Modicon Quantum automation platform

Catalogue

September 2012

Schneider Electric

All technical information about products listed in this catalogue are now available on:

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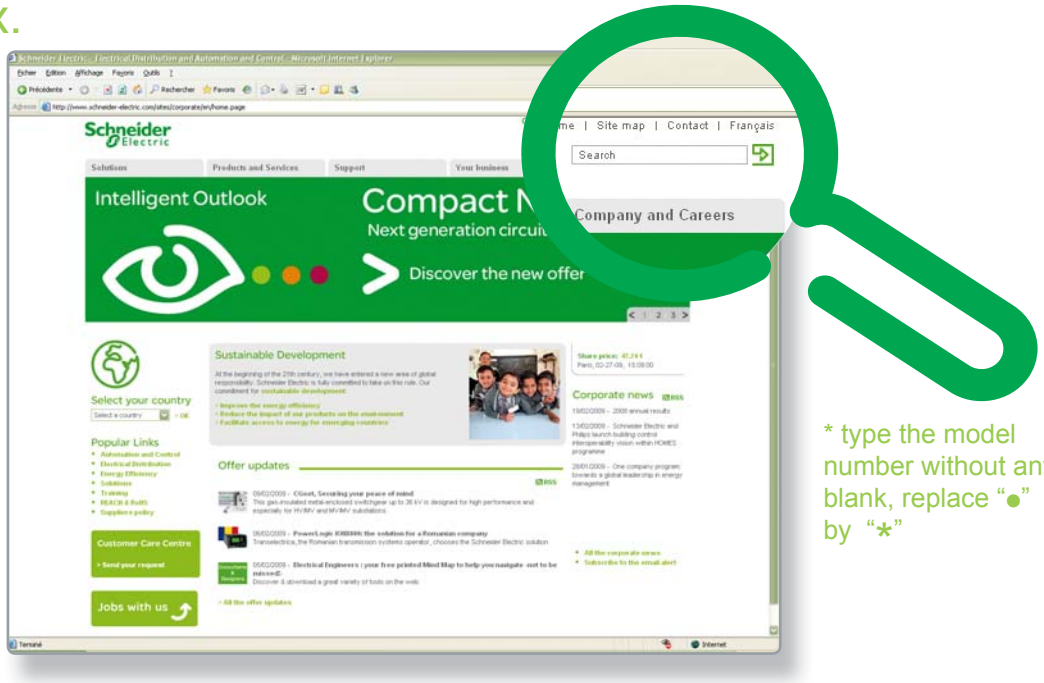
Browse the “product data sheet” to check out :

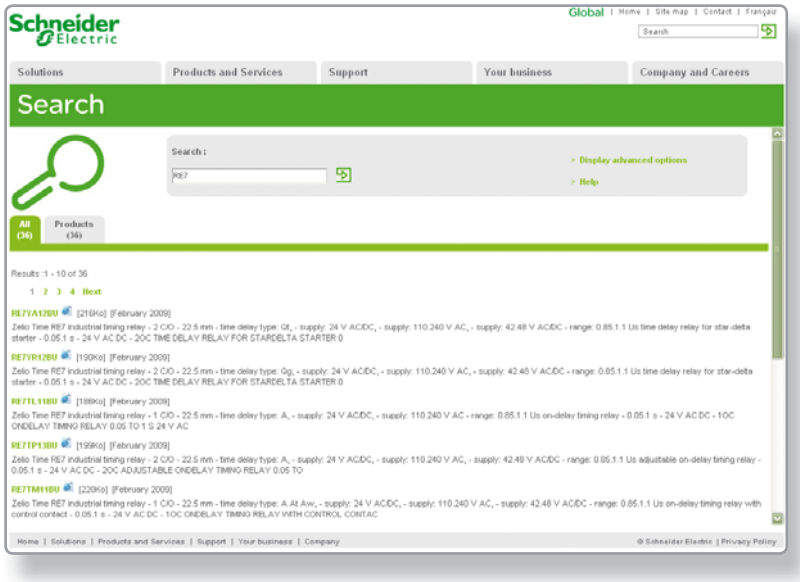
- characteristics,
- dimensions,
- curves, ...
- and also the links to the user guides and the CAD files.

1 From the home page, type the model number* into the “Search” box.



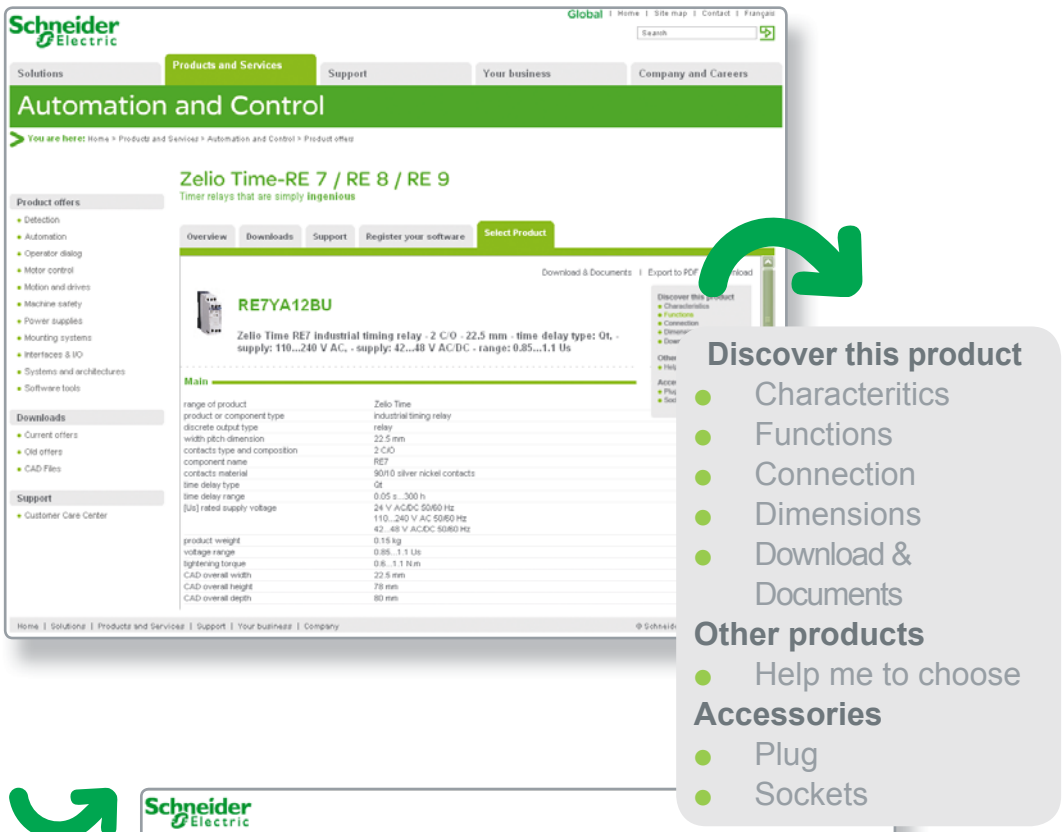
* type the model number without any blank, replace “●” by “*”

2 Under ”All” tab, click the model number that interests you.

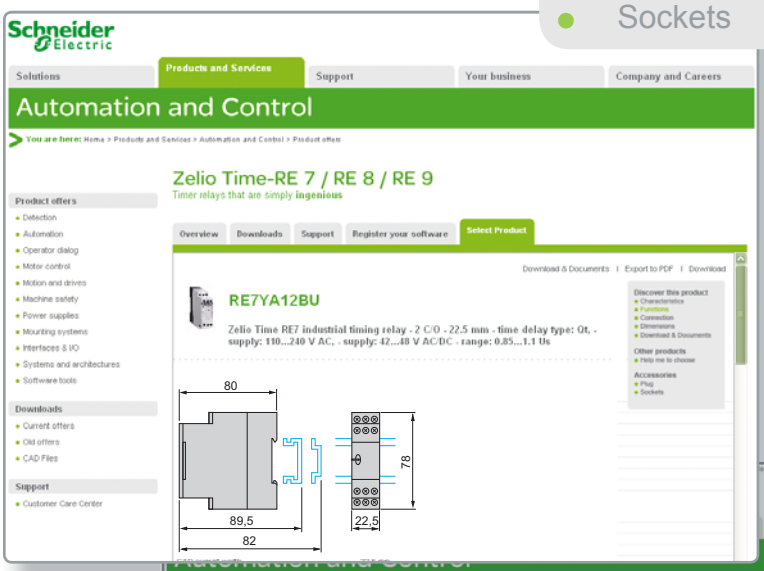


3 The product data sheet displays.

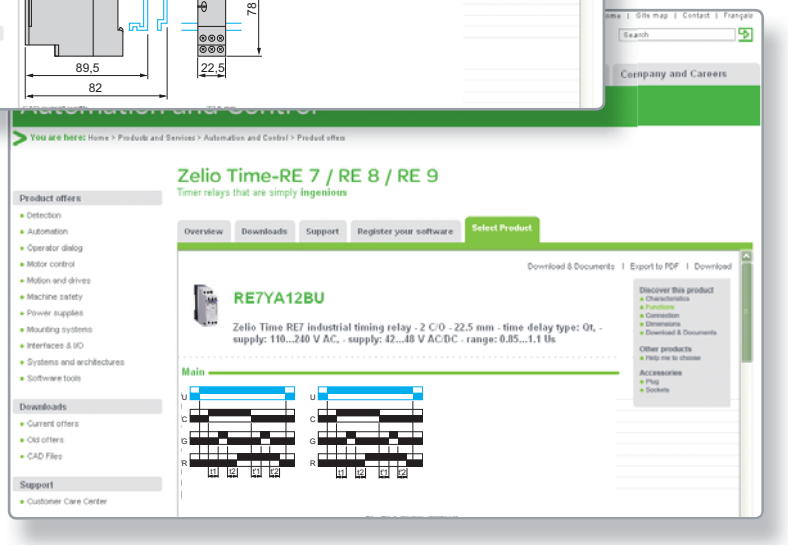
Example : Zelio Time data sheet



Example : Zelio Time data sheet



Example : Zelio Time data sheet



☑ You can get this information in one single pdf file.

Modicon Quantum automation platform

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2 - I/O architectures and Hot Standby architectures

3 - Discrete and analog I/O modules

4 - Application-specific modules and solutions

5 - Communication

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Modicon Quantum automation platform

To the world of Schneider Electric

Presentation

This catalogue presents the range of Modicon Quantum PLCs and includes new products, such as CPUs, power supplies and communication modules, which extend the field of application of the range in the various standard and safety industrial application areas.

With an already wide selection of I/O modules, and an already extensive offer in terms of communication on fieldbuses and networks, Modicon Quantum is even better suited to the needs of continuous or semi-continuous industrial processes and control of large infrastructure sites.

Capitalizing as it does on more than 25 years' experience in redundant processing architectures, and fully meeting safety requirements for people, production installations and their environment, Modicon Quantum is the ideal solution for applications requiring maximum availability in complete safety.

The Modicon Quantum offer is, de facto, inherently designed for high availability applications in the areas below:

- Petrochemicals
- Metallurgy
- Cement
- Energy
- Tunnels
- Airports
- Water treatment
- Mines
- Hydropower

Its role is reaffirmed in this catalogue, most notably with:

- ATEX Zone 2/22 certification of several Quantum “Conformal coating” offers, in accordance with the IEC-EX 60079-0, IEC-EX 60079-15 and IEC-EX 60079-31 standards for applications requiring a high degree of safety in harsh and potentially explosive environments (see pages 10/2 to 10/9).

- The Quantum Ethernet I/O solution, compatible with Modicon X80, provides a more flexible, less costly I/O architecture solution on Ethernet networks. In fact, the Modicon X80 offer includes common I/O modules that can be used in Ethernet RIO drops connected to a Quantum local controller (see page 2/6).

- Introduction of the Hot Standby CPU, 140 CPU 672 60, specifically for applications for which the distance between the 2 CPUs may be up to 2 km. With a 3 MB user memory, it provides access to advanced functions which the 140 CPU 671 60 does not have, such as the addition of ERIO drops online, the S908 bus and ERIO combination, and no limitation to the number of Modicon X80 drops. The 140 CPU 672 60 CPU has a multimode fibre optic port (see page 1/2).

- The EtherNet/IP and Modbus/TCP network modules 140 NOC 780 00 and 140 NOC 781 00, conforming to the ODVA standard. These modules have 4 ports. The 140 NOC 781 00 module has a router function which makes for easy integration of several networks (see pages 5/2 and 5/3).

- The fibre optic repeater for RIO drops on S908 bus, 140 NRP 954 01C, which improves the network's noise immunity and significantly increases the cable length (up to 16 km) in an RIO architecture (see page 2/22).

- The 140 ERT 854 20 multifunction module with integrated I/O. This module is compatible with GPS, DCF and IRIG-B signals (see page 4/3).

- A new range of ConneXium industrial Ethernet firewalls for optimum protection of networks against malicious attacks (see page 5/43).

- An upgrade to our Quantum safety architecture offer, in particular with the Unity Pro XLSafety software (see page 7/38).

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Modicon Quantum automation platform
Unity Pro standard CPUs

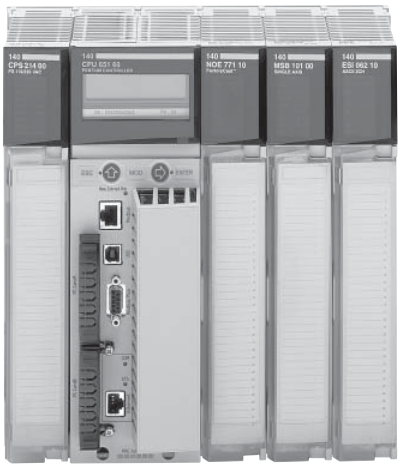
Automation platform for Unity Pro software offer			Simple applications	Simple and complex applications
Number of racks 3/4/6/10/16 slots	Local I/O		2 racks (1 main + 1 expansion)	
	Remote I/O (RIO)		31 drops of 2 racks	
Maximum discrete I/O	Local I/O		No limit (max. 27 slots)	
	Remote I/O (RIO) on S908 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**
Page			1/8	

(1) The maximum values for the number of discrete I/O and analog I/O are not cumulative.
(2) Profibus DP module by our 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 km (see our website www.schneider-electric.com).

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 Kinst/ms					
10.07 Kinst/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**
1/8					

(5) Max. distance between the 2 Hot Standby CPUs: Up to 16 km.
(6) With a maximum of a network head adaptor with integral router (140 NOC 78100).
(7) Only Conformal Coating versions are ATEX Zone 2/22 certified. For more information, see pages 10/2 to 10/9.

Modicon Quantum automation platform
Unity Pro standard CPUs



Presentation

The CPUs for the Modicon Quantum automation platform are based on high-performance processors and are compatible with Unity Pro software. Numerous functions are included as standard in Quantum CPUs:

- Superior scan times and fast I/O acquisition
- Ability to handle interrupts (timed and I/O based)
- Handling of Fast task, as well as a Master task
- Memory expansion using PCMCIA cards
- Multiple communication ports integrated in the CPU
- Ease of diagnostics and maintenance via the LCD display block on the front panel of high-end CPUs

The CPUs offered have different memory capacities, processing speeds and communication options.

Protected backed up memory

As standard, the CPUs store the application program in a battery-backed internal RAM. This battery is located on the front of the CPU and can be replaced while the CPU is running.
A switch enables the application to be made secure against malicious tampering via a remote connection.
To protect the application program from inadvertent changes during operation, the CPUs feature a key switch on the front panel to protect the memory. This key switch can also be used to start and stop the CPU. The **140 CPU 311 10** CPU only has a memory-protect slide switch.
The high-end **140 CPU 651 50/60**, **140 CPU 652 60**,**140 CPU 671 60, 140 CPU 672 60** and **140 CPU 672 61** CPUs have 2 slots for a PCMCIA card:

- An upper slot (no. 0) for a memory expansion card (programs, symbols, constants and/or data storage)
- A lower slot (no. 1) for a data storage memory expansion card

Built-in communication ports

Quantum CPUs incorporate, depending on the model:

- Two RS 232 Modbus ports (1 RS 232/485 Modbus port for **140 CPU 6●● ●●** CPUs)
- One Modbus Plus port
- One TCP/IP 10BASE-T/100BASE-TX Ethernet TCP/IP port (100BASE-FX for **140 CPU 67● 6●** Hot Standby CPUs)
- One USB port for connecting a programming PC terminal for the CPUs

LCD display

Depending on the model, the CPUs have an LCD display (2 lines of 16 characters) with adjustable brightness and contrast controls. The keypad associated with the display can be used for diagnostics, access to certain configuration parameters and starting and stopping the CPU.

Hot Standby redundancy

140 CPU 671 60, 140 CPU 672 60 and **140 CPU 672 61** CPUs are dedicated to the availability function of Hot Standby applications. They have a 100 Mbps Ethernet fibre optic link and the Hot Standby function can be diagnosed using the LCD display.
The **140 CPU 672 61** CPU is specifically designed for Hot Standby applications for which the distance between the two Hot Standby CPUs can be as much as 16 km.
Due to their greater memory capacity, **140 CPU 672 60** and **140 CPU 672 61** CPUs can improve performance by around 10 to 20% compared to that of the **140 CPU 671 60** CPU.
The **140 CPU 672 60** provides the user with up to 3 MB of usable memory without memory card and offers advanced functions compared to those of the **140 CPU 671 60** (possibility of adding online drops, PLC in RUN, enables S908 bus + Quantum Ethernet I/O combination, etc.).
In order to take advantage of this improved performance and advanced functions in an existing installation using a **140 CPU 671 60**, no rewiring is required by the user. The **140 CPU 671 60** CPU is simply replaced by the **140 CPU 672 60** CPU.

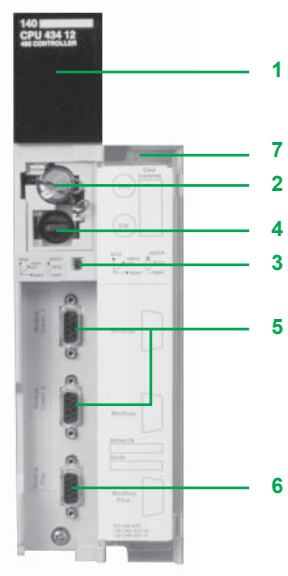
Quantum application design and installation

Use of these Quantum CPUs requires:

- Unity Pro Large or Extra Large programming software. This software is compatible with the Premium and M340 platforms.
- Optionally, as required:
  - □ Unity Application Generator (UAG) specialist software for modelling and generating process applications
  - □ Unity EFB toolkit software for developing EF and EFB function block libraries in C language
  - □ Unity Dif software for comparing Unity Pro applications
  - □ Unity Loader software for updating Unity Pro projects

Modicon Quantum automation platform

Unity Pro standard CPUs



140 CPU 434 12U

Description

Standard CPUs

140 CPU 311 10 and **140 CPU 434 12U** CPU front panels comprise:

1 A display block with 7 LEDs:
- Ready LED (green): Power-up diagnostic tests successful
- Run LED (green): Program executing
- Modbus LED (green): Activity on the Modbus port
- Modbus Plus LED (green): Activity on the Modbus Plus port
- Mem Prt LED (orange): Memory write-protected (memory protection switch activated)
- Bat Low LED (red): Backup battery needs replacing or is missing
- Error A LED (red): Communication fault on the Modbus Plus port

2 A backup battery slot *(1)*

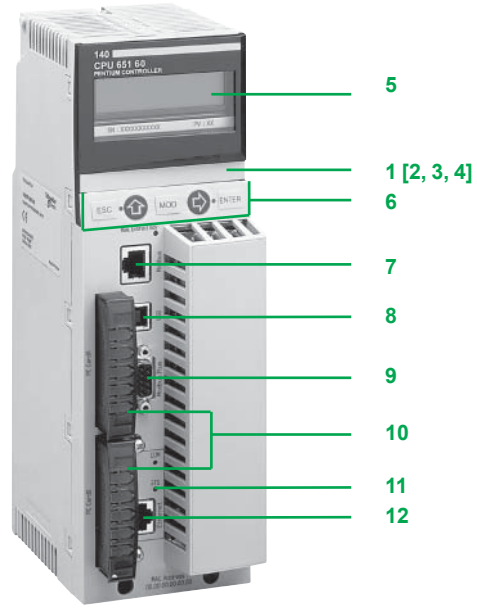
3 A slide switch for selecting the Modbus port communication parameters
- A slide switch (**140 CPU 311 10** model) for write-protecting the memory

4 A key switch (**140 CPU 434 12U** models):
- Stop position: The PLC is stopped and program modifications are not permitted
- Mem Prt position: The PLC is either stopped or running and program modifications are not permitted
- Start position: The PLC is either stopped or running, program modifications are permitted

5 Two 9-way female SUB-D connectors for connecting to the Modbus bus

6 A 9-way female SUB-D connector for connecting to the Modbus Plus network

7 A removable hinged door with a customizable identification label



140 CPU 651 50/60
140 CPU 652 60

High performance CPUs

140 CPU 651 50, **140 CPU 651 60**, **140 CPU 652 60**, **140 CPU 671 60,**
140 CPU 672 60 and **140 CPU 672 61** CPU front panels comprise:

1 An LCD display cover, providing access to:

2 A key switch:
- Unlocked: All system operations can be invoked and all changeable module parameters can be modified via the LCD and keypad. The memory is not write-protected
- Locked: No system operations can be invoked and all changeable module parameters are read-only. Memory is write-protected and the application program safeguarded. This mode avoids malicious tampering via a remote connection

3 A backup battery slot *(1)*

4 A reset button (Restart)

5 An LCD display (2 lines of 16 characters) with brightness and contrast controls

6 A 5-button keypad with 2 LEDs *(ESC, ENTER, MOD, ⇧, ⇨)*

7 An RJ45 connector for connecting to the Modbus bus

8 A type B female USB connector for connecting the programming PC terminal

9 A 9-way female SUB-D connector for connecting to the Modbus Plus network

10 Two slots for PCMCIA memory expansion cards

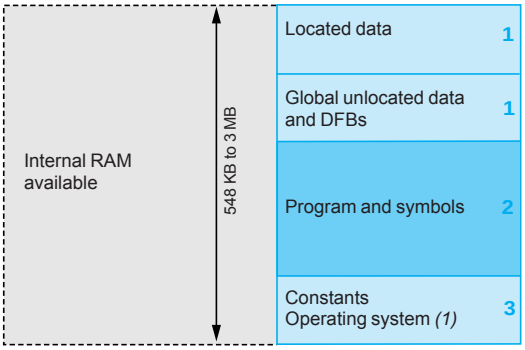
11 Two LEDs:
- COM LED (green): Activity on the Ethernet port (**140 CPU 651 50/60**, **140 CPU 652 60** models), activity on the Hot Standby primary or secondary drop (**140 CPU 671 60**, **140 CPU 672 60** and **140 CPU 672 61** models)
- ERR LED (red): Ethernet frame collision (**140 CPU 651 50/60**, **140 CPU 652 60** models), communication error between the Hot Standby primary and secondary drops (**140 CPU 671 60**, **140 CPU 672 60** and **140 CPU 672 61** models)

12 A connector:
- RJ45 connector for connection to the Ethernet network (**140 CPU 651 50/60**, **140 CPU 652 60** models)
- MT-RJ multimode fibre optic connector (**140 CPU 671 60** and **140 CPU 672 60** models) or LC single mode fibre optic connector (**140 CPU 672 61** model) for interconnecting the primary and standby PLCs in the Hot Standby architecture

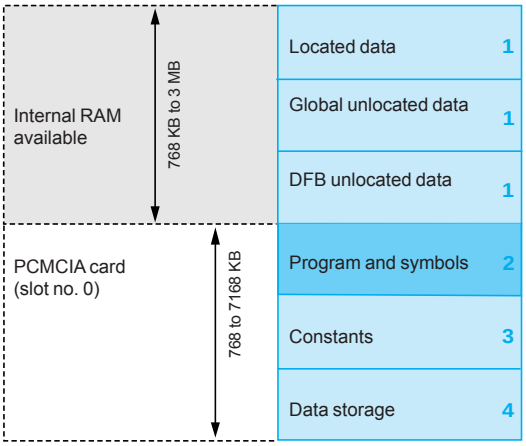
(1) Internal RAM backup battery:
- Product reference: 990 XCP 980 00
- Type: 3 V ⎓ lithium
- Capacity: 1200 mAh
- Storage life: 10 years

Modicon Quantum automation platform
Unity Pro standard CPUs

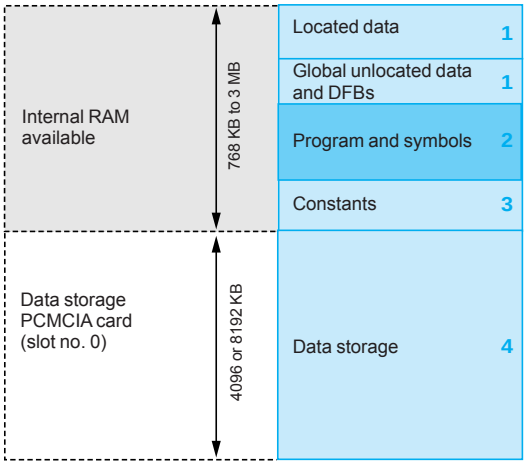
CPU without PCMCIA memory card



CPU with PCMCIA memory card in slot no. 0



CPU with data storage memory card in slot no. 0



Memory structure

The application memory is divided into memory areas physically distributed in the internal RAM and on 1 or 2 PCMCIA memory expansion cards (only on **140 CPU 651 50/60**, **140 CPU 652 60**, **140 CPU 671 60**, **140 CPU 672 61** and **140 CPU 672 60** CPUs):

1 Application data area always in internal RAM. This area is broken down into 2 types of data, to be used according to the user's habits and preferences:
- Global located data, corresponding to data defined by an address (for example, %MW237) with which a symbol can be associated (for example, Counting_rejects).
- Unlocated data, corresponding to data defined only by a symbol. This type of addressing removes the memory “mapping” management constraints because the addresses are assigned automatically.
- DFB unlocated data corresponding to DFB user function blocks. The size of this object area is only limited by the size of the internal RAM physical memory available.

2 Application program and symbols area in the internal RAM or in the PCMCIA memory card (descriptor, executable code for the tasks and application symbols database)

3 Constants area in internal RAM or the PCMCIA memory card (constant words, initial values and configuration)

4 Area for storing additional data that can be used for distributed applications to store information such as production data and manufacturing recipes (only on **140 CPU 651 50/60**, **140 CPU 652 60**, **140 CPU 671 60, 140 CPU 672 60** and **140 CPU 672 61** CPUs)

According to the application memory size requirements, two memory structures are possible depending on whether the Quantum CPU has 0, 1 or 2 PCMCIA memory expansion cards:

■ Application in internal RAM, the application is completely loaded into the CPU’s battery-backed internal RAM *(2)* the capacity of which depends on the CPU model.

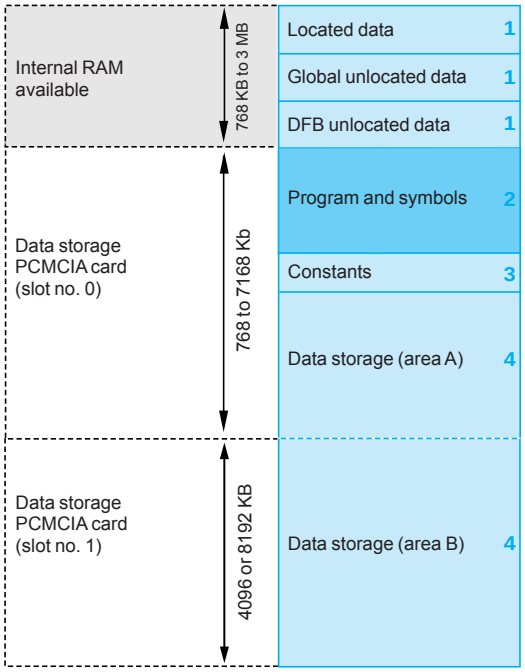
■ Application in the PCMCIA card, the internal RAM is reserved for the application data. The PCMCIA memory card contains the program space (program, symbols and constants areas). Certain types of PCMCIA memory card also take the data storage area.

The presence of the symbols area with the program area is optional. The fact of having the application symbols database on the PLC means that, when it is connected to an empty programming PC (with no applications), all the elements needed to debug or upgrade this PLC are available.

(1) Only with **140 CPU 311 10/434 12U** *CPUs.*
(2) The internal RAM is backed up by a 3 V ⎓ lithium battery (installed by the user). SRAM memory expansion cards are protected by a lithium battery.

Modicon Quantum automation platform
Unity Pro standard CPUs

CPU with 2 PCMCIA memory cards in slot no. 0 and no. 1



Memory structure (continued)

Expansion of the file storage area

With the **TSX MRP F004M/F008M** file storage memory cards (4096 or 8192 KB):

■ A file storage area can be provided when the application is completely loaded in the internal RAM

■ Memory space can be freed up for the program when the application is in the PCMCIA card

The Unity Pro programming software assists the application designer with management of the structure and the occupation of memory space in the Quantum PLC.

Protecting the application

Whether located in the internal RAM or in the PCMCIA card, the application can be protected with a key switch (see page 1/5), in order to prohibit access to it (read or modify program) online in Unity Pro.

Modicon Quantum automation platform
Unity Pro standard CPUs

140 CPU 434 12U

140 CPU 65● ●0

Unity Pro standard CPUs

CPU		Max. application memory capacity		Communication ports	Optical fibre		Reference	Weight
Clock speed	Coprocessor	Internal RAM available (for reference stated)	With PCMCIA card		Type and max. distance			
MHz		KB	KB			km		kg
66	Built-in math	548	–	2 Modbus RS 232 1 Modbus Plus	–	–	**140 CPU 311 10**	0.770
	Built-in math	1056	–	2 Modbus RS 232 1 Modbus Plus	–	–	**140 CPU 434 12U**	0.623
166	Yes, built-in Ethernet TCP/IP	768	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Ethernet TCP/IP	–	–	**140 CPU 651 50**	1.430
266	Yes, built-in Ethernet TCP/IP	1024	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Ethernet TCP/IP	–	–	**140 CPU 651 60**	1.967
		3072	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Ethernet TCP/IP	–	–	**140 CPU 652 60**	1.468
		1024	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps) *(2)*	multimode	2	**140 CPU 671 60**	1.424
		3072	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps) *(2)*	multimode	2	**140 CPU 672 60**	1.424
		3072	7168	1 Modbus (1) 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps) *(3)*	single mode	16	**140 CPU 672 61**	1.424

(1) RS 232/485 Modbus port.
(2) 100 Mbps Ethernet port for multimode optical fibre.
(3) 100 Mbps Ethernet port for single mode optical fibre.

Modicon Quantum automation platform
Unity Pro standard CPUs

PCMCIA memory expansion cards

Quantum **140 CPU 651 50/60**, **140 CPU 652 60**, **140 CPU 671 60**, **140 CPU 672 60** and **140 CPU 672 61** CPUs can take up to 2 memory expansion cards. However, the useful memory capacity is limited to the maximum size defined for the CPU model (see pages 1/4 and 1/5).

Connection cables and accessories

Description	Use		Length	Reference	Weight kg
	From CPU	To PC port			
Cables for connection to the PC terminal	Modbus port, 9-way SUB-D for: 140 CPU 311 10, 140 CPU 434 12U	RS 232 9-way SUB-D connector	3.7 m	**990 NAA 263 20**	0.300
			15 m	**990 NAA 263 50**	1.820
		USB port of PC	0.4 m	**TSX C USB 232** *(1)*	0.145
	Modbus port, RJ45 for: 140 CPU 6●● ●●	RJ45 connector	1 m	**110 XCA 282 01**	–
			3 m	**110 XCA 282 02**	–
			6 m	**110 XCA 282 03**	–
		USB port of PC	0.4 m	**TSX C USB 232** *(2)*	0.145
	USB port for: 140 CPU 6●●●●	USB port of PC	3.3 m	**UNY XCA USB 033**	–
Connection cable for Modbus network	Modbus port, RJ45 on high performance CPUs 140 CPU 65● ●● and 140 CPU 67● ●●	RJ 45 port on Modbus splitter box LU9GC3	3 m	**TCSMCN3M3M3S2**	–
Connection cables for Modbus Plus network	Modbus Plus port, 9-way SUB-D for: 140 CPU 311 10, 140 CPU 434 12U Elbowed connector (left side)	Modbus Plus tap *(3)*	2.4 m	**990 NAD 211 10**	–
			6 m	**990 NAD 211 30**	–
	Modbus Plus port, 9-way SUB-D for: 140 CPU 6●● ●● Straight connector	Modbus Plus tap *(3)*	2.4 m	**990 NAD 218 10**	–
			6 m	**990 NAD 218 30**	–
Modbus Plus/USB converter *(5)*	Modbus Plus tap *(3)*	USB port	0.4 m	**TSX C USB MBP** *(4)*	0.186
Adaptor	RJ45 connector for 140 CPU 6●● ●●	RS 232 9-way SUB-D connector	–	**110 XCA 203 00**	–

TSX C USB 232

990 NAD 211 ●0

990 NAD 218 ●0

TSX C USB MBP

(1) With the **TSX C USB 232** *converter, use the* **990 NAA 263 20/30** *cable.*
(2) With the **TSX C USB 232** *converter, use the* **110 XCA 203 00** *adaptor and the* **110 XCA 282 0●** *cable.*
(3) Modbus Plus tap: **990 NAD 230 20/21** *(IP 20) or* **990 NAD 230 10** *(IP 65).*
(4) With the **TSX C USB MBP** *converter, use the* **990 NAD 211 10/30** *or* **990 NAD 218 10/30** *cable.*
(5) This converter is recommended for updating the CPU firmware.

Modicon Quantum automation platform

PCMCIA memory expansion cards

Unity Pro

Presentation

PCMCIA memory expansion cards make it possible to expand the RAM memory capacity of high-performance Quantum CPUs.
Depending on the model, these cards are designed to accommodate:
- The application program, symbols and constants
- The additional application data
- Or both

PCMCIA memory expansion cards

All the cards fit into the PCMCIA slots in Quantum **140 CPU 651 50/60**, **140 CPU 652 60, 140 CPU 671 60, 140 CPU 672 60** and **140 CPU 672 61** CPUs.

These cards provide three different storage types:
- Storage of the application: Program, symbols and constants in a common space of 512 KB to 4096 KB: **TSX MFP P●●●K/M** for Flash EPROM memories.
- Storage of the application and additional data, comprising:
  - An application area from 192 KB to 7 MB
  - A data storage area of 7 MB to 0 KB for additional data

The limit between these two spaces is configurable. The configurable cards are:
- **TSX MRP C●●●K/M** for SRAM memories
- **TSX MCP C●●●K/M** for Flash EPROM and SRAM memories

- Storage of additional data, provided by SRAM **TSX MRP F004M/008M** 4 or 8 MB memory cards.

These cards use two technologies:
- Battery-backed SRAM

Used particularly in the application program design and debugging phases.
These cards provide:
- All of the application's transfer and modification services in online mode
- Additional data storage

The memory is protected by a removable battery built into the PCMCIA card.
A second auxiliary battery is present to enable the main battery to be replaced without loss of data.

- Flash EPROM

Used when debugging of the application program is complete. This is used to:
- Overcome battery life restrictions
- Perform one global application transfer

When in use, it is impossible to carry out modifications to the application in online mode.

Program modification in online mode

Only those expansion cards in which the program is stored in SRAM memory **TSX MRP C●●●K/M** allow program modifications to be carried out in online mode.

A user with a CPU equipped with a memory expansion card and who wishes to make modifications or additions to the program in online mode must structure the application program in several reasonably sized sections.

Modicon Quantum automation platform

PCMCIA memory expansion cards

Unity Pro

TSX MRP/MCP/MRP ●●●●

TSX MFP P●●●●

References

Quantum **140 CPU 651 50**, **140 CPU 651 60**, **140 CPU 671 60, 140 CPU 672 60** and **140 CPU 672 61** CPUs can take the memory expansion cards listed below.
There are two types of memory limits:
- One associated with the type of CPU
- One associated with the chosen model of PCMCIA memory card

The lower of these two limits defines the memory capacity that is accessible to the user for the application.

PCMCIA memory expansion cards

Description	Memory size		Reference	Weight kg
	Application	Data file		
SRAM configurable data file/application memory expansion	192…768 KB	576…0 KB	**TSX MRP C768K**	0.076
	192…1024 KB	832…0 KB	**TSX MRP C001M**	0.076
	192…1792 KB	1600…0 KB	**TSX MRP C01M7**	0.076
	192…2048 KB	1856…0 KB	**TSX MRP C002M**	0.076
	192…3072 KB	2880…0 KB	**TSX MRP C003M**	0.076
	192…7168 KB	6976…0 KB	**TSX MRP C007M**	0.076
Flash EPROM application memory expansion	512 KB	–	**TSX MFP P512K**	0.044
	1024 KB	–	**TSX MFP P001M**	0.044
	2048 KB	–	**TSX MFP P002M**	0.044
	4096 KB	–	**TSX MFP P004M**	0.044
Flash EPROM and SRAM configurable data file/application memory expansion	512 KB	512 KB	**TSX MCP C512K**	0.076
	2048 KB	1024 KB	**TSX MCP C002M**	0.076
SRAM data file memory expansion *(1)*	–	4096 KB	**TSX MRP F004M**	0.076
	–	8192 KB	**TSX MRP F008M**	0.076

Replacement parts

Description	Use	Type	Reference	Weight kg
Backup battery	SRAM PCMCIA memory card	Main	**TSX BAT M02**	0.010
		Auxiliary	**TSX BAT M03**	0.005

(1) Intended for the storage of manufacturing recipes and production data. Capacity depends on the PCMCIA card model.

Modicon Quantum automation platform
Concept/ProWORX standard CPUs

Automation platform for Concept and ProWORX software offer			Simple applications	
Number of racks 2/3/4/6/10/16 slots	Local I/O		2 racks (1 main + 1 expansion)	
	Remote I/O (RIO)		31 drops of 2 racks (1 main + 1 expansion)	
Maximum discrete I/O	Local I/O		1024 input channels and 1024 output channels (27 slots max.)	
	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		64 input channels and 64 output channels (27 slots max.)	
	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	
Bus connections	Modbus		1 integrated RS 232 Modbus master or ASCII port via EFB XXMIT on Concept or XMIT module on ProWORX	
	AS-Interface sensor/actuator bus		4 on local rack, 4 on remote rack (RIO)	
	INTERBUS	Generation 3	–	3
		Generation 4	–	2
	Profibus DP		2 “option” modules on local rack	
Network connections	Modbus Plus		1 integrated port, 2 “option” modules on local rack	
	Ethernet TCP/IP		2 “option” modules on local rack	
Process control	Control loops *(2)*		10 to 20 programmable channels	
Redundancy			Power supplies, remote I/O network, Modbus Plus modules, Ethernet TCP/IP modules	
Hot Standby	Hot Standby LL984		Yes	
	Hot Standby IEC		–	
CPUs			80186	
Math coprocessor			No	
Clock speed			20 MHz	
Memory capacity	LL984 program (max.)		8 Kwords	16 Kwords
	IEC program (max.)		109 KB	368 KB
	Located data (State RAM)	I/O bits (max.)	8192 input bits and 8192 output bits	
		16-bit I/O words (max.)	9999 I/O words	
Logic solve time (984 LL instructions)			0.3…1.4 ms/K	
Bus current required			780 mA	790 mA
Functional safety certification			–	
Approvals			UL 508, CSA 22,2-142, C UL, FM Class 1 Div. 2, CE	
Type of Quantum CPU			**140 CPU 113 02**	**140 CPU 113 03**
Page			1/15	

(1) The maximum values for the number of discrete I/O and analog I/O are not cumulative.
(2) Usage values, including memory resources and CPU power.

Simple and complex applications	Complex applications
2 racks (1 main + 1 expansion)	
31 drops of 2 racks (1 main + 1 expansion)	
1024 input channels and 1024 output channels (27 slots max.)	
31,000 input channels and 31,000 output channels	
–	
64 input channels and 64 output channels (27 slots max.)	
230 input channels and 230 output channels	
–	
High-speed counter, interrupt inputs, serial link, accurate time stamping	
6	
2 integrated RS 232 Modbus master or ASCII ports on port no. 1 via EFB XXMIT on Concept or XMIT module on ProWORX	
4 on local rack, 4 on remote rack (RIO)	
3	
6	
6 “option” modules on local rack	
1 integrated port, 6 “option” modules on local rack	
6 “option” modules on local rack	
40 to 80 programmable channels	60 to 100 programmable channels
Power supplies, remote I/O network, Modbus Plus modules, Ethernet TCP/IP modules	
Yes	
Yes	
80486	
Yes	
66 MHz	100 MHz
64 Kwords	
896 KB	2.5 MB
64 Kbps I/O	
57 Kwords I/O	
0.1…0.5 ms/K	
1250 mA	
–	
UL 508, CSA 22,2-142, C UL, FM Class 1 Div. 2, CE	UL 508, CSA 22,2-142, C UL, FM Class 1 Div. 2, e, CE, ATEX Zone 2/22 *(5)*
140 CPU 434 12 A *(3)*	**140 CPU 534 14 B** *(4)*
1/15	

(3) CPU able to migrate from Concept to Unity Pro.
(4) CPU able to migrate from Concept to Unity Pro with Unity Pro software version ≥ 3.0.
(5) Only Conformal Coating versions are ATEX Zone 2/22 certified. For more information, see pages 10/2 to 10/9.

Modicon Quantum automation platform
Concept/ProWORX standard CPUs

Presentation

Quantum CPUs, which are compatible with Concept and ProWORX software, are single-slot CPUs. They have a built-in system memory, application memory and communication ports. With all memory components on-board, you do not need extra chips or cartridges for configuration.

Flash-based executive memory

Quantum CPUs use flash memory technology to support the CPU's system memory and instruction set. Flash is a state-of-the-art, non-volatile memory technology that enables field upgrades by downloading files via the integrated Modbus or Modbus Plus ports as new features and maintenance updates become available.

Memory backup and protection

The CPU stores the application program in a battery-backed RAM. This battery is located on the front of the module and can be replaced while the CPU is running.
To protect the application program from inadvertent changes during operation, the CPUs feature a memory-protect slide switch. An LED lights up when this switch is activated.

Math coprocessor

For math-intensive applications, a math coprocessor is available on certain CPU models. This coprocessor significantly improves execution times for the 984 Process Control Function Library (PCFL) and Equation Editor, as well as math operations in the IEC languages. Improved floating point execution times mean more power for processing process algorithms and math calculations.

Write protection

PLC write protection minimizes the possibility of a programmer inadvertently writing from a source PLC to a memory area in a destination PLC. Any data that is not authorized to be written is prevented from being written, both locally and over the network. This data protection option provides security against data transfer errors.

Communication ports

All CPUs support Modbus and Modbus Plus networking strategies. Rotary switches on the back of the modules are used to define the network address of the Modbus Plus port(s). Each device on a Modbus Plus network must have a unique address in the range 1...64. Modbus port settings include: Baud rate, parity, number of data bits, number of stop bits, protocol and Slave address. By default, these settings are 9600 bps, even parity, 8 data bits, 1 stop bit, RTU mode and address 1.
A switch on the front of the CPUs can be used to configure the Modbus port as a modem communication interface (2400 bps, even parity, 7 data bits, 1 stop bit, ASCII mode and address 1).

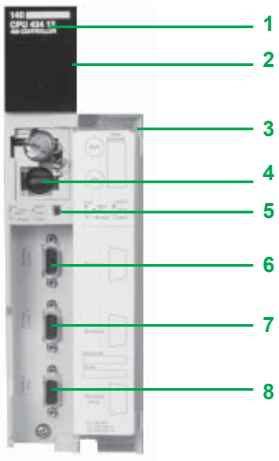
140 CPU 434 12A and **140 CPU 534 14B** CPUs have two serial Modbus ports:
- Modbus port 1, with full modem interfacing ability
- Modbus port 2, with RTS/CTS flow control (does not support modem connection)

Language choices

All the CPUs can use the following programming languages:
- Advanced IEC 66631-3 languages:
  - Sequential Function Chart (SFC) or Grafcet
  - Function Block Diagram (FBD) language
  - Ladder (LD) language
  - Structured Text (ST)
  - Instruction List (IL) language
- 984 Ladder Logic: A high performance, low level language whose application source code resides in the PLC

I/O architectures: page 2/2 | I/O: page 3/2 | Communication: page 5/2 | Software: page 6/2 | Safety modules: page 7/2

Modicon Quantum automation platform
Concept/ProWORX standard CPUs



140 CPU 434 12 A
140 CPU 534 14 B

Description

The **140 CPU ●●●** CPU front panel comprises:
1 Model number and colour code
2 A display block
3 A removable hinged door with a customizable identification label
4 A battery slot *(1)*
5 Two slide-switches for write-protecting the memory and for selecting the communication parameters of the Modbus port(s) *(2)*
6 One Modbus port (A)
7 One Modbus port (B) (for **140 CPU 434 12 A** and **140 CPU 534 14 B** CPUs)
8 One Modbus Plus port

Note:
140 CPU 113 0● CPUs have one Modbus and one Modbus Plus communication port.

Migrating Quantum CPUs

As both the **140 CPU 434 12A** and **140 CPU 534 14B** Quantum CPUs are compatible with Concept or ProWORX software, they can be migrated to be compatible with the Unity Pro software without any hardware modification. This Concept to Unity Pro migration is carried out by updating the CPU operating system.
This update is carried out using the OS-Loader loader tool which is included in the Unity Pro software (see page 6/13).

The migrated **140 CPU 434 12A** CPU is then equivalent to the corresponding Unity CPU **140 CPU 434 12U.**

Note: *Migration of the* **140 CPU 534 14B** *CPU requires version ≥ 3.0 of Unity Pro software.*

CPUs

Memory (IEC program)	**Coprocessors**	**Safety**	**Reference**	**Weight kg**
109 KB	No	–	**140 CPU 113 02**	0.300
368 KB	No	–	**140 CPU 113 03**	0.300
896 KB	Built-in	–	**140 CPU 434 12A**	0.850
2.5 MB	Built-in	–	**140 CPU 534 14B**	0.850

Accessories

Description	**Length**	**Safety**	**Reference**	**Weight kg**
Programming cable for Modbus interface	3.7 m	–	**990 NAA 263 20**	0.300
	15 m	–	**990 NAA 263 50**	1.820
Backup battery	–	–	**990 XCP 980 00**	–

(1) Internal RAM memory backup battery:
- Product reference: 990 XCP 980 00
- Type: 3 V ⎓ lithium
- Capacity: 1200 mAh
- Storage life: 10 years
(2) Slide switch for selecting the communication parameters: "RTU" position (default setting), "ASCII" position for communication via modem (2400 bps, even parity, 7 data bits, 1 stop bit, ASCII mode and address 1).

Modicon Quantum automation platform
Racks

Presentation

Modicon Quantum automation platform modules mount easily in racks in standard industrial electrical cabinets or in 19 inch racks. Mounting brackets are available as options for mounting these racks. Each rack provides the control signals and distributes the power necessary to operate the installed modules.

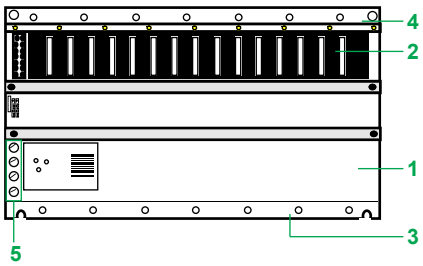
Description

Five different rack models are available, with 3, 4, 6, 10 or 16 slots. The rack slots are universal (any module can fit into any slot). Almost all Quantum modules are designed to fit into a single slot in a Quantum rack *(1)*.

There are no reserved slots in a Quantum system, although it is recommended that power supply modules are fitted in the extreme left slot, for optimum heat dissipation. The only limits on the rack are the power available for the modules and the addressing space. Any rack can be used in any of the three architectures supported by the Quantum platform: Local I/O, remote I/O or distributed I/O.

In a Quantum system, module addressing and configuration is handled by the software. No switches or other hardware components are used.

140 XBP 0●● 00 racks comprise:

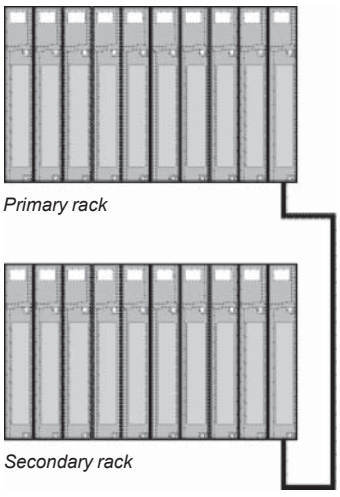


1 A metal frame
2 Connectors for module/rack connection
3 Tapped holes for fixing each module
4 Holes for fixing the rack
5 Earth terminals for earthing the rack

Rack expansion module

The **140 XBE 100 00** rack expansion module enables I/O in an adjacent “secondary” rack to communicate with the CPU or RIO drop in the “primary” rack via a specific communication cable. An expansion module must be installed in each rack. The extension cable provides all the signals necessary for data transmission between the two racks. A single rack expansion module can be added to each rack.

The rack expansion module has the following flexible characteristics:



■ The same **140 XBE 100 00** rack expansion module is used for both “primary” and “secondary” racks. A rack expansion system consists of two **140 XBE 100 00** rack expansion modules and one cable, available in 1, 2 or 3 m lengths.
■ The system can use any Quantum power supply module. Each rack can have a different type of power supply module.
■ Loss of power in the “secondary” rack will not shut down the entire drop. Only those modules located in the “secondary” rack will lose power.
■ Rack expansion modules can be placed in any slot in the rack and do not necessarily have to be placed in corresponding slots in the “primary” and “secondary” racks.
■ The rack expansion module is not recognized by the configuration software. It will appear as an unfilled slot in the I/O map.
■ All rack sizes are possible.
■ The rack expansion module supports local I/O and remote I/O (31 drops).
■ Expansion racks can take all discrete and analog I/O modules and also high-speed counter modules.

(1) Except **140 CPU 6●●●●** *high-performance CPUs, which require 2 slots.*

Modicon Quantum automation platform
Racks

Racks

Description	Number of slots	Safety	Reference	Weight kg
Racks for: **- Local I/O modules** **- Remote I/O modules**	3	–	**140 XBP 003 00**	0.340
	4	–	**140 XBP 004 00**	0.450
	6	Non-interfering	**140 XBP 006 00**	0.640
	10	Non-interfering	**140 XBP 010 00**	1.000
	16	Non-interfering	**140 XBP 016 00**	1.600

Rack accessories

Description	Length/ dimensions	Reference	Weight kg
Rack expansion module	–	**140 XBE 100 00**	–
Cables for expansion racks	1 m	**140 XCA 717 03**	–
	2 m	**140 XCA 717 06**	–
	3 m	**140 XCA 717 09**	–
19" front rail mounting bracket for 140 XBP 010 00 rack	125 mm deep	**140 XCP 401 00**	–
19" support for surface mounting a 140 XBP 010 00 rack	20 mm deep	**140 XCP 402 00**	–

Modicon Quantum automation platform
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**
Page	1/21			

(1) Only Conformal Coating versions, depending on model, are ATEX Zone 2/22 certified.
For more information, see pages 10/2 to 10/9.

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**
1/21						

Modicon Quantum automation platform
Power supply modules

Presentation

Quantum power supply modules serve two purposes - they provide power to the system rack and protect the system from noise and voltage swings. All power supply modules feature overcurrent and overvoltage protection. They operate in most electrically noisy environments without the need for external isolation transformers. In the event of an unforeseen loss of power, the power supply modules ensure that the system has adequate time for a safe and orderly shutdown. A power supply module converts the input voltage to regulated + 5 VDC for the requirements of the CPU, the I/O modules and those of all the communication modules installed in the rack. The power between the sensors/preactuators and the I/O points on the Quantum system is not provided by these power supply modules.

Three types of power supply module are available for use in local or remote (RIO) architectures:
- Low power standalone power supply modules
- High power summable power supply modules
- High power redundant power supply modules

For distributed I/O architectures on Modbus Plus, low power standalone power supplies are available. These are dedicated to distributed architectures and integrated in distributed I/O drop adaptors. Distributed power supplies are described in the pages on the distributed I/O architecture.

Functions

Standalone power supply modules

A standalone power supply module provides a 3 A current to the Quantum rack. When the system only requires low power, a standalone power supply module is an economical choice. These standalone power supply modules are available for 115/230 V ∿, 24 V ⎓ and 125 V ⎓ supply voltages.

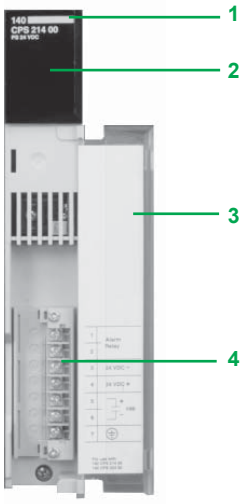
Summable power supply modules

A summable power supply module provides an 8 A or 11 A current to the Quantum rack. These summable power supply modules can operate in either standalone or summable mode. When two summable power supply modules are installed in the same rack, they automatically operate in summable mode, providing a current of 16 A or 20 A (depending on the model). In summable mode, both power supply modules must be the same type and must be installed in the left and right end slots of the rack for maximum life. If one of the two power supply modules has a problem, power is lost to the rack.
If only one summable power supply module is installed in a rack, it operates in standalone mode, supplying a current of 8 A or 11 A to this rack.
Summable power supply modules are available for 115/230 V ∿, 24 V ⎓ and 48/60 V ⎓ supply voltages.

Redundant power supply modules

A redundant power supply module provides a current of 8 A or 11 A (depending on the model) to the Quantum rack. For high-availability applications, two redundant power supply modules will provide a redundant current of 8 A or 11 A.
If one of the two power supply modules is out of service, the one that remains operational maintains the supply of the required power. Each redundant power supply module has a status bit that can be monitored by the application program or by a supervision system, in order to react quickly if the power supply has a problem.
If an additional power supply module is necessary in a configuration with redundant power supply modules, a third redundant power supply module can be added to the rack, increasing the available capacity to 16 A or 20 A. If one of the three power supply modules has technical issues, those which remain operational supply a redundant current of 16 A or 20 A to the rack. If a second power supply module has a problem, power is lost to the rack.
A redundant power supply module can be used as a standalone power supply module.
Summable power supply modules are available for 115/230 V ∿, 24 V ⎓, 48/60 V ⎓ and 125 V ⎓ supply voltages.

Modicon Quantum automation platform
Power supply modules



Description

140 CPS ●●● ●0 power supply modules have the following on the front panel:
1 Model number and colour code
2 A display block
3 A removable hinged door with a customizable identification label
4 A 7-way screw terminal block (degree of protection < IP 20)

To be ordered separately if required:
□ 7-way screw terminal block (degree of protection IP 20) **140 XTS 005 00**.

Compatibility of power supplies

Adhere to the following compatibility rules for applications that require the combination of two power supplies, possibly of different ∼ or ⎓ types, on the same rack.

Compatibility of summable power supplies

	Type	140 CPS 114 20	140 CPS 214 00	140 CPS 414 00
140 CPS 114 20	∼	■		
140 CPS 214 00	⎓		■	■
140 CPS 414 00	⎓		■	■

Compatibility of redundant power supplies

	Type	140 CPS 124 20	140 CPS 124 00	140 CPS 224 00	140 CPS 424 00	140 CPS 524 00
140 CPS 124 20	∼	■		■	■	
140 CPS 124 00	∼		■			■
140 CPS 224 00	⎓	■		■	■	
140 CPS 424 00	⎓	■		■	■	
140 CPS 524 00	⎓		■			■

■ : *Compatible power supplies*
■ : *Incompatible power supplies*

References

Power supply modules

Input voltage	Output current	Type	Safety	Reference	Weight kg
120/230 V ∼	3 A	Standalone	–	**140 CPS 111 00**	0.650
115/230 V ∼	11 A	Summable	–	**140 CPS 114 20**	0.650
115/230 V ∼	8 A	Redundant	–	**140 CPS 124 00**	0.650
115/230 V ∼	11 A	Redundant	Non-interfering	**140 CPS 124 20**	0.650
24 V ⎓	3 A	Standalone	–	**140 CPS 211 00**	0.650
	8 A	Summable	–	**140 CPS 214 00**	0.650
		Redundant	Non-interfering	**140 CPS 224 00**	0.650
48…60 V ⎓	8 A	Summable	–	**140 CPS 414 00**	0.650
		Redundant	–	**140 CPS 424 00**	0.650
125 V ⎓	3 A	Standalone	–	**140 CPS 511 00**	0.650
	8 A	Redundant	–	**140 CPS 524 00**	0.650

Separate part

Description	Degree of protection	Reference	Weight kg
7-way screw terminal block	IP 20	**140 XTS 005 00**	0.150

Contents

2 - I/O architectures and Hot Standby architectures

I/O architectures

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■ **RIO architectures on S908 bus**

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Hot Standby architectures

■ **Unity Hot Standby system**

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■ **Unity Hot Standby system with PTQ-PDPMV1 module**

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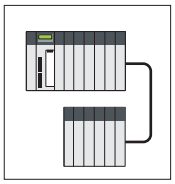
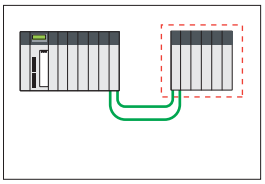
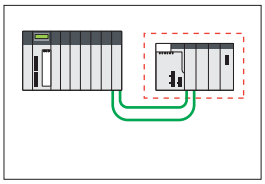
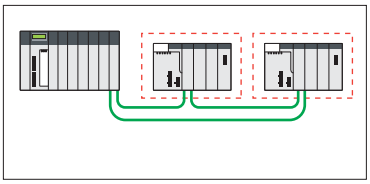
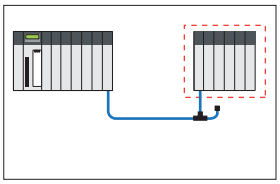
Modicon Quantum automation platform
I/O architectures

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●●●●
Page		2/4	2/6

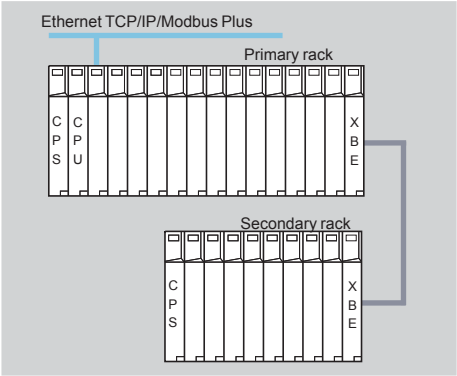
(1) The maximum values for the number of discrete I/O and analog I/O are not cumulative.
(2) "Solution mode" allows time and date-stamped events to be formatted in the OPC Factory server without having to programme the PLVC. "Solution mode" mode requires OFS ≥ V3.4 software and Vijeo Citect ≥ V7.3.
(3) Updated certifications shown on our website www.schneider-electric.com.
(4) Please refer to the specific user guide supplied with each product.
(5) The maximum number of NOM serial link modules is limited to 4 per Unity project. For a greater number of modules, please consult our Customer Care Centre.

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
2/6		2/22

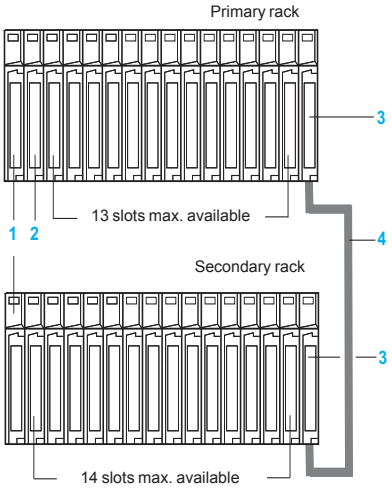
Modicon Quantum automation platform

I/O architectures

Local I/O



Local I/O architecture



1 Power supply **140 CPS ●●● 00** (1 slot)
2 CPU **140 CPU ●●● ●●** (1 or 2 slot(s))
3 Rack extension module **140 XBE 100 00** (1 slot)
4 Rack extension cable **140 XCA 717 0●** (length 1, 2 or 3 m)

For references of accessories for racks see page 2/19.

Presentation

The local I/O architecture is used for control systems that are wired on the main control cabinet.

This architecture is recommended for applications in which the I/O need to be refreshed more quickly than the normal scan cycle.

The Quantum platform provides interrupt services for this type of application.

Up to 27 slots are possible for I/O modules in a configuration comprising a primary rack and a secondary rack, connected by two **140 XBE 100 00** rack expansion modules.

Description

The Quantum automation platform provides local I/O management for control systems that are wired on the main control cabinet.

The local I/O can comprise a maximum of 14 I/O modules in the primary rack, including the CPU module 2 and the power supply module 1.
These local I/O can be extended on a second rack (secondary rack) by using a **140 XBE 100 00** rack expansion module 3.

The choice of the appropriate rack depends on the required number of modules for the system. Racks are available in the following formats: 3, 4, 6, 10 and 16 slots.

If necessary, communication and network modules can be installed in the local rack. Most communication and network modules need to be in the local rack.

As well as discrete and analog I/O modules, the following modules are available:
- Modbus Plus and Modbus modules
- Ethernet modules for TCP/IP, Sy/Max
- Remote I/O modules
- Hot Standby modules *(1)* (Concept/ProWORX)
- InterBus modules (Concept/ProWORX)
- Profibus DP modules
- RIO drop adaptors (S908 bus or Quantum Ethernet I/O)

High performance interrupt functions

In some applications, the I/O need to be refreshed more quickly than the normal scan cycle. The Quantum platform provides interrupt services for this type of application.

These services include the incorporation of interrupts on time bases and on inputs, as well as updating of I/O “on the fly”, thus providing very fast transfer times, only on the I/O modules in the local rack.

These services are determined by instructions in the instruction set in the Quantum languages. These instructions can be programmed via the Unity Pro, Concept or ProWORX programming software. They can immediately update the I/O in the CPU.

Using a segment dedicated to interrupt processing subroutines, it is therefore possible to use this “on the fly” access either on internal variables, or on outputs of modules in the local rack.

Overview: page 2/2
Software: page 6/2

Modicon Quantum automation platform
I/O architectures
Local I/O

Presentation (continued)

Local I/O configuration rules

When configuring a local I/O system, the following four parameters should be considered:
- Discrete and analog I/O modules are not compatible with Hot Standby architectures
- Number of slots available in the 2 local racks (primary and secondary)
- Slots available for optional modules
- Power consumed by the installed modules
- Addressing words available for configuring the modules

Available slots and power consumption

A local I/O system can have a maximum of 27 available slots (with two 16-slot racks) for I/O modules, application-specific modules, communication modules and motion control modules.

All these modules are powered from the power supply included in the rack.

To ensure a valid configuration, simply add together the consumptions (in mA) of the modules in the rack and check that the total current is less than that provided by the selected power supply.

This power consumption calculation can be easily performed using Unity Pro software.

Empty **140 XCP 500 00** modules are also available to occupy unused slots.

Module addressing

With Unity Pro, the I/O addressing is unlimited (physical limitation to 27 slots).

With Concept/ProWORX, the Quantum CPU can manage up to 64 input words and 64 output words in each local rack.

A 16-bit input or output module is equivalent to one word.
Simply add together the addressing requirements of each module and check that the limit is not exceeded.

Overview:
page 2/2

Software:
page 6/2

Modicon Quantum automation platform
Quantum Ethernet I/O
I/O architectures

Presentation

The Modicon Quantum automation platform offers an I/O architecture solution over Ethernet, connecting the Quantum local rack to remote I/O (RIO) drops, installed on a Quantum rack or on a Modicon X80 rack *(1)*, and distributed I/O (DIO) devices.

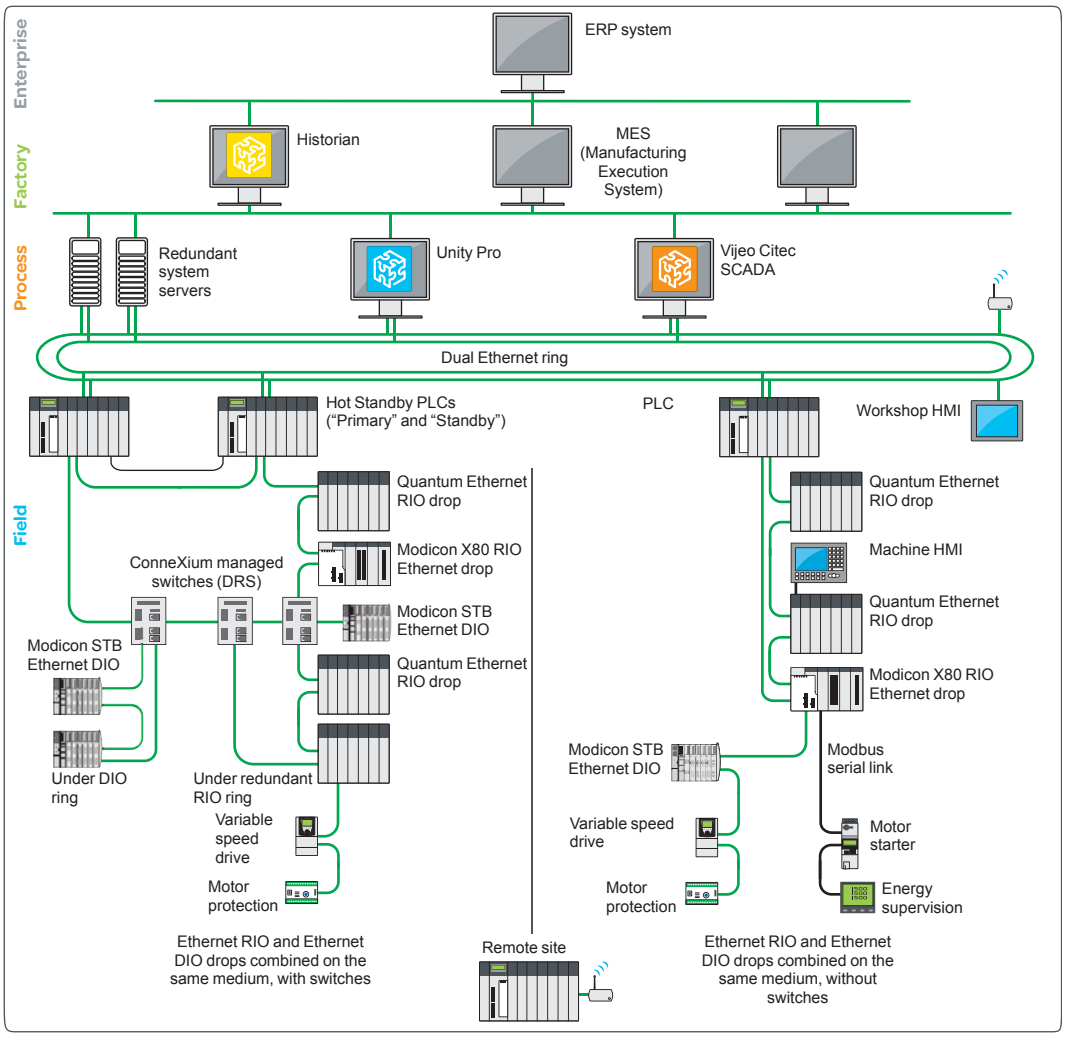
This Quantum Ethernet I/O solution comprises:
- RIO drops on a Quantum rack or on a Modicon X80 rack
- Ethernet DIO devices
- A CRP head adaptor on a local Quantum local rack
- A CRA drop adaptor on each Quantum RIO drop
- A choice of two CRA drop adaptors (standard or high performance) in each Modicon X80 RIO drop
- Two optical repeaters, for single mode or multimode optical fibre, on Modicon X80 RIO drop
- A choice of three types of managed dual ring switches (DRS) from the ConneXium offer *(2)*, configurable by means of predefined configuration files for immediate setup

Different architectures are therefore possible, such as:
- Ethernet RIO architectures with or without ConneXium managed switches *(2)*
- Architectures with separate or combined Ethernet RIO and Ethernet DIO devices on the same physical medium
- Hot Standby (HSBY) architectures

This solution also includes numerous options and functions as standard, providing:
- High process availability, with the option of connecting Ethernet RIO and Ethernet DIO in a daisy chain loop
- Deterministic data exchanges between the PLC and the Ethernet RIO
- Remote service, with a SERVICE port available on the Quantum or Modicon X80 CRP Ethernet head adaptor and CRA Ethernet drop adaptors

Note

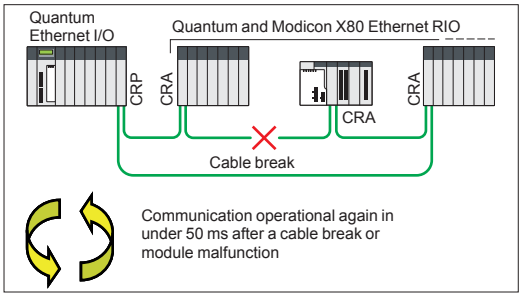
- All the validated and tested architectures are shown in the technical documentation available on our website www.schneider-electric.com.
- The use of switches other than those detailed in these Quantum Ethernet I/O pages (pages 2/6 to 2/21) is not supported *(2)*.



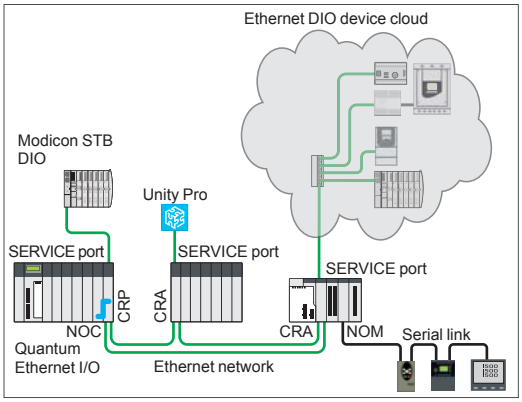
Typical architecture

(1) The Modicon X80 range offers common I/O modules which can be used both in Ethernet RIO drops connected to a Quantum local controller and in Modicon M340 automation platforms.
(2) Supported ConneXium switches: TCS ESM 083F23F1/063F2CU1/063F2CS1 (see page 2/14).

Modicon Quantum automation platform
Quantum Ethernet I/O
I/O architectures



Ethernet RIO architecture, self-healing of a ring



Connection to SERVICE ports

Presentation (continued)

Advantages of the offer

Flexibility, ability to combine and determinism

■ The flexibility of Ethernet topologies provides many different options to meet the needs of numerous applications.
■ The ability to combine Quantum or Modicon X80 Ethernet RIO and DIO devices on the same medium enables:
□ Reduced wiring costs
□ Up to 31 Ethernet RIO drops and up to 128 Ethernet DIO devices per Ethernet DIO head adaptor *(1)*
■ The deterministic nature of data exchanges between the PLC and the Ethernet RIO allows the system response time to be calculated for the Ethernet RIO, irrespective of the number of Ethernet DIO devices.

Increased process performance and availability

■ High performance levels exceeding the current limits for Quantum architectures on S908 bus:
□ 64 input words and 64 output words for Quantum Ethernet drops on S908 bus
□ 400 input words and 400 output words for Quantum or Modicon X80 Ethernet drops on Ethernet network
■ High overall process availability in Quantum Ethernet I/O architectures with:
□ Ring topologies using the 2 Ethernet ports on the CRP Ethernet head adaptor and CRA Ethernet drop adaptor
□ Self-healing of a primary or secondary ring in less than 50 ms (*recovering time*), in the event of a cable break or module malfunction. This performance is due to the execution speed of the Ethernet components in the modules and switches (DRS) validated for this type of architecture (see page 2/14).

Remote debugging on the SERVICE ports *(2)*

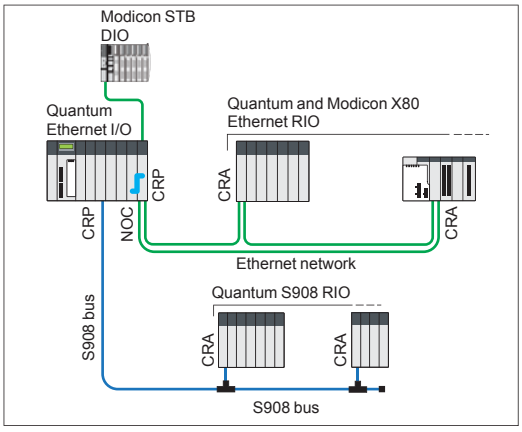
CRP Ethernet head adaptors and Quantum or Modicon X80 CRA Ethernet drop adaptors *(3)* have a SERVICE port which supports a data rate of 5 Mbps (up to a maximum of 20 Mbps for all the Ethernet DIO ports in the network) and allows the connection of:
■ A local HMI (Magelis terminal, etc.) *(4)*
■ One or more Ethernet DIO devices *(5)*
■ A PC with Unity Pro software *(6)*, for remote debugging of an application
■ A network diagnostic device with software such as ConneXium Network Manager or network analysis tools (Port Mirroring function available on the SERVICE port).

