32 devices).				
36 max.				
BMXEHC0200 2-channel (60 kHz) or BMXEHC0800 8-channel (10 kHz) modules				
BMXMSP0200 2-channel (200 kHz) PTO *(Pulse Train Output)* modules for servo drives				
MFB (Motion Function Blocks) library (for drives or servo drives on CANopen bus)	–	MFB (Motion Function Blocks) library (for drives or servo drives on CANopen bus)		
BMXNOM0200 2-channel module or BMXNOR0200H module with 1 RTU serial channel				
Process control EFB library				
–	1 x 10BASE-T/100BASE-TX (Modbus/TCP, BOOTP/DHCP, FDR client, e-mail notification, class B10 standard web server)			
1 (63 slaves, 50…1000 Kbps, class M20) *(3)*	–	1 (63 slaves, 50…1000 Kbps, class M20) *(3)*		
1 in RTU/ASCII Modbus master/slave mode or in Character mode (non-isolated RS232/RS485, 0.3…38.4 Kbps)		–		
1 programming port (PC terminal) or HMI connection port				
2				
BMXNOE0100/0110 or BMXNOC0401 network modules or BMXNOR0200H module with 1 Ethernet RTU channel				
4				
BMXEIA0100 master module				
4096 KB				
3584 KB				
256 KB				
8 MB as standard	Supplied without card	8 MB as standard		Supplied without card
(2)				
8 or 128 MB (according to BMXRMS●●8MPF option card)				
1				
1				
64				
8.1 Kinstructions/ms				
6.4 Kinstructions/ms				
24 V ⎓ isolated, 24…48 V ⎓ isolated or 100…240 V ∿ power supply module				
BMXP3420102	**BMXP3420102CL**	**BMXP342020**	**BMXP3420302**	**BMXP3420302CL**

13.4.3 Communication, integrated ports and modules

Applications		Ethernet communication		
Type of device		Processors with integrated Modbus/TCP port	Ethernet modules	
				
Network protocols		◀ Ethernet Modbus/TCP		
Structure	Physical interface	10BASE-T/100BASE-TX		
	Type of connector	RJ45		
	Access method	CSMA-CD		
	Data rate	10/100 Mbps		
Medium		Double twisted pair copper cable, category CAT 5E Optical fibre via ConneXium cabling system		
Configuration	Maximum number of devices	–		
	Max. length	100 m/328.08 ft (copper cable), 4000 m/13,123.32 ft (multi-mode optical fibre), 32,500 m/106,627 ft (single-mode optical fibre)		
	Number of modules of the same type per station	1	2 Ethernet or RTU modules per station with any BMXP34 processor	
Standard services		Modbus/TCP messaging		
Transparent Ready conformity class		B10	B30	C30
Embedded Web server services	Standard services	Rack Viewer PLC diagnostics, Data Editor access to PLC data and variables		
	Configurable services	–		Alarm Viewer and Graphic Data Editor
				Hosting and display of user Web pages (14 MB)
Transparent Ready communication services	I/O Scanning service	–	Yes	
	Global Data service	–	Yes	
	NTP time synchronization	–	Yes (module version ≥ 2.0)	
	FDR service	Yes (client)	Yes (client/server)	
	SMTP e-mail notification service	Yes, via EF function block Unity Pro ≥ 4.0	–	
	SOAP/XML Web service	–	–	Server
	SNMP network management service	Yes	Yes	
	RSTP redundancy service	–	–	–
	QoS (Quality of Service) service	–	–	–
RTU communication services IEC 60870-5-104, DNP3 IP or IEC 60870-5-101, DNP3 serial	Master or Slave configuration	–		
	Time and date stamped data exchange	–		
	RTU time synchronization	–		
	Management and buffering of time and date stamped events	–		
	Automatic transfer of time and date stamped events to the Master/SCADA	–		
Data Logging service		–	–	–
Compatibility with processor		–	Standard and Performance (see page 1/8)	

Processor or module references depending on other type of integrated port		BMXNOE0100	BMXNOE0110
	No other integrated port	BMXP342020	
	Serial link		
	Ethernet Modbus/TCP		
	CANopen*	BMXP3420302/ BMXP3420302CL	

* not supported in PES architecture

Ethernet communication	RTU communication	
Ethernet modules*	RTU module	
		
◀ EtherNet/IP and Modbus/TCP	◀ Modbus/TCP, IEC 60870-5-104, DNP3 (subset level 3)	◀ Serial link, External modem link, IEC 60870-5-101, DNP3 (subset level 3)
10BASE-T/100BASE-TX	10BASE-T/100BASE-TX (Modbus/TCP), PPPoE (Point-to-Point Protocol over Ethernet) for ADSL external modem link	Non-isolated RS 232/485 (Serial link), Non-isolated RS 232 (Radio, PSTN, GSM, GPRS/3G external modem link)
Four RJ45 connectors (2 connectors for a ring topology)	One RJ45 connector	One RJ45 connector
CSMA-CD	CSMA-CD (Modbus/TCP), Master/slave (IEC 104/DNP3)	Master/slave (IEC 101/DNP3)
10/100 Mbps	10/100 Mbps (Modbus/TCP)	0.3…38.4 Kbps (Serial link)
Double twisted pair copper cable, category CAT 5E, optical fibre via ConneXium cabling system		Double shielded twisted pair copper cable, Crossover serial cable (Serial link), Direct serial cable (External modem link)
128 (EtherNet/IP or Modbus/TCP)	128 (Modbus/TCP), 64 slaves/servers (IEC 104/DNP3)	32 max.
100 m/328.08 ft (copper cable), 4000 m/13,123.32 ft (multi-mode optical fibre), 32,500 m/106,627 ft (single-mode optical fibre)		1000 m/3280.83 ft (Serial link with insulating case)
2 Ethernet or RTU modules per station with any BMXP34 processor		Depending on application-specific channels (20/36 application-specific channels with BMXP341000/P342●●●●)
EtherNet/IP and Modbus/TCP messaging	Modbus/TCP messaging	Reading/writing digital and analog I/O, counters
B30	C30	–
Rack Viewer PLC diagnostics, Data Editor access to PLC data and variables		–
–	–	–
–	Hosting and display of user Web pages	–
Yes	–	
–	–	
–	Yes	
Yes (client/server)	Yes (client)	–
–	Yes	–
–	Server	–
Yes	Yes (agent)	–
Yes	–	
Yes	–	
–	Yes, IEC101/104 and DNP3	
–	Interrogation via polling and exchanges on change of status (RBE), unsolicited messaging	
–	Yes, IEC101/104 and DNP3	
–	Yes, IEC101/104 and DNP3	
–	Yes, IEC101/104 and DNP3 Buffer holding 10,000 events (per connected client, 4 clients max.)	
–	Yes, on SD 128 MB memory card, in CSV files, access via FTP or sent by e-mail	
Standard and Performance (see page 1/8)		

BMXNOC0401		
	BMXNOR0200H	
		BMXNOR0200H

DEXYI® module is not supported in PES architecture

Applications		CANopen communication *		AS-Interface communication**
Type of device		Processors with integrated CANopen port		AS-Interface actuator/sensor bus module
				
