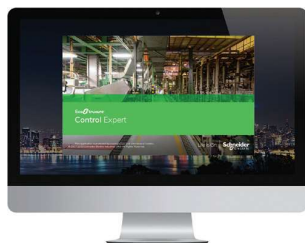


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EcoStruxure Control Expert

UnityPro is renamed EcoStruxure Control Expert

In line with EcoStruxure™ strategy and values, Unity Pro, our Engineering software for the Modicon PAC platform for hybrid and process industries, has been renamed EcoStruxure™ Control Expert.

Presentation

This catalog describes EcoStruxure Control Expert software V15, which is the latest version available.

EcoStruxure Control Expert is the common programming, debugging, and operating software for the Modicon M340, M580, M580S, Premium, Momentum, and Quantum ranges.

Note: Please use Unity Pro software V7 for Quantum SIL3 (safety integrity level 3).

EcoStruxure Control Expert is multitasking software offering the following features:

- All-in-one software
- Five IEC 61131-3 programming languages
- LL 984 programming language
- Device integration with FDT/DTM standard
- Integrated, customizable DFB library
- Topology Manager
- PAC-to-PAC communication
- PLC simulator on PC for program validation prior to installation
- Built-in tests and diagnostics
- Wide range of online services
- Cybersecurity

EcoStruxure Control Expert supports the new M580 Safety PACs, mixing process and safety in a single project. It allows users to:

- Optimize engineering time
- Simplify programming with IEC61508 functions
- Facilitate maintenance

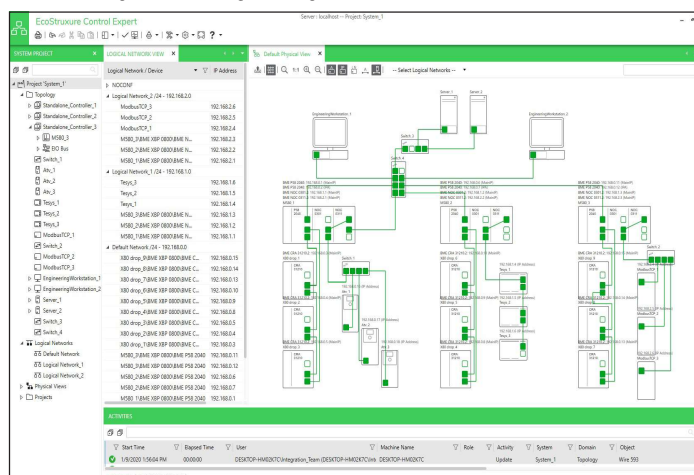
EcoStruxure Control Expert is available in two modes:

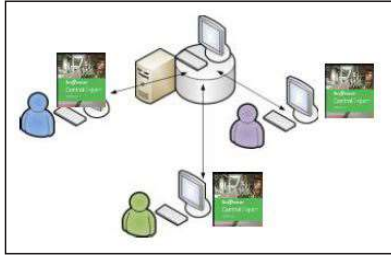
- Classic mode for single-controller architectures, with Topology Manager license
- Topology Manager mode for multi-controller architectures

Topology Manager

EcoStruxure Control Expert V15 with the new Topology Manager offers a common environment to design, engineer, commission, operate, and maintain a complete plant. The multi-controller architecture in graphical tree representation makes the design and deployment of entire multi-PAC systems, including the various types of automation assets, very easy.

The intuitive design workflow (drag/drop, copy/paste) is created for the global administration of complete architecture. A consistent update of the logical network view with automatic assignment of IP address allows you to update a project easily, reducing engineering maintenance and total lifecycle costs. During commissioning, users will also be able to deploy one or a group of controllers/assets in one click, thus reducing time and engineering costs.



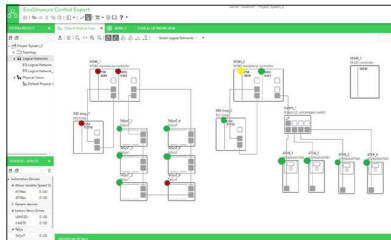


Client-Server model

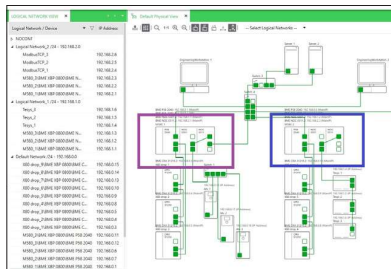
Logical Network / Device	Interface	IP Address
M580_2BANE RSP 1200 M0BANE P38 3040 M0	Embedded Interface/MainIP	192.168.0.1
M580_2BANE RSP 1200 M0BANE P38 3040 M0	Embedded Interface/PA	192.168.0.2
M580_2BANE RSP 1200 M0BANE P38 3040 M0	Embedded Interface/MainIP	192.168.0.3
M580_2BANE RSP 1200 M0BANE P38 3040 M0	Embedded Interface/MainIP	192.168.0.4
M580_2BANE RSP 1200 M0BANE P38 3040 M0	Embedded Interface/MainIP	192.168.0.5
M580_2BANE RSP 1200 M0BANE P38 3040 M0	Embedded Interface/PA	192.168.0.6
M580_2BANE RSP 1200 M0BANE P38 3040 M0	Embedded Interface/MainIP	192.168.0.7
M580_2BANE RSP 1200 M0BANE P38 3040 M0	Embedded Interface/MainIP	192.168.0.8
M580_2BANE RSP 1200 M0BANE P38 3040 M0	Embedded Interface/PA	192.168.0.9

Object	Description
M580_2BANE RSP 1200 M0BANE P38 3040 M0	At least one redundant port for which the RSTP service is enabled is not linked (ID: 5000)
ATV6_4	The DHCP client is enabled but no DHCP server is configured. (ID: 4010)
ATV6_3	The DHCP client is enabled but no DHCP server is configured. (ID: 4010)
ATV6_2	The DHCP client is enabled but no DHCP server is configured. (ID: 4010)
ATV6_1	The DHCP client is enabled but no DHCP server is configured. (ID: 4010)
M580_2BANE RSP 1200 M0BANE P38 3040 M0	The following services are disabled in the Security tab of the Properties pane. Verify that the
M580_2BANE RSP 1200 M0BANE P38 3040 M0	The following services are disabled in the Security tab of the Properties pane. Verify that the
Logical Network_1	The Logical Network properties are not unique (ID: 1004)
Logical Network_2	The Logical Network properties are not unique (ID: 1004)
Logical Network_3	The Logical Network properties are not unique (ID: 1004)

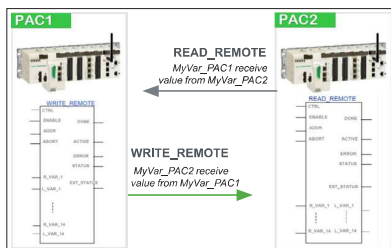
Network consistency check



System diagnostics



Implicit messaging



Explicit messaging



Topology Manager (continued)

Client-server model

The client-server model enables multiple engineers to work concurrently on the same project. The central repository (single global database) enables active services to share information across all automation system components as well as share real-time engineering data with all users, thus helping to maintain data consistency.