Online configuration modification with the CCOTF function

The CCOTF (*Change Configuration On The Fly*) function enables the addition or removal of I/O modules, or even the addition of a complete Quantum or Modicon X80 Ethernet RIO drop *(6)* in a Quantum Ethernet I/O configuration, in RUN mode. These changes are possible on the Quantum local rack and on Quantum or Modicon X80 Ethernet RIO drops equipped with a high performance type CRA module (see page 2/11).
For further information on the CCOTF function, see page 2/33.

(1) Ethernet head adaptor, see page 2/12.
(2) Requires Ethernet module 140 NOC 78000 or 140 NOE 771●1, linked to the CRP Ethernet head adaptor in the Quantum local rack (see page 2/12).
(3) Requires Modicon X80 BMX CRA 31210 Ethernet drop adaptor (see page 2/13).
(4) Please refer to the "Human-Machine Interfaces" catalogue.
(5) Please refer to the relevant product catalogues on our website www.schneider-electric.com.
(6) Requires Unity Pro Extra Large software ≥ V7.0.

Modicon Quantum automation platform
Quantum Ethernet I/O
Ethernet RIO architectures



Configuration of dedicated I/O on Quantum Ethernet I/O network and on S908 bus in a single PLC.

Presentation (continued)

Advantages of the offer (continued)

Compatibility with references in the Quantum offer *(1)*

The Quantum Ethernet I/O offer is fully compatible with the references in the Quantum offer; CPUs, power supplies, I/O modules, racks, etc *(1)*.
This compatibility simplifies:

- Implementation of Ethernet I/O architectures
- Migration from a S908 bus architecture to a Quantum Ethernet I/O architecture.

It is also possible to configure a S908 bus and a Quantum Ethernet I/O network in a single PLC. This makes it possible to extend existing installations while taking advantage of the functions of the Quantum Ethernet I/O offer *(2)*.

Compatibility with references in the Modicon X80 offer

The Quantum Ethernet I/O offer is fully compatible with the references in the Modicon X80 offer: CPUs, power supplies, I/O modules, racks, etc.
However, the capacity of Modicon X80 I/O drops depends on the CRA Ethernet drop adaptor module used, see page 2/13.

Rack Viewer function *(3)*

The Rack Viewer function provides access to Ethernet RIO data via a web browser.

Predefined configurations for ConneXium managed switches

The use of ConneXium managed switches specifically for Quantum Ethernet I/O architectures is simplified using 15 predefined configuration files (included on the Unity Pro ≥ V7.0 DVD). These configurations are optimized to meet the requirements of the majority of Ethernet architectures, see page 2/11.

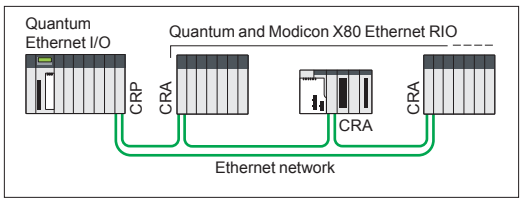
Types of Quantum Ethernet I/O architecture *(4)*

The Quantum Ethernet I/O offer can be used in three types of architecture:

- Ethernet RIO architectures: standard of for long distances
- Architectures with combined Ethernet RIO and Ethernet DIO devices on the same physical network: standard or high availability and extended device integration capability
- Quantum Ethernet I/O Hot Standby architectures

Ethernet RIO architectures

Ethernet RIO architecture, standard



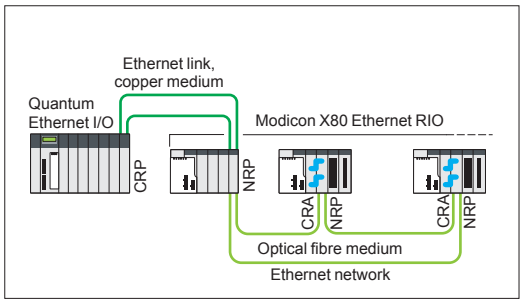
Ethernet RIO architecture, standard

Simple ring (Daisy Chain Loop) architecture consisting of a local Quantum Ethernet drop containing a 140 CRP 312 00 head adaptor module and Quantum or Modicon X80 Ethernet RIO drops containing a CRA drop adaptor:

- 140 CRA 31200: Quantum RIO Ethernet drop adaptor
- BMX CRA 31200: Modicon X80 RIO Ethernet drop adaptor, without SERVICE port
- BMX CRA 31210: Modicon X80 RIO Ethernet drop adaptor, with SERVICE port

The links are achieved via RJ45 Ethernet copper cables. The maximum distance between each rack is 100 m.

Ethernet RIO architecture, long distance



Ethernet RIO architecture, long distance

Standard Ethernet RIO architecture comprising one or more remotely located Modicon X80 Ethernet drops, via integrated NRP optical fibre repeaters.
There are two types of NRP repeater:

- BMX NRP 0200: multimode optical fibre repeater (remote location up to 2 km)
- BMX NRP 0201: single mode optical fibre repeater (remote location up to 16 km)

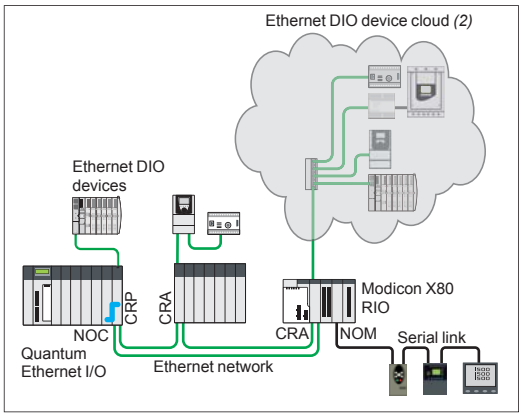
The NRP repeaters are linked to CRA drop adaptors by means of Ethernet Interlink cables in order to access the functions of these cables.

(1) The Quantum Ethernet I/O offer is not compatible with communication modules and application-specific modules which cannot be installed on a remote station.
(2) This function is only available with 140 CPU 6●2●● CPUs.
(3) Requires Ethernet module 140 NOC 78000 or 140 NOE 771●1, linked to the CRP Ethernet head adaptor in the Quantum local rack (see page 2/12).
(4) Requires Unity Pro Extra Large software ≥ V7.0.

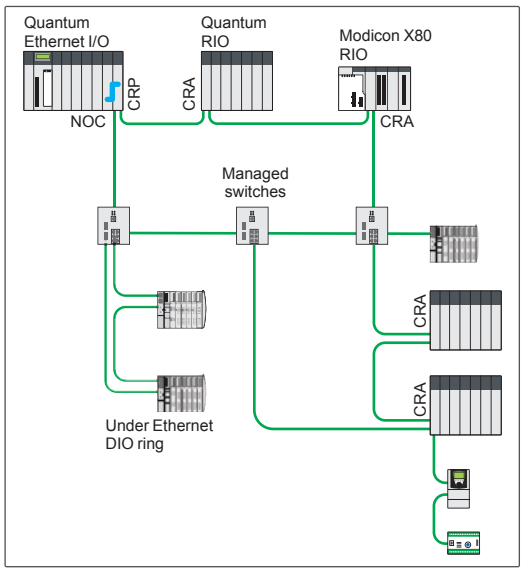
Modicon Quantum automation platform

Quantum Ethernet I/O

Ethernet RIO and Ethernet DIO architectures



Architecture with Ethernet RIO and Ethernet DIO devices, standard



Ethernet RIO and Ethernet DIO device architecture, high availability and extended integration capability

Types of Quantum Ethernet I/O architecture (continued) *(1)*

Ethernet RIO and Ethernet DIO device architectures

Architecture with Ethernet RIO and Ethernet DIO devices, standard

This architecture has the advantage of being able to combine Ethernet RIO (Quantum or Modicon X80) and Ethernet DIO devices on the same physical network: Modicon STB distributed I/O, Altivar drive, Tesys T motor protection, etc. *(2)*.

In the example opposite:

- Ethernet DIO devices are connected to the SERVICE ports of CRP Ethernet head adaptors and CRA Ethernet drop adaptors
- Ethernet DIO devices are managed by the Ethernet DIO head adaptor module (140 NOC 78000), linked to the CRP Ethernet head adaptor by an Ethernet Interlink cable
- Modbus serial link devices are integrated in the network via the serial link (BMX NOM 0200) of the Modicon X80 drop

This type of standard architecture without switches simplifies setting up and maintenance operations.

Ethernet RIO and Ethernet DIO device architecture, high availability and extended integration capability

This architecture integrates ConneXium managed DRS (Dual Ring Switch) switches into the Ethernet RIO network. 15 predefined configurations which can be loaded into the switches simplify their implementation.

The use of DRS switches provides enhanced capacity for the integration of devices, according to different types of topology:

- Under Ethernet RIO ring
- Under Ethernet DIO device ring
- Ethernet DIO device clouds
- Optical fibre medium for long distance remote location, etc.

The advantages of this architecture are:

- Reduced wiring costs
- Deterministic data exchanges between the PLC and the Ethernet RIO
- High availability of Ethernet DIO devices which can be connected in daisy chain loop topology (limited to devices compatible with this type of architecture)
- Functions offered by the DRS switches:
  - The secondary rings can be linked to the main ring by two DRS switches, which improves availability
  - Redundancy of the primary ring with a Hot Standby “Primary/Standby” operating mode for the two DRS switches managing the same secondary ring

Maximum distance between each ConneXium managed switch:

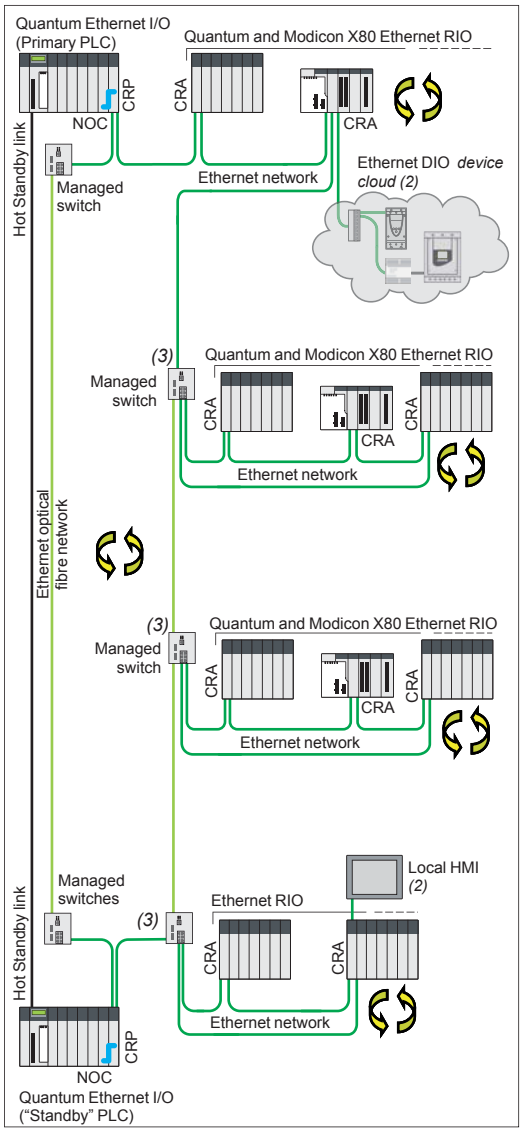
- 100 m with copper medium
- 2 km with multimode optical fibre medium
- 16 km with single mode optical fibre medium

(1) Requires Unity Pro Extra Large software ≥ V7.0.
(2) Please refer to the relevant product catalogues on our website www.schneider-electric.com.

Modicon Quantum automation platform

Quantum Ethernet I/O

Ethernet Hot Standby architectures



Quantum Hot Standby Ethernet I/O architecture, long distance

Types of Quantum Ethernet I/O architecture (continued) *(1)*

Hot Standby system

The Unity Hot Standby system is used for the the most demanding applications, in terms of the availability of their control/command system, as no interruption of the process can be tolerated. This system ensures global availability of the Hot Standby CPU and Ethernet I/O devices.

At the heart of this architecture are two PLC racks ("Primary" and "Standby") with identical hardware configurations, based on 140 CPU 67● 6● Unity Hot Standby CPUs, connected via a high-speed optical fibre cable. The volume of data exchanged between the "Primary" and "Standby" PLCs can reach 1.5 MB depending on the CPU.

The "Primary" PLC executes the application program and controls the I/O, while the "Standby" PLC remains in the background.
In the event of an unexpected failure affecting the "Primary" PLC, the "Standby" system switches over automatically, changing over execution of the application program and control of the I/O to the Standby PLC with an up-to-date data context.
Once the changeover is complete, the "Standby" PLC becomes the "Primary" PLC.
Once the faulty PLC has been repaired and reconnected to the standby system, it takes the role of the "Standby" PLC.
The changeover is performed smoothly at the outputs and is completely transparent to the process.

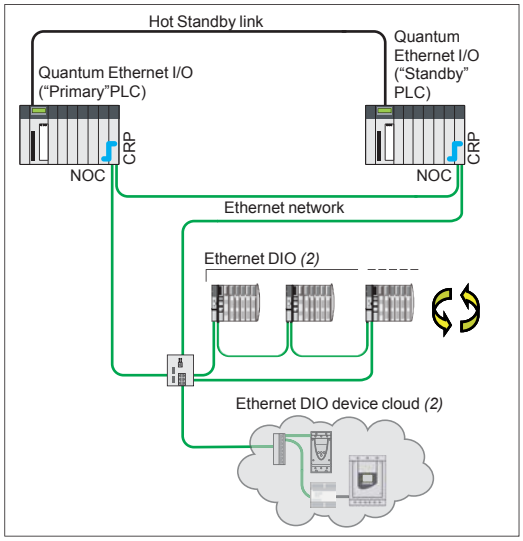
The Hot Standby system with Unity Pro software thus increases productivity by minimizing process downtime.

Hot Standby system based on Ethernet RIO architecture

The Hot Standby system based on the remote I/O (RIO) architecture is used for sensitive processes which require an I/O control takeover time within the region of the PLC scan time.
As the Ethernet RIO drops are synchronized with the PLC CPU scan time, the CPU changeover is carried out smoothly at the outputs, i.e. it is bumpless.

Ethernet head adaptor modules140 NOC 78000 and control network head adaptor modules 140 NOC 78100 are compatible with Hot Standby Ethernet RIO architectures. Automatic switching of the IP address of these modules ensures transparent addressing, even in the event of a CPU changeover.

Maximum distance between each ConneXium managed switch:
- 100 m with copper medium
- 2 km with multimode optical fibre medium
- 16 km with single mode optical fibre medium



Quantum Hot Standby Ethernet I/O architecture with Ethernet DIO devices, without CRA Ethernet drop adaptor

Hot Standby system based on Ethernet DIO device architecture

In this type of Hot Standby architecture without Ethernet RIO drops, the CRA Ethernet drop adaptor is not required.
Only a CRP Ethernet head adaptor and a 140 NOC 78000 RIO head adaptor, connected by an Ethernet Interlink cable, are required in each "Primary" and "Standby" PLC (see page 2/12).

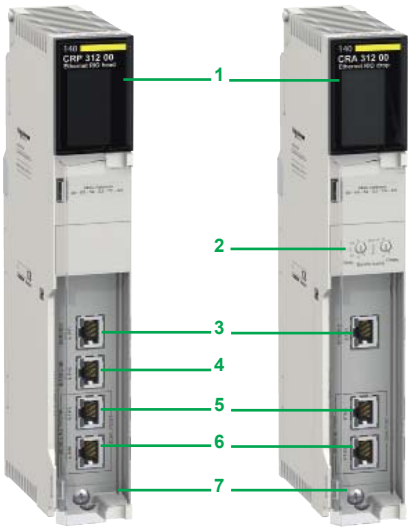
(1) Requires Unity Pro Extra Large software ≥ V7.0.
(2) Please refer to the relevant product catalogues on our website www.schneider-electric.com.
(3) As well as the secondary ring, an Ethernet DIO device cloud can be connected to each managed switch.

Modicon Quantum automation platform

Quantum Ethernet I/O

CRP Ethernet head adaptor

Quantum CRA Ethernet drop adaptor



140 CRP 31200 *140 CRA 31200*

CRP Ethernet head adaptors and CRA Ethernet drop adaptors *(1)(2)*

Presentation

A Quantum Ethernet I/O architecture with Ethernet RIO drops requires the use of CRP and CRA Ethernet adaptors:

- 140 CRP 31200 head adaptor installed in the Quantum local rack
- 140 CRA 31200 drop adaptor installed in each Quantum Ethernet RIO drop

Each of these adaptors is connected by Ethernet cables equipped with RJ45 connectors.
The dual Ethernet network connection port on each adaptor allows *Daisy Chain Loop* connections using the RSTP protocol (*Rapid Spanning Tree Protocol*).

Each adaptor uses one slot in the Quantum rack.
These adaptors are also offered in Conformal coating version for harsh environments (see page 10/2).

Capacity of Quantum Ethernet I/O architectures, with Quantum RIO drops

- 1 Quantum CPU drop equipped with a 140 CPU 6●●●● type CPU that can have one primary rack and one secondary rack *(4)*
- Up to 31 Quantum Ethernet RIO drops, limited to a maximum of 31 RIO drops (Quantum + Modicon X80) *(3)*; each Quantum CPU drop can comprise one primary rack and one secondary rack *(4)*
- Distance:
  - 100 m between drops (copper medium)
  - 2 km between each ConneXium managed switch, with a multimode optical fibre cable *(5)*
  - 16 km between each ConneXium managed switch, with a single mode optical fibre cable *(5)*
- Up to 15 ConneXium managed switches *(6)*
- 1 secondary ring level per ConneXium managed switch
- Up to 128 Ethernet DIO devices per 140 NOC 78000 Ethernet head adaptor
- Up to 64 Ethernet DIO devices per 140 NOC 78100 Ethernet head adaptor with integrated router function

Description

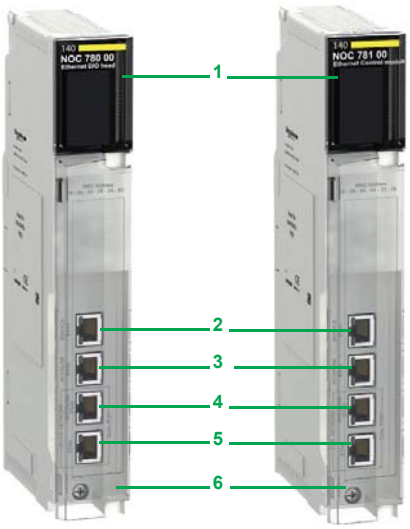
1 Display block indicating the module status
2 On 140 CRA 31200 adaptor: rotary switches for addressing Ethernet RIO drops (00…159)
3 Dedicated RJ45 SERVICE port for remote service tools such as a PC with Unity Pro *(7)*, network diagnostics software (ConneXium Network Manager, etc.) or with network analysis tools (Port Mirroring, etc.), or an HMI terminal, etc.
This port can also be used to connect Ethernet DIO devices such as Modicon ETB I/O, Altivar variable speed drives, TeSys T motor protection, etc. *(8)*.
4 RJ45 INTERLINK port on 140 CRP 31200 adaptor for connecting the Ethernet Interlink cable
5 RJ45 DEVICE NETWORK port for connection to the Ethernet network
6 RJ45 DEVICE NETWORK port for connection to the Ethernet network
7 Removable hinged door

(1) For additional characteristics, see our website www.schneider-electric.com.
(2) Requires Unity Pro Extra Large software ≥ V7.0.
(3) 140 CPU 6●1●● CPUs support a maximum of 16 Modicon X80 RIO drops.
(4) Requires two 140 XBE 100 00 rack expansion modules (one in the primary rack and one in the secondary rack) and a 140 XCA 717 0● extension cable (1, 2 or 3 m) for connecting these two modules. See page 2/19.
(5) See page 2/14.
(6) Each ConneXium switch counts as two Ethernet RIO drops.
(7) To connect Unity Pro to the SERVICE port, the 140 NOC 78000 Ethernet DIO head adaptor or 140 NOE 771●1 Ethernet module and the Ethernet Interlink cable must be used. See page 2/12.
(8) Please refer to the relevant product catalogues on our website www.schneider-electric.com.

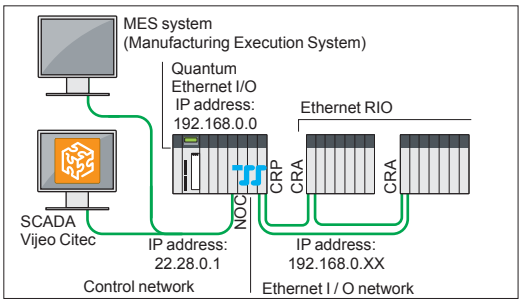
Modicon Quantum automation platform

Quantum Ethernet I/O

NOC Ethernet DIO head adaptor module
NOC Ethernet control network head adaptor



140 NOC 78000 140 NOC 78100



Router integrated in the 140 NOC 78100 Ethernet module managing several IP addresses

Example of NOC and CRP module combination: 140 NOC 78100 / 140 NOC 78000 / 140 CRP 31200

Ethernet DIO head adaptor and control network head adaptor modules NOC *(1)(2)*

Presentation

Two Ethernet 140 NOC 78●00 adaptors modules are specifically dedicated for Quantum Ethernet I/O architectures:

■ The 140 NOC 78000 DIO Ethernet head adaptor, installed in the Quantum local rack (4 adaptors max.). This adaptor manages the Ethernet DIO devices connected to the Quantum Ethernet I/O network.

■ The 140 NOC 78100 control network head adaptor module, installed in the Quantum local rack (1 adaptor max.). This adaptor manages exchanges with the control network, in which other PLCs and/or supervisors may be present. It is equipped with integrated router which allows routing between networks.

The Ethernet DIO devices can be connected in star, ring or network topology:

■ On the SERVICE port of CRP Ethernet head adaptors or CRA Ethernet drop adaptors or Quantum or Modicon X80 Ethernet RIO drops, or on the Ethernet ports of DRS switches. In this case, a link between the NOC Ethernet DIO head adaptor and the CRP is necessary for the Ethernet DIO devices to be integrated into the Quantum Ethernet I/O network (see below).

■ On the ports of the NOC Ethernet DIO head adaptor *(3)*, directly, without any link with the CRP Ethernet head adaptor. In this case, the Ethernet DIO devices are independent of the Quantum Ethernet I/O network.

The 140 NOC 78100 module has an integrated router which can manage several IP addresses and which provides transparency between the control network and the Quantum Ethernet I/O network. This function limits the use of an external router and makes setting up easier. A link is required between the NOC module and the CRP Ethernet head adaptor or the NOC Ethernet DIO head adaptor, depending on the configuration.

Capacity of NOC Ethernet modules

■ 140 NOC 78000 Ethernet DIO head adaptor module:
- □ Maximum of four NOC modules, installed in the Quantum local rack
- □ Maximum of 128 Ethernet DIO devices per module

■ 140 NOC 78100 Ethernet control network head adaptor module:
- □ Maximum of one NOC module, installed in the Quantum local rack
- □ Maximum of 64 Ethernet DIO devices per module

Description

1 Display block indicating the module status
2 Dedicated RJ45 SERVICE port for remote service tools or for connection of Ethernet DIO devices (see CRP and CRA module SERVICE port, page 2/11)
3 RJ45 INTERLINK port for connection of the Ethernet Interlink cable
4 RJ45 DEVICE NETWORK port for connection to the Ethernet network
5 RJ45 DEVICE NETWORK port for connection to the Ethernet network
6 Removable hinged door

Combination of Ethernet modules and CRP Ethernet head adaptor *(3)*

The two NOC Ethernet modules **(7,8)** are linked to the CRP Ethernet head adaptor module **(9)** by means of Ethernet Interlink cables **(10)**. Multiple combinations are possible:

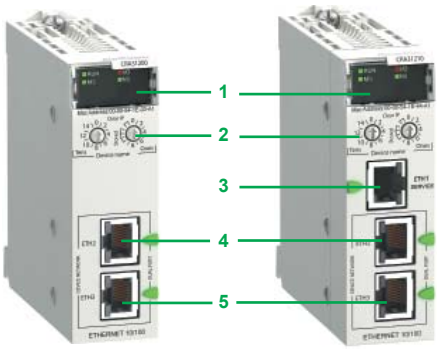
7 Ethernet control network head adaptor module 140 NOC 78100
8 Ethernet DIO head adaptor module 140 NOC 78000
9 Ethernet head adaptor 140 CRP 31200
10 Ethernet Interlink cable TCS ECN 3M3M 1S4/1S4U

(1) For additional characteristics, see our website www.schneider-electric.com.
(2) Requires Unity Pro Extra Large software ≥ V7.0.
(3) The 140 NOE 771 Ethernet Modbus TCP modules ●1 in installed bases can also manage Ethernet DIO devices in a Quantum Ethernet I/O system. These modules do however have performance restrictions which are not present in the 140 NOC 78000 module. In particular, only a 140 NOE 771 ●1 module can be part of the Quantum Ethernet I/O network; please consult our Customer Care Centre.

Modicon Quantum automation platform

Quantum Ethernet I/O

Modicon X80 CRA Ethernet drop adaptors



BMX CRA 31200 *BMX CRA 31210*

Modicon X80 CRA Ethernet drop adaptors *(1)(2)*

Presentation

A Quantum Ethernet I/O architecture with Modicon X80 RIO drops requires the use of a dedicated CRA drop adaptor in each Modicon X80 drop:
- Standard drop adaptor BMX CRA 31200 (capacity, see below)
- High performance drop adaptor BMX CRA 31210 (capacity, see below)

These drop adaptors are connected by Ethernet cordsets fitted with RJ45 connectors. The dual Ethernet network connection port on each drop adaptor allows *Daisy Chain Loop* connections using the RSTP protocol (*Rapid Spanning Tree Protocol*).

Each module uses one slot in the Modicon X80 rack.
The BMX CRA 31210 adaptor is also available in a conformal coating version for harsh environments.

Capacity of Quantum Ethernet I/O architectures with Modicon X80 Ethernet RIO

- 1 Quantum CPU drop that can have one primary rack and one secondary rack *(3)*, equipped with a 140 CPU 6●●●● advanced CPU
- With 140 CPU 651●● standard CPUs and the 140 CPU 67160 HSBY CPU:
  - Up to 16 Modicon X80 RIO drops, limited to a maximum of 31 RIO drops (Quantum + Modicon X80)
- With the 140 CPU 65260 standard CPU and 140 CPU 6726 HSBY CPUs●:
  - Up to 31 Modicon X80 RIO drops, limited to a maximum of 31 RIO drops (Ethernet Quantum and Modicon X80)
- Each Modicon X80 RIO drop can comprise one primary rack and one secondary rack *(3)*
- Distance:
  - 100 m between stations (copper medium)
  - 2 km between Modicon X80 drops, with BMX NRP 0200 multimode optical fibre repeaters
  - 16 km between Modicon X80 drops, with BMX NRP 0201 multimode optical fibre repeaters

Capacity of Modicon X80 CRA drop adaptors

Type of module	BMX CRA 31200 "standard"	BMX CRA 31210 "high performance"
Primary racks per drop	Up to 2	Up to 2
SERVICE port	–	1
Discrete I/O modules	Up to 128	Up to 1024
Analog I/O modules	Up to 16	Up to 256
Expert modules supported:		
■ serial link	–	BMX NOM 0200
■ time and date stamping at 1 ms	–	BMX ERT 1604T
■ counting	–	BMX EHC 0200/0800
CCOTF function	–	Yes
Time and date stamping	–	10 ms

Description

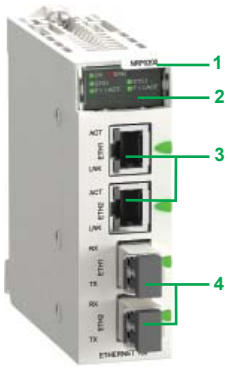
1 Display block indicating the module status
2 Rotary switches for addressing Ethernet RIO drops (00…159)
3 On BMX CRA 31210 module: dedicated RJ45 SERVICE port for remote service tools such as a PC, an HMI terminal or Ethernet DIO devices (identical to the SERVICE port on Quantum CRP/CRA modules, see page 2/10)
4 RJ45 DEVICE NETWORK port for connection to the Ethernet network
5 RJ45 DEVICE NETWORK port for connection to the Ethernet network

(1) For additional characteristics, see our website www.schneider-electric.com.
(2) Requires Unity Pro Extra Large software ≥ V7.0.
(3) Requires two BMX XBE 1000 rack expansion modules (one in the primary rack and one in the secondary rack) and a BMX XBC ●●●K extension cable (0.8, 2 or 28 m) for connecting these two modules. See page 2/20.

Modicon Quantum automation platform

Quantum Ethernet I/O

Modicon X80 NRP RIO drop optical repeaters, ConneXium managed switches



BMX NRP 020●

Modicon X80 Ethernet RIO drop optical repeaters *(1)(2)*

Presentation

BMX NRP 0200/0201 optical fibre repeaters are an alternative to the use of ConneXium managed dual ring switches (DRS), for optical fibre communications over long distances, in Quantum Ethernet I/O systems.
When inserted in Modicon X80 RIO drops, BMX NRP 0200/0201 optical fibre repeaters make it possible to:

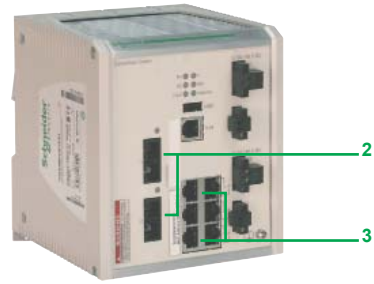
- Extend the total distance of the Quantum Ethernet I/O network, when Ethernet RIO drops are located in areas of the factory more than 100 m away
- Enhance immunity to noise
- Resolve earthing problems, between sites which have different earthing methods

NRP repeaters can be installed on the primary ring or on secondary rings. These modules cannot however be used to connect secondary rings to the primary ring.
The BMX NRP 0200 repeater for multimode optical fibre allows remote location up to 2 km.
The BMX NRP 0201 repeater or single mode optical fibre allows remote location up to 16 km.
Depending on the configuration, the NRP repeater must be linked to the CRA adaptor of the drop where it is installed, via one or two Ethernet Interlink cables.

Description

1 Module reference
2 Display block indicating the module status
3 RJ45 Ethernet ports. Two LEDs LNK and ACT indicate the state of each port
4 Optical fibre ports with SFP transceiver for LC type connector

TCS ESM 083F23F1



TCS ESM 063F2CU1
TCS ESM 063F2CS1

ConneXium managed switches *(3)*

Presentation

There are three ConneXium managed DRS (Dual Ring Switch) models available specifically for Quantum Ethernet I/O architectures. They are used in the following situations:

- For remote racks located at a distance of more than 100 m
- Use of optical fibre media:
  - For remote racks located over long distances: 2 km (multimode optical fibre) or 16 km (single mode optical fibre)
  - In environments subject to interference
  - Between sites with different earth equipotentiality
- Architectures with combined Ethernet RIO and Ethernet DIO devices
- Implementation of a secondary ring

ConneXium managed switches specific to medium

ConneXium managed switch	Copper port	Multimode optical fibre port	Single mode optical fibre port	Distance between switches
	RJ45 shielded connectors	Duplex SC connectors		
TCS ESM 083F23F1	**1** : 8 x 10/100 BASE-TX ports	–	–	100 m
TCS ESM 063F2CU1	**3** : 6 x 10/100 BASE-TX ports	**2** : 2 x 10/100 BASE-FX ports	–	2 km
TCS ESM 063F2CS1	**3** : 6 x 10/100 BASE-TX ports	–	**2** : 2 x 10/100 BASE-FX ports	16 km

Predefined configuration files *(4)*

For ease of implementation of the 3 switches described above, 15 predefined configuration files are available for building all validated and tested architectures. These configuration files are included, as standard, on the Unity Pro V7.0 DVD.
The parameters of the switch(es) present on the Ethernet network can then be easily set with the chosen configuration using a PC equipped with a web browser or Ethernet Switch Configurator software. The switch is configured immediately. Ethernet Switch Configurator software is also available on the ConneXium Resource CD-ROM.

(1) For additional characteristics, see our website www.schneider-electric.com.
(2) Requires Unity Pro Extra Large software ≥ V7.0.
(3) The functions described are only available for the three ConneXium managed switches mentioned on this page: (TCS ESM 083F23F1/063F2CU1/063F2CS1).
(4) All configurations can also be used in Ethernet Hot Standby architectures.

Modicon Quantum automation platform

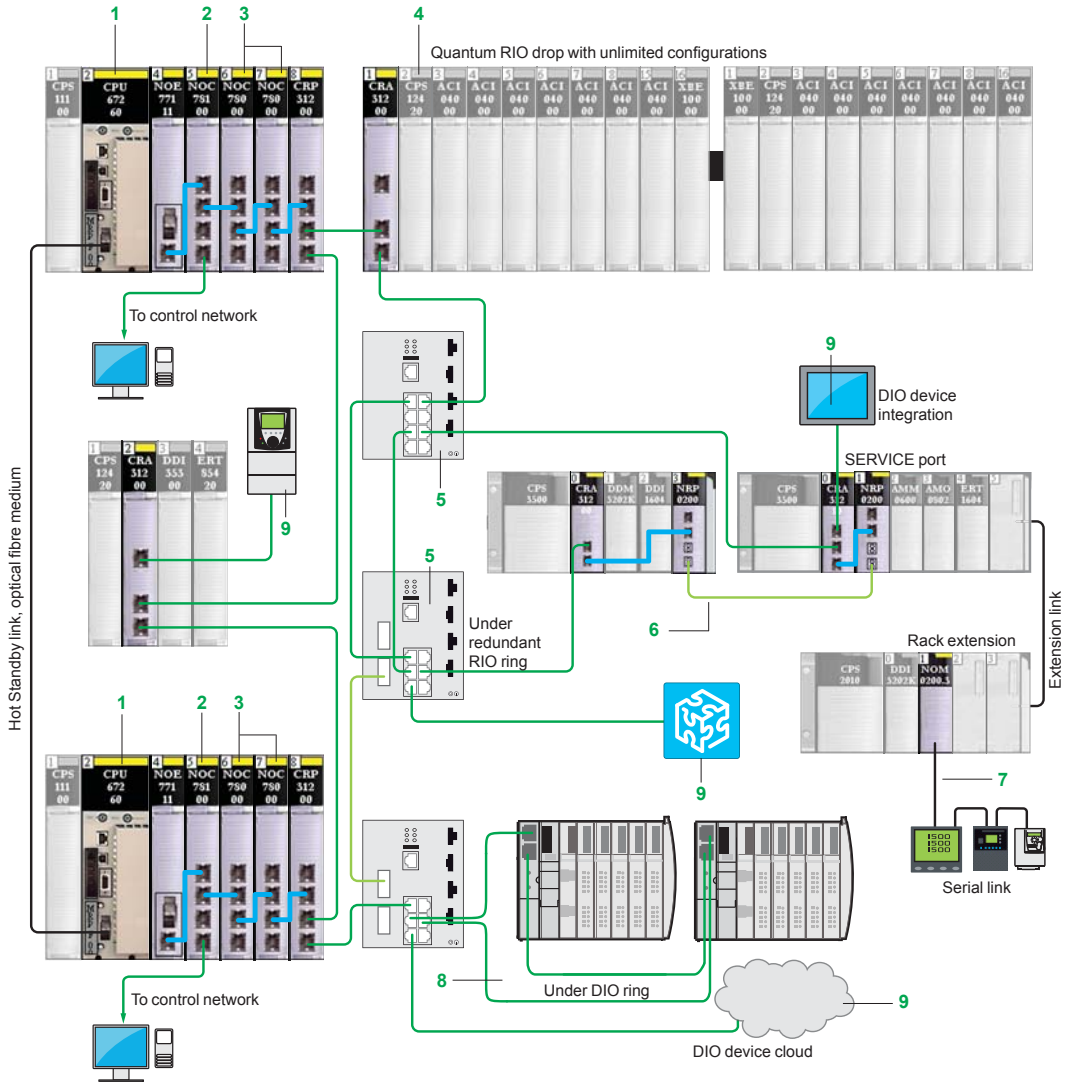
Quantum Ethernet I/O

Complex architecture example

Complex architecture example

The complex architecture below illustrates the extensive possibilities of the Quantum Ethernet I/O offer:

- High availability with Hot Standby CPUs **(1)**
- Easy integration of the I/O network with supervisors in the control network, due to the 140 NOC 78100 Ethernet module **(2)** and its integrated router function
- Optimized wiring with RIO and DIO control via a single medium: the DIO are controlled via a 140 NOC 78000 Ethernet module **(3)**, which is connected directly to the 140 CRP 31200 head adaptor module
- Increased I/O capacity: no more limitation of modules in Quantum drop configurations **(4)**. It is also now possible to add entire I/O drops without stopping the PLC (addition of drops online)
- High availability of secondary rings with managed switch redundancy function **(5)**: if one fails, the other takes over
- Long distance optimized by the optical fibre converter **(6)**, directly in the Modicon X80 rack
- Simplified integration of devices via a serial link **(7)** (for example: measuring centre, variable speed drive, motor starters, protection relays, etc.). FTD/DTM technology makes it possible to configure and debug devices transparently via the Ethernet network, from any supervisor
- Under DIO device ring for greater availability **(8)**
- Great flexibility due to integration of DIO devices **(9)** or other diagnostic/configuration tools on any drop SERVICE port or on the DIO port of a managed switch

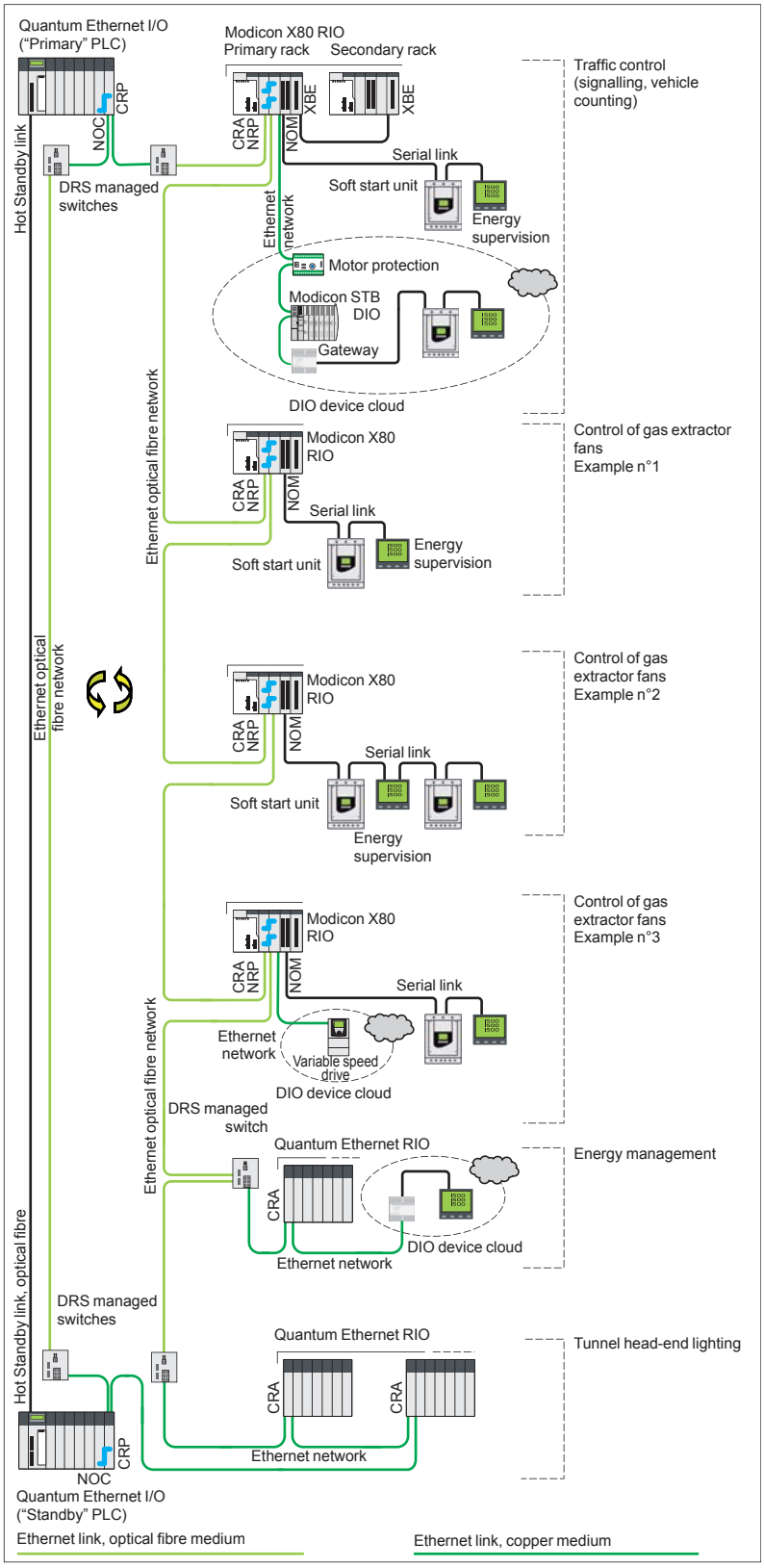


Modicon Quantum automation platform

Quantum Ethernet I/O

Example architecture

Example architecture for a tunnel



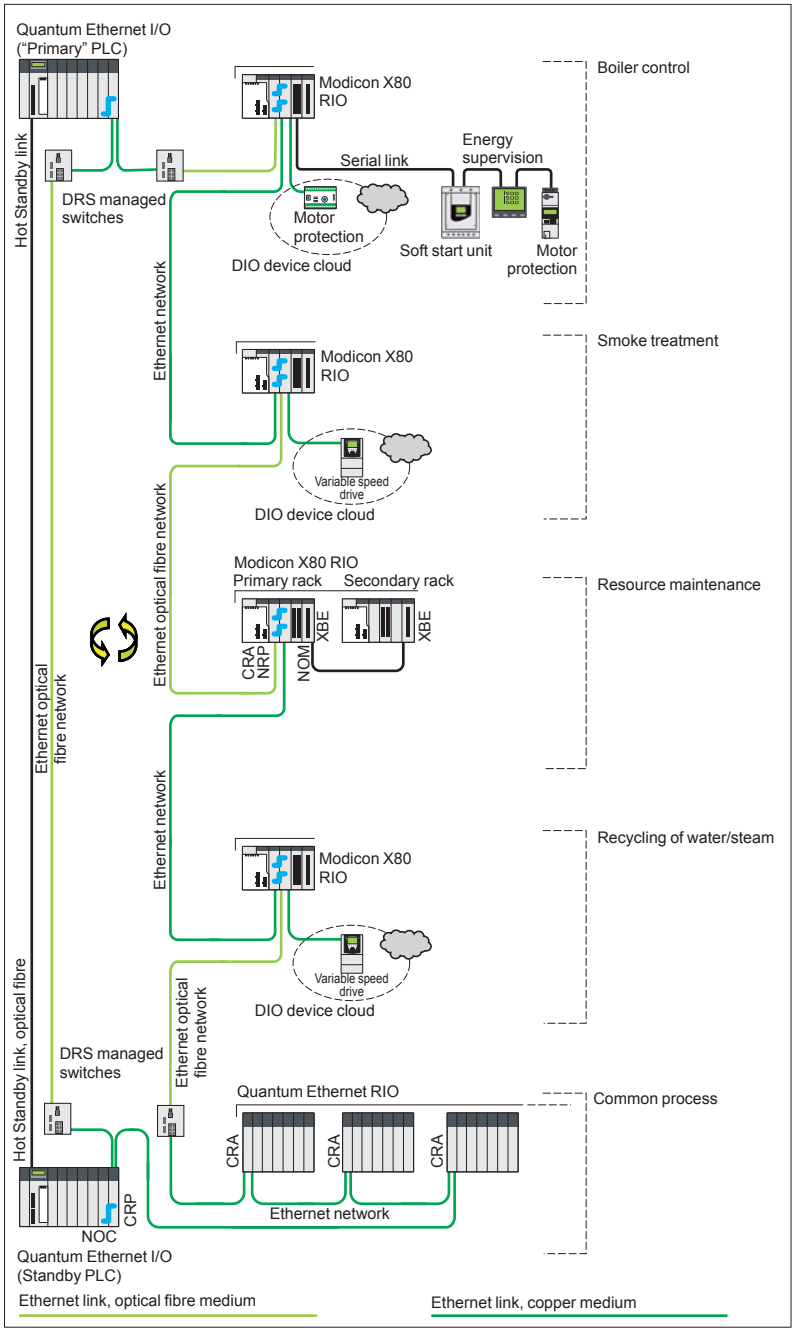
Quantum Ethernet I/O Hot Standby architecture: road tunnel management

Modicon Quantum automation platform

Quantum Ethernet I/O

Example architecture

Process type architecture (e.g.: biomass factory)

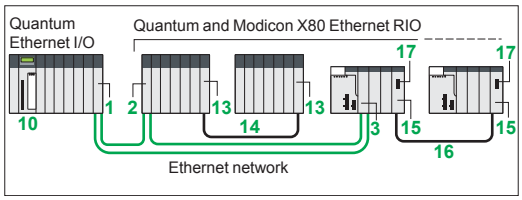


Process type architecture (for example: biomass factory)

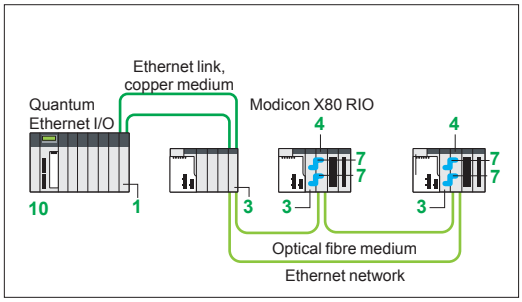
Modicon Quantum automation platform

Quantum Ethernet I/O

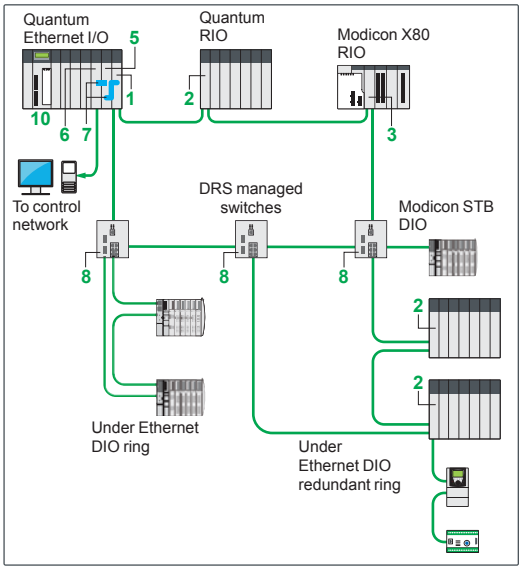
Quantum Ethernet I/O standard topologies



Ethernet RIO architecture, standard



Ethernet RIO architecture, long distance



Ethernet RIO and Ethernet DIO device architecture, high availability and extended integration capability

References *(1)*

Ethernet head and drop adaptors *(2)*

Description	SERVICE port	Item *(3)*	Reference	Weight kg
Quantum Ethernet I/O head adaptor Provide 1 adaptor per Quantum Ethernet I/O CPU rack	1	1	**140 CRP 31200** *(4)*	–
Quantum Ethernet RIO drop adaptor Provide 1 module per Quantum Ethernet RIO drop	1	2	**140 CRA 31200** *(4)*	–
Modicon X80 Ethernet RIO drop adaptor Provide 1 module per Modicon X80 Ethernet RIO drop	–	3	**BMX CRA 31200**	–
	1	3	**BMX CRA 31210** *(4)*	–

Modicon X80 Ethernet RIO drop optical repeaters *(2)*

Description	Optical fibre	Item *(3)*	Reference	Weight kg
Modicon X80 Ethernet RIO drop optical repeaters	multimode	4	**BMX NRP 0200**	–
	single mode	4	**BMX NRP 0201**	–

Ethernet communication modules and cordsets *(2)*

Description		Item *(3)*	Reference	Weight kg
Quantum Ethernet DIO head adaptor module Required if there are Ethernet DIO devices in the architecture *(7)*		5	**140 NOC 78000**	0.554
Quantum Ethernet control network head adaptor Required if there is a control network in the architecture		6	**140 NOC 78100**	0.554
Ethernet Interlink cables Length 1 m	Standard version	7	**TCS ECN 3M3M 1S4**	–
	UL version	7	**TCS ECN 3M3M 1S4U**	–

Dedicated ConneXium managed switches *(5)(6)*

Copper port	Multimode optical fibre port	Single mode optical fibre port	Item *(3)*	Reference *(4)*	Weight kg
RJ45 shielded connectors	Duplex SC connectors				
8 x 10/100 BASE-TX ports	–	–	8	**TCS ESM 083F23F1**	1.000
6 x 10/100 BASE-TX ports	2 x 10/100 BASE-FX ports	–	9	**TCS ESM 063F2CU1**	1.000
	–	2 x 10/100 BASE-FX ports	9	**TCS ESM 063F2CS1**	1.000

Quantum standard CPUs

CPU	Maximum application memory capacity		Item *(3)*	Reference *(4)*	Weight
Clock frequency	Available internal RAM (with located variables)	With PCMCIA card			
MHz	KB	KB			kg
166	768	7168	10	**140 CPU 651 50**	–
266	1024	7168	10	**140 CPU 651 60**	–
	3072	7168	10	**140 CPU 652 60**	–

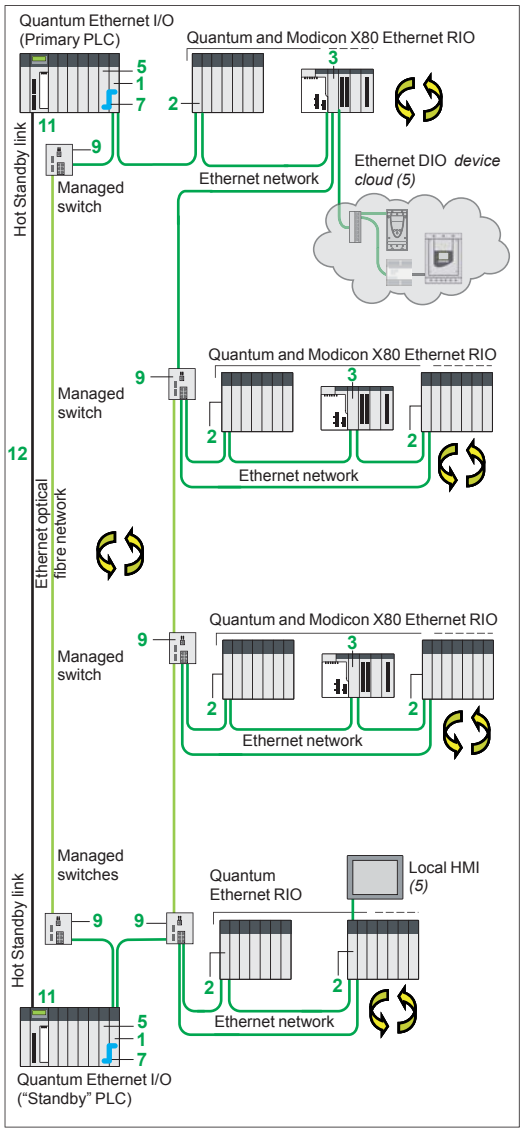
(1) For additional characteristics, see our website www.schneider-electric.com.
(2) Requires Unity Pro Extra Large software ≥ V7.0, (see page 2/21).
(3) For items 11 to 14, see page 2/19; 15 to 17, see page 2/20.
(4) Conformal coating version for harsh environments. In this case, add the letter "C" to the end of the reference.
(5) ConneXium managed switches validated for Quantum Ethernet I/O architectures.
(6) Predefined configuration files included on Unity Pro ≥ V7.0. DVD.
(7) The 140 NOE 771 Ethernet Modbus TCP modules ●1 in installed bases can also manage Ethernet DIO devices in a Quantum Ethernet I/O system. These modules do however have performance restrictions which are not present in the 140 NOC 78000 module. In particular, only a 140 NOE 771 ●1 module can be part of the Quantum Ethernet I/O network; please consult our Customer Care Centre.

Modicon Quantum automation platform

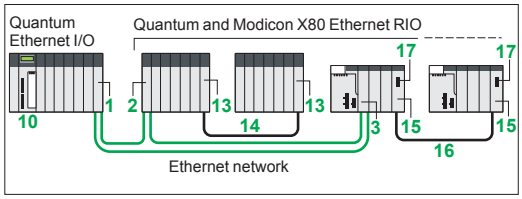
Quantum Ethernet I/O

Quantum Ethernet I/O Hot Standby topologies

Rack extension for Quantum RIO drop



Quantum Hot Standby Ethernet I/O architecture, long distance



Ethernet RIO architecture, standard

References (continued) *(1)*

Quantum Hot Standby CPUs

Hot Standby CPU	Maximum application memory capacity		Optical fibre		Item *(2)*	Reference *(3)*	Weight
Clock frequency	Available internal RAM (with located variables)	With PCMCIA card	Type and max. distance				
MHz	KB	KB		km			kg
266 *(4)*	1024	7168	Multi-mode	2	11	**140 CPU 671 60**	1.424
	3072	7168	Multi-mode	2	11	**140 CPU 672 60**	1.424
	3072	7168	Single mode	16	11	**140 CPU 672 61**	1.424

Optical fibre cable for Hot Standby architecture

Description	Length m	Item *(2)*	Reference	Weight kg
62.5/125 µm multimode optical fibre cables equipped with MT-RJ connectors For interconnection of the Ethernet port on 140 CPU 67● 60 CPUs ("Primary" and "Standby") (11)	3	12	**490 NOR 000 03**	–
	5	12	**490 NOR 000 05**	–
	15	12	**490 NOR 000 15**	–
9/125 µm single mode optical fibre cable equipped with LC connectors For interconnection of the Ethernet port on 140 CPU 672 61 "Primary" and "Standby" CPUs (11)	5	12	**VDIF0646463505**	–
9/125 µm single mode optical fibre cable equipped with LC and SC connectors For connecting a PC, via a ConneXium managed switch (9), to the Ethernet port on the 140 CPU 672 61 (11) (for example, for updating the firmware)	5	–	**VDIF0626463505**	–

Rack extension for Ethernet RIO drop

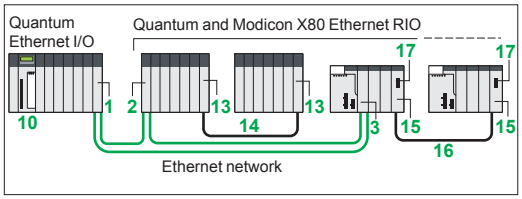
Description	Length m	Item *(2)*	Reference	Weight kg
Quantum rack expansion module Provide 2 modules: 1 for the primary rack, 1for the secondary rack	–	13	**140 XBE 100 00** *(3)(4)*	–
Cable for Quantum rack expansion module	1	14	**140 XCA 717 03**	–
	2	14	**140 XCA 717 06**	–
	3	14	**140 XCA 717 09**	–

(1) For additional characteristics, see our website www.schneider-electric.com.
(2) For items 1 to10, see page 2/18; 15 to 17, see page 2/20.
(3) Conformal coating version for harsh environments. In this case, add the letter "C" to the end of the reference.
(4) Maximum data exchange volume:
- 140 CPU 671 60: 1 MB
- 140 CPU 672 6●: 1.5 MB
(5) Please refer to the relevant product catalogues on our website www.schneider-electric.com.

Modicon Quantum automation platform

Quantum Ethernet I/O

Rack extension for Modicon X80 RIO drop



Ethernet RIO architecture, standard

References (continued) *(1)*

Rack extension for Modicon X80 Ethernet RIO drop

Description	Item *(2)*	Reference	Weight kg
Modicon X80 rack expansion module Standard module for mounting in each rack (XBE slot) and allowing the interconnection of 2 racks max.	15	**BMX XBE 1000**	0.178
Modicon X80 rack expansion kit Complete kit for 2-rack configuration comprising: - 2 BMX XBE 1000 rack expansion modules - 1 extension cordset, length 0.8 m BMX XBC 008K - 1 TSX TLY EX line terminator (pack of 2)	 15 16 17	**BMX XBE 2005**	0.700

Description	Type of connector	Length m	Item *(2)*	Reference	Weight kg
Bus X preformed extension cordsets with two 9-pin SUB-D connectors	Elbowed	0.8	16	**BMX XBC 008K**	0.165
		1.5	16	**BMX XBC 015K**	0.250
		3	16	**BMX XBC 030K**	0.420
		5	16	**BMX XBC 050K**	0.650
		12	16	**BMX XBC 120K**	1.440
	Straight	1	16	**TSX CBY 010K**	0.160
		3	16	**TSX CBY 030K**	0.260
		5	16	**TSX CBY 050K**	0.360
		12	16	**TSX CBY 120K**	1,260
		18	16	**TSX CBY 180K**	1,860
		28	16	**TSX CBY 280K**	2.860

Description	Use	Length m	Item *(2)*	Reference	Weight kg
Cable on reel Cable with free ends, 2 line testers	To be fitted with 2 TSX CBY K9 connectors	100	–	**TSX CBY 1000**	12,320

Description	Use	Sold in lots of	Item *(2)*	Reference	
Line terminator 2 x 9-way SUB-D connectors marked A/ and /B	Required on the 2 BMX XBP ●●●0 modules located at either end of the daisy chain	2	17	**TSX TLY EX**	0.050
Bus X straight connectors 2 x 9-way SUB-D connectors	For TSX CBY 1000 cable ends	2	–	**TSX CBY K9**	0.080
Connector installation kit 2 crimping pliers, 1 pen *(3)*	Fitting TSX CBY K9 connectors	–	–	**TSX CBY ACC 10**	–

(1) For additional characteristics, see our website www.schneider-electric.com.
*(2) For items **1** to**10**, see page 2/18; **11** to **14**, see page 2/19.*
(3) Installation of connectors on the cable also requires a wire stripper, a pair of scissors and a digital ohmmeter.

Modicon Quantum automation platform

Quantum Ethernet I/O

Requirements

Requirements for a Quantum Ethernet I/O architecture *(1)*

The table below gives the minimum hardware and software requirements for setting up a Quantum Ethernet I/O architecture.

Description of the hardware or software required	Reference	Version	Item *(2)*
Unity Pro Extra Large software	**UNI SPU EF● CD70**	≥ 7.0	**–**
Ethernet head adaptor	**140 CRP 31200**	–	**1**
Quantum RIO drop adaptor	**140 CRA 31200**	–	**2**
Modicon X80 RIO drop adaptor	**BMX CRA 31200**	–	**3**
	BMX CRA 31210	–	**3**
Modicon X80 NRP RIO drop optical repeaters	**BMX NRP 0200**	–	**4**
	BMX NRP 0201	–	**4**
Quantum Ethernet DIO head adaptor module	**140 NOC 78000**	–	**5**
Quantum Ethernet control network head adaptor	**140 NOC 78100**	–	**6**
Ethernet communication modules	**140 NOE 771 01**	Firmware ≥ 4.9	–
	140 NOE 771 11	Firmware ≥ 5.0	–
ConneXium managed switches	**TSC ESM 083F23F1**	Firmware ≥ 6.0	**8, 9**
	TSC ESM 063F2CU1	Firmware ≥ 6.0	**8, 9**
	TSC ESM 063F2CS1	Firmware ≥ 6.0	**8, 9**
Quantum standard CPUs	**140 CPU 651 50**	Firmware ≥ 3.1	**10**
	140 CPU 651 60	Firmware ≥ 3.1	**10**
	140 CPU 652 60	Firmware ≥ 3.1	**10**
Quantum Hot Standby CPUs	**140 CPU 671 60**	Firmware ≥ 3.1	**11**
	140 CPU 672 60	Firmware ≥ 3.1	**11**
	140 CPU 672 61	Firmware ≥ 3.1	**11**

(1) For additional characteristics, see our website www.schneider-electric.com.
*(2) For Items **1** to **10**, see page 2/18; **11** to **14**, see page 2/19; **15** to **17**, see page 2/20.*

Modicon Quantum automation platform

I/O architectures

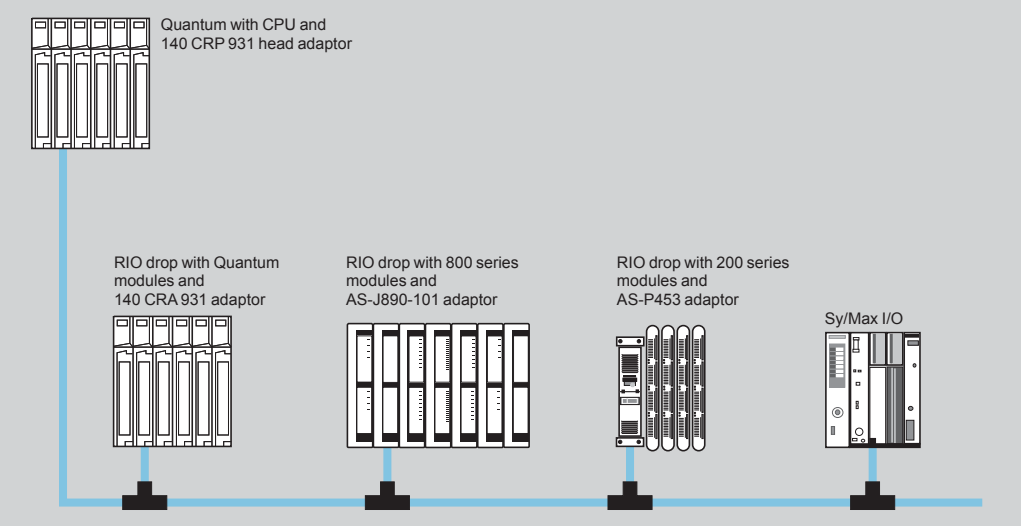
Remote I/O (RIO)

S908 bus

Presentation

For applications that require remotely mounted I/O drops, a higher I/O capacity and/or connectivity to existing Modicon I/O installations, Quantum provides a remote I/O (RIO) architecture solution.

Based on the S908 RIO network technology, this network is compatible with existing Modicon I/O installations, including those with 800 and 200 series I/O modules and Sy/Max I/O. Retrofit installations can therefore incorporate an installed I/O base to reduce installation costs.



The RIO architecture uses coaxial cabling and provides long distance capability up to 4572 m with a CATV cable, or longer with an optional optical fibre cable. It is a high-performance network, operating at 1.544 Mbps, providing a high I/O data throughput.

The RIO cabling system consists of a linear trunk cable, with line taps and drop cables for connection to each remote drop.
Up to 31 remote drops can be configured. Each drop can support up to 128 I/O words (64 input words/64 output words).

Segment scheduler mechanism

The segment scheduler mechanism increases the performance of the RIO network by interleaving I/O scanning and program execution.

The segment scheduler breaks the application program into logical segments, then co-ordinates the scanning of the inputs and the updating of the outputs in conjunction with the execution of the program associated with the segment. The inputs are read before the program is processed and the outputs are written after the program is processed. This avoids having to wait for an entire scan before the outputs are set, thus giving a faster system response time. This means that an RIO architecture does not reduce system performance.

For most systems, throughput of local or remote I/O can be estimated at no less than two times scan (with 24 V ⎓ I/O modules). Analog values and words are updated automatically, as fast as discrete I/O, with no user programming.

Compatibility with 800 and 200 series I/O products

Quantum is compatible with 800 and 200 series I/O, which are earlier generation products. Using the same RIO head adaptor, 800 series I/O are connected via J890, J892, P890 or P892 RIO adaptors and 200 series I/O are connected via P453/J290 and P451/J291 RIO adaptors.

Other standard components are also compatible with this system, including **MA 0185 100** network T-connectors and **MA 0186 100** splitter boxes. The Quantum remote I/O system also takes Sy/Max I/O drops.

Configuration rules

To ensure a valid configuration, add together the consumptions (in mA) of the modules in the rack, for each drop, and check that the total is less than the power available with the selected power supply.

Modicon Quantum automation platform

I/O architectures

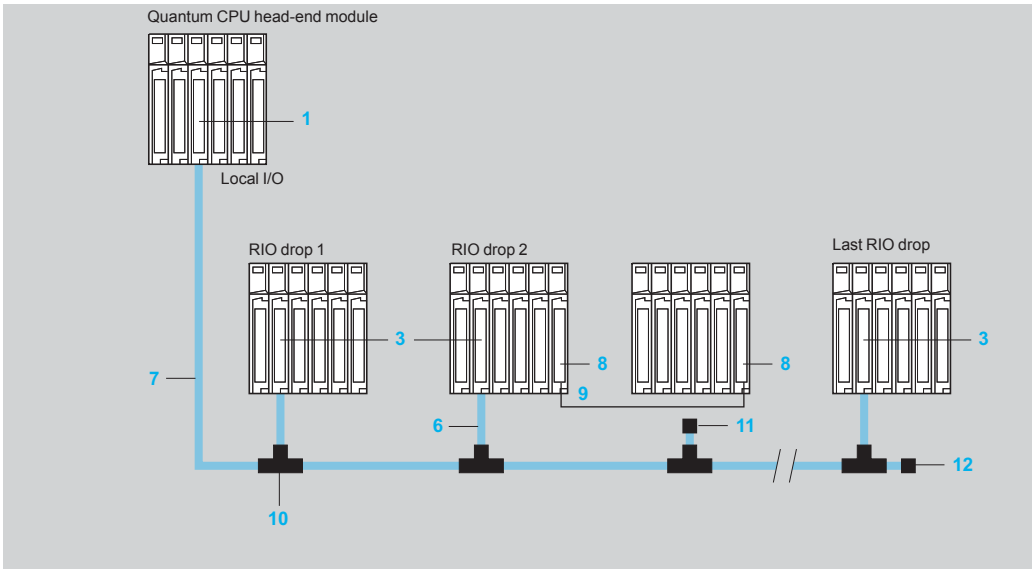
Remote I/O (RIO)

S908 bus

Topologies

Single-cable topology

Line length 4.572 km max.



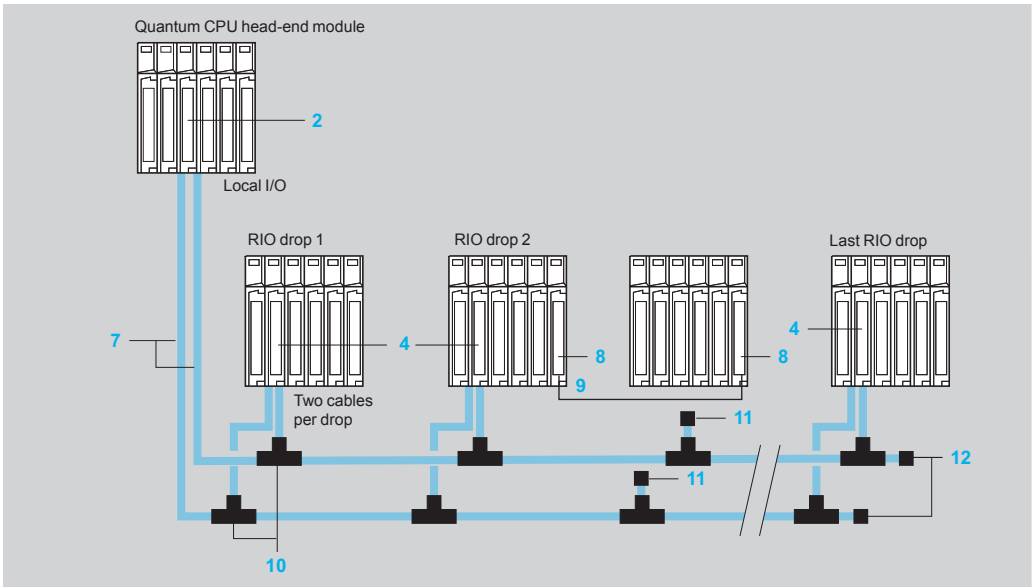
1 **140 CRP 931 00** RIO head adaptor
2 **140 CRP 932 00** RIO head adaptor (redundant)
3 **140 CRA 931 00** RIO drop adaptor
4 **140 CRA 932 00** RIO drop adaptor (redundant)
5 **140 NRP 954 00** or **140 NRP 954 01C** RIO drop optical fibre repeater
6 RG-6 coaxial cable (drop)
7 RG-11 coaxial cable (trunk)
8 **140 XBE 100 00** rack expansion module
9 **140 XCA 717 0●** cable for expansion module
10 **MA 0185 100** T-connector 2 x RG-11/1 x RG-6
11 **52 0402 000** RG-6 terminator for T-connector
12 **52 0422 000** RG-11 trunk cable terminator for T-connector

A **MA 0185 100** T-connector 10 is required for each I/O drop on the system to electrically isolate the drop from the trunk cable and to protect the system from impedance mismatches and cable disconnections. A minimum signal strength of 14 dB is required between the trunk cable and each I/O drop to ensure correct operation. The signal loss on the trunk cable is less than 1 dB as it crosses a T-connector. A total of 35 dB is available from the head-end RIO CPU. The whole cabling architecture must not exceed this system limit.

For systems that require high availability, a solution with redundant cable is available, to provide protection against cable breaks and damaged connectors. With two cables connected between the host and each drop, the first cable break does not disrupt communication. If a cable break occurs, a status bit is set to 1 to indicate the problem drop or the faulty cable. For preventive maintenance, the system also provides counter values for all communication transactions to all drops. High counter values on a cable in a specific drop could indicate connection problems. This will enable corrective work to be scheduled before there is unwanted downtime.

RIO topology with redundant cable

Line length 4.572 km max.



Modicon Quantum automation platform

I/O architectures

Remote I/O (RIO)

S908 bus

Topologies (continued)

Point-to-point RIO communication with optical fibre repeaters

140 NRP 954 00 optical fibre repeaters **5** or **140 NRP 954 01C** enhance network noise immunity and allow significantly increased cable lengths.

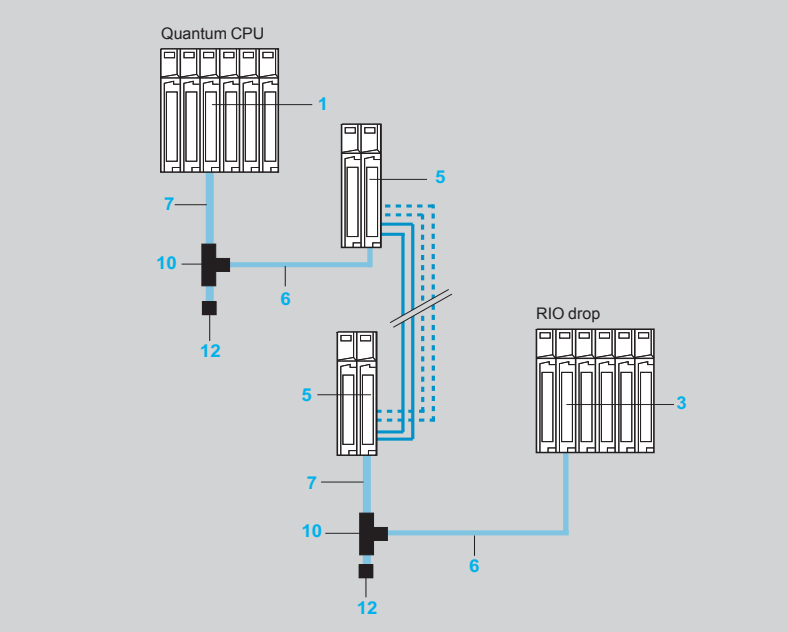
These repeaters enable a standard 62.5/125 µm or 9/125 µm single mode optical fibre cable to be used instead of an RG-6/RG-11 coaxial cable, while maintaining the dynamic range of the network.

Up to 12 repeaters can be daisy-chained, creating bus architectures over fifteen or so kilometres or redundant ring architectures over a perimeter of fifteen or so kilometres.

As these optical fibre repeaters are in Quantum module format, they can be used as *standalone* devices with a single power supply in a 3-slot rack (for example replacing **490 NRP 954 00** or **140 NRP 954 01C** repeaters, with which they are fully compatible) or directly incorporated in the Quantum racks, which provides a more compact configuration and enables the redundant power supplies of the Quantum PLC to be used.

Optical fibre repeaters used as *standalone devices*

Line length 16 km max.

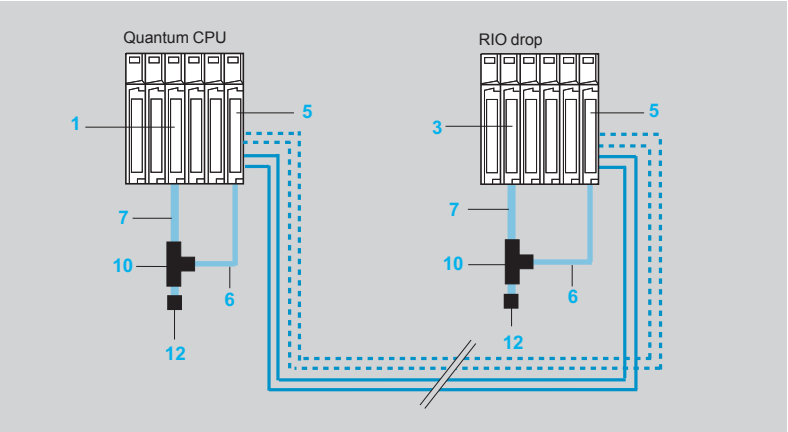


1 **140 CRP 931 00** RIO head adaptor
2 **140 CRP 932 00** RIO head adaptor (redundant)
3 **140 CRA 931 00** RIO drop adaptor
4 **140 CRA 932 00** RIO drop adaptor (redundant)
5 **140 NRP 954 00** or **140 NRP 954 01C** RIO drop optical fibre repeater
6 RG-6 coaxial cable (drop) *(1)*
7 RG-11 coaxial cable (trunk) *(1)*
8 **140 XBE 100 00** rack expansion module
9 **140 XCA 717 0●** cable for expansion module
10 **MA 0185 100** T-connector 2 x RG-11/1 x RG-6 *(1)*
11 **52 0402 000** RG-6 terminator for T-connector
12 **52 0422 000** RG-11 trunk cable terminator for T-connector *(1)*

(1) The connection between the CRP/CRA and NRP modules in the same rack, with 2 coaxial cables 7 and 6, the T-connector 10 and the T-connector terminator 12, can be replaced by a connection with a single RG-6 coaxial cable 6, if the distance between the modules is less than 30 cm.