Network protocols		CANopen		AS-Interface
Structure	Physical interface	ISO 11898 (9-way SUB-D connector)		AS-Interface V3 standard
	Type of connector	9-way SUB-D		3-way SUB-D
	Access method	CSMA/CA (multiple access)		Master/slave
	Data rate	20 Kbps...1 Mbps depending on distance		167 Kbps
Medium		Double shielded twisted pair copper cable		Two-wire AS-Interface cable
Configuration	Maximum number of devices	63 depending on the devices connected		62 slaves
	Max. length	20 m/65.62 ft (1 Mbps)...2500 m/8202.08 ft (20 Kbps)		100 m/328.08 ft, 500 m/1640.42 ft max. with 2 repeaters
	Number of links of the same type per station	1		BMXP341000 processor: 2 AS-Interface modules BMXP3420•0 processor: 4 AS-Interface modules BMXCRA31210 Ethernet drop adaptor: 2 AS-Interface modules
Standard services		PDO implicit exchange (application data) SDO explicit exchange (service data)		Transparent exchanges with the sensors/actuators
Conformity class		Class M20		M4 profile
SMTP service notification by e-mail		–	Yes, via EF function block Unity Pro ≥ 4.0	–
Compatibility with processor		–		Standard and Performance (see page 1/8)
Type of processor or module depending on other integrated port	None			BMXEIA0100
	Serial link	BMXP3420102/ BMXP3420102CL		
	Ethernet Modbus/TCP		BMXP3420302/ BMXP3420302CL	
	CANopen*			

(*) CANopen bus is not supported in PES architecture
(**) BMXEIA0100 (AS-Interface) is supported, management of AS-Interface in PES applications requires programming in addition to the hardware configuration
ation

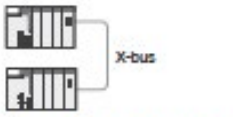
Serial link communication	
Processors with integrated serial link	**2-channel serial link module**
	
Modbus and Character mode	
Non-isolated RS 232, 4-wire Non-isolated RS 485, 2-wire	Non-isolated RS 232, 8-wire Isolated RS 485, 2-wire
RJ45	2 RJ45 and 1 RJ45
Master/slave with Modbus link, Full duplex (RS 232)/Half duplex (RS 485) in Character mode	
0.3...38.4 Kbps	0.3...115.2 Kbps in RS 232 0.3...57.6 Kbps in RS 485
Double shielded twisted pair copper cable	Shielded twisted pair copper cable
32 per segment, 247 max.	2 per drop, 16 per Ethernet remote I/O *(RIO)* network max.
15 m/*49.21 ft* (non-isolated), 1000 m/*3280.83 ft* with insulating case	15 m/*49.21 ft* with non-isolated RS 232, 1000 m/*3280.83 ft* with non-isolated RS 485
1	20/36 application-specific channels with BMXP341000/P342●●●● (1 application-specific channel = 1 counter, motion control module or serial link channel)
	36 application specific channels max. per BMXCRA31210 Ethernet drop adaptor: 2 BMXNOM0200 modules
Read/write bits and words, diagnostics in Modbus mode Send and receive character string in Character mode	
–	
–	
–	Standard and Performance (see page 1/8)
BMXP341000/2000	
	BMXNOM0200
BMXP342020	
BMXP3420102/BMXP3420102CL	

13.5
Modicon X80 I/O platform

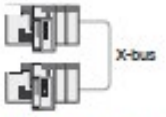
13.5.1 Overview

The Modicon X80 I/O platform serves as the common base for automation platforms by simply adding a dedicated processor. It may also:

- Form part of a Quantum and Modicon M580 Ethernet I/O architecture as an Ethernet RIO (EIO) drop with a CRA bus terminal module
- Form an Ethernet Modbus/TCP DIO drop with a PRA module



Multi-rack configuration with M340 processor



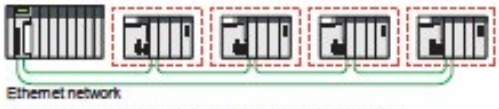
Multi-rack configuration with M580 processor

Architectures based on the Modicon X80 I/O platform

Single-rack or multi-rack local I/O configuration with Modicon M580 or M340 processor

This configuration comprises:
- a Modicon X80 I/O primary rack with a Modicon M580 or M340 processor
- a Modicon X80 I/O secondary rack

This configuration may comprise four racks with **BMXP342●●●** processors separated by a cumulative distance of up to a maximum of 30 metres/*98.42 feet*. It can comprise up to seven racks with M580 processors.



Quantum Ethernet I/O with Modicon X80 EIO drop

Quantum Ethernet I/O with Modicon X80 EIO drop

This architecture comprises:
- a Quantum Ethernet I/O platform comprising a processor and a CRP Ethernet head adapter
- one or more Modicon X80 EIO drops with a standard or performance CRA drop adapter

This configuration may include:
- 16 drops with **140CPU6●1●●** processors
- 31 drops with **140CPU6●2●●/140CPU6●8●●** processors

Modicon M580 platform with Modicon X80 EIO drop

Modicon M580 with Modicon X80 EIO drop

This architecture comprises:
- a Modicon M580 automation platform comprising a processor and dedicated modules
- one or more Modicon X80 EIO drops with a standard or performance BMXCRA drop adapter on an X-bus rack or
- one or more Modicon X80 EIO drops with a BMECRA drop adapter on an Ethernet + X-bus rack

Ethernet Modbus/TCP DIO drop connected to an automation system platform

Ethernet Modbus/TCP DIO drop connected to an automation system platform

This architecture comprises:
- a Quantum/Premium/M580/M340 automation platform
- one or more Ethernet Modbus/TCP DIO drops with a **BMXPRA0100** peripheral I/O remote adapter, a power supply and I/O

13.5.2 Power supply modules

BMXCPSxxxx power supply modules provide the power supply for each BMEXBPxx00 or BMXXBPxx00 Modicon X80 I/O rack and the modules installed on it.

The Modicon X80 I/O power supply module offer comprises:

- Three power supply modules for DC line supplies:
  > 24 V c isolated power supply module, BMXCPS2010
  > 24...48 V c isolated power supply module, BMXCPS3020
  > 125 V c power supply module, BMXCPS3540T (extended operating temperature -25 to +70 °C / -13 to +158 °F)

- Three power supply modules for AC line supplies:
  > 100...240 V a, 20 W power supply module, BMXCPS2000
  > 100...240 V a, 36 W power supply module, BMXCPS3500
  > 100...240 V a, 36 W redundant power supply module, BMXCPS4002

The redundant AC power supply could be used alone in single power supply rack or dual power supply rack as a pair. For high available applications, two independent redundant power supplies could be used to increase the security of power supply. In case the master power supply fails to provide the whole current, the slave power supply will change to master mode and continue to function.

13.5.3 Product compatibility according to the network architecture

Product type	X80 module reference	Short description of X80 module	M340	M580			
				Local rack with CPU			
				Standalone		HSBY	
				X-bus rack BMXXBP●●●●	X-bus + Ethernet rack BMEXBP●●●●	X-bus rack BMXXBP●●●●	X-bus + Ethernet rack BMEXBP●●●●
Power Supplies	BMXCPS2000	Power supply	■	■	■	■	■
	BMXCPS2010	Power supply	■	■	■	■	■
	BMXCPS3020 (H)	Power supply	■	■	■	■	■
	BMXCPS3500 (H)	Power supply	■	■	■	■	■
	BMXCPS3540T	Power supply	■	■	■	■	■
	BMXCPS4002 (H)	Redundant power supply	■	■	■	■	■
I/O	BMXAMI0410 (H)	Analog I/O	■	■	■		
	BMXAMI0800	Analog I/O	■	■	■		
	BMXAMI0810 (H)	Analog I/O	■	■	■		
	BMXAMM0600 (H)	Analog I/O	■	■	■		
	BMXAMO0210 (H)	Analog I/O	■	■	■		
	BMXAMO0410 (H)	Analog I/O	■	■	■		
	BMXAMO0802	Analog I/O	■	■	■		
	BMXART0414 (H)	Analog I/O	■	■	■		
	BMXART0814 (H)	Analog I/O	■	■	■		
	BMXDAI0805	Discrete I/O	■	■	■		
	BMXDAI1602 (H)	Discrete I/O	■	■	■		
	BMXDAI1603 (H)	Discrete I/O	■	■	■		
	BMXDAI1604 (H)	Discrete I/O	■	■	■		
	BMXDAI0814	Discrete I/O	■	■	■		
	BMXDAO1605 (H)	Discrete I/O	■	■	■		
	BMXDDI1602 (H)	Discrete I/O	■	■	■		
	BMXDDI1603 (H)	Discrete I/O	■	■	■		
	BMXDDI1604T	Discrete I/O	■	■	■		
	BMXDDI3202K	Discrete I/O	■	■	■		
	BMXDDI6402K	Discrete I/O	■	■	■		
	BMXDDM16022 (H)	Discrete I/O	■	■	■		
	BMXDDM16025 (H)	Discrete I/O	■	■	■		
	BMXDDM3202K	Discrete I/O	■	■	■		
	BMXDDO1602 (H)	Discrete I/O	■	■	■		
	BMXDDO1612 (H)	Discrete I/O	■	■	■		
	BMXDDO3202K	Discrete I/O	■	■	■		
	BMXDDO6402K	Discrete I/O	■	■	■		
	BMXDRA0804T	Discrete I/O	■	■	■		
	BMXDRA0805 (H)	Discrete I/O	■	■	■		
	BMXDRA1605 (H)	Discrete I/O	■	■	■		
	BMEAHI0812	HART I/O*			■		
	BMEAHO0412	HART I/O*			■		