Network consistency

The accuracy and consistency of the network design can be analyzed and automatically validated with just one click. Detected errors or warnings are reported with detailed instructions for easy correction.

System diagnostics

The system diagnostics provides live statistics for the entire plant during the operation or commissioning phase. Detected errors are localized and analyzed in real time. The intuitive interface also helps to easily visualize these detected errors and resolve them quickly to boost efficiency.

PAC-to-PAC communication

The PAC-to-PAC communication is made flexible and easy with:

- Explicit messaging with READ_REMOTE and WRITE_REMOTE communication function blocks. These blocks enable exchange of variables by using the name of the variable between M580 and M340 PLCs.
- Implicit messaging with local slave being configured in Topology Manager and checked for consistency

Cybersecurity

Schneider Electric constantly endeavours to maintain the security of its systems. Security guidelines are available for our customers to help ensure their systems are protected from attack.

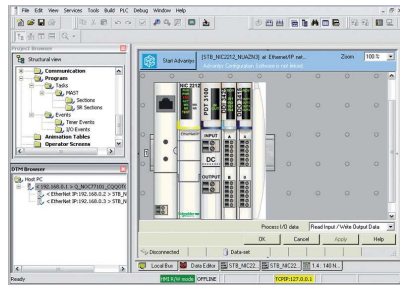
The Modicon M340, M580, M580S, Premium, Momentum, and Quantum automation platforms feature:

- Protection against remote programming changes via a password
- Option to enable or disable HTTP or FTP services

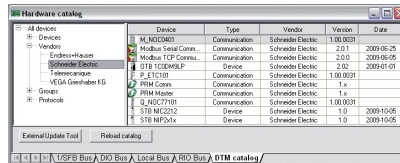
With the Modicon M580 automation platform:

- Log of security events in the SYSLOG database
- Extended Ethernet services management (DHCP, etc.) can be set for each user in the Access Control List
- More secure IPsec communication between EcoStruxure Control Expert or SCADA and PAC

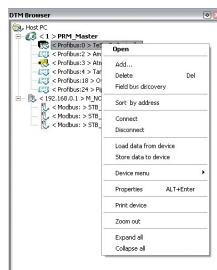
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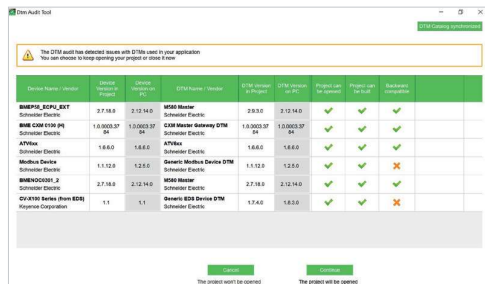
DTM editor (Modicon STB island)



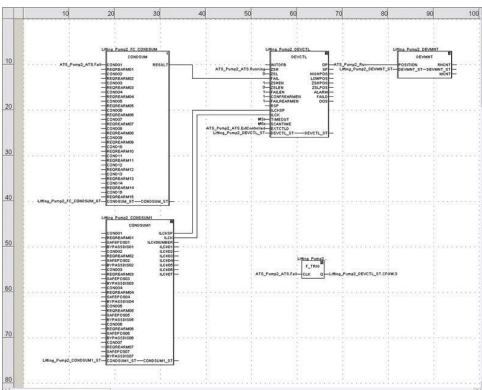
DTM hardware catalog



DTM Browser and DTM context menu



DTM Audit Tool screen



FBD language editor

FDT/DTM function

EcoStruxure Control Expert facilitates integration of fieldbus architectures into engineering control systems using FDT/DTM technology:

- FDT (Field Device Tool) is the container which supports the device DTMs.
- DTM (Device Type Manager) is the configuration tool for devices with integrated graphic interfaces. It contains the properties specific to each device.

In addition to the FDI/DTM standard, the software uses specific information from the Master DTM created for the Profibus Remote Master (PRM) module, the HART module, the Premium ISPY101 weighing module, Altivar process drive integration, and the Modbus/TCP and EtherNet/IP network modules BMXNOC0401 and BMENOC0301.

Use of the Master DTM allows EcoStruxure Control Expert to perform the following actions:

- Manage the PAC I/O scan
- Create the application variables based on the description of the process objects available from the connected DTM devices
- Manage synchronization with the PAC configuration
- Create a generic DTM from the description files (GSD or EDS)

The DTM configuration is stored in the PAC memory so that the application can be downloaded in its entirety. It is also saved in the PAC project file (STU), the archive file (STA), and the full application exchange file (ZEF).

A third-party DTM can be installed in the DTM hardware catalog.

The DTM hardware catalog can be used to sort or filter the DTMs according to various criteria such as device, vendor, groups or protocols.

The DTM Browser in EcoStruxure Control Expert:

- Displays the fieldbus topologies in a tree structure
- Allows the user to configure the DTM devices:
 - ☐ add and delete DTMs
 - ☐ connect and disconnect DTMs to/from their physical devices
 - ☐ display and print the properties of a DTM
 - ☐ transfer DTM configuration data to and from the physical device
 - ☐ execute functions specific to the DTM, via the Device menu

The fieldbus discovery function scans the physical devices in a fieldbus network and adds the selected devices to the DTM Browser.

DTM Audit Tool is provided to have a clear vision of the DTM versions embedded in a project and the versions installed on the PC. Depending on the DTM version compatibility, the tool informs if the project can be opened and built.

Programming languages

The five IEC 61131-3 compliant languages

The five graphical or textual languages available in EcoStruxure Control Expert are used for programming Modicon M340, Modicon M580, Modicon M580 Safety, Modicon Momentum, Premium, and Quantum automation platforms.