Optical fibre repeaters incorporated in the Quantum racks

Line length 16 km max.



Modicon Quantum automation platform

I/O architectures

Remote I/O (RIO)

S908 bus

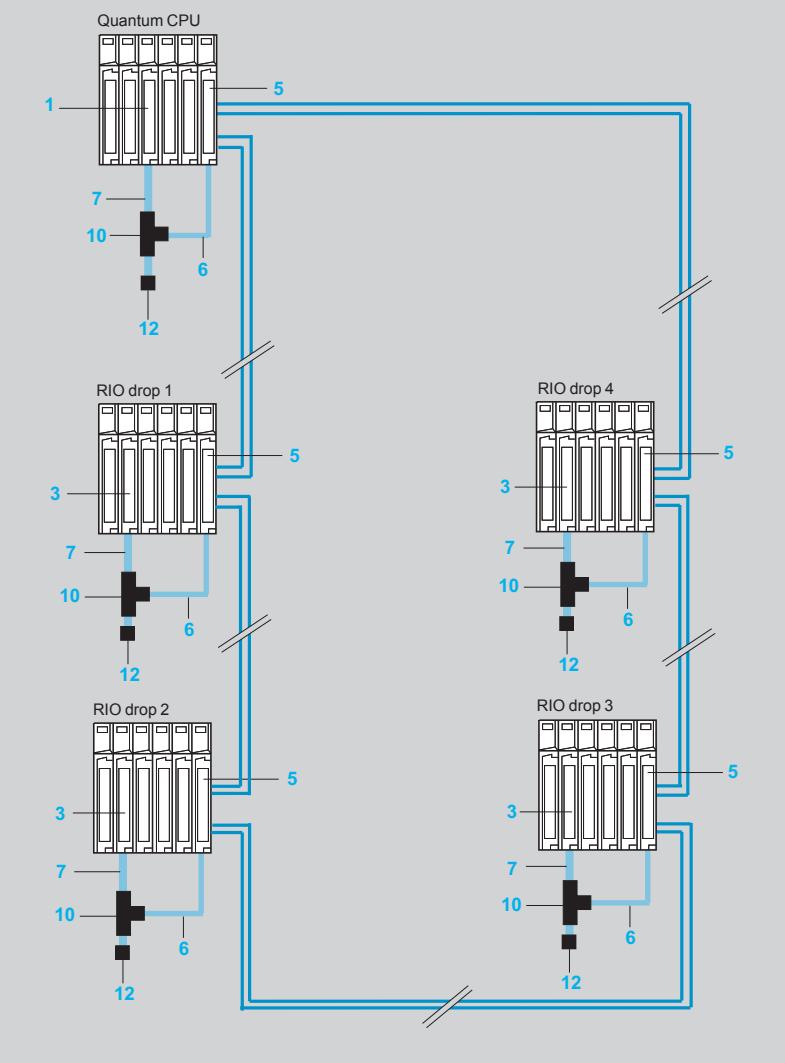
Topologies (continued)

"Self-healing" ring topology with optical fibre repeaters

Several **140 NRP 954 00** or **140 NRP 954 01C** optical fibre repeaters can be interconnected to form a ring, so that if a break occurs anywhere on the ring, the network can reconfigure itself.

The RIO signal is sent by the drop repeater to the head repeaters, in both legs of the ring. When a signal is received on one Rx line, the other Rx channel is blanked, which prevents the same signal being transmitted twice on the ring.

Line length 16 km max.



1 **140 CRP 931 00** RIO head adaptor
2 **140 CRP 932 00** RIO head adaptor (redundant)
3 **140 CRA 931 00** RIO drop adaptor
4 **140 CRA 932 00** RIO drop adaptor (redundant)
5 **140 NRP 954 00**
or **140 NRP 954 01C** RIO drop optical fibre repeater
6 RG-6 coaxial cable (drop) *(1)*
7 RG-11 coaxial cable (trunk) *(1)*
8 **140 XBE 100 00** rack expansion module
9 **140 XCA 717 0●** cable for expansion module
10 **MA 0185 100** T-connector 2 x RG-11/1 x RG-6 *(1)*
11 **52 0402 000** RG-6 terminator for T-connector
12 **52 0422 000** RG-11 trunk cable terminator for T-connector *(1)*

(1) The connection between the CRP/CRA and NRP modules in the same rack, with 2 coaxial cables 7 and 6, the T-connector 10 and the T-connector terminator 12, can be replaced by a connection with a single RG-6 coaxial cable 6, if the distance between the modules is less than 30 cm.

Note on optical fibre cables

To use a optical fibre link on a RIO network, the following points must be taken into consideration when selecting the optical fibre cable from a supplier:

■ For most applications, 62.5/125 µm fibre is recommended because of its relatively low loss and signal distortion. However, for high optical power applications, such as those using splitter boxes or star couplers, 100/140 µm fibre should be used.

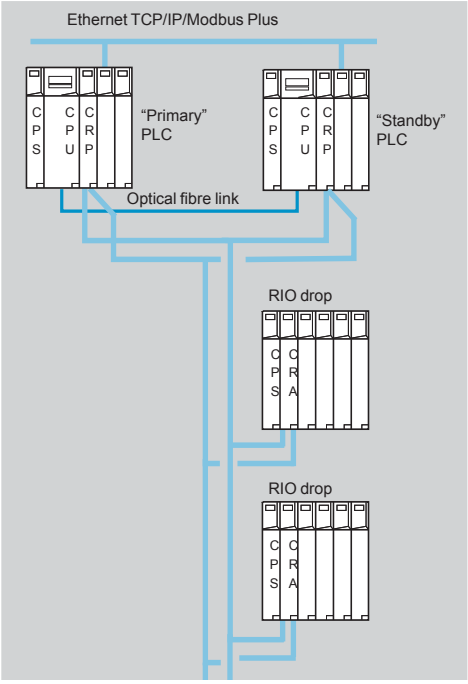
■ Whenever possible, select a multiconductor cable. For a small additional cost this provides a backup solution in case a fibre breaks during installation.

Modicon Quantum automation platform

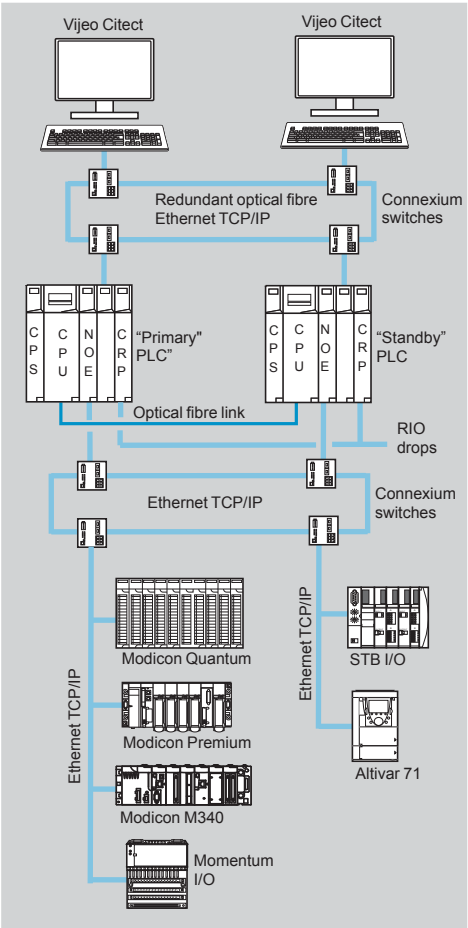
I/O architectures

Remote I/O (RIO)

S908 bus



Hot Standby system and RIO drops



Mixed Hot Standby system, Ethernet network and RIO drops

Hot Standby system with Unity Pro software

The Unity Hot Standby system is used for the the most demanding applications, in terms of the availability of their control/command system, as no interruption of the process can be tolerated.

This system consists of two PLC racks (Primary and Standby) with identical hardware configurations, based on **140 CPU 67● 6●** Unity Hot Standby CPUs, linked via a high-speed optical fibre cable (100 Mbps).

The “Primary” PLC executes the application program and controls the I/O, while the “Standby” PLC remains in the background.

If a fault occurs on the “Primary” PLC, the Standby system automatically switches execution of the application program and control of the I/O to the “Standby”PLC. The changeover is performed smoothly at the outputs and is transparent for the process.

The Hot Standby system with Unity Pro software increases productivity by minimizing process downtime.

Hot Standby system based on remote I/O (RIO) architecture

The Hot Standby system based on the remote I/O (RIO) architecture is used for sensitive processes which require an I/O control takeover time within the region of the PLC scan time.

As the RIO drops are synchronized with the PLC's CPU scan time, the CPU changeover is carried out smoothly at the outputs, *i.e. bumpless*. See page 2/35.

Ethernet Hot Standby system

The Ethernet Hot Standby system is used for processes for which the I/O control time is compatible with Ethernet technology.

It is possible to adopt a mixed architecture, combining both RIO distribution on at least one drop and distribution of devices on an Ethernet TCP/IP network.

From an operational point of view, client type devices (PLC modules, Human-Machine interfaces, etc.) and Modbus TCP server type devices (Modicon OTB or Momentum distributed I/O, Modicon STB I/O islands, Altivar variable speed drives, etc.) can in fact coexist on a single Ethernet TCP/IP network.

As far as Ethernet network topology elements for connection between PLC modules and distributed devices are concerned, it is better to use switches rather than hubs. The topology adopted can be bus or ring type (copper wire or optical fibre), as appropriate

With 140 CPU 6●2●● CPUs, it is also possible to implement the S908 bus and Quantum Ethernet I/O architectures.

Hot Standby system based on Profibus DP fieldbus modules

This Hot Standby system is based on the use of two **PTQ-PDPMV1** communication modules from ProSoft Technology which are used to control the I/O on the Profibus DP fieldbus. See page 2/38.

Hot Standby system with Concept/ProWORX software

The Hot Standby system, which is compatible with Concept and ProWORX software, gives Quantum CPUs the high availability that security-critical applications demand.

This system consists of two PLC racks (Primary and Standby) with identical hardware configurations, based on a **140 CPU ●●● ●●** Concept/ProWORX Hot Standby CPU, linked by a high-speed optical fibre cable (10 Mbps), via two **140 CHS 110 00** Hot Standby modules.

The Hot Standby system controls a group of RIO drops. Its operation is identical to that of the Unity software Hot Standby system (please consult our website www.schneider-electric.com).

Modicon Quantum automation platform

I/O architectures
Remote I/O (RIO)
S908 bus

Adaptor modules

Description	Cable	Safety	Bus current required	Power dissipation	Item (4)	Reference	Weight kg
Quantum RIO head adaptor (max. 1) *(1)*	Single coaxial	–	600 mA	3 W	1	**140 CRP 931 00**	–
	Redundant coaxial	Non-interfering	750 mA	3.8 W	2	**140 CRP 932 00**	–
Quantum RIO drop adaptor (max. 31) *(1)*	Single coaxial	–	600 mA	3 W	3	**140 CRA 931 00**	–
	Redundant coaxial	Non-interfering	750 mA	3.8 W	4	**140 CRA 932 00**	–
RIO drop optical fibre repeater *(2)*	Multimode optical fibre	–	500 mA	2.5 W	5	**140 NRP 954 00**	–
	Single mode optical fibre	–	750 mA	5 W	5	**140 NRP 954 01C**	–

Connection cables

Description	Use/ length	Item (4)	Reference	Weight kg
RG 6 quad shield coaxial cable	Drop cable, 320 m per reel	6	**97 5750 000**	–
RG 11 quad shield coaxial cable	Trunk cable 320 m per reel	7	**97 5951 000**	–
Pre-assembled drop cable (supplied with F connectors, line termination impedance and quad shield RG 6 cable)	15 m	–	**AS MBII 003**	–
	42 m	–	**AS MBII 004**	–

Rack accessories *(3)*

Description	Length	Item (4)	Reference	Weight kg
Rack expansion module	–	8	**140 XBE 100 00**	–
Cables for rack expansion module	1 m	9	**140 XCA 717 03**	–
	2 m	9	**140 XCA 717 06**	–
	3 m	9	**140 XCA 717 09**	–

(1) Approvals: UL 508, CSA 22.2-142, cUL, FM Class 1 Div. 2, CE.
(2) Module can be declared and configured in Unity Pro Small/Medium/Large/Extra Large version ≥ 6.0.
(3) For racks with 3 to 16 slots, see page 1/17.
(4) For item numbers, see pages 2/23 to 2/25.

Modicon Quantum automation platform
I/O architectures
Remote I/O (RIO)
S908 bus

Connection accessories

Description		Sold lots of	Item	Reference	Weight kg
T-connector (connects the RG-6 drop cable to the RG-11 trunk cable)		1	10	**MA 0185 100**	–
Splitter box for coaxial cable for redundant topology *(1)*		–	11	**MA 0186 100**	–
RG-6 terminator for T-connector (for unused drop slot)		1	12	**52 0402 000**	–
Trunk cable terminator (on last T-connector on the network)		1	13	**52 0422 000**	–
F connector cassette	For RG-6 cable	10	–	**MA 0329 001**	–
	For RG-11 cable	6	–	**490 RIO 002 11**	–
Right angle F adaptor, for semi-rigid cable		1	–	**52 0480 000**	–
BNC connector for RG-6 cable		1	–	**43509446**	–
F (female)/BNC (male) converter for RG-11 cable		1	–	**52 0614 000**	–
BNC line terminator		1	–	**60 0513 000**	–
Earthing block		1	–	**60 0545 000**	–

(1) T-connector for joining RG-6 coaxial cables coming from two **140 CRP 93● 00** head-end adaptors. *Forms the start of the RIO links.*

Modicon Quantum automation platform

I/O architectures

Remote I/O (RIO)

S908 bus

Cabling accessories

Description		Sold in lots of	Unit reference	Weight kg
Stripping tool	For RG-6 cable	1	**490 RIO 004 00**	–
	For RG-11 cable	1	**490 RIO 0S4 11**	–
Replacement blades	For RG-6 cable	2	**490 RIO 004 06**	–
	For RG-11 cable	2	**490 RIO 004 11**	–
Crimping tools	F connector on RG-6	1	**60 0544 000**	–
	F connector on RG-11	1	**490 RIO 0C4 11**	–
Cable cutter	–	1	**60 0558 000**	–

Modicon Quantum automation platform
Hot Standby system
Unity Pro

Presentation

The Hot Standby system is compatible with Unity Pro software, and provides Quantum CPUs with the high level of availability required by the most critical process applications, in terms of availability of their control system.

At the centre of the system are two Quantum PLC racks, commonly known as the “Primary” PLC and the “Standby” PLC. Their hardware configurations must be identical (same modules in each local rack). The key element, on each of them, is the **140 CPU 671 60** or **140 CPU 672 61** or **140 CPU 672 60** CPU, which is specially designed for Hot Standby architectures with Unity Pro software.
These Hot Standby CPUs are double-slot modules, which combine the central processor unit function with that of the redundant coprocessor in the same housing.

The “Primary” PLC executes the application program and controls the I/O. The “Standby” PLC stays in the background, ready to take over if necessary.
The “Standby” PLC is connected to the “Primary” PLC via a high speed optical fibre link (100 Mbps) integrated in the CPU:
- For **140 CPU 671 60** or **140 CPU 672 60** CPUs, a 62.5/125 µm, multimode optical fibre link is used, with a maximum distance between CPUs of 4 km (depending on the CPU product version. See our website www.schneider-electric.com)
- For **140 CPU 672 61** CPUs, an ITU-T G.652, single mode optical fibre link, known as being the SMF standard (1310 nm) is used, with a maximum distance between CPUs of 16 km

It is via this optical fibre link that the user application data is updated cyclically on the “Standby” PLC.

In the event of an unexpected failure affecting the “Primary” PLC, the standby system switches over automatically, changing over execution of the application program and control of the I/O to the “Standby” PLC, with an up-to-date data context. Once the changeover is complete, the “Standby” PLC becomes the “Primary” PLC. Once the faulty PLC has been repaired and reconnected to the standby system, it takes the role of the “Standby” PLC.

Using the Hot Standby system with Unity Pro software means there is a smooth changeover from primary to standby at the outputs. The changeover is transparent for the process, which will continue to be managed without any permanent ill-effects from the occurrence of a hardware failure. The Hot Standby system with Unity Pro software therefore increases productivity by minimizing downtime.

Modicon Quantum automation platform
Hot Standby system
Unity Pro

Function

■ **Application program memory space**

All the memory space reserved for the application program is managed by the Hot Standby system with Unity Pro.

The three CPUs dedicated to Hot Standby applications (**140 CPU 671 60**, **140 CPU 672 61** and **140 CPU 672 60)** have an embedded RAM memory (1024 KB and 3072 KB respectively). The RAM memory in these CPUs can be increased to 7.168 MB by adding a PCMCIA memory card (see page 1/11).

■ **Configuration**

The installation of the application program does not differ fundamentally from installing a single PLC program. It essentially uses the information provided by a dedicated dialogue box, filled in during the configuration of the system.

■ **Mini-terminal on front panel**

The **140 CPU 671 60**, **140 CPU 672 61** and **140 CPU 672 60** CPUs are double-slot modules, with a mini-terminal at the top of the front panel. Equipped with an LCD screen and navigation buttons, it has a special sub-menu for the standby system. It can be used for example to check the status of the PLC, or to force the PLC to active or inactive standby state.

■ **System registers**

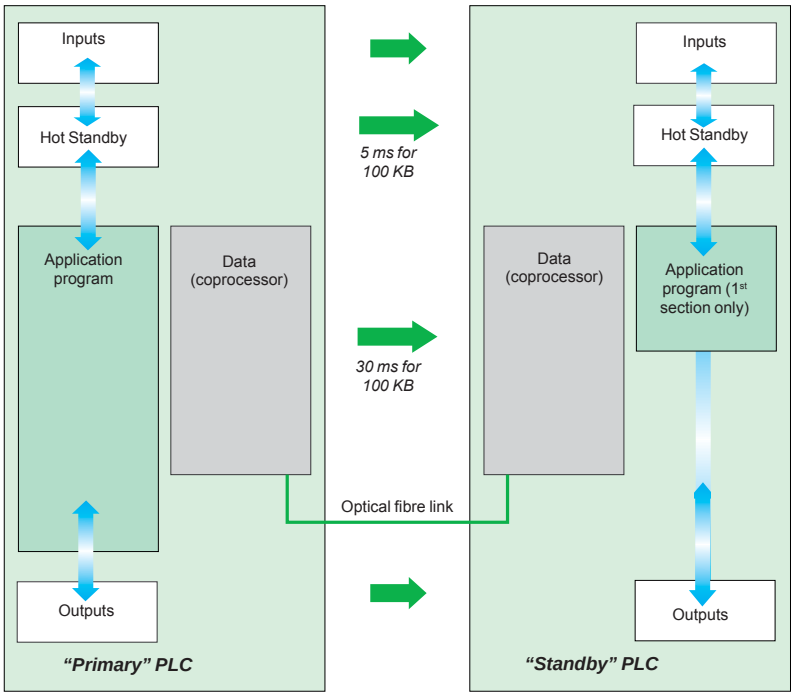
Control of the standby system is managed by an internal register called the Command Register, carried by a system word. This Command Register accepts user requests, expressed via the configuration dialogue box and/or via the mini-terminal on the front panel. This Command Register can be used in particular to disable acknowledgement of commands made from the mini-terminal.

Feedback on the status of the standby system is given by a Status Register, which is also carried by a system word.

■ **Function blocks**

Standard function blocks are provided in the Unity Pro programming environment, making it possible to read/write to the Command Register and read the Status Register, by individually identifying each of the bits carrying a particular function.

■ **Cyclic transfer of the application context**



At the start of each scan cycle, the content of the data memory in the "Primary" PLC is transferred to the "Standby" PLC via the optical fibre link, at the same time as the contents of the I/O state tables are transferred to it. The Hot Standby system is thus able to transfer all the 128 KB made available to receive the located variables (RAM State) from the "Primary" PLC to the "Standby" PLC. As far as unlocated application variables are concerned, and also application data such as DFB instance data, for example, up to 512 KB can be transferred.

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Hot Standby system
Unity Pro

Functions (continued)

■ **Monitoring program discrepancies**
The majority of redundant PLC applications require identical application programs on both CPUs. To this end, a comparison is made of the application program in both PLCs. This is carried out immediately on power-up, and is repeated constantly while the standby system remains active.

By default, the “Standby” PLC will disconnect itself from the standby system as soon as a difference in program is detected. In order to maximize availability of the control system, including during interventions on the application program, it is possible, via the configurator dialogue box or via the Command Register, to authorize the continued activity of the standby system with applications whose program code and/or database are different.

■ **Ensuring parity of the content of the PLC memories**
When the second PLC is powered up, the content of the PLC memory is automatically made identical to that of the first PLC (Plug and Play) in a certain number of cases. This is in particular true when this second PLC is empty. At the end of the transfer, the standby system is active, the first PLC then takes the “Primary” role and the second the “Standby” role.
The user can also request an upgrade via the mini dialogue terminal, which can be accessed from the front panel of the “Primary” PLC, especially after a modification has been made to the application. This operation on the mini-terminal can be performed by a maintenance engineer, without needing to use a programming terminal. This function is also available via a Command Register bit.

■ **Upgrading the operating systems**
A Command Register bit, set if necessary from the configuration dialogue box of the Hot Standby system, is used for sequential upgrading of the operating systems of both PLCs, while maintaining control of the process by the application program.

■ **Automatic exchange of communication port addresses**
When the standby system changes over, the respective addresses of the equivalent communication ports on the “Primary” and “Standby” PLCs are exchanged automatically. This exchange of addresses is unconditional for Ethernet and Modbus Plus ports. It is conditional for the local Modbus port on **140 CPU 671 60, 140 CPU 672 60** or **140 CPU 672 61** CPUs.
This function for the automatic exchange of communication port addresses greatly simplifies the task of the developer on supervisory control systems (HMI, SCADA, etc.). In effect, a given address thus characterizes an “operational” PLC (“Primary” or “Standby”) and not a physical PLC.

■ **Automatic exchange mechanisms during communication**
Irrespective of the I/O architectures used (RIO or mixed I/O), the Hot Standby system automatically manages the exchange mechanisms between the I/O and the PLC performing the “Primary” function.

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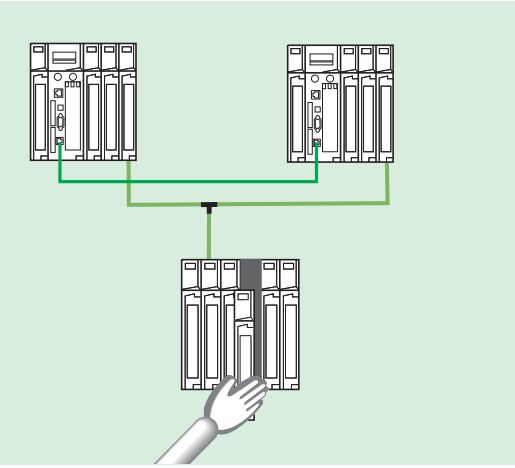


CCOTF function: exchanging I/O modules with the application in RUN mode

Functions (continued)

Online modification of the configuration (CCOTF)

This function, which is also called *CCOTF (Change Configuration On The Fly)*, is used to add or remove discrete or analog I/O modules to/from a Quantum CPU configuration in RUN mode.
It also enables Ethernet RIO drops to be added in RUN mode.
The addition of a complete Ethernet RIO drop in RUN mode requires Unity Pro ≥ V7.0 on the following CPUs:
- 140 CPU 652 60
- 140 CPU 672 60
- 140 CPU 672 61

It also enables the configuration parameters of pre-existing and new I/O modules to be modified online.
The *CCOTF* function thus avoids interrupting processes and helps to reduce production costs.

The *CCOTF* function is supported by Standalone CPUs from version 5 or later of Unity Pro, and for Hot Standby CPUs from version 4.1 or later of Unity Pro.

The following tables list the CPUs which support the *CCOTF* function and the I/O modules for which this function is permitted:

Standalone CPUs (Unity Pro version V5 and later)	**Hot Standby CPUs** (Unity Pro version V4.1 and later)
140 CPU 311 10	140 CPU 671 60
140 CPU 434 12A *(1)*	140 CPU 672 60 *(2)*
140 CPU 534 14B *(1)*	140 CPU 672 61 *(2)*
140 CPU 434 12U	
140 CPU 65 150	
140 CPU 65 160	
140 CPU 65 260 *(2)*	

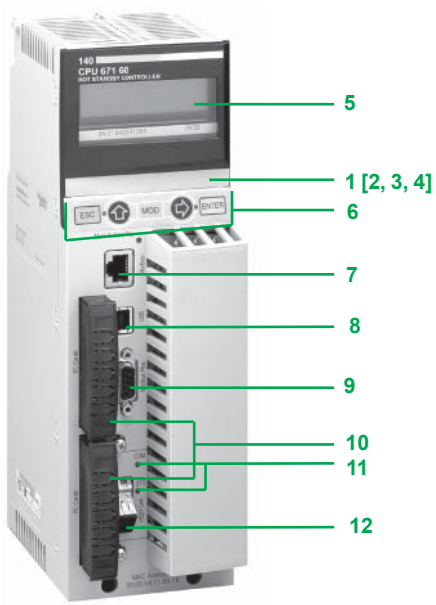
Analog I/O modules	**Discrete I/O modules**		
140 ACI 030 00	140 DDI 153 10	140 DAI 553 00	140 DAO 842 10
140 ACI 040 00	140 DDI 353 00	140 DAI 740 00	140 DAO 842 20
140 ACO 020 00	140 DDI 353 10	140 DAI 753 00	140 DAO 853 00
140 ACO 130 00	140 DDI 364 00	140 DSI 353 00	140 DRA 840 00
140 AII 330 00	140 DDI 673 00	140 DDO 153 10	140 DRC 830 00
140 AII 330 10	140 DDI 841 00	140 DDO 353 00	140 DVO 853 00
140 AIO 330 00	140 DDI 853 00	140 DDO 353 01	140 DDM 390 00
140 AMM 090 00	140 DAI 340 00	140 DDO 353 10	140 DDM 690 00
140 ARI 030 10	140 DAI 353 00	140 DDO 364 00	140 DAM 590 00
140 ATI 030 00	140 DAI 440 00	140 DDO 843 00	140 DII 330 00
140 AVI 030 00	140 DAI 453 00	140 DDO 885 00	140 DIO 330 00
140 AVO 020 00	140 DAI 540 00	140 DAO 840 00	
	140 DAI 543 00	140 DAO 840 10	

(1) CPUs updated with the Unity Pro firmware.
(2) The addition of a complete Ethernet RIO drop function is available for these CPUs with Unity Pro ≥ V7.0.

Modicon Quantum automation platform

Hot Standby system

Unity Pro



140 CPU 671 60 CPU

Mini operator dialogue terminal

Hot Standby CPUs

The front panel of **140 CPU 671 60**, **140 CPU 672 60** and **140 CPU 672 61** Hot Standby CPUs comprises:

1 An LCD display cover, providing access to:

2 A key switch:
- □ Unlocked: All system operations can be invoked and all changeable module parameters can be modified via the LCD and keypad. The memory is not write-protected.
- □ Locked: No system operations can be invoked and all changeable module parameters are read-only. The memory is write-protected. This state increases data security.

3 One backup battery slot

4 A reset button (Restart)

5 An LCD display (2 lines of 16 characters) with brightness and contrast controls.

6 A 5-button keypad with 2 LEDs *(ESC, ENTER, MOD, ⇧, ⇨)*

7 An RJ45 connector for connecting to the Modbus bus

8 A type B female USB connector for connecting the programming PC terminal

9 A 9-way female SUB-D connector for connecting to the Modbus Plus network

10 Two slots for PCMCIA memory expansion cards

11 Two LEDs:
- □ COM LED (green): activity on the Hot Standby primary or secondary drop
- □ ERR LED (red): communication error between the Hot Standby primary and secondary drops

12 A optical fibre connector for interconnecting the primary and secondary PLCs in the Hot Standby architecture:
- □ An MT-RJ multimode optical fibre connector for the **140 CPU 671 60 CPU**
- □ An LC single mode optical fibre connector for the **140 CPU 672 61 CPU**

Mini operator dialogue terminal

The mini operator dialogue terminal, located on the front of the **140 CPU 671 60, 140 CPU 672 60** and**140 CPU 672 61** Hot Standby CPUs, gives the user direct information (RUN, STOP, No Conf) on the PLC status, without a programming terminal.
It can also be used to display, and if necessary to modify, a certain number of operating parameters, using the 5 navigation buttons: ESC, ENTER, MOD, ⇧ and ⇨.

Four main command functions are accessible from a menu/sub-menu tree structure:
- Quantum PLC operating mode: **PLC Operations**
- Communication port parameter settings: **Communications**
- System information: **System Info**
- LCD screen settings: **LCD Settings**

The **PLC Operations** menu is used to execute the following commands:
- Start PLC
- Stop PLC
- Init PLC

It can also be used to go into the **Hot Standby** sub-menu offering commands specific to the standby system.

It is possible to display (**State** sub-menu) the active/inactive state (with regard to standby) of the PLC which the user is working on, and this sub-menu also offers the option of forcing (**Mode** sub-menu) this PLC to active/inactive state.

The other sub-menus are:
- **Order:** delivers topological information on the current PLC
- **Diag:** gives, if necessary, error information on the state of the standby system
- **Transfer:** is used to transfer the content of the “Primary” PLC memory to that of the “Standby” PLC, for updating

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Hot Standby system
Unity Pro

Architecture

Time-critical processes: remote I/O architecture (RIO)

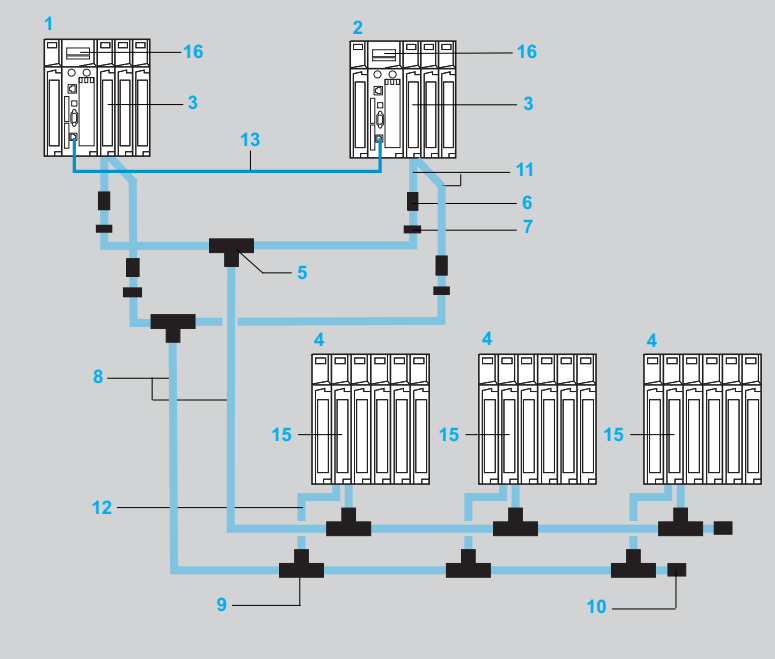
For sensitive processes, requiring an I/O control takeover time within the region of the PLC scan time, an I/O architecture based on RIO (Remote I/O) native topology should be chosen by default.

The scanning of RIO drops is synchronous with the CPU scan time. As a result, the RIO architecture provides a smooth CPU changeover with regard to the outputs, i.e. bumpless.

RIO drops, consisting of Quantum modules, are recognized and configured from the Unity Pro software programming environment.

A **MA 0186 100** splitter box 5 is used to enable I/O exchanges between the RIO drops 4 and the "Primary" 1 and "Standby" 2 PLCs.
The **52 0411 000** line impedances 6 are used to maintain a suitable line when it is necessary to disconnect one of the I/O CPUs. The optional **60 0545 000** earthing terminals 7 are used to maintain the earthing of the coaxial cable in these conditions.

The availability of this I/O system can be reinforced by using a dual-medium I/O wiring system. It is possible to transpose these I/O drops on an optical ring (single or dual), using optical repeaters.



1 "Primary" Quantum PLC
2 "Standby" Quantum PLC
3 **140 CRP 932 00** 140 CRP 932 00 RIO head adaptor (redundant)
4 RIO drop
5 **MA 0186 100** splitter box for coaxial cable
6 **52 0411 000** line impedance
7 **60 0545 000** earthing terminal
8 RG-11 coaxial trunk cable
9 **MA 0185 100** T-connector 2 x RG-11/1 x RG-6
10 **52 0422 000** RG-11 trunk cable terminator for T-connector
11 RG-6 coaxial cable (0.3 m)
12 RG-6 drop coaxial cable (2.4 m)
13 Optical fibre cable (3/5/15 m)
14 **140 NOE 771 ●1** or **140 NOC 78●00** Ethernet network module, depending on type of architecture (not shown)
15 **140 CRA 932 00** RIO drop adaptor (redundant)
16 **140 CPU 67● 6●** Hot Standby CPU

***Note**: for items 1, 2, …15, see pages 2/37 to 2/38.*

The components are available in kits.
For example, the configuration illustrated above can be created using:
- 1 splitter kit **140 CHS 320 00**
- 4 head adaptor connection kits **RPX KIT CRP**
- 6 drop kits **RPX KIT 6F**
- 1 RG-11 coaxial trunk cable: for example, a 320 m reel **97 5951 00**

(see page 2/27)

Modicon Quantum automation platform
Hot Standby system
Unity Pro

140 CPU 671 60

140 NOE 771 ●1

140 NOC 78000/78100

References

Hot Standby CPU with Unity Pro

Hot Standby CPU		Application memory capacity (max.)		Communication ports	Optical fibre	Reference	Weight kg
Clock speed	Coprocessor	Internal RAM available (with located variables)	With PCMCIA card		Type and max. distance		
MHz		KB	KB				
266	Yes, integrated Ethernet TCP/IP, use reserved for Hot Standby	1024	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps) *(2)*	Multimode, 2 km	**140 CPU 671 60**	1.424
	Yes, integrated Ethernet TCP/IP, use reserved for Hot Standby	3072	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps) *(2)*	Multimode, 2 km	**140 CPU 672 60**	1.424
	Yes, integrated Ethernet TCP/IP, use reserved for Hot Standby	3072	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps) *(3)*	Single mode, 16 km	**140 CPU 672 61**	1.424

Associated modules

Description	Type of architecture	Topology	Characteristic	Item *(4)*	Safety	Reference	Weight kg
RIO head adaptor modules	Remote I/O (RIO) and mixed I/O	Single cable	–	3	–	**140 CRP 931 00**	–
		Redundant cable	–	3	Non-interfering	**140 CRP 932 00**	–
		Redundant cable	–	3	Non-interfering	**140 CRP 312 00**	–
Ethernet Modbus TCP/IP network modules *(5)*	Distributed I/O on Modbus TCP/IP	Bus or ring (copper or optic fibre)	Transparent Ready: Class B30	14	–	**140 NOE 771 01**	0.345
			Transparent Ready: Class C30	14	Non-interfering	**140 NOE 771 11**	0.345
Ethernet DIO head adaptor module Required if there are Ethernet DIO devices in the architecture *(5)*	Mixed distributed I/O	Bus or ring (copper or optic fibre)	–	15	–	**140 NOC 78000**	0.554
Ethernet head-end adaptor module Required if there is a control network in the architecture	Mixed distributed I/O	Bus or ring (copper or optic fibre)	Integrated router	15	–	**140 NOC 78100**	0.554

(1) RS 232/RS 485 Modbus port.
(2) Ethernet 100 Mbps port for multimode optical fibre.
(3) Ethernet 100 Mbps port for multimode optical fibre.
(4) For item numbers, see diagram on page 2/35.
(5) The 140 NOE 771 Ethernet Modbus TCP modules ●1 in installed bases can also manage Ethernet DIO devices in a Quantum Ethernet I/O system. These modules do however have performance restrictions which are not present in the 140 NOC 78000 module. In particular, only a 140 NOE 771 ●1 module can be part of the Quantum Ethernet I/O network; please consult our Customer Care Centre.

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Modicon Quantum automation platform
Hot Standby system
Unity Pro

490 NOR 000 ●●

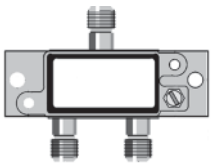
References (continued)

Optical fibre cables for Hot Standby architectures

Description	Use/composition	Length	Item (1)	Reference	Weight kg
Optical fibre cables for interconnecting the Ethernet ports on the **140 CPU 671 60** **140 CPU 672 60** CPUs (“Primary” and “Standby”)	62.5/125 µm multimode optical fibre cable, equipped with MT-RJ connectors	3 m	13	**490 NOR 000 03**	–
		5 m	13	**490 NOR 000 05**	–
		15 m	13	**490 NOR 000 15**	–
Optical fibre cable for interconnecting the Ethernet ports on **140 CPU 672 61** CPUs (“Primary” and “Standby”) (for example for platform testing)	9/125 µm single mode optical fibre cable, equipped with LC connectors	5 m	13	**VDIF0646463505**	–
Optical fibre cable for connecting a PC to the Ethernet port of the **140 CPU 672 61** CPU (for example for updating the firmware) *(2)*	9/125 µm single mode optical fibre cable, equipped with LC and SC connectors	5 m	–	**VDIF0626463505**	–

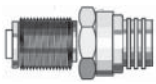
Connection kits

Description	Composition and item no. *(1)*	Reference	Weight kg
Splitter kit for coaxial cable	Comprising: - 2 MA 0186 100 splitter boxes **5** for coaxial cable with terminator 52 0402 000 for trunk cable - 4 52 0411 000 line impedances **6**	**140 CHS 320 00**	–
Connection kit for 140 CRP 93● 00 head adaptor modules	Comprising: - 1 RG 6 coaxial cable **11** (length 0.3 m) equipped with type F female connectors - 1 60 0545 000 earthing terminal **7**	**RPX KIT CRP**	–
RIO drop kit	Comprising: - 1 MA 0185 100 T-connector **9** for RG-11/RG-6 coaxial cables with 520 422 000 trunk cable terminator **10** - 2 RG-6 coaxial cables **12** (length 2.4 m) equipped with type F female connectors	**RPX KIT 6F**	–

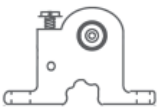


MA 0186 100

52 0411 000



52 0720 000



60 0545 000

Connection accessories for Hot Standby architecture *(3)*

Description	Use/composition	Length	Item (1)	Reference	Weight kg
Splitter box for coaxial cable	T-connector for joining sections of RG-6 coaxial cable coming from two 140 CRP 932 00 head adaptor modules. Forms the start of the RIO links.	–	5	**MA 0186 100**	–
Line impedance for RG-6 coaxial cable	Crimp-type adaptor for RG-6 RIO coaxial cable. Used to maintain a suitable RIO line on disconnection of the cable coming from the head adaptor (140 CRP 932 00). Connection at both ends on female connector.	–	6	**52 0411 000**	–
Line impedance for coaxial cable RG-6/RG-11	Screw-type adaptor for RG-6/RG-11 RIO coaxial cable. Used to maintain a suitable RIO line on disconnection of the cable coming from the head adaptor (140 CRP 932 00). Connection at both ends on female connector	–	–	**52 0720 000**	–
Earthing terminal for RG-6/RG-11 coaxial cable	Earthing terminal for RIO coaxial cable. Used to maintain earthing of the RIO line on disconnection of the cable coming from the head adaptor (140 CRP 932 00). Connection at both ends on female connector.	–	7	**60 0545 000**	–

(1) For item numbers, see diagram on page 2/35.

(2) Connection via an RJ45 copper/SC single mode optical fibre Ethernet port converter, for example the ConneXium switch **499 NSS 251 01** *(unmanaged) or* **TCS ESM 043F1CS0** *(managed).*

(3) For other RG connection accessories, see pages 2/27 and 2/28.

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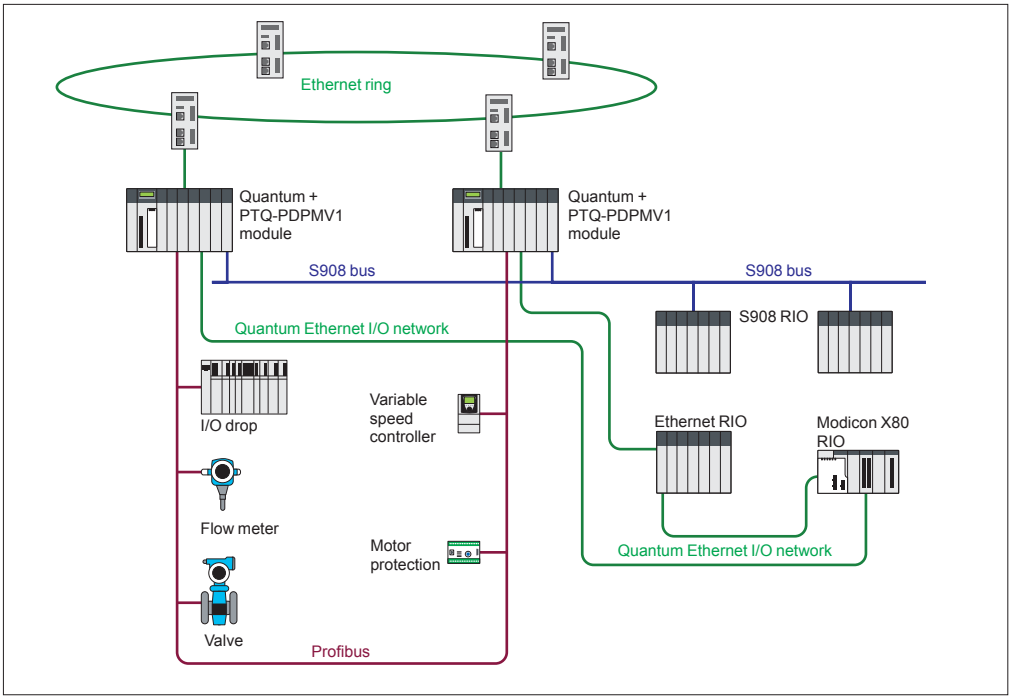
Modicon Quantum automation platform
Hot Standby system
ProSoft Technology PTQ-PDPMV1 module

Presentation *(1)*

The **PTQ-PDPMV1** communication module from ProSoft Technology can be used to create Hot Standby architectures based on Modicon Quantum **140 CPU 671 60**, **140 CPU 672 60** or **140 CPU 672 61** CPUs with Unity Pro and I/O architectures on Profibus DP fieldbus.



Profibus DP bus configuration

The Profibus DP bus is configured using the ProSoft Configuration Builder software, supplied with the module. This software is used to generate a file containing all the information relating to the connected devices. This extension file is transferred to the **PTQ-PDPMV1** module via the serial port.

Device configuration, adjustment and diagnostics

Integration of FDT/DTM technologies into the software makes it possible to configure, adjust and perform diagnostics on a device using the application-specific function provided by the manufacturer of the third-party device.

(1) Profibus DP from our partner ProSoft Technology (Collaborative Automation Partner Program).

Overview:
page 2/2

References (continued) *(1)*

The **PTQ-PDPMV1** module has three connectors on the front panel:
- Profibus DP master port: 9-way female SUB-D connector, RS485
- Ethernet port for configuration/communication: RJ45 connector
- Serial link for configuration: 9-way male SUB-D, RS232, PC-compatible

Operating principle of PTQ modules in a Hot Standby system

The **PTQ-PDPMV1** modules are connected to the primary and standby PLCs respectively.

Each **PTQ-PDPMV1** module monitors the Profibus DP bus and communicates the bus status to the other **PTQ-PDPMV1** module via the integrated Ethernet connection. At the same time, the PLC application is also informed via dedicated registers in the **PTQ-PDPMV1** modules.

It is the responsibility of the PLC application to manage this status data and also to initiate the changeover of CPU via the command registers if necessary.

Main characteristics

- Hot Standby function compatible with **140 CPU 671 60**, **140 CPU 672 60** or **140 CPU 672 61** CPUs
- Up to four **PTQ-PDPMV1** modules per rack when the Hot Standby function is active. Configuration in local rack only
- Application monitoring of active (primary) and passive (secondary) master modules via status words
- Profibus DP status words updated from the passive (secondary) master by a ping on the Profibus DP FDL link layer
- Detection of cable break with information on the number of slaves on the two segments of the broken bus
- Changeover time on Profibus DP bus for a 500 kbaud bus:
  - Typical: 100 ms
  - Max.: 300 ms

No parameter setting is required for Hot Standby operation, as the module automatically detects the Hot Standby configuration.

The ProSoft Configuration Builder (PCB) configuration software is useful to generate various DFBs for monitoring the status of the module and the bus, and managing data exchanges with the devices, keeping the input and output areas separate.

ProSoft Configuration Builder can also export a function module specific to the ProSoft Technology **PTQ-PDPMV1** module to Unity Pro.
This function module provides:
- DFBs
- Program sections with instantiated DFBs
- Dedicated animation tables
- A hyperlink to the PCB configurator

Additional products

Any information that may be required concerning the **PTQ-PDPMV1** *(1)* communication module and associated hardware and software products is available on the ProSoft Technology website http://www.prosoft-technology.com.

(1) Profibus DP from our partner ProSoft Technology (Collaborative Automation Partner Program).

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Modicon Quantum automation platform
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_s)		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**
Page		3/14		

(1) For online modification of configuration, see page 2/33.
(2) For connection, requires the Modicon Telefast ABE 7 pre-wired system:
- Connection sub-bases **ABE 7H08●●●/7H16●●●/7S16●●●** *(see page page 9/2)*
- Connection cables **TSX CDP 053/●03** *(see page 9/17)*

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**
3/14				

(3) Only Conformal Coating versions, depending on model, are ATEX Zone 2/22 certified. For more information, see pages 10/2 to 10/9.

Modicon Quantum automation platform

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**
Page		3/14			

(1) For online modification of configuration, see page 2/33.
(2) Only Conformal Coating versions, depending on model, are ATEX Zone 2/22 certified.
For more information, see pages 10/2 to 10/9.

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**
3/14				

Modicon Quantum automation platform

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_s)		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)*
Page		3/14			

(1) For online modification of configuration, see page 2/33.
(2) **140 DDO 353 00** module: *1.75 + (0.4 x total module load current) in W*
140 DDO 353 01 module: *5 W, with all outputs at state 1.*
(3) Only module **140 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**
3/14				

(4) For connection, requires the Modicon Telefast ABE 7 pre-wired system:
- Connection sub-bases ABE 7R08S●●●/7S08●●●/7P08●●●/7R16●●●/7S16●●●/7P16●●● (see page 9/2)
- Connection cables TSX CDP 053/●03 (see page 9/17)
(5) Only Conformal Coating versions, depending on model, are ATEX Zone 2/22 certified. For more information, see pages 10/2 to 10/9.

Modicon Quantum automation platform

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**
Page		3/14	

(1) For online modification of configuration, see page 2/23.

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**
3/14		

Modicon Quantum automation platform
Discrete I/O modules
Mixed I/O modules

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_s)		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**
Page		3/15	

(1) For online modification of configuration, see page 2/33.

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

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(2) Only Conformal Coating versions, depending on model, are ATEX Zone 2/22 certified. For more information, see pages 10/2 to 10/9.

Modicon Quantum automation platform
Discrete I/O modules

Presentation

The Modicon Quantum automation platform offers a complete range of discrete I/O modules designed to interface with a wide variety of devices. All these modules comply with the internationally recognized IEC electrical standards, which ensure their reliability in severe environments. For increased protection and extended life in extremely harsh environments, these modules can be ordered with a special treatment (see page 10/10).

Fully software-configurable

All Quantum I/O modules can be configured using Unity Pro, Concept or ProWORX software. Software allocation of the module I/O addresses simplifies adding or changing modules on the configuration, without intervention on the application program.

Definition of the behaviour of an output module in the event of a fault

The Quantum platform gives you the ability to predefine how a discrete output will behave in the event of a fault, if the module stops being controlled for any reason. The outputs can be configured by the software so that they will:

- Go to state 0
- Go to a predefined safe state
- Stay in the same state as at the time of the fault

The behaviour in the event of a fault can be defined for each output. If the module is changed, the previously defined states in the event of faults are sent to the replacement module.

Mechanical keying pins

It is possible to insert mechanical keying pins between the I/O module and its screw terminal block to ensure that the correct connector/module combination is used. These keying pins have codes that are unique to each type of module. When a rack contains identical modules, secondary keying pins can be used for the connector/module combination.
The keying pins are supplied with each I/O module.

I/O connectors

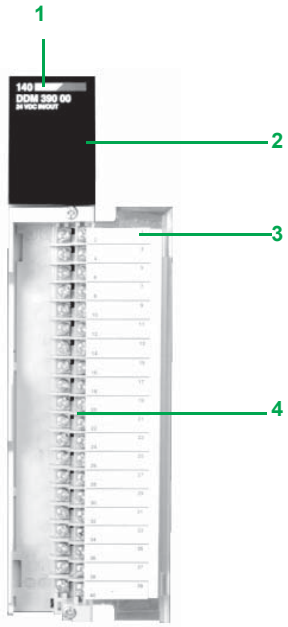
Each I/O module *(1)* requires a 40-way screw terminal block **140 XTS 001 00/002 00**, to be ordered separately. These connectors are identical for all discrete *(1)* and analog I/O modules.

Description

140 D●● discrete I/O modules have the following on the front panel:

1 Model number and colour code
2 A display block with LEDs
3 A removable hinged door and customizable identification label

To be ordered separately:
4 A 40-way screw terminal block **140 XTS 002 00**



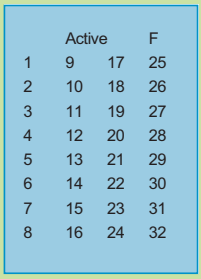
(1) Except for **140 DDI 364 00** *and* **140 DDO364 00** *96-channel modules which require* **TSX CDP ●●3** *connection cables (with one HE 10 connector at each end, to be used with the Modicon Telefast ABE 7 pre-wired system).*

Modicon Quantum automation platform
Discrete I/O modules

Display and diagnostics

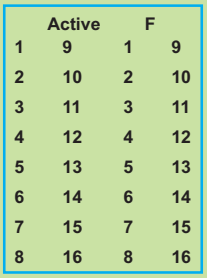
The LEDs provide a wealth of information about each of the modules. This information includes both activity on the I/O points and characteristics specific to each module, such as indication of a wiring fault or blown fuse. Visual indication of the quality of the communication with the CPU is given by an “Active” display, which can be used for troubleshooting.

32-point I/O modules



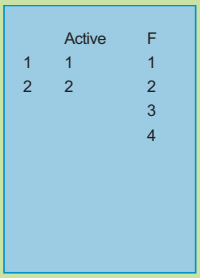
LED	Colour	Indication when on
Active	Green	Communication present on bus
F	Red	External fault detected
1…32	Green	The I/O concerned has been activated

16-point I/O modules



LED	Colour	Meaning when on
Active	Green	Communication present on bus
F	Red	External fault detected
1…16	Green	The point concerned is activated
1…16	Red	There is a fault on the point indicated

Bi-directional discrete modules



LED	Colour	Meaning when on
Active	Green	Communication present on bus
F	Red	No power supply to outputs or inputs out of tolerance
1 and 2, left column	Green	Output activated
1 and 2 middle column	Red	Fault detected on the output point
1 to 4, right column	Red	Fault detected on the input point

Modicon Quantum automation platform

Discrete I/O modules

Input modules and output modules

References

Discrete input modules

Voltage	Modularity	Description	Logic	Safety	Reference	Weight kg
5 V ⎓ TTL	32 inputs	4 groups of 8 inputs	Negative	–	**140 DDI 153 10**	0.450
24 V ⎓	32 inputs	4 groups of 8 inputs	Positive	Non-interfering *(1)*	**140 DDI 353 00**	0.300
			Negative	–	**140 DDI 353 10**	0.300
	96 inputs	6 groups of 16 inputs	Positive	–	**140 DDI 364 00**	0.300
	32 inputs	4 groups of 8 inputs	Positive	–	**140 DSI 353 00**	0.300
10…60 V ⎓	16 inputs	8 groups of 2 inputs	Positive	–	**140 DDI 841 00**	0.300
	32 inputs	4 groups of 8 inputs	Positive	–	**140 DDI 853 00**	0.295
125 V ⎓	24 inputs	3 groups of 8 inputs	Positive	–	**140 DDI 673 00**	0.300
24 V ∿	16 inputs	No common point	–	–	**140 DAI 340 00**	0.300
	32 inputs	4 groups of 8 inputs	–	–	**140 DAI 353 00**	0.340
48 V ∿	16 inputs	No common point	–	–	**140 DAI 440 00**	0.300
	32 inputs	4 groups of 8 inputs	–	–	**140 DAI 453 00**	0.300
115 V ∿	16 inputs	No common point	–	–	**140 DAI 540 00**	0.310
	16 inputs	2 groups of 8 inputs	–	–	**140 DAI 543 00**	0.300
	32 inputs	4 groups of 8 inputs	–	–	**140 DAI 553 00**	0.330
230 V ∿	16 inputs	No common point	–	–	**140 DAI 740 00**	0.350
	32 inputs	4 groups of 8 inputs	–	–	**140 DAI 753 00**	0.300

Discrete output modules

Voltage		Description	Logic	Safety	Reference	Weight kg
5 V ⎓ TTL	32 outputs	4 groups of 8 outputs	Negative	–	**140 DDO 153 10**	0.450
24 V ⎓	32 outputs	4 groups of 8 outputs	Positive	Non-interfering *(1)*	**140 DDO 353 00**	0.450
			Positive *(2)*	–	**140 DDO 353 01**	0.450
			Negative	–	**140 DDO 353 10**	0.450
	96 outputs	6 groups of 16 outputs	Positive	–	**140 DDO 364 00**	0.450
10…30 V ⎓	32 outputs	4 groups of 8 outputs	Positive	–	**140 DVO 853 00**	0.300
10…60 V ⎓	16 outputs	2 groups of 8 outputs	Positive	–	**140 DDO 843 00**	0.450
24…125 V ⎓	12 outputs	2 groups of 6 outputs	Positive	–	**140 DDO 885 00**	0.450
Relay 20…250 V ∿ 5…150 V ⎓	16 outputs	No common point	1 “NO” contact	–	**140 DRA 840 00**	0.410
	8 outputs	No common point	2 “NC” and “NO” contacts	–	**140 DRC 830 00**	0.300
24…48 V ∿	16 outputs	4 groups of 4 outputs	–	–	**140 DAO 842 20**	0.450
24…115 V ∿	16 outputs	No common point	–	–	**140 DAO 840 10**	0.485
24…230 V ∿	16 outputs	No common point	–	–	**140 DAO 840 00**	0.485
	32 outputs	4 groups of 8 outputs	–	–	**140 DAO 853 00**	0.450
100…230 V ∿	16 outputs	4 groups of 4 outputs	–	–	**140 DAO 842 10**	0.450

(1) Version ≥ 1.
(2) Outputs protected against short-circuits and overloads by thermal monitoring.

CPUs: page 1/2 | I/O architectures: page 2/2 | Communication: page 5/2 | Software: page 6/2 | Safety modules: page 7/2

Modicon Quantum automation platform

Discrete I/O modules

Mixed I/O modules and accessories

References (continued)

Mixed discrete I/O modules

Number	Inputs	Outputs	Safety	Reference	Weight kg
24 I/O	**16 inputs 24 V ⎓** 2 groups of 8, positive logic	**8 outputs 24 V ⎓** 2 groups of 4, positive logic	–	**140 DDM 390 00**	0.300
	16 inputs 125 V ∿ 2 groups of 8	**8 outputs 125 V ∿** 2 groups of 4	–	**140 DAM 590 00**	0.450
8 I/O	**4 inputs 125 V ⎓** 1 group of 4, positive logic	**4 outputs 24…125 V ⎓** No common point, positive or negative logic	–	**140 DDM 690 00**	0.300

Accessories

Description	Sold in lots of	Safety	Reference	Weight kg
40-way screw terminal block for I/O modules *(1)* Degree of protection < IP 20	–	Non-interfering	**140 XTS 002 00**	0.150
40-way screw terminal block for I/O modules *(1)* Degree of protection IP 20	–	–	**140 XTS 001 00**	–
Empty module without screw terminal block	–	–	**140 XCP 500 00**	–
Empty module with hinged cover without screw terminal block	–	–	**140 XCP 510 00**	–
Pack of jumpers for 40-way screw terminal block	12	–	**140 XCP 600 00**	–

Connection cables for I/O modules with HE 10 connectors

Description	Used for	Gauge Cross-sect.	Length	Reference	Weight kg
Connection cables 1 HE 10 connector at each end	96-channel modules 140 DDI 364 00 140 DDO 364 00 With Modicon Telefast ABE 7 pre-wired system (see page 9/8)	AWG 22 0.324 mm²	0.5 m	**TSX CDP 053**	0.085
			1 m	**TSX CDP 103**	0.150
			2 m	**TSX CDP 203**	0.280
			3 m	**TSX CDP 303**	0.410
			5 m	**TSX CDP 503**	0.670
			10 m	**TSX CDP 1003**	1.180

Replacement parts

Description	Sold in lots of	Reference	Weight kg
Set of keying pins for 40-way screw terminal blocks	60	**140 XCP 200 00**	–

(1) Except for 96-channel modules **140 DDI 364 00** *and* **140 DDO 364 00** *which are connected via 6 HE 10 connectors. Require the Modicon Telefast ABE 7 pre-wired system.*

Modicon Quantum automation platform

Analog I/O modules

Current/voltage, temperature probe, thermocouple inputs

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**
Page	3/22		

(1) For online modification of configuration, see page 2/33.
(2) Only Conformal Coating versions, depending on model, are ATEX Zone 2/22 certified. For more information, see pages 10/2 to 10/9.

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**
3/22	

Modicon Quantum automation platform

Analog I/O modules

Current/voltage outputs, mixed I/O

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**
Page	3/22		

(1) For online modification of configuration, see page 2/33.
(2) External fuse to 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:	Outputs:
0…10 V, 0…5 V, 0…20 mA ± 10 V, ± 5 V, ± 20 mA 1…5 V, 4…20 mA	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

3/22

(3) Only Conformal Coating versions, depending on model, are ATEX Zone 2/22 certified. For more information, see pages 10/2 to 10/9.

Modicon Quantum automation platform
Analog I/O modules

Presentation

The Modicon Quantum automation platform offers a complete range of analog I/O modules designed to interface with a wide variety of devices. All these modules comply with internationally accepted IEC electrical standards that ensure their reliability in severe environments. For increased protection and extended life in extremely harsh environments, these modules can be ordered with a special treatment.

Fully software-configurable

All Quantum I/O modules can be configured using Unity Pro, Concept or ProWORX software. Software allocation of the module I/O addresses simplifies adding or changing modules on the configuration, without intervention on the application program.

I/O Map zoom function

Analog modules frequently require the specification of particular parameters for various functions. The ability of the Quantum platform to configure multifunction modules via the software eliminates the need for selection using miniswitches or complex programming. A software function, called I/O Map zoom, provides access to a configuration screen in which the operational parameters of the module can be initialized or modified. This zoom technique is used on multifunction analog input modules, fast counters or temperature measurement modules using thermocouples or RTDs.

Definition of the behaviour of the output modules in the event of a fault

The Quantum platform gives you the ability to predefine how an analog output channel will behave in the event of a fault, if the module stops being controlled for any reason. The outputs can be configured in the software so that they will:
- Go to state 0
- Go to a predefined safe state
- Maintain the value they had at the time of the fault

The behaviour in the event of a fault can be defined for each channel. If the module is changed, the individually defined states in the event of faults are sent to the replacement module.

Mechanical keying pins

Optionally, primary mechanical keying pins can be inserted between the I/O module and its screw terminal block to ensure that the correct connector/module pairing is used. These primary keying pins are unique to each type of module. Secondary mechanical keying pins can be used, for example so that a rack containing identical modules, thus with the same primary keying pin, has the correct connector/module pairings. The keying pins are supplied with each I/O module.

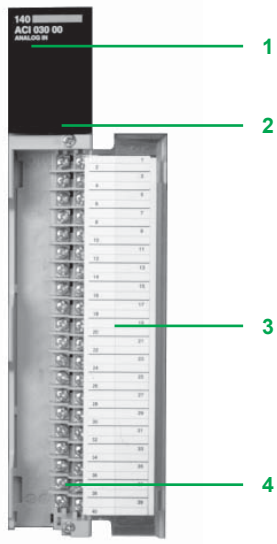
I/O connectors

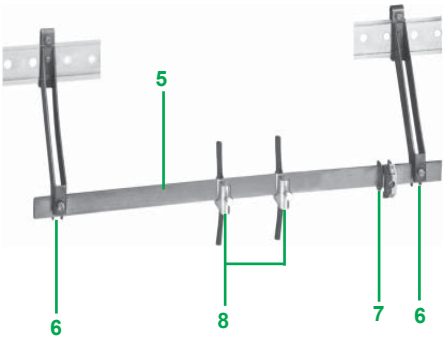
Each I/O module requires a **140 XTS 002 00**I/O connector, to be ordered separately. This connector is identical for all the I/O modules.

The "Grounding and Electromagnetic Compatibility of PLC Systems. Basic Principles and Measures. User Manual" no. 33002439 provides helpful information on setting up Modicon Quantum PLCs in accordance with the directives and legal regulations in force in the European Union and North America.

CPUs: page 1/2 | I/O architectures: page 2/2 | Communication: page 5/2 | Software: page 6/2 | Safety modules: page 7/2

Modicon Quantum automation platform
Analog I/O modules





Description

The **140 A●I/A●O/AMM** analog I/O module front panel comprises:

1 Model number and colour code

2 A display block with LEDs:
- Active LED (green): Communication bus detected as present
- F LED (red): A fault (external to the module) has been detected
- LED 1...16 (green): The indicated point or channel is on
- LED 1...16 (red): Fault present on the indicated point or channel

3 A removable hinged door and customizable identification label

To be ordered separately:

4 A 40-way screw terminal block **140 XTS 002 00** (degree of protection < IP 20) or **140 XTS 001 00** (degree of protection IP 20)

■ Earthing of the cable shielding is mandatory. The optional earthing kit **STB XSP 3000** can also be used to secure cables in installations subject to severe vibration.

The **STB XSP 3000** optional earthing kit comprises:
- **5** A metal bar which takes the clamping rings
- **6** Two sub-bases to be mounted on the rack
- **7** An earthing terminal
- **8** Spring mounting rings **STB XSP 3010** for 1.5…6 mm^2 cross-section cables or **STB XSP 3020** for 5…11 mm^2 cross-section cables, to be ordered separately

3

Modicon Quantum automation platform

Analog I/O modules

Input, output and mixed modules

Analog input modules

Description	Range	Safety	Reference	Weight kg
8 high level channels 12-bit, unipolar	4...20 mA 1... 5 V	–	**140 ACI 030 00**	0.300
16 high level channels 0…25,000 points, unipolar	0...20 mA, 0...25 mA 4...20 mA	Non-interfering	**140 ACI 040 00**	0.300
8 RTD channels 13-bit	Ni 100, Ni 200, Ni 500, Ni 1000, Pt 100, Pt 200, Pt 500, Pt 1000	–	**140 ARI 030 10**	0.300
8 thermocouple and low level channels 16-bit	Types J, K, E, T, S, R, B ± 25 mV, ± 100 mV	–	**140 ATI 030 00**	0.300
8 high level channels 16-bit, bipolar	± 20 mA, 0…20 mA, 4…20 mA ± 10 V, ± 5 V, 0…10 V, 0…5 V, 1…5 V	–	**140 AVI 030 00**	0.300

Analog output modules

Description	Range	Safety	Reference	Weight kg
4 current channels 12-bit	4...20 mA	Non-interfering	**140 ACO 020 00**	0.300
8 current channels 0…25,000 points	0...20 mA 0...25 mA 4...20 mA	–	**140 ACO 130 00**	0.300
4 high level voltage channels 12-bit	± 5 V, ± 10 V 0…5 V, 0…10 V	–	**140 AVO 020 00**	0.300

Mixed analog I/O modules

Description	Range	Safety	Reference	Weight kg
4 input channels, 14…16-bit	± 20 mA, 0…20 mA, 4…20 mA ± 5 V, ± 10 V, 0…5 V, 0…10 V, 1…5 V	–	**140 AMM 090 00**	0.300
2 output channels 12-bit	4…20 mA			

Modicon Quantum automation platform

Analog I/O modules

Accessories

STB XSP 3000 + STB XSP 3010/3020

Accessories

Description	Degree of protection	Sold in lots of	Safety	Reference	Weight kg
40-way screw terminal blocks Required for all analog I/O modules	< IP 20	–	Non-interfering	**140 XTS 002 00**	0.150
	IP 20	–	–	**140 XTS 001 00**	–
Keying pin kit for screw terminal block	–	60	–	**140 XCP 200 00**	–
Analog I/O simulation kit *(1)*	–	–	–	**140 XSM 010 00**	–
Earthing kit	–	–	–	**STB XSP 3000**	–
Spring clamping rings for earthing kit	–	10	–	**STB XSP 3010**	–
	–	10	–	**STB XSP 3020**	–

(1) Simulation kit for **140 A●I 030 00**, **140 A●O 020 00** *and* **140 AMM 090 00** *modules, comprising:*
- 1 x 0…5 V measurement device
- 2 x 10-turn potentiometers
- 1 x 24 V ⎓ power supply

3

Modicon distributed I/O solutions

Type of splitter box and module		Monobloc IP 67 I/O splitter boxes Modicon ETB
Available buses and networks		Ethernet Modbus TCP/IP EtherNet/IP
Max. number per connection point		
Discrete I/O	Modularity	Splitter box with 16 configurable I/O, 16 I, 12 I + 4 O, or 8 I +8 O
	Input voltage	24 V ⎓
	Output voltage	24 V ⎓
Analog I/O		–
Application-specific I/O		– –
I/O connection		M12 connectors
Type of housing		Plastic
Type of module		**ETB 1E●●●**
Pages		Please consult the catalogue pages on our website www.schneider-electric.com

Monobloc IP 20 distributed I/O	Optimum IP 20 distributed I/O	Modular IP 20 distributed I/O
Modicon Momentum	**Modicon OTB**	**Modicon STB**
Ethernet Modbus TCP/IP Modbus Plus Fipio InterBus Profibus DP DeviceNet	Ethernet Modbus TCP/IP CANopen Modbus (RS 485)	Ethernet Modbus TCP/IP EtherNet/IP CANopen Modbus Plus Fipio InterBus Profibus DP DeviceNet
1 sub-base with 1 CPU or 1 communication module	1 interface module + 7 Twido expansion modules	1 NIM (Network Interface Module) + 32 I/O modules
Sub-base with 16 I, 32 I, 8 O, 16 O, 32 O, 10 I/8 O, 16 I/8 O, 16 I/12 O and 16 I/16 O	12 I/8 O (interface module) 8 I, 16 I, 32 I, 8 O, 16 O, 32 O, 4 I/4 O and 16 I/8 O (expansion modules)	Module with 2 I, 4 I, 6 I, 16 I, 2 O, 4 O, 6 O or 16 O
24 V ⎓, 120 V ∿ and 230 V ∿	24 V ⎓	24 V ⎓, 115 V ∿ and 230 V ∿
24 V ⎓ V, 120 V ∿ and 230 V ∿ and relay	24 V ⎓ and relay	24 V ⎓, 115/230 V ∿ and relay
8 I, 16 I or 4 O voltage/current sub-bases Sub-base with 4 thermocouple or probe inputs	2 I, 4 I, 8 I, 1 O, 2 O, 2 I/1 O and 4 I/2 O (expansion modules) voltage/current, thermocouple or temperature probe	Modules with 2, 4 or 8 inputs and 1 or 2 outputs (voltage/current) Sub-base with 2 thermocouple or probe inputs
10 kHz/200 kHz 2-channel counter sub-base	Integrated in interface module: - Two 5 kHz/20 kHz channels - 2 PWM function channels	Counter module with one 40 kHz channel
6 I/3 O 120 V ∿ sub-base with 1 Modbus port	–	Parallel interface modules for TeSys Quickfit and TeSys U motor starters, integrated connection for third-party CANopen products
Screw or spring-type removable terminal blocks	Removable screw terminal block (interface module) Removable screw terminal block, non-removable spring-type terminal block and HE 10 connector (expansion modules)	Removable screw or spring-type connectors, Telefast connectors
Plastic		
170 AD●	**OTB 1●0 DM9LP**	**STB ●●●**
Please consult the catalogue pages on our website www.schneider-electric.com		

Modicon STB distributed I/O solution

Open and modular system

Colour code	Type of module
	NIM network interface EOS/BOS island expansion CANopen expansion
	24 V ⎓ digital inputs
	24 V ⎓ supply distribution 24 V ⎓ digital outputs
	115 V ∿ or 230 V ∿ digital current inputs
	115/230 V ∿ supply distribution 115/230 V ∿ digital current outputs
	Digital relay outputs TeSys U and TeSys Quickfit interface, counter module
	Analog inputs
	Analog outputs

Presentation *(1)*

To meet the needs of machine manufacturers and users,automation architectures have been decentralized while delivering performance close to that of centralized systems.

Architectures based around islands installed as close to the machine as possible reduce the time and cost of wiring for sensors and actuators, while increasing system availability.

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
- FTB IP 67 distributed I/O
- OsiSense rotary encoders
- Magelis operator dialogue terminals
- Approved third-party products via the CANopen bus: Bosch, Festo, Parker solenoid valves, Balluff linear encoders, etc. *(1)*

Advantys software guides users through the design phase, start-up, and even maintenance of the system. This single software package covers the Modicon STB, OTB, FTB, and FTM ranges.

The island components are electronic modules mounted on one or more DIN rails. These clusters of modules, known as segments, carry a bus from beginning to end of each island. The island bus provides power distribution, signal sensing, and power management to all compatible modules, in the form of a wiring management system.

The Modicon STB I/O family is divided into 2 groups of modules:
- **Basic modules:** A complete set of low-cost modules, with simplified operating modes
- **Standard modules:** An extended offer of I/O modules, with additional functions: Configurable parameters, extended operating modes

The basic range comprises:
- PDM power distribution modules (24 V ⎓ and 115/230 V ∿)
- I/O modules:
  - Digital I/O (24 V ⎓)
  - Analog I/O (10-bit resolution)

The standard range comprises:
- NIM modules: Network interfaces
- PDM power distribution modules (24 V ⎓ and 115/230 V ∿)
- I/O modules:
  - Digital I/O (24 V ⎓ and 115/230 V ∿)
  - Analog I/O (10, 12 and 16-bit resolution)
  - Relay outputs (24 V ⎓ coil and 24 V ⎓ contact or 115/230 V ∿)
- Application module: Counter module
- Dedicated module: For TeSys U and TeSys Quickfit applications
- EOS end of segment and BOS beginning of segment modules
- External equipment support module on CANopen expansion

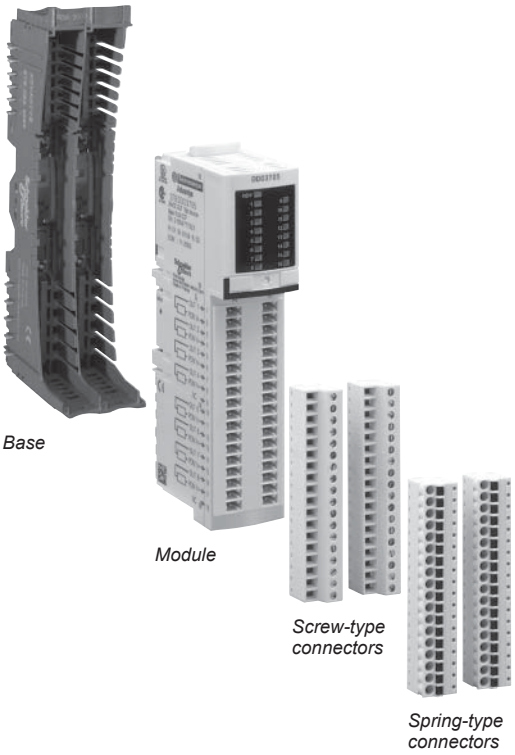
Standard and basic modules can be combined on the same island. Combining them in this way allows a wide range of functions *(1)*.