■ Compatible Not compatible

HART in PES applications requires programming in addition to the hardware configuration and objects instantiation

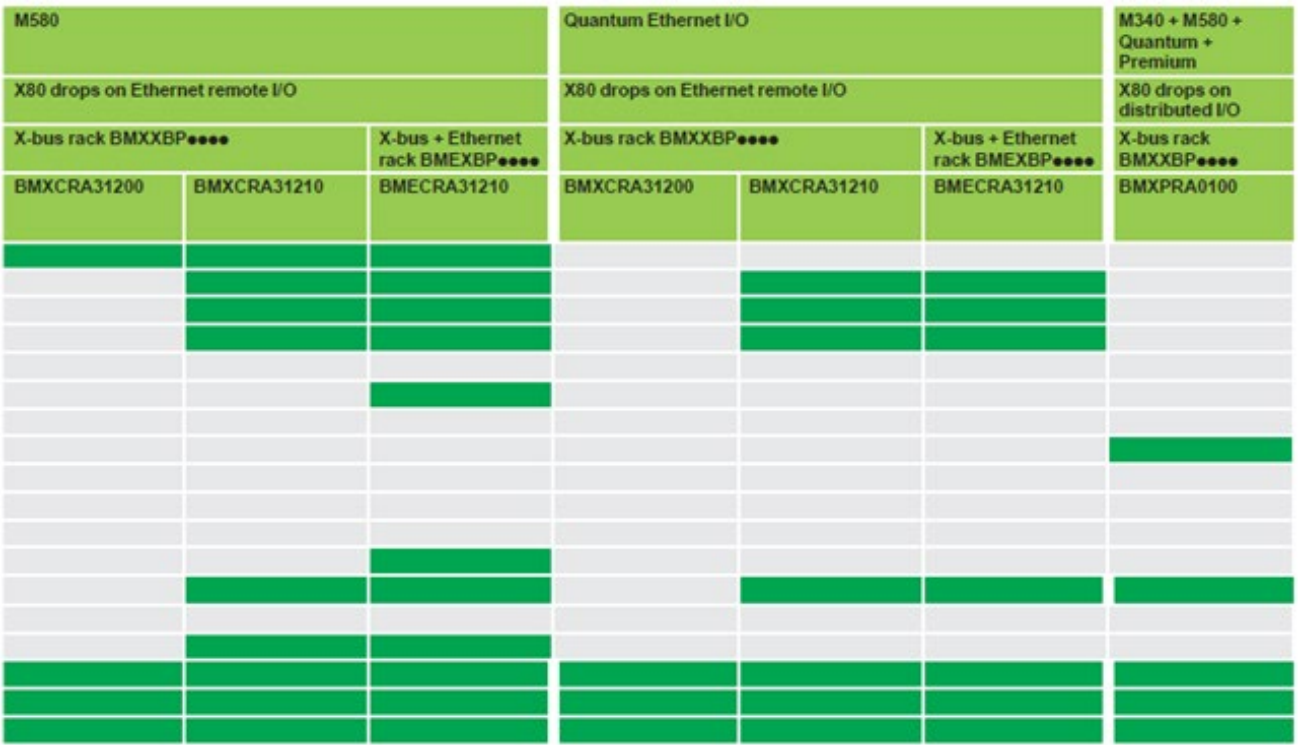
M580			Quantum Ethernet I/O			M340 + M580 + Quantum + Premium
X80 drops on Ethernet remote I/O			X80 drops on Ethernet remote I/O			X80 drops on distributed I/O
X-bus rack BMXXBP●●●●		X-bus + Ethernet rack BMEXBP●●●●	X-bus rack BMXXBP●●●●		X-bus + Ethernet rack BMEXBP●●●●	X-bus rack BMXXBP●●●●
BMXCRA31200	BMXCRA31210	BMECRA31210	BMXCRA31200	BMXCRA31210	BMECRA31210	BMXPRA0100

13 Automation Platforms selection guide

Product type	X80 module reference	Short description of X80 module	M340	M580			
				Local rack with CPU			
				Standalone		HSBY	
				X-bus rack BMXXBP●●●●	X-bus + Ethernet rack BMEXBP●●●●	X-bus rack BMXXBP●●●●	X-bus + Ethernet rack BMEXBP●●●●
Expert modules	BMXEAE0300 (H)	SSI encoder*	■	■	■		
	BMXEHC0200 (H)	Counter	■	■	■		
	BMXEHC0800 (H)	Counter	■	■	■		
	BMXERT1604T	Time stamping*	■	■	■		
	BMXMSP0200	PTO*	■	■	■		
	PMESWT0100	Weighing*			■		
Communication modules	BMXNOC0401	Ethernet	■				
	BMXNOE0100 (H)	Ethernet	■				
	BMXNOE0110 (H)	Ethernet	■				
	BMENOC0301	Ethernet standard web server			■		■
	BMENOC0311	Ethernet FC web server			■		■
	BMENOS0300 (C)	eDRS switch			■		■
	BMXNOM0200 (H)	Serial	■	■	■		
	BMXNOR0200H	RTU	■	■	■		
	BMXEIA0100	ASi**	■	■	■		
	BMXNRP0200	Optical transceiver	■	■	■	■	■
	BMXNRP0201	Optical transceiver	■	■	■	■	■
	PMXNOW0300	Wireless***	■	■	■	■	■

■ Compatible Not compatible

(*) SSI encoder, PTO, weighing, Ethernet BMX NOC, are not supported in PES architecture
(**) Management of AS-Interface in PES applications requires programming in addition to the hardware configuration and objects instantiation
…le can be used in PES architectures, but this module is not configured in the PES



13.5.4 Discrete I/O modules: Input modules

Applications		8-channel input modules		16-channel input modules	
		Connection via cage clamp, screw clamp, or spring-type removable block terminal			
					