The three graphical languages are:

- Ladder (LD) language
- Function Block Diagram (FBD)
- Sequential Function Chart (SFC) or Grafcet

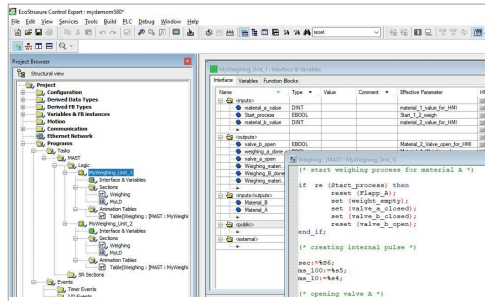
The two textual languages are:

- Structured Text (ST)
- Instruction List (IL)

For these five languages, you can use the standard set of instructions compliant with IEC standard 61131-3 to create applications that can be transferred from one platform to another. EcoStruxure Control Expert software also provides extensions to this standard set of instructions. As they are specific to Modicon M340, Modicon M580, Modicon M580 Safety, Modicon Momentum, Premium, and Quantum automation platforms, these extensions support the development of more complex applications in order to maximize the potential of the specific features of each of these platforms.

LL984 language

LL984 (Ladder Logic 984) language enables migration from legacy Modicon ranges. It is used to program Modicon M580, Modicon M580 Safety, Modicon M340, Momentum, and Quantum automation platforms.



Program units

Program units

Program units are compliant with Program Organization Units (POUs) as defined in standard IEC 61131-3.

Program units are autonomous programming entities (only available for Modicon M580 and M340). Program units allows easy duplication and clear organization of a program with local and public variables.

The program unit includes:

- Public and local variables
- Sections
- Animation tables

The following programming languages are supported:

- FBD (Function Block Diagram)
- LD (Ladder Diagram Language)
- SFC (Sequential Function Chart) only for sections in the program unit that belong to the MAST task
- IL (Instruction List)
- ST (Structured Text)

Common functional Safety architecture on Modicon M580 (1)

Presentation

The EcoStruxure Control Expert user-friendly interface for Modicon automation platforms family is now available for safety.

EcoStruxure Control Expert allows users to:

- Manage a complete control and safety automation system from design to operation and maintenance.
- Increase productivity during engineering, commissioning, and operation for both process and safety, reducing time to market.

EcoStruxure Control Expert makes it possible to design a common safety architecture by executing:

- The Safety functions of your process in specific safety tasks
- Standard functions in other tasks

All X80 safety I/O are managed through safety tasks, and standard and non-interfering X80 modules are managed in other tasks. This means it is possible to mix safety and standard X80 modules in the same M580 Safety PAC.

IEC 61131-3 compliant languages

FBD and LD are supported in the SAFE task. The safe task has 2 modes for operation and maintenance:

- Safety mode: During operation, the SAFE task is running and is locked for users
- Maintenance mode: Dedicated for maintenance operations in safety part of the application

Data editor

PROCESS and SAFE data are managed in a distinct M580 memory area.

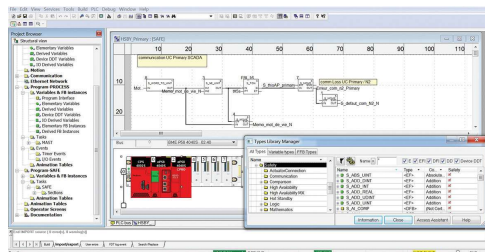
EcoStruxure Control Expert allows users to easily manage:

- Exchange of data between process and safe areas of the project in "Data Editor"
- Process data in the "PROCESS Data Editor"
- Safe data in the "SAFE Data Editor"

Safety function blocks

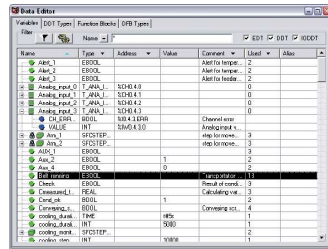
EcoStruxure Control Expert supports new M580 Safety offers with IEC 61508 programming languages and a rich library of Safety function blocks.

(1) Available from V13.

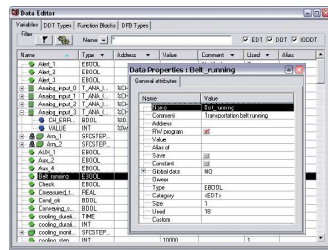


Safety function block

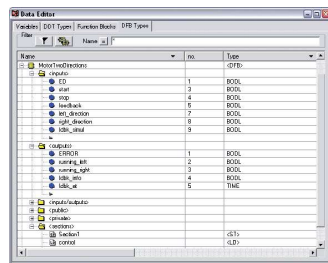
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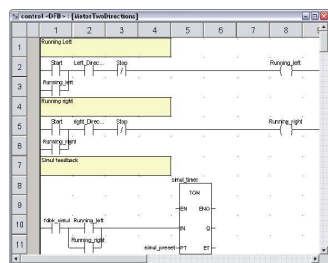
Data editor



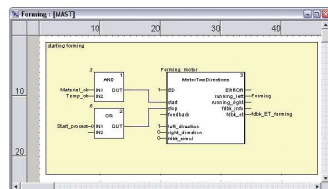
Data properties



Design



Creating the code



Use within the program

Data editor

The data editor provides a single tool for performing the following editing tasks:

- Declaration of data including variables and function blocks (declaration of their type, instances, and attributes)
- Use and archiving of function block data types in different libraries
- Hierarchical view of data structures
- Searching, sorting, and filtering of data
- Creation of a hyperlink to access a description from any variable comment

The data is displayed in four tabs:

- “Variables” tab for the creation and management of the following data instances: bits, words, double words, inputs/outputs, tables, and structures
- “DDT Types” tab for the creation of derived data types (tables and structures)
- “Function Blocks” tab for the declaration of EFBs and DFBs
- “DFB Types” tab for the creation of DFB user function block data types

Each data element has several attributes, of which:

- Variable name and type are mandatory
- Comment, physical address in the memory, and initial values are optional

The data editor columns can be configured (number of columns, order). The attributes associated with a variable can be displayed in a properties window.

This editor can be accessed at any time during programming by selecting variables for data modification or creation.