The sensors and actuators are connected to the I/O modules via removable screw or spring-type terminals *(2)*.
Standard Modicon STB I/O modules are hot-swappable, provided the network interface modules are also standard type.
Modicon STB distributed I/O islands have a protection rating of IP 20. For installations in production workshops, they must be housed in enclosures providing at least IP 54 (complying to IEC 60950 or NEMA 250) *(1)*.

(1) For further information, please consult our "Modicon STB IP 20 distributed I/O" catalogue available on our website www.schneider-electric.com.
(2) For much easier wiring and for freeing-up space in the electrical cabinet, Modicon STB 16-channel digital I/O modules can be combined with Modicon Telefast ABE 7 pre-wired or adaptor blocks.

Modicon STB distributed I/O solution

Open and modular system



Modicon STB modules *(1)*

The Modicon STB module references allow you to acquire the following items under a single reference:

- A module
- Its base
- The appropriate screw-type and/or spring-type connectors

The following table gives the contents of the Modicon STB modules and the general form of their references *(1)*.

Module	Contents	Reference *(1)*
NIM network interface	Module, screw-type and spring-type connectors (base not required), bus terminator, documentation on mini CD-ROM *(2) (3)*	**STB N●● ●●●●**
Power distribution module (PDM) **Digital I/O (except 16-channel)** **Analog I/O** **EOS and BOS island bus expansion** **CANopen bus expansion** **Auxiliary power supply** **TeSys U and TeSys Quickfit interface**	Base, module, screw-type and spring-type connectors	**STB ●●● ●●●● K**
Digital I/O 16-channel	Base, module, screw-type connectors	**STB DD● 37●5 KS**
	Base, module, spring-type connectors	**STB DD● 37●5 KC**
	Module *(4)*	**STB DD● 37●5**
Counting	Base, module, spring-type connectors	**STB EHC 3020 KC**

(1) For further information, please consult our "Modicon STB IP 20 distributed I/O" catalogue available on our website www.schneider-electric.com.
(2) DeviceNet STB NDN ●●●● NIM network interface module: The 5-way removable terminals, screw-type and spring-type (fieldbus connection), are to be ordered separately (1).
(3) An English language mini-CD-ROM supporting the user documentation, a label template and one exchange file per network type. The user documentation is also available on our website www.schneider-electric.com.
(4) For use with the Modicon Telefast ABE 7 pre-wired or adaptor system:
- STB XBA 3000 base to be ordered separately (1)
- Telefast ABE 7 base and connection accessories to be ordered separately (1)

Modicon STB distributed I/O solution
Open and modular system

Composition of a Modicon STB island *(1)*

A Modicon STB island is made up of one or more segments comprising PDMs *(Power Distribution Modules)* and I/O modules.
The island begins with a NIM network interface module and ends with a bus terminator supplied with the NIM.
An island can be made up of a single segment or a primary segment and up to 6 expansion segments.
The island's segments are chained by EOS *(End Of Segment)* and BOS *(Beginning Of Segment)* internal bus expansion modules.

On each segment:
- The PDMs must be placed immediately to the right of the network interface modules or expansion modules.
- The I/O modules are placed to the right of the PDM module supplying them with power.
- Each module (with the exception of the NIM network interface module), is held in a fixing base on the DIN rail.

Three module and base widths are possible. On the DIN rail, the overall width needed for a segment is the sum of widths of the network interface module, the bases and any bus terminator.

The bases ensure the continuity of the internal bus, the auto-addressing of the modules, and the separated and isolated distribution of the internal power supplies, actuators (outputs) and sensors (inputs).
The advantages of this arrangement are:
- Unplugging modules:
  - When switched off (cold swap), all modules can be unplugged very quickly
  - When switched on *(hot swap)*, I/O modules can be unplugged provided the network interface module is the standard type
- Output power supply independent of inputs: For example, if an output power supply is cut by a Preventa module, the inputs are still managed.
- Immunity of inputs: For example, the closing of power contactors (controlled by outputs) does not disturb analog input measurements.

Network Interface Module *(NIM)*:
This module manages communications on the island bus. It acts as a gateway for exchanges with the fieldbus or network master.

Various NIM network interface modules (only standard type) are available for the following major fieldbuses or industrial networks:
- Ethernet Modbus TCP/IP: Single or double port Network Interface Modules.
- EtherNet/IP, Modbus Plus and Fipio: Only standard type NIM network interface modules.
- CANopen, InterBus, Modbus Plus, Fipio, Profibus DP and DeviceNet.

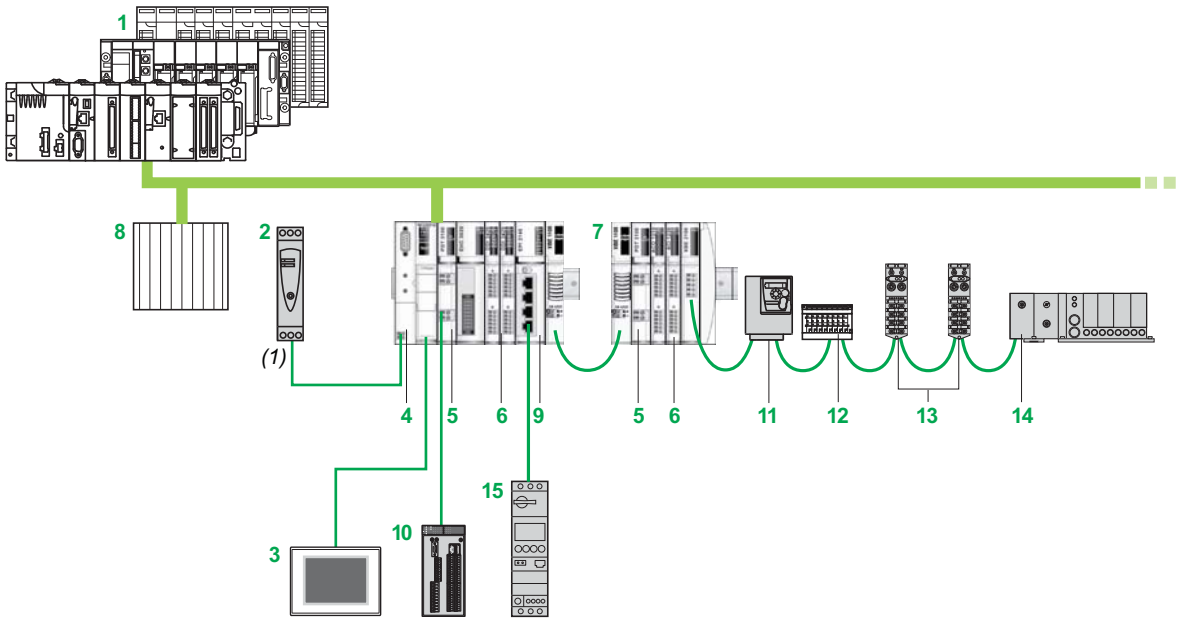
(1) For further information, please consult our "Modicon STB IP 20 distributed I/O" catalogue available on our website www.schneider-electric.com.

Modicon STB distributed I/O solution
Open and modular system

Control system configuration example *(1)*

NIM network interface modules STB N●● 2●1● located at the beginning of each island, are gateways for exchanging data between the network or bus master PLC and the Modicon STB automation island.

Standard NIM network interface modules STB N●● 2●1● can be used to configure and address the installation external devices. These settings are stored in the module's internal RAM or Flash memory. Optionally, they can be saved to the 32 KB removable SIM card STB XMP 4440 (except for the address of the network connection point) to duplicate the configuration from one island to another.



The control system configuration in the above example comprises:

1 Modicon M340/Premium/Quantum automation platform
2 24 V ⎓ external power supply
3 HMI terminal with Magelis XBT, XBT G, XBT GT, etc, type Modbus link *(1)*
4 Network Interface Module *(NIM)*
5 Power Distribution Module *(PDM)*
6 I/O modules
7 Second STB segment
8 Another control system
9 Parallel interface module for TeSys U and TeSys Quickfit starter-controllers
10 Configurable Preventa XPS MC safety controller connected on the power supply to the outputs of power distribution module STB PDT ●100 K
11 ATV 312 variable speed drive
12 Festo solenoid valves
13 Modicon FTB IP 67 I/O
14 Parker solenoid valves
15 TeSys U starter-controller

(1) For further information, please consult our "Modicon STB IP 20 distributed I/O" catalogue available on our website www.schneider-electric.com.

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4 - Application-specific modules and solutions

Application-specific modules

Counter and special-purpose module selection guide *4/2*

■ **High-speed counter modules**

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■ **High-speed input interrupt module**

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■ **Accurate time stamping, multifunction input module**

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■ **Quantum-Sy/Max integration**

□ Presentation *4/10*

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4

Modicon Quantum automation platform
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_s)		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**
Page		4/4	

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**
4/7	4/8

Modicon Quantum automation platform
High-speed counter modules

Presentation

The Quantum automation platform offers two processor-controlled high-speed counter modules, the **140 EHC 105 00** module and the **140 EHC 202 00** module. These modules independently count pulses at high speeds. They automatically report the count value to the CPU on every scan and, if the counter is installed in the local rack, they can update the CPU asynchronously to the scan (via the IMOD instruction in LL984 language).

140 EHC 105 00 module

The **140 EHC 105 00** is a five-channel high-speed counter, which can be configured in one of four operating modes. This module is ideal for the incremental high-speed counting of pulses up to 100 kHz at 5 V ⎓ or 20 kHz at 24 V ⎓. The operating mode for each channel can be configured easily via the zoom screen in Unity Pro, Concept or ProWORX 32. These operating modes can be defined as follows:
- 32-bit event counters on one or all channels, with output mode specified (latched or timed)
- 32-bit differential counters that use two channels per function - the difference between the count values on each channel is reported to the CPU. A module can be configured to handle two differential counters, two channels per function
- 16-bit repetitive counters on one or all channels; the counter repeats the count after reaching the setpoint
- 32-bit rate counters on one or all channels; the rate is sampled over a time interval specified as either 1 s or 100 ms

The counter configuration also includes 8 outputs, each of which can be triggered by a setpoint or by a programmable count value in upcount/downcount operations. Each of the outputs can be configured as follows:
- Output turns on at setpoint, either latched or as a one-shot
- Output turns on at final value, either latched or as a one-shot
- Output changes state on rising or falling edge applications
- Output turns on after a specified time delay from a final count value (16,383 ms max.)

140 EHC 202 00 module

The **140 EHC 202 00** is a 2-channel module best suited to high-speed counting applications up to 500 kHz or applications that require a quadrature encoder interface. The operating mode for each channel can be configured easily via the zoom screen in Unity Pro, Concept or ProWORX 32. These operating modes can be defined as follows:

16-bit counters on one or both channels with two outputs, configurable in incremental or quadrature mode

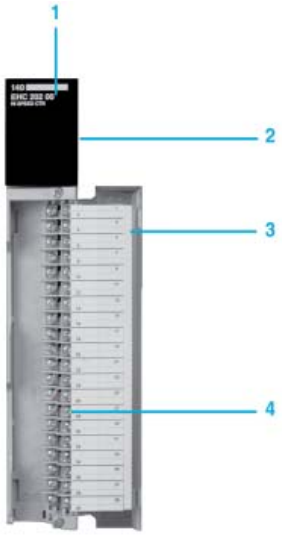
32-bit counters that use both channels with two outputs, configurable in incremental or quadrature mode

32-bit counters on one or both channels with no outputs, configurable for incremental or quadrature mode

16-bit counters on one or both channels with no outputs, in rate sampling mode for incremental or quadrature encoders

When the counter configuration includes outputs, each can be triggered by a setpoint or by a programmable count value less than the setpoint in upcount/downcount operations. Each of the outputs can be configured as follows:
- Output latched on at setpoint
- Output latched on at final count value
- Output timed on at setpoint, with a time range of 0…16,383 ms (only one of the four outputs can be configured in this mode)
- Output timed on at final count value, with a time range of 0…16,383 ms (only one of the four outputs can be configured in this mode)

Modicon Quantum automation platform
High-speed counter modules



Description

The **140 EHC ●0● 00** high-speed counter module front panel comprises:

1 Type and colour code
2 A display block with LED indicators
3 Removable, hinged door and customizable identification label, to be ordered separately
4 Screw connection block (40-way) **140 XTS 002 00/001 00**, to be ordered separately

References

Description	Safety	Reference	Weight kg
Counter module, 5 channels of 100 kHz max.	–	**140 EHC 105 00**	0.350
Counter module, 2 channels of 500 kHz max.	–	**140 EHC 202 00**	0.350
40-way terminal block, degree of protection less than IP 20	Non-interfering	**140 XTS 002 00**	0.150
40-way terminal block, degree of protection IP 20	Non-interfering	**140 XTS 001 00**	0.150

Modicon Quantum automation platform

High-speed input interrupt module

Presentation

The **140 HLI 340 00** high-speed input interrupt module is a multipurpose, high-performance device that combines latch and interrupt capabilities for use in time-critical applications. It can only be used in the local rack, not in remote or distributed racks.
This module has 16 individually programmable 24 V ⎓ inputs (positive or negative logic). When it is programmed in LL984 language, the module benefits from several special interrupt-handling instructions (IMOD, ITMR, IE, ID and BMDI) and an immediate I/O access (IMIO) instruction to update its I/O asynchronously with respect to normal I/O scanning. The inputs are also updated at the end of the program segment as part of the normal logic solving process.

The **140 HLI 340 00** module is channel-configurable to any of the following modes:
- MOD interrupt handling mode
- Latch mode
- High-speed input mode

Functions

IMOD interrupt mode

In IMOD interrupt mode, a physical real-world interrupt signal will stop the CPU from executing the main application program and activate a subroutine called an interrupt handler. Interrupt data coming to the CPU is taken into account almost instantaneously. Handshaking on the local rack guarantees that the interrupt data will be taken into account.

Each input can be configured to cause an interrupt whenever it changes to state 1, state 0 or both. Multiple interrupts on the same local rack are priority-handled in the following manner:

- If two interrupts on two different **140 HLI 340 00** modules in the same local rack generate interrupts simultaneously, the slot position in the rack determines its priority. An interrupt from the module in slot 3 therefore has priority over an interrupt generated by the module in slots 4…16.
- If two interrupts from the same **140 HLI 340 00** module are generated simultaneously, the number of the input generating the interrupts determines their priority. An interrupt generated by input No. 1 will therefore have priority over all other interrupts.
- If an interrupt occurs while another interrupt handler is running, the CPU will take the new interrupt into account, end the current interrupt handler, then handle the new interrupt as a matter of priority.

Latch mode

A latching signal is guaranteed to be read by the CPU, at which time it automatically unlatches the input signal. In latch mode, the **140 HLI 340 00** module can latch/unlatch inputs on a rising or falling edge. The inputs cannot generate interrupts in latch mode.

The latching mechanism is used in applications where the input signal pulse duration is shorter than the CPU's scan time. Data from latched inputs is taken into account by the process during I/O updating, with no special user programming required.

If a **140 HLI 340 00** module has been configured in split mode (where some inputs are latched and others are used for interrupts), any latched input data is read and reset when the interrupt is taken into account and may not be valid at the end of the scan. In order to latch an input at state 1, the signal pulse must be at least 30 µs long. In order to latch an input at state 0, the signal pulse must be at least 130 µs long.

Modicon Quantum automation platform
High-speed input interrupt module

Functions (continued)

High-speed input mode

When an input on the **140 HLI 340 00** module has not been configured as an interrupt or a latch, it can operate as a normal high-speed input (this is the default operating mode for all inputs on the module).

The high-speed input data is taken into account by the normal I/O handling process and is updated at the end of a program segment. These inputs are often considered as auxiliary process inputs for interrupt operations that require a combination of interrupts, latches and high-speed inputs. Response times for high-speed inputs are 30 µs from off to on and 130 µs from on to off.

Interrupts

Time-based interrupts

Another form of interrupt processing available as standard on Quantum can be accomplished by using the CPU's internal clock to generate interrupt signals at regular intervals (this method does not require the use of the 140 HLI 340 00 module). The interrupt timing is user-programmable.

These interrupts can be used when the application program needs to take account of data events at predictable or regular intervals and this process lasts less than the CPU's scan time.
Timer interrupts can be programmed down to 1 ms minimum, corresponding to the CPU clock speed (see below for the impact of interrupts on the scan time).

Performance

Impact of interrupts on the scan time

For most applications, the impact of interrupt handlers on the scan time is minimal, even when interrupts are generated several times during the scan. Interrupt handlers allow a critical part of the application to be taken into account faster than the overall application. However, take care not to overtax the CPU's capacity by taking account of interrupts. We recommend that you create a timing diagram to ensure that interrupts do not consume more than 40% of the CPU's processing time. The percentage of CPU usage (the time required to take account of an interrupt) is critical to analyzing the impact on the scan time.

General performance

Interrupt handler performance is measured from the time the input signal arrives at the input module to the time an output is commanded to change state. The measurement takes account of module filter times and the time for taking account of and handling interrupts.

References

Description	Number of channels	Functions	Safety	Reference	Weight kg
High-speed input interrupt module	16 x 24 V ⎓ inputs	Interrupts, latching, high-speed inputs	–	**140 HLI 340 00**	–

Modicon Quantum automation platform

Accurate time stamping
Multifunction input module

Presentation

The **140 ERT 854 20** multifunction input module is designed for time and date stamped event logging applications. It is suitable for combining time and date stamping with variations of discrete inputs quickly and accurately.

This module can also be used for counting operations (maximum frequency of 500 Hz) on its discrete inputs.
It is designed for the following areas of application:
- Status monitoring on discrete inputs
- Time and date stamped event logging
- Counting

The **140 ERT 854 20** multifunction input module offers the PLC application an image of an external precision clock, relayed to this module. The user can use this date/time information for the following areas of application:
- Periodic time and date stamping of process values
- Time-based tables

The processor module's internal clock can also be used to synchronize the time independently.

Operation

For the **140 ERT 854 20** multifunction input module, the information, time and date stamped in real time, made available to the application or used to operate event logging, is generated from a DCF signal, supplied by an external time receiver.

The GPS signal indicates Greenwich Mean Time, broadcast by GPS satellites. This date/time information is converted to DCF format by an external time receiver.

IRIG-B (Inter Range Instrumentation Group) is a widely used standard enabling coding and transmission of the time and date stamping via serial link.

The DCF signal indicates Central European Time. It is broadcast on long wave by a transmitter located near Frankfurt. This date/time information is captured and transmitted in the form of a DCF signal by an external time receiver.

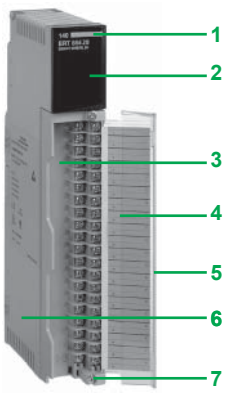
The **140 ERT 854 20** multifunction input module is a module with 32 discrete inputs, 24 V to 125 V ⎓, integrating the following functions:
- **Discrete inputs**: Scanned inputs transferred cyclically to the PLC program
- **Event-triggered inputs**:
  - Time and date stamped event logs on a FIFO memory buffer, integrated in the card, which can contain 4096 of these time and date stamped events concurrently
  - Validation by the user of transmission of these time and date stamped events to the PLC memory, checked by the application program
- **Counter inputs**: Counting on 32 event bits appearing at a maximum frequency of 500 Hz. Cyclical transfer of these counter values to the PLC memory
- **Periodic time and date stamping** of process values and logging of counter values according to the stated time intervals
- **Time-based tables**: Special actions on the process actuators depending on the time. States consecutive to these actions can be logged by the multifunction input module

Up to nine **140 ERT 854 20** multifunction input modules can be installed on the same rack, local or remote.

Modicon Quantum automation platform

Accurate time stamping

Multifunction input module



Description

The **140 ERT 854 20** multifunction input module front panel comprises:

1 Module number and colour code

2 A display block with 35 LEDs:

- Status LEDs for the 32 discrete inputs (**1** to **32**)
- **R** (green): Self-test OK, module ready
- **Active** (green): Communication on the bus
- **F** (red): Fault

3 A connection block for the discrete inputs

4 An identification label (slipped inside the module door)

5 An access flap for the terminal block

6 A standard Quantum module casing

7 A module fixing screw

To be ordered separately:

- A 40-way screw connection block **140 XTS 002 00**
- A backup battery holder (optional) **140 XCP 900 00** for storing, in the event of a power cut, time and date stamped events logged in the internal buffers of the **140 ERT 854 20** multifunction input modules (a module has one Quantum-format slot per rack)

References

Module

Description	Functions	Safety	Reference	Weight kg
Multifunction input module	32 discrete inputs, supplied at between 24 V and 125 V ⎓ Status logging 500 Hz counting 3 clock signal inputs	–	**140 ERT 854 20**	0.450

Separate parts

Description	Functions	Safety	Reference	Weight kg
Screw connection block (40-way)	Connection of the 140 ERT 854 20 module inputs	Non-interfering	**140 XTS 002 00**	–
Backup battery holder module	For backing up logs operated by 140 ERT 854 20 module(s)	–	**140 XCP 900 00**	–

Modicon Quantum automation platform
Quantum-Sy/Max integration

Presentation

Integration solutions

Quantum-Sy/Max integration products are designed to help Sy/Max users gradually upgrade their installations to Quantum control systems at a comfortable and cost-effective pace. These products allow users to protect their investments in communication networks, application programs, I/O installations and training. They allow Sy/Max users to move gradually toward Quantum where they can take advantage of:

- Structured programming with Unity Pro and Concept's IEC 1131 languages
- Faster execution times and larger CPU memory sizes
- More flexibility in terms of network choices, including Modbus, Modbus Plus, TCP/IP Ethernet, Quantum remote I/O (RIO)
- High availability offer: Hot Standby
- A wide variety of choices from our Collaborative Automation Partners

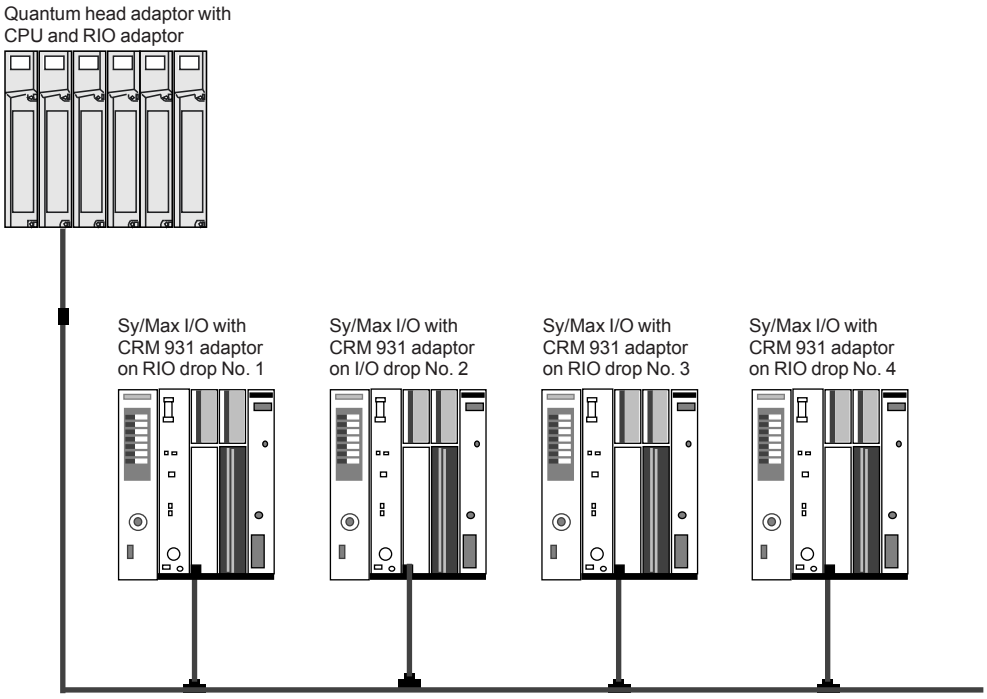
Upgrading strategies

Upgrading Sy/Max CPUs

Schneider Electric offers a conversion service for Sy/Max application programs to 984 ladder logic. These conversions include comments and header files, as well as the application program. The LL984 language is now available in the Unity Pro software from version 7.0 upwards.

Upgrading Sy/Max I/O networks

A remote I/O adaptor **8030 CRM 931** can be placed in slot 1 of a Sy/Max drop. This adaptor enables Class 8030 discrete intelligent I/O in that drop to operate under the control of a Quantum CPU (over the RIO coaxial cable network). The **8030 CRM 931** adaptor module can reside in any Class 8030 Type RRK-100, -200 or -300 register rack or any Class 8030 Type HRK-100, -150 or -200 Boolean rack.



The original Sy/Max I/O wiring remains intact. Because the I/O is now on a Quantum RIO network, they can take advantage of its 1.544 Mbps data transfer rate with 16-bit CRC.

Each I/O drop has 128 addressable registers (64 inputs and 64 outputs).

Presentation (continued)

Upgrading strategies (continued)

Upgrading Sy/Max communication networks

The **NW BM85Y422** Modbus Plus-to-Sy/Max gateway provides a bridge for data exchange between Sy/Max or PowerLogic® systems and a Modbus Plus local area network. Modbus Plus gives the system connectivity to many HMI and motion control products, as well as small distributed PLCs. The **NW BM85Y422** gateway supports the following protocols:

- Sy/Max point-to-point
- Sy/Max net-to-net
- PowerLogic NIM

The gateway has one Modbus Plus port and four configurable (RS 422) ports for direct connection to Sy/Max devices. Each RS 422 port supports communications from 300 to 14.4 Kbps. DIP switch settings determine the gateway's mode of operation: Configuration mode or protocol conversion mode. Configuration mode allows you to program communication parameters (speed and time-out values, for example) and store them in the gateway's Flash memory. The gateway parameters can be set in one of three ways using:

- An ASCII terminal or a PC with a terminal emulation program on serial port No. 1
- 984LL (MSTR) language instructions
- With Sy/Max TREAD or TWRTE instructions via serial ports No. 2, 3 or 4

An MEB Modbus Plus-to-Sy/Max NIM module is also available from our partner Niobrara R&D Corporation. This module fits in a Sy/Max RRK rack. It exchanges data between an existing Sy/Max network and a Modbus Plus network. Visit Niobrara's web site (www.niobrara.com) for more information.

References

Description	Connection type	Safety	Reference	Weight kg
Adaptor module for Sy/Max drop on Quantum RIO network		–	**8030 CRM 931**	–
Modbus Plus-to-Sy/Max NIM gateway		–	**NW BM85Y422**	–
Modbus Plus-to-Sy/Max Niobrara NIM gateway module	Ethernet BNC, 2 RS 485 ports	–	**MEB TCP D** *(1)*	–
	Ethernet 10BASE-T 2 RS 485 ports	–	**MEB TCP T** *(1)*	–

(1) To order this product, consult our partner Niobrara (Collaborative Automation Partner Program): www.niobrara.com

5 - Communication

Networks and buses selection guide 5/2

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AS-Interface bus

■ **Master module for Modicon Quantum PLCs**
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Other buses and networks

■ **Modbus Plus network**
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Serial links

■ **Asynchronous serial link module**

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Modicon Quantum automation platform
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**
Page			1/2	5/39	

(1) Only one Ethernet port can be used at a time.
(2) Automatic assignment of IP address and network parameters.

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**
5/39	5/41		

(3) See page 1/2.

Modicon Quantum automation platform
Networks and buses

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**
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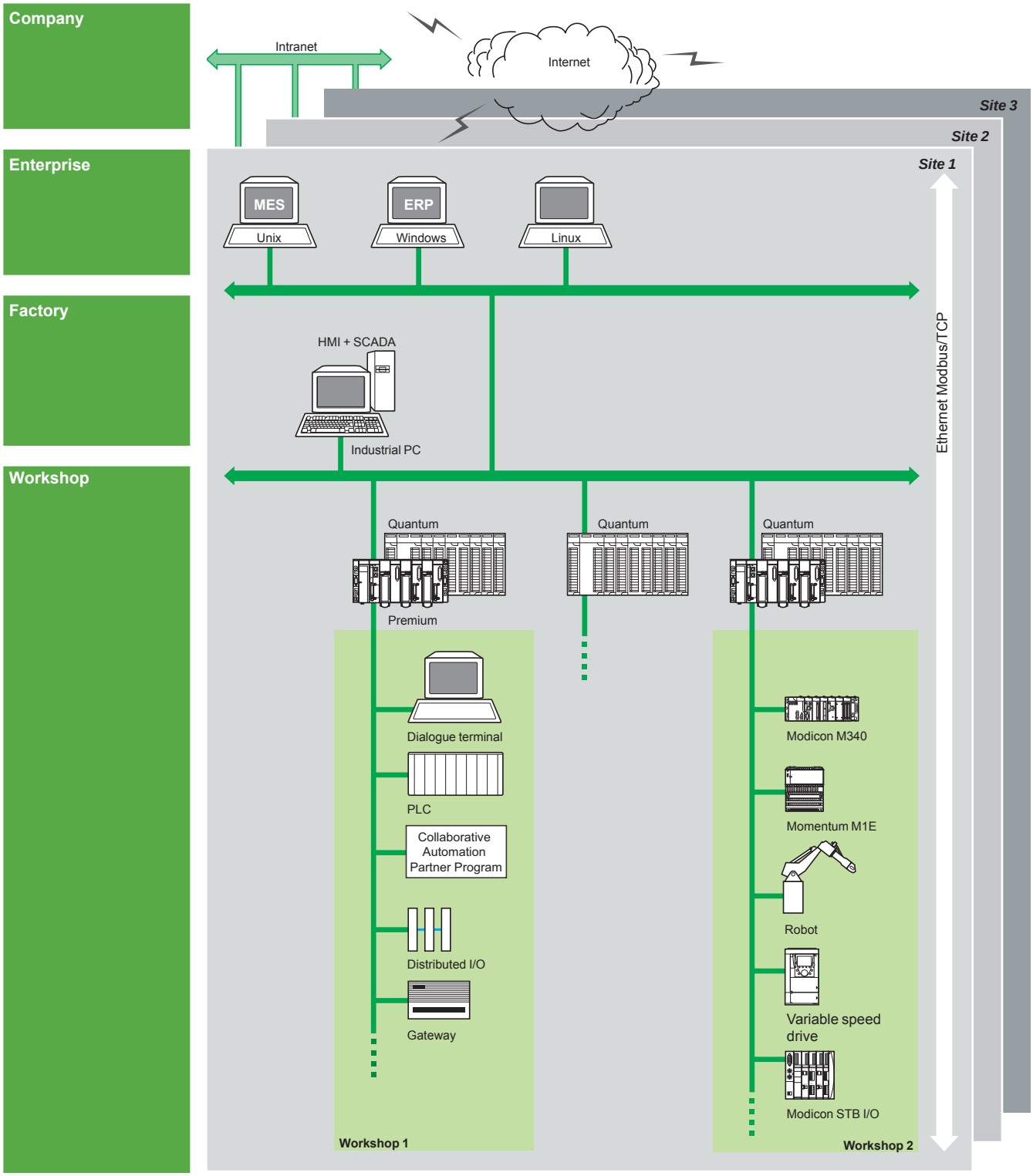
Asynchronous serial links	Profibus DP V1 and Profibus PA buses	
	Ethernet Modbus/TCP ports	Profibus DP V1 and Profibus PA ports (via gateway)
2 non-isolated RS 232 channels	10BASE-T/100BASE-TX (two RJ45 ports, supporting daisy chain topology)	Isolated RS 485 (one 9-way female SUB-D connector)
–	CSMA-CD	Master/slave
19.2 Kbps	10/100 Mbps	9.6 Kbps...12 Mbps
Shielded cable	CAT 5E double shielded twisted pair cable (straight-through or crossover)	Shielded twisted pair cable
–	Transparent Ready Class A20	Class 1 and Class 2
–	No Web server	–
–	Modbus TCP messaging (reading/writing data words)	Cyclic and acyclic data exchange with slaves
■ Reading/writing of ASCII sequences, 7 or 8 bits, controlled by PLC application program ■ Application of message formats to character strings ■ Integrated command interpreter	■ Modbus server scanned by the PLC ■ FDR service ■ SNMP agent network management service	■ Master/slave communication ■ Global Control service ■ Acyclic communication (read/write) in Class 1 and Class 2 ■ Support for extended diagnostics ■ Auto-scanning service of slaves on the bus
All CPUs	All Unity Pro CPUs	
Unity Pro, Concept V2.2 (min.) ProWORX 32	Unity Pro	
300 mA	150 mA (on external power supply)	
–	18...30 V ⎓	
–		
140 ESI 062 10	**TCS EGPA23F14F**	
5/93	5/91	

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

Logical communication architecture

Logical communication architecture



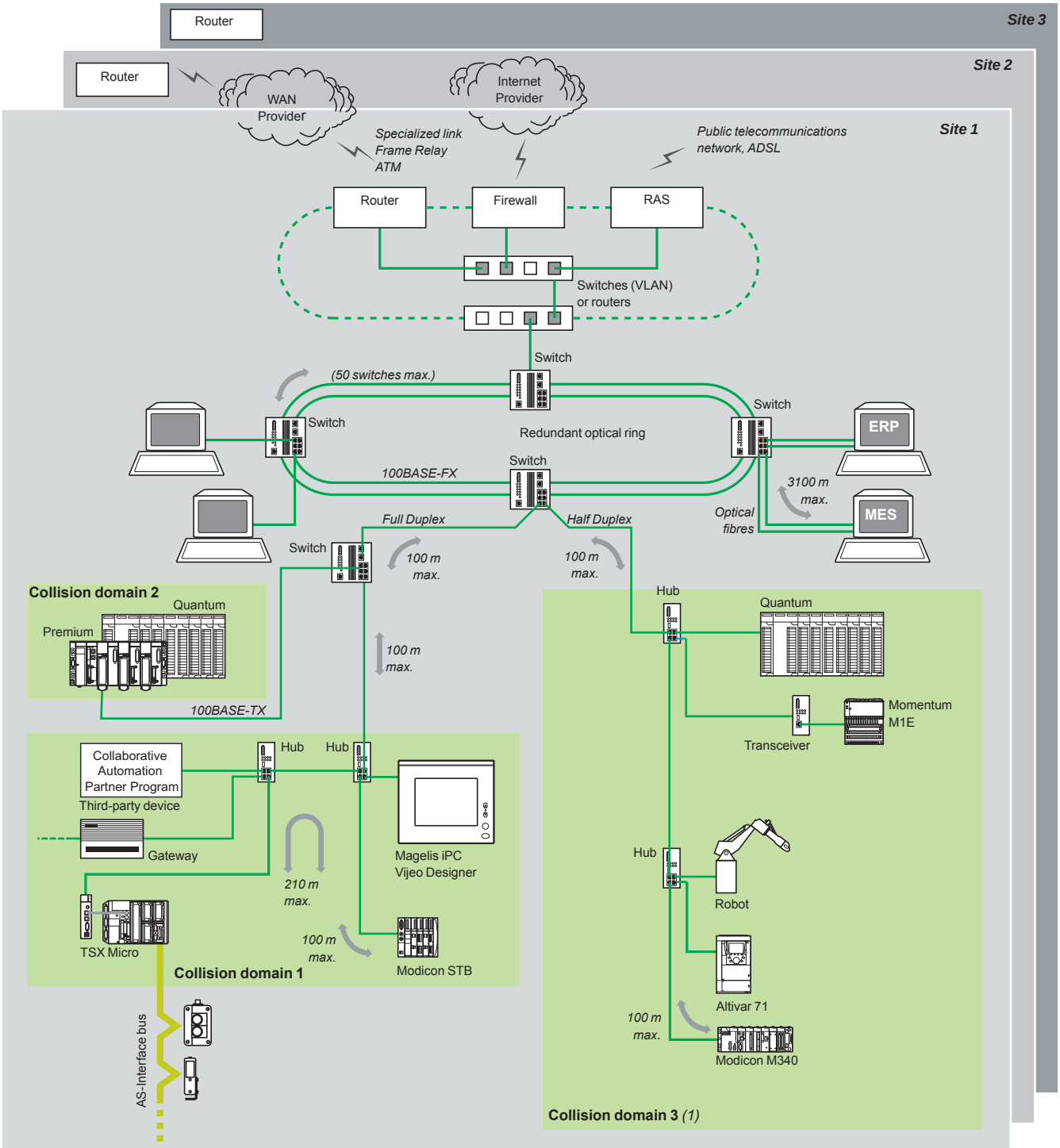
MES: Manufacturing Execution System (production management system)
ERP: Enterprise Resource Planning (integrated management software packages)
IHM/SCADA: Human/Machine Interface and Supervision Control And Data Acquisition
Gateway: Gateway to sensor/actuator bus, to installed base network, fieldbus, etc.

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

Physical communication architecture

Physical communication architecture



(1) As a general rule, defining several collision domains can increase the size of the architecture and improve performance (see pages 10/14 to 10/19).

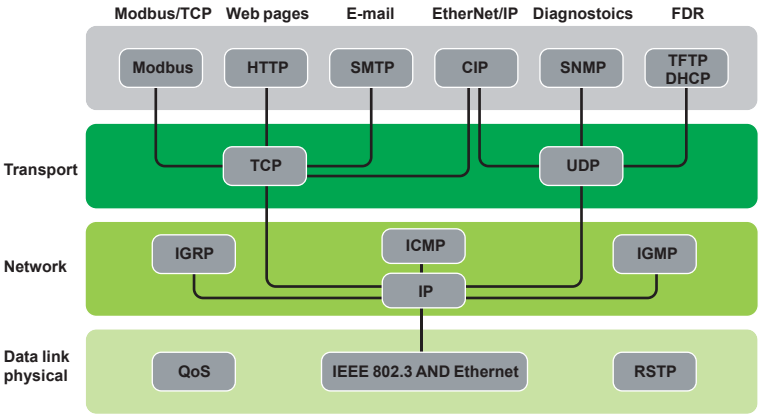
Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

Industrial Ethernet communication services

Presentation

PlantStruxure Ethernet architectures provide transparent communication services to the entire operation through the implementation of standard, unmodified Ethernet protocols and services.



In addition to the typical Ethernet services (HTTP, BOOTP, DHCP, etc) Ethernet communication modules are equipped with automation-specific services, such as:

- Device scanning using Modbus TCP and EtherNet/IP
- Messaging using Modbus TCP and EtherNet/IP
- Automatic replacement device configuration using FDR (Fast Device replacement)
- Extensive diagnostics through SNMP
- Clock synchronization using NTP
- E-mail alarm notification via SMTP
- Packet prioritization using QoS
- Ring topology redundancy through RSTP

Note: *The above services may not be offered in all devices. Please refer to the Selection Guide and Reference pages for a comprehensive list of the services offered by each device.*

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

Industrial Ethernet communication services

Functions

Ethernet basic services

HTTP (RFC 1945)

HTTP *(HyperText Transfer Protocol)* is used to transmit Web pages between a server and a browser. HTTP has been used on the Web since 1990. Web servers embedded in Schneider Electric automation products provide easy Access product information and diagnostics from anywhere in the network.

BOOTP/DHCP (RFC1531)

BOOTP/DHCP is used to provide devices with IP parameters automatically. This avoids having to manage each device address individually by transferring this management to a dedicated IP address server.
The DHCP protocol *(Dynamic Host Configuration Protocol)* is used to assign configuration parameters to devices automatically. DHCP is an extension of BOOTP.

Schneider Electric devices can be:
- BOOTP clients, allowing the IP address to be retrieved automatically from a server, or
- BOOTP servers, allowing the device to distribute IP addresses to the network stations.

FTP *(File Transfer Protocol)* & TFTP *(Trivial File Transfer Protocol)* (RFCs 959, 2228, and 2640)

File Transfer Protocols such as FTP and TFTP provide the basic elements for file sharing. In an automation device, FTP or TFTP are often used to deliver firmware updates

NTP (Network Time Protocol) (RFC 1305)

NTP *(Network Time Protocol)* is used to synchronize the time of a client or server device from a time server.

SMTP (Simple Mail Transfer Protocol) (RFC 0821)

SMTP (Simple Mail Transfer Protocol) is an e-mail transmission service. It is used to send e-mail between a sender and a recipient via an SMTP email server.

SNMP *(Simple Network Management Protocol)* (RFCs 1155, 1156 and 1157)

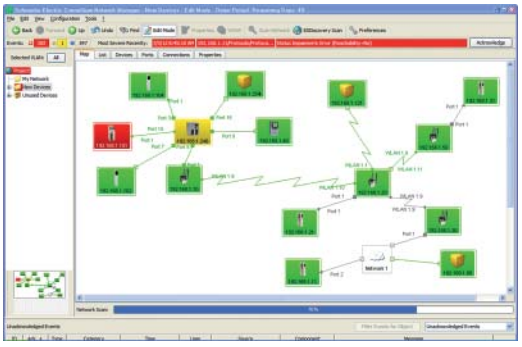
Simple Network Management Protocol (SNMP) is a Internet protocol used to manage IP based network devices. SNMP is used to:
Monitor network components such as computer workstations, routers, switches, bridges and end devices to view their status.
Obtain statistics about the network such as bandwidth utilization and network errors
Change information in the device SNMP database such as when to report a high temperature condition.
SNMP is comprised of a network manager (usually running on a computer) and agents (running on the network devices). Network Management Systems (NMS) are software applications used to manage SNMP managed devices.

QoS (*Quality of Service*) (RFC 2474)

QoS provides the ability to mark or “tag” packets of a specific type or origin so that in a congested network, the switches will give higher priority to the most important packets.

RSTP *(Rapid Spanning Tree Protocol)*

RSTP has been implemented in Schneider Electric automation products to allow multi-port devices to be connected in ring configurations.
RSTP prevents the formation of broadcast storms and monitors the state of the ring. Should a link in the ring become disconnected, the protocol routes packets in a different direction to ensure continuity of service.



Network Management software application

Schneider Electric offers a Network Management software application tailored for the industrial control environment. ConneXium Network Manager has been developed with the Automation and Controls professional in mind. ConneXium Network Manager provides a window in network equipment operation to help improve plant productivity. The software can be used to:
- Discover network devices and generate a network map.
- Set network performance thresholds and alert on issues to prevent downtime
- Manage ports (multiple ports at once)
- Baseline network performance
- Document the network
- Generate a report to send to technical support
- Interface to SCADA via the built-in OPC server
- The software is compatible with third party as well as Schneider Electric network devices.

Modbus/TCP function codes		dec	hex
Bit access	Read n input bits	02	02
	Read n output bits	01	01
	Read exception status	07	07
	Write 1 output bit	05	05
	Write n output bits	15	0F
	Read 1 input word	04	04
	Read n input words	03	03
	Write 1 output word	06	06
	Write n output words	16	10
	Read device ID	43/14	2B/0E

Examples of Modbus/TCP function codes for accessing data and diagnostics

Functions (continued)

Modbus standard communication protocol

Modbus, the industry communication standard since 1979, has been combined with Ethernet Modbus/TCP, the medium for the Internet revolution, to form Modbus/TCP, a completely open Ethernet protocol. The development of a connection to Modbus/TCP does not require any proprietary component, nor purchase of a license.
This protocol can easily be combined with any product supporting a standard TCP/IP communication stack. The specifications can be obtained free of charge from the following website: **www.modbus.org**.

Modbus/TCP, simple and open

The Modbus application layer is very simple and universally familiar with its 9 million installed connections. Thousands of manufacturers have already implemented this protocol. Many have already developed a Modbus/TCP connection and numerous products are presently available.
The simplicity of Modbus/TCP enables any field device, such as an I/O module, to communicate on Ethernet without the need for a powerful microprocessor or a lot of internal memory.

Modbus/TCP, high-performance

Due to the simplicity of its protocol and the fast speed of 100 Mbps Ethernet, the performance of Modbus/TCP is excellent. This allows this type of network to be used in real-time applications such as I/O scanning.

Modbus/TCP, a standard

The application protocol is identical on Modbus serial link, Modbus Plus or Modbus/TCP. This means that messages can be routed from one network to the other without converting protocol.
Since Modbus is implemented on top of the TCP/IP layer, users can also benefit from IP routing enabling devices located anywhere in the world to communicate without worrying about the distance between them.
Schneider Electric offers a complete range of gateways for interconnecting a Modbus/TCP network to existing Modbus Plus or Modbus serial link networks.

The IANA organization (Internet Assigned Numbers Authority) has allocated the fixed port TCP 502 (Well known port) to the Modbus protocol. Thus Modbus has become an Internet standard.

A study by the ARC Advisory Group, a leading analyst in the automation and software sectors, shows that Modbus/TCP is the world's leading Ethernet industrial protocol in terms of units sold in 2004.

Modbus and Modbus/TCP are recognized by the IEC/EN 61158 international standard as a fieldbus. They are also compliant with the “Chinese National Standard” managed by ITEI.

Interfacing CANopen with Modbus/TCP

CiA DSP 309-2 provides standardized mapping of CANopen data for transport on Ethernet Modbus/TCP networks. The specification reserves Modbus function code 43/13 for this purpose. This function code is reserved exclusively for CANopen.

Modbus TCP/IP characteristics

Maximum size of data:
- Read: 125 words or registers
- Write: 100 words or registers

Functions (continued)

EtherNet/IP standard communication protocol

EtherNet/IP is an industrial communications protocol based on the Common Industrial Protocol (CIP) which is owned and managed by the ODVA, an international, independent standards organization **(www.odva.org).**

Standard, unmodified Ethernet

Schneider Electric added EtherNet/IP as a core network in 2007. EtherNet/IP is very similar to Modbus TCP in many aspects. In particular, it shares the same principles of standardization and interoperability. EtherNet/IP operates on the same equipment and infrastructure as Modbus TCP, and both protocols can operate simultaneously on the network at any time.

Advanced services and high performance

EtherNet/IP is built on an object-based model. Data in each EtherNet/IP device is grouped in Objects, and each device may have different types of objects, depending on the purpose of the device.

EtherNet/IP Objects

The Ethernet modules implement the standard set of objects prescribed by the ODVA. The most common objects are listed below:

Communication	Identity Object (01hex)
	Message Router Object (02hex)
	Assembly Object (04hex)
	Connection Object (05hex)
	Connection Configuration Object (F3hex)
	Connection Manager Object (06hex)
	Modbus Object (44hex)
EtherNet/IP Network	QoS Object (48hex)
	Port Object (F4hex)
	TCP/IP Interface Object (F5hex)
	Ethernet Link Object (F6hex)
Diagnostics	EtherNet/IP Interface Diagnostic Object (350hex)
	EtherNet/IP IO Scanner Diagnostic Object (351hex)
	IO Connection Diagnostic Object (352hex)
	EtherNet/IP Explicit Connection Diagnostic Object (353hex)

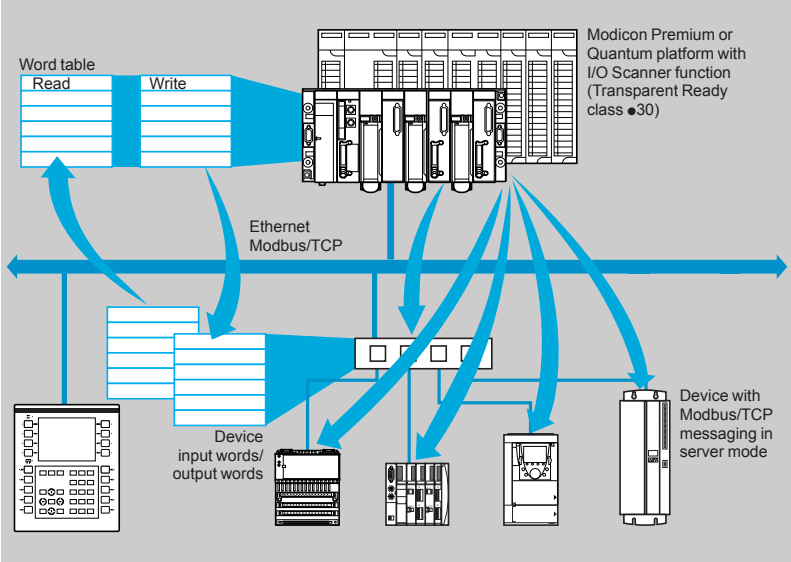
Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

Ethernet Modbus/TCP communication services

Functions (continued)

I/O Scanning service



The I/O Scanning Service is used to manage the exchange of remote I/O states on the Ethernet network after simple configuration, without the need for any special programming.
I/O scanning is performed transparently by means of read/write requests according to the Modbus client/server protocol on the TCP/IP profile.
This principle of scanning via a standard protocol enables communication with any device supporting Modbus TCP messaging in server mode.
This service can be used to define:
- A %MW word zone reserved for reading inputs
- A %MW word zone reserved for writing outputs
- Refresh periods independent of the PLC scan

During operation, the module:
- Manages TCP/IP connections with each remote device
- Scans devices and copies the I/O to the configured %MW word zone
- Feeds back status words used to check that the service is working correctly from the PLC application.
- Applies pre-configured fallback values if a communication problem occurs

A range of hardware and software products is available enabling the I/O Scanning protocol to be implemented on any type of device that can be connected to the Ethernet network. Please consult the Modbus-IDA website: **www.modbus-ida.org**.

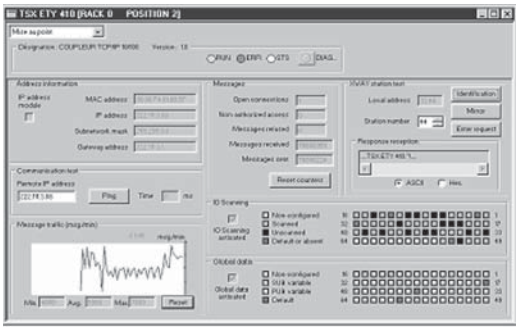
Characteristics

- Under Unity Pro software, each station can exchange a maximum of:
  - 120 write words
  - 125 read words
- Maximum size in the PLC managing the service:
  - 2 Kwords %MW *(1)* in inputs and 2 Kwords %MW *(1)* in outputs with manager PLC limited to 64 stations
  - 4 Kwords %MW *(1)* in inputs and 4 Kwords %MW *(1)* in outputs with manager PLC limited to 128 stations

I/O Scanning service diagnostics

I/O Scanning service diagnostics can be performed in one of five ways:
- Via the application program from a specific PLC data zone
- From the setup software debug screen
- From the PLC system diagnostic function displayed by means of an internet browser on a PC station
- Using standard SNMP network management software

(1) or 4x registers with Concept or ProWORX.

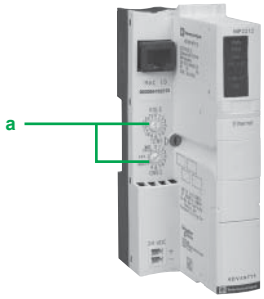


I/O Scanning service diagnostics

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

Ethernet Modbus/TCP communication services



NIM network module for Modicon STB I/O

Functions (continued)

FDR *(Faulty Device Replacement)* **service**

The Faulty Device Replacement service uses standard address management technologies (BOOTP, DHCP) and the TFTP *(Trivial File Transfer Protocol)* file management service, with the aim of simplifying maintenance of Ethernet devices.

It is used to replace a faulty device with a new device with the guarantee that it will be detected, reconfigured and automatically restarted by the system.

The main steps in replacement are:

1. *A device using the FDR service malfunctions.*
2. *Another similar device is taken from the maintenance store, preconfigured with the Device name for the faulty device, then reinstalled on the network. Depending on the device, addressing can be performed using rotary selector switches (as for Modicon STB distributed I/O* **a** *or Modicon OTB for example) or can be given using the keypad integrated in the device (as for Altivar variable speed drives for example).*
3. *The FDR server detects the new device, allocates it an IP address and transfers the configuration parameters to it.*
4. *The substituted device checks that all these parameters are indeed compatible with its own characteristics and switches to operational mode.*

The FDR server can be:

- A Modicon M340 Ethernet network module, **BMX NOE 0100/0110, BMX NOC 0401**
- A Modicon Premium Ethernet module, **TSX ETY 4103/5103, TSX ETC 101**
- A Modicon Quantum PLC Ethernet module, **140 NOE 771 01/ 771 11, 140 NOC 771 01, 140 NOC 780 00, 140 NOC 781 00**
- A Modicon Premium CPU with integrated Ethernet port, **TSX P57 ●●●●M**
- A Modicon Quantum CPU with integrated Ethernet port, **140 CPU 651 50/60, 140 CPU 652 60**

Modicon Quantum automation platform

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**
Page			5/39

Note: *The performance capacity listed here is effected by certain test conditions including input/output size, RPI (Request Packet Interval), CPU scan time. Customers may experience different results under different conditions.*

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**
5/39	

Modicon Quantum automation platform

Ethernet Modbus/TCP network

Performance

Selecting the communication architecture

When selecting an architecture, take performance into account at the earliest possible stage. To do this, the developer must:

1 Know exactly what he needs:

- quantity and type of devices to be interconnected
- volume and type of exchanges
- expected response times
- environment

2 Compare his needs with the characteristics of the offers available and be aware that the actual performance level between any 2 points in an architecture depends on the weakest link in the chain, which can be:

- dependent on the hardware
- but also dependent on the applications (size, architecture, operating system, machine power rating, etc) which are often only vaguely defined at this stage of the project

3 Work out from these which is the most suitable architecture

The purpose of the next few pages is to provide the main information and instructions needed to answer the second point. Given that the performance of an Ethernet architecture is linked to several parameters, these pages do not supply all the information needed to calculate the network performance. Their aim is to focus on the following main aspects:

- **Guidelines for calculating the network load** so as to design an Ethernet network that meets the application requirements
- **Application response time** to be obtained depending on the configuration used (see pages 5/17 to 5/19)
- **Processing capability of Modicon M340, Modicon Premium and Modicon Quantum** platforms so as to be able to select the CPU and define the number of Ethernet connections required on the PLC depending on the application (see pages 5/20 and 5/21)

5

Calculating the network load

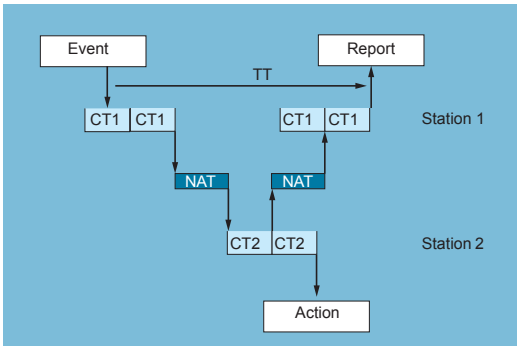
Introduction

When calculating the load on an Ethernet network, all the communication services of all the peripheral devices connected to the network need to be calculated.
Because of the outstanding performance of the Ethernet network, the load is often less than the Ethernet network limits and does not significantly affect the application response time. This phenomenon is explained by the high speed of the Ethernet network: the network transaction time is 10% less than the application response time. In order to ensure a low network load and avoid large theoretical calculations, it is highly advisable to separate the collision domain so as to limit the network load, using only the switched network (tree, star or daisy-chain topology).

Modicon Quantum automation platform

Ethernet Modbus/TCP network

Performance



Modbus messaging service response time

Application response time

Modbus (or Uni-TE) messaging service response time

Exchanges between the PLC CPU and the Ethernet module are synchronous with the PLC scan cycle time (CT), just like the I/O exchanges. When an event occurs (such as an input being set to 1 for example), a message can be transmitted only after this input has been taken into account (start of the next cycle) and the PLC (Modicon M340, Modicon Premium or Modicon Quantum) program has been executed, i.e. on average approximately 1.5 cycles after the event occurred.

The network access time (NAT) shown in the table below in ms is a total of the module transit time and the delay before the message can be transmitted on the network.

Processing Modbus TCP/IP message requests	Modicon M340		Modicon Premium		Modicon Quantum	
	BMX NOE 0100 BMX NOE 0100WS	BMX P34 2020 BMX P34 2030	TSX ETY 210 TSX ETY 110WS	TSX ETY 4103/5103 TSX WMY 100 TSX P57 10...57 60	140 NOE 771 01/111 140 CPU 113/311 ●● 140 CPU 434/534 1●	140 CPU 65● ●● 140 CPU 67● ●● 140 NOC 771 01 140 NOC 78● 00
Network access time (NAT)	< 10 ms	< 10 ms	< 25 ms	< 10 ms	< 10 ms	< 10 ms

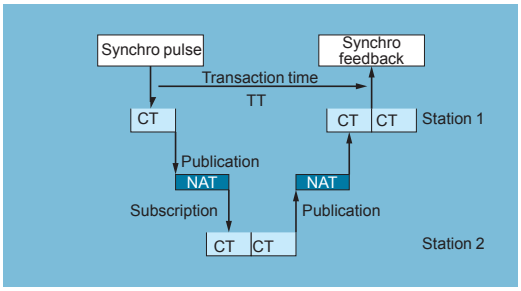
The transaction time TT includes the delay between the transmission of a message from a client station **1**, its reception by the server station **2**, processing the request, sending back the response and it being taken into account by the station **1** (updating an output for example).
As the block diagram above shows:

- The transaction time TT will be between:

$$2 \times CT1 + 2 \times NAT < TT < 4 \times CT1 + CT2 + 2 \times NAT$$

- The average duration TT_{av} is equivalent to:

$$TT_{av} = 3 \times CT1 + 0.5 \times CT2 + 2 \times NAT$$



Global Data service response time

Global Data service response time

The transaction time TT includes the delay between publication of Global Data by the station **1**, its reception and processing by the remote station **2** and its retransmission to the initial station **1**:
For an exchanged variable:

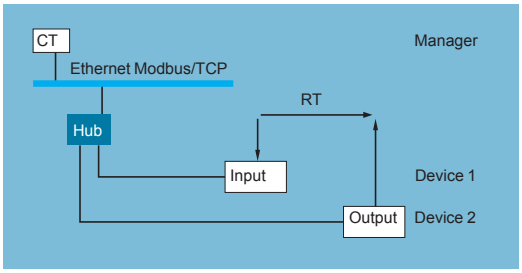
- If CT < 5 ms, transaction time: $TT = 5 \text{ to } 6 \times CT$
- If CT ≥ 10 ms, transaction time: $TT = 3 \times CT$

5

Modicon Quantum automation platform

Ethernet Modbus/TCP network

Performance



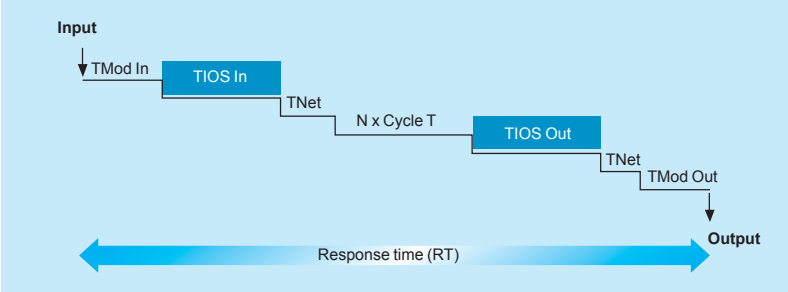
I/O Scanning service response time

Application response time (continued)

I/O Scanning service response time

The response time RT includes the time between taking account of information from a remote input and updating the state of a remote output. It includes the processing time in the PLC.

This response time RT consists of the following parameters:



□ TMod In and TMod Out: Response time of the read/written device, excluding the electrical transition time at the input/output (TMod depends on the device, usually between 1 and 8 ms)
□ TIOS In and TIOS Out: Time between 2 read/write operations on the same device (0.3 ms x number of devices scanned), at least equivalent to the configured scan time
As TIOS is executed in parallel with the PLC cycle, it can be hidden from the viewpoint of the response time RT).
□ Cycle T: PLC scan cycle time
□ TNet: Propagation time on the network (depends on the application, but usually TNet = 0.05 ms at 10 Mbps and 0.005 ms at 100 Mbps)

The response time RT can be estimated using the following 3 formulae:

■ RT_{min}, minimum response time with TIOS hidden and 1 PLC scan cycle:

$$RT_{min} = (TMod\ In + 0) \times TIOS\ In + (Tnet + N) \times cycle\ T + (0 \times TIOS\ Out) + Tnet + TMod\ Out$$

■ RT_{typic}, typical response time with 0.5 TIOS hidden:

$$RT_{typic} = (TMod\ In + 0.5) \times TIOS\ In + (Tnet + N) \times cycle\ T + (0.5 \times TIOS\ Out) + Tnet + TMod\ Out$$

■ RT_{max}, maximum response time with TIOS not hidden:

$$RT_{max} = TMod\ In + TIOS\ In + (Tnet + N) \times T\ cycle + TIOS\ Out + Tnet + TMod\ Out$$

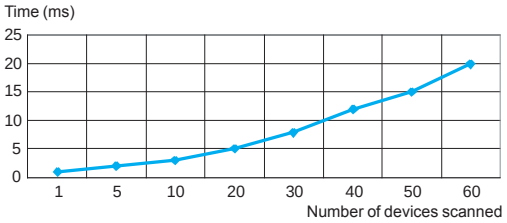
Modicon Quantum automation platform
Ethernet Modbus/TCP network
Performance

Application response time (continued)
I/O Scanning service response time (continued)

Below are the TMod In and TMod Out response times:

Type of distributed I/O	Response time	Min.	Typical	Max.
Momentum **170 ENT 110 02**	TMod In	1 ms	1 ms	1 ms
	TMod Out	5 ms	5 ms	5 ms
Momentum **170 ENT 110 01**	TMod In	4 ms	6 ms	8 ms
	TMod Out	4 ms	6 ms	8 ms
Advantys STB **STB NIP 2212**	TMod In	2 ms	3 ms	4 ms
	TMod Out	2 ms	3 ms	4 ms

The TIOS In/TIOS Out times measured between 2 scan cycles (Ethernet network with switches) are shown below:



The number N of CPU scan cycles is shown below:

Number of CPU cycles N	Min.	Typical	Max.
Modicon M340 platform with **BMX NOE 0100** and **BMX NOE 0100WS** modules	2	2.5	3
Premium platform with **TSX ETY 4103** and **TSX ETY 5103** modules			
Quantum platform with **140 NOE 771 01** and **140 NOE 771 11** modules			
Quantum platform with **140 NOC 771 01** and **140 NOC 78● 00** modules			
Modicon M340 **BMX P34 2020/2030** CPUs			
Premium **TSX P57 26/3634M, TSX P57 26/2823M** and **TSX P57 36/4823AM** CPUs			
Premium **TSX P57 46/56/6634M** CPUs	1	1	2
Quantum **140 CPU 651 50/60** CPUs			

Modicon Quantum automation platform

Ethernet Modbus/TCP network

Performance

Processing capacities of Modicon platforms

Processing capacity

Use the table below to compare, for each station, the total number of messages received via the Modbus (or Uni-TE) messaging service if used (value R1, R2 or Ri) with the capacity of the station CPU.

Processing of Modbus requests per PLC scan cycle

Modicon M340, Modicon Premium/Atrium platforms		Messages received
Total messages received by the PLC from all the communication modules *(1)*	**TSX 57 10**	4 messages/cycle
	BMX P34 20 / TSX 57 20	8 messages/cycle
	TSX 57 30	12 messages/cycle
	TSX 57 40	16 messages/cycle
	TSX 57 50/60 *(2)*	16/20 messages/cycle

Modicon Quantum platform	Integrated port limitations		Communication module limitations		Ethernet modules per PLC
	All types of communication request	Additional read/write 4x registers	All types of communication request	Additional read/write 4x registers	
140 CPU 113 *(3)*	–	–	1 message/cycle	4 messages/cycle	Up to 2
140 CPU 311	–	–	1 message/cycle	4 messages/cycle	Up to 2
140 CPU 434/534	–	–	4 messages/cycle	8 messages/cycle	Up to 6
140 CPU 651	16 messages/cycle	16 messages/cycle	4 messages/cycle	8 messages/cycle	Up to 6

messages/cycle: *number of messages received per cycle from the PLC master task (typical cycle of 50 to 100 ms)*

Example:
Quantum **140 CPU 434 12●** CPU with 4 Ethernet **140 NOE 771 ●1** modules:
- 20 messages/cycle for all types of communication request, and
- 32 messages/cycle for the read/write 4x registers

Ethernet transaction processing capacity

For each station, compare the total number of messages received Σ [values Ri, Rj] and the total number of messages transmitted Σ [values Ei, Ej] (for station N, for example) with the Ethernet transaction processing capacity shown below.
Use the elements below for the Ethernet connection per PLC, rather than the number of transactions required by the application.

Ethernet transaction processing capacity	Modicon M340 BMX		Modicon Premium TSX			Modicon Quantum 140	
	NOE 0100 NOE 0100WS	P34 2020 P34 2030	ETY 210 ETY 110WS	ETY 4103/5103 WMY 100 P57 10/20/30/40	P57 50 P57 60	NOE 771 01/11 NWM 100 00	CPU 65● ●● CPU 67● ●●
Modbus messaging	500 transactions/s	500 transactions/s	60 transactions/s	450 transactions/s	500 transactions/s	350 transactions/s	350 transactions/s
I/O Scanning service	2000 transactions/s	Server mode *(4)*	Service not available	2000 transactions/s *(5)*	2000 transactions/s	2000 transactions/s *(5)*	2000 transactions/s
Global Data subscription	800	Service not available	Service not available	800 *(5)*	800	800 *(5)*	800

(1) A temporary overload, due for example to an adjustment terminal or the temporary connection of an Internet browser, lasting for a few PLC scans, is permitted.
(2) Only with Unity Pro software.
(3) Only with Concept/ProWORX software.
(4) **BMX P34 20●0** *CPUs with Modbus TCP messaging in server mode can be scanned by a device with the I/O Scanning service.*
(5) **TSX WMY 100** and **140 NWM 100 00** *modules do not have I/O Scanning and Global Data services.*

Modicon Quantum automation platform
Ethernet Modbus/TCP network
Performance

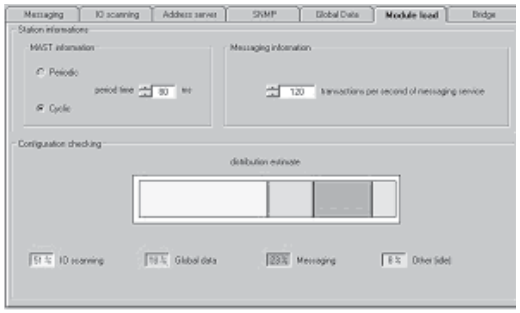
Processing capacities of Modicon platforms (continued)

Number of simultaneous TCP/IP connections

The number of simultaneous TCP/IP connections depends on the platform as well as the type of connection to the Ethernet network:
- 10/100BASE-TX port in network modules
- 10/100BASE-TX port integrated in CPUs

Number of simultaneous TCP/IP connections	Modicon M340		Modicon Premium		Modicon Quantum		
	BMX NOE 0100 BMX NOE 0110	BMX P34 2020 BMX P34 2030	TSX ETY 210 TSX ETY 110WS	TSX ETY 4103/5103 TSX WMY 100 TSX P57 10...57 60	140 NOE 771 01/11 140 CPU 113/311 ●● 140 CPU 434/534 14B	140 CPU 65● ●● 140 CPU 67● ●●	140 NOC 771 01 140 NOC 78● 00
Client	16	16	32	16 *(1)*	16 *(1)*	16 *(1)*	16
Server	32	32		64 *(1)*	64 *(1)*	64 *(1)*	32

1) With 64 TCP/IP connections maximum (cumulative total of client and server connections)



Bandwidth management

Bandwidth management for Ethernet Modbus/TCP modules

The bandwidth management service indicates the load level of the Ethernet network module. This allows the user to monitor any drift and anticipate any problems.
The Ethernet module load is indicated in one of three ways:
- Expected load in the Unity Pro/PL7 configuration screen
- Actual load in the Unity Pro/PL7 diagnostics/debug screen, as well as in the diagnostics pages via the Web. It is displayed in the form of a bar chart animated in real time
- In the SNMP interface for access by the SNMP network manager

The bandwidth is shown as a percentage for each of the following services:
- Modbus (and Uni-TE) messaging
- I/O Scanning
- Global Data
- Others

Ethernet port integrated in the CPU (for example with BMX P34 2020 / 2030 Modicon M340 CPU)

or

Dedicated Ethernet module (for example with BMX NOE 0100/0110 Modicon M340 module)

Ethernet solutions with Modicon M340 platforms

Modicon platforms feature two types of connection to the Ethernet network:
- The 10/100BASE-TX port integrated in the CPUs, which also process the application and exchange data with the other modules supported by the rack and other communication ports (CANopen bus, Modbus serial link, etc)
- The 10/100BASE-TX port in dedicated Ethernet modules on which, unlike the CPU with integrated Ethernet port, all the resources are allocated to Ethernet Modbus/TCP communication

These fundamentally different hardware characteristics result in equally different capacities in terms of services and performance:
- The integrated port is a low-cost way of satisfying applications that are not too demanding in terms of communication (≤ 500 useful messages/s)
- Where there are a large number of exchanges, use of a dedicated Ethernet network module is unavoidable

Modicon Quantum automation platform
Web servers and gateways

Applications		**Standalone Web Gateway/Server module for remote access**	
Type		**FactoryCast Gateway ETG 10●0**	
Target products	Type	All equipment supporting Modbus	All equipment supporting Uni-Telway
Network/Remote access services	Remote access	Intranet or via external Modem and integrated RAS function	Intranet or Modem, External Modem and integrated RAS function
		Remote programming, downloading via FTP, access to Web server via web browser	
	Gateway function	Ethernet to Modbus serial Modem to Modbus serial and Ethernet	Ethernet to Uni-Telway serial Modem to Uni-Telway and Ethernet
	Serial protocols	Modbus master	Uni-Telway slave
	Ethernet protocols	Modbus/TCP	Modbus/TCP Uni-TE (Premium, Micro)
	TCP/IP protocols	BootP/DHCP, DNS, SNMP agent, SMTP client, NTP client *(1)*, FTP	BootP/DHCP, DNS, SNMP agent, SMTP client, NTP client *(1)*, FTP
	Security	Protection by IP address filtering and passwords	
Web server	Characteristics	HTTP and FTP server, 8 MB memory available for user, hosting of user Web pages and documents (Doc, Pdf, Excel)	
Predefined services	Configuration	Via Web Designer software or predefined Web pages	
	Diagnostics	Serial device diagnostics via predefined Web pages	
	Monitoring	Monitoring via animation tables Display of PLC Unity program in a Web page	Monitoring of devices and application via animation tables (read/write variables) Display of PLC Unity program in a Web page
	Alarm management	–	
Customizable services	Graphic views	Graphic monitoring via animated views (integrated graphic editor)	
	Unity Pro operator screen	–	
	User Web pages	Graphic monitoring via animated Web pages created by the user	
Advanced and HMI services	Calculation scripts	–	
	E-mail service	Alarm notification by e-mail	
	Data logging	–	
	Database connection	–	
	Report service	–	
	Recipe service	–	
Application development software		Web Designer (supplied with each module)	
		Web Designer	
References		**TSX ETG1000**	**TSX ETG1010**
Catalogue or website		www.schneider-electric.com	

(1) Except with TSX P57 103M/153M Modicon Premium processors which do not have the NTP service.

Standalone Web Gateway/Server modules for remote access

FactoryCast HMI Gateway ETG30●●

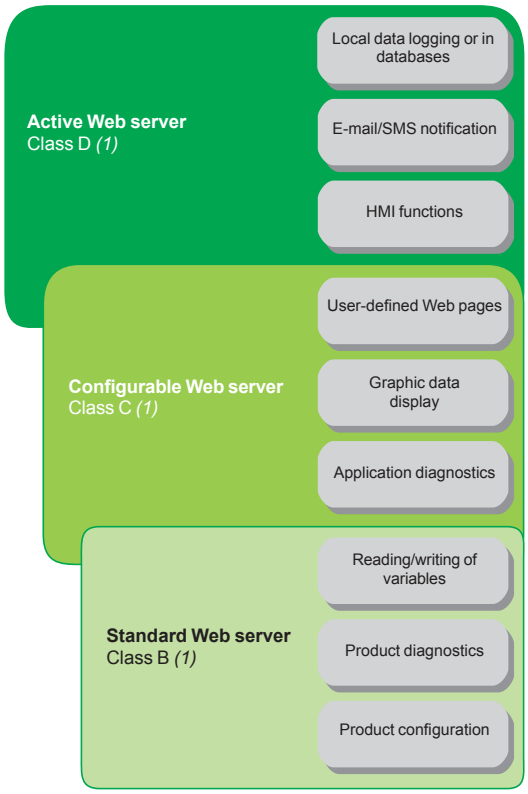
All Modicon PLCs and third-party equipment supporting Modbus

Intranet or Modem, External Modem and integrated RAS function	Intranet or Modem RTC modem and integrated RAS function	Intranet or Modem GSM modem and integrated RAS function
Remote programming, downloading via FTP, access to Web server via web browser		
Ethernet to Uni-Telway serial, Modem to Modbus serial and Ethernet		
Modbus master		
Modbus/TCP		
DHCP, DNS, SNMP agent, SMTP client, NTP client *(1)*, FTP		
Protection by IP address filtering and passwords		
HTTP and FTP server, 32 MB memory available for user Web pages, memory expansion using Compact Flash cards 1 GB max., hosting of user Web pages and documents (Doc, Pdf, Excel)		
Via Web Designer software or predefined Web pages		
Network diagnostics, serial and Ethernet device diagnostics via predefined Web pages		
Monitoring of devices and application via animation tables (read/write variables) Display of PLC Unity program in a Web page		
–		
Graphic monitoring via animated views (integrated graphic editor)		
–		
Graphic monitoring via animated Web pages created by the user		
Arithmetic and logical scripts		
Alarm notification by e-mail/SMS		
Data recorded in the module with date and time stamping (CSV files)		
Direct recording in an SQL, Oracle or MySQL server		
Dynamic HTML report management		
Management of “Recipe” data (storage and review locally or on remote database)		
Web Designer (supplied with each module)		
Web Designer		
TSX ETG3000	**TSX ETG3010 (PSTN modem)**	**TSX ETG3021 (GSM 900/1800 MHz band) TSX ETG3022 function (GSM 850/1900 MHz band)**
www.schneider-electric.com		

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

FactoryCast Web servers and gateways



FactoryCast Web server offer

Schneider Electric offers a wide range of Transparent Ready products, such as controllers and PLCs, industrial PCs, HMI devices (2), variable speed drives, distributed I/O modules, gateways, Web servers, switches, SCADA software and inductive identification systems.