Type		∿	∿	⎓	
Voltage		200…240 V	100…120 V	24 V	48 V
Current per channel		10.4 mA (for U = 220 V to 50 Hz)	5 mA	3.5 mA	2.5 mA
Modularity (Number of channels and commons)		8 isolated inputs and 1 common	8 isolated channels and no common point	16 isolated inputs and 1 common	
Connection		Via 20-way cage clamp, screw clamp, or spring-type removable terminal block BMXFTB2000/2010/2020			
Isolated inputs	IEC/EN 61131-2 conformity	Type 2	Type 3	Type 3	Type 1
	Logic	–	–	Positive *(sink)*	
	Type of input	Capacitive	Capacitive	Current sink	
	Sensor compatibility IEC/EN 60947-5-2	2-wire ∿	2-wire ∿	2-wire ⎓, 3-wire ⎓ PNP any type	
Sensor power supply (ripple included)		170…264 V	85…132 V (no sensor power monitoring)	19…30 V	38…60 V
Protection of inputs		Use one 0.5 A fast-blow fuse per group of channels	Use one 0.25 A fast-blow fuse per channel	Use one 0.5 A fast-blow fuse per group of channels	
Maximum dissipated power		4.73 W	2.35 W	2.5 W	3.6 W
Operating temperature		0…60 °C/*0…140 °F*			
Compatibility with TeSys Quickfit installation system		–			
Compatibility with Modicon Telefast ABE7 pre-wired system	Passive connection sub-bases	–			
	Adapter sub-bases with relays	–			
References		BMXDAI0805	BMXDAI0814	BMXDDI1602	BMXDDI1603

16-channel input modules			
Connection via cage clamp, screw clamp, or spring-type removable block terminal			
			
∿ or ⎓	∿		⎓
24 V (∿ or ⎓)	48 V	100…120 V	125 V
3 mA (∿ or ⎓)	5 mA		2.4 mA
16 isolated inputs and 1 common			
Via BMXFTB2000/2010/2020 20-way cage clamp, screw clamp, or spring-type removable block terminal			
Type 1 (∿)	Type 3		–
Negative *(source)* (⎓)	–		Positive *(sink)*
Resistive	Capacitive		Current sink
2-wire ⎓/∿, 3-wire ⎓ PNP or NPN any type	2-wire ∿		–
19…30 V ⎓ 20…26 V ∿	40…52 V	85…132 V	88…150 V
Use one 0.5 A fast-blow fuse per group of channels			
3 W	4 W	3.8 W	8.5 W (at 40 °C/*104 °F*)
0…60 °C/*0…140 °F*			-25…70 °C/*-13…158 °F*
–			
–			
–			
BMXDAI1602	**BMXDAI1603**	**BMXDAI1604**	**BMXDDI1604T**

13.5.5 Discrete I/O modules: Input modules and mixed I/O modules

Applications		32 or 64-channel high-density input modules Connection via 40-way connectors with preassembled cordsets	
			
Type		⎓	
Voltage		24 V	
Current per channel	Inputs	2.5 mA	1 mA
	Outputs	–	–
Modularity (Number of channels and commons)		32 isolated inputs and 2 commons	64 isolated inputs and 4 commons
Connection		Via one 40-way connector	Via two 40-way connectors
Isolated inputs	IEC/EN 61131-2 conformity	Type 3	Non-IEC
	Logic	Positive *(sink)*	
	Type of input	Current sink	
	Sensor compatibility IEC/EN 60947-5-2	2-wire ⎓, 3-wire ⎓ PNP any type	–
Sensor power supply (ripple included)		19…30 V	
Protection of inputs		Use one 0.5 A fast-blow fuse per group of channels	
Isolated outputs	Fallback	–	
	IEC/EN 61131-2 conformity	–	
	Protection	–	
	Logic	–	
Preactuator power supply (ripple included)		–	
Output fuse protection		–	
Maximum dissipated power		3.9 W	4.3 W
Operating temperature		0…60 °C/*0…140 °F*	
Compatibility with TeSys Quickfit installation system		LU9 G02 splitter boxes (8 motor starters) and BMXFCC●●1/●●3 preassembled cordsets. See pages 3/9 and 3/13.	
Compatibility with Modicon Telefast ABE7 pre-wired system	Passive connection sub-bases	Depending on model, 8 or 16-channel passive sub-bases, with or without LED, with common or 2 terminals per channel. See pages 6/2 and 6/8.	
	Adapter sub-bases with relays	Depending on model, active sub-bases with solid state or electromagnetic relays (fixed or removable), 16 channels, with common or 2 terminals per channel (screw or spring-type connection). See pages 6/2 and 6/8.	
References		BMXDDI3202K	BMXDDI6402K

16 or 32-channel mixed I/O modules		
Connection via cage clamp, screw clamp, or spring-type removable block terminal		Connection via 40-way connector with preassembled cordsets
		
⎓	⎓ and ∿ (outputs only)	⎓
Inputs: 24 V Solid-state outputs: 24 V	Inputs: 24 V ⎓ Relay outputs: 24 V ⎓ or 24…240 V ∿	Inputs: 24 V Solid-state outputs: 24 V
3.5 mA	3.5 mA	2.5 mA
0.5 A	2 A (⎓ or ∿)	0.1 A
8 isolated inputs and 1 common, 8 isolated outputs and 1 common		16 isolated inputs and 1 common, 16 isolated outputs and 1 common
Via BMXFTB2000/2010/2020 20-way cage clamp, screw clamp, or spring-type removable terminal block		Via one 40-way connector
Type 3		
Positive *(sink)*	–	Positive *(sink)*
Current sink		
2-wire ⎓, 3-wire ⎓ PNP any type		
19…30 V		
Use one 0.5 A fast-blow fuse per group of channels		
Configurable output fallback, continuous monitoring of output control, and resetting of outputs in case of internal detected fault		
Yes		
Protected	Not protected	Protected
Positive	–	Positive
19…30 V	19…30 V ⎓ 24…240 V ∿	19…30 V
Use a 2 A fast-blow fuse	Use a 12 A fast-blow fuse	Use a 2 A fast-blow fuse
3.7 W	3.1 W	4 W
0…60 °C/0…140 °F		
–		LU9 G02 splitter boxes (8 motor starters) and BMXFCC●●1/●●3 preassembled cordsets. See pages 3/9 and 3/13.
–		Depending on model, 8 or 16-channel passive sub-bases, with or without LED, with common or 2 terminals per channel. See pages 6/2 and 6/8.
–		Depending on model, active sub-bases with solid state or electromagnetic relays (fixed or removable) 16 channels, with common or 2 terminals per channel (screw or spring-type connection). See pages 6/2 and 6/8.
BMXDDM16022	**BMXDDM16025**	**BMXDDM3202K**

13.5.6 Discrete I/O modules: Output modules

Applications		**32 or 64-channel high-density output modules** **Connection via 40-way connectors with preassembled cordsets**	
			
Type		⎓ transistor	
Voltage		24 V	
Current per channel		0.1 A	
Modularity (Number of channels and commons)		32 protected outputs and 2 commons	64 protected outputs and 4 commons
Connection		Via one 40-way connector	Via two 40-way connectors
Isolated outputs	Fallback	Configurable output fallback, continuous monitoring of output control, and resetting of outputs in case of internal detected fault	
	IEC/EN 61131-2 conformity	Yes	
	Protection	Yes	
	Logic	Positive	
Preactuator power supply (ripple included)		19…30 V ⎓	
Output fuse protection		Use one 2 A fast-blow fuse per group of channels	
Maximum dissipated power		3.6 W	6.85 W
Operating temperature		0…60 °C/*0…140* °F	
Compatibility with TeSys Quickfit installation system		LU9 G02 splitter boxes (8 motor starters) and BMXFCC●●1/●●3 preassembled cordsets. See pages 3/9 and 3/13.	
Compatibility with Modicon Telefast ABE7 pre-wired system	Passive connection sub-bases	Depending on model, passive sub-bases with 8 or 16 channels, with or without LED, with common or with 2 terminals per channel. See pages 6/2 and 6/8.	
	Adapter sub-bases with relays	Depending on model, active sub-bases with solid state or electromagnetic relays (fixed or removable). 16 channels with 1 common or 2 terminals per channel, screw or spring-type connection. See pages 6/2 and 6/8.	
References		**BMXDDO3202K**	**BMXDDO6402K**