DFB user function blocks

With EcoStruxure Control Expert software, users can create their own function blocks for specific application requirements on Modicon M340, Modicon M580, Modicon M580 Safety, Modicon Momentum, Premium, and Quantum platforms.

Once created and saved in the library, these user function blocks can be reused as easily as EFBs (Elementary Function Blocks).

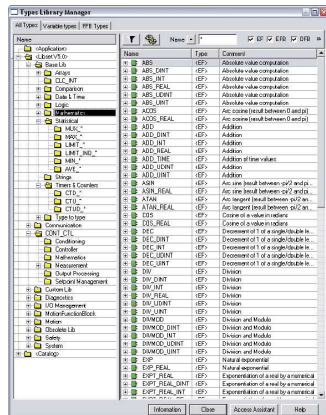
The user function blocks can be used to structure an application. They are used when a program sequence is repeated several times in the application or for freezing a standard programming routine. They can be read-only or read/write. They can be exported to other EcoStruxure Control Expert applications.

Using a DFB in one or more applications:

- simplifies program design and entry
- improves program readability and understanding
- facilitates program debugging (variables handled by the DFB are identified in the data editor)
- enables the use of private variables specific to the DFBs, which are independent of the application

A DFB is set up in several stages:

- The DFB is designed by assigning a name, a set of parameters (inputs, outputs, public and private internal variables) and a comment to it via the data editor.
- The code is created in one or more sections of the program, with the following languages selected according to requirements: Structured Text, Instruction List, Ladder, or Function Block Diagram (ST, IL, LD, or FBD).
- The DFB can be stored in a library with an associated version number.
- A DFB instance is created in the data editor or when the function is called in the program editor.
- This instance is used in the program in the same way as an EFB (the instance can be created from within the program).



Standard function block libraries

Function block libraries

The function and function block libraries manager contains the elements provided with EcoStruxure Control Expert software. Functions and function blocks are organized into libraries, which themselves consist of families. Depending on the type of PAC selected and the processor model, users will have a subset of these libraries available to write their applications. However, the "Base Lib" library contains a set of functions and function blocks, for the majority of which compatibility is independent of the platforms. In particular, it contains the blocks compliant with IEC 61131-3.

The "Base Lib" library is structured into families:

- Timers and counters
- Process control on integers
- Table management
- Comparison
- Date and time management
- Logic processing
- Mathematical processing
- Statistical processing
- Character string processing
- Type-to-type data conversion

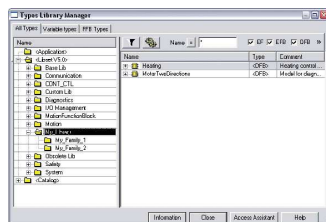
The "Base Lib" library, which covers standard automation functions, is supplemented by other, more application-specific libraries and platform-specific functions:

- **Communication library**, providing an easy means of integrating communication programs from PACs with those used by HMIs from the PAC application program. Like other function blocks, these EFBs can be used in any language to exchange data between PACs or to deliver data to be displayed on an HMI.
- **Process control library**. The CONT_CTL library can be used to set up process-specific control loops. It offers controller, derivative, and integral control functions and additional algorithms, such as EFBs for calculating mean values, selecting a maximum value, detecting edges, or assigning a hysteresis to process values, etc.
- **Diagnostics library**, which can be used to monitor actuators and contains EFBs for active diagnostics, reactive diagnostics, interlocking diagnostics, permanent process condition diagnostics, dynamic diagnostics, monitoring of signal groups, etc.
- **I/O management library**, providing services to handle information exchanged with hardware modules (formatting data, scaling, etc.).
- **Motion Function Block library**, containing a set of predefined functions and structures to manage motion controlled by drives and servo drives connected on CANopen.
- **Motion library** for motion control and fast counting.
- **System library**, which provides EFBs for the execution of system functions, including: evaluation of scan time, availability of several different system clocks, SFC section monitoring, display of system status, management of files on the memory cartridge of the Modicon M340 processor, M580 processor, etc.
- Finally, a library named "obsolete", containing the function blocks used by legacy programming software needed to perform application conversions.

Management of user standards

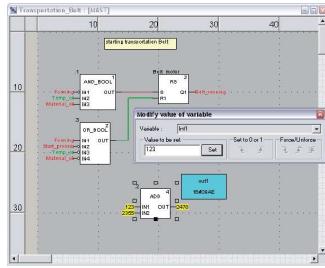
Users can create libraries and families in order to store their own DFBs and DDTs. This enhancement allows users to take advantage of programming standards adapted to their needs, along with version management. This means that it is possible to:

- Check the version of the elements used in an application program against those stored in the library
- Perform an upgrade, if necessary

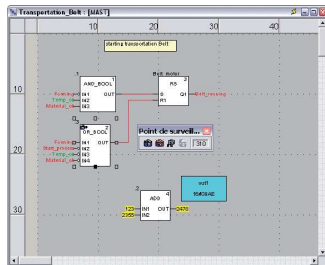


User libraries

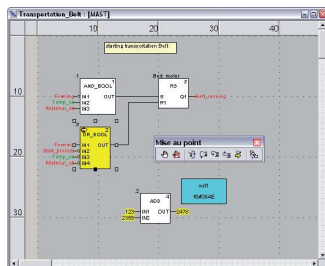
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Debugging tools: Dynamic animation/adjustment



Debugging tools: Watchpoint



Debugging tools: Breakpoint/step-by-step

Debugging tools

EcoStruxure Control Expert software offers a complete set of tools for debugging Modicon M340, M580, M580S, Momentum, Premium, or Quantum applications. A tool palette provides direct access to the main functions:

- Dynamic program animation
 - Setting of watchpoints or breakpoints (not authorized in event-triggered tasks)
 - Step-by-step program execution. A function in this mode enables section-by-section execution. Instruction-by-instruction execution can be launched from the previous breakpoint. Three execution commands are therefore possible when the element to be processed is a subroutine (SR) or DFB user block instance:
 - Step Into: This command is used to move to the first element of the SR or DFB.
 - Step Over: This command is used to execute the entire SR or DFB.
 - Step Out: This command is used to move to the next instruction after the SR or DFB element.
 - Independent execution of the master (MAST), fast (FAST), auxiliary (AUX), and event-triggered (EVTi) tasks

Animation of program elements

Dynamic animation is managed section-by-section. A button on the toolbar is used to activate or deactivate animation for each section.