These products provide different levels of Web services and communication services on Ethernet Modbus/TCP, according to users' requirements.

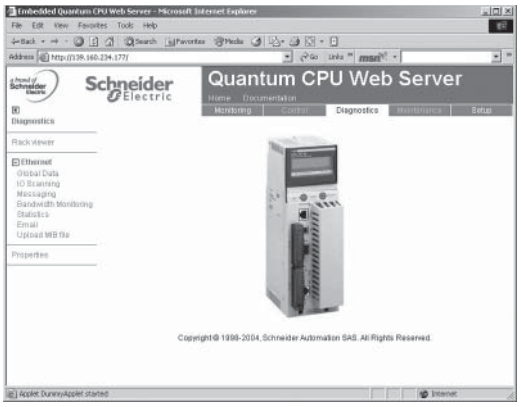
Among these Transparent Ready products, FactoryCast defines a range of modules and gateways with configurable Web server combining:
- Real-time communication functions based on Ethernet Modbus/TCP
- Predefined Web pages for advanced installation diagnostics
- The capacity to host dynamic user-defined Web pages or any document (.doc, pdf, etc) designed to assist maintenance

Presentation of the Web server modules and gateways

In the Transparent Ready approach, Ethernet network modules or Web gateways integrate Ethernet Modbus/TCP services (Modbus TCP/IP messaging, SNMP network management functions, etc). They also offer, depending on the product, the following Web functions:
- Standard Web services (predefined)
- FactoryCast configurable Web services
- FactoryCast HMI active Web services

There are two ranges of configurable Web server:
- **FactoryCast Web modules for PLCs,** which are embedded in the TSX Micro, Premium, Quantum, and Modicon M340 automation platforms. These modules provide transparent access to system and application diagnostic information in real time using Web technologies.
- **FactoryCast Web Gateway modules,** with all the network interfaces in one standalone unit:
  - A modem (depending on the version)
  - An RAS/Router function
  - A customizable Web server
  - HMI functions (depending on the version)

FactoryCast Gateways are a cost-effective response to requirements for remote access to customized remote diagnostics, maintenance, monitoring and control services using a simple Internet browser as well as to requirements to integrate serial installations (Modbus RTU or Uni-Telway) in an existing Ethernet Modbus/TCP infrastructure.



Presentation of Web services

Standard Web services

Standard Web services are integrated in the following Schneider Electric Ethernet products: automation platform CPUs and Ethernet modules, distributed I/O modules, variable speed drives and Ethernet gateways. See page 5/25.

Using a simple Internet browser, the standard Web server provides the following "ready-to-use" functions:
- Product configuration
- Remote diagnostics and maintenance of products
- Display and adjustment of products (reading/writing variables, status)

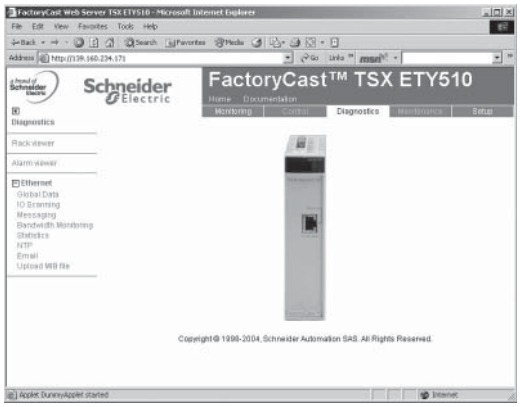
The embedded Web server is a real-time data server. All the data can be presented in the form of standard Web pages in HTML format and can therefore be accessed using any Web browser that supports the embedded Java code. The standard functions provided by the Web server are supplied "ready-to-use" and thus do not require any programming of either the PLC or the client PC device supporting a Web browser.

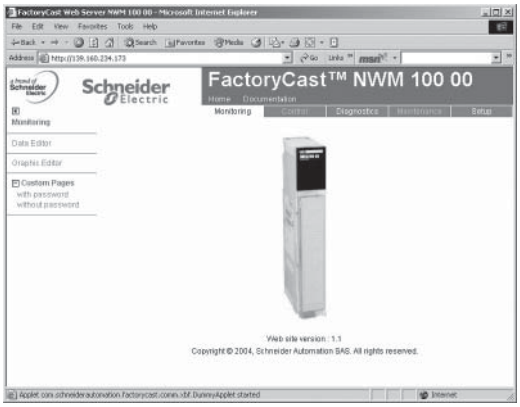
(1) In order to simplify their selection and ensure their interoperability within a system, each Transparent Ready product is identified by the class of services it provides. Letter A, B, C or D (level of service for the Web server) followed by 10, 20 or 30 (level of service for Ethernet communication).
(2) HMI = Human Machine Interface

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

FactoryCast Web servers and gateways





Presentation of Web services (continued)

FactoryCast configurable Web services

The configurable Web services are integrated in the following Schneider Electric Ethernet products: FactoryCast PLC modules (TSX Micro, Premium and Quantum) and FactoryCast Gateway modules.
In addition to the standard Web services, the configurable Web servers offer the following functions:

- Graphic application diagnostics (customized graphic views created by the user)
- Graphic supervision via animated Web pages created by the user and stored in the Web server module

And depending on the products:

- Management of PLC alarms (system and application) with partial or total acknowledgement ("ready-to-use" Alarm Viewer function pages)
- Open data server interface. SOAP/XML protocol, WSDL interface *(1)*

FactoryCast Web servers can also be used to customize the supervision, diagnostics or maintenance interface via Web pages defined by the user or any other document (doc, pdf, etc) hosted in the module.

FactoryCast HMI active Web services

The active Web services are integrated in the FactoryCast HMI modules of Premium and Quantum PLCs.
In addition to the FactoryCast Web services, the FactoryCast HMI modules provide HMI functions, which are executed in the module itself:

- Real-time HMI database management, independent of the PLC CPU
- Arithmetic and logical calculations on HMI data
- Direct connectivity with relational databases (traceability)
- Data Logging: recording of data in the module
- Display of Unity Pro graphic runtime screens in the form of Web pages
- Recipe management (read/write)
- Alarm and report notification by e-mail
- Active page server, dynamic generation of animated HTML pages
- Dynamic generation of HTML reports
- Open data server interface. SOAP/XML WSDL interface protocol *(1)*

FactoryCast HMI is defined as an active Web server used to execute HMI functions without any effect on the PLC application program and therefore on its scan time.

5

Web server automation products

Product		Reference	Embedded Web server		
			Standard, class B20	Configurable, class C20/C30	Active, class D10
Modicon Quantum platform	CPUs	140 CPU 65● ●●		–	
		140 CPU 67● ●●		–	
	Modules	140 NOC 771 01		–	
		140 NOC 780 00		–	
		140 NOC 781 00		–	
		140 NOE 771 01		–	
		140 NOE 771 11		FactoryCast	
		140 NWM 100 00		FactoryCast	FactoryCast HMI
Modicon Premium platform	CPUs	TSX P57 2●23 M		–	
		TSX P57 3623 M		–	
		TSX P57 4823 M		–	
		TSX P57 1634 M		–	
		TSX P57 ●634 M		–	
	Modules	TSX ETY 4103		–	
		TSX ETY 110WS		FactoryCast	
		TSX ETY 5103		FactoryCast	
		TSX WMY 100		FactoryCast	FactoryCast HMI
Modicon M340 platform	Module	BMX NOE 0110		FactoryCast	
Modicon TSX Micro platform	Modules	TSX ETZ 410		–	
		TSX ETZ 510		FactoryCast	
Inductel identification station		XGK S1715503		–	
FactoryCast Web Gateway		TSX ETG 10●0		FactoryCast	
FactoryCast HMI Web Gateway		TSX ETG 30●●		FactoryCast	FactoryCast HMI *(2)*

(1) Standard protocol providing interoperability with computer management applications (see page 5/36)

(2) Class D20 for **TSX ETG 30●●**

Modicon Quantum automation platform

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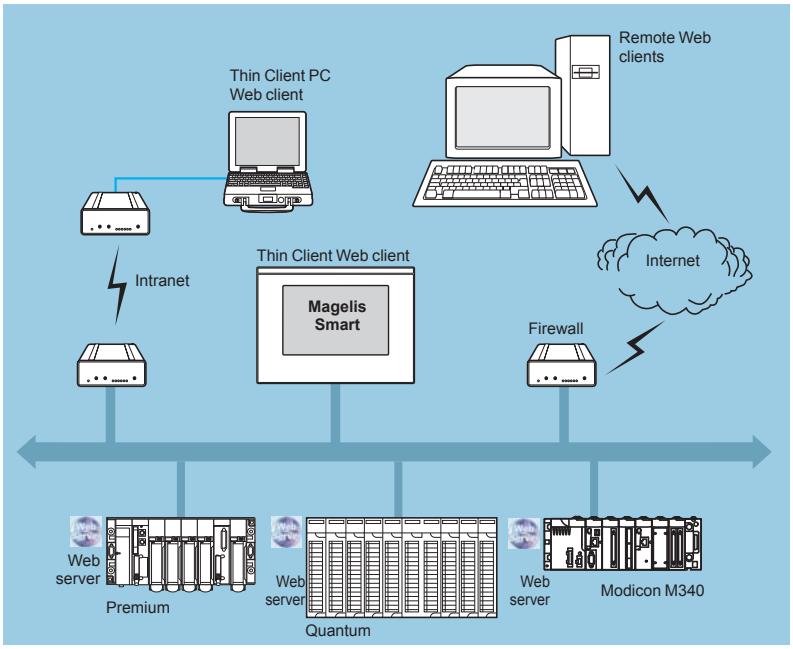
Modicon PLC standard Web services

Modicon PLC standard Web services



The predefined Rack Viewer PLC diagnostic function and the Data Editor read/write function are supported by all Ethernet TCP/IP modules *(1)* in the following Modicon automation platforms:

- Modicon M340 platform
- TSX Micro platform
- Premium platform
- Quantum platform
- Momentum platform

See the selection of Web server products on page 5/25.

These functions can be accessed using a standard web browser connected to the network. They are “ready to use” and secure (password-protected).

They can be used locally or remotely via:

- Intranet
- A modem and RAS server
- Internet

(1) For standard Web servers integrated in variable speed drives, please consult our catalogue “Soft starters and variable speed drives”.

Modicon Quantum automation platform

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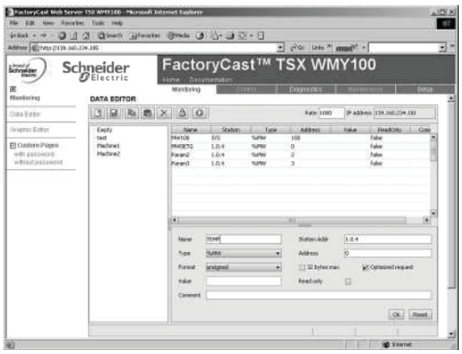
Modicon PLC standard Web services

Quantum hardware configuration



Data Editor variables table

Modicon PLC standard Web services (continued)

Rack Viewer PLC diagnostics function

The Rack Viewer function can be used for PLC system and I/O diagnostics.
It displays the following in real time:

- LED status on the front panel of the PLC
- The PLC type and version
- The hardware configuration of the PLC including the status of the system bits and words
- Detailed diagnostics of each I/O module channel or application-specific channel in the configuration
- Remote I/O drops present in the system

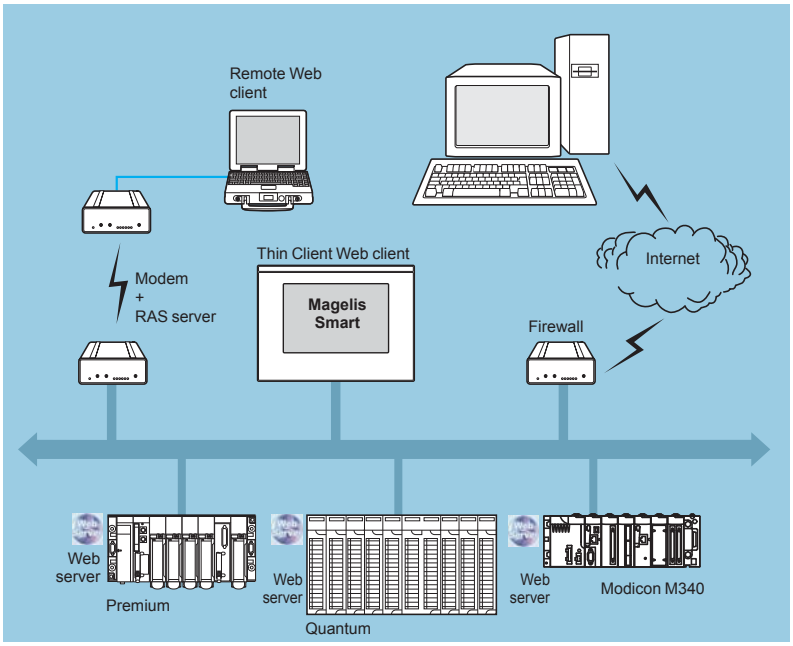
5

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

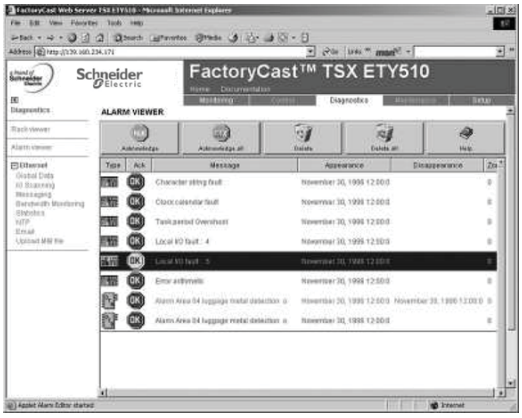
FactoryCast configurable Web services

FactoryCast configurable Web server



In addition to standard Web services, FactoryCast modules (see selection table on page 5/25) support the following functions:

- Alarm Viewer
- Creation and display of graphic views via an online graphics editor (Graphic Data Editor, supplied)
- Hosting and display of Web pages created by the user
- SOAP/XML server interface



Alarm Viewer

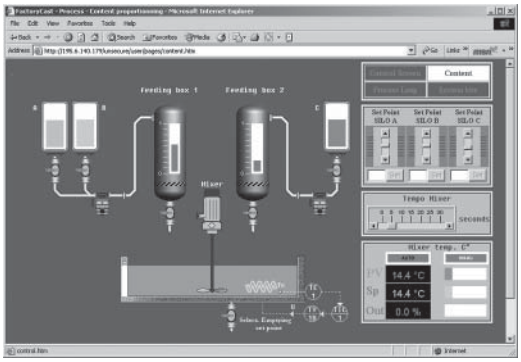
Alarm Viewer function

The Alarm Viewer is a “ready to use”, password-protected function. It is used to process alarms (display, acknowledgement and deletion) managed at PLC level by the system or using diagnostic function blocks known as DFBs (system-specific diagnostic function blocks and application-specific diagnostic function blocks created by the user).

These alarms are stored in the PLC diagnostics buffer (specific memory area used to store all diagnostic events). This function is available with the Premium/Atrium platforms (with PL7 or Unity software) and the Quantum platform (with Unity software).

The diagnostics viewer consists of a Web page displaying a list of messages with the following information for each alarm:

- Dates and times of the appearance/disappearance of the fault
- Alarm message
- Alarm status
- Type of associated diagnostic function block (DFB)



Hosting and display of user Web pages

FactoryCast configurable Web server (continued)

User Web page hosting and display function

FactoryCast Web modules have an 8 Mbyte memory *(1)* which is accessed in the same way as a hard drive and can be used to host Web pages and all user-defined documents in Word or Acrobat Reader (for example, maintenance manuals, diagrams, etc).

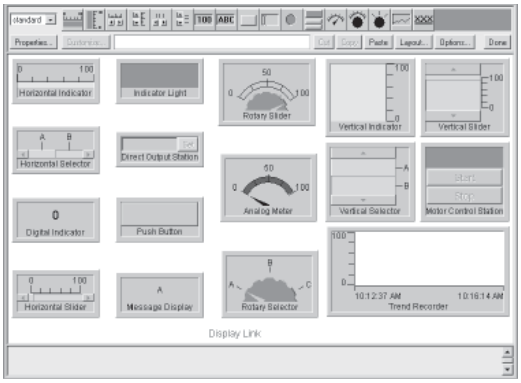
These Web pages can be created using any standard tool for creation and editing in HTML format. These pages can be enhanced by inserting animated graphic objects linked to PLC variables. These animated objects are created using the Graphic Data Editor supplied with FactoryCast.

Web pages created in this way can be used, for example, to:
- Display and modify all PLC variables in real time
- Create hyperlinks to other external Web servers (documentation, suppliers, etc)

This function is particularly suitable for creating graphic interfaces used for the following purposes:
- Real-time display and supervision
- Production monitoring
- Diagnostics and maintenance assistance
- Operator manuals

SOAP/XML server interface

FactoryCast modules incorporate a standard SOAP/XML data server that provides direct interoperability between automation devices and computer management applications (MES, ERP, SAP .Net application, etc). See pages 5/36.



Graphic Data Editor

Graphic Data Editor function

This function can be used to create graphic views animated by PLC variables. The graphic editor is available online “ready to use”, and also offline using FactoryCast configuration software.

These views are created from a library of predefined graphic objects by simple copy/paste operations. The objects are configured to suit the user's requirements (colour, PLC variables, name, etc).

List of graphic objects available:
- Analog and digital indicators
- Horizontal and vertical bar charts
- Boxes for displaying messages and entering values
- Pushbutton boxes
- Trend recorders
- Vats, valves, motors, etc

Customized graphic objects can be added to this list. They can be reused in user Web pages that have been created using standard software for editing HTML pages.

The views created can be saved in the FactoryCast modules.

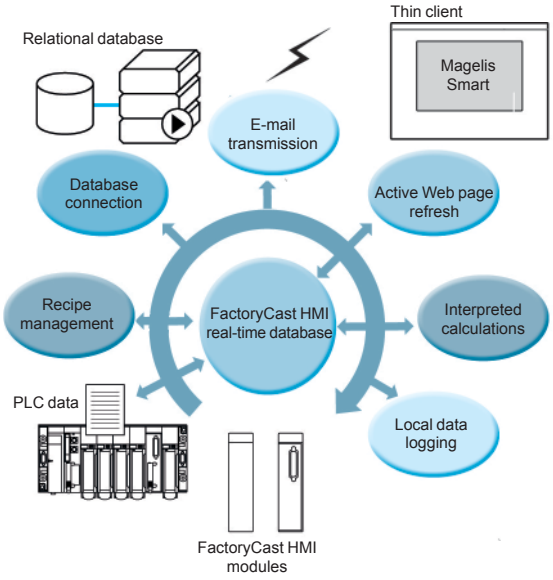
(1) Memory is not affected by power outages or reinitialization of the PLC.

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

FactoryCast HMI active Web services

FactoryCast HMI active Web servers



FactoryCast HMI Web services are integrated in the Web server modules embedded in the Modicon Premium and Quantum automation platforms.

These modules have the following Ethernet and Web services:
- Ethernet Modbus/TCP communication functions:
  - TCP/IP messaging service with Modbus TCP/IP and Uni-TE TCP/IP protocols
  - SNMP agent for standardized network management, which supports standard MIB II and Transparent Ready private MIB
- FactoryCast configurable Web services:
  - Rack Viewer PLC diagnostics functions (see page 5/27)
  - Data Editor read/write functions for PLC variables (see page 5/27)
  - Alarm Viewer alarm display functions (see page 5/28)
  - Graphic Data Editor online functions (see page 5/28)
  - Function for hosting and displaying user Web pages (see page 5/29)

FactoryCast HMI modules also provide the following specialized HMI Web services:
- Real-time HMI database management, independent of the PLC CPU
- Arithmetic and logical calculations on HMI data
- Direct connectivity with relational databases (traceability)
- Data Logging: recording data in the module
- Display of Unity Pro graphic runtime screens in the form of Web pages
- Recipe management (read/write)
- Alarm and report notification by e-mail
- Active page server, dynamic generation of animated HTML pages
- Dynamic generation of HTML reports
- Open data server interface. SOAP/XML WSDL interface protocol *(1)*

(1) In order to simplify their selection and ensure their interoperability within a system, each Transparent Ready product is identified by the class of services it provides. Letter A, B, C or D (level of service for the Web server) followed by 10, 20 or 30 (level of service for Ethernet communication).

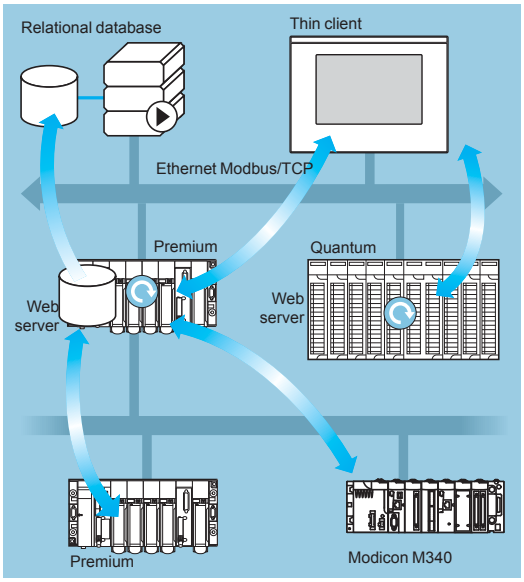
Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

FactoryCast HMI active Web services

Architectures

FactoryCast HMI Web servers can be integrated in various architectures:
- Installations that require a flexible distributed HMI solution
- Mixed architectures, supplementing conventional SCADA systems
- Architectures where a direct link is required between automation systems and information management levels (IT link)



Flexible distributed HMI solution

Flexible distributed HMI solution

The use of Web-based technologies means that FactoryCast HMI can replace conventional HMI or SCADA solutions in applications where architectures require a flexible multistation HMI, thus providing a temporary “nomadic” remote control function.

These architectures consist of:
- Several PLCs networked on Ethernet, equipped with FactoryCast HMI Web server modules
- One or more PC terminals simply equipped with a Web browser thus providing a Thin Client interface (licence free)
- If necessary, a relational database in which FactoryCast HMI can archive data from the automation system

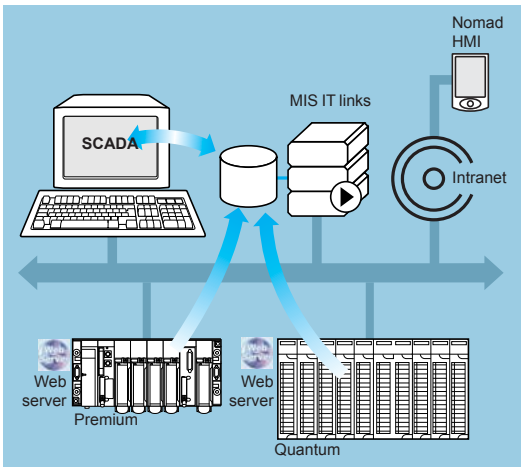
FactoryCast HMI modules read PLC data and execute HMI services (e-mail, interpreted calculations, connection to relational databases, updating Web pages) at source in the PLC, without affecting the PLC program or the scan time.

This solution provides:
- A reliable HMI application, which is executed at source in a robust PLC device
- An integrated multistation interface and remote access that is easy and cost-effective to set up (Thin Client terminal, for example Magelis Smart)
- An HMI application that is easy to maintain (the application is housed in a single location on the server side)
- Preventive maintenance via e-mail
- Greater availability for archiving data in the PLC

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

FactoryCast HMI active Web services



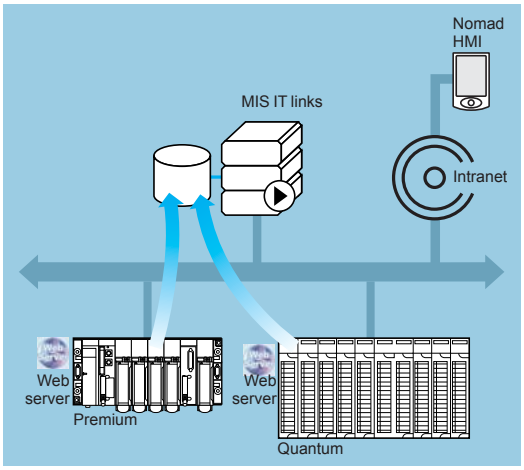
Mixed architecture

Architectures (continued)

Mixed architectures

In this type of architecture, FactoryCast HMI supplements conventional SCADA systems, such as Vijeo Citect, meeting the requirement to centralize information for global supervision from a central site.

Combining a FactoryCast HMI solution and a conventional SCADA solution enables:
- Simplification of the SCADA application by locating some of the SCADA processing functions at source, at PLC level
- Increased availability of the traceability function due to the direct connection between FactoryCast HMI modules and relational databases
- Powerful “ready to use” remote diagnostics capability
- “Nomad” client stations to be connected to the Intranet or Internet



Direct links with the information management levels

Direct links with information management levels

In this type of architecture, FactoryCast HMI eliminates the need for intermediate devices (software or hardware gateways), which are expensive to install and maintain, by establishing direct links between the automation levels and the global information management levels (MES, ERP, etc).

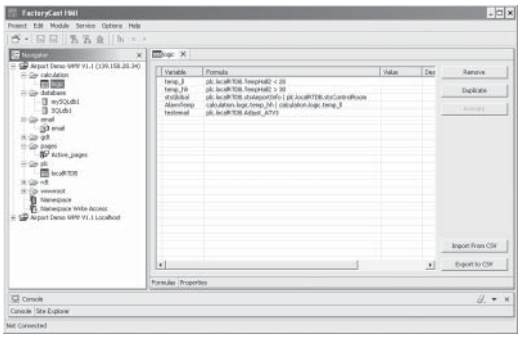
The PLC manages the following links which allow a “collaborative” automation system to be set up, making it easier to share data in real time:
- Direct archiving of information from the automation system in relational databases
- Direct interaction with IT applications via the SOAP/XML client/server interface

This solution results in:
- Simplified architectures
- Lower installation, development and maintenance costs
- Increased reliability of information (the data is collected at source)
- Increased interoperability with IT applications
- Greater availability of data archiving

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

FactoryCast HMI active Web services



Real-time database

Specialized HMI services

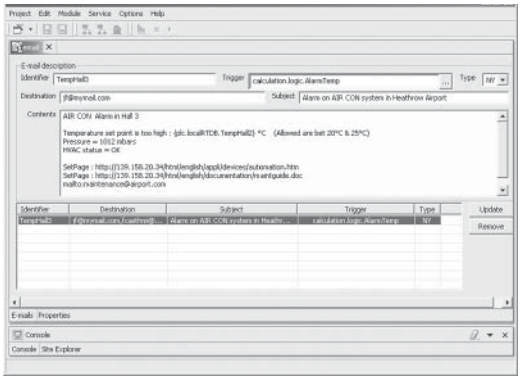
Real-time database

With an internal architecture similar to that of an HMI/SCADA system, FactoryCast HMI modules manage their own variables database in real time, independently of the PLC program. It is this variable database that is used to execute various functions, including internal processing, archiving, alarm, e-mail, etc.
Variables in this real-time database are updated using the PLC's data acquisition service.
This service becomes operational once the following parameters have been set in the FactoryCast HMI software:

- Direct import of PLC variable/symbol databases (no double entry)
- Definition of the acquisition frequency (period at which this variable is updated)

Characteristics

- Maximum number of I/O variables per application: 1000 variables from PLCs
- Maximum number of internal variables per application: 100
- Acquisition frequency: 500 ms minimum

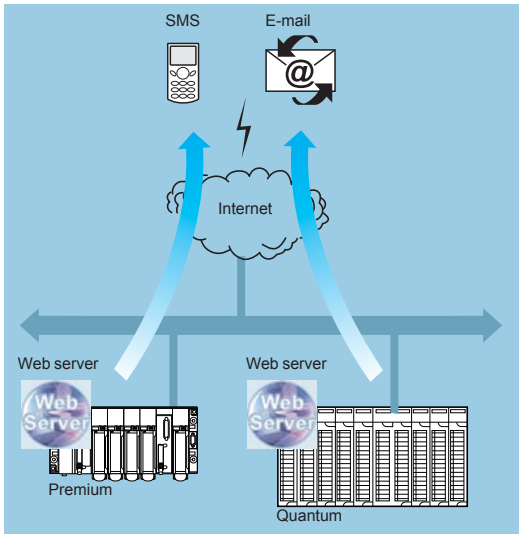


Calculation function

Calculation functions

The FactoryCast HMI server can carry out various arithmetic or logical operations on a combination of variables from the HMI database. These calculations include, for example, scaling, formatting, logic processing for event triggering, etc.

This calculation function is operational from the local HMI database, independently of the PLC CPU, and is in the form of spreadsheets where the formulas are defined in cells. These spreadsheets are interpreted and processed by the server. The result of each formula is associated with a new internal variable. The processing of each spreadsheet is initiated by a trigger.



E-mail transmission

E-mail transmission

The FactoryCast HMI module can, on a specific event, send e-mails completely autonomously to a predefined list of e-mail addresses. This function is executed independently of the PLC program.

The event that triggers the e-mail may be associated with the following:

- A PLC variable (I/O, internal variable)
- An alarm, a threshold overshoot
- A machine or process state
- An operator action, etc

When an e-mail is sent it passes via an SMTP (Simple Mail Transfer Protocol) server. This server receives the e-mail and waits for the recipient to acknowledge it. The e-mail service is compatible with all SMTP servers. A return address can be defined should delivery to the destination address fail.

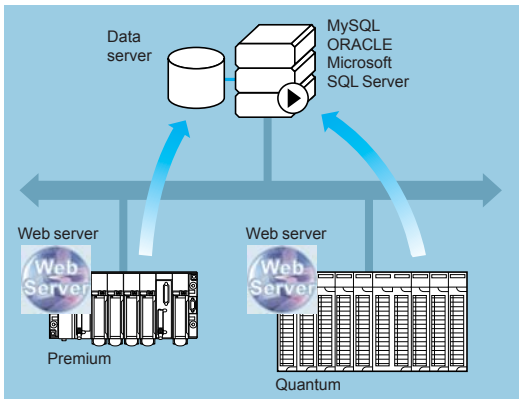
Characteristics

- Configuration of the SMTP server: compatible with all SMTP servers
- Maximum number of e-mails: 100
- Contents of e-mail messages: free text with embedded dynamic variable values (from the PLC) and hyperlinks (unlimited)

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

FactoryCast HMI active Web services



Connection to databases

Specialized HMI services (continued)

Connection to relational databases

The FactoryCast HMI module can be connected directly and completely autonomously to the following remote relational databases:

- SQL Server
- MySQL
- Oracle

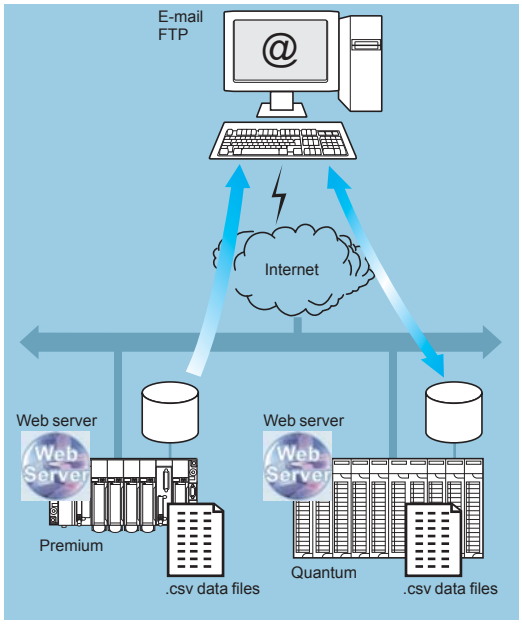
This connection enables all process or internal data to be archived directly in the FactoryCast HMI module without any intermediate system (hardware or software).

The data can be archived (written) periodically and/or on a specific event.
These variables can be either from PLCs (I/O bits, internal bits, internal words and registers) or local to the module.

The FactoryCast HMI Roll Over function controls the size of tables by managing the maximum number of records.
This circular data archiving function automatically deletes the oldest data and can be accessed by simply setting parameters in the FactoryCast HMI software.

Characteristics

- Number of databases that can be connected: 3
- Number of tables that can be written per database: 10 maximum
- Number of columns per table: 50 maximum
- Type of database supported: Oracle, SQL Server and MySQL
- Automatic table creation: the FactoryCast HMI server creates a table in the database if one does not already exist



Data Logging

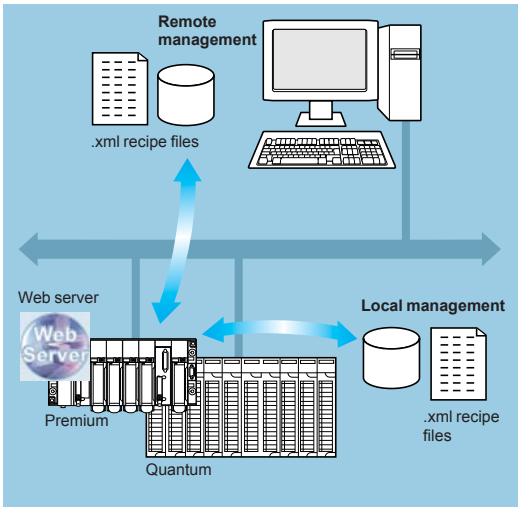
Data Logging

FactoryCast HMI modules can log data in the internal flash memory periodically or on an event.

This logging is done in a CSV file, which can be:

- Automatically exported via FTP
- Attached to an e-mail

This function is particularly useful for standalone installations, or stations that are not connected to an Intranet, or for local traceability of data.



Recipe management

Specialized HMI services (continued)

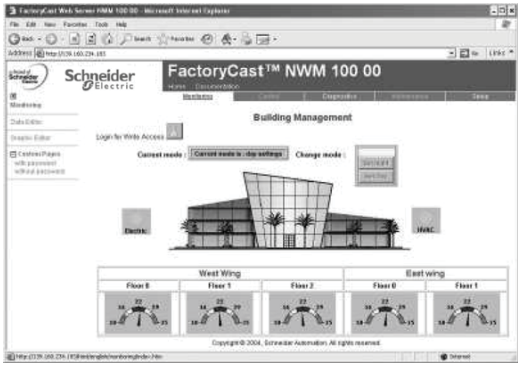
Recipe management

The recipe management function enables a FactoryCast HMI application to take recipe files into account automatically on process events or at the request of an operator, applying the recipe values to the PLC data memory.

This function provides very flexible data management in the execution of production or process changes by sending new setpoints and new parameters.

Characteristics

- Recipes are described using XML format (SOAP/XML format)
- Recipes are stored in the module or remotely
- Recipes contain setpoint values in accordance with “standard” recipes, and these values are transferred to the PLC memory

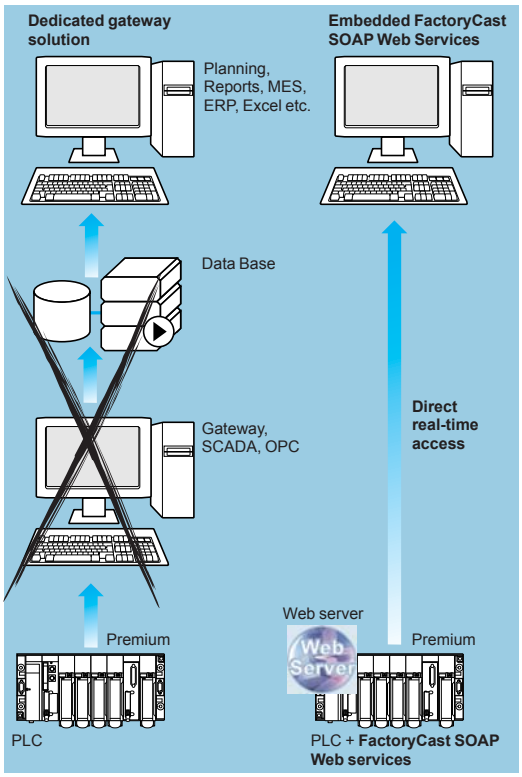


Web-based HMI interface

Web-based HMI interface

The memory of the FactoryCast HMI Web server receives Web pages defined by the user to provide a graphic HMI interface. The Active Web Server provides dynamic refreshing of Web pages generated by the server itself.

FactoryCast HMI supports two types of Web page:
- HTML pages animated in real time with Java graphic objects used to create the user interface (FactoryCast HMI comes with a complete library of Java graphic objects)
- Active Web pages dynamically generated in the Web server with integration of PLC variables inside the HTML code (PLC “tags”) which can be used to generate reports. These active pages consisting of HTML code are fully compatible with all Thin Client terminals (pocket PC, PDA, or PC terminal).



SOAP/XML client/server interface

SOAP/XML client/server interface

For greater interoperability, FactoryCast HMI implements the following SOAP/XML Web service: server function capable of answering SOAP requests generated by any client application (MES, ERP, SAP, SCADA or third-party applications developed in .NET or Java).

See page 5/36.

Modicon Quantum automation platform

PlantStruxure Ethernet Architectures

SOAP/XML Web services

Presentation, functions

The standardization of Web services has come about as a result of joint development between **Microsoft** and **IBM**, amongst others, validated at the **W3C** *(World Wide Web Consortium)* as an open "standard".
It now provides all the tools, specifications and environments needed for each platform. Web services are based on standards such as:

- **XML** *(eXtensible Markup Language)*, the universal standard for data exchange
- **SOAP** *(Single Object Access Protocol)* carried via the **HTTP** *(Hyper Text Transfer Protocol) channel*
- **WSDL** *(Web Services Description Language)*, in **XML** format

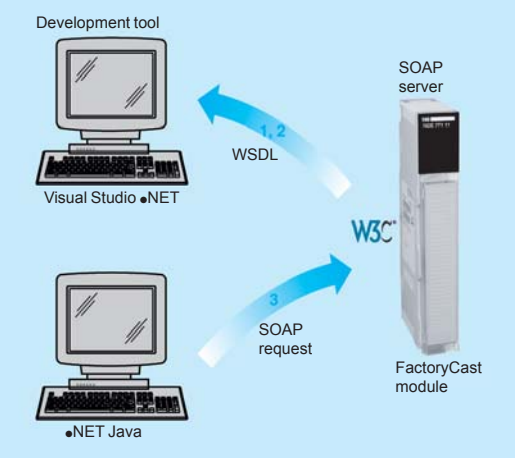
SOAP is currently considered to be the reference protocol, including in industry.
It has now been adopted by the main market players, including Microsoft (•NET, SQL Server, OFFICE, etc), IBM (Java, Web Sphere), Lotus, ORACLE, SUN, SAP, etc.

Embedded SOAP/XML Web services: ModbusXMLDa Web services

This new Transparent Ready service offers the hitherto unheard of possibility of making an IT/e-business application interact directly with the control system levels using the same standards.

With the implementation of ModbusXMLDa *(Modbus XML Data access)* services in FactoryCast Web servers, IT engineers can easily create their own application to access the desired information directly in the PLC and in real time.
Data exchanges are made in XML standard format in response to a request using the SOAP protocol.

The implementation of Web services in control system equipment makes it easy to achieve vertical integration of the control level and create even more collaborative architectures which can be used to link production systems to enterprise management systems. It simplifies access to information, reduces training, development and roll-out costs, and increases productivity.



ModbusXMLDa server interface

ModbusXMLDa Web services in FactoryCast modules

ModbusXMLDa server interface

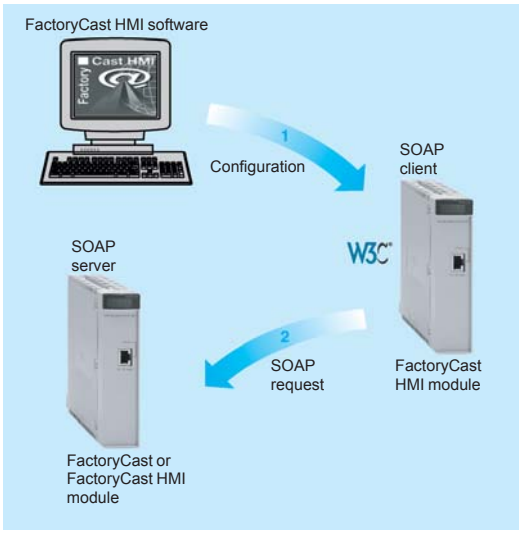
This implementation enables a SOAP client application (management level computer application, MES, ERP, etc) to communicate directly with a FactoryCast Web server module embedded in the PLC.

Exchanges are initiated by the SOAP client application (the server responds to these requests).

□ **Step 1: Creation of the client application with learning of the Web services**. The development environment (for example, Visual Studio •NET) looks in the FactoryCast server for the list of available services and their WSDL standard interfaces provided by the module.

□ **Step 2: Development of the client application**. The developer integrates the Web service functions using the code retrieved at step 1 of the learning process.

□ **Step 3: Execution of the client application**. The client application communicates in real time with the FactoryCast Web server module using the SOAP protocol.



ModbusXMLDa client interface

Presentation, functions (continued)

ModbusXMLDa Web services in FactoryCast modules (continued)

ModbusXMLDa client interface

This implementation allows a FactoryCast HMI module to execute a SOAP client application in order to communicate with a remote SOAP server application (for example another FactoryCast Web server module or a computer management application, MES, ERP, etc).

Exchanges are initiated by the FactoryCast HMI client module (the remote application server responds to SOAP requests sent by the FactoryCast HMI module).

□ **Step 1: Configuration of the ModbusXMLDa client service**. The user declares the PLC variables that are to be exchanged (in read or write mode), using the FactoryCast HMI configuration software.

□ **Step 2: Use of the application**. The ModbusXMLDa client service executed in the FactoryCast HMI module communicates directly with the remote server application using SOAP requests in **XML** format.

ModbusXMLDa functions implemented in FactoryCast modules

Requests implemented	ModbusXMLDa functions implemented in FactoryCast modules
Access to data via physical addresses	ReadDeviceIdentification
	ReadMultipleRegisters
	WriteMultipleRegisters
	ReadCoils
	WriteMultipleCoils
	ReadDiscreteInputs
Access to data via symbols	Read, operation to read item list value
	Write, operation to write item list value
	Browse, operation to browse item list

ModbusXMLDa functions are implemented in the FactoryCast modules:
- ■ Server interface:
  - □ Modicon M340: **BMX NOE 0110**,
  - □ Premium: **TSX ETY 5103/WMY 100**,
  - □ Quantum: **140 NOE 771 11/NWM 100 00**
- ■ Client interface:
  - □ Premium: **TSX WMY 100,**
  - □ Quantum: **140 NWM 100 00**

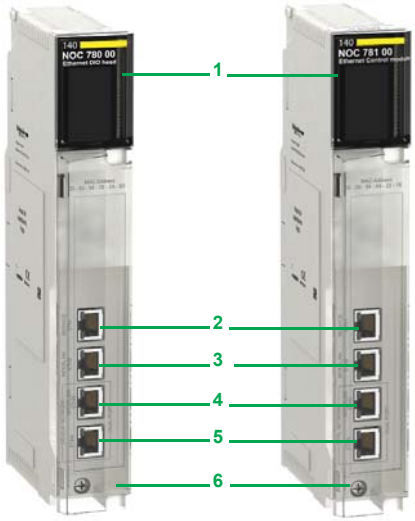
5

Modicon Quantum automation platform

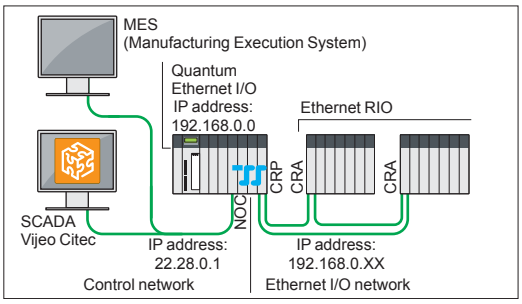
Quantum Ethernet I/O

NOC Ethernet DIO head module

NOC Ethernet control network head module



140 NOC 78000 *140 NOC 78100*



Router integrated in the 140 NOC 78100 Ethernet module managing several IP addresses

Example of a combination of NOC and CRP modules: 140 NOC 78100/140 NOC 78000/140 CRP 31200

NOC Ethernet DIO head module and control network head module *(1)(2)*

Presentation

There are two 140 NOC 78●00 Ethernet modules specifically for use in Quantum Ethernet I/O architectures:

- The 140 NOC 78000 Ethernet DIO head module, installed in the Quantum local rack (4 modules max.). This module manages the Ethernet DIO devices connected to the Quantum Ethernet I/O network.
- The 140 NOC 78100 control network head module, installed in the Quantum local rack (1 module max.). This module manages the exchanges with the control network in which other PLCs and/or supervisors may be located.

Ethernet DIO devices can be connected in a star, ring or network topology:

- On the "SERVICE" port of CRP head adaptor modules or CRA drop adaptor modules on Quantum or Modicon X80 Ethernet RIO drops, or on the Ethernet ports of DRS switches. In this case, the NOC Ethernet DIO head module and the CRP need to be linked for the Ethernet DIO devices to be integrated in the Quantum Ethernet I/O network (see below).
- Directly on the ports of the NOC Ethernet DIO head module *(3)*, with no link with the CRP Ethernet head adaptor module. In this case, the Ethernet DIO devices are independent of the Quantum Ethernet I/O network.

The 140 NOC 78100 module has an integrated router which can manage several IP addresses and provides transparency between the control network and the Quantum Ethernet I/O network. This function limits the use of external routers and makes setup easier. There must be a link between the NOC module and the CRP head adaptor module or the NOC DIO head module, depending on the configuration.

Capacity of NOC Ethernet modules

- 140 NOC 78000 Ethernet DIO head module:
  - 4 NOC modules max., installed in the Quantum local rack
  - 128 Ethernet DIO devices max. per module
- 140 NOC 78100 Ethernet control network head module:
  - 1 NOC module max., installed in the Quantum local rack
  - 64 Ethernet DIO devices max. per module

Description

1 Display block indicating the module status
2 RJ45 "SERVICE" port specifically for remote service tools or connecting Ethernet DIO devices (see "SERVICE" port on CRP and CRA modules, page 2/11)
3 RJ45 "INTERLINK" port for connecting the "Ethernet Interlink" cable
4 RJ45 "DEVICE NETWORK" port for connection to the Ethernet network
5 RJ45 "DEVICE NETWORK" port for connection to the Ethernet network
6 Removable hinged cover

Linking Ethernet modules and CRP Ethernet head adaptor module *(3)*

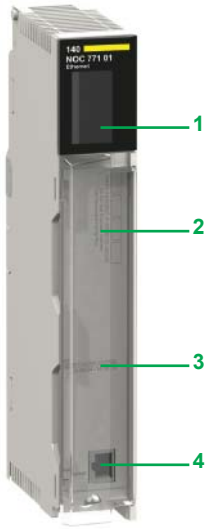
The two NOC Ethernet modules **(7, 8)** are linked to the CRP head adaptor module **(9)** using "Ethernet Interlink" cables **(10)**. Numerous combinations are possible:

7 140 NOC 78100 Ethernet control network head module
8 140 NOC 78000 Ethernet DIO head module
9 140 CRP 31200 Ethernet head adaptor module
10 TCS ECN 3M3M 1S4/1S4U "Ethernet Interlink" cable

(1) Additional characteristics can be found on our website www.schneider-electric.com.
(2) Requires Unity Pro Extra Large software ≥ V7.0.
(3) 140 NOE 771 ●1 Ethernet Modbus TCP modules in installed automation system bases can also manage Ethernet DIO devices in a Quantum Ethernet I/O system. However these modules have performance restrictions which the 140 NOC 78000 module does not have. In particular, there can only be one 140 NOE 771 ●1 module in the Quantum Ethernet I/O network. Please contact our Customer Care Centre.

Modicon Quantum automation platform

EtherNet/IP and Modbus/TCP network module NOC Ethernet modules



140 NOC 77101

Presentation

The **140 NOC 771 01** network module acts as an interface between the Quantum PLC and other Ethernet network devices via the EtherNet/IP and Modbus/TCP communication protocols.
The standard format **140 NOC 771 01** network module occupies a single slot in the rack of the Modicon Quantum platform.

Functions

The **140 NOC 771 01** module offers the following functions:
- Modbus/TCP and EtherNet/IP protocols operating simultaneously
- Priority of Ethernet packets using QoS (Quality of Service)
- Module exchange without shutting down the PLC. Automatic module configuration recovery from the CPU
- Support for SCADA functions via the OPC protocol
- Embedded Web server for application monitoring and module diagnostics
- Sharing data between PLCs
- Network management using SNMP (Simple Network Management Protocol)

Description

The front panel of the **140 NOC 771 01** module features:
1 A display block, which indicates the module status and the transmission status on the network:
- Active: communication status
- Mod Status: module operating status
- Net Status: network status
- Ready: configuration status
- Link: Ethernet connection status
- Activity: activity on the link
- 100 MB: connection at 100 Mbps
- Fduplex: full-duplex connection

A hinged cover for access to:
2 A space where the user can write the IP address
3 A MAC address label
4 A connector (RJ45) for 10BASE-T/100BASE-TX interface

140 NOC 77101

140 NOC 78000

140 NOC 78100

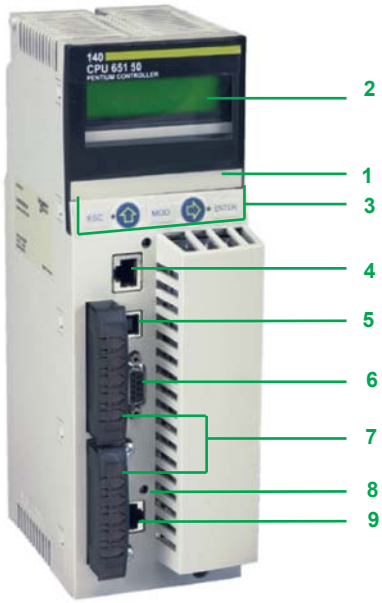
References

Description	Data rate Mbps	Number of ports	Function	Reference	Weight kg
Modbus/TCP and EtherNet/IP network module	10/100	1 Ethernet	–	**140 NOC 77101**	0.350
Quantum Ethernet DIO head module Necessary if Ethernet DIO devices in the architecture *(1)*	10/100	2 Ethernet 1 "SERVICE" port	–	**140 NOC 78000**	0.554
Quantum Ethernet control network head module Necessary if there is a control network in the architecture	10/100/ 1000	2 Ethernet 1 "SERVICE" port	Integrated router	**140 NOC 78100**	0.554
"Ethernet Interlink" cables Length 1 m			Standard version	**TCS ECN 3M3M 1S4**	–
			UL version	**TCS ECN 3M3M 1S4U**	–

(1) 140 NOE 771 ●1 Ethernet Modbus TCP modules in installed automation system bases can also manage Ethernet DIO devices in a Quantum Ethernet I/O system. However these modules have performance restrictions which the 140 NOC 78000 module does not have. In particular, there can only be one 140 NOE 771 ●1 module in the Quantum Ethernet I/O network. Please contact our Customer Care Centre.

CPUs: page 1/2 | I/O architectures: page 2/2 | I/O: page 3/2 | Software: page 6/2 | Safety modules: page 7/2

Modicon Quantum automation platform
CPUs with integrated Ethernet port



140 CPU 651 50/60
140 CPU 652 60

140 CPU 651 50/60

Presentation

High-end Quantum **140 CPU 651 50**, **140 CPU 651 60** and **140 CPU 652 60** CPUs have an integrated Ethernet 10BASE-T/100BASE-TX port for connection to an Ethernet Modbus TCP network via an RJ45 connector.

Description

140 CPU 651 50, **140 CPU 651 60** and **140 CPU 652 60** CPUs feature the following on the front panel:

1 An LCD display cover, providing access to:
□ A key switch for locking system operations that may be requested and all the permitted parameters that may be modified via the LCD display (2) and 5-button keypad (3)
□ A slot for the backup battery
□ A "Restart" pushbutton
2 An LCD display (2 lines of 16 characters) with brightness and contrast controls
3 A keypad with 5 buttons (ESC, ENTER, MOD, ÎI, =>) and 2 LEDs
4 An RJ45 connector for connecting to the Modbus bus
5 A female USB B type connector for connecting the programming PC
6 A 9-way female SUB-D connector for connecting to the Modbus Plus network
7 Two slots for PCMCIA memory expansion cards
8 Two LEDS marked COM and ERR
9 An RJ45 connector for connecting to the Ethernet network

References

Description	CPU clock frequency	Program/data capacity *(1)*	Reference	Weight kg
CPUs with integrated Ethernet link Class B30	166 MHz	7168 KB/512 KB	**140 CPU 651 50**	–
	266 MHz	7168 KB/1024 KB	**140 CPU 651 60**	–
		7168 KB/3072 KB	**140 CPU 652 60**	–

(1) With PCMCIA card (see pages 1/10 and 1/11).

Modicon Quantum automation platform
Ethernet network modules

Presentation

140 NOE 771 ●●/NWM 100 00 Ethernet network modules are single format modules for installing in the slots in the local rack of a Modicon Quantum PLC configuration. A configuration can take from 2 to 6 application-specific modules, including network modules, depending on the type of CPU.

Description

The front panel of **140 NOE 771 01/771 11** and **140 NWM 100 00** Ethernet TCP/IP modules comprises:

1 A display block, which indicates the module status and the transmission status on the network

A hinged cover for access to:

2 A connector (MT-RJ) for 100BASE-FX optical interface
3 A standard connector (RJ45) for 10BASE-T/100BASE-TX interface

140 NOE 771 ●●
140 NWM 100 00

References

Description	Data rate	Transparent Ready class	Reference	Weight kg
Ethernet TCP/IP modules	10/100 Mbps	B20	**140 NOE 771 00**	0.345
		C20	**140 NOE 771 00**	0.345
		B30	**140 NOE 771 01**	0.345
		C30	**140 NOE 771 11** *(1)*	0.345
		D10	**140 NWM 100 00**	0.345

(1) Non-interfering

5

Ethernet network
Cabling system
ConneXium hub and unmanaged switches

Device type			**Hub**
Interfaces	Copper cable ports	Number and type	4 x 10BASE-T ports
		Shielded connectors	RJ45
		Medium	Shielded twisted pair, category CAT 5E
		Total length of pair	100 m
	Fibre optic ports	Number and type	–
		Connectors	–
		Medium	–
	Length of optical fibre	50/125 µm	–
		62.2/125 µm	–
	Optical fibre attenuation analysis	50/125 µm fibre	–
		62.2/125 µm fibre	–
	Ethernet services		–
Topology	Number of hubs or switches	Cascaded	4 max.
		In a ring	–
Redundancy			P1 and P2 redundant power supplies
Power supply	Voltage		24 V ⎓ (18…32) safety extra low voltage (SELV)
	Consumption		80 mA (130 max. at 24 V ⎓)
	Removable terminal block		5 terminals
Operating temperature			0…+ 60°C
Relative humidity			10…95% non-condensing
Degree of protection			IP 30
Dimensions		W x H x D	40 x 125 x 80 mm
Mounting			On symmetrical DIN rail, 35 mm wide
Weight			0.530 kg
Conforming to standards			cUL 60950, UL 508 and CSA 22.2 No. 142, UL 1604 and CSA 22.2 No. 213 class 1 division 2, CE, GL, C-Tick
			FM 3810, FM 3611 class 1 division 2
LED indicators			Power supply, activity, link
Alarm relay			Power supply fault, Ethernet network fault or communication port fault (volt-free contact 1 A max. at 24 V ⎓)
Reference			**499 NEH 104 10**
Pages			5/60

Unmanaged switches, copper twisted pair

5 x 10BASE-T/100BASE-TX ports
M12 (type D)
Shielded twisted pair, category CAT 5E
100 m
–
–
–
–
–
–
–
Storage and re-routing of received data, auto MDI/MDX, automatic negotiation of 10/100 Mbps and duplex mode (on all ports)
Unlimited
–
–
24 V ⎓ (18…32) safety extra low voltage (SELV)
100 mA max.
5 terminals, M12 (type A, male)
0…+ 60°C
–
IP 67
60 x 126 x 31 mm
On a flat surface
0.210 kg
cUL 508 and CSA 22.2 No. 142
Power supply, link status, data rate
–

TCS ESU 051F0

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Ethernet network
Cabling system
ConneXium unmanaged switches

Device type			Unmanaged switches, copper twisted pair	Unmanaged switches (IP 67), copper twisted pair
Interfaces	Copper cable ports	Number and type	8 x 10BASE-T/100BASE-TX ports	
		Shielded connectors	RJ45	
		Medium	Shielded twisted pair, category CAT 5E	
		Total length of pair	100 m	
	Fibre optic ports	Number and type	–	
		Connectors	–	
		Medium	–	
	Length of optical fibre	50/125 µm	–	
		62.2/125 µm	–	
	Optical fibre attenuation analysis	50/125 µm fibre	–	
		62.2/125 µm fibre	–	
	Ethernet services		–	Storage and re-routing of received data, auto MDI/MDX, automatic negotiation of 10/100 Mbps and duplex mode (on all ports), automatic change of polarity
Topology	Number of switches	Cascaded	Unlimited	
		Redundant in a ring	–	
Redundancy			P1 and P2 redundant power supplies	–
Power supply	Voltage		24 V ⎓ (18…32) safety extra low voltage (SELV)	24 V ⎓ (9.6…32) SELV
	Consumption		125 mA (290 mA max.)	4.1 W max.
	Removable terminal block		5 terminals	3 terminals
Operating temperature			0…+ 60°C	
Relative humidity			10…95% non-condensing	95% max. non-condensing
Degree of protection			IP 20	IP 30
Dimensions		W x H x D	47 x 135 x 111 mm	35 x 138 x 121 mm
Mounting			On symmetrical DIN rail, 35 mm wide	
Weight			0.230 kg	0.246 kg
Conforming to standards			cUL 60950, UL 508 and CSA 22.2 No. 142, UL 1604 and CSA 22.2 No. 213 class 1 division 2, CE, GL, C-Tick	UL 508 and CSA 22.2 No.142 IEC/EN 61131-2, IEC 60825-1 class 1, CISPR 11A
LED indicators			P1 and P2 power supplies, Ethernet link/port status	Power supply, copper port activity, 10 or 100 Mbps data rate
Alarm relay			Power supply fault, Ethernet network fault or communication port fault (volt-free contact 1 A max. at 24 V ⎓)	–
Reference			**499 NES 181 00**	**TCS ESU 083FN0**
Pages			5/61	

(1) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 2000 m).

Unmanaged switches, 4 and 5 ports, copper twisted pair and fibre optic

3 x 10BASE-T/100BASE-TX ports	4 x 10BASE-T/100BASE-TX ports	5 x 10BASE-T/100BASE-TX ports
RJ45		
Shielded twisted pair, category CAT 5E		
100 m		
–	1 x 100BASE-FX port	–
–	Duplex SC	–
–	Multimode optical fibre	–
–	5000 m *(1)*	–
–	4000 m *(1)*	–
–	8 dB	–
–	11 dB	–
Storage and re-routing of received data, auto MDI/MDX, automatic negotiation of 10/100 Mbps and duplex mode (on all ports)		
Unlimited		
–		
–		
24 V ⎓ (9.6…32 V) safety extra low voltage (SELV)		
2.2 W max.	3.9 W max.	2.2 W max.
3-terminal removable screw terminal block		
0…+ 60°C		
95% max. non-condensing		
IP 30		
25 x 114 x 79 mm		
On symmetrical DIN rail, 35 mm wide		
0.113 kg	0.120 kg	0.113 kg
UL 508 and CSA 22.2 No. 142 IEC/EN 61131-2, IEC 60825-1 class 1, CISPR 11A		
Power supply, copper port activity, 10 or 100 Mbps data rate		
–	Fibre port activity and status	–
–		
TCS ESU 033FN0	**TCS ESU 043F1N0**	**TCS ESU 053FN0**
5/62		

Ethernet network
Cabling system
Managed and unmanaged ConneXium switches

Device type			**Unmanaged switches, 5 ports, copper twisted pair and fibre optic**			
Interfaces	Copper cable ports	Number and type	4 x 10BASE-T/ 100BASE-TX ports	3 x 10BASE-T/ 100BASE-TX ports	4 x 10BASE-T/ 100BASE-TX ports	3 x 10BASE-T/ 100BASE-TX ports
		Shielded connectors	RJ45			
		Medium	Shielded twisted pair, category CAT 5E			
		Total length of pair	100 m			
	Fibre optic ports	Number and type	1 x 100BASE-FX port	2 x 100BASE-FX ports	1 x 100BASE-FX port	2 x 100BASE-FX ports
		Connectors	SC			
		Medium	Multimode optical fibre		Single mode optical fibre	
	Length of optical fibre	50/125 µm	5000 m *(1)*		–	
		62.2/125 µm	4000 m *(1)*		–	
		9/125 µm fibre	–		32,500 m *(2)*	
	Optical fibre attenuation analysis	50/125 µm fibre	8 dB		–	
		62.2/125 µm fibre	11 dB		–	
		9/125 µm fibre	–		16 dB	
	Ethernet services		–			
Topology	Number of switches	Cascaded	Unlimited			
		Redundant in a ring	–			
Redundancy			P1 and P2 redundant power supplies			
Power supply	Voltage		24 V ⎓ (18…32 V) safety extra low voltage (SELV)			
	Consumption		200 mA max.	240 mA max.	200 mA max.	240 mA max.
	Removable terminal block		5 terminals			
Operating temperature			- 40...+ 70°C			
Relative humidity			10…95% non-condensing			
Degree of protection			IP 20			
Dimensions		W x H x D	47 x 135 x 111 mm			
Mounting			On symmetrical DIN rail, 35 mm wide			
Weight			0.330 kg	0.335 kg	0.330 kg	0.335 kg
Conforming to standards			cUL 60950, cUL 508 and CSA 22.2 No. 142, UL 1604 and CSA 22.2 No. 213 class 1 division 2, CE, GL, C-Tick			
LED indicators			P1 and P2 power supplies, Ethernet link status, transmission activity			
Alarm relay			Activity, power supply fault, Ethernet network fault or communication port fault (volt-free contact 1 A max. at 24 V ⎓)			
Reference			**499 NMS 251 01**	**499 NMS 251 02**	**499 NSS 251 01**	**499 NSS 251 02**
Pages			5/62			

(1) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 2000 m).
(2) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 15,000 m).

Managed switches, 4 ports, copper twisted pair and fibre optic

3 x 10/100BASE-TX ports	2 x 10/100BASE-TX ports	3 x 10/100BASE-TX ports	2 x 10/100BASE-TX ports
RJ45			
Shielded twisted pair, category CAT 5E			
100 m			
1 x 100BASE-FX port	2 x 100BASE-FX ports	1 x 100BASE-FX port	2 x 100BASE-FX ports
Duplex SC			
Multimode optical fibre		Single mode optical fibre	
5000 m *(1)*		–	
4000 m *(1)*		–	
–		32,500 m *(2)*	
8 dB		–	
11 dB		–	
–		16 dB	
FDR, SMTP V3, SNTP client, multicast filtering for optimization of the Global Data protocol, configuration via Web access,VLAN, IGMP Snooping, RSTP *(Rapid Scanning Tree Protocol)*, priority port, data stream control, secure port			
Unlimited			
50 max.			
Redundant power supplies, redundant single ring, ring coupling			
9.6...60 V ⎓ /18…30 V ∼ safety extra low voltage (SELV)			
6.5 W	7.3 W	6.5 W	7.3 W
6 terminals			
0…+ 60°C			
10…90% non-condensing			
IP 20			
47 x 131 x 111 mm			
On symmetrical DIN rail, 35 mm wide			
0.400 kg			
IEC 61131-2, UL 508, UL 1604 class 1 division 2, CSA 22.2 No. 142 (cUL), CSA 22.2 No. 213 class 1 division 2 (cUL), CE, GL, C-Tick			
Power supply status, alarm relay status, active redundancy, redundancy management, copper port status and copper port activity			
Power supply fault, Ethernet network fault, communication port fault, redundancy fault (volt-free contact 1 A max. at 24 V ⎓)			
TCS ESM 043F1CU0	**TCS ESM 043F2CU0**	**TCS ESM 043F1CS0**	**TCS ESM 043F2CS0**
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(1) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 2000 m).
(2) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 15,000 m).

Ethernet network
Cabling system
ConneXium managed switches

Device type			**Managed switches, 4 and 8 ports, copper twisted pair**	
Interfaces	Copper cable ports	Number and type	4 x 10/100BASE-TX ports	8 x 10/100BASE-TX ports
		Shielded connectors	RJ45	
		Medium	Shielded twisted pair, category CAT 5E	
		Total length of pair	100 m	
	Fibre optic ports	Number and type	–	
		Connectors	–	
		Medium	–	
	Length of optical fibre	50/125 µm	–	
		62.2/125 µm	–	
		9/125 µm fibre	–	
	Attenuation analysis	50/125 µm fibre	–	
		62.2/125 µm fibre	–	
		9/125 µm fibre	–	
	Ethernet services		FDR, SMTP V3, SNTP client, multicast filtering for optimization of the Global Data protocol, configuration via Web access,VLAN, IGMP Snooping, RSTP *(Rapid Scanning Tree Protocol)*, priority port, data stream control, secure port	
Topology	Number of switches	Cascaded	Unlimited	
		Redundant in a ring	50 max.	
Redundancy			P1 and P2 redundant power supplies, redundant single ring, ring coupling	
Power supply	Voltage		9.6...60 V ⎓ /18…30 V ∿ safety extra low voltage (SELV)	
	Consumption		5.3 W	
	Removable terminal block		6 terminals	
Operating temperature			0...+ 60°C	
Relative humidity			10…90% non-condensing	
Degree of protection			IP 20	
Dimensions		W x H x D	47 x 131 x 111 mm	74 x 131 x 111 mm
Mounting			On symmetrical DIN rail, 35 mm wide	
Weight			0.400 kg	0.410 kg
Conforming to standards			IEC/EN 61131-2, UL 508, UL 1604 class 1 division 2, CSA 22.2 No. 214 (cUL), CSA 22.2 No. 213 class 1 division 2 (cUL), CE, GL, C-Tick	
LED indicators			Power supply status, alarm relay status, active redundancy, redundancy management, copper port status and copper port activity	Power supply status, alarm relay status, active redundancy, redundancy management, fibre port status and fibre port activity
Alarm relay			Power supply fault, Ethernet network fault or communication port fault (volt-free contact 1 A max. at 24 V ⎓)	
Reference			**TCS ESM 043F23F0**	**TCS ESM 083F23F0**
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Managed switches, 8 ports, copper twisted pair and fibre optic

7 x 10/100BASE-TX ports	6 x 10/100BASE-TX ports	7 x 10/100BASE-TX ports	6 x 10/100BASE-T ports
RJ45			
Shielded twisted pair, category CAT 5E			
100 m			
1 x 100BASE-FX port	2 x 100BASE-FX ports	1 x 100BASE-FX port	2 x 100BASE-FX ports
Duplex SC			
Multimode optical fibre		Single mode optical fibre	
5000 m *(1)*		–	
4000 m *(1)*		–	
–		32,500 m *(2)*	
8 dB		–	
11 dB		–	
–		16 dB	
FDR, SMTP V3, SNTP client, multicast filtering for optimization of the Global Data protocol, configuration via Web access,VLAN, IGMP Snooping, RSTP *(Rapid Scanning Tree Protocol)*, priority port, data stream control, secure port			
Unlimited			
50 max.			
Redundant power supplies, redundant single ring, ring coupling			
9.6...60 V ⎓ /18…30 V ∿ safety extra low voltage (SELV)			
6.5 W	7.3 W	6.5 W	7.3 W
6 terminals			
0…+ 60°C			
10…90% non-condensing			
IP 20			
75 x 131 x 111 mm			
On symmetrical DIN rail, 35 mm wide			
0.410 kg			
IEC/EN 61131-2, UL 508, UL 1604 class 1 division 2, CSA 22.2 No. 214 (cUL), CSA 22.2 No. 213 class 1 division 2 (cUL), CE, GL, C-Tick			
Power supply status, alarm relay status, active redundancy, redundancy management, fibre port status and fibre port activity			
Power supply fault, Ethernet network fault or communication port fault (volt-free contact 1 A max. at 24 V ⎓)			
TCS ESM 083F1CU0	**TCS ESM 083F2CU0**	**TCS ESM 083F1CS0**	**TCS ESM 083F2CS0**
5/64			

(1) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 2000 m).
(2) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 15,000 m).

Ethernet network
Cabling system
Basic ConneXium managed switches

Device type			**Basic managed switch, 8 ports, copper twisted pair**
Interfaces	Copper cable ports	Number and type	8 x 10/100BASE-TX ports
		Shielded connectors	RJ45
		Medium	Shielded twisted pair, category CAT 5E
		Total length of pair	100 m
	Fibre optic ports	Number and type	–
		Connectors	–
		Medium	–
	Length of optical fibre	50/125 µm	–
		62.2/125 µm	–
		9/125 µm fibre	–
	Attenuation analysis	50/125 µm fibre	–
		62.2/125 µm fibre	–
		9/125 µm fibre	–
	Ethernet services		FDR, SNTP client, multicast filtering for optimization of the Global Data protocol, configuration via Web access, IGMP Snooping, RSTP *(Rapid Scanning Tree Protocol)*, priority port
Topology	Number of switches	Cascaded	Unlimited
		Redundant in a ring	50 max.
Redundancy			P1 and P2 redundant power supplies, redundant single ring, ring coupling
Power supply	Voltage		9.6...32 V ⎓ safety extra low voltage (SELV)
	Consumption		6 W
	Removable terminal block		6 terminals
Operating temperature			0...+ 60°C
Relative humidity			95% max. non-condensing
Degree of protection			IP 20
Dimensions		W x H x D	47 x 131 x 111 mm
Mounting			On symmetrical DIN rail, 35 mm wide
Weight			0.400 kg
Conforming to standards			IEC/EN 61131-2, UL 508, UL 1604 class 1 division 2, CSA 22.2 No. 214 (cUL), CSA 22.2 No. 213 class 1 division 2 (cUL), CE, GL, C-Tick
LED indicators			Power supply status, alarm relay status, active redundancy, redundancy management, copper port status and copper port activity
Alarm relay			Power supply fault, Ethernet network fault or communication port fault (volt-free contact 1 A max. at 24 V ⎓)
Reference			**TCS ESB 083F23F0**
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Basic managed switches, 8 and 9 ports, copper twisted pair and fibre optic

6 x 10/100BASE-TX ports	6 x 10/100BASE-TX ports	
RJ45		
Shielded twisted pair, category CAT 5E		
100 m		
2 x 100BASE-FX ports	3 x 100BASE-FX ports	
Duplex SC		
Multimode optical fibre		
5000 m *(1)*		
4000 m *(1)*		
–		
8 dB+		
11 dB		
–		
FDR, SNTP client, multicast filtering for optimization of the Global Data protocol, configuration via Web access, IGMP Snooping, RSTP *(Rapid Scanning Tree Protocol)*, priority port		
Unlimited		
50 max.		
P1 and P2 redundant power supplies, redundant single ring, ring coupling		
9.6...32 V ⎓ safety extra low voltage (SELV)		
8 W	9 W	
6 terminals		
0…+ 60°C		
95% max. non-condensing		
IP 20		
74 x 131 x 111 mm		
On symmetrical DIN rail, 35 mm wide		
0.400 kg		
IEC/EN 61131-2, UL 508, UL 1604 class 1 division 2, CSA 22.2 No. 214 (cUL), CSA 22.2 No. 213 class 1 division 2 (cUL), CE, GL, C-Tick		
Power supply status, alarm relay status, active redundancy, redundancy management, fibre port status and fibre port activity		
Power supply fault, Ethernet network fault or communication port fault (volt-free contact 1 A max. at 24 V ⎓)		
TCS ESB 083F2CU0	**TCS ESB 093F2CU0**	
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(1) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 2000 m).
(2) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 15,000 m).