16-channel output modules		8 or 16-channel output modules			
Connection via cage clamp, screw clamp, or spring-type removable block terminal					
					
⎓ transistor		∿ triac	⎓ relay	⎓/∿ relay	
24 V		100…240 V	100…150 V	24 V ⎓, 24…240 V ∿	
0.5 A		0.6 A	0.3 A (Ith)	2 A (Ith)	
16 protected outputs and 1 common		16 non-protected outputs and 4 commons	8 non-protected outputs, without common		16 non-protected outputs and 2 commons
Via BMXFTB2000/2010/2020 20-way cage clamp, screw clamp, or spring-type removable block terminal					
Configurable output fallback, continuous monitoring of output control, and resetting of outputs in case of internal detected fault		Configurable output fallback			
Yes		Yes			
Yes		–			
Positive *(source)*	Negative *(sink)*	–			
19…30 V		100…240 V	100…150 V	19…30 V ⎓ 24…240 V ∿	
Use one 6.3 A fast-blow fuse per group of channels		Use one 3 A fast-blow fuse per group of channels	Use one 0.5 A, 250 V DC fast-blow fuse on each relay	Use one 3 A fast-blow fuse on each channel	Use one 12 A fast-blow fuse on each group of channels
4 W	2.26 W	–	3.17 W	2.7 W	3 W
0…60 °C/0…140 °F			-25…70 °C/-13…158 °F	0…60 °C/0…140 °F	
–					
–					
–					
BMXDDO1602	**BMXDDO1612**	**BMXDAO1605**	**BMXDRA0804T**	**BMXDRA0805**	**BMXDRA1605**

13.5.7 Analog I/O modules: Input modules

Applications		Analog inputs	
			
Type of input		Isolated low-level inputs, voltage, thermocouples, temperature probes, resistors	
Type		Multirange	
Range	Voltage	± 40 mV, ± 80 mV, ± 160 mV, ± 320 mV, ± 640 mV, ± 1.28 V	
	Current	–	
	Thermocouple Temperature probe Resistor	Thermocouples, type B, E, J, K, L, N, R, S, T, U 2, 3 or 4-wire temperature probes, type Pt100, JPt100, Pt1000, JPt1000, Ni100, Ni1000 (in accordance with DIN43760) and Cu 10 2, 3 or 4-wire resistors, 400 Ω or 4000 Ω	
Modularity		4 inputs	8 inputs
Acquisition period		400 ms for the 4 inputs	400 ms for the 8 inputs
Conversion time		–	
Resolution		15 bits + sign	
Isolation	Between channels	750 V ⎓	
	Between channels and bus	1400 V ⎓	
	Between channels and ground	750 V ⎓	
Connection	Directly to the module	Via 40-way connector	Via two 40-way connectors
	Via preassembled cordsets	Cordsets with one end with color-coded flying leads BMXFCW•01S (3 or 5 m/*9.84 or 16.40 ft* long)	
Compatibility with Modicon Telefast ABE7 pre-wired system	Connection sub-base	4-channel sub-base for direct connection of 4 thermocouples plus connection and provision of cold junction compensation (see page 6/8)	
	Type of connection sub-base	ABE7CPA412	
	Type of preassembled cordsets	BMXFCA••2 (1.5, 3 or 5 m/*4.92, 9.84 or 16.40 ft* long)	
References		BMXART0414	BMXART0814

Analog Inputs

Isolated high-level inputs	Non-isolated high-level inputs	Isolated high-level inputs
Voltage/current		
± 10 V, 0...10 V, 0...5 V, 1..5 V, ± 5 V		
0...20 mA, 4...20 mA, ± 20 mA		
–		
4 inputs	8 inputs	
Fast: 1 + (1 x no. of declared channels) ms Default: 5 ms for the 4 channels	Fast: 1 + (1 x no. of declared channels) ms Default: 9 ms for the 8 channels	
–		
16 bits	15 bits + sign	
300 V ⎓	–	300 V ⎓
1400 V ⎓		
1400 V ⎓		
Via 20-way removable terminal block (screw or spring-type) BMXFTB20●0	Via 28-way removable terminal block (cage clamp-type) BMXFTB2800 or (spring-type) BMXFTB2820	
Cordsets with one end with color-coded flying leads BMXFTW●01S (3 or 5 m/*9.84 or 16.40 ft* long)	Cordsets with one end with color-coded flying leads BMXFTW●08S (3 or 5 m/*9.84 or 16.40 ft* long)	
4-channel sub-base for direct connection of 4 inputs, delivers and distributes 4 protected isolated power supplies (see page 6/8)	8-channel sub-base for direct connection of 8 current/voltage inputs (see page 6/8)	
ABE7CPA410	ABE7CPA02/03/31/31E	ABE7CPA02/31/31E
BMXFCA●●0 (1.5, 3 or 5 m/*4.92, 9.84 or 16.40 ft* long)	BMXFTA●●0 (1.5 or 3 m/*4.92, 9.84 or 16.40 ft* long)	
BMXAMI0410	**BMXAMI0800**	**BMXAMI0810**

13.5.8 Analog I/O modules: Output modules and mixed I/O modules

Applications		Analog outputs		
				
Type of I/O		Isolated high-level outputs	Isolated high-level outputs	Non-isolated high-level outputs
Type		Voltage/current		Current
Range	Voltage	± 10 V		–
	Current	0–20 mA, 4–20 mA		
Modularity		2 outputs	4 outputs	8 outputs
Acquisition period (inputs)		–		
Conversion time (outputs)		≤ 1 ms		≤ 4 ms
Resolution	Inputs	–		
	Outputs	15 bits + sign		
Isolation		Between channels: 750 V ⎓		
		Between channels and bus: 1400 V ⎓		
		Between channels and ground: 1400 V ⎓		
Connection	Directly to the module	Via 20-way removable terminal block (screw or spring-type) BMXFTB20●0		
	Via preassembled cordsets	Cordsets with one end with color-coded flying leads BMXFTW●01S (3 or 5 m/*9.84 or 16.40 ft* long)		
Compatibility with Modicon Telefast ABE7 pre-wired system	Connection sub-base	4-channel sub-base for direct connection of 2/4 current/voltage outputs (see page 6/8)		8-channel sub-base for direct connection of 8 current/voltage inputs (see page 6/8)
	Type of connection sub-base	ABE7CPA21		ABE7CPA02
	Type of preassembled cordsets	BMXFCA●●0 (1.5, 3 or 5 m/*4.92, 9.84 or 16.40 ft* long)		BMXFTA●●2 (1.5 or 3 m/*4.92, 9.84 or 16.40 ft* long)
References		**BMXAMO0210**	**BMXAMO0410**	**BMXAMO0802**

Mixed analog I/O

Non-isolated high-level inputs and outputs
Voltage/current
Inputs: ± 10 V, 0…10 V, 0...5 V, 1..5 V Outputs: ± 10 V
Inputs: 0–20 mA, 4–20 mA Outputs: 0–20 mA, 4–20 mA
4 inputs and 2 outputs
Fast: 1 + (1 x no. of declared channels) ms Default: 5 ms for the 4 channels
≤ 1 ms
14…12-bit in U range 12-bit in I range
12-bit in U range 11-bit in I range
Between groups of input or output channels: 750 V ⎓
Between channels and bus: 1400 V ⎓
Between channels and ground: 1400 V ⎓
Via 20-way removable terminal block (screw or spring-type) BMXFTB20●0
BMXFTW●01S cordsets with one end with color-coded flying leads (3 or 5 m/*9.84 or 16.40 ft* long)
–
–
–
BMXAMM0600