When the PAC is in RUN, this mode can be used to simultaneously view:

- The animation of a program section, regardless of the language used
- The variables window containing the application objects created automatically from the section viewed

Animation table

Tables containing the variables of the application to be monitored or modified can be created by data entry or initialized automatically from the selected program section. The tables can be stored in the application and retrieved from there at a later date.

EcoStruxure Control Expert can be used to save, import, and export Animation tables with predefined set values. As it allows population of set values along with current values and vice versa in the PAC, Animation tables can be used as templates to make the application easier to tune.

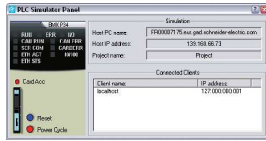
Debugging DFB user function blocks

The parameters and public variables of these blocks are displayed and animated in real time using animation tables, with the possibility of modifying and forcing the required objects.

In exactly the same way as with other program elements, the watchpoint, breakpoint, step-by-step execution, and program code diagnostics functions can be used to analyze the behavior of DFBs. Setting a breakpoint in a DFB user function block instance stops execution of the task containing this block.

Debugging in Sequential Function Chart (SFC) language

The various debugging tools are also available in SFC language. However, unlike other sections (IL, ST, LD, or FBD), an SFC section executed step-by-step does not stop execution of the task but instead freezes the SFC chart. Several breakpoints can be declared simultaneously within a single SFC section.



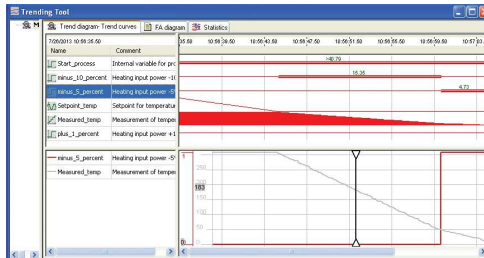
Simulator control panel

PLC simulator

EcoStruxure Control Expert's integrated simulator can be used to test the application program for Modicon M340, M580, M580S, Momentum, Premium, or Quantum automation platforms from the PC terminal without having to connect to the processor. The functions provided by the debugging tools are available for debugging the master, fast, and auxiliary tasks.

As the simulator does not manage the PLC I/O, animation tables can be used to simulate the state of inputs by forcing them to 0 or 1.

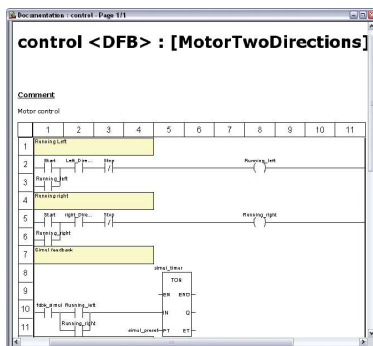
The simulator can be connected to third-party applications via an OPC server with OFS (OPC Factory Server) software.



Trending tool control panel

Trending tool

The trending tool allows easy monitoring of variables by detecting operating problems or improving process performance. You can select any variable in your application and start acquisition, save records, and analyze records with integrated tools or Excel. The PAC mast scan can scan up to 16 variables.



Accessing the documentation editor

Documentation editor

The documentation editor is based on the Documentation Browser, which shows the file structure in tree form.

It allows all or part of the application file to be printed on any graphics printer accessible under Windows using True Type technology, in A4 or US letter print format.

The documentation editor supports the creation of user-specific files using the following headings:

- Title page
- Contents
- General information
- Footer
- Configuration
- EF, EFB, and DFB type function blocks
- User variables
- Communication
- Project structure
- Program
- Animation tables and cross-references
- Runtime screens

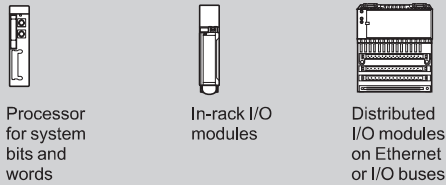
System time stamping

System mode allows time stamping of I/O or internal variables for easy management via OFS and SCADA. Programming or use of any function block is not required as the configuration is easy to perform in EcoStruxure Control Expert Data Editor supported by OFS version 3.51.

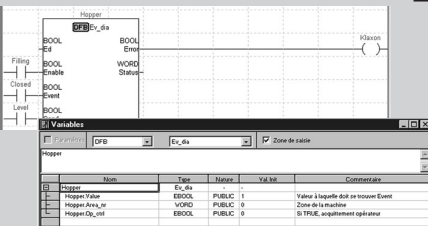
Diagnostics integrated in Modicon M340, Modicon M580, Modicon M580 Safety, Premium, and Quantum automation platforms

Presentation

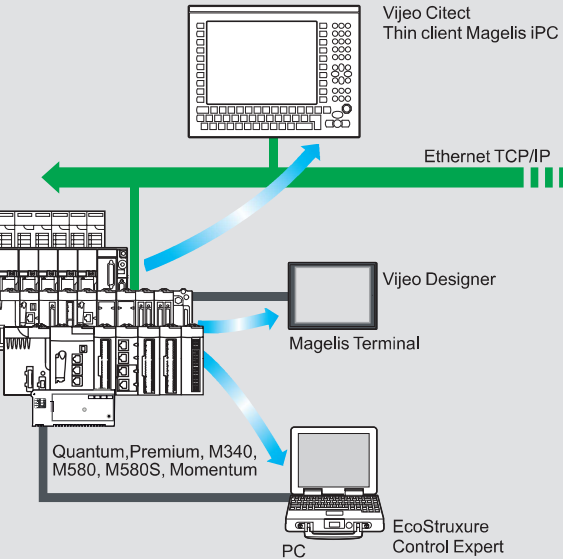
System diagnostics



Application diagnostics



Diagnostics viewers



Higher-level MES

Cell level

Machine level

The diagnostics offer for Modicon M340, M580, M580S, Momentum, Premium, and Quantum platforms is based on the following three components:

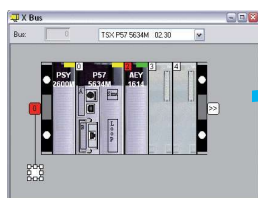
- System diagnostics
- DFB and EFB diagnostic function blocks (for system and application diagnostics)
- Error message display system, called viewers, supplied as a standard component of Magelis terminal, Vijeo Citect supervisory software and EcoStruxure Control Expert setup software

System diagnostics

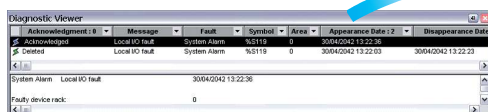
The system diagnostics for the Modicon M340, M580, M580S, Momentum, Premium, and Quantum platforms support the monitoring of system bits/words, I/O modules, and activity times (minimum/maximum) of SFC steps. By simply choosing the relevant option during application configuration, any event will generate time-stamped messages logged in the diagnostic buffer of the PAC.