Ethernet network
Cabling system
ConneXium managed switches

Device type			**Managed switches, 8 extended ports, copper twisted pair and fibre optic**		
Interfaces	Copper cable ports	Number and type	8 x 10/100BASE-TX ports	6 x 10/100BASE-TX ports	6 x 10/100BASE-T ports
		Shielded connectors	RJ45		
		Medium	Shielded twisted pair, category CAT 5E		
		Total length of pair	100 m		
	Fibre optic ports	Number and type	–	2 x 100BASE-FX ports	
		Connectors	–	Duplex SC	
		Medium	–	Multimode optical fibre	Single mode optical fibre
	Length of optical fibre	50/125 µm	–	5000 m *(1)*	–
		62.2/125 µm	–	4000 m *(1)*	–
		9/125 µm fibre	–	–	32,500 m *(2)*
	Attenuation analysis	50/125 µm fibre	–	8 dB	–
		62.2/125 µm fibre	–	11 dB	–
		9/125 µm fibre	–	–	16 dB
	Ethernet services		FDR, SMTP V3, SNTP client, multicast filtering for optimization of the Global Data protocol, configuration via Web access,VLAN, IGMP Snooping, RSTP *(Rapid Scanning Tree Protocol)*, priority port, data stream control, secure port		
Topology	Number of switches	Cascaded	Unlimited		
		Redundant in a ring	50 max.		
Redundancy			Redundant power supplies, redundant single ring, ring coupling, rings supporting MRP, Fast HIPER Ring and RSTP		
Power supply	Voltage		18...60 V ⎓		
	Consumption		10 W	12 W	
	Removable terminal block		2 terminal blocks, 2 terminals		
Operating temperature			0...+ 60°C		
Relative humidity			10…90% non-condensing		
Degree of protection			IP 30		
Dimensions		W x H x D	120 x 137 x 115 mm		
Mounting			On symmetrical DIN rail, 35 mm wide		
Weight			1 kg		
Conforming to standards			IEC/EN 61131-2, IEC 61850-3, UL 508, UL 1604 class 1 division 2, CSA 22.2 No. 214 (cUL), CSA 22.2 No. 213 class 1 division 2 (cUL), CE, GL, C-Tick, LR, BV		
LED indicators			Power supply status, alarm relay status, active redundancy, redundancy management, copper port status and copper port activity		
Alarm relay			Power supply fault, Ethernet network fault or communication port fault (volt-free contact 1 A max. at 24 V ⎓, 2-way)		
Reference			**TCS ESM 083F23F1**	**TCS ESM 063F2CU1**	**TCS ESM 063F2CS1**
Pages			5/64		

(1) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 2000 m).
(2) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 15,000 m).

Managed switches, 16 and 24 ports, copper twisted pair and fibre optic

16 x 10/100BASE-TX ports	14 x 10/100BASE-TX ports	14 x 10/100BASE-TX ports	22 x 10/100BASE-TX ports
RJ45			
Shielded twisted pair, category CAT 5E			
100 m			
–	2 x 100BASE-FX ports		
–	Duplex SC		
–	Multimode optical fibre	Single mode optical fibre	Multimode optical fibre
–	5000 m *(1)*	–	5000 m *(1)*
–	4000 m *(1)*	–	4000 m *(1)*
–	–	32,500 m *(2)*	–
–	8 dB	–	8 dB
–	11 dB	–	11 dB
–	–	16 dB	–
FDR, SMTP V3, SNTP client, multicast filtering for optimization of the Global Data protocol, configuration via Web access,VLAN, IGMP Snooping, RSTP *(Rapid Scanning Tree Protocol)*, priority port, data stream control, secure port			
Unlimited			
50 max.			
Redundant power supplies, redundant single ring, ring coupling			
9.6...60 V ⎓ /18…30 V ∿ safety extra low voltage (SELV)			
9.4 W	11.8 W	11.8 W	15.5 W
6 terminals			
0…+ 60°C			
10…90% non-condensing		95% max. non-condensing	10…90% non-condensing
IP 20			
111 x 131 x 111 mm			
On symmetrical DIN rail, 35 mm wide			
0.600 kg			0.650 kg
cUL 60950, UL 508 and CSA 22.2 No. 142, UL 1604 and CSA 22.2 No. 213 class 1 division 2		IEC/EN 61131-2, UL 508, UL 1604 class 1 division 2, CSA 22.2 No. 214 (cUL), CSA 22.2 No. 213 class 1 division 2 (cUL), CE, GL, C-Tick	cUL 60950, UL 508 and CSA 22.2 No. 142, UL 1604 and CSA 22.2 No. 213 class 1 division 2
Power supply status, alarm relay status, active redundancy, redundancy management, copper port status and copper port activity	Power supply status, alarm relay status, active redundancy, redundancy management, fibre port status and fibre port activity		
Power supply fault, Ethernet network fault or communication port fault (volt-free contact 1 A max. at 24 V ⎓)			
TCS ESM 163F23F0	**TCS ESM 163F2CU0**	**TCS ESM 163F2CS0**	**TCS ESM 243F2CU0**
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(1) Length dependent on the attenuation analysis and attenuation of the optical fibre (typical value: 2000 m).

Ethernet network
Cabling system
ConneXium managed switches

Device type			**Managed switch, 8 ports and 2 Gigabit ports, copper twisted pair and bre optic**		
Interfaces	Copper cable ports	Number and type	8 x 10/100BASE-TX ports		
		Shielded connectors	RJ45		
		Medium	Shielded twisted pair, category CAT 5E		
		Total length of pair	100 m		
	Fibre optic Gigabit ports (with SFP fibre optic module to be mounted on SFP connector)	Number and type	2 x 1000BASE-SX ports *(1)*	2 x 1000BASE-LH ports *(2)*	2 x 1000BASE-LX ports *(3)*
		Connectors	LC		
		Medium	Multimode optical fibre	Single mode optical fibre	Single mode and multimode optical fibre
	Length of optical fibre	50/125 µm	550 m	–	550 m
		62.2/125 µm	275 m	–	550 m
		9/125 µm fibre	–	8 - 72,000 m	20,000 m
	Attenuation analysis	50/125 µm fibre	7.5 dB	–	11 dB
		62.2/125 µm fibre	7.5 dB	–	11 dB
		9/125 µm fibre	–	6 - 22 dB	11 dB
	Ethernet services		FDR, SMTP V3, SNTP client, multicast filtering for optimization of the Global Data protocol, configuration via Web access, VLAN, IGMP Snooping, RSTP *(Rapid Scanning Tree Protocol)*, priority port, data stream control, secure port		
Topology	Number of switches	Cascaded	Unlimited		
		Redundant in a ring	50 max.		
Redundancy			Redundant power supplies, redundant single ring, ring coupling		
Power supply	Voltage		9.6...60 V ⎓ /18…30 V ∿ safety extra low voltage (SELV)		
	Consumption		8.9 W + 1 W per SFP fibre optic module		
	Removable terminal block		6 terminals		
Operating temperature			0...+ 60°C		
Relative humidity			10…90% non-condensing		
Degree of protection			IP 20		
Dimensions		W x H x D	111 x 131 x 111 mm		
Mounting			On symmetrical DIN rail, 35 mm wide		
Weight			0.410 kg		
Conforming to standards			cUL 60950, UL 508 and CSA 22.2 No. 142, UL 1604 and CSA 22.2 No. 213 class 1 division 2, CE, GL		
LED indicators			Power supply status, alarm relay status, active redundancy, redundancy management, fibre port status and fibre port activity		
Alarm relay			Power supply fault, Ethernet network fault or communication port fault (volt-free contact 1 A max. at 24 V ⎓)		
Reference			**TCS ESM 103F2LG0**		
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*(1) With **TCS EAA F1LFU00** fibre optic module to be ordered separately (see page 5/59).*
*(2) With **TCS EAA F1LFH00** fibre optic module to be ordered separately (see page 5/59).*
*(3) With **TCS EAA F1LFS00** fibre optic module to be ordered separately (see page 5/59).*

Managed switch, 8 ports and 2 Gigabit ports, copper twisted pair

8 x 10/100BASE-TX ports and 2 x 10/100/1000BASE-TX ports (Gigabit)
RJ45
Shielded twisted pair, category CAT 5E
100 m
–
LC
–
–
–
–
–
–
–
FDR, SMTP V3, SNTP client, multicast filtering for optimization of the Global Data protocol, configuration via Web access,VLAN, IGMP Snooping, RSTP *(Rapid Scanning Tree Protocol)*, priority port, data stream control, secure port
Unlimited
50 max.
Redundant power supplies, redundant single ring, ring coupling
9.6...60 V ⎓ /18…30 V ∼ safety extra low voltage (SELV)
8.3 W
6 terminals
0...+ 60°C
10…90% non-condensing
IP 20
111 x 131 x 111 mm
On symmetrical DIN rail, 35 mm wide
0.410 kg
cUL 60950, UL 508 and CSA 22.2 No. 142, UL 1604 and CSA 22.2 No. 213 class 1 division 2, CE, GL
Power supply status, alarm relay status, active redundancy, redundancy management, fibre port status and fibre port activity
Power supply fault, Ethernet network fault or communication port fault (volt-free contact 1 A max. at 24 V ⎓)

TCS ESM 103F23G0

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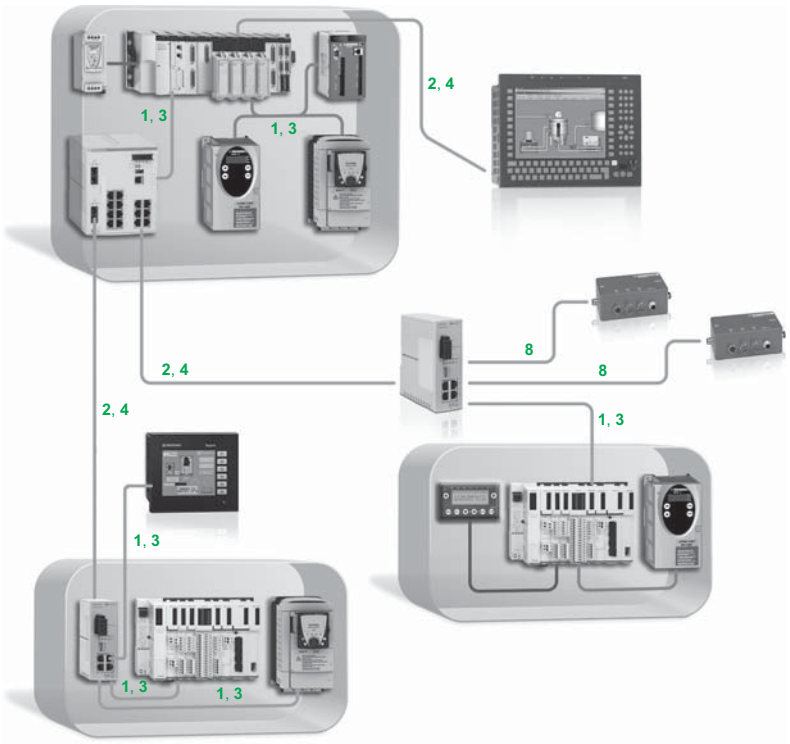
Ethernet network
Infrastructure

Presentation

Schneider Electric offers copper and fibre optic cables for connecting IP 20 and IP 67 Ethernet devices.

Examples

Mixed IP 20 and IP 67 wiring (copper)



Key:
1, **3** : Straight-through copper cables
2, **4** : Crossover copper cables
8 : Cables with IP 67 connector (see pages 5/58 and 5/59)

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Selection guide:
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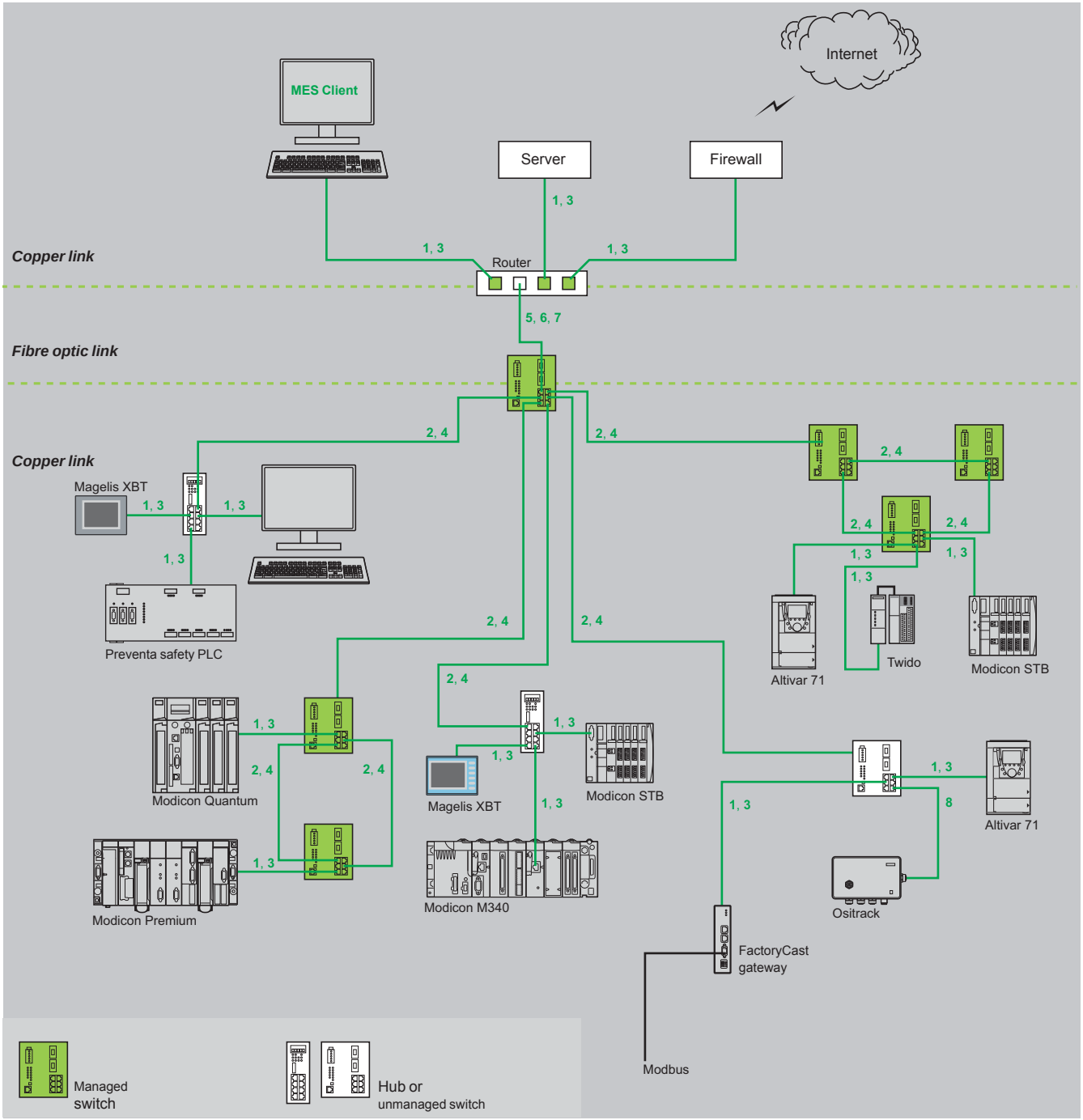
Ethernet network
Infrastructure

Examples (continued)
Mixed copper and fibre optic wiring



Key:
1, 3: Straight-through copper cables
2, 4 : Crossover copper cables
5, 6, 7 : Fibre optic cables
8 : Cables with IP 67 connector (see pages 5/58 and 5/59)

Selection guide:
page 5/42

Ethernet network
Wiring system
ConneXium connection components

Shielded copper connection cables

ConneXium shielded connection cables are available in two versions to meet the various current standards and approvals:

■ **EIA/TIA 568 shielded twisted pair cables for** CE market

These cables conform to:

□ EIA/TIA-568 standard, category CAT 5E

□ IEC 11801/EN 50173-1 standard, class D

Their fire resistance conforms to:

□ NF C32-070 standard, class C2

□ IEC 322/1 standards

□ Low Smoke Zero Halogen (LSZH)

■ **EIA/TIA 568 shielded twisted pair cables for UL market**

These cables are:

□ CEC type FT-1

□ NEC type CM

A new range of ConneXium fully shielded preassembled cables has been specially designed for use in harsh industrial environments. These cables combine a category 5E shielded cable and RJ45 connectors reinforced with a metal profile.

TCS EC● 3M3M●●S4

EIA/TIA 568 shielded twisted pair cables for CE market

Description	With connectors at both ends	No.	Type	Length	Reference	Weight kg
Straight-through copper cables CE compatible	2 x RJ45 connectors For connection to terminal equipment (DTE)	1	Standard	2 m	**490 NTW 000 02**	–
				5 m	**490 NTW 000 05**	–
				12 m	**490 NTW 000 12**	–
				40 m	**490 NTW 000 40**	–
				80 m	**490 NTW 000 80**	–
			Ruggedized	1 m	**TCS ECE 3M3M1S4**	–
				2 m	**TCS ECE 3M3M2S4**	–
				3 m	**TCS ECE 3M3M3S4**	–
				5 m	**TCS ECE 3M3M5S4**	–
				10 m	**TCS ECE 3M3M10S4**	–
Crossover copper cables CE compatible	2 x RJ45 connectors For connection between hubs, switches and transceivers	2	Standard	5 m	**490 NTC 000 05**	–
				15 m	**490 NTC 000 15**	–
				40 m	**490 NTC 000 40**	–
				80 m	**490 NTC 000 80**	–

Shielded twisted pair cables for UL market

Description	With connectors at both ends	No.	Type	Length	Reference	Weight kg
Straight-through copper cables UL compatible	2 x RJ45 connectors For connection to terminal equipment (DTE)	3	Standard	2 m	**490 NTW 000 02U**	–
				5 m	**490 NTW 000 05U**	–
				12 m	**490 NTW 000 12U**	–
				40 m	**490 NTW 000 40U**	–
				80 m	**490 NTW 000 80U**	–
			Ruggedized	1 m	**TCS ECU 3M3M1S4**	–
				2 m	**TCS ECU 3M3M2S4**	–
				3 m	**TCS ECU 3M3M3S4**	–
				5 m	**TCS ECU 3M3M5S4**	–
				10 m	**TCS ECU 3M3M10S4**	–
Crossover copper cables UL compatible	2 x RJ45 connectors For connection between hubs, switches and transceivers	4	Standard	5 m	**490 NTC 000 05U**	–
				40 m	**490 NTC 000 40U**	–
				80 m	**490 NTC 000 80U**	–

Do it Yourself copper cable and connectors

The ConneXium Do it Yourself offer consists of 2 references for connectors (M12 and RJ45) and 1 cable reference (300 m coil), enabling Ethernet 10/100 Mbps networks to be cabled in the field.
The maximum length of cables created in this way is 80 m.
They are quick to assemble using a knife and simple wire cutters (no special tools are required).

Description	Characteristics	Length	Reference	Weight kg
Ethernet copper cable 2 shielded twisted pairs 24 AWG	Conforms to the standards and approvals listed above	300 m	**CS ECN 300R2**	–
RJ45 connector	Conforms to EIA/TIA-568-D	–	**TCS EK3 MDS**	–
M12 connector	Conforms to IEC 60176-2-101	–	**TCS EK1 MDRS**	–

490 NOC 000 05

490 NOT 000 05

490 NOR 000 05

Glass fibre optic cables

Glass fibre optic cables are intended for connection:
- To terminal devices (DTE)
- Between hubs, transceivers and switches

Description	With connectors at both ends	No.	Length	Reference	Weight kg
Glass fibre optic cables	1 SC connector 1 MT-RJ connector	5	5 m	**490 NOC 000 05**	–
	1 ST (BFOC) connector 1 MT-RJ connector	6	5 m	**490 NOT 000 05**	–
	2 MT-RJ connectors	7	3 m	**490 NOR 000 03**	–
			5 m	**490 NOR 000 05**	–

Separate parts for TCS ESM and TCS ESB switches

Description	Optical fibre	Type	Reference	Weight kg
Fibre optic modules for Gigabit ports with LC connector *(1)*	Multimode 50/125 µm or 62.5/125 µm	1000BASE -SX	**TCS EAA F1LFU00**	0.040
	Single mode 9/125 µm	1000BASE -LH	**TCS EAA F1LFH00**	0.040
	Multimode 50/125 µm or 62.5/125 µm Single mode 62.5/125 µm	1000BASE -LX	**TCS EAA F1LFS00**	0.040

Description	Use	Port	Reference	Weight kg
Configuration backup key for TCS ESM switches	Connected on the front of the switch, used to: - Save and retrieve the switch configuration - Update the internal software	USB	**TCS EAM 0100**	–
Configuration backup key for TCS ESB switches		RJ45 (V24)	**TCS EAM 0200**	–

Connection components for IP 67 switch

Description	With connectors at both ends	No.	Length	Reference	Weight kg
Straight-through copper cables	1 x IP 67 4-way M12 connector and 1 x RJ45 connector	8	1 m	**TCS ECL 1M3M 1S2**	–
			3 m	**TCS ECL 1M3M 3S2**	–
			10 m	**TCS ECL 1M3M 10S2**	–
			25 m	**TCS ECL 1M3M 25S2**	–
			40 m	**TCS ECL 1M3M 40S2**	–
	2 x IP 67 4-way M12 connectors	–	1 m	**TCS ECL 1M1M 1S2**	–
			3 m	**TCS ECL 1M1M 3S2**	–
			10 m	**TCS ECL 1M1M 10S2**	–
			25 m	**TCS ECL 1M1M 25S2**	–
			40 m	**TCS ECL 1M1M 40S2**	–
Power supply cables	2 female M12 straight connectors	–	2 m	**XZC P1164L2**	–
			5 m	**XZC P1164L5**	–
	2 female M12 elbowed connectors	–	2.5 m	**XZC P1264L2**	–
			5 m	**XZC P1264L5**	–
	2 female M12 straight connectors	–	–	**XZC C12 FDM 50B**	–
	2 female M12 elbowed connectors	–	–	**XZC C12 FCM 50B**	–
M12/RJ45 adaptor	IP 67 4-way female M12 connector and female RJ45 connector	–	–	**TCS EAA F11F13F00**	–

(1) Dimensions: W x H x D = 20 x 18 x 50 mm

Selection guide:
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Ethernet network
Wiring system
ConneXium hub and transceiver

499 NEH 104 10

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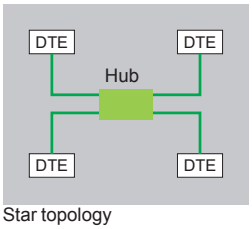
ConneXium hub

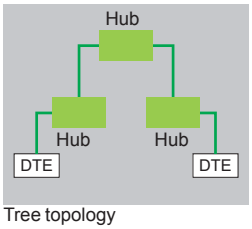
Presentation

Hubs *(concentrators)* are used for transmitting signals between several media (ports). Hubs are plug and play devices that do not need to be con gured by the user.

The use of hubs makes it possible to create the following topologies:
- Star topology
- Tree topology



Star topology



Tree topology

Reference

Description	Interfaces	Reference	Weight kg
ConneXium hub	4 x 10BASE-T ports (copper cable), RJ45 shielded connectors	**499 NEH 104 10**	0.530

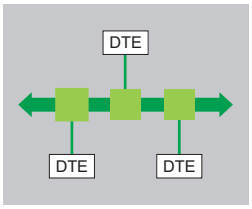
ConneXium transceiver

Presentation

ConneXium transceivers are used to:
- Create bre optic linear bus topologies, for devices with a twisted pair cable Ethernet connection
- Interface devices with a twisted pair cable Ethernet connection with a bre optic cable

Transceivers are plug and play devices that do not need to be con gured by the user.

ConneXium transceivers provide bre optic connections for transmission in areas subject to interference (high levels of electromagnetic interference) and for long distance communications.



Linear topology on optical bre

Selection guide:
page 5/42

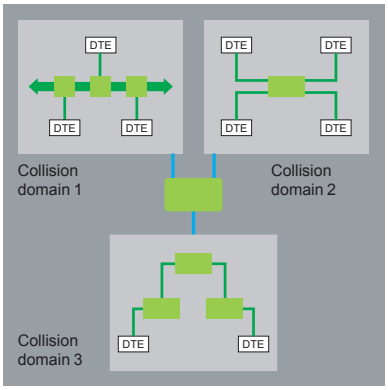
Ethernet network
Wiring system
ConneXium unmanaged switches

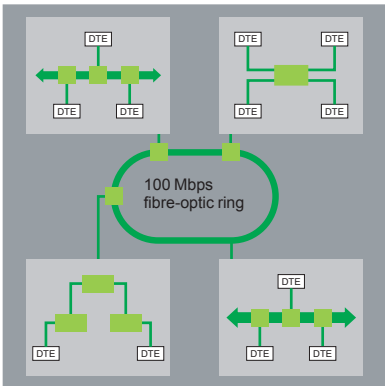
ConneXium unmanaged switches, twisted pair

Presentation

Switches are used to increase the limits of architectures based on hubs or transceivers, by separating collision domains.
Higher layer communication is provided between the ports, and collisions at link layer are not propagated (filtering).
They therefore improve performance by better allocation of the bandwidth due to the reduction of collisions and network load.
Certain ConneXium switch models also enable redundant architectures to be created on twisted pair copper ring or optical fibre.

Unmanaged switches are plug and play devices that do not need to be configured by the user. Certain models can also be managed remotely via SNMP or HTTP protocols for monitoring and diagnostic purposes.





TCS ESU 051F0

499 NES 181 00

Reference

Description	Interfaces	Reference	Weight kg
ConneXium unmanaged switches	5 x 10BASE-T/100BASE-TX ports (copper cable), shielded M12 type D connectors, IP67	**TCS ESU 051F0**	0.210
	8 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors, IP20	**499 NES 181 00**	0.230
	8 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors, IP30	**TCS ESU 083FN0**	0.246

Description	With connectors at both ends	Length	Reference	Weight kg
IP67 power supply cables *(for ConneXium switch **TCS ESU 051F0**)*	Female M12 straight connector	0.230 kg	**XZC P1164L2**	–
		5 m	**XZC P1164L5**	–
	Female M12 elbowed connector	2 m	**XZC P1264L2**	–
		5 m	**XZC P1264L5**	–
IP67 power supply connectors *(for ConneXium switch **TCS ESU 051F0**)*	Female M12 straight connector	–	**XZC C12 FDM 50B**	–
	Female M12 elbowed connector	–	**XZC C12 FCM 50B**	–

Selection guide:
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TCS ESU 053FN0

ConneXium unmanaged switches, 3, 4 and 5 ports, twisted pair and fibre optic

References

Description	Interfaces	Reference	Weight kg
ConneXium unmanaged switches	3 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors	**TCS ESU 033FN0**	0.113
	■ 4 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 1 x 100BASE-FX port (multimode optical fibre), duplex SC connector	**TCS ESU 043F1N0**	0.120
	5 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors	**TCS ESU 053FN0**	0.113

499 NMS 251 01

499 NSS 251 02

ConneXium unmanaged switches, 5 ports, twisted pair and fibre optic

Reference

Description	Interfaces	Reference	Weight kg
ConneXium unmanaged switches	■ 4 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 1 x 100BASE-FX port (multimode optical fibre), duplex SC connector	**499 NMS 251 01**	0.330
	■ 3 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 100BASE-FX ports (multimode optical fibre), duplex SC connector	**499 NMS 251 02**	0.335
	■ 4 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 1 x 100BASE-FX port (single mode optical fibre), duplex SC connector	**499 NSS 251 01**	0.330
	■ 3 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 100BASE-FX ports (single mode optical fibre), duplex SC connector	**499 NSS 251 02**	0.335

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Selection guide:
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TCS ESM 043F1CU0

TCS ESM 043F2CS0

ConneXium managed switches, 4 ports, twisted pair and fibre optic

References

Description	Interfaces	Reference	Weight kg
ConneXium managed switches	■ 3 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 1 x 100BASE-FX port (multimode optical fibre), duplex SC connector	**TCS ESM 043F1CU0**	0.400
	■ 2 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 100BASE-FX ports (multimode optical fibre), duplex SC connector	**TCS ESM 043F2CU0**	0.400
	■ 3 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 1 x 100BASE-FX port (single mode optical fibre), duplex SC connector	**TCS ESU 043F1CS0**	0.400
	■ 2 x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 100BASE-FX ports (single mode optical fibre), duplex SC connector	**TCS ESU 043F2CS0**	0.400

TCS ESM 083F23F0

ConneXium managed switches, 4 and 8 ports, twisted pair

References

Description	Interfaces	Reference	Weight kg
ConneXium managed switches	4 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors	**TCS ESM 043F23F0**	0.400
	8 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors	**TCS ESM 083F23F0**	0.410

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Selection guide:
page 5/42

TCS ESM 083F1CU0

TCS ESM 083F2CS0

TCS ESB 083F23F0

TCS ESM 063F2CS1

ConneXium managed switches, 8 ports, twisted pair and fibre optic

References

Description	Interfaces	Reference	Weight kg
ConneXium managed switches	■ 7 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 1 x 100BASE-FX port (multimode optical fibre), duplex SC connector	**TCS ESM 083F1CU0**	0.410
	■ 6 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 100BASE-FX ports (multimode optical fibre), duplex SC connector	**TCS ESM 083F2CU0**	0.410
	■ 7 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 1 x 100BASE-FX port (single mode optical fibre), duplex SC connector	**TCS ESM 083F1CS0**	0.410
	■ 6 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 100BASE-FX ports (single mode optical fibre), duplex SC connector	**TCS ESM 083F2CS0**	0.410

Basic ConneXium managed switches, 8 and 9 ports, twisted pair and fibre optic

References

Description	Interfaces	Reference	Weight kg
Basic ConneXium managed switches	8 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors	**TCS ESB 083F23F0**	0.400
	■ 6 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 100BASE-FX ports (multimode optical fibre), duplex SC connector	**TCS ESB 083F2CU0**	0.400
	■ 6 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 3 x 100BASE-FX ports (multimode optical fibre), duplex SC connector	**TCS ESB 093F2CU0**	0.400

ConneXium managed switches, 8 extended ports, twisted pair and fibre optic

References

Description	Interfaces	Reference	Weight kg
ConneXium managed switches	8 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors, IP30	**TCS ESM 083F23F1** *(1)*	1.000
	■ 6 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors, IP30 ■ 2 x 100BASE-FX ports (multimode optical fibre), duplex SC connector	**TCS ESM 063F2CU1** *(1)*	1.000
	■ 6 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors, IP30 ■ 2 x 100BASE-FX ports (single mode optical fibre), duplex SC connector	**TCS ESM 063F2CS1** *(1)*	1.000

(1) Available in Conformal Coating version. For this version, add the letter **C** *at the end of the reference. For example, the* **TCS ESM 083F23F1** *switch becomes* **TCS ESM 083F23F1C** *in the Conformal Coating version. For further information on treatments for harsh environments, see page 10/2 or consult our website www.schneider-electric.com.*

Ethernet network
Wiring system
ConneXium managed switches

TCS ESM 163F23F0

TCS ESM 243F2CU0

TCS ESM 103F2LG0

TCS ESM 103F23G0

TCS EFE C23FCF20

TCS EFE C2CF3F20

ConneXium managed switches, 16 and 24 ports, twisted pair and bre optic

References

Description	Interfaces	Reference	Weight kg
ConneXium managed switches	16 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors	**TCS ESM 163F23F0**	0.600
	■ 14 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 100BASE-FX ports (multimode optical bre), duplex SC connector	**TCS ESM 163F2CU0**	0.600
	■ 14 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 100BASE-FX ports (single mode optical bre), duplex SC connector	**TCS ESM 163F2CS0**	0.600
	■ 22 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 100BASE-FX ports (multimode optical bre), duplex SC connector	**TCS ESM 243F2CU0**	0.650

ConneXium managed switches, 8 ports and 2 Gigabit ports, twisted pair and bre optic

References

Description	Interfaces	Reference	Weight kg
ConneXium managed switches	■ 8 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 1000BASE-SX ports (multimode optical bre) *(1)*, or ■ 2 x 1000BASE-LH ports (single mode optical bre) (*2*), or ■ 2 x 1000BASE-LX ports (single mode and multimode optical bre) (*3*)	**TCS ESM 103F2LG0**	0.410
	■ 8 x 10/100BASE-TX ports (copper cable), RJ45 shielded connectors ■ 2 x 10/100/1000BASE-TX (Gigabit) ports (copper cable), RJ45 shielded connectors	**TCS ESM 103F23G0**	0.410

ConneXium industrial Ethernet rewalls

References

Description	Interfaces	Reference	Weight kg
ConneXium industrial Ethernet rewall TX/TX	2 TX ports (copper cable) for internal and external network connections	**TCS EFE C23F3F20**	0.600
ConneXium industrial Ethernet rewall TX/MM	1 TX port (copper cable) for internal network and 1 FX port (multimode optical ber) *(1)* for external network connections	**TCS EFE C23FCF20**	0.600
ConneXium industrial Ethernet rewall MM/TX	1 FX port for internal network (multimode optical ber) *(1)* and 1 TX port (copper cable) *(2)* for external network connections	**TCS EFE C2CF3F20**	0.630

(1) With **TCS EAA F1LFU000** *fibre optic module to be ordered separately (see page 5/59)*
(2) With **TCS EAA F1LFH000** *fibre optic module to be ordered separately (see page 5/59)*
(3) With **TCS EAA F1LFS000** *fibre optic module to be ordered separately (see page 5/59)*

Selection guide:
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Wi-Fi network
Wi-Fi Access Points and Clients

Device type		Wi-Fi 802.11g Access Point	FCC Wi-Fi 802.11g Access Point
Description		Dual band industrial Wi-Fi LAN Access Point/ Client with two independent radio modules based on IEEE 802.11a/b/g/h/i	Dual band industrial Wi-Fi LAN Access Point/ Client with two independent radio modules based on IEEE 802.11a/b/g/h/i. With FCC approval for USA and Canada.
Type		Access point and Client	
Wi-Fi standards		IEEE 802.11a/b/g/h/i	
Operating frequencies		2.4 GHz and 5 GHz	
Degree of protection		IP 40	
Regional approvals		–	FCC
Mounting		DIN rail	
Number of radios		2	
Nominal data rate		54 Mbps	
Antenna connections		4 x RP-SMA	
Ethernet connections		2 x 10/100BASE-TX	
Wi-Fi connections		2 x WLAN interfaces, 8 SSIDs per interface *(1)*	
Range		Up to 20 km with external antenna (frequency range and data rate dependent on type of antenna)	
Dimensions		80 x 100 x 135 mm	
Operating temperature		-30°C to +50°C	
Storage temperature		-40°C to +70°C	
Humidity		Max. 95% (non-condensing)	
Power supplies		2 x 24 V ⎓; 12 V ⎓ , redundant capable 2 x PoE per IEEE802.3af, redundant capable *(2)*	
Consumption		12 V ⎓: 625 mA; 24 V ⎓: 417 mA PoE (48 V ⎓): 167 mA *(2)*	
Agency certifications	Safety	EN 60950	
	Radio	EN 300328, EN 301893, notified in all EU countries	FCC identifier: U99BAT54RAIL, IC certification number: 4019A-BAT54R
	Environment	EN 61131 for operation in automation environment. EMC test documentation for E1 certification (cars and vehicles) available	
References		**TCSG WA 242** *(3)*	**TCSG WA 242F** *(3)*
Pages		5/76	

(1) SSID: Service Set IDentifier
(2) PoE: Power over Ethernet
(3) All TCSG ●● ●●●● products are supplied with 2 pen-type antennas

Wi-Fi 802.11g Access Point IP67	Wi-Fi 802.11g Client
Dual band industrial Wi-Fi LAN Access Point/Client with two independent radio modules based on IEEE 802.11a/b/g/h/i. For installation in harsh environment, IP 67 rated.	Single band industrial Wi-Fi LAN Client with one radio module based on IEEE 802.11a/b/g/h/i
Access point and Client	Client only
IEEE 802.11a/b/g/h/i	
2.4 GHz and 5 GHz	
IP 67	IP 40
–	–
Wall/mast	DIN rail
2	1
54 Mbps	
4 x N-type	4 x RP-SMA
1 x 10/100BASE-TX	
2 x WLAN interfaces, 8 SSIDs per interface *(1)*	1 x WLAN interface
Up to 20 km with external antenna (frequency range and data rate dependent on type of antenna)	
261 x 189 x 55 mm	80 x 100 x 135 mm
-30°C to +55°C	
-40°C to +70°C	
Max. 95% (non-condensing)	
2 x 24 V ⎓; 12 V ⎓ , redundant capable 2 x PoE per IEEE802.3af, redundant capable *(2)*	2 x 24 V ⎓; 12 V⎓ , redundant capable 1 x PoE per IEEE802.3af *(2)*
12 V ⎓: 625 mA; 24 V ⎓: 417 mA PoE (48 V ⎓): 167 mA *(2)*	
EN 60950	
EN 300328, EN 301893, notified in all EU countries	
EN 61131 for operation in automation environment. EMC test documentation for E1 certification (cars and vehicles) available	
TCSN WA 272 *(3)*	**TCSG WC 241** *(3)*
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Wi-Fi network
Wi-Fi Access Points and Clients

Device type		Wi-Fi 802.11n Access Point	FCC Wi-Fi 802.11n Access Point
Description		Dual band industrial high performance Wi-Fi LAN Access Point/Client with one radio module based on IEEE 802.11n (draft 2.0).	Dual band industrial high performance Wi-Fi LAN Access Point/Client with one radio module based on IEEE 802.11n (draft 2.0). With FCC approval for USA and Canada.
Type		Access point and Client	
Wi-Fi standards		IEEE 802.11a/b/g/h/n	
Operating frequencies		2.4 GHz and 5 GHz	
Degree of protection		IP 40	
Regional approvals		–	FCC
Mounting		DIN rail	
Number of radios		1	
Nominal data rate		300 Mbps	
Antenna connections		3 x RP-SMA	
Ethernet connections		2 x 10/100BASE-TX	
Wi-Fi connections		1 x WLAN interface, 8 SSIDs per interface *(1)*	
Range		Up to 20 km with external antenna (frequency range and data rate dependent on type of antenna)	
Dimensions		80 x 100 x 135 mm	
Operating temperature		-30°C to +50°C	
Storage temperature		-40°C to +70°C	
Humidity		Max. 95% (non-condensing)	
Power supplies		2 x 24 V ⎓; 12 V ⎓ , redundant capable 2 x PoE per IEEE802.3af, redundant capable *(2)*	
Consumption		2 V ⎓ 1: 625 mA; 24 V ⎓: 417 mA PoE (48 V ⎓): 167 mA *(2)*	
Agency certifications	Safety	EN 60950	
	Radio	EN 300328, EN 301893, notified in all EU countries	Certifications for FCC
	Environment	EN 61131 for operation in automation environment	
References		**TCSN WA 241** *(3)*	**TCSN WA 241** *(3)*
Pages		5/76	

(1) SSID: Service Set IDentifier
(2) PoE: Power over Ethernet
(3) All TCSN ●● ●●●● products are supplied with 3 pen-type antennas

IP67 Wi-Fi 802.11n Access Point	FCC IP67 Wi-Fi 802.11n Access Point	ATEX IP67 Wi-Fi 802.11n Access Point
Dual band industrial high performance Wi-Fi LAN Access Point/Client with one radio module based on IEEE 802.11n (draft 2.0). For installation in harsh environment, IP 67 rated.	Dual band industrial high performance Wi-Fi LAN Access Point/Client with one radio module based on IEEE 802.11n (draft 2.0). For installation in harsh environment, IP 67 rated. With FCC approval for USA and Canada.	Dual band industrial high performance Wi-Fi LAN Access Point/Client with one radio module based on IEEE 802.11n (draft 2.0). For installation in harsh environment, IP 67 ATEX Zone II rated. With FCC approval for USA and Canada.
Access point and Client		
IEEE 802.11a/b/g/h/n		
2.4 GHz and 5 GHz		
IP 67		IP 67 ATEX
–	FCC	–
Wall/mast		
1		
300 Mbps		
3 x N-type		
2 x 10/100BASE-TX		
1 x WLAN interface, 8 SSIDs per interface *(1)*		
Up to 20 km with external antenna (frequency range and data rate dependent on type of antenna)		
261 x 189 x 55 mm		
-30°C to +55°C		
-40°C to +70°C		
Max. 95% (non-condensing)		
2 x 24 V ⎓, redundant capable 2 x PoE per IEEE802.3af, redundant capable *(2)*		
24 V ⎓: 417 mA PoE (48 V ⎓): 167 mA *(2)*		
EN 60950		
EN 300328, EN 301893, notified in all EU countries		
EN 61000-6-2, EN 61131 EN 50155 (draft) E1 (draft)	EN 61131 for operation in automation environment	EN 61000-6-2, EN 61131 ATEX Zone II
TCSN WA 271 *(3)*	**TCSN WA 271F** *(3)*	**TCSN WA 2A1** *(3)*
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Wi-Fi network
Wi-Fi antennas

Device type		Dual band antennas	
Description		Dual band hemispherical antenna	5 GHz Very directional antenna
Frequency range		2300 - 2500 MHz 4900 - 5935 MHz	5150 - 5250 MHz 5250 - 5350 MHz 5350 - 5725 MHz 5725 - 5875 MHz
Antenna gain		6 dBi at 2.4 GHz 8 dBi at 5 GHz	18 dBi 19 dBi 18.5 dBi 18 dBi
VSWR *(1)*		1.8	1.5
Polarization		Linear, vertical	
Horizontal HPBW *(2)*		360° at 2.4 GHz	18°
Vertical HPBW *(2)*		173° at 5 GHz	18°
Max. power		75 W (cw) at 25°C	6 W (cw)
Impedance		50 Ω	
Connector		N female	N female
Operating temperature		-40°C to +80°C	-45°C to +70°C
Storage temperature		-40°C to +80°C	-45°C to +70°C
Radome colour		RAL 7044 (Silk grey)	7035 (Light grey)
Radome material		LEXAN EXL 9330	Plastic
Weight		0.3 kg	0.107 kg
Dimensions		Ø 86 x 43 mm	190 x 190 x 30.5 mm
Wind load		10 N at 160 km/h	104 N at 216 km/h
Degree of protection		IP 65	IP 65/IP 67
Shipping package contents	Cordset/cable	1 m cable with N male connectors at both ends	
	Adaptor cable	Adaptor cable, R-SMA male connector to N female connector	
	Mounting kit	–	Yes
Access point/client compatibility		TCSG ●● ●●●●	
References		**TCS WAB DH**	**TCS WAB 5V**
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(1) VSWR: Voltage Standing Wave Ratio
(2) HPBW: Half Power BeamWidth

Dual band antenna

Dual band omnidirectional 11n antenna
2400 - 2500 MHz 5150 - 5875 MHz
3.5 dBi 5.5 dBi
1.8
3 x linear, vertical
360°
–
2 W
50 Ω
3 x N male, 1 m cable directly attached to antenna
-40°C to +80°C
-40°C to +80°C
7035 (Light grey)
Plastic
0.3 kg
310 x 110 x 40 mm
–
IP 65
3 x 90 cm cordsets directly attached to antenna, with N male connector
3 x adaptor cables, R-SMA male connector to N female connector
Yes
TCSN ●● ●●●●

TCS WAB DON

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Wi-Fi network
Wi-Fi antennas

Device type		5 GHz antennas	
Description		5 GHz omnidirectional antenna	5 GHz dual slant antenna
Frequency range		5150 - 5875 MHz	5150 - 5925 MHz
Antenna gain		5 dBi	9 dBi
VSWR *(1)*		1.5	2
Polarization		Linear, vertical	2 x linear, ± 45° slant
Horizontal HPBW *(2)*		360°	70°
Vertical HPBW *(2)*		25°	60°
Max. power		6 W	10 W (cw) at 25°C
Impedance		50 Ω	
Connector		N female	2 x N female
Operating temperature		-45 °C to +70 °C	-40°C to +80°C
Storage temperature		-45 °C to +70 °C	-40°C to +80°C
Radome colour		Grey-white	RAL 7044 (Silk grey)
Radome material		Polypropylene	ASA, LEXAN EXL 9330
Weight		0.300 kg	0.110 kg
Dimensions		16 x 160 mm	101 x 80 x 35 mm
Wind load		–	15 N at 160 km/h
Degree of protection		IP 65	
Shipping package contents	Cordset/cable	1 m cordset with N male connectors at both ends	2 x 1 m cordsets with N male connectors at both ends
	Adaptor cable	Adaptor cable, R-SMA male connector to N female connector	2 x adaptor cables, R-SMA male connector to N female connector
	Mounting kit	Yes	
Access point/client compatibility		TCSG ●● ●●●●	TCSG ●● ●●●● TCSN ●● ●●●●
References		**TCS WAB 5O**	**TCS WAB 5S**
Pages		5/76	

(1) VSWR: Voltage Standing Wave Ratio
(2) HPBW: Half Power BeamWidth

5 GHz antennas

5 GHz MiMo directional 11n antenna *(3)*	5 GHz Medium directional antenna	5 GHz Very directional 11n antenna
5150 - 5875 MHz	5150 - 5250 MHz 5250 - 5350 MHz 5350 - 5725 MHz 5725 - 5875 MHz	5150 - 5875 MHz
9 dBi	18 dBi 19 dBi 18.5 dBi 18 dBi	23 dBi
1.5	1.5	< 1.7
3 x linear vertical/horizontal/+45°	Linear, vertical	Dual linear, vertical and horizontal
65°	18°	9°
65°	18°	9°
2 W (cw) at 25°C	6 W (cw)	6 W
50 Ω		
N female	N female	2 x N female
-40°C to +80°C	-45°C to +70°C	
-40°C to +80°C	-45°C to +70°C	
RAL 7044 (Silk grey)	7035 (Light grey)	Grey-white
LEXAN EXL 9330	Plastic	
0.110 kg	0.107 kg	2.5 kg
101 x 80 x 35 mm	190 x 190 x 30.5 mm	371 x 371 x 40 mm
15 N at 160 km/h	–	264 N at 220 km/h
IP 65	IP 65/IP 67	
3 x 1 m cordsets with N male connectors at both ends	1 m cordset with N male connectors at both ends	2 x 1 m cordsets with N male connectors at both ends
3 x adaptor cables, R-SMA male connector to N female connector	Adaptor cable, R-SMA male connector to N female connector	2 x adaptor cables, R-SMA male connector to N female connector
Yes		
TCSN ●● ●●●●	TCSG ●● ●●●●	TCSG ●● ●●●● TCSN ●● ●●●●
TCS WAB 5DN	**TCS WAB 5D**	**TCS WAB 5VN**

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(3) MiMo: Multiple-Input Multiple-Output

Wi-Fi network
Wi-Fi antennas

Device type		2.4 GHz antennas		
Description		2.4 GHz omni directional antenna	2.4 GHz directional antenna	2.4 GHz dual slant antenna
Frequency range		2400 - 2500 MHz	2300 - 2500 MHz	2400 - 2485 MHz
Antenna gain		6.0 dBi	14 dBi	8 dBi
VSWR *(1)*		< 1.8	1.5	
Polarization		Linear, vertical	Vertical	Dual linear, ± 45° slant
Horizontal HPBW *(2)*		360°	35°	75°
Vertical HPBW *(2)*		–	30°	70°
Max. power		25 W	75 W (CW) at 25 °C	10 W (CW) at 25 °C
Impedance		50 Ω		
Connector		N female		2 x N female
Operating temperature		-40°C to +80°C		
Storage temperature		-40°C to +80°C		
Radome colour		Grey-white	RAL 7044 (Silk grey)	
Radome material		Fibreglass	LEXAN EXL 9330	
Weight		0.340 kg	0.110 kg	
Dimensions		Ø 22 mm x 250 mm	101 x 80 x 35 mm	
Wind load		–	15 N at 160 km/h	
Degree of protection		IP 65	IP 23	IP 65
Shipping package contents	Cordset/cable	1 m cordset with N male connectors at both ends		2 x 1 m cordsets with N male connectors at both ends
	Adaptor cable	Adaptor cable, R-SMA male connector to N female connector		2 x adaptor cables, R-SMA male to N female
	Mounting kit	Yes		
Access point/client compatibility		TCSG ●● ●●●●	TCSG ●● ●●●●	TCSG ●● ●●●● TCSN ●● ●●●●
References		**TCS WAB 2O**	**TCS WAB 2D**	**TCS WAB 2S**
Pages		5/76	5/77	

(1) VSWR: Voltage Standing Wave Ratio
(2) HPBW: Half Power BeamWidth

Cable antennas

2.4 GHz Leaky cable, 50 m	2.4 GHz Leaky cable, 100 m
2000 - 2900 MHz	
0.15 dB at 2.4 GHz	
–	
–	
–	
–	
–	
–	
2 x N male	
-40°C to +85°C	
-70°C to +85°C	
–	
–	
12 kg	24 kg
50 m, Ø 15 mm	100 m, Ø 15 mm
–	
IP 65	
50 m cable with N male connectors at both ends	100 m cable with N male connectors at both ends
–	
1 x 50 Ohm terminator, 50 fastening clips (mounting on flat surface)	
TCSG ●● ●●●●	

TCS WAB C5	TCS WAB C10
5/77	

Wi-Fi network
Wi-Fi Access Points and Clients

TCSG WA 242

TCSN WA 241

TCSN WA 271

5

TCS WAB DH

TCS WAB 5DN

TCS WAB 5D

TCS WAB 2O

References

Wi-Fi Access Points and Clients

Description	Number of radios	Data rate	Degree of protection	Country approvals	Reference	Weight
		Mbps				kg
Wi-Fi 802.11g Access Point	2	54	IP 40	–	**TCSG WA 242**	–
FCC Wi-Fi 802.11g Access Point	2	54	IP 40	US and Canada	**TCSG WA 242F**	–
IP 67 Wi-Fi 802.11g Access Point	2	54	IP 40	–	**TCSG WA 272**	–
Wi-Fi 802.11g Client	1	54	IP 40	–	**TCSG WC 241**	–
Wi-Fi 802.11n Access Point	1	300	IP 40	–	**TCSN WA 241**	–
FCC Wi-Fi 802.11n Access Point	1	300	IP 40	US and Canada	**TCSN WA 241F**	–
IP 67 Wi-Fi 802.11n Access Point	1	300	IP 67	–	**TCSN WA 271**	–
FCC IP 67 Wi-Fi 802.11n Access Point	1	300	IP 67	US and Canada	**TCSN WA 271F**	–
IP 67 ATEX Wi-Fi 802.11n Access Point	1	300	IP 67 ATEX	–	**TCSN WA 2A1**	–

Wi-Fi antennas

Description	Frequency range	Gain	Degree of protection	Reference	Weight
	MHz	dBi			kg
Dual band hemispherical antenna	2300 - 2500	6	IP 65	**TCS WAB DH**	0.300
	4900 - 5935	8			
5 GHz Very directional antenna	5150 - 5250	18	IP 67/IP 65	**TCS WAB 5V**	0.107
	5250 - 5350	19			
	5350 - 5725	18.5			
	5725 - 5875	18			
Dual band omnidirectional 11n antenna	2400 - 2500	3.5	IP 65	**TCS WAB DON**	0.300
	5150 - 5875	5.5			
5 GHz omnidirectional antenna	5150 - 5875	5	IP 65	**TCS WAB 5O**	0.300
5 GHz dual slant antenna	5150 - 5925	9	IP 65	**TCS WAB 5S**	0.110
5 GHz MiMo 11n directional antenna	5150 - 5875	9	IP 65	**TCS WAB 5DN**	0.110
5 GHz Medium directional antenna	5150 - 5250	18	IP 67/IP 65	**TCS WAB 5D**	0.107
	5250 - 5350	19			
	5350 - 5725	18.5			
	5725 - 5875	18			
5 GHz Very 11n directional antenna	5150 - 5875	23	IP 67/IP 65	**TCS WAB 5VN**	2.500
2.4 GHz omnidirectional antenna	2400 - 2500	6	IP 65	**TCS WAB 2O**	0.340

Wi-Fi Access Points and Clients selection guide: page 5/66

Wi-Fi antenna selection guide: page 5/70

Wi-Fi network
Wi-Fi antennas, cables and accessories

TCS WAB 2D

TCS WAB C5

Wi-Fi antennas (continued)

Description	Frequency range MHz	Gain	Degree of protection	Reference	Weight kg
2.4 GHz directional antenna	2300 - 2500	14 dBi	IP 23	**TCS WAB 2D**	0.110
2.4 GHz dual slant antenna	2400 - 2485	8 dBi	IP 65	**TCS WAB 2S**	0.110
2.4 GHz Leaky cable, 50 m	2000 - 2900	0.15 dB at 2.4 GHz	IP 65	**TCS WAB C5**	12.000
2.4 GHz Leaky cable, 100 m	2000 - 2900	0.15 dB at 2.4 GHz	IP 65	**TCS WAB C10**	24.000

TCS WAAC

TCS WABAC2

Cables

Description	Type	Length m	Reference	Weight kg
Adaptor cable	1 RP-SMA male connector 1 N female connector	0.520	**TCS WAAC**	0.340
Adaptor cable N-plug to N-jack, 2 m	1 N female connector 1 N male connector	2.000	**TCS WABAC2**	0.340
Adaptor cable N-plug to N-jack, 15 m	1 N female connector 1 N male connector	15.000	**TCS WABAC15**	0.340

TCS WABP

TCS WAMCD

TCS WABMK

Accessories

Description	Degree of protection	Type	Cable length m	Reference	Weight kg
Overvoltage protector for antennas	–	N female, N male	–	**TCS WABP**	0.080
Overvoltage protector for LAN/PoE	IP 68	N female, N male	–	**TCS WABP68**	0.080
Memory card modules *(1)*	IP 40	Mini-DIN connector	0.315	**TCS WAMC67**	0.035
	IP 67	M12 connector	0.500	**TCS WAMCD**	0.025
Adaptor kit for pole mounting	–	–	–	**TCS WABMK**	–

(1) Auto-configuration adaptors which are used to save 2 different versions of the configuration and operating program data for the Wi-Fi access point to which it is connected. They enable managed Wi-Fi access points to be easily commissioned and quickly replaced.

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Wi-Fi Access Points and Clients selection guide: page 5/66
Wi-Fi antenna selection guide: page 5/70

Modicon Quantum automation platform

AS-Interface cabling system

Master module for Modicon Quantum PLCs

Presentation

The AS-Interface (actuator sensor interface) system is a cabling solution used in machine level automated systems instead of conventional parallel wiring. This serial interface consists of an unshielded non-twisted pair enabling communication with user devices (sensors and actuators) provided with internal intelligence.

The 140 EIA 921 00 AS-Interface module for Modicon Quantum PLCs is a single-slot module with one AS-Interface channel. The Quantum I/O map interface makes the module usable in local, remote (RIO) and distributed (DIO) I/O drops.

Network media and topology

The AS-Interface line uses an unshielded 2-wire cable for data and power distribution. The protocol is based on a master/slave hierarchy and allows up to 31 slaves to be connected to a single network over a maximum distance of 100 metres. This length can be increased through the use of repeaters.

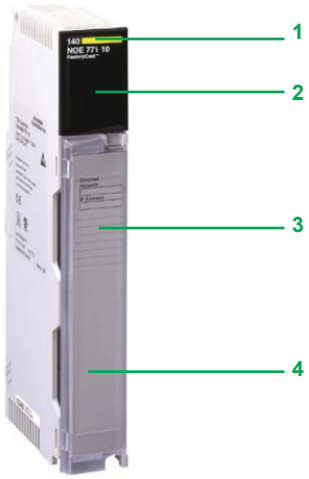
The 140 EIA 921 00 master module supports the AS-Interface M2 *(AS-Interface V1),* profile, one of the simplest to use. It is designed to meet the requirements of actuator and sensor devices where the connection cost is high and there is a relatively small amount of data to be handled.

The topology of the AS-Interface line is totally flexible and can be adapted to users' requirements (point-to-point, line or tree structure topology). In all cases, the total length of all branches of the line must not exceed 100 metres (without using repeaters).

The AS-Interface cable consists of one unshielded non-twisted pair enabling simultaneous powering of and communication with the connected devices. The wire has a cross-section of between 1.5 and 2.5 mm^2 depending on the power consumption of the devices.

Functions of the Modicon Quantum AS-Interface module

- Compatible with all Quantum CPUs
- Module parameter setup using Unity Pro, Concept 2.6 or ProWORX 32 software
- The Quantum I/O map interface allows 4 modules per local drop, 4 per remote drop (RIO) and 2 per distributed I/O drop (DIO)
- Display block of 32 LED indicators displays slave addresses and the state of slave I/O bits
- Hot swap function available without damage for all Quantum I/O racks
- Protected against reverse polarity of AS-Interface line inputs
- Less commissioning time and increased diagnostic capability reduces the overall cost of an automated system
- Automatic device reconfiguration (addresses and parameters)



Description

The **140 EIA 921 00** AS-Interface module consists of the following:

1 Type and colour code
2 Display block of 32 LED indicators
3 Removable hinged door
4 3-way male SUB-D connector for AS-Interface cable connection

Modicon Quantum automation platform

AS-Interface cabling system

Master module for Modicon Quantum PLCs

140 EIA 921 00

XZ CB1●●01

References

Description	Number per Quantum PLC	Profile	Max. number of I/O	Reference	Weight kg
AS-Interface master module for Quantum PLCs	4 per local drop 4 per remote drop (RIO) 2 per distributed drop (DIO)	AS-Interface M2	31 discrete devices, i.e. 248 I/O	**140 EIA 921 00**	0.450

Separate parts

Description	Use	Length	Reference	Weight kg
AS-Interface line ribbon cables (yellow)	For AS-Interface line	20 m	**XZ CB 10201**	1.400
		50 m	**XZ CB 10501**	3.500
		100 m	**XZ CB 11001**	7.000

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Modicon Quantum automation platform
Modbus Plus network

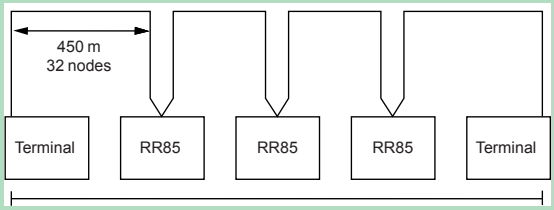
Presentation

All Quantum **140 CPUs** contain a Modbus Plus port, allowing high-speed point-to-point communications with easy implementation designed to simplify data sharing between nodes across a network. The Modbus Plus local area network facilitates communications between CPUs, host computers and other data sources via twisted pair cable or optional optical fibre cable. Communications take place at a speed of 1 Mbps.

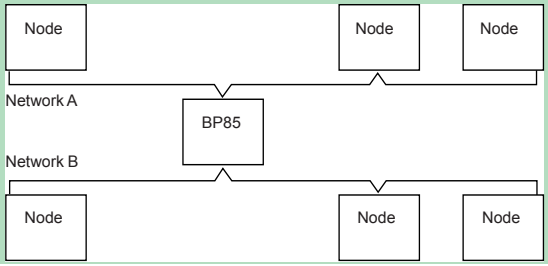
Typical applications include interlocking on control networks, data acquisition, uploading/downloading software, remote online programming, connecting to operator interfaces and host computer data exporting. Modbus Plus is able to handle communications for real-time systems such as I/O and variable speed drives.

Topology

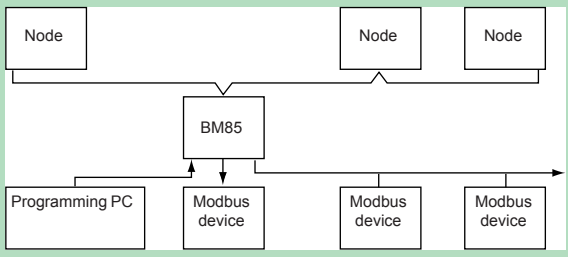
A standard Modbus Plus network based on twisted pair cable supports up to 32 nodes and can communicate over distances up to 450 m. If an application requires more nodes or longer distances, an RR85 Modbus Plus repeater placed between network connections allows 64 addresses over a distance of up to 900 m. As many as three repeaters can be used, supporting distances of up to 1800 m. The maximum number of network addresses supported is 64.



If an application requires more than 64 nodes, a BP85 Modbus Plus gateway can be used to connect two Modbus Plus networks. Bridges can be used to interconnect network segments in order to achieve maximum performance.



When a Modbus device, such as a programming terminal, operator interface or third-party computer, requires access to data from a Modbus Plus network, a BM85 Modbus Plus gateway must be used. The Modbus Plus BM85 gateway has four Modbus-compatible RS 232 serial ports, enabling a Modbus master or Modbus slave to connect to a Modbus Plus network. The gateway connections allow data exchanges between Modbus devices and with the entire Modbus Plus network.



Modicon Quantum automation platform
Modbus Plus network

Presentation (continued)

The application program allows event-initiated communications and incorporates network diagnostics using either instructions in MSTR 984LL language or an equivalent function in an IEC 1131 language. A central computer can implement the Modbus Plus protocol, with NetBios-compatible software libraries that are called by this computer's application program. Appropriate libraries are provided for each type of computer interface, for the majority of platforms and operating systems.

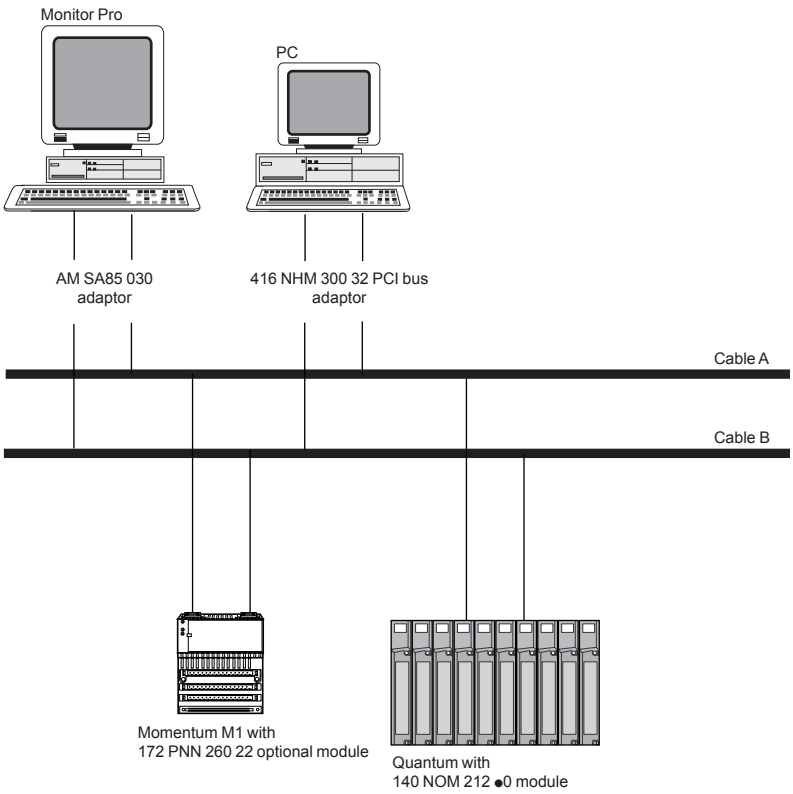
Setup

Modbus Plus is a standalone network that uses inexpensive twisted-pair cables. It is a plug and play network. Modbus Plus connectivity is available on a great variety of PLC families, with additional connectivity made possible through our Collaborative Automation Partner Program. Modbus Plus supports up to 20,000 registers per second in a predictable, deterministic manner. Modbus Plus functions are based on a global database and a data table exchange mechanism.

Diagnostic programs and visual LED indicators are an aid to network operation.

Redundant cables

For high-availability applications, Schneider Automation offers a series of Modbus Plus network components and options for redundant operations. The redundant cabling enables Modbus Plus communication over two independent cable systems, with link health being checked and validated on every message transfer. A faulty link is identified in the network statistics. If one link fails, for any reason whatsoever, the system will automatically switch to the other cable while the faulty link is repaired.



Modicon Quantum automation platform
Modbus Plus network

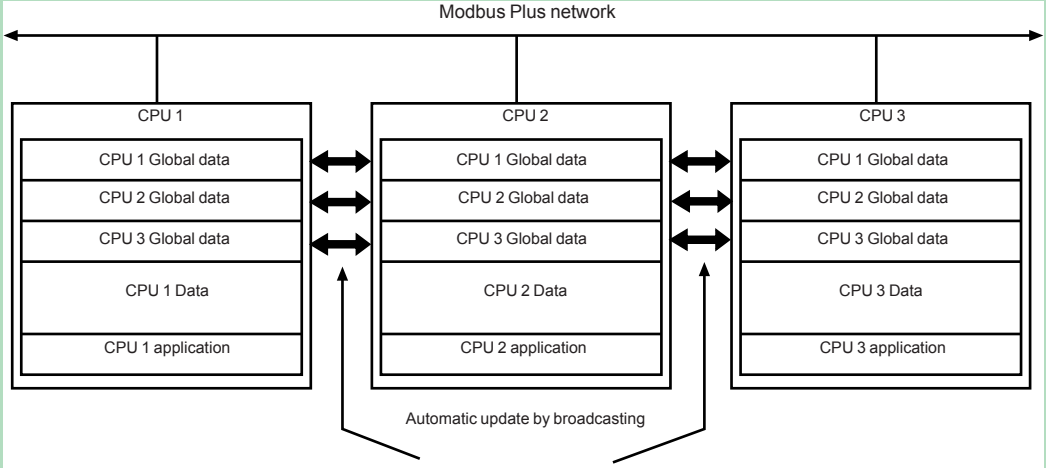
Global database

The global database allows global variables to be shared across a Modbus Plus network of PLCs. Because the global database is broadcast, this global information is updated extremely quickly.

Each CPU has up to 32 global data registers; Modbus Plus nodes can support 2048 global data registers (32 registers x 64 CPUs). Each of up to 64 CPUs on the network is responsible for updating its own 32 global data registers using an MSTR instruction. Each CPU also has the ability to read the 32 global data registers of all the other CPUs on the network. When a CPU updates its global data, this information is automatically broadcast to all other CPUs on the network. Each receiving CPU collects the new global data and stores them in its network interface memory. A CPU wishing to access another node's global data actually extracts them from its own network interface.

The global database works only within the same segment of the Modbus Plus network. It cannot be transmitted via an NW BMB5 C00● multiplexer gateway or an NW BP85 002 gateway.

Global data structure



Peer Cop

Peer Cop is a software utility accessible under Unity Pro, Concept or ProWORX and Concept and can be used to define point-to-point data transactions between a CPU and the other nodes on the Modbus Plus network. Peer Cop uses defined references (bits or registers) as source and destination. A block of registers can therefore constitute the data source on the sending node, and another block of registers can be the destination on the receiving device. A maximum of 32 words can be addressed on a CPU via Peer Cop (a 16-channel discrete module is equivalent to one word).

Peer Cop offers two methods of data transaction - global and specific. Because all Modbus Plus nodes monitor the network, any one of them can extract the data addressed specifically to it. Likewise, all nodes can extract global data. Peer Cop enables the Modbus Plus node currently holding the token to direct specific data to particular nodes and broadcast global data to all nodes as part of its token frame. Each sending node can specify particular references as data sources, and each receiving node can specify the same or different references as data targets. When nodes receive global data, each node can index to specific locations in the incoming data and extract specific lengths of data from those points. Data transactions can therefore take place quickly as part of the token rotation and can be set up between sending references and receiving references.

Network and data security are obtained with the CPU's write-protect feature. It is therefore possible to configure sections of references within the CPU as read-only so that those references cannot be written by a node on the network.

Peer Cop, like the global database, works only within a segment of the Modbus Plus network.

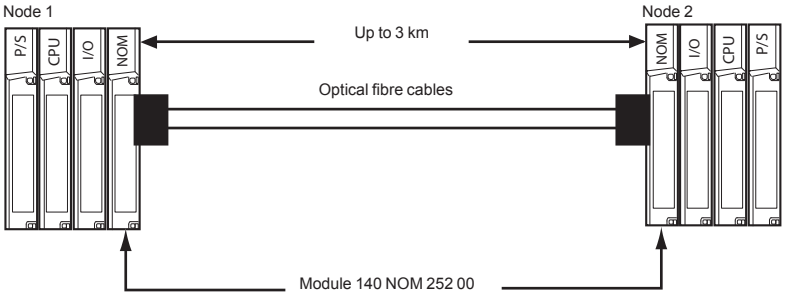
Modicon Quantum automation platform
Modbus Plus network

Optical fibre network

Optional optical fibre cabling is available for a Modbus Plus network. With optical fibre, the total length of the network can be increased to as much as 3 km. The optical fibre medium provides secure links, which may be necessary in certain harsh environments. Optical fibre cabling is not susceptible to the effects of electromagnetic interference, RF interference or lightning. It also provides total isolation between terminal points on the link.

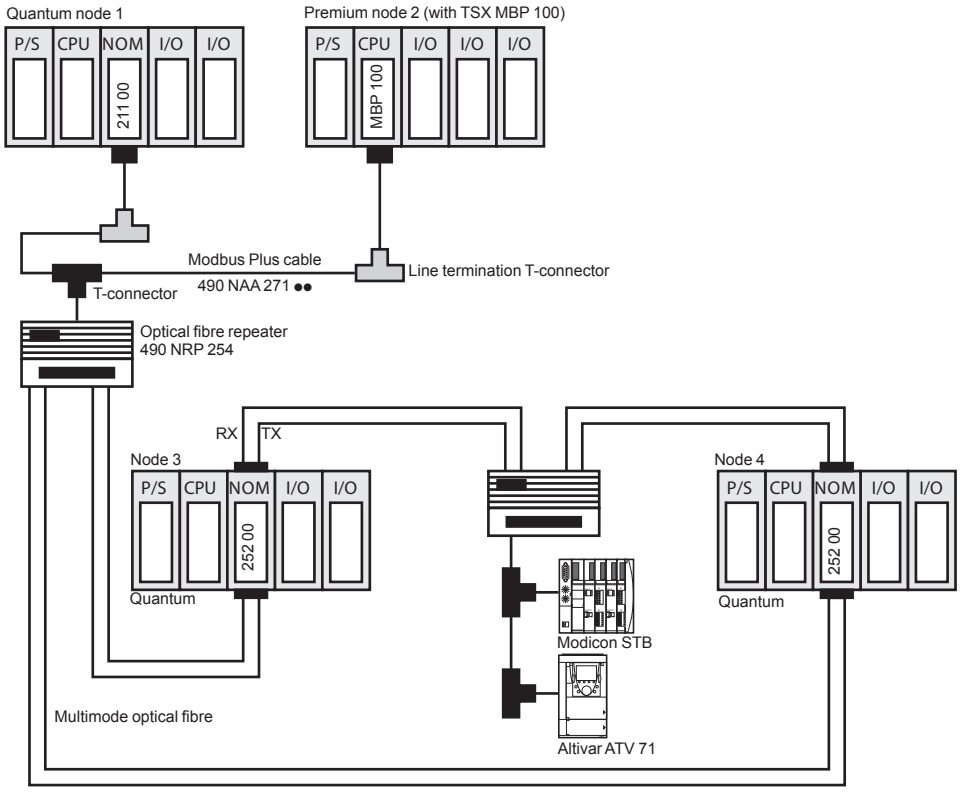
Point-to-point topology

A point-to-point link between CPUs on a Modbus Plus network allows safe communications in a harsh environment over distances of up to 3 km.



Ring topology

It is possible to create a “self-healing” ring in a mixed optical fibre/twisted pair network by connecting the unused optical fibre ports of the first and last 140 NOM 252 00 modules, either directly or via a optical fibre repeater. This type of configuration retains all the advantages described previously, with built-in redundancy in addition. A broken connection between any two Quantum modules in the ring will automatically reconfigure the network into a bus configuration, and continue communication.



Modicon Quantum automation platform
Modbus Plus network
I/O architecture

Presentation

The Modicon Quantum platform DIO (Distributed I/O) architecture uses the same I/O modules as a local or remote I/O (RIO) subsystem, and reduces installation costs by using low-cost twisted pair cables.

Special DIO drop adaptors, with a built-in power supply, are used with each drop. The Quantum DIO drop adaptor is specifically designed to link I/O modules to the head-end via a shielded twisted pair cable. DIO drop adaptors (one per drop) also provide the power supply to the I/O (maximum 3 A), from a 24 V ⎓ or 115/230 V ∿ source. These DIO drops can also be powered by standard 8 A power supply modules. In this case the 3 A supply built into the drop adaptor is not wired.

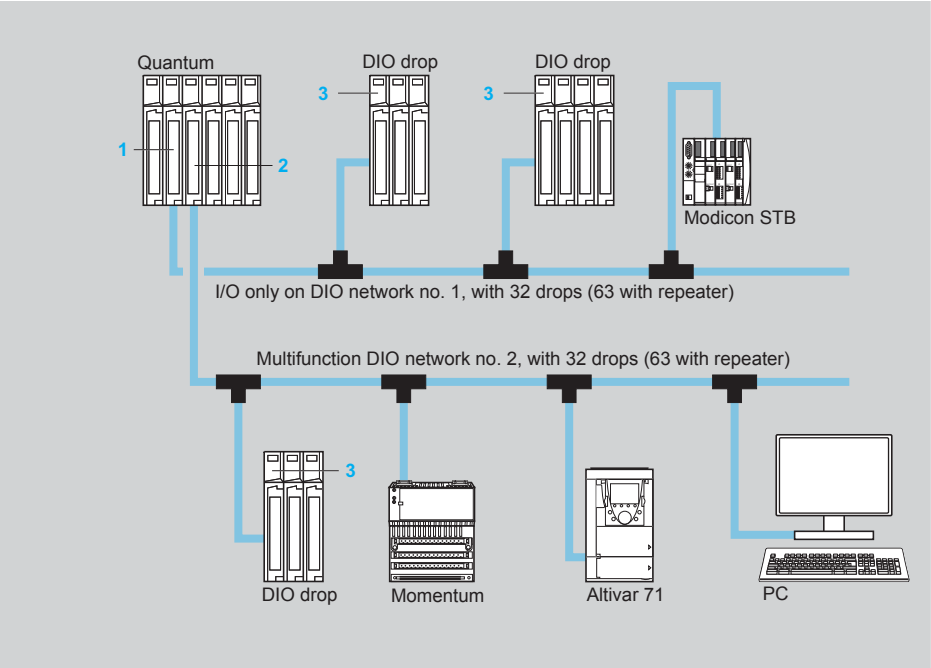
The DIO architecture can take up to three head-end adaptors per CPU and up to 1800 m per network (using RR85 repeaters). Even greater distances can be achieved using optical fibre repeaters.