13.5.9 HART analog I/O modules

Applications		HART analog inputs
		
Type of I/O		Isolated analog inputs with HART
Number of channels		8
Range	Current	4-20 mA
Maximum load impedance		–
Operating temperature		0…60°C/32…*140°F*
Compatible devices		BMEP58●●●● processors, BMECRA31210 head module, BMEXBP●●00(H) Ethernet + X-bus backplanes
Resolution		15 bits + sign
Isolation	Between channels	1000 V ⎓ for 1 minute
	Between channels and bus	1400 V ⎓ for 1 minute
	Between channels and earth	1400 V ⎓ for 1 minute
Connection	Directly to the module	Via 20-way removable terminal blocks (screw or spring-type) BMXFTB20●0
Compatibility with pre-wired ABE7	Connection sub-base	8-channel sub-base for direct connection of 8 current/voltage inputs
	Type of connection sub-base	ABE7CPA02/03/31
	Type of preassembled cordsets	BMXFTA1522/3022 (1.5 or 3 m/*4.92 or 9.84 ft* long)
Field device support		2-wire/4-wire
HART specification *	HART field device compliance	HART V5, V6, V7
	HART field device connection	Point to point
	HART I/O mapping	Yes
References		**BMEAHI0812**

HART analog outputs

Isolated analog outputs with HART
4
4-20 mA
600 Ω (0-20 mA)
0...60°C/32...*140°F*
BMEP58●●●● processors, BMECRA31210 head module, BMEXBP●●00(H) Ethernet + X-bus backplanes
15 bits + sign
1000 V ⎓ for 1 minute
1400 V ⎓ for 1 minute
1400 V ⎓ for 1 minute
Via 20-way removable terminal blocks (screw or spring-type) BMXFTB20●0
4-channel sub-base for direct connection of 2/4 current/voltage outputs
ABE7CPA21
BMXFCA150/300/500 (1.5, 3 or 5 m/*4.92, 9.84 or 16.4 ft* long)
2-wire/4-wire
HART V5, V6, V7
Point to point
Yes

BMEAHO0412

13.5.10 Communication, integrated ports and modules

Applications		RTU communication*	
Type of device		RTU module	
			
Network protocols		◀ Modbus/TCP, IEC 60870-5-104, DNP3 (subset level 3)	◀ Serial link, External modem link, IEC 60870-5-101, DNP3 (subset level 3)
Structure	Physical interface	10BASE-T/100BASE-TX (Modbus/TCP), PPPoE (Point-to-Point Protocol over Ethernet) for ADSL external modem link	Non-isolated RS 232/485 (Serial link), Non-isolated RS 232 (Radio, PSTN, GSM, GPRS/3G external modem link)
	Type of connector	One RJ45 connector	One RJ45 connector
	Access method	CSMA-CD (Modbus/TCP), Master/slave (IEC 104/DNP3)	Master/slave (IEC101/DNP3)
	Data rate	10/100 Mbps (Modbus/TCP)	0.3…38.4 Kbps (Serial link)
Medium		Double twisted pair copper cable, category CAT 5E, optical fibre via ConneXium cabling system	Double shielded twisted pair copper cable, crossover serial cable (Serial link), direct serial cable (External modem link)
Configuration	Maximum number of devices	128 (Modbus/TCP), 64 slaves/servers (IEC 104/DNP3)	32 max.
	Max. length	100 m/*328.08 ft* (copper cable), 4000 m/*13123.3 ft* (multi-mode optical fibre), 32,500 m/*106627 ft* (single-mode optical fibre)	1000 m/*3280.83 ft* (Serial link with insulating case)
	Number of modules of the same type per station	2 Ethernet or RTU modules per station with any BMXP34 or BMEP58 processor	Depending on application-specific channels (20/64 application-specific channels with BMXP34/BMEP58)
Standard services		Modbus/TCP messaging	Reading/writing discrete and analog I/O, counters
Transparent Ready conformity class		C30	–
Embedded Web server services	Standard services	Rack Viewer PLC diagnostics, Data Editor access to PLC data and variables	–
	Configurable services	–	–
		Hosting and display of user Web pages	–
Transparent Ready communication services	I/O Scanning service	–	
	Global Data service	–	
	NTP time synchronization	Yes	
	FDR service	Yes (client)	–
	SMTP e-mail notification service	Yes	–
	SOAP/XML Web service	Server	–
	SNMP network management service	Yes (agent)	–
	RSTP redundancy service	–	
	QoS (Quality of Service) service	–	
RTU communication services IEC 60870-5-104, DNP3 IP or IEC 60870-5-101, DNP3 serial	Master or Slave configuration	Yes, IEC101/104 and DNP3	
	Time and date stamped data exchange	Interrogation via polling and exchanges on change of status (RBE), unsolicited messaging	
	RTU time synchronization	Yes, IEC101/104 and DNP3	
	Management and buffering of time and date stamped events	Yes, IEC101/104 and DNP3	
	Automatic transfer of time and date stamped events to the Master/SCADA	Yes, IEC101/104 and DNP3 Buffer holding 10,000 events (per connected client, 4 clients max.)	
Data Logging service		Yes, on SD 128 MB memory card, in CSV files, access via FTP or sent by e-mail	
Compatibility with processor		Standard and Performance M340 processors All M580 processors	–
Processor or module references depending on other type of integrated port	No other integrated port		
	Serial link	**BMXNOR0200H**	
	Ethernet Modbus/TCP		**BMXNOR0200H**
	CANopen		

* communication with the RTU module requires programming refinement

Applications		AS-Interface communication	Serial link communication
Type of device		AS-Interface actuator/sensor bus module*	2-channel serial link module
			
Network protocols		◀ AS-Interface	◀ Modbus and Character mode
Structure	Physical interface	AS-Interface V3 standard	Non-isolated RS 232, 8-wire Isolated RS 485, 2-wire
	Type of connector	3-way SUB-D	2 RJ45 and 1 RJ45
	Access method	Master/slave	–
	Data rate	167 Kbps	0.3...115.2 Kbps in RS 232 0.3...57.6 Kbps in RS 485
Medium		Two-wire AS-Interface cable	Shielded twisted pair copper cable
Configuration	Maximum number of devices	62 slaves	2 per drop, 16 per Ethernet remote I/O (RIO) network max.
	Max. length	100 m/328.08 ft, 500 m/1640.42 ft max. with 2 repeaters	15 m/49.21 ft with non-isolated RS 232, 1000 m/3280.83 ft with non-isolated RS 485
	Number of links of the same type per station	BMXP341000 processor: 2 AS-Interface modules	20/36 application-specific channels with BMXP341000/P342●●●● (1 application-specific channel = 1 counter, motion control module or serial link channel)
		BMXP3420●0 or BMEP58 processor: 4 AS-Interface modules	36 application specific channels max. 2 BMXNOM0200 modules per BM●CRA31210 Ethernet drop adapter
		BM●CRA31210 Ethernet drop adapter: 2 AS-Interface module	All M580 processors: 36 application-specific channels
Standard services		Transparent exchanges with the sensors/actuators	Read/write bits and words, diagnostics in Modbus mode Send and receive character string in Character mode
Conformity class		M4 profile	–
SMTP e-mail notification service		–	–
Compatibility with processor		Standard and Performance M340 processors All M580 processors	
Type of processor or module depending on other integrated port	None	BMXEIA0100	
	Serial link		BMXNOM0200
	Ethernet Modbus/TCP		
	CANopen		

* AS-Interface in PES applications requires programming in addition to the hardware configuration and objects instantiation

13.6
Modicon STB distributed I/O solution

The Modicon STB distributed I/O solution is an open, modular input/output system that makes it possible to design automation islands managed by a master controller via a bus or communication network.

These islands can be used to connect:

- TeSys U or TeSys T starter-controllers
- Altivar variable speed drives

In addition to discrete and analog I/Os, application specific I/O HART channels are available in the island with the HART multiplexer module.