These events are displayed automatically in a diagnostics viewer (1) without requiring any additional programming.

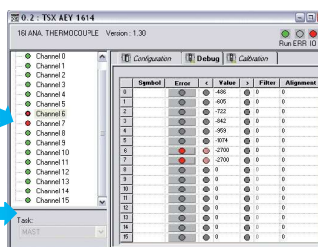
With EcoStruxure Control Expert integrated diagnostics, this function can be used to perform first-level diagnostics of the elements in the configuration, up to and including each I/O module channel.



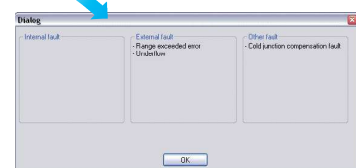
Configuration level



Viewer window (example with EcoStruxure Control Expert software)



Module level



Channel level

(1) Diagnostics viewers are tools for displaying and acknowledging diagnostic error messages. They are supplied as a standard component of EcoStruxure Control Expert and Vijeo Designer software, with Magelis terminals and with the PLC Web server that can be accessed via a thin client Magelis iPC.

Modifying the program with the PAC in RUN mode

With EcoStruxure Control Expert, changes can be made to the program when the PAC connected to the programming terminal is in RUN mode. These modifications are performed with the following operations:

- The application contained in the PAC is transferred to the PC terminal running EcoStruxure Control Expert, if necessary.
- Program changes are prepared. These program modifications can be of any type and in any language (IL, ST, LD, FBD, and SFC), for example, addition or deletion of SFC steps or actions. The code of a DFB user function block can also be modified (however, modification of its interface is not permitted).
- These program changes are updated in the PAC (in RUN mode).

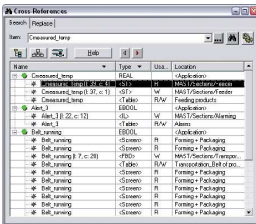
This function makes it possible to add or modify program code and data in different parts of the application during a single modification session (thus resulting in a uniform, consistent modification with respect to the controlled process). This increased flexibility comes at a cost in terms of the amount of program memory required.

Cross-references function

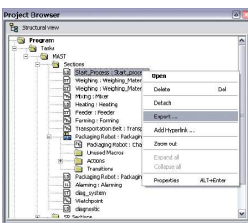
The EcoStruxure Control Expert's cross-references function, which is available in standalone mode (offline) and when connected to the PAC in Run (online), allows users to view the elements of a PAC application when searching for any type of variable. This view indicates where the declared variable is used, as well as how it is used (for writing, reading, etc.).

This function also provides access to the Search/Replace function for variable names.

The variable search can be initialized from any editor (language, data, runtime screen, animation table, etc.).



Cross-references table



Data export shortcut menu

Import/export function

The import/export function available in EcoStruxure Control Expert supports the following operations from the structural and functional project views:

- Via the import function, reuse of all or part of a previously created project in the current project
- Via the export function, copying of all or part of the current project to a file for subsequent reuse

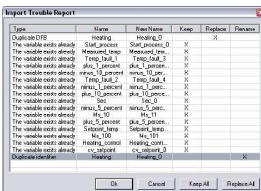
The files generated during export are generally in XML format ⁽¹⁾. However, in addition to XML, variables can be exported and imported in the following formats:

- .xvm format compatible with OFS data server software
- source format, in an .scy file compatible with PL7 development software
- text format with separator (Tab) in a .txt file for compatibility with any other system

During an import, a wizard can be used to reassign data to new instances of:

- DFB function blocks
- DDT data structures
- simple data

In addition, when a functional module is imported, the data associated with animation tables and runtime screens is also reassigned.



Data import wizard

The XML import function also supports the transfer of a Modicon M340, Modicon M580, Modicon M580 Safety, Premium, or Quantum PAC configuration prepared in the SIS Pro costing and configuration tool for use in the creation of a project in EcoStruxure Control Expert. This import function spares the user from having to redefine the PAC configuration when the PAC has already been configured with the SIS Pro tool.

EcoStruxure Control Expert includes an Excel import/export tool that makes it easy to manage the variables using an XML export file in Excel.

⁽¹⁾ XML language is an open, text-based language that provides structural and semantic information.

Application converters

EcoStruxure Control Expert's integrated conversion tools can be used to convert applications created with ModSoft, ProWorX, Concept, and PL7 programming software to EcoStruxure Control Expert applications.

Concept/EcoStruxure Control Expert converter (Quantum and Momentum PACs)

This conversion is performed with a Concept application V2.5 or later (it can also be performed in V2.11 or later, but only after an update to V2.5). In order to perform the conversion, the application should be exported to an ASCII file in Concept. The export file is converted to a EcoStruxure Control Expert source file automatically. This file is then analyzed by EcoStruxure Control Expert. At the end of the procedure, a conversion report is generated and an output window displays any conversion detected error and provides direct access to the part of the program to be modified. The Concept application converter converts the application to EcoStruxure Control Expert, but does not guarantee that it will operate correctly in real time. It is therefore essential to test or debug all converted applications.

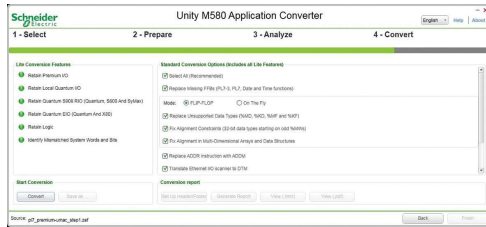
PL7/EcoStruxure Control Expert converter (Premium PAC and Atrium slot PAC)

This conversion is performed with a PL7 application V4 or later (Premium PAC or Atrium slot PAC). In order to perform the conversion, the source file (complete application or user function block) should be exported to PL7. The conversion procedure is similar to that of the Concept conversion described above.

Note: Applications created with Concept, Modsoft and ProWORX can be converted to LL984. Please contact our Customer Care Center.