The DIO architecture is based on Modbus Plus technology. Each DIO network can take 32 nodes over 472 m (64 nodes over 2000 m with repeaters). Up to three DIO networks are permitted, one native to the CPU itself, and the other two by adding **140 NOM 211 ●0** (with single network cable) or **140 NOM 212 ●0** (with redundant network cable) head adaptor modules on the local Quantum rack.

RIO and DIO architectures can be combined in the same CPU for large quantities of I/O.

All products that can be connected to Modbus Plus networks (for example HMI equipment) can coexist on the DIO network. For example, a programming terminal can be connected to the DIO network to monitor and troubleshoot a control system from a remote site, without requiring a separate communication link.

Typical multi-network distributed I/O system



1 Quantum CPU with integrated Modbus Plus port **140 CPU ●●● ●●** (for DIO no. 1)
2 Modbus Plus head-end adaptor **140 NOM 2●● DO** (for DIO no. 2 and no. 3)
3 DIO drop adaptor **40 CRA 21● ●0** (including 24 V ⎓ or 115/230 V ∿ power supply)

Line length 472 m max., 1800 m with repeaters

Using Modbus Plus for distributed I/O (DIO)

Modbus Plus is used as a fieldbus in a distributed I/O architecture, controlled by a Quantum CPU.

The Modbus Plus "master" at the head end of the network is a Quantum CPU with an integrated Modbus Plus port or a **140 NOM 21● 00** head-end adaptor module.

A **140 CRA 211 ●0** drop adaptor module must be installed in each I/O drop in the DIO architecture. A **140 CRA 211 ●0** module acts both as a distributed I/O adaptor and a power supply for the I/O drop (no additional power supply module is necessary). Each DIO drop can address up to 30 input words and 32 output words.

Modicon Quantum automation platform

Modbus Plus network

I/O architecture

Architecture (continued)

Using Modbus Plus for distributed I/O (DIO) (continued)

A single or redundant network cable topology can be used in a distributed I/O system. Depending on the system requirements, one of the following combinations of modules can be used to create a DIO system on Modbus Plus:

Head-end no. 1	Head-end no. 2 or no. 3	DIO drop	Type of DIO system
CPU with integrated Modbus Plus port **140 CPU**	DIO adaptor **140 NOM 211 00**	Adaptor **140 CRA 211 10**	Single network cable and 115/230 V ∼ drop power supply
		Adaptor **140 CRA 211 20**	Single network cable and 24 V ⎓ drop power supply
–	DIO adaptor **140 NOM 212 00**	Adaptor **140 CRA 212 10**	Redundant network cable and 115/230 V ∼ drop power supply
		Adaptor **140 CRA 212 20**	Single network cable and 24 V ⎓ drop power supply

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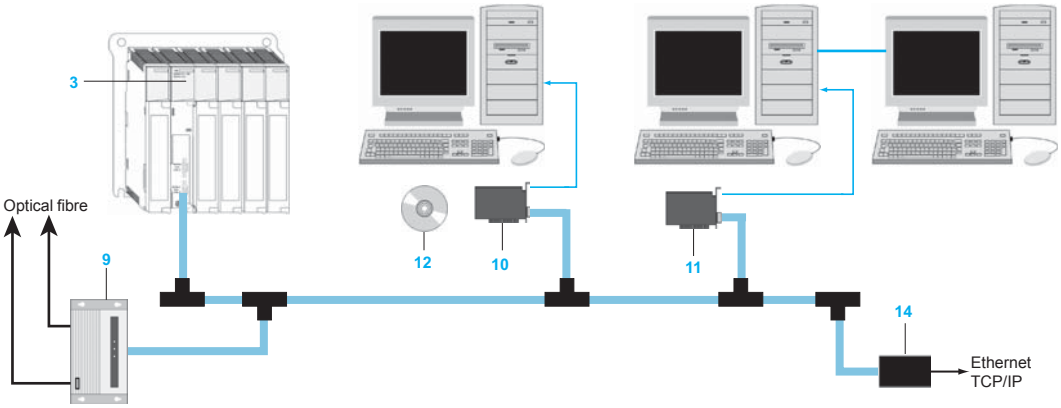
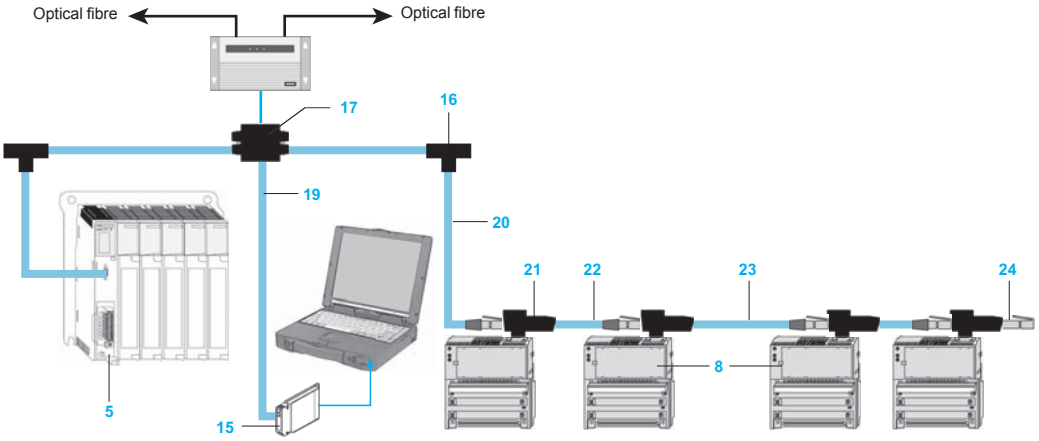
Modicon Quantum automation platform
Modbus Plus network

Connection

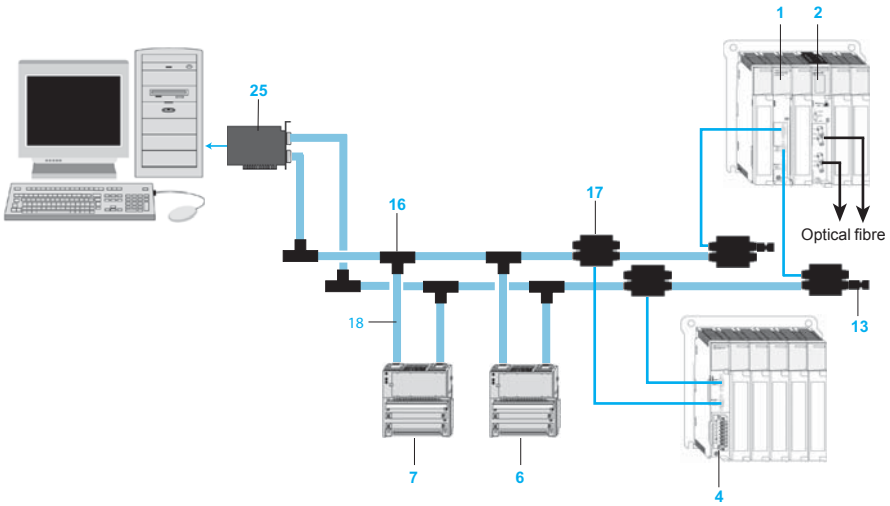
Network with PC cards for Modbus Plus



Modbus Plus network for Quantum and Momentum



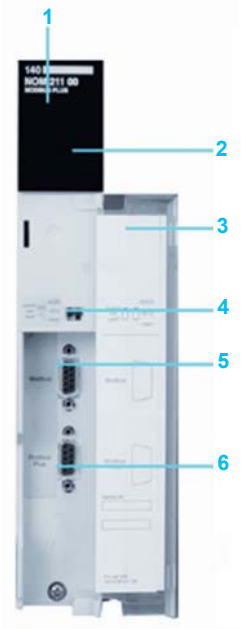
Modbus Plus redundant network



Connection (continued)

For diagram numbers, see page 5/84

1 **140 NOM 212 00**: Quantum Modbus Plus head-end interface, redundant medium, twisted pair cable
– **140 NOM 211 00**: Quantum Modbus Plus head-end interface, single medium, twisted pair cable
2 **140 NOM 252 00**: Quantum Modbus Plus head-end interface, redundant medium, optical fibre cable (TX/RX)
3 **140 CPU**: Quantum CPU with integrated Modbus Plus port, single-cable medium, twisted pair cable
4 **140 CRA 212 10**: Quantum Modbus Plus drop interface and power supply, redundant medium, 115/230 V ∿
– **140 CRA 212 20**: Quantum Modbus Plus drop interface and power supply, redundant medium, 24 V ⎓
5 **140 CRA 211 10**: Quantum Modbus Plus drop interface and power supply, single-cable medium, 115/230 V ∿
– **140 CRA 211 20**: Quantum Modbus Plus drop interface and power supply, single-cable medium, 24 V ⎓
6 **170 PNT 160 20**: Momentum Modbus Plus communication adaptor, redundant network, IEC medium
7 **170 NEF 160 21**: Momentum Modbus Plus communication adaptor, redundant network, 984 medium
– **170 NEF 110 21**: Momentum Modbus Plus communication adaptor, non-redundant network, 984 medium
8 **170 PNT 110 20**: Momentum Modbus Plus communication adaptor, non-redundant network, IEC medium
9 **490 NRP 254 00**: Modbus Plus repeater, line/drop, optical fibre medium
– **490 NRP 253 00**: Modbus Plus repeater, point-to-point, optical fibre medium
– **NW BM85C 002**: Modbus Plus gateway/multiplexer, panel or shelf mount, 4 Modbus Plus ports
– **NW RR85 001**: Modbus Plus repeater, coaxial cable
10 **AM SA85 030**: Modbus Plus ISA PC adaptor, single port
11 **416 NHM 300 30**: Modbus Plus PCI PC adaptor, single port
12 **SW MXDS 001**: Modbus Plus driver suite
13 **990 NAD 230 11**: Modbus Plus T-connector ruggedized terminators
14 **174 CEV 200 40**: Modbus Plus-Ethernet bridge
15 **416 NHM 212 34**: Modbus Plus type III PCMCIA card, single port with Plug-and-Play capability
16 **990 NAD 230 00**: Modbus Plus T-connector, IP 20
17 **990 NAD 230 10**: Modbus Plus T-connector, IP 65
– **AS MBKT 085**: Modbus Plus inline connector
– **AS MBKT 185**: Modbus Plus terminating connector
18 **990 NAD 211 10**: Drop cable, 2.4 m
19 **990 NAA 215 10**: Ruggedized T-connector programming cable, 3.05 m
20 **170 MCI 021 20**: Modbus Plus RJ45 cable, 3.05 m
21 **170 XTS 020 00**: Modbus Plus "T" connector (DB9 base)
22 **170 MCI 020 10**: Modbus Plus RS 485 cable, 25 cm
23 **170 MCI 020 80**: Modbus Plus RJ45 cable, differential, 10 m
24 **170 XTS 021 00**: Modbus Plus RJ45 terminator
25 **416 NHM 300 32**: Modbus Plus PCI PC adaptor, two ports
– **NW BP85 002**: Modbus Plus Bridge Plus, 4 Modbus Plus ports



140 NOM 211 ●0 / 140 NOM 212 ●0

Description

140 CPU modules incorporate a Modbus Plus port as standard, which can be used for DIO network no. 1 (see description on pages 1/5 and 1/15).

140 NOM 211 ●0 and **140 NOM 212 ●0** Modbus Plus head-end adaptors for DIO network no. 2 or no. 3 have the following on the front panel:

1 Model number and colour code
2 A display block with 6 LEDs: Ready (green), Fault (red), Pwr ok (green), Modbus + (green), Ready (green), Error B (red)
3 A removable hinged door with a customizable identification label
4 A microswitch for configuring the Modbus port (ASCII-RTU-mem)
5 A 9-way female SUB-D connector for connecting the Modbus link
6 A 9-way female SUB-D connector for connection to DIO Modbus Plus network no. 2 or no. 3

Modicon Quantum automation platform
Modbus Plus network

References

Modbus Plus gateways and repeaters

Description	Supply	Medium	Number and type of ports	Item	Reference	Weight kg
Gateways/ Multiplexers	115/220 V ∿ or 24 V ⎓	Panel or shelf	2 Modbus Plus 4 RS 232 Modbus	–	**NW BM85C 002**	–
	24 V ⎓ or 115 V ⎓	19" rack-mount	2 Modbus Plus 4 RS 232 Modbus	–	**NW BM85D 008**	–
Router	115/220 V ∿ or 24 V ⎓	Panel or shelf	4 Modbus Plus	–	**NW BP85 002**	–
Modbus Plus repeater		Coaxial cable		–	**NW RR85 001**	–
Point-to-point transceiver		Optical fibre/copper		–	**490 NRP 253 00**	–
Line/drop transceiver		Optical fibre/fibre optic/copper		9	**490 NRP 254 00**	–

Modbus Plus communication devices *(1)*

Description		Medium	Type	Item	Reference	Weight kg
Quantum Modbus Plus	**DIO drop adaptors** (including power supply)	Single	115/230 ∿ *(3)*	5	**140 CRA 211 10**	–
			24 ⎓ *(4)*	–	**140 CRA 211 20**	–
		Redundant	115/230 ∿ *(3)*	4	**140 CRA 212 10**	–
			24 ⎓ *(4)*	–	**140 CRA 212 20**	–
	Quantum CPU DIO head-end no. 1	Single	Twisted pair cable	3	**140 CPU** *(2)*	–
	DIO head-end adaptors no. 2 and no. 3	Single	Twisted pair cable	–	**140 NOM 211 00**	–
		Redundant	Twisted pair cable	1	**140 NOM 212 00**	–
		Redundant	Optical fibre cable	2	**140 NOM 252 00**	–
Momentum Modbus Plus	Communication adaptor	Non-redundant	IEC medium	8	**170 PNT 110 20**	–
		Network	984 medium	–	**170 NEF 110 21**	–
		Redundant	IEC medium	6	**170 PNT 160 20**	–
		Network	984 medium	7	**170 NEF 160 21**	–

PC interface cards

Description	Number of ports	Item	Reference	Weight kg
Modbus Plus ISA PC adaptor	1	9	**AM SA85 030**	–
	2	–	**AM SA85 032**	–
Modbus Plus PCI PC adaptor	1	11	**416 NHM 300 30**	–
	2	25	**416 NHM 300 32**	–
Modbus Plus, PnP type III PCMCIA card	1	15	**416 NHM 212 34**	–
Modbus Plus driver suite	–	12	**SW MXDS 001**	–

(1) Other devices: For TSX Micro/Premium PLCs, Modicon STB distributed I/O, etc, see the respective catalogues.
(2) See pages 1/8 and 1/15.
(3) Input current: 0.4 A at 115 V ∿; 0.2 A at 230 V ∿. External fuse: 1.5 A
(4) Input current: 1.6 A. External fuse: 2.5 A

Modicon Quantum automation platform
Modbus Plus network

References (continued)

Connection cables

Description	Length m	Item	Reference	Weight kg
Modbus Plus standard cables	30.5	–	490 NAA 271 01	–
	152.5	–	490 NAA 271 02	–
	305	–	490 NAA 271 03	–
	457	–	490 NAA 271 04	–
	1525	–	490 NAA 271 06	–
Modbus Plus drop cables	2.4	18	990 NAD 211 10	–
	6	–	990 NAD 211 30	–
PC programming cable/ T-connector	3.05	19	990 NAA 215 10	–
Modbus Plus RS 485 cable	25 cm	22	170 MCI 020 10	–
	1	–	170 MCI 020 36	–
Modbus Plus RS 485 Master communication cable (RJ45/RJ45)	0.3	–	170 MCI 041 10	–
Modbus Plus RJ45 cable	3	20	170 MCI 021 20	–
Modbus Plus differential RJ45 cables	3	–	170 MCI 021 80	–
	10	23	170 MCI 020 80	–
Cable (RJ45/RJ45)	1	–	110 XCA 282 01	–
	3	–	110 XCA 282 02	–
	6	–	110 XCA 282 03	–

Cabling accessories

Description	Type	Item	Reference	Weight kg
Modbus Plus power supply module connector	IP 20	–	140 XTS 005 00	–
Modbus Plus D-shell adaptor for AT serial port	9-way RJ45	–	110 XCA 203 00	–
Modbus Plus D-shell adaptor for XT serial port	25-way RJ45	–	110 XCA 204 00	–

Cabling tools

Description		Item	Reference	Weight kg
Modbus Plus network cable installation tool	–	–	AS MBPL 001	–
RJ crimping tool	–	–	170 XTS 023 00	–
Earthing clamp	–	–	424 244 739	–

Connectors

Description	Sold in lots of	Item	Reference	Weight kg
Modbus Plus inline	1 per kit	–	AS MBKT 085	–
Modbus Plus terminator	2 per kit	–	AS MBKT 185	–
Modbus Plus "T" connector (DB9 base)	1	21	170 XTS 020 00	–
RJ45 terminator	2 per kit	24	170 XTS 021 00	–
RJ45 "T" connector for RS 485 cable (DB9 base)	–	–	170 XTS 040 00	–
RJ45 shielded connectors	20 per kit	–	170 XTS 022 00	–
RJ45 "T" connector for RS 485 cable	1	–	170 XTS 041 00	–
RS 485 multi-master RJ45 drop connections	2	–	170 XTS 042 00	–

T-connectors

Description	Sold in lots of	Item	Reference	Weight kg
Modbus Plus T-connector, IP 20	1	16	990 NAD 230 00	–
Modbus Plus ruggedized T-connector, IP 65	1	17	990 NAD 230 10	–
Modbus Plus T-connector ruggedized terminators	2 per kit	13	990 NAD 230 11	–
Modbus Plus DIN rack flush-mounting assembly with ruggedized T-connector	1	–	990 NAD 230 12	–
Modbus Plus lightning arrester	1	–	490 NAC 721 00	–

Modicon Quantum automation platform

Profibus DP V1 and Profibus PA buses

Profibus Remote Master module

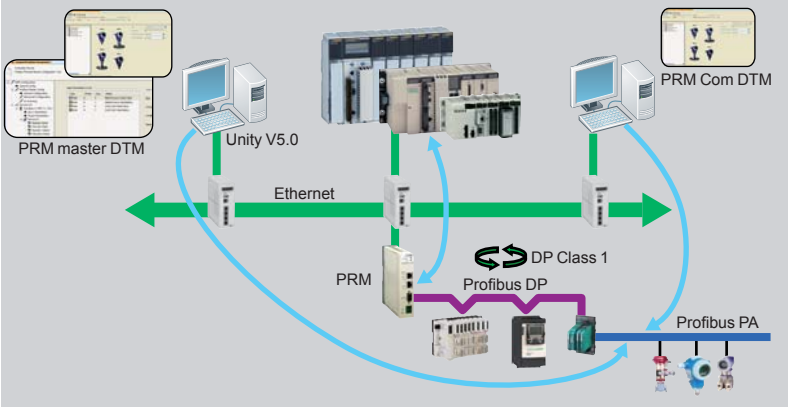
Profibus DP fieldbus

Profibus DP is one of the most widely used fieldbuses in industry.
Based on a master/slave protocol, only master stations, sometimes called active stations, have the right to access the bus, with slave, or passive, stations being limited to responding to interrogations.

Version V0 of Profibus only allows cyclic exchanges with I/O, whereas version V1 offers an acyclic message handling channel which can be used for device adjustment or diagnostics during operation.

The physical link is a single shielded twisted pair, but numerous interfaces are available for creating all sorts of topologies - tree, star or ring - including those using optical fibre or a non-physical link.

Gateways can be used to communicate transparently with Profibus PA, one of the most commonly used standards in process applications for connecting instrumentation.
Profibus PA can be used to supply devices across the network and also to install sensors in potentially explosive zones (ATEX).



Profibus Remote Master (PRM) module

Presentation

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, Modicon Premium and Modicon 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 setup is identical, thus reducing training and maintenance costs.
Two versions are available, standard and tropicalized, so as to adapt to any type of environment.

The PRM module is open to Asset Management tools.
A dedicated communication DTM is supplied with the product, thus allowing any compatible FDT standard tool to remotely adjust devices on Profibus using Ethernet (see page 6/5).

Configuration

From a single Unity tool, the user can create the Profibus configuration, the PLC application and configure or calibrate devices.
The latter are integrated in the Unity catalogue via their DTMs if they exist, or their *gsd* files.

The I/O scanner configuration is created implicitly in Unity Pro using the Profibus configuration. The parameters assigned by default guarantee optimized performance, as well as the consistency of I/O data in the PLC application, irrespective of the PLC platform.
Similarly, the I/O variables defined and presymbolized in the DTMs can be used directly in the application. Finally, the screens integrated in Unity Pro, together with the diagnostic functions integrated in the device DTMs simplify application maintenance.

Profibus Remote Master (PRM) module (continued)

Connectable devices

The following Schneider Electric devices can be connected to this bus:
- TeSys U and TeSys T starter-controllers
- Momentum and Modicon STB distributed I/O
- Altivar 312/61/71 variable speed drives for asynchronous motors
- Lexium 05/15 servo drives for brushless motors
- Altistart ATS 48 soft start-soft stop units
- Any third-party device compatible with Profibus DP and PA standard profiles

Limitations

Once saved, the Unity project incorporates all the Profibus parameters as well as those of the slaves connected to the bus. Modicon Quantum, Modicon Premium and Modicon M340 PLCs are capable of embedding all this data so that an empty Unity terminal without any applications is able, after a simple transfer from the PLC, to locate the whole application, including the slave parameters. This function is called ETS *(Empty Terminal Service)*.

In certain cases, it may be that the memory size required to save the device parameters exceeds the PLC memory capacity (signalled by a “memory full” message during the build). This is particularly likely on devices which have DTM (the most common instrumentation on PA). Typically, each device of this type takes up around 20 KB of the PLC memory.

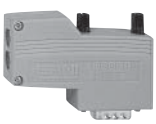
It is therefore essential to create a memory map according to the type of configuration used and possibly adapt it accordingly, either by increasing the amount of memory dedicated to the application (by reducing the zone allocated to data), or by increasing the overall memory via cartridges available in the catalogue.

If the ETS function is not required, Unity Pro can also be configured in such a way as to reduce the size of the embedded data by disabling comments and animation tables, or by disabling the upload function so that the application does not include data relating to DTMs. In this case, the upload from an empty terminal function is no longer available.

References

The Profibus Remote Master module is supplied with a CD-ROM, which includes:
- PRM master DTMs and generic Profibus DTMs (for configuration in Unity Pro V5.0 or later)
- The PRM communication DTM for third-party (non-Schneider Electric) FDT

TCS EGPA23F14F



490 NAD 911 03

Profibus Remote Master modules

Description	Type	Reference	Weight kg
Profibus Remote Master modules	Standard	**TCS EGPA23F14F**	0.620
	Ruggedized *(1)*	**TCS EGPA23F14FK**	0.620

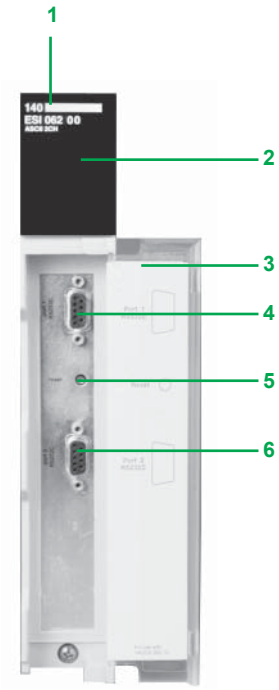
Profibus DP bus connection components

Description	Type	Reference	Weight kg
Distributed I/O on Profibus DP bus	Modicon STB network interface module	**STB NDP 2112**	0.140
	Momentum communication module	**170 DTN 110 00**	0.070
Connectors for remote I/O communication module	Line terminators	**490 NAD 911 03**	–
	In-line connector	**490 NAD 911 04**	–
	In-line connector and terminal port	**490 NAD 911 05**	–

Description	Length	Reference	Weight kg
Profibus DP connection cables	100 m	**TSX PBS CA 100**	–
	400 m	**TSX PBS CA 400**	–

(1) Conformal coating and extended operating temperatures between -25 and +70°C. See ruggedized module characteristics on page 10/10.

Modicon Quantum automation platform
Asynchronous serial link module



Presentation

The **140 ESI 062 10** asynchronous serial link module is a general-purpose ASCII communication module that can be used to exchange data messages with third-party devices.

This module is particularly suitable for use in applications with printers, bar code readers and scanners, or devices communicating via a serial link, such as weigh scales, meters or other measuring devices.

This module has been designed for relatively simple point-to-point ASCII communications. A resident command interpreter can be used primarily to specify the formats and baud rate of the communication ports in operational mode, using a serial link management utility such as Microsoft® HyperTerminal. This interpreter can also be used to enter ASCII message formats, which will be stored in this module.

These message formats constitute the base around which communication is organized. Thus, using an appropriate syntax, these formats define for example, for transmissions, the fixed characters that must be sent on the communication line. These transmission message formats can also be used to specify the sending of data that is an image of the card registers, in accordance with a particular representation (binary, integer, ASCII, etc).

For reception, the message formats used are usually limited to specifying a wait for a certain number of values or characters, directed to the module's internal data registers. Unlike transmission, the specifiers used on these reception message formats can be used to define the numerical base(s).

The Quantum PLC application program communicates with the asynchronous serial link module via mailbox registers. These registers submit commands to the module and translate the responses. Communication commands are processed by requesting transmission on a port, through the use of a message format. Conversely, it is possible to listen for reception on this port, through the use of a message format.

If the exchange mailboxes between the PLC and the module are not large enough to carry all the application data required for a transaction, at the same time as the transmission and reception commands, additional commands (Get/Put) will be used for exchanges between the PLC database and the module's internal registers.

Note: *In LL984 programming, with Concept and ProWORX programming software, it is possible to use an additional instruction (ESI), which is designed to simplify the management of data exchange sequences between the PLC application and the asynchronous serial link module. This programming software also requires integration of special software (NSUP and ESI) during PLC configuration (Concept IEC uses only ESI software). The ESI software is provided on diskette, supplied together with the asynchronous serial link module installation manual.*

Description

The **140 ESI 062 10** asynchronous serial link module features the following on the front panel:

1 Module number and colour code
2 A display block
3 A removable hinged door with a customizable identification label
4 A 9-way SUB-D connector (RS 232C comms port 1)
5 A reset button
6 A 9-way SUB-D connector (RS 232C comms port 2)

Modicon Quantum automation platform
Asynchronous serial link module

140 ESI 062 10

References

Description	Characteristic	Reference	Weight kg
ASCII serial link module with 2 RS 232 C ports	19.2 Kbps	**140 ESI 062 10**	0.300
Backup battery holder module	2 C type lithium batteries, 3 V	**140 XCP 900 00**	–
Cables for programming terminal with Modbus interface	3.7 m	**990 NAA 263 20**	0.300
	15 m	**990 NAA 263 50**	1.820

5

6 - Design and operating software

Unity software

Unity software selection guide *6/2*

■ **Unity Pro Small/Medium/Large/Extra Large software**

□ Presentation, functions *6/4*

□ References *6/18*

■ **Unity EFB Toolkit software**

□ Presentation *6/22*

□ References *6/23*

■ **Unity Dif application comparison software**

□ Presentation, setup *6/24*

□ References *6/25*

■ **Unity Loader software**

□ Presentation *6/26*

□ References *6/27*

■ **Specific libraries**

□ Presentation *6/28*

□ References *6/29*

UAG (Unity Application Generator) software

■ **Unity Application Generator**

□ Presentation *6/30*

□ References *6/31*

Concept software

Concept software selection guide *6/32*

■ **Concept programming software**

□ Presentation *6/34*

□ References *6/35*

■ **Concept SFC View software**

□ Presentation *6/34*

□ References *6/35*

ProWORX 32 software

■ **ProWORX 32 programming software**

□ Presentation *6/36*

□ References *6/39*

Software
Unity Pro software

Unity Pro programming software for Modicon M340 M, Premium P, Quantum Q, Safety S and Modicon distributed I/O D platforms			
IEC 61131-3 languages	Instruction List (IL)	**M - D**	**M - P - D**
	Ladder (LD)	**M - D**	**M - P - D**
	Structured Text (ST)	**M - D**	**M - P - D**
	Function Block Diagram (FBD)	**M - D**	**M - P - D**
	Sequential Function Chart (SFC)/Grafcet	**M - D**	**M - P - D**
Ladder Logic Language LL984		**M**	**M**
Programming services	Multitask programming (Master, fast and event-triggered)	**M - D**	**M - P - D**
	Multitask programming (Master, fast, auxiliary and event-triggered)		
	Functional view and function modules	**M - D**	**M - P - D**
	DFB editor and instances	**M - D**	**M - P - D**
	DDT compound data editors	**M - D**	**M - P - D**
	Data structure instances and tables	**M - D**	**M - P - D**
	EF and EFB libraries	**M - D**	**M - P - D**
	User-definable control loops		**P** (TSX P57 2●) **- D**
	Programmable control loops (with process control FB library)	**M - D**	**M - P - D**
	Safety function block libraries		
	Motion function block (MFB) libraries	**M - D**	**M - P - D**
	Hot Standby PLC redundancy system		**P** (TSX P57 24M) **- D**
	System diagnostics	**M - D**	**M - P - D**
	Application diagnostics	**M - D**	**M - P - D**
	Diagnostics with location of error source	**M - D**	**M - P - D**
	Bus and network configuration to slave devices (Modicon distributed I/O, etc.)	**M - D**	**M - P - D**
Debugging and display services	PLC simulator	**M - D**	**M - P - D**
	Hypertext link animations in graphic languages	**M - D**	**M - P - D**
	Step by step execution, breakpoint	**M - D**	**M - P - D**
	Watchpoint	**M - D**	**M - P - D**
	Runtime screens	**M - D**	**M - P - D**
	Diagnostics viewer	**M - D**	**M - P - D**
Other services	Creation of hyperlinks	**M - D**	**M - P - D**
	XML import/export	**M - D**	**M - P - D**
	Application converters (Concept, PL7)		**M - P - D**
	Utilities for updating PLCs and Advantys operating system	**M - D**	**M - P - D**
	Communication drivers for Modicon platforms	**M - D**	**M - P - D**
	Unity Pro servers - Openness		
	Online modification of the configuration		
	Importing of applications (Modsoft, Concept, ProWORX) written in LL984 language		
UDE support OFS exchanges	Dynamic exchange with 3rd party tools, OFS		
	Static exchange via XML/XVM export files	**M - D**	**M - P - D**
Compatible Modicon platforms	Modicon M340 CPUs M	All models	All models
	Premium CPUs P	–	TSX P57 104M/1634M/154M TSX P57 204M/2634M/254M TSX H57 24M
	Quantum CPUs Q	–	–
	Safety CPUs S	–	–
Compatible Modicon distributed I/O D		STB, OTB, TM7, ETB, Momentum	STB, OTB, TM7, ETB, Momentum
Software name		**Unity Pro Small**	**Unity Pro Medium**
Unity Pro software type		**UNY SPU SF● CD70**	**UNY SPU MF● CD70**
Page/website		6/18	6/19

Unity Pro programming software for Modicon M340 M, Premium P, Quantum Q, Safety S and Modicon distributed I/O D platforms

M - P - Q - D	M - P - Q - D	M - P - Q - D
M - P - Q - D	M - P - Q - D	M - P - Q - S - D
M - P - Q - D	M - P - Q - D	M - P - Q - D
M - P - Q - D	M - P - Q - D	M - P - Q - S - D
M - P - Q - D	M - P - Q - D	M - P - Q - D
M - Q	M - Q	M - Q
M - P - Q - D	M - P - Q - D	M - P - Q - D
	P (TSX P57 5●) - Q (140 CPU 651/671) - D	P (TSX P57 5●) - Q (140 CPU 651/671) - D
M - P - Q - D	M - P - Q - D	M - P - Q - S - D
M - P - Q - D	M - P - Q - D	M - P - Q - S - D
M - P - Q - D	M - P - Q - D	M - P - Q - D
M - P - Q - D	M - P - Q - D	M - P - Q - D
M - P - Q - D	M - P - Q - D	M - P - Q - D
P (TSX P57 2●/3●/4●) - D	P (TSX P57 2●/3●/4●/5●) - D	P (TSX P57 2●/3●/4●/5●) - D
M - P - Q - D	M - P - Q - D	M - P - Q - D
		S - D
M - P - Q - D	M - P - D	M - P - D
P (TSX H57 24/44M) - D	P (TSX H57 24/44M) - Q (140 CPU 67 160) - D	P (TSX H57 24/44M) - Q (140 CPU 67 160) - S - D
M - P - Q - D	M - P - Q - D	M - P - Q - S - D
M - P - Q - D	M - P - Q - D	M - P - Q - D
M - P - Q - D	M - P - Q - D	M - P - Q - D
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M - P - Q - D	M - P - Q - D	M - P - Q - S - D
M - P - Q - D	M - P - Q - D	M - P - Q - S - D
M - P - Q - D	M - P - Q - D	M - P - Q - S - D
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M - P - Q - D	M - P - Q - D	M - P - Q - D
M - P - Q - D	M - P - Q - D	M - P - Q - S - D
	M - P - Q - D	M - P - Q - S - D
Q	Q	
Q	Q	
	M - P - Q - D	M - P - Q - S - D
M - P - Q - D	M - P - Q - D	M - P - Q - S - D
All models	All models	All models
TSX P57 104M/1634M/154M TSX P57 204M/2634M/254M TSX P57 304M/3634M/354M TSX P57 4634/454M TSX H57 24/44M	TSX P57 104M/1634M/154M TSX P57 204M/2634M/254M TSX P57 304M/3634M/354M TSX P57 4634M/454M TSX P57 5634M/554M TSX P57 6634M TSX H57 24M/44M	TSX P57 104M/1634M/154M TSX P57 204M/2634M/254M TSX P57 304M/3634M/354M TSX P57 4634M/454M TSX P57 5634M/554M TSX P57 6634M TSX H57 24M/44M
140 CPU 311 10 140 CPU 434 12U 140 CPU 534 14U	140 CPU 311 10 140 CPU 434 12U 140 CPU 534 14U 140 CPU 651 50/60 140 CPU 652 60 140 CPU 671 60 140 CPU 672 60/61	140 CPU 311 10 140 CPU 434 12U 140 CPU 534 14U 140 CPU 651 50/60 140 CPU 652 60 140 CPU 671 60 140 CPU 672 60/61
–	–	140 CPU 651 60S 140 CPU 671 60S
STB, OTB, TM7, ETB, Momentum	STB, OTB, TM7, ETB, Momentum	STB, OTB, TM7, ETB, Momentum
Unity Pro Large	**Unity Pro Extra Large**	**Unity Pro XL Safety**
UNY SPU LF● CD70	**UNY SPU EF● CD70**	**UNY SPU XF● CD70**
6/19	6/20	7/41

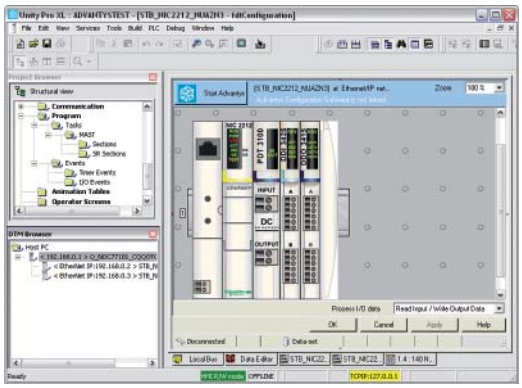
Software
Unity Pro software
Small/Medium/Large/Extra Large

Unity Pro

Presentation

Unity Pro is the common programming, debugging and operating software for the Modicon M340, Premium and Quantum PLC ranges.

Unity Pro is multitasking software offering the following features:
- All in one software
- Five IEC 61131-3 programming languages
- LL 984 programming language
- Integrated, customizable DFB library
- PLC simulator on PC for program validation prior to installation
- Built-in tests and diagnostics
- Wide range of online services



DTM editor (Modicon STB island)

FDT/DTM function

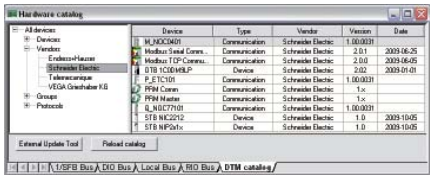
Unity Pro facilitates integration of fieldbus architectures into engineering control systems using FDT/DTM technology:
- FDT *(Field Device Tool)* is the container which supports the device DTMs.
- DTM *(Device Type Manager)* is the configuration tool for devices with integrated graphic interfaces. It contains all the properties specific to each device.

In addition to the FDT/DTM standard, Unity Pro uses specific information from the Master DTM created for the Profibus Remote Master (PRM) module and the Modbus/TCP and EtherNet/IP network module BMX NOC 0401.

Use of the Master DTM allows Unity Pro to perform the following actions:
- Manage the PLC 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 PLC configuration
- Create a generic DTM from the description files (GSD or EDS)

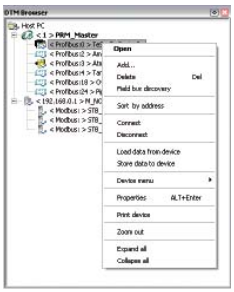
The DTM configuration is stored in the PLC memory so that the application can be downloaded in its entirety. It is also saved in the PLC project file (STU) and the archive file (STA).

A third-party DTM can be installed in the DTM hardware catalogue.
The DTM hardware catalogue can be used to sort or filter the DTMs according to various criteria such as Device, Vendor, Groups or Protocols.



DTM hardware catalogue

The DTM Browser in Unity Pro:
- 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
  - Functions specific to the DTM, via the Device menu



DTM browser and DTM context menu

6

Selection guide:
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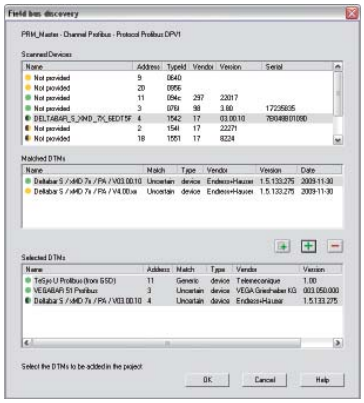
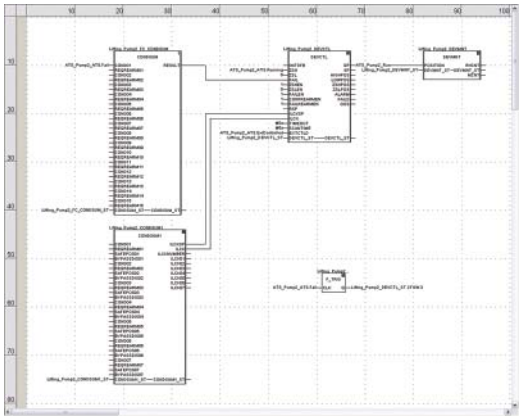


Fieldbus lookup screen

FDT/DTM function (continued)

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



FBD language editor

Programming languages

The five IEC 61131-3 compliant languages

The five graphical or textual languages available in Unity Pro are used for programming Modicon M340, 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 which can be transferred from one platform to another. Unity Pro software also provides extensions to this standard set of instructions. As they are specific to Modicon M340, Premium and Quantum PLCs, 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.

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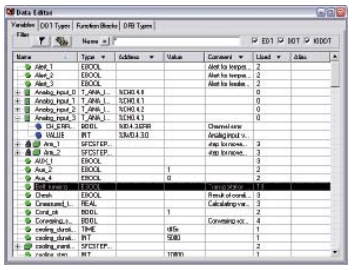
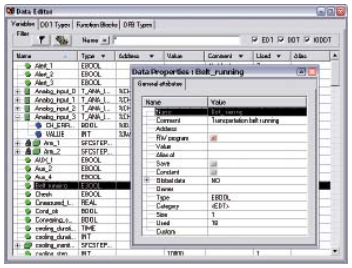


Data editor



Data properties

Data editor

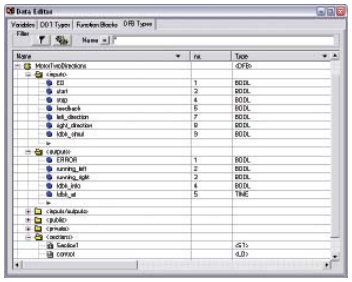
The data editor, which can be accessed from the structural view of the project, provides a single tool for performing the following editing tasks:
- Declaration of data including variables and function blocks (declaration of their type, instances and attributes)
- Use and archiving of function block 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

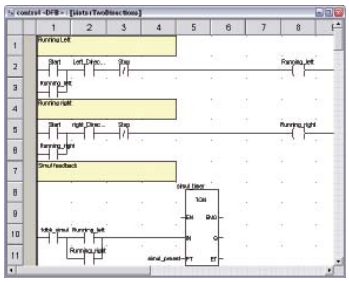
Each data element has several attributes, of which:
- The variable name and type are mandatory
- The comment, physical address in the memory and initial values are optional

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

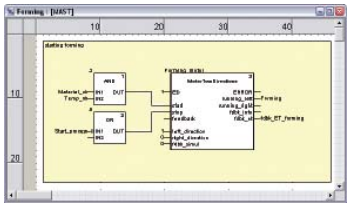
This editor can be accessed at any time during programming by selecting variables for data modification or creation.



Design



Creating the code



Use within the program

DFB user function blocks

With Unity Pro software, users can create their own function blocks for specific application requirements on Modicon M340, 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 all other Unity Pro applications.

Using a DFB in one or more applications:
- Simplifies program design and entry
- Improves program readability and understanding
- Facilitates program debugging (all 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 may 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).

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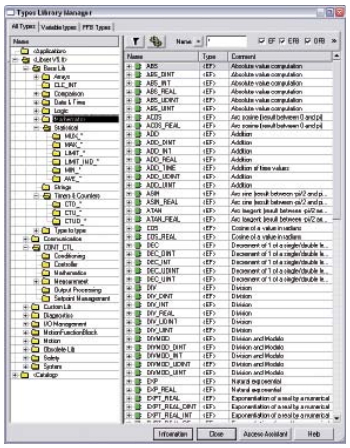


Standard function block libraries

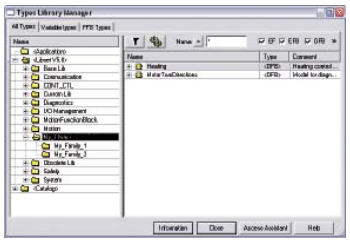
Function block libraries

The function and function block libraries manager contains all the elements provided with Unity Pro software. Functions and function blocks are organized into libraries, which themselves consist of families. Depending on the type of PLC 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 PLCs with those used by HMIs from the PLC application program. Like other function blocks, these EFBs can be used in all languages to exchange data among PLCs 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 plus 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 Blocks 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 state, management of files on the memory cartridge of the Modicon M340 processor, etc.
- Finally, a library named “obsolete”, containing all function blocks used by legacy programming software needed to perform application conversions.

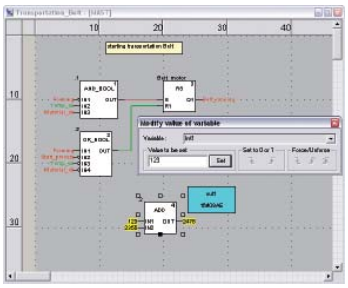


User libraries

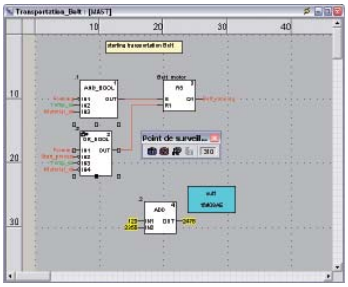
Management of user standards

Users may 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:

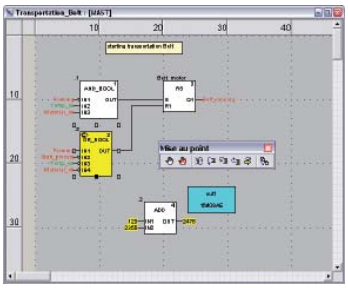
- Check the version of the elements used in an application program against those stored in the library
- Perform an upgrade, if necessary



Dynamic animation/adjustment



Watchpoint



Breakpoint/step-by-step

Debugging tools

Unity Pro software offers a complete set of tools for debugging Modicon M340, 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 PLC is in RUN, this mode can be used to view, simultaneously:

- 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.

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 the 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.

Selection guide:
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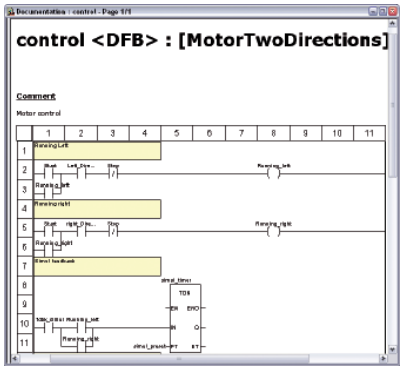
Software
Unity Pro software
Small/Medium/Large/Extra Large

Simulator control panel

PLC simulator

Unity Pro's integrated simulator can be used to test the application program for Modicon M340, Premium or Quantum PLCs from the PC terminal without having to connect to the PLC 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.



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 and 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:

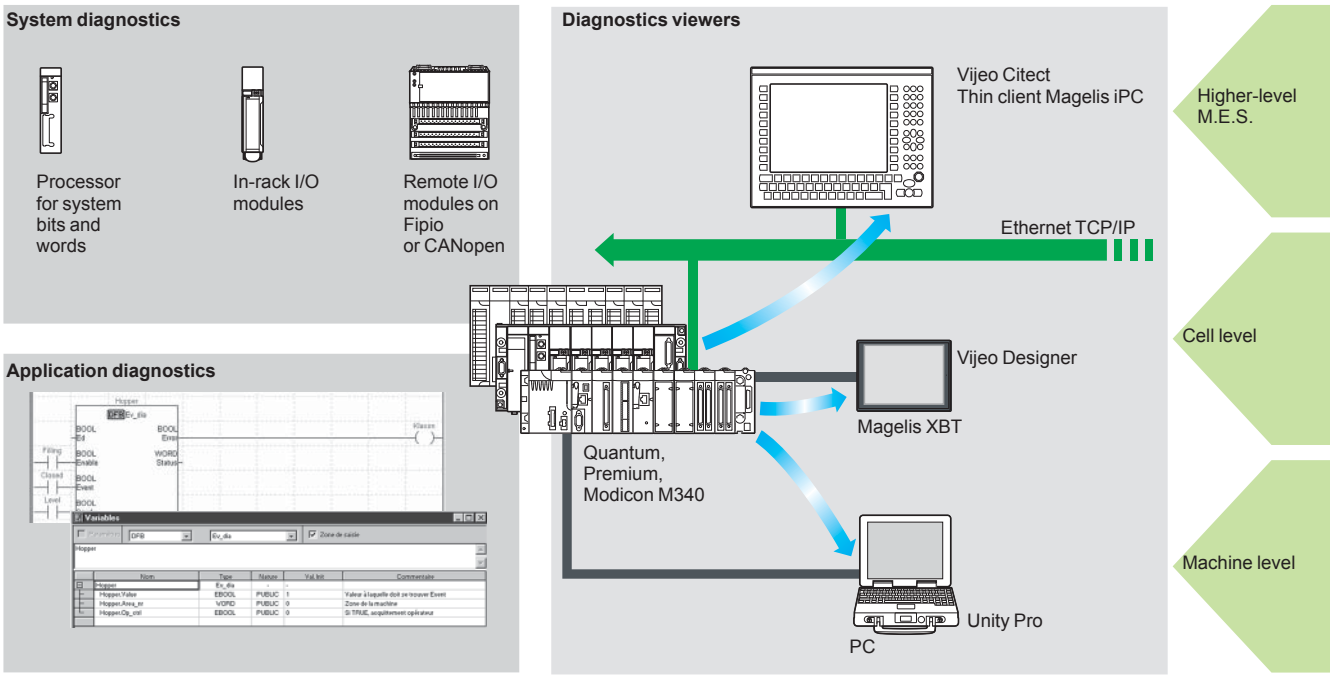
- Title page
- Contents
- General information
- Footer
- Configuration
- EF, EFB and DFB type function blocks
- User variables
- Communication
- Project structure
- Program
- Animation tables and cross-references
- Runtime screens

Selection guide:
page 6/2

Software
Unity Pro software
Small/Medium/Large/Extra Large
Integrated diagnostics

Diagnostics integrated in Modicon M340, Premium and Quantum automation platforms

Presentation

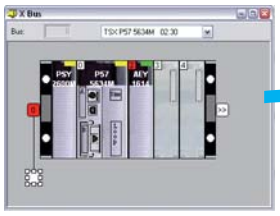


The diagnostics offer for Modicon M340, Premium and Quantum platforms is based on the following three components:
- System diagnostics
- DFB and EFB diagnostic function blocks (for system and application diagnostics)
- Error message display system, called viewers, supplied as a standard component of Magelis XBT terminals, Vijeo Citect supervisory software and Unity Pro setup software

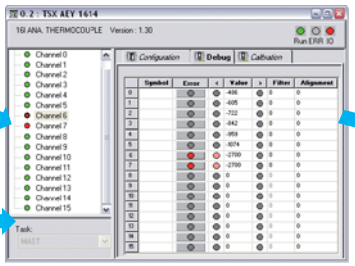
System diagnostics

The system diagnostics for the Modicon M340, 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 PLC.
These events are displayed automatically in a diagnostics viewer *(1)* without requiring any additional programming.

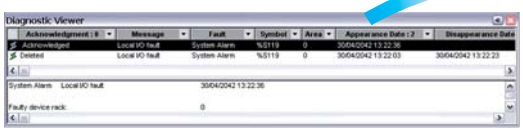
With Unity Pro integrated diagnostics, this function can be used to perform first level diagnostics of the elements in the configuration, up to and including each I/O module channel.



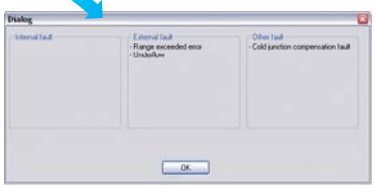
Configuration level



Module level



Viewer window (example with Unity Pro software)



Channel level

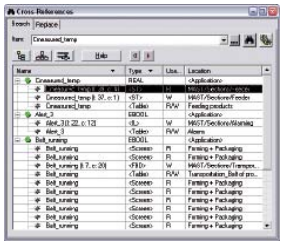
(1) Diagnostics viewers are tools for displaying and acknowledging diagnostic error messages. They are supplied as a standard component of Unity Pro and Vijeo Designer software, with Magelis terminals and with the PLC Web server that can be accessed via a thin client Magelis iPC.

Software
Unity Pro software
Small/Medium/Large/Extra Large

Modifying the program with the PLC in RUN mode

With Unity Pro, changes can be made to the program when the PLC connected to the programming terminal is in RUN mode. These modifications are performed with the following operations:
- The application contained in the PLC is transferred to the PC terminal running Unity Pro, 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 PLC (in RUN mode).

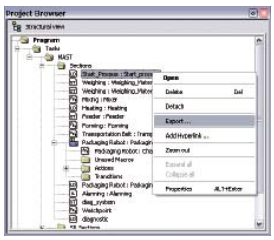
This function makes it possible to add or modify program code and data in different parts of the application in one single modification session (thus resulting in a uniform, consistent modification with respect to the controlled process). This increased flexibility comes at a cost in terms of the amount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



Cross-references table

Cross-references function

Unity Pro's cross-references function, which is available in standalone mode (offline) and when connected to the PLC in Run (online), allows users to view all the elements of a PLC 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.).



Data export shortcut menu

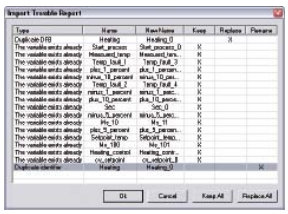
Import/export function

The import/export function available in Unity Pro supports the following operations from the structural and functional project views:
- Via the import function, reuse 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, Premium or Quantum PLC configuration prepared in the SIS Pro costing and configuration tool for use in the creation of a project in Unity Pro.
This import function spares the user from having to redefine the PLC configuration when the PLC has already been configured with the SIS Pro tool.

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

Selection guide:
page 6/2

Software
Unity Pro software
Small/Medium/Large/Extra Large

Application converters

Unity Pro's integrated conversion tools can be used to convert PLC applications created with Concept and PL7 programming software to Unity Pro applications.

Concept/Unity Pro converter (Quantum PLC)

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 must be exported to an ASCII file in Concept.
The export file is converted to a Unity Pro source file automatically. This file is then analyzed by Unity Pro. At the end of the procedure, a conversion report is generated and an output window displays any conversion errors and provides direct access to the part of the program to be modified.
The Concept application converter converts the application to Unity Pro, but does not guarantee that it will operate correctly in real-time. It is therefore essential to test or debug all converted applications.

PL7/Unity Pro converter (Premium PLC and Atrium slot PLC)

This conversion is performed with a PL7 application V4 or later (Premium PLC or Atrium slot PLC). In order to perform the conversion, the source file (complete application or user function block) must be exported in 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 consult our Customer Care Centre.*

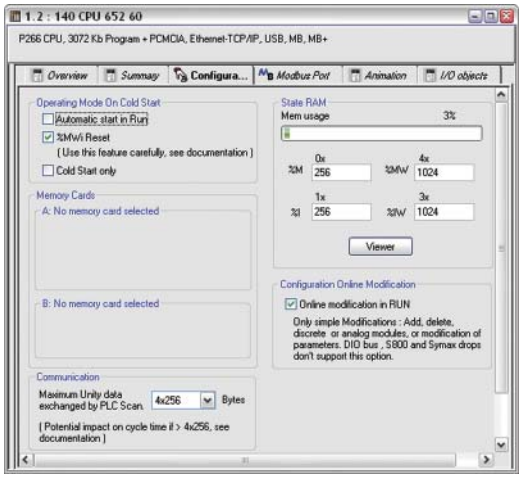
Operating system update utilities

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

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, this service is provided by Unity Loader (see page 6/26).*



Configuration screen

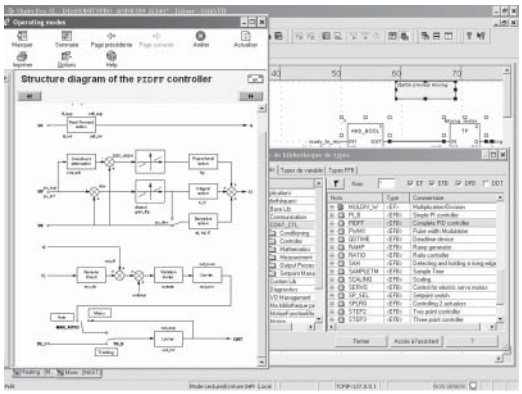
Online modification of the Quantum configuration

This function, also called *Change Configuration On The Fly (CCOTF)*, is used to modify the 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)

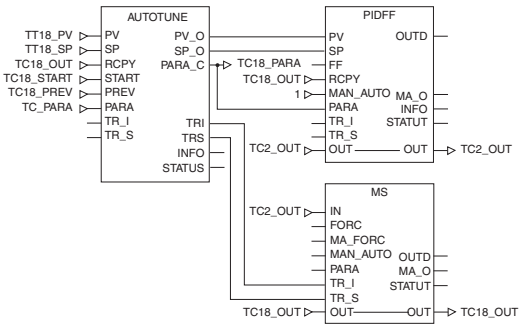
The CCOTF function is supported by standalone processors for all three types of I/O architecture (local, RIO, DIO) using version 5 of Unity Pro, and for Hot Standby processors using version 4.1 of Unity Pro.

The CCOTF function must first be validated in the Unity Pro configuration screen. A confirmation screen appears when the configuration has been modified online.

Software
Unity Pro software
Small/Medium/Large/Extra Large Programmable process control



CONT_CTL, programmable process control integrated in Unity Pro



Example: PID controller with MS manual control

Process control in machines

Unity Pro contains **CONT_CTL,** a library of 36 function blocks used to create control loops for machine control.

All requirements for closed loop control functions in machines are adequately met by Modicon M340, 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 eliminates the need for external controllers and simplifies the overall control architecture of the machine, as well as its design, roll-out and operation.

The EFs or EFBs can be used in all Unity Pro languages (LD, ST, IL and FBD). FBD is particularly suitable for accessing control processing operations in Unity Pro through its wizard for entering and viewing parameters and function block variables.

CONT_CTL library functions

The library consists of five function families:
- Input data conditioning
- Controllers
- Mathematical functions
- Process value processing
- Output value processing

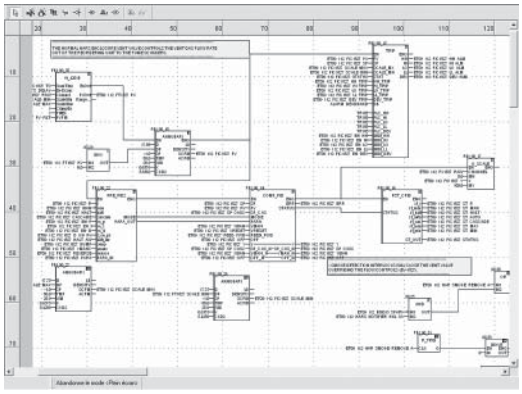
Input data conditioning	
DTIME	Pure time delay
INTEGRATOR	Integrator with limiting
LAG_FILTER	First order time lag
LDLG	Lead/lag function with smoothing
LEAD	Lead function with smoothing
MFLOW	Mass flow calculation based on the measurement of differential pressure or flow speed with pressure and temperature 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 and 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

6

Selection guide:
page 6/2



Programming in Unity Pro in offline mode

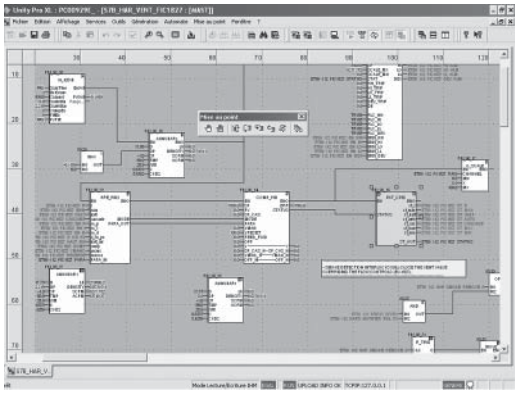
Process control in machines (continued)

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 Unity Pro 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 Unity Pro's ST, IL or LD language, or in C language.



Programming in online mode

Debugging, operation

All Unity Pro's standard debugging services (see page 6/9) are available. In particular, the Modicon M340 processor 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 Unity Pro. It is compatible with all processors in the Modicon M340, 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 6/28).

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 document "Process control, Unity V3.0" available online at www.schneider-electric.com.

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

Software
Unity Pro software
Small/Medium/Large/Extra Large

Communication drivers

The most commonly used communication drivers for Modicon M340, Premium and Quantum platforms are installed at the same time as the Unity Pro software.

Unity Pro also includes the following drivers, which can be installed as required *(1)*:

Protocol - Hardware	Windows XP Professional	Windows Vista Business 32-bit edition Windows 7 32-bit and 64-bit editions
Ethway - Ethernet	■	
Fip - FPC10 ISA card	■	
Fip - FPC20 PCMCIA card	■	
Fip adaptor - CUSBFIP	■	■
ISAway - PCX57 ISA card	■	
Modbus Serial - COM port	■	■
PCIway - Atrium TPCI57 PCI card	■	■
Uni-Telway - COM port	■	■
Uni-Telway - SCP114 PCMCIA card	■	
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 Unity Pro version V4.1 software at a reduced price.

These upgrades are only available for licences of the same type (e.g. from Concept XL group licence to Unity Pro Extra Large group licence).

Composition and Windows OS compatibility

Unity Pro multilingual software packages are compatible with Windows XP (32-bit), Windows Vista (32-bit) and Windows 7 (32-bit and 64-bit) operating systems.
They include:
- Documentation in electronic format in six languages (English, French, German, Italian, Spanish and Chinese)
- Converters for converting applications created with Concept and PL7 Pro programming software
- PLC simulator

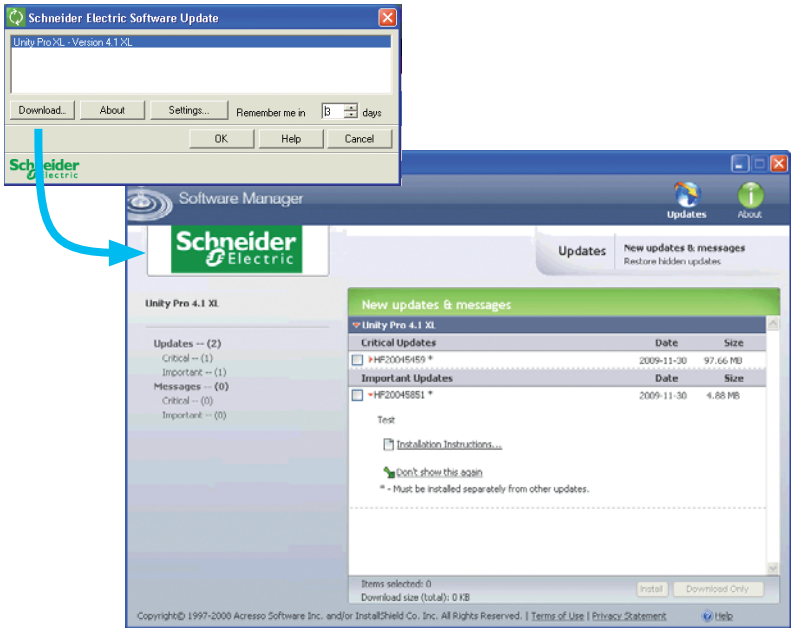
Cables for connecting the processor to the programming PC must be ordered separately.

(1) Also available separately under reference **TLX CD DRV 20M.**

Software
Unity Pro software
Small/Medium/Large/Extra Large

Unity Pro update

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



***Note**: The latest firmware versions are available for download from our website www.schneider-electric.com.*

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Selection guide:
page 6/2

Software
Unity Pro software
Small/Medium/Large/Extra Large

Unity Pro

References

Unity Pro Small, Medium, Large and Extra Large software packages

These software packages are for programming and setting up Unity automation platforms. The software is available in five versions:
- **Unity Pro Small** (see page 6/18)
- **Unity Pro Medium** (see page 6/19)
- **Unity Pro Large** (see page 6/19)
- **Unity Pro Extra Large** (see page 6/20)

Upgrade kits for Concept, PL7 Pro and ProWORX software

These upgrade kits allow users who already have these software programs from the installed base and who have a **current subscription** to obtain Unity Pro version V7.0 software at a reduced price. These upgrades are only available for licences of the same type (e.g. from Concept XL group licence to Unity Pro Extra Large group licence). See page 6/20.

Composition and Windows OS compatibility

Unity Pro multilingual software packages are compatible with Windows XP (32-bit), Windows Vista Business Edition (32-bit) and Windows 7 (32-bit and 64-bit) operating systems.

The packages comprise:
- A Unity Pro V7.0 DVD in six languages (English, French, German, Italian, Spanish and Chinese)
- A Unity Loader V2.3 CD
- An Advantys V7.0 configuration software CD
- A DVD containing the documentation in electronic format in six languages (English, French, German, Italian, Spanish and Chinese)
- A one-year services subscription

Unity Pro Small version 7.0 software

For Modicon M340: All models
For distributed I/O: **Modicon ETB**, **TM7**, **OTB**, **STB**, **Momentum**

Unity Pro Small version 7.0 software packages *(1)*

Description	Licence type	Reference	Weight kg
Unity Pro Small software packages	Single (1 station)	**UNY SPU SFU CD 70**	–
	Group (3 stations)	**UNY SPU SFG CD 70**	–
	Team (10 stations)	**UNY SPU SFT CD 70**	–
Software upgrades from: - Concept S - PL7 Micro - ProWORX NxT/32 Lite	Single (1 station)	**UNY SPU SZU CD 70**	–
	Group (3 stations)	**UNY SPU SZG CD 70**	–
	Team (10 stations)	**UNY SPU SZT CD 70**	–

Licence type extensions for Unity Pro Small version 7.0

From	To	Reference	Weight kg
Single (1 station)	Group (3 stations)	**UNY SPU SZUG CD 70**	–
Group (3 stations)	Team (10 stations)	**UNY SPU SZGT CD 70**	–

(1) For compatibility of Unity software/automation platforms and distributed I/O, refer to the selection guide on page 6/2.

Selection guide:
page 6/2

Software
Unity Pro software
Small/Medium/Large/Extra Large

Unity Pro Medium version 7.0 software

For Modicon M340: All models
For Modicon Premium: **TSX 57 1●...2●**
For distributed I/O: **Modicon ETB**, **TM7**, **OTB**, **STB**, **Momentum**

Unity Pro Medium version 7.0 software packages *(1)*

Description	Licence type	Reference	Weight kg
Unity Pro Medium software packages	Single (1 station)	**UNY SPU MFU CD 70**	–
	Group (3 stations)	**UNY SPU MFG CD 70**	–
	Team (10 stations)	**UNY SPU MFT CD 70**	–
Software upgrades from: - Concept S, M - PL7 Micro, Junior - ProWORX NxT/32 Lite	Single (1 station)	**UNY SPU MZU CD 70**	–
	Group (3 stations)	**UNY SPU MZG CD 70**	–
	Team (10 stations)	**UNY SPU MZT CD 70**	–

Licence type extensions for Unity Pro Medium version 7.0

From	To	Reference	Weight kg
Single (1 station)	Group (3 stations)	**UNY SPU MZUG CD 70**	–
Group (3 stations)	Team (10 stations)	**UNY SPU MZGT CD 70**	–

Upgrade to Unity Pro Medium from Unity Pro Small

Type of upgrade The number of stations is unchanged	Reference	Weight kg
Small to Medium Single (1 station)	**UNY SPU MZSU CD 70**	–
Small to Medium Group (3 stations)	**UNY SPU MZSG CD 70**	–
Small to Medium Team (10 stations)	**UNY SPU MZST CD 70**	–

Unity Pro Large version 7.0 software

For Modicon M340: All models
For Modicon Premium: **TSX 57 1●…4●**
For Modicon Quantum: **140 CPU 311 10/434 12U/534 14U**
For distributed I/O: **Modicon ETB**, **TM7**, **OTB**, **STB**, **Momentum**

Unity Pro Large version 7.0 software packages *(1)*

Description	Licence type	Reference	Weight kg
Unity Pro Large software packages	Single (1 station)	**UNY SPU LFU CD 70**	–
	Group (3 stations)	**UNY SPU LFG CD 70**	–
	Team (10 stations)	**UNY SPU LFT CD 70**	–
	Site (⩽ 100 users)	**UNY SPU LFF CD 70**	–
Software upgrades from: - Concept S, M - PL7 Micro, Junior, Pro - ProWORX NxT/32 Lite	Single (1 station)	**UNY SPU LZU CD 70**	–
	Group (3 stations)	**UNY SPU LZG CD 70**	–
	Team (10 stations)	**UNY SPU LZT CD 70**	–
	Site (⩽ 100 users)	**UNY SPU LZF CD 70**	–

Licence type extensions for Unity Pro Large version 7.0

From	To	Reference	Weight kg
Single (1 station)	Group (3 stations)	**UNY SPU LZUG CD 70**	–
Group (3 stations)	Team (10 stations)	**UNY SPU LZGT CD 70**	–

Upgrade to Unity Pro Large from Unity Pro Medium

Type of upgrade The number of stations is unchanged	Reference	Weight kg
Medium to Large Single (1 station)	**UNY SPU LZMU CD 70**	–
Medium to Large Group (3 stations)	**UNY SPU LZMG CD 70**	–
Medium to Large Team (10 stations)	**UNY SPU LZMT CD 70**	–

(1) For compatibility of Unity software/automation platforms and distributed I/O, refer to the selection guide on page 6/2.

Selection guide:
page 6/2

Unity Pro

Unity Pro Extra Large version 7.0 software

For Modicon M340: All models
For Modicon Premium: **TSX 57 1●...6●**
For Modicon Quantum: **140 CPU 311 10/434 12U/534 14U/651 50/651 60/652 60/671 60/672 60/672 61**
For distributed I/O: **Modicon ETB**, **TM7**, **OTB**, **STB**, **Momentum**

Unity Pro Extra Large version 7.0 software packages *(1)*

Description	Licence type	Reference	Weight kg
Unity Pro Extra Large software packages	Single (1 station)	**UNY SPU EFU CD 70**	–
	Group (3 stations)	**UNY SPU EFG CD 70**	–
	Team (10 stations)	**UNY SPU EFT CD 70**	–
	Site (≤ 100 users)	**UNY SPU EFF CD 70**	–
Software upgrades from: - Concept S, M, XL - PL7 Micro, Junior, Pro - ProWORX NxT Lite, Full - ProWORX 32 Lite, Full	Single (1 station)	**UNY SPU EZU CD 70**	–
	Group (3 stations)	**UNY SPU EZG CD 70**	–
	Team (10 stations)	**UNY SPU EZT CD 70**	–
	Site (≤ 100 users)	**UNY SPU EZF CD 70**	–

Licence type extensions for Unity Pro Extra Large

From	To	Reference	Weight kg
Single (1 station)	Group (3 stations)	**UNY SPU EZUG CD 70**	–
Group (3 stations)	Team (10 stations)	**UNY SPU EZGT CD 70**	–

Upgrade to Unity Pro Extra Large from Unity Pro Large

Type of upgrade The number of stations is unchanged	Reference	Weight kg
Large to Extra Large Single (1 station)	**UNY SPU EZLU CD 70**	–
Large to Extra Large Group (3 stations)	**UNY SPU EZLG CD 70**	–
Large to Extra Large Team (10 stations)	**UNY SPU EZLT CD 70**	–

Documentation for Unity Pro version 7.0

Description	Licence type	Reference	Weight kg
Hardware and software manuals (on DVD) - Platform setup for: Modicon M340, Premium, Quantum, Momentum - Electromagnetic compatibility of networks and fieldbuses - Software setup for: Unity Pro, Function block library	Multilingual: English, French, German, Italian, Spanish, Chinese	**UNY USE 909 CD M**	–

(1) For compatibility of Unity software/automation platforms and distributed I/O, refer to the selection guide on page 6/2.

BMX XCA USB H0●●

Accessories for connecting to the PC programming terminal

Description	Use		Length	Reference	Weight kg
	From processor port	To PC port			
PC terminal connection cables (PC to PLC)	USB mini B port BMX P34 1000/20●0/20●02	USB port	1.8 m	**BMX XCA USB H018**	0.065
			4.5 m	**BMX XCA USB H045**	0.110
	Mini-DIN port Premium TSX 57 1●/2●/3●/4●	RS 232D (9-way SUB-D connector)	2.5 m	**TSX PCX 1031**	0.170
		USB port (USB/RS 485 converter)	0.4 m	**TSX CUSB 485** *(1)*	0.144
		USB port (mini-DIN/ RJ45 cordset)	2.5 m	**TSX CRJMD 25** *(1)*	0.150
	Modbus port 15-way SUB-D Quantum 140 CPU 311 10 140 CPU 434 12A 140 CPU 534 14A	RS 232D (9-way SUB-D connector)	3.7 m	**990 NAA 263 20**	0.300
			15 m	**990 NAA 263 50**	0.180
	USB port Premium TSX 57 5●/6● Quantum 140 CPU 6●1	USB port	3.3 m	**UNY XCA USB 033**	–
	Modbus port, RJ45 connector Quantum 140 CPU 6●1	RJ 45 connector	1 m	**110 XCA 282 01**	–
			3 m	**110 XCA 282 02**	–
			6 m	**110 XCA 282 03**	–
PC terminal connection cables (PC SUB-D to Modicon STB I/O)	HE13 connector Modicon STB I/O network interface module (NIM)	RS 232D *(2)* (9-way SUB-D connector)	2 m	**STB XCA 4002**	0.210
USB/SUB-D adaptor (PC USB to Modicon STB I/O)	HE13 connector Modicon STB I/O network interface module (NIM) with STB XCA 4002 cable *(3)*	USB port *(3)*	–	**SR2 CBL 06**	0.185

TSX PCX 1031

TSX CUSB485

Description	Use	Reference	Weight kg
Universal Bluetooth® interface (UBI)	Provides Bluetooth® connectivity for products such as the Modicon M340/Premium platforms and Altivar/Lexium servo drives, via their serial port (RS 485). Used for setting-up and maintenance of products. Designed for permanent installation and can be safely fitted on the inside or outside of electrical enclosures. ■ Protocols supported: Modbus and Uni-Telway ■ Powered via the product's RS 485 serial port ■ Max. range in direct line of sight: 20 m The kit comprises: ■ A Universal Bluetooth® interface (UBI) ■ An RJ45/mini-DIN cable (length 1 m) ■ An RJ45/RJ45 cable (length 1 m) ■ A fixing clamp for installation inside the electrical enclosure ■ A CD with configuration software and user manual	**TCS WAAC 13FB**	0.320

TCS WAAC 13FB

(1) The **TSX CUSB 485** *converter requires use of the* **TSX CRJMD 25** *mini-DIN/RJ45 cordset.*
(2) For connection on a USB port, the **SR2 CBL 06** *cable must also be used (3).*
(3) Adaptor equipped with a USB connector (PC side) and a 9-way SUB-D connector (STB XCA 4002 cable side); requires the **STB XCA 4002** *cable (9-way SUB-D/HE 13) for connection to the HE13 connector on the Modicon STB NIM.*

Selection guide:
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Software
Unity Pro software
Unity EFB Toolkit software

Unity EFB Toolkit

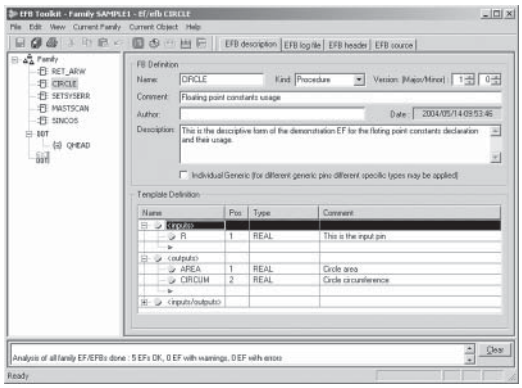
Presentation

Unity EFB Toolkit is the software for developing EFs and EFBs in “C” programming language. As an option with Unity Pro, it can be used to extend all the standard Unity Pro function blocks in order to increase functionality. This software comes with *Microsoft Visual Studio*, which can be used to debug the function blocks developed in the Unity Pro PLC simulator. Unity EFB Toolkit also includes a service for creating and managing families of function blocks and integrating them in Unity Pro.