Type of splitter box and module		Modular IP 20 distributed I/O Modicon STB 
Available buses and networks		Ethernet Modbus TCP/IP EtherNet/IP CANopen Modbus Plus Fipio InterBus Profibus DP DeviceNet
Max. number per connection point		1 NIM (Network Interface Module) + 32 I/O modules
Discrete I/O	Modularity	Module with 2 I, 4 I, 6 I, 16 I, 2 O, 4 O, 6 O or 16 O
	Input voltage	24 V ⎓, 115 V ∿ and 230 V ∿
	Output voltage	24 V ⎓, 115/230 V ∿ and relay
Analog I/O		Modules with 2, 4 or 8 inputs and 1 or 2 outputs (voltage/current) Module with 2 thermocouple or probe inputs
Application-specific I/O		Counter module with one 40 kHz channel HART multiplexer module - 4 HART channels per HART multiplexer module - Up to 8 HART multiplexer modules per island Parallel interface modules for TeSys Quickfit and TeSys U motor starters, integrated connection for third-party CANopen products
I/O connection		Removable screw or spring-type connectors, Telefast connectors

PES architectures supports Modicon STB distributed I/O connected to a controller through Ethernet ModBus/TCP.

Only Altivar 31/61/71 variable speed drives and motor controller / starters TeSys T / TeSys U can be connected through the local bus CANopen.

13.7
Profibus Remote Master

The Profibus Remote Master (PRM) module is connected to the Ethernet Modbus TCP/IP network via its integrated 2-port switch, as close as possible to the process and the instrumentation. The PRM module can be used to connect Modicon Quantum, M580, and M340 PLCs to Profibus DP V1 via the I/O scanner function. Irrespective of the type of PLC, only one product reference is required and the setup is identical.

Applications	Profibus DP and Profibus PA communication
Type of device	Profibus Remote Master (PRM) module (external)

Network protocols		Ethernet Modbus/TCP	Profibus DP V1 Profibus PA (via gateway)
Structure	Physical interface	10BASE-T/100BASE-TX	Isolated RS 485
	Type of connector	Two RJ45 connectors (supporting daisy chain topology)	One 9-way female SUB-D connector
	Access method	CSMA-CD	Master/slave
	Data rate	10/100 Mbps	9.6 Kbps...12 Mbps
Medium		Double shielded twisted pair copper cable, category CAT 5E (direct or crossover)	Shielded twisted pair copper cable
Configuration	Maximum number of devices	Several PRMs can be connected to the Ethernet port on the M580, M340, Premium or Quantum PLC, as long as the I/O Scanner capacity is not exceeded	125 slaves
	Max. length	100 m/328.08 ft (copper)	1,200 m/3,936.99 ft (9.6 Kbps), 4,800 m/15,747 ft with 3 repeaters, 100 m/328.08 ft (12 Mbps), 400 m/1,312.33 ft with 3 repeaters
	Number of links of the same type per station	–	
		–	
Standard services		Modbus/TCP messaging	Cyclic and acyclic data exchange with slaves
Conformity class		Transparent Ready Class A20	Class 1 and Class 2
Embedded Web server service	Standard service	–	
	Advanced services	–	
Communication services		–	
		Modbus server (scanned by the PLC)	Master/slave communication
		FDR service	Global Control service
		SNMP agent network management service	Acyclic communication (read/write) in Class 1 and Class 2
		–	Support for extended diagnostics
		–	Auto-scanning service of slaves on the bus
24 V ⎓ external power supply		18...30 V	
		TCSEGPA23F14F	

13.8
Connection Interfaces

13.8.1 Modicon Telefast ABE7 pre-wired system discrete input and/or output sub-bases

Applications	Discrete inputs or outputs				
	Optimum "Economy"	Optimum "Miniature"	Universal		
					
Compatibility	TSX Micro, Modicon Premium, Modicon M340, Modicon M580	TSX Micro, Modicon Premium, Modicon Quantum, Modicon M340, Modicon M580			
Sub-base type	Passive connection sub-bases				
Equipped with relays	–				
Control voltage	24 V ⎓				
Output voltage	24 V ⎓				
Output current per channel	0.5 A				
Modularity	16		8 -12 -16		
No. of terminals per channel	1	1 to 3	1	2	
Type of connection terminals	Signal	Signal, common (configurable as 24 V ⎓ or 0 V)	Signal	Signal, common (configurable as 24 V ⎓ or 0 V)	
Connectors	20-way HE10 connector				
Terminal block – Removable	No		No		
Terminal block – Terminal type	Screw				
Additional or optional* function	Low-cost version fitted with cable	Miniature sub-bases	Compact size *	Input type 2 * *(1)*	Isolator *
Type of device	ABE7H••E•00	ABE7H16C••	ABE7H••R1• ABE7H••R50	ABE7H••R2•	ABE7H••S21

Discrete inputs or outputs		Outputs for solid state and/or electromechanical relays
Optimum "Miniature"		Optimum and Universal
		
TSX Micro, Modicon Premium, Modicon Quantum, Modicon M340, Modicon M580		
Passive connection sub-bases		Plug-in electromechanical or solid state relays
–		Yes
24 V ⎓		
24 V ⎓		24V ⎓ (solid state) 5... 24 V ⎓, 230 V ∿ (electromechanical)
0.5 A		5 A (th)
16		16 8 passive inputs 8 relay outputs
1	2	1
Signal, 2 common connections between the inputs and the outputs	Signal, common, 2 common connections between the inputs and the outputs	1 N/O contact and common, 4 output channels 2 input connection points
20-way HE10 connectors		
No		
Screw		
Miniature sub-base Synergy with Tego Power and Micro PLC		Miniature sub-base - Common per group of 4 channels Synergy with Tego Power and Micro PLC
ABE7H16CM11	ABE7H16CM21	ABE7R16M111

13.8.2 Modicon Telefast ABE7 pre-wired system discrete input and output sub-bases

Applications	Discrete outputs					
	Optimum		Universal	Optimum		Universal
						
Compatibility	TSX Micro, Modicon Premium, Modicon Quantum, Modicon M340, Modicon M580					
Relay sub-base	Electromechanical, fixed			Electromechanical or solid state		
Equipped with relays	Yes			Yes	No	No
Control voltage	24 V ⎓					
Output voltage	5 V... 30 V ⎓ 230 V ∿		5 V... 150 V ⎓ 230 V ∿	24 V ⎓ (solid state) 5 V... 24 V ⎓, 230 V ∿ (E.M.)		5 V... 150 V ⎓ 230 V ∿
Output current per channel	2 A (th)	3 A (th)	5 A (th)	2 A (solid state) 6 A (electromechanical)		0.5 to 10 A (dependent on relay)
Modularity	8	8 - 16		16		8 or 16
No. of terminals per channel	2	1	2	1		2 to 3
Type of connection terminals	1 N/O contact and common Volt-free	1 N/O contact	1 N/O contact and common	1 N/O contact		Signal, Polarities
Connectors	20-way HE 10 connector					
Terminal block — Removable	Yes	Yes	Yes	No		No
Terminal block — Terminal type	Screw or spring			Screw		
Additional or optional* function	Miniature sub-base Latching relay	Volt-free or common per group of 8 channels		Miniature sub-bases Common per group of 4 channels		Isolator and fuse
Type of device	ABE7R08S216●	ABE7R●●S1●●	ABE7R●●S2●●	ABE7R16T111	ABE7P16T111	ABE7P16T2●●● ABE7P08T3●●●