Unity M580 Application Converter (UMAC)

The conversion from Unity Quantum and Unity Premium applications to Unity M580 applications is performed with UMAC. UMAC is a standalone software tool that can be installed on a Windows PC. The complete conversion process relies on the use of EcoStruxure Control Expert. UMAC is available in 2 sizes: Lite and Standard. UMAC Lite is free and downloadable from our website www.schneider-electric.com. UMAC Lite allows the existing configuration to be retained while UMAC Standard adapts the code to Modicon M580.



Unity M580 Application Converter tool

Operating system update utilities

The OS-Loader software is designed for updating operating systems on Premium and Quantum platforms. It is supplied with EcoStruxure Control Expert software. It is used to upgrade EcoStruxure Control Expert processors and modules as well as to upgrade PL7 or Concept processors and modules to make them compatible with EcoStruxure Control Expert.

OS-Loader software supports:

- Premium processors
- Quantum processors
- Ethernet communication modules
- EtherNet/IP communication modules

The operating system updates are performed as follows:

- Uni-Telway RS 485 terminal link for Premium processors
- Modbus or Modbus Plus terminal link for Quantum processors
- Ethernet TCP/IP network for integrated Ethernet port on Premium processors and Premium and Quantum Ethernet modules

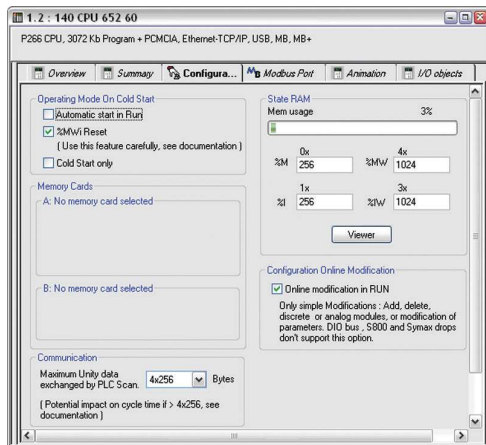
Note: For Modicon M340, M580, and Momentum this service is provided by Unity Loader (see page 2/6).

Online modification of the configuration (CCOTF)

This function, also called Change Configuration On The Fly (CCOTF), is used to modify the Modicon M580 or Modicon Quantum configuration online (application in RUN mode):

- Addition or removal of discrete or analog I/O modules
- Modification of configuration parameters of discrete or analog I/O modules (already present or newly installed)

On Quantum, the CCOTF function is supported by standalone processors for the three types of I/O architecture (local, RIO, DIO) using version 5 of EcoStruxure Control Expert, and for Hot Standby processors using version 4.1 or higher of EcoStruxure Control Expert. The CCOTF function should first be validated in the EcoStruxure Control Expert configuration screen. A confirmation screen appears when the configuration has been modified online.

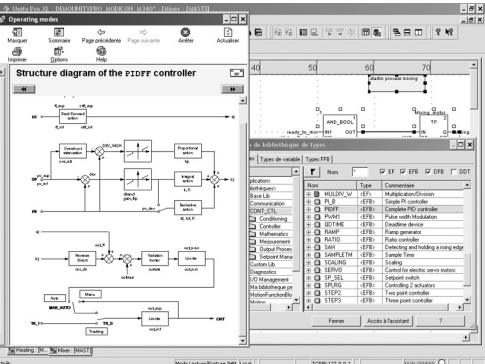


Configuration screen

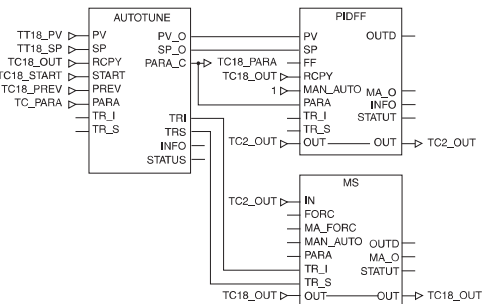
Software

EcoStruxure Control Expert

Small/Large/Extra Large/Extra Large with
Topology Manager and M580 Safety
Programmable process control



CONT_CTL, programmable process control integrated in EcoStruxure Control Expert



Example: PID controller with MS manual control

Process control in machines

EcoStruxure Control Expert contains **CONT_CTL**, a library of 36 function blocks used to create control loops for machine control.

The requirements for closed loop control functions in machines are adequately met by Modicon M340, Modicon M580, Modicon M580 Safety, Modicon Momentum, Premium, and Quantum platforms thanks to the wealth of functions in the library and the flexibility with which function blocks can be linked together through programming. This solution therefore avoids the need for external controllers and simplifies the overall control architecture of the machine, as well as its design, rollout, and operation.

The EFs or EFBs can be used in any of the EcoStruxure Control Expert languages (LD, ST, IL, and FBD). FBD is particularly suitable for accessing control processing operations in EcoStruxure Control Expert through its wizard for entering and viewing parameters and function block variables.

CONT_CTL library functions

The library consists of six function families:

- input data conditioning
- controllers
- mathematical functions
- process value processing
- output value processing
- setpoint management

Input data conditioning

DTIME	Pure time delay
INTEGRATOR	Integrator with limiting
LAG_FILTER	First order time lag
LDLG	Lead/lag function with smoothing
LEAD	Lead function with smoothing
MFLOW	Mass flow calculation based on the measurement of differential pressure or flow speed with pressure and temperature compensation
QDTIME	Dead time term
SCALING	Scaling
TOTALIZER	Integrator (typically of flow) until a limit (typically a volume) is reached, with automatic reset
VEL_LIM	Velocity limiter, with manipulated variable limiting

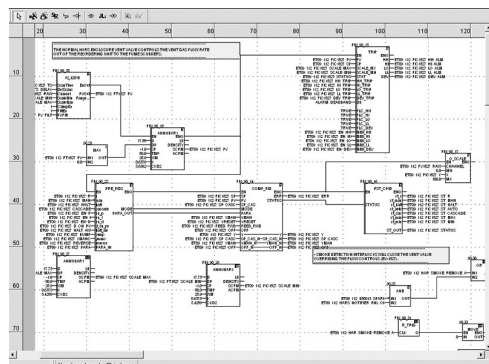
Controllers

PI_B	Basic PI controller: PI algorithm with a mixed structure (series/parallel)
PIDFF	Complete PID controller: PID algorithm with a parallel or mixed structure (series/parallel)
AUTOTUNE	Automatic tuner setting for the PIDFF (complete PID) controller or the PI_B (simple PI) controller □ Identification using Ziegler Nichols type method □ Modeling based on first-order process □ Building of control parameters with criterion for prioritizing either the reaction time to disturbance (dynamic) or the stability of the process
IMC	Model-based controller. The model is a first-order model with delay. This corrector is useful: □ When there are serious delays compared with the main time constant of the process; this scenario cannot be satisfactorily resolved by standard PID process control. □ For regulating a non-linear process IMC can handle any stable aperiodic process of any order.
SAMPLETM	Control of controller startup and sampling
STEP2	Simple two-position controller
STEP3	Three-position controller for temperature regulation