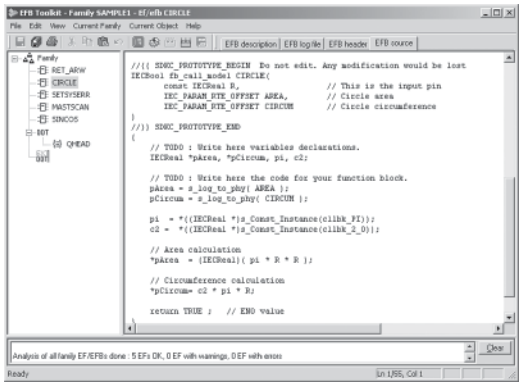
Setup

Unity EFB Toolkit manages the whole process of developing Unity Pro function blocks:

- User-friendly graphical user interface with automatic file organization
- Powerful tools for testing and debugging
- Management of compatibilities and software versions of created functions
- Generation of files for subsequent installation of functions on other Unity Pro stations



EFB Toolkit: Managing function block families



EFB Toolkit: Editor

Managing function block families

The software can be used to create function block families. The function blocks developed, also known as EFs/EFBs, are stored in families. This makes it possible to create an organized library of functions written in “C” language. Once created, these function block families are installed on the Unity Pro stations for the purpose of extending the standard Unity Pro libraries. Integration in Unity Pro can be executed from Unity EFB Toolkit or via the tool for updating Unity Pro libraries, which allows these families to be distributed without the use of any other software.

Developing function blocks

The EFB Toolkit software allows the user to create a function block as follows:

- Declaration of the function block interface in the same way as for the DFBs in Unity Pro
- Definition of all data types needed (elementary, structures, tables)
- Support of public and private variables
- Generation of all files and the block “C” coding frame (the user only adds functionality to this frame)
- Granting of access to numerous internal PLC services, such as the real-time clock, PLC variables and data, system words and math functions, including high-precision numerical processing in “double” format
- Structure of the function block family (compilation/link for all Unity Pro automation platforms)
- Provision of a debugging environment: the function blocks created can easily be debugged in *Microsoft Visual Studio* by downloading a Unity Pro application containing the function developed in the Unity Pro PLC simulator. All the debugging functions in *Microsoft Visual Studio*, especially breakpoints, step-by-step operations, display of the code/data and manipulation of the data, can be accessed without restriction.
- Support for managing Unity Pro versions, important during the function block maintenance phase

***Note**: A specific GNU compiler is used to generate the code for a Modicon M340 platform. It is supplied with the Unity EFB Toolkit.*

Compatibility

Unity EFB Toolkit is compatible with Unity Pro Small, Medium, Large and Extra Large. EFs and EFBs can be developed for Modicon Premium, Modicon M340 and Modicon Quantum platforms.

Software
Unity Pro software
Unity EFB Toolkit software

References

Unity Pro companion software, Unity EFB Toolkit, can be used to create Unity Pro function blocks in “C” programming language. The developed function blocks can then be integrated in standard Unity Pro function block libraries.
Unity EFB Toolkit and its documentation are supplied in electronic format on CD-ROM in English.

Description	Type	Language	Reference	Weight kg
Unity EFB Toolkit software	Single licence (1 station)	English (software and electronic documentation)	**UNY SPU ZFU CD 31E**	–

Software
Unity Pro software
Unity Dif application comparison software

Unity Dif

Presentation

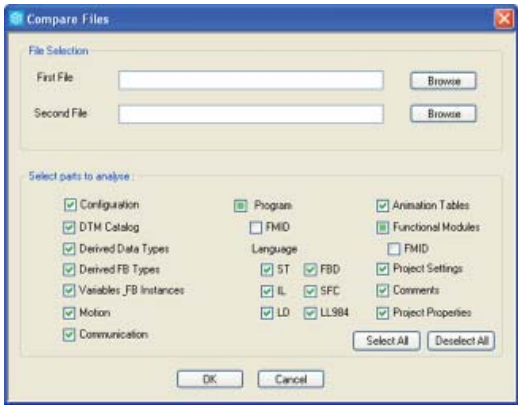
Unity Dif is an optional program for Unity Pro. It can handle all Unity Pro automation platforms. It compares two Unity Pro applications and returns an exhaustive list of all the differences. Unity Dif improves productivity during the main life stages of a control system, mainly during development and debugging of applications and commissioning, operation and maintenance of the installation.

Software setup

Unity Dif can be launched in several ways:
- From Unity Pro
- From the Windows Start menu
- From a command line interface without a graphical user interface

Unity Dif identifies all the differences between two Unity Pro applications at different levels:
- Hardware configuration
- Network configuration (Modbus/TCP, CANopen and RIO (Quantum only))
- All the variables and instances of function blocks
- Structure and content of the application, regardless of which language is used (including LL 984)
- DFB and DDT code
- Project options
- DTM catalogue

The result of the comparison can be displayed in the user interface, printed or saved in .txt file format.



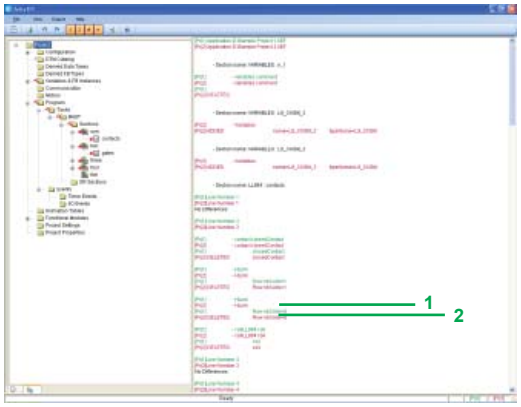
Selection of elements to compare

Comparison

The end of the comparison operation is signaled by the appearance of the application browser with its two tabs:

1 Identification tab for accessing the characteristics of the two applications being compared. The differences are summarized.

2 Browser tab for accessing the application tree structure.



Displaying results

Displaying results

The tree structure can be accessed after comparison, via the Browser tab. It shows any differences using four symbols, where the information associated with application 1 appears in blue and that associated with application **2** appears in red:

This branch, appearing at this level in the tree structure, contains at least one difference

This block contains at least one difference

This section is only present in application **1**

This section is only present in application **2**

In the example opposite, a difference is detected on the rung:
1 The line displayed in green belongs to application 1 [Prj1]
2 The line displayed in red belongs to application 2 [Prj2]

The source code extracts of both applications can be used to locate the differences precisely.

Software
Unity Pro software
Unity Dif application comparison software

References

This Unity Dif software extension is used to compare two Unity applications generated by Unity Pro software version V2.1 or later.

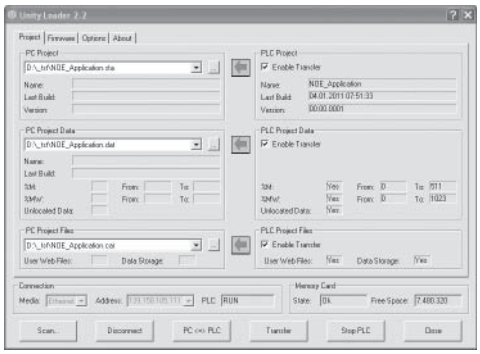
Description	Target extension PLC target	Type	Reference	Weight kg
Unity Dif comparison software extension for Unity Pro applications CD-ROM containing software and electronic documentation (English-French)	All Unity Pro Modicon M340, Premium, Quantum versions	Single licence (1 station) Download or CD	**UNY SDU ZFU CD70**	–
		Site licence (100 stations) CD only	**UNY SDU ZFF CD70**	–

Software
Unity Pro software
Unity Loader software

Unity Loader

Presentation

Unity Loader is companion software to Unity Pro and is used to perform maintenance operations on automation applications. Its easy setup and the small size of its executable make it an essential tool for updating Unity Pro projects without needing to use Unity Pro. It can also be used for updating the embedded software on Modicon M340 modules. It performs the following main functions:
- Transferring automation project components, such as the program and data, from the PC to the PLC or the PLC to the PC
- Transferring files and user Web pages stored in the memory card of Modicon M340 PLCs
- Transferring the firmware from the PC to Modicon M340 modules only

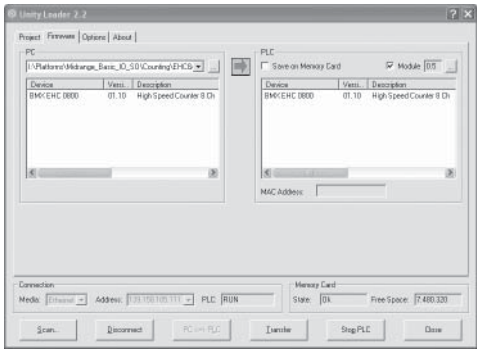


Unity Loader: Project tab

Software graphic interface

The interface is easy to use and has four tabs for access to different operations:
- The "**Project**" tab manages the transfer of projects (program and data) between the PC and the PLC CPU. The software transfers the program (application file format: .stu; archive file format: .sta) and data (located and unlocated) of a Unity Pro project in both directions. The program and data files created by Unity Loader are compatible with Unity Pro. When it is connected to the PLC, Unity Loader displays the information associated with the data read in the PLC. This information is displayed on the PC for the selected files. The user decides which project elements will be transferred by a single command after validation of the required transfers.
  - *Modicon M340 PLCs and BMX RMS ●●8MFP memory card only*: the files and user Web pages can be transferred from the memory card to the PC and vice versa.
  - *BMX NOE 0110 with flash memory card only*: Web pages stored in the flash memory can be transferred from the module to the PC and vice versa.
- The "**Firmware**" tab can be used to update the firmware in the Modicon M340 modules. The screen displays the detailed content of the firmware versions existing in the module and on the PC. Firmware updating works in the same way as project transfers.
- The "**Options**" tabs is used to configure the working environment, especially the location of files on the PC and the selection of one of the six languages supported (English, French, German, Italian, Spanish and Chinese) for the user interface and online help.
- The "**About…**" tab displays information about the software.

Note: *Regardless of which tab is selected, the connection status with the PLC is always displayed, together with commands for connection/disconnection and changing the PLC operating mode.*



Unity Loader: Firmware tab

Modicon M340 PLC and BMX RMS ●●8MFP memory card only

The Unity Loader software can download the project files and the firmware (PLC or module) onto a flash memory card (**BMX RMS ●●8MFP** only) plugged into the PLC CPU.
This firmware download can then be used to update a remote Modicon M340 PLC.

Automation of Unity Loader commands

Projects can be downloaded/uploaded between a PLC and a supervisory station equipped with Unity Loader software by means of a command file included in the supervisory application.

Communication between the PC and the PLC

Unity Loader supports the following PC-to-PLC communication:
- Quantum Unity Pro PLCs: Modbus communication, transfer of project components only
- Premium Unity Pro PLCs: Unitelway communication, transfer of project components only
- Modicon M340 PLCs and modules: communication via Ethernet and USB ports, transfer of project components and firmware. See the table below.

Reference	Type of module	Ethernet port	USB port
BMX P34 2000	CPU with Modbus		
BMX P34 2010/20103	CPU with CANopen		
BMX P34 2020	CPU with integrated Ethernet port		
BMX P34 2030/20302			
BMX NOE 0100/0110	Ethernet Modbus/TCP		
BMX AMI/ART/AMO/AMM	Analog I/O		
BMX EHC 0200/0800	Counter		
BMX MSP 0200	Motion control		

Supported Supported if CPU has integrated Ethernet port

For Ethernet networks, Unity Loader contains a network scanner which can be used to scan a range of network addresses. Once a recognized Modicon M340 PLC has been selected, data transfer operations can be performed.

References

Unity Loader is supplied with Unity Pro Small, Medium, Large and Extra Large.
It can also be downloaded free of charge from our website www.schneider-electric.com, download section.

Compatibility:

Unity Loader is independent of Unity Pro and compatible with all Modicon M340 PLCs, Unity Pro Quantum PLCs via Modbus and Unity Pro Premium PLCs via Unitelway. The program files and PLC data files are compatible between Unity Pro and Unity Loader.

Description	Type	Reference	Weight kg
Unity Loader software	Single licence (1 station)	Software can be downloaded free of charge from our website www.schneider-electric.com	–

Software
Unity Pro software
Specific libraries

Unity specific Libraries

Presentation

The CONT_CTL process control function block library supplied with Unity Pro software can be supplemented with optional specialized libraries so as to meet specific needs such as:
- Predictive control
- Fuzzy logic controller
- HVAC
- Mass flow calculation

Fuzzy Control Library

This library is used in particular in the water treatment field, for example for controlling chlorine levels in fresh water pools or controlling water levels in high-level reservoirs.

Flow Calculation Library

This library is used in the vertical Oil & Gas field, for measuring the gas flow in compliance with the *American Gas Association (AGA)* standard. This version of the library includes the AGA3, AGA7 and AGA8 function blocks.

TeSys Library

This library was developed by the PCP department and provides function blocks for TeSys T and TeSys U starter-controllers for M340 and Premium platforms.
It includes function blocks and a help function for Unity Pro.

Predictive Control Library

This library is used for predictive control of process applications.
Originally developed for reactors, predictive control can be used in other industrial sectors.
Schneider Electric's *Companion Unity & Libraries* team works in partnership with the French company *Sherpa Engineering*, who specialize in predictive control consultancy services.

Heating Ventilation & Air Conditioning Library

This library is used in the HVAC field and deals with repetitive temperature control and humidity problems using ventilation equipment.

Software
Unity Pro software
Specific libraries

Unity specific Libraries

Specific libraries depending on the software used

Specific libraries depending on the software used (see below) can be ordered separately.

Control libraries

Description	Target software	Type	Reference	Weight kg
Predictive Control Library	Unity Pro/ Concept	Single licence (1 station)	**UNY LPC ZAU CD10**	–
Fuzzy Library	Unity Pro		**UNY LFZ ZAU WB12**	–
TeSys Library			**UNY LTS ZAU WB10**	–
Heating Ventilation & Air Conditioning Library			**UNY LHV ZAU WB10**	–
Flow Calculation Library			**UNY LAG ZAU WB20**	–

System libraries

Description	Target software	Type	Reference	Weight kg
Enhanced Process Library *(1)*	UAG	Single licence (1 station)	**UAG SBT CFU CD10**	–
Devices and Process Library *(1)*			**UAG SBT DFU WB13**	–

(1) Compatible with Unity Pro V5.0 max. For Unity Pro ≥ V6.0, please consult our Customer Care Centre.

Software
Unity software
Unity Application Generator

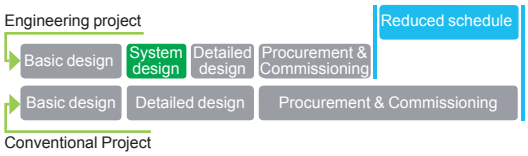
UAG

Advanced design tool for automation solutions *(1)*

Deliver your automation projects faster and re-use your know how!
Unity Application Generator (UAG) is an advanced design and generation software tool that integrates multiple PLCs and HMI/SCADA systems to provide an automation solution similar to a distributed control system. Using an approach based upon reusable objects (application libraries) and automatic application generation, UAG ensures consistent design and implementation of user-defined standards and specifications. Featuring change tracking and automatic documentation functions, UAG supports standards such as ISA-88 and GAMP.

Business advantage

UAG provides significant business advantages in terms of cost reduction, quality and performance improvement.



Business advantage

- ■ **Cost**
- □ Savings in system implementation cost
- □ Improved time-to-market for the end user by allowing the project
- □ Quicker return on investment
- ■ **Quality**
- □ Improved software quality,
- □ Improved maintainability
- □ Reduced risk and improved project schedules
- ■ **Performance**
- □ Standardized design and systematic improvement
- □ Capture and re-use of your best practices
- □ Integrated automation system design in your plant engineering workflow

Working efficiently

UAG provides the key features for an advanced automation solution to increase efficiency and share and re-use your know-how.

Working efficiently

Structured project design - bridge from the process engineer to the control/ automation designer (from the PID to the automation system).
It is possible to capture and re-use the customer's best practices within **application specific libraries** which reduces the dependency on experts, allows standardization and increases software robustness.
Single database entry avoids duplicate effort and resulting errors.
Automatic application generation, including the **automatic configuration of networks** in multi device systems increases efficiency, improves software quality and shortens setup times while simultaneously **reducing project risk**. Integrated **change tracking** and **automatic documentation generation** reduces engineering effort and enables system validation.

Advanced automation platform

UAG integrates best in class products from Schneider Electric and leading partners into an advanced automation platform based on standards, including: ISA-88, GAMP and IEC 61131-3.
Single data point entry and management integrates the process control, monitoring and supervision and ensures data consistency and integrated communication between all devices.

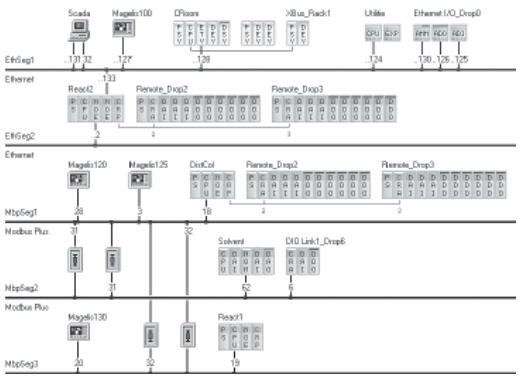
Standards

Applications *(1)*

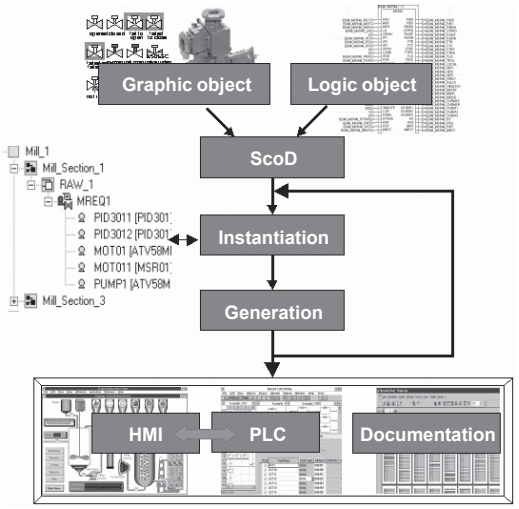
- ■ **Methodology**: UAG allows you to capture and re-use your know-how. Through automatic generation, the project information is propagated to all applications consistently, easily and quickly.
- ■ **Creating user libraries**: libraries are based on re-usable control devices – **S**mart **C**ontrol **D**evices (SCoDs).
- ■ **High level objects (template types) consisting of multiple SCoDs**: template types allow you to pre-define complex objects, e.g. a PID or a sequence, which consist of multiple SCoDs. A common graphic symbol can also be defined. This makes instantiation more efficient as the number of individual steps can be reduced by using the type definition.
- ■ **Structuring your project**: a structured project design provides a bridge from the process engineer to the control automation designer (from the PID to the automation system) based on the ISA-88 standard. The PID drawing is mapped to the physical model in UAG.

(1) For more technical information, please consult our website www.schneider-electric.com.

Software
Unity software
Unity Application Generator



Multi-station automation configuration



Generating the application

UAG

Applications (continued) *(1)*

■ **Multi-station automation configuration**: the entire process control, monitoring and supervision topology of the distributed automation system is managed within UAG.

■ **Generating the application**: the automation solution is generated based on the structured design and your standards contained within the pre-qualified UAG library, ensuring consistent information for the PLCs and the HMI/SCADA. The use of resources (addresses, name space, etc.) is optimized to avoid conflicts and errors. UAG can generate complete projects, as well as **incremental changes** when modifications occur.

■ **Validation**: UAG simplifies validation when required by regulation or to comply with GAMP (Good Automation Manufacturing Practice). UAG uses ISA 88 standard terminology for batch control and supports the GAMP methodology for creating an automation system.

■ **Process Application Library for Vijeo Citect**: the Process Application Library for Vijeo Citect is shipped together with the UAG CD and can be installed from there. A separate order is not necessary; simply complete the registration details during installation.

■ **Device and Process Library**: the Device and Process Library is shipped together with the UAG CD and can be installed from there. A separate order is not necessary; simply complete the registration details during installation.

Segment/Application-specific libraries

A number of more specialized libraries have been developed to provide a more complete starting point for certain projects, such as:

■ Water & Wastewater
■ Mining, Minerals, Metals
■ etc.

Supported platforms and environment

■ **Supported platforms**
□ PLC software: Unity Pro ≥ V4.1
□ PLC hardware: M340, Premium and Quantum
□ M340 I/O, Premium I/O, Quantum I/O and Modicon I/O
□ Modbus TCP and Modbus Plus
□ Fieldbus support
□ Advantys STB configuration and debugging software ≥ V4.7
■ **HMI/SCADA**
□ Vijeo Citect ≥ V6.1
□ Wonderware Archestra V3.0
□ OPC data server software (OFS)
□ Other HMI/SCADA via the UAG “Plug-In” interface
■ **Export of information for other devices/applications**
□ XML export file
□ CSV export file
■ **Environment**: Compatible with Microsoft Windows® 7 Professional *(2)*, Windows® Vista Business and Windows® XP Professional operating systems

References *(1)*

Description	License type	Reference	Weight kg
UAG software suites *(3)* Comprising: ■ UAG (Unity Application Generator) software in English, French, German, ■ Documentation (electronic format)	Single (1 station)	**UAG SEW LFU CD33**	–
	Site (> 10 stations)	**UAG SEW LFF CD33**	–

(1) For more technical information, please consult our website www.schneider-electric.com.
(2) Please contact our Customer Care Centre.
(3) The PLC/SCADA programming tools and/or communication driver must be ordered separately.

6

Modicon Quantum automation platform
Concept software

Concept programming software

IEC 61131-3 languages	Instruction List (IL)		MI	MI - C	MI - C - Q
	Ladder (LD)		MI	MI - C	MI - C - Q
	Structured Text (ST)		MI	MI - C	MI - C - Q
	Function Block Diagram (FBD)		MI	MI - C	MI - C - Q
	Sequential Function Chart (SFC)			MI - C	MI - C - Q
LL984 Ladder Logic language			ML	ML - C	ML - C - Q
Programming services	Multitask programming (master, fast, and event-triggered tasks)			MI - ML - C	MI - ML - C - Q
	DFB editor		MI - ML	MI - ML - C	MI - ML - C - Q
	DDT compound data editor		MI - ML	MI - ML - C	MI - ML - C - Q
	Data structure instances and tables		MI - ML	MI - ML - C	MI - ML - C - Q
	Use of DFB instances		MI - ML	MI - ML - C	MI - ML - C - Q
	EF and EFB libraries		MI - ML	MI - ML - C	MI - ML - C - Q
	Programmable control loops (with FB library)		MI - ML	MI - ML - C	MI - ML - C - Q
	Hot Standby PLC redundancy system	IEC			Q (140 CPU 434 12A/534 14B)
		LL 984			Q
	System diagnostics		MI - ML	MI - ML - C	MI - ML - C - Q
	Application diagnostics		MI - ML	MI - ML - C	MI - ML - C - Q
	Diagnostics with location of error source		MI - ML	MI - ML - C	MI - ML - C - Q
Debugging and display services	PLC simulator		MI - ML	MI - ML - C	MI - ML - C - Q
	Step by step execution, breakpoint		MI - ML	MI - ML - C	MI - ML - C - Q
	Watchpoint		MI - ML	MI - ML - C	MI - ML - C - Q
	Diagnostics viewers		MI - ML	MI - ML - C	MI - ML - C - Q
Programming services	Modsoft application converters		MI - ML	MI - ML - C	MI - ML - C - Q
	Safety			MI - ML - C	MI - ML - C - Q

Compatible Modicon platforms	Quantum CPUs **Q**	–		140 CPU 113 02 140 CPU 113 03 140 CPU 434 12A 140 CPU 534 14B
	Momentum M1 and M1E CPUs **M● M●**	171 CCS 700 00 **ML** 171 CCS 700 10 **ML** 171 CCS 780 00 **ML** 171 CCS 760 00 **ML - MI** 171 CCC 760 10 **ML - MI** 171 CCC 780 10 **ML - MI** 171 CCC 980 20 **ML** 171 CCC 980 30 **ML - MI** 171 CCC 960 20 **ML** 171 CCC 960 30 **ML - MI**		
	Compact CPUs **C**	–	PC E984 258 PC E984 265 PC E984 275 PC E984 285	

Software name	**Concept S**	**Concept M**	**Concept XL**
Type of Concept software	**372 SPU 471 01 V26**	**372 SPU 472 01 V26**	**372 SPU 474 ●1 V26**
Pages	6/35		

EF/EFB function development software in C language	Concept runtime/maintenance version software	SFC View application diagnostic and monitoring software
Enhancement of EF and EFB libraries: □ Creation of families □ Development of functions in C language □ Access to all data and variable types □ Use of functions created in all languages Supplied with Borland C++ software	Software intended for maintenance technicians for runtime applications: □ Remote program loading □ Application monitoring and diagnostics Does not allow program modification	ActiveX control component for monitoring and diagnostics of chart status (SFC or Grafcet) in sequential applications: □ Overview of charts and detailed views □ Can be integrated in human/machine interface (HMI) applications □ Access to PLC data via OFS *(OPC Factory Server)* Includes EFB library for Concept
Compatible with: □ Concept S, M, and XL □ All CPUs for Concept	Compatible with all CPUs for Concept	Compatible with: □ Concept S, M, and XL □ All CPUs for Concept
Concept EFB Toolkit	**Concept Application Loader**	**Concept SFC View**
332 SPU 470 01 V26	**372 SPU 477 01 V26**	**372 SFV 160●0 V30**

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Modicon Quantum automation platform
Concept programming software

Concept programming software

Concept is a software configuration and application programming tool for the Quantum and Momentum automation platforms. It is Windows-based software that can be run on a standard PC. The configuration task can be carried out online (with the PC connected to the Quantum CPU) or offline (PC only). Concept supports the configuration by recommending only permissible combinations. During online operation, the configured hardware is checked immediately for validity and illegal statements are rejected.

When the connection between the programming terminal (PC) and the Quantum CPU is established, the configured values are checked and compared with actual hardware resources. If a mismatch is detected, an error message is issued.

Concept editors support five IEC programming languages:
- Function Block Diagram (FBD) language
- Ladder (LD) language
- Sequential Function Chart (SFC) and Grafcet language
- Instruction List (IL) language
- Structured Text (ST) language

as well as a Modicon Ladder language compatible with ProWORX/Modsoft (LL984). IEC 61131-3 compliant data types are also available. With the data type editor, custom data types can be converted to and from the IEC data types.

The basic elements of the FBD programming language are functions and function blocks that can be combined to create a logical unit. The same basic elements are used in the LD programming language; LD provides contact and coil elements.
The Grafcet SFC programming language uses basic step, transition, connection, branch, join and jump elements. The IL and ST text programming languages use instructions, expressions and key words. The LL984 programming language uses an instruction set and contact and coil elements.

You can write your control program in logical segments. A segment can be a functional unit, such as conveyor belt control. Only one programming language can be used within a given segment. You build the control program, which the CPU executes to control the process, by combining segments within one program. Within the program, IEC segments (written in FBD, LD, SFC, IL and ST) can be merged. The LL984 segments are always processed as a block by the IEC segments. Concept's sophisticated user interface uses windows and menus for easy navigation. Commands can be selected and executed quickly and easily using a mouse. Context-sensitive help is available at each editing step.

Optional Concept SFC View software

When integrated in an HMI application, Concept SFC View can be used to monitor and control charts in applications developed in Sequential Function Chart (SFC) language running on Quantum PLCs.

Modicon Quantum automation platform
Concept programming software

Concept programming software

Concept software packages

Description	Licence type	Reference	Weight kg
Concept S Version 2.6	Single (1 station)	**372 SPU 471 01 V26**	–
Concept M Version 2.6	Single (1 station)	**372 SPU 472 01 V26**	–
Concept XL Version 2.6	Single (1 station)	**372 SPU 474 01 V26**	–
	Group (3 stations)	**372 SPU 474 11 V26**	–
	Team (10 stations)	**372 SPU 474 21 V26**	–
	Site (network)	**372 SPU 474 31 V26**	–
Concept EFB Toolkit Version 2.6	Single (1 station)	**332 SPU 470 01 V26**	–
HVAC Function Blocks Library	Site (network)	**372 HVA 160 30V25**	–

Concept maintenance and diagnostics packages

Description	Licence type	Reference	Weight kg
Concept Application Loader Version 2.6	Single (1 station)	**372 SPU 477 01 V26**	–

Concept updates

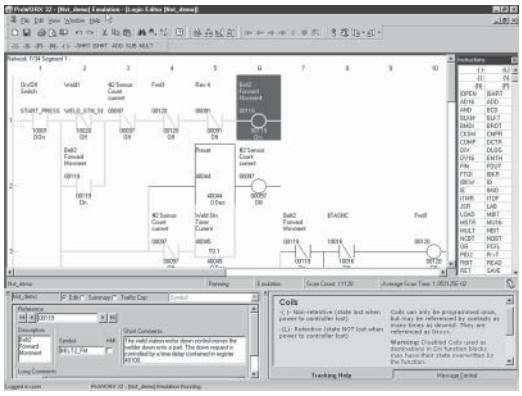
Description	Licence type	Reference	Weight kg
Concept XL Version ●.● to Concept XL V 2.6	Single (1 station)	**372 ESS 474 01**	–
	Group (3 stations)	**372 ESS 474 03**	–
	Team (10 stations)	**372 ESS 474 10**	–
	Site (network)	**372 ESS 474 00**	–
Concept S Version ●.● to Concept S V 2.6	Single (1 station)	**372 ESS 471 01**	–
Concept M Version ●.● to Concept M V 2.6	Single (1 station)	**372 ESS 472 01**	–
Modsoft version ●.● to Concept XL V 2.6	Depends on number of users	**372 ESS 485 01**	–
Concept EFB Toolkit version ●.● to Version 2.6	–	**372 ESS 470 01**	–

Optional Concept SFC View software

Description	Licence type	Reference	Weight kg
Concept SFC View software packages (version V3.0)	Single (1 station)	**372 SFV 16000 V30**	–
	Team (10 stations)	**372 SFV 16020 V30**	–
	Site (100 stations)	**372 SFV 16030 V30**	–

Modicon Quantum automation platform

ProWORX 32 programming software



Presentation

ProWORX 32 LL984 programming software is a full-featured Modicon Quantum and Momentum M1/M1E PLC programming software compatible with Windows platforms (98/NT/2000/XP) that gives you the power to program all your Modicon controllers online or offline, manage your I/O subsystems and analyze your plant's activity in real time.
ProWORX32 offers client/server functions for organizing groups and user rights and centralizing project backup, and serves as a bridge between design office and workshop. The project emulator makes it possible to test projects before executing them in a PLC runtime environment so as to ensure optimal system effectiveness at any time.
Some of the new ProWORX 32 features include:
32-bit processing: With 32-bit processing, ProWORX 32 is an even more powerful solution than its predecessors, ProWORX Plus and ProWORX NxT. 32-bit processing lets you utilize the power of state-of-the-art operating systems for optimal development and operational performance.
A comprehensive suite of tools: ProWORX 32 provides everything you will need to start, configure, test and debug your project, quickly, reliably and professionally. And with its improved suite of standard utilities, ProWORX 32 is a virtual "one stop shop" for your Automation Journey. No more searching on the web for special features or functions, they're all included to save you time and increase your productivity.
A high-performance offer: In addition, ProWORX 32 will simplify and speed up your system development and commissioning time with powerful diagnostics, easier integration and greater openness and flexibility.
Easier integration: Using standard Microsoft components based on ProWORX 32 opens up a wealth of user data. Import and export capabilities have been enhanced to provide a variety of integration options for HMI and third-party devices, such as a built-in "Alliance Tool" which allows users to create hardware profiles for newly developed peripherals. The profiles can even be sent electronically to Schneider Electric for inclusion in future ProWORX 32 releases.

Windows environment

The familiar Windows-based programming environment means you spend less time learning how to do things and more time being productive. ProWORX uses familiar Windows features like user-defined screens, drag-and-drop, cut-and-paste, search and global replace.

Conversion

484 to 984 in one step! The most flexible conversion tools available in the automation industry. That is the reputation ProWORX products have always enjoyed, and ProWORX 32 is no exception. With the ability to convert older project databases to this latest tool, ProWORX 32 supports almost 30 years of PLC heritage.

Multiple projects

Imagine the time and effort you could save by testing a new project with an existing project while it is running live. Now you can with the Multiple Projects function of ProWORX 32, even with two PLCs running simultaneously! Perform diagnostic checks to validate interdependencies between your emulated project and your live applications, all in real time, so you can go live with total confidence.

Intuitive register editor

A powerful analysis tool, the Data Watch Window shows you information from your plant in real time, or saves it to disk for in-depth historical analysis later on. You can easily get the data you need to make informed, effective production decisions. View and edit data in full page display, see trends and track data points against time in a spreadsheet and monitor any combinations of digital and analog data.

References:
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Modicon Quantum automation platform
ProWORX 32 programming software

Presentation (continued)

I/O drawing generator

Save hours of painstaking effort with ProWORX 32's I/O Drawing Generator, which automatically creates wiring diagrams for the I/O modules defined in the Traffic Cop. Generate necessary drawings all at once or just one module at a time – simply select an address the I/O module uses with the Network Editor, then click the drawing button on the Hardware Back Referencing panel to display the diagram and, if desired, save it as an AUTOCAD-compatible .DXF file and print it.

Network editor

With the Network Editor, ProWORX 32 reduces development time by using the same commands and instructions for all PLCs. Simply cut, copy and paste networks from one platform to any other.

Program documentation

ProWORX is first-class software with first-class program documentation. Use one of the many standard templates to get started, and progress to assemble your own custom documentation. For better references and easier-to-use documentation, we have provided annotation down to "bit" level to allow longer comments and more lines of text. Even simple things like using Windows O/S fonts to eliminate printer issues demonstrates that every detail has been considered.

Real-time network status

Find the controller you need fast and simplify network diagnostics with ProWORX 32's powerful Network Scan feature. Network Scan searches your Modbus or Modbus Plus networks, then identifies and graphically displays each device found and shows its status.

Advanced I/O management

Ensure that the I/O module you are configuring in the software matches the one on your plant floor with ProWORX 32's graphical Traffic Cop. It displays I/O modules on your screen the same way they look in real life, eliminating all confusion. To place a module, just select it from the convenient drop-down menu and then drag it into the PLC slot you want. To save even more time, the Traffic Cop automatically associates the module's I/O points with a block of free addresses in your PLC. Once configured, manage your I/O with Pro WORX 32's complete documentation tools, with references for each head, drop, rack, slot and address. And the Traffic Cop's graphical display shows you at a glance that your I/O are healthy.

References:
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Presentation (continued)

Client/server tools

ProWORX 32 allows projects to be developed in a collaborative environment without sacrificing control and safety by utilizing the ProWORX 32 server as the central repository for projects, the safety centre and the hub for communications. The system administrator has total control over user accounts, user groups, passwords, access privileges and can grant access rights when and where needed.

The client/server relationship allows projects to be skilfully managed and controlled. The server can be used to keep “Master” versions of automation projects for editing (subject to rights), while editing is performed on the client. This can be done via a standalone PC or even on the server since both client and server can reside on the same PC.

The ProWORX server has the capability to schedule software backups of the applications, detect software modifications and store multiple versions. Even more powerful is the ability to communicate from the client to the server using either Ethernet TCP/IP or Modbus Plus.

Project emulator

The project emulator is a very powerful tool that will help save considerable time in developing and debugging your system. It provides the ability to test projects prior to running them in the PLC environment to ensure your system will run at peak efficiency immediately upon commissioning.
Two emulators are provided that test interdependent projects. They are used to test communication, such as I/O scanning and monitoring network activities between projects.

Material List Generation

The Material List Generation function automatically creates a list for the project, either online or offline, even taking into account the contents of the Traffic Cop. Add prices and comments once the list is generated, saving you time and ensuring that all required components are fully documented and identified.

References:
page 6/39

Modicon Quantum automation platform
ProWORX 32 programming software

ProWORX 32

ProWORX Client/Server software

ProWORX software packages

Description	Use	Licence type	Reference	Weight kg
ProWORX 32	Server	Single-station	**372 SPU 780 01 PSEV**	–
	Client/server suite	Single-station	**372 SPU 780 01 PSSV**	–
	Development/runtime client	Single-station	**372 SPU 780 01 PDEV**	–
		Group (3 stations)	**372 SPU 780 01 PSTH**	–
		Team (10 stations)	**372 SPU 780 01 PSTE**	–
		Site	**372 SPU 780 01 SITE**	–
	Runtime client	Single-station	**372 SPU 781 01 PONL**	–
ProWORX 32 Lite	Development/runtime client	Single-station	**372 SPU 710 01 PLDV**	–
		Group (3 stations)	**372 SPU 710 01 PLTH**	–
		Team (10 stations)	**372 SPU 710 01 PLTE**	–
ProWORX 32 upgrades	Client	Single-station	**372 SPU 784 01 LPUP**	–
		Additional multi-use	**372 SPU 784 01 SEAT**	–
		Group (3 stations)	**372 SPU 784 01 LPTH**	–
		Team (10 stations)	**372 SPU 784 01 LPTE**	–

Documentation

Description	Language	Reference	Weight kg
ProWORX 32 programming manuals	English	**372 SPU 780 01 EMAN**	–
	French	**372 SPU 780 01 FMAN**	–
	German	**372 SPU 780 01 DMAN**	–
	Spanish	**372 SPU 780 01 SMAN**	–

Presentation:
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7 - Quantum safety architectures

Safety PLCs

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Safety architectures

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Modicon Quantum automation platform
Safety PLCs

For more detailed information about the installation, use and maintenance of a system in accordance with the requirements of standard IEC 61508, refer to the "*Quantum Safety PLC, Safety Reference Manual*", 01/2010, reference 33003879. 03, which has been approved by TÜV Rheinland *and* is available on our website **www.schneider-electric.com**.

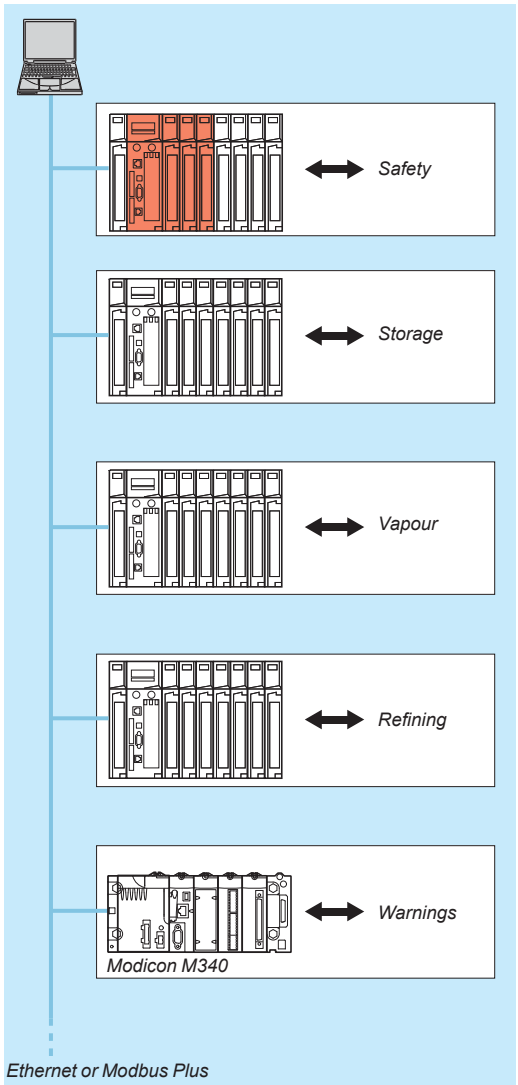
Presentation

Because of the potential for serious human, financial and environmental consequences of an industrial accident, safety is becoming an increasingly important factor for companies. It is not only a question of protecting employees and local residents but also of protecting production tools and the environment, and all within the terms of the applicable legislation. New safety challenges are being added to the more traditional industrial challenges of reducing operating costs and optimizing production costs.
In response to these new demands, Schneider Electric has developed a safety PLC offer based on the Modicon Quantum range. This Quantum safety PLC offer has been certified by TÜV Rheinland Group according to IEC 61508 for use in applications requiring a level of safety up to and including SIL3.

Integration of certified safety functions and Hot Standby mode in a single configurable PLC platform, which can all be programmed using a common tool, makes the Quantum safety PLC offer unique on today's automation market.
This new offer can be used to create simple, standard safety architectures with:
- In-depth internal diagnostics at I/O management level
- Type 1oo2 CPU internal architecture
- No external voting function or additional hardware components required to guarantee the safety level

Since the safety part is integrated in the PLC itself, the I/O wiring is the same as that of standard PLCs.
The safety architectures are identical to standard Modicon Quantum architectures. They use:
- Standard remote I/O system
- CRP/CRA RIO modules providing wiring redundancy between the remote racks and the main rack
- A standard wiring system
- Standard Quantum backplanes
- A standard redundant power supply
- A Hot Standby architecture similar to that of the standard Quantum Hot Standby, which is very easy to wire and requires no special software development

Unity Pro



The same programming software and communication and system hardware components for both the safety and the automation functions

Target applications

SIL3 certified Quantum Safety Unity CPUs are the ideal solution for industrial control processes.
They have been certified for use in the following applications in particular:
- Emergency Shut Down (ESD) systems
- Gas burner control systems
- *Fire and Gas* applications, fire alarm and detection system
- Safety machines

Process safety: General

Safety system

A system is considered to be functionally "safe" if the causes of random or systematic failures do not lead to malfunctioning of the system and do not result in injury or death, loss of equipment or pollution of the environment.

Safety Instrumented System (SIS)

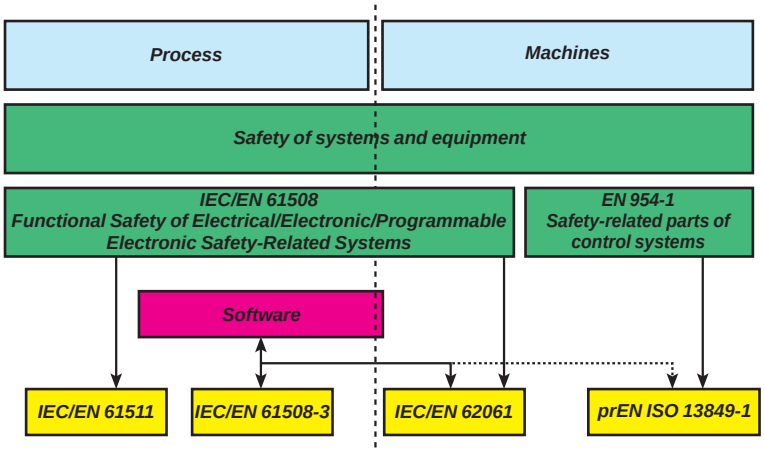
A Safety Instrumented System is an independent system of sensors, logic controllers (SIL3 certified Quantum PLCs for example) and actuators designed to place the process in a safe state if the predefined conditions for safe operation are violated.

Process safety: General (continued)

Safety Integrity Level (SIL)

Safety Integrity Level (SIL) has become a synonym for functional safety.
SIL defines the level of performance or reliability of an electrical or electronic system in terms of its safety. Hence, the SIL is an indicator of a system's ability to perform safety-related tasks.

Safety standards (IEC 61508 and IEC 61511)



Standard IEC 61508 “Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems” was published in 1998 and validated in 2002. This new safety standard was the first to define safety requirements for control systems independently of the application. IEC 61508 is a technical standard covering the functional safety of electrical or electronic equipment. A system is said to be safe if it performs one or more specific functions in such a way as to keep any risks to an acceptable minimum. Such functions are defined as being safety functions.

IEC 61508 contains general requirements for minimizing the following risks:
- Incorrect specifications of the system, hardware or software
- Omissions in the specifications
- Random failures of hardware
- Systematic failures of hardware and software
- Common cause failures
- Environmental influences (e.g. electromagnetic, temperature, etc.)
- Supply system voltage disturbances

While IEC 61508 is primarily intended for manufacturers of components for protecting equipment and products, standard IEC 61511, Functional Safety – Technical Safety Systems for the Process Industry, is aimed at users and designers of safety equipment.
IEC 61511 provides recommendations and is designed to help assess the risk of damage to installations as well as facilitate the selection of safety components.
IEC 61511 is specific to industrial processes:
- It is widely applied to safety instrumented systems.
- It is aimed primarily at system designers, integrators and users of safety systems or equipment.

TÜV Rheinland

TÜV is a group of companies specializing in authorizing IEC 61508 certification. One of these companies, TÜV Rheinland (Germany), is a world-renowned leader in safety-related systems.
Recognized as one of the world's best certification agencies, TÜV Rheinland has the backing of both insurance companies and governments.

TÜVRheinland®

Modicon Quantum automation platform
Safety PLCs

Certifications and standards

The Modicon Quantum safety PLC offer has been certified by TÜV Rheinland for use in applications requiring a level of safety up to and including SIL3.

This certification means that Modicon Quantum Safety PLCs conform to the following standards:
- IEC 61508: Functional safety of electrical/electronic/programmable electronic safety-related control systems, Part 1-7, second edition, September 2012
- IEC 61131: PLCs: Part 2: Equipment requirements and tests: second edition, February 2003
- Protection of boilers:
  - European standards: EN 50156
  - USA standards: NFPA 85 and NFPA 86
- EN 54-2: Fire detection and fire alarm systems
- EN 298: Automatic gas burner control systems (with or without fans)
- Safety of machinery: IEC 62061 and EN ISO 13849

Modicon Quantum Safety PLCs also meet the requirements of the following certifications:
- UL
- CSA
- CE.
- Hazardous Locations
- ATEX, depending on the model (see pages 10/2 to 10/9)

Training

With more than 30 years' experience in control and supervision of critical processes, Schneider Electric offers you its most experienced safety experts through its support and consulting services.

In collaboration with your teams, they estimate the risk, determine reasonably foreseeable parameters for it and, if a safety system needs to be installed, specify the required SIL. They can also take responsibility for designing the architecture and specifying the associated safety functions. Finally, they will be able to guide you through the process of getting the system and the application certified.

- Functional safety training
- Risk and hazard analysis
- Definition of safety functions and required SIL
- Design of safety system architecture and specification of safety functions
- Assessment of level of intrinsic safety
- Technical support for development
- Control of the safety system acceptance test
- Assistance with application startup
- Assistance with preventive maintenance

Modicon Quantum automation platform
Safety PLCs

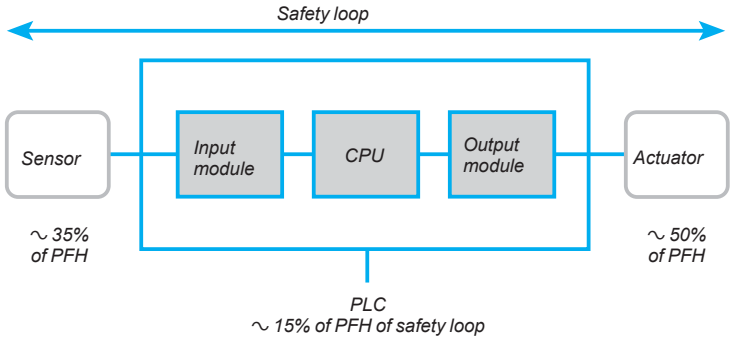
Safety CPUs and modules

The Modicon Quantum safety offer comprises five references: two CPUs and three I/O modules, and also uses power supply module **140 CPS 124 20**.
These products are certified for use in safety applications up to and including SIL3:

Safety CPU	**140 CPU 651 60S**
Hot Standby safety CPU	**140 CPU 671 60S**
Safety discrete inputs	**140 SDI 953 00S**
Safety discrete outputs	**140 SDO 953 00S**
Safety analog inputs	**140 SAI 940 00S**
Power supply	**140 CPS 124 20** *(1)*

Description of the safety loop

The safety loop into which the Quantum safety PLC is integrated consists of the following 3 parts:
- Sensors
- Quantum safety PLC
- Actuators



Probability of failure PFD, PFH

As far as SIL3 applications are concerned, standard IEC 61508 defines the probability of failure on demand (PFD) or the probability of failure per hour (PFH), depending on the system's mode of operation:
- $10^{-4} \leq PFD < 10^{-3}$ in a low-demand mode of operation
- $10^{-8} \leq PFH < 10^{-7}$ in a high-demand mode of operation

The Quantum safety PLC has been certified for use with both low and high-demand systems.
In terms of calculating the PFD/PFH values for a typical system, the maximum permissible value for the PLC is generally 15%. The PFD/PFH values for Quantum safety modules, for PTI values *(2)* of 5 and 10 years, are given in the following table:

	Reference	PTI = 5 years		PTI = 10 years	
		PFD ($x10^{-5}$)	PFH ($x10^{-9}$)	PFD ($x10^{-5}$)	PFH ($x10^{-9}$)
Safety CPU	**140 CPU 651 60S**	4.9	5.1	9.9	5.6
Hot Standby safety CPU	**140 CPU 671 60S**	4.9	5.1	9.9	5.6
Safety discrete inputs	**140 SDI 953 00S**	0.3	1.9	0.6	1.9
Safety discrete outputs	**140 SDO 953 00S**	0.4	1.2	0.7	1.2
Safety analog inputs	**140 SAI 940 00S**	0.4	1.4	0.9	1.4
Power supply	**140 CPS 124 20**	–	–	–	–
Power supply	**140 CPS 224 00**	–	–	–	–

(1) Non-interfering module certified by TÜV Rheinland, please consult our website www.schneider-electric.com.
(2) Proof Test Interval (see page 7/6).

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Modicon Quantum automation platform
Safety PLCs

PTI

Qualification testing is a process carried out at regular intervals that is designed to determine whether the system needs to be overhauled in its entirety or only partially.
The PTI (*Proof Test Interval*) is the time interval between two qualification tests.

Example 1: Safety loop

With:
- 1 discrete input module
- 1 discrete output module
- 1 independent CPU

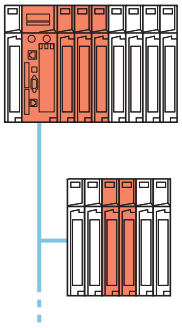
The Quantum Safety PLC is involved in the safety loop to the following extent:
0.2 + 1.1 + 0.2 = 1.5%.
The sensors and actuators account for 98.5%.

Example 2: Redundant safety loop

With 2 sensors:
- 2 redundant analog input modules
- 2 redundant discrete output modules
- 2 high-availability CPUs (Hot Standby)

The Quantum Safety PLC is involved in the safety loop to the following extent:
0.2 + 1.1 + 0.2 = 1.5%.
The sensors and actuators account for 98.5%.

***Note**: Each pair of identical modules is actually only represented once, as the sole purpose of redundancy is to increase availability.*
Therefore, only 1 module from each pair will be active within the safety loop.



Unity Pro XLS supports a combination of safety I/O and non-interfering I/O.

Non-interfering modules

Certain I/O modules from the Quantum catalog can be used in a safety architecture without interfering with the safety process.
Unlike the safety modules, these modules, which are referred to as “non-interfering”, are not responsible for any safety functions.
The following is a list of Quantum non-interfering modules which are fully compatible with a Quantum Safety configuration *(1)*:

Type	Reference
RIO head adaptor	**140 CRP 932 00**
RIO drop adaptor	**140 CRA 932 00**
Ethernet module	**140 NOE 771 11**
16-slot rack	**140 XBP 016 00**
10-slot rack	**140 XBP 010 00**
6-slot rack	**140 XBP 006 00**
Discrete inputs	**140 DDI 353 00**
Discrete outputs	**140 DDO 353 00**
Analog inputs	**140 ACI 040 00**
Analog outputs	**140 ACO 020 00**
40-way terminal block	**140 XTS 002 00**
	140 XTS 001 00
Optical repeater	**140 NRP 954 00**

Treatment for severe environments

Safety CPUs **140 CPU 6●1 60S** and safety I/O modules **140 SD● 953 00S** and **140 SAI 940 00S** have a “Humiseal 1A33” coating which makes them suitable for operation in severe environments (see page 10/2).
Non-interfering modules and racks compatible with safety PLCs are also available in a Conformal Coating version with the same treatment (see pages 10/2 to 10/9).

These modules and racks with protective coating have an additional letter “**C**” at the end of the reference of the standard module.

(1) Non-interfering modules certified by TÜV Rheinland, please consult our website www.schneider-electric.com.

Unity Pro XL Safety programming software

Quantum Safety PLCs are programmed with the Unity Pro XL Safety software.
This programming tool is compatible with various Schneider Electric PLC ranges (Modicon M340, Modicon Premium, Standard Modicon Quantum, Safety Modicon Quantum). Ethernet and Modbus Plus can be used to establish a connection not only with other PLCs (both safety PLC and standard PLC), but also the supervision system.
In order to meet the requirements of standard IEC 61508, certified programming software must be used to program the safety applications.
That is why Schneider Electric has developed a special safety version of its programming software: Unity Pro XLS (XL Safety).
Not only does this version of Unity Pro support fault diagnostics, but it also ensures that the project is protected to the extent necessary for programming a safety application.
Unity Pro XLS can be used to generate both safety applications and standard applications.
Therefore, you only need to install one version of the programming software on your PC.
For further information, see page 7/38.

Floating point instructions

Unity Pro XLS version 4.1 or later enables floating point format numerical instructions to be used for programming safety applications.

Differences between Quantum safety PLCs and standard Quantum PLCs

The Quantum safety PLC differs from the standard Quantum PLC in terms of its functions and behaviour in order to meet the requirements of standard IEC 61508.

Characteristic	Quantum standard PLC	Quantum safety PLC
Configuration	■ Backplane ■ Local rack ■ Remote I/O ■ All power supplies ■ Backplane extensions ■ Distributed I/O ■ I/O on a fieldbus	■ Backplane ■ Local rack ■ Remote I/O ■ Dedicated power supply
Firmware	Standard	Safety
Software	■ Unity Pro XLS ■ Unity Pro XL ■ Unity Pro L	Unity Pro XLS
User logic	■ FBD ■ LD ■ IL ■ ST ■ SFC	■ FBD ■ LD
Data types	■ EDT ■ DDT	■ EDT ■ Simple arrays only
Mode	–	■ Maintenance mode ■ Safety mode
Restart behaviour	■ Start from stop ■ Cold restart ■ Warm restart	■ Start from stop ■ Cold restart
Safety mode	No	Yes
Minimum MAST execution time in cyclic mode	3 ms	20 ms
Forcing in safety mode with key-switch locking	No	Yes
Memory check	No	Yes
Password	No	Yes
MSTR blocks	Yes	No
Global Data subscription (Ethernet)	Access to all areas	Access to unrestricted area only
Read I/O scanner (Ethernet)	Access to all areas	Access to unrestricted area only
PCMCIA cards	Slots A and B	Slot A

***Note**: The Quantum safety PLC can only perform a cold start: the application is reinitialized on each start.*
The Quantum safety PLC can run in cyclic or periodic mode.

Ethernet and Modbus Plus communication

General principle

There are no restrictions in terms of sending information to an external PLC or HMI terminal, regardless of the Ethernet or Modbus Plus network used or the protocol implemented. However, information can only be received (written to the safety PLC) in the “unrestricted” memory area *(1)*.

PLC-to-PLC communication

The Quantum safety PLC can communicate with other PLCs via:
- Modbus TCP. CPU connection or module **140 NOE 771 11**
- Modbus Plus (CPU serial port), server only
- Modbus RS232/RS485 (CPU serial port)

This communication method is certified for use in safety loops.These communication methods are classed as “non-interfering”.

Ethernet communication

The Ethernet network connects:
- Via the CPU Ethernet port
- Via an Ethernet module **140 NOE 771 11**

Note: With a Hot Standby safety CPU, the Ethernet port is reserved for data exchange between the primary and standby PLCs.

Ethernet module **140 NOE 771 11** has been certified as a non-interfering product for use with a Quantum safety PLC.
Both peer-to-peer and Global Data communication are supported. All standard Ethernet components can be used for the wiring.

Ethernet peer-to-peer communication

Using Unity Pro XLS, this type of communication is defined separately for the read and write directions in the Ethernet network configuration. Unity Pro XLS checks that the read data only uses (is only written to) the “unrestricted” memory area *(1)*.

Ethernet Global Data communication

Global Data communication is configured within the Ethernet network configuration in Unity Pro XLS so that write data can be published and read data can be subscribed to.
Read data may only be sent to the “unrestricted” memory area *(1)*.

Modbus Plus communication

On a Modbus Plus network, the Modbus Plus port on the CPU is used for peer-to-peer communication and Global Data exchange.

Peer-to-peer communication on Modbus Plus

Using Unity Pro XLS, this type of communication is defined separately for the read and write directions in the Modbus Plus network configuration. Unity Pro XLS checks that the read data only uses (is only written to) the “unrestricted” memory area *(1)*.

Global Data communication on Modbus Plus

Global Data communication is defined within the Modbus Plus network configuration in Unity Pro XLS so that write data can be published and read data can be subscribed to.
Read data may only be sent to the “unrestricted” memory area *(1)*.

(1) For details of the safety memory and unrestricted memory, see page 7/22.

Communication with HMI terminals

An HMI terminal is permitted to read data from the Quantum safety PLC, but may only write data to the “unrestricted” memory area *(1)* via:
- Modbus TCP: either via the CPU port, or via module **140 NOE 771 11**
- Modbus Plus
- Modbus RS232/RS485

As this type of communication is not defined with Unity Pro XLS, it is the Quantum safety PLC that is responsible for protecting itself against write access attempts by the HMI terminal: any attempt to send a write command to the safety memory *(1)* will be ignored.

Writing in maintenance mode

Even in maintenance mode, write protection prevents data being written to the safety memory by other PLCs or HMI terminals.

It is only possible to change to maintenance mode using Unity Pro XLS and after entering a password. The data in this area can be modified or adjusted with Unity Pro XLS or an OPC data server in maintenance mode:
- Modification of program logic
- Assignment of values
- Forcing of values
- Debugging

PC-to-PLC communication

Communication between Unity Pro XLS and the Quantum safety PLC takes place via:
- Modbus TCP. CPU port or NOE module
- Modbus Plus
- Modbus RS232/RS485
- USB

Even if communication between Unity Pro XLS and the Quantum safety PLC is not integrated into the safety loop, it is still subject to checks (e.g. a CRC) to ensure that the data is transferred correctly and that no communication errors occur.

(1) For details of the safety memory and unrestricted memory, see page 7/22.

Modicon Quantum automation platform
Safety architectures

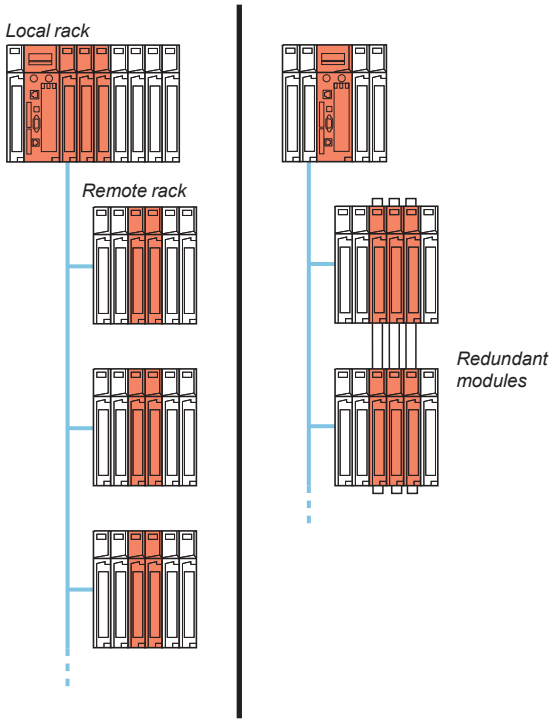
Introduction

Quantum safety PLC architectures feature the same flexibility and high availability benefits as standard Quantum PLC architectures.

Flexible architectures

"1oo2" CPU architectures

Example of architecture with redundant or non-redundant safety I/O *(1)*



Standard architecture with non-redundant safety I/O

Standard architecture with redundant safety I/O placed in 2 separate RIO drops

These architectures use the **140 CPU 651 60S** CPU.

(1) For more information about topologies with a single cable, see page 2/23.

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Modicon Quantum automation platform
Safety architectures

Flexible architectures (continued)

Hot Standby safety architectures:
"1oo2 Hot Repair" CPU architectures

With Hot Standby safety architectures:
- System availability can be increased significantly
- Process downtimes can be eliminated because of the redundant CPUs
- Redundancy is possible at every level within the architecture: CPU, wiring, power supply, I/O, etc.

The Hot Standby system is compatible with Unity Pro XL Safety software, and provides Quantum safety CPUs with the high level of availability required by the the most demanding applications, in terms of their control/command system.

At the centre of the system are two Quantum safety PLC racks, commonly known as the "Primary" PLC and the "Standby" PLC.
Their hardware configurations must be identical (same modules in each local rack).
The key element, on each of them, is the **140 CPU 671 60S** CPU, which is specially designed for Hot Standby architectures with the Unity Pro XL Safety software. This CPU is a double-slot module, which combines the central processor unit function with that of the redundant coprocessor in the same housing.

The "Primary" PLC executes the application program and controls the I/O. The "Standby" PLC stays in the background, ready to take over if necessary. The "Standby" PLC is connected to the "Primary" PLC via a high speed optical fibre link (100 Mbps) integrated in the CPU.
This optical fibre link (62.5/125 µm multimode) can be extended to 2 km without any special additional equipment. It is via this that the user application data is updated cyclically on the "Standby" PLC.

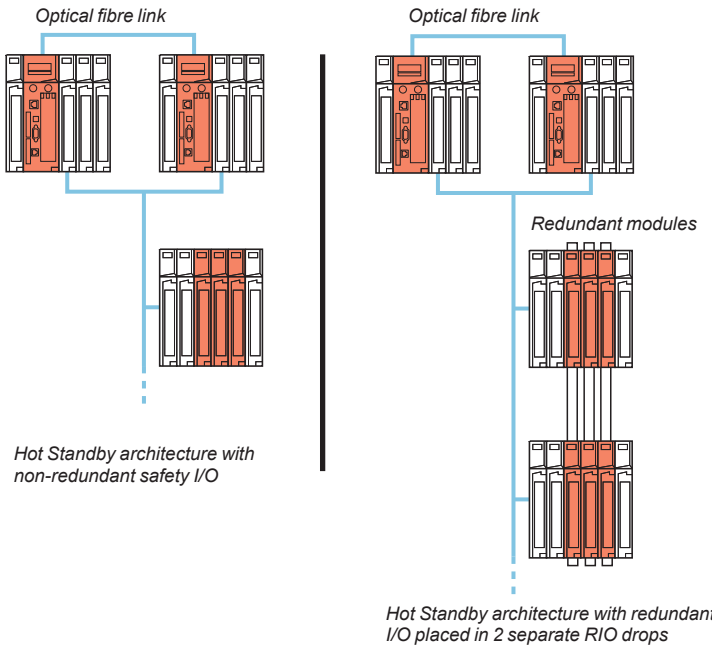
In the event of an unexpected failure affecting the "Primary" PLC, the standby system switches over automatically, changing execution of the application program and control of the I/O over to the "Standby" PLC, with an up-to-date data context. Once the changeover is complete, the "Standby" PLC becomes the "Primary" PLC. Once the faulty PLC has been repaired and reconnected to the standby system, it takes the role of the "Standby" PLC.

Using the Hot Standby system with Unity Pro XL Safety means a smooth changeover from normal to standby at the outputs. The changeover is transparent for the process, which will continue to be managed without any permanent ill-effects from the occurrence of a hardware failure.
The Hot Standby system with Unity Pro XL Safety software therefore increases productivity by minimizing downtime.

Modicon Quantum automation platform
Safety architectures

Flexible architectures (continued)

Example of architecture with redundant or non-redundant safety I/O



"1oo2 Hot Repair" architecture

A Hot Standby architecture enables safety and availability to be combined in a single PLC. This type of architecture ensures that even if one of the CPUs fails, the system still provides SIL3 safety. Since Quantum safety PLCs are based on the same Hot Standby architecture as standard Quantum PLCs, the solution is indisputably robust and has proved its worth in the field.

As a result of the "1oo2" design of safety CPUs (see page 7/20), they represent a simple and cost-effective solution compared to multiprocessor solutions with 3 CPUs and voting for control between one another with external equipment. The complete redundancy of functions, from the I/O through to the supervision system, has the advantage of being able to tolerate more than one error while still maintaining the required level of functional safety.

Particularly well suited to designing production systems which combine safety with availability and cost-effectiveness, the solution is the at the heart of the TÜV Rheinland **"1oo2 Hot Repair"** architecture concept.

Details

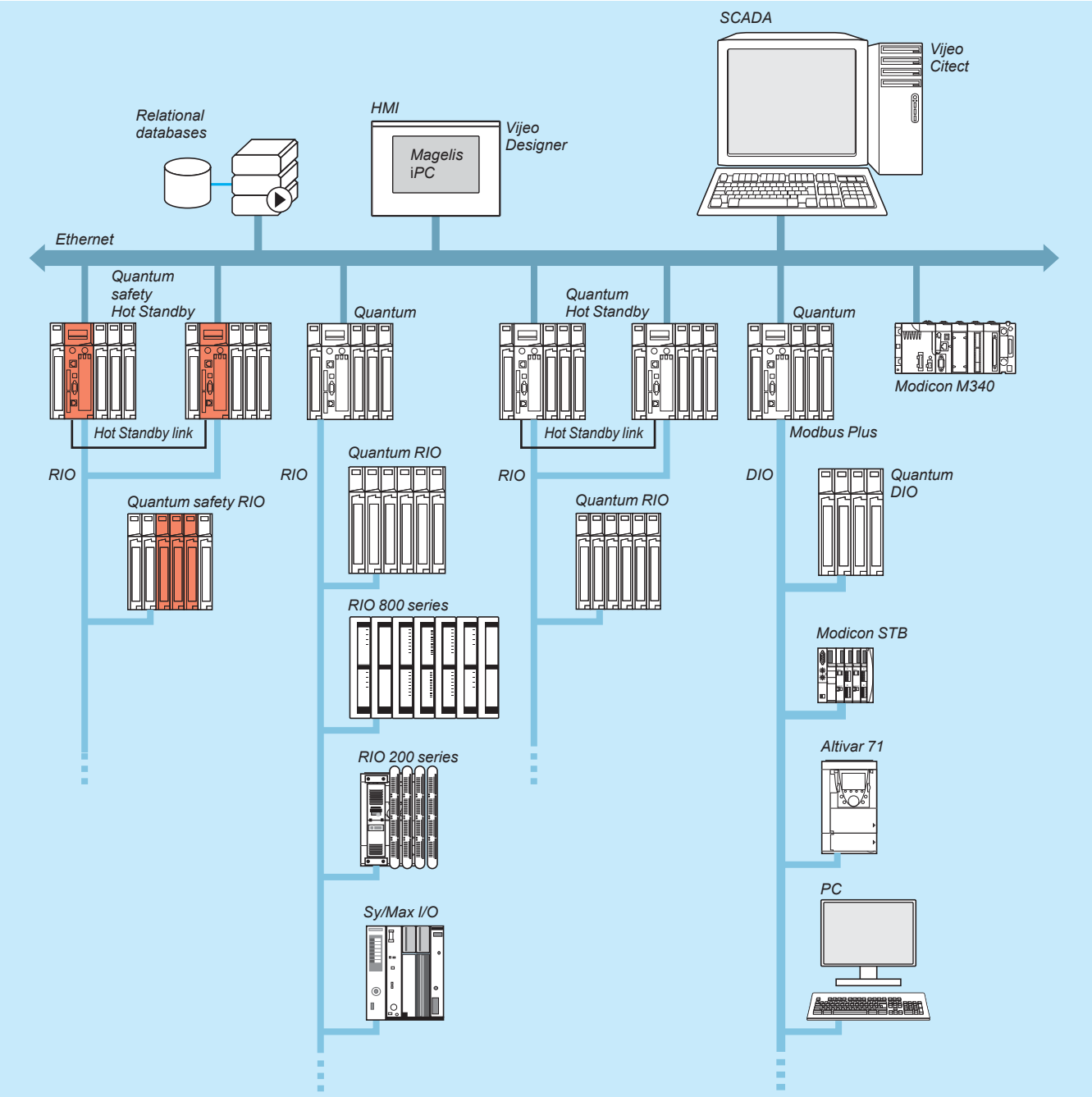
These architectures use two **140 CPU 671 60S** connected via optical fibre link. The safety I/O modules are placed in the RIO drops so that they can be controlled by both CPUs *(1)*.

The Quantum safety high availability CPU differs from the standalone CPU **140 CPU 651 60S** in its use of the Ethernet port. In a standalone configuration, the Ethernet port is used for communication with other devices via standard Ethernet cables. In a high availability safety configuration, it is used for data exchanges between the primary and standby controllers via optical fibre link. Since this optical fibre link is not part of the safety loop, the PFD and PFH values for the high availability CPU are the same as those for the standalone CPU.

(1) For more information on the connections, see page 2/35.

Modicon Quantum automation platform
Safety architectures

Collaborative architecture



The Quantum safety PLC is easy to use in a collaborative architecture:
- The same software tool is used for both the safety and the control PLCs
- The safety PLC has all the necessary protection against write operations from other equipment in the architecture

Modicon Quantum automation platform
Safety architectures

High availability functions

The following functions are available for high availability, in maintenance mode and safety mode:

Function	Maintenance mode	Safety mode
High availability	Yes	Yes
Role exchange	Yes	Yes
Role exchange by EFB	–	Yes
Key switch	Yes	Yes
Different logic	Yes	–
OS loading	Yes, if secondary PLC is in stop mode and disconnected	–
Application transfer	Yes	Yes, via CPU keyboard

Safety I/O modules in high availability configurations

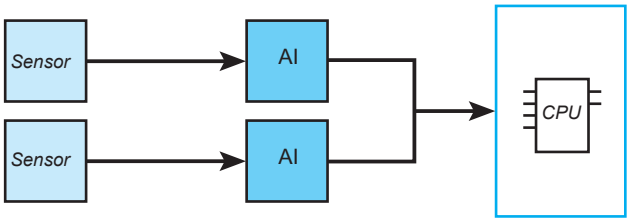
Safety I/O modules can be used in a redundant way to increase control system availability.
Schneider Electric offers function blocks for supervising the state of a configuration with redundant modules.
The state of the modules is available in system words, which can be made available to operators and maintenance staff to inform them that a module is faulty and must be changed.

To increase the availability of the system, Schneider Electric recommends using different remote I/O racks for redundant I/O modules.

Analog input modules

2 different sensors must be used for a high availability safety analog input and each must be connected to a different input channel.
It is advisable to locate these 2 input channels on different analog input modules.

Block diagram:



Function block S_AISIL2 can be used for selecting data from the 2 redundant analog inputs and to supervise the state of the inputs.

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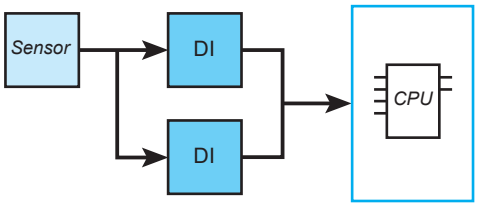