Discrete outputs				Discrete inputs or outputs			
Universal				Universal			
							
TSX Micro, Modicon Premium, Modicon Quantum, Modicon M340, Modicon M580							
Electromechanical, plug-in		Solid state, fixed	–	–		Solid state, fixed	Solid state, plug-in
Yes		Yes	–	–		Yes	No
24 V ⎓						From 24 V ⎓ to 230 V ∿	From 5 V TTL to 230 V ∿
5 V... 150 V ⎓ 230 V ∿		24 V ⎓					
5 A (th)	8 A (th)	0.5 to 2 A	125 mA	0.5 A	125 mA	12 mA	
16							
2 to 3	2 to 6	2		3	2		
1 C/O contact or 1 N/O contact and common	1 C/O contact or 2 C/O contacts and common	Signal and 0 V		24 V ⎓ and 0 V signal	Signal can be isolated, Protected common	Signal	Signal and common
20-way HE 10 connector							
No		Yes	No	No		Yes	No
Screw		Screw or spring		Screw		Screw or spring	
Volt-free or common per group of: 8 channels	4 channels	Fault signal	Isolator and fuse (indicator)	3-wire proximity sensor	Isolator and fuse (indicator)	–	
ABE7R16T2●●	ABE7R16T3●●	ABE7S●●S2B●	ABE7H16F43	ABE7H16R3●	ABE7H16S43	ABE7S16E2●●E	ABE7P16F31●

13.8.3 Modicon Telefast ABE7 pre-wired system analog and application-specific sub-bases

Analog signals and special functions

Modicon Premium: □ TSXAEY800 □ TSXAEY1600 Modicon Quantum: □ 140AVI03000 □ 140ACI03000 □ 140ACI04000	Modicon Premium: □ TSXAEY810 Modicon X80 I/O: □ BMXAMI0800 □ BMXAMI0810 □ BMEAHI0812 Modicon Quantum: □ 140AVI03000 □ 140ACI03000 □ 140ACI04000	Modicon Premium: □ TSXCAY●1, □ TSXCTY●A	Modicon Premium: □ TSXAEY1614	Modicon Premium: □ TSXPAY2●2
Analog inputs Current Voltage Pt 100	Isolated analog inputs	Counter inputs	Inputs for thermocouples	I/O
Distribution of sensor power supplies by limiter (25 mA)	Distribution of isolated sensor power supplies by converter	Acquisition of value from an absolute encoder	Connection of 16 thermocouples with cold junction compensation	Safety module (BG)
8 channels	8 channels	1 channel	16 channels	12 Emergency stops
24 V ⎓				
24 V ⎓				
25 mA				–
2 or 4		–	2 or 4	1
25-way SUB-D	25-way SUB-D	15-way SUB-D	25-way SUB-D	50-way SUB-D
No	No	No	No	No
Screw	Screw or spring	Screw	Screw	Screw
ABE7CPA03	**ABE7CPA31●**	**ABE7CPA11**	**ABE7CPA12**	**ABE7CPA13**

Analog signals and special functions

Modicon Premium: □ TSXAEY800 □ TSXAEY1600 Modicon Quantum: □ 140AVI03000 □ 140ACI03000 □ 140ACI04000	Modicon Premium: □ TSXAEY810 Modicon X80 I/O: □ BMXAMI0800 □ BMXAMI0810 □ BMEAHI0812 Modicon Quantum: □ 140AVI03000 □ 140ACI03000 □ 140ACI04000	Modicon Premium: □ TSXCAY●1, □ TSXCTY●A	Modicon Premium: □ TSXAEY1614	Modicon Premium: □ TSXPAY2●2
Analog inputs Current Voltage Pt 100	Isolated analog inputs	Counter inputs	Inputs for thermocouples	I/O
Distribution of sensor power supplies by limiter (25 mA)	Distribution of isolated sensor power supplies by converter	Acquisition of value from an absolute encoder	Connection of 16 thermocouples with cold junction compensation	Safety module (BG)
8 channels	8 channels	1 channel	16 channels	12 Emergency stops
24 V ⎓				
24 V ⎓				
25 mA				–
2 or 4		–	2 or 4	1
25-way SUB-D	25-way SUB-D	15-way SUB-D	25-way SUB-D	50-way SUB-D
No	No	No	No	No
Screw	Screw or spring	Screw	Screw	Screw
ABE7CPA03	**ABE7CPA31●**	**ABE7CPA11**	**ABE7CPA12**	**ABE7CPA13**

13.9 List of unsupported modules in PES architectures

This section summarizes the list of hardware modules that are not supported or have limited functionalities in the context of applications designed with Process Expert System (PES).

13.9.1 M580 automation platform

All modules compatible with the M580 automation platform, including in X80 I/O platform, are supported except for the following modules:

Communication modules:

- PMX NOW 0300 (Wi-Fi access point) – It is ignored in the controller configuration, but can be used in PES architectures

Other module not supported and not mentioned in this document:

- BMX NOC 0402 (Ethernet MB/TCP & IP)

Application specific modules:

- BMX MSP 0200 (pulse train outputs)
- BMX EAE 0300 (SSI encoder)
- PME SWT 0100 (Scaime partner weighing module)
- BMX EIA 0100 (AS-I V3 master) – Can be configured through PES, but management of AS-I devices must be done by project refinement (no ready-to-configure services to manage devices)
- BMEAHI0812 & BMEAHO0412 (HART modules) – They are configured through PES, but require program refinement in addition to the hardware configuration and objects instantiation to use other data than the process value. Refer to the Process Expert Foundation Application Templates User Guide, chapter: "Using Hart Analog I/O Signals to configure the modules with full features".

13.9.2 Quantum automation platform

All modules on Quantum Ethernet RIO drop or Quantum S908 RIO drop are compatible with the Quantum automation platform, except the following modules:

Communication modules:

- 140 NOC 771 01 (Ethernet IP)
- 140 NOM 2xx 00 (Modbus Plus)
- 140 NWM 100 00 (Web server Factory Cast)
- 140 ESI 062 10 (Ascii serial line)
- 140 EIA 921 00 (AS-I master)

Other modules not supported and not discussed in this document:

- 140 PTQ PDP MV1 (Profibus master DPV1) – Can be used in a PES application with a complementary design inside the control project
- 140 NPP 954 00 (fiber optical repeater)

Application specific modules:
- 140 HLI 340 00 (High speed inputs)

Other modules not supported and not discussed in this document:
- 140 MSB 101 00 (mono axis with encoder)
- 140 MSC 101 00 (mono axis with resolver)
- 140 MMS 425 01 (Sercos 66Mhz)
- 140 MMS 535 02 (Sercos 133Mhz)

All modules compatible with the X80 I/O platform on Quantum are supported except the following modules:

Communication modules:
- PMX NOW 0300 (Wi-Fi access point) – It is ignored in the controller configuration, but can be used in PES architectures

Other module not supported and not discussed in this document:
- BMX NOC 0402 (Ethernet MB/TCP & IP)

Application specific modules:
- BMEAHI0812 & BMEAHO0412 (HART modules) – They are configured through PES, but require program refinement in addition to the hardware configuration and objects instantiation to use other data than the process value. Refer to the Process Expert Foundation Application Templates User Guide, chapter: "Using Hart Analog I/O Signals to configure the modules with full features".

13.9.3 M340 automation platform

All modules compatible with the M340 automation platform, including in an X80 I/O platform, are supported except the following modules:

Communication modules:
- BMX NOC 0401/ 0401.2 (Ethernet MB/TCP & IP)
- PMX NOW 0300 (Wi-Fi access point) – It is ignored in the controller configuration, but can be used in PES architectures

Application specific modules:
- BMX MSP 0200 (pulse train outputs)
- BMX EAE 0300 (SSI encoder)
- BMX EIA 0100 (AS-I V3 master) – Can be configured through PES, but management of AS-I devices must be done by project refinement (no ready-to-configure services to manage devices)