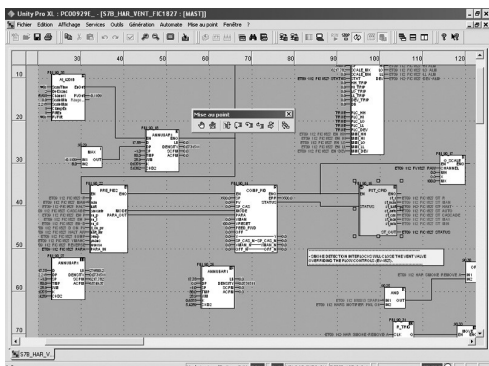
Mathematical functions

COMP_DB	Comparison of two values, with dead zone and hysteresis
K_SQRT	Square root, with weighting and threshold, useful for linearization of flow measurements
MULDIV_W	Weighted multiplication/division of 3 numerical values
SUM_W	Weighted summing of 3 numerical values

1



Programming in EcoStruxure Control Expert in offline mode



Programming in online mode

Process control in machines (continued)

CONT_CTL library functions (continued)

Process value processing

AVGMV	Moving average with fixed number of samples (50 max.)
AVGMV_K	Moving average with constant correction factor, 10,000 samples max.
DEAD_ZONE	Dead zone
LOOKUP_TABLE1	Linearization of characteristic curves using first-order interpolation
SAH	Detection of a rising edge
HYST_XXX	Detection of high threshold with hysteresis (1)
INDLIM_XXX	Detection of high and low thresholds with hysteresis (1)

Output value processing

MS	Manual control of an output
MS_DB	Manual control of an output with dead zone
PWM1	Control via pulse width modulation
SERVO	Control for servo motors
SPLRG	Control of two Split Range actuators

Setpoint management

RAMP	Ramp generator, with separate ascending and descending ramps
RATIO	Ratio controller
SP_SEL	Selection of setpoint value: local (operator) or remote (processing)

Setting up process control function blocks

Based on the sequencing of function blocks, the FBD language integrated in EcoStruxure Control Expert is a programming language particularly suitable for building control loops.

Designers can use FBD to easily associate blocks from the CONT_CTL library with their own DFBs written in EcoStruxure Control Expert's ST, IL, or LD language, or in C language.

Debugging, operation

All EcoStruxure Control Expert's standard debugging services (see [page 1/11](#)) are available. In particular, the PLC simulator can be used to check correct execution of processing offline.

Compatibility

The CONT_CTL control function block library is available in all versions of EcoStruxure Control Expert. It is compatible with processors in the Modicon M340, Modicon M580, Modicon M580 Safety, Modicon Momentum, Premium, and Quantum ranges.

Optional specialized libraries

The CONT_CTL control function block library can be supplemented with optional specialized libraries, to meet specific needs such as predictive control, fuzzy logic controller, HVAC, and mass flow calculation (see [page 2/8](#)).

Resources

The technical documentation provides many examples of how to set up programmable process control function blocks in FBD, LD, IL, and ST languages.

The techniques for adjusting process control loops are described in the EcoStruxure Control Expert online help and also the document available in www.schneider-electric.com.

(1) XXX according to the type of variable: DINT, INT, UINT, UDINT, REAL.

Communication drivers

The most commonly used communication drivers for Modicon M340, M580, M580S, Momentum, Premium, and Quantum platforms are installed at the same time as the EcoStruxure Control Expert software.

EcoStruxure Control Expert also includes the following drivers, which can be installed as required (1):

Protocol - Hardware	Windows® 7 32-bit and 64-bit editions	Windows® 10 32-bit and 64-bit editions
Fip adaptor - CUSBFIP		
Modbus Serial - COM port		
PCIway - Atrium TPCI57 PCI card		
Uni-Telway - COM port		
USB for high end PLC		
XIP - XWay on TCP/IP		

 Driver available  Driver not available

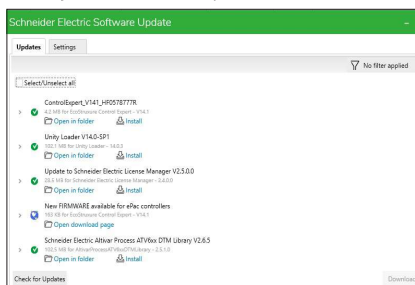
Upgrade kits for Concept, PL7 Pro, and ProWORX software

The Concept, PL7 Pro, and ProWORX upgrade kits allow users who already have one of these programs from the installed base, and who have a current subscription, to obtain EcoStruxure Control Expert version V4.1 software at a reduced price.

These upgrades are only available for licenses of the same type (e.g. from Concept XL group license to EcoStruxure Control Expert Extra Large group license).

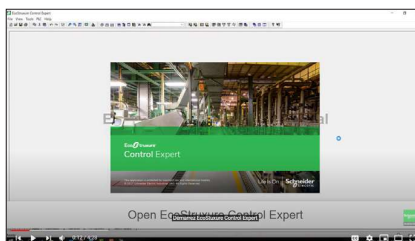
EcoStruxure Control Expert update (2)

Customers are notified automatically when a new EcoStruxure Control Expert update becomes available. They can then access the software update manager directly, download the update, and install it locally on their workstation.



How-to Tutorials

The EcoStruxure Control Expert has a dedicated YouTube channel showcasing videos that help you easily navigate and work with the software. It includes videos on topics like configuration, installation, testing, software features, etc. To explore more, click on the following link:



(1) Also available separately under reference **TLXCDDR20M**.

(2) EcoStruxure Control Expert requires .NET Framework 3.5 and .NET Framework 4.5.2.

Note: The latest firmware versions can be downloaded from our website www.schneider-electric.com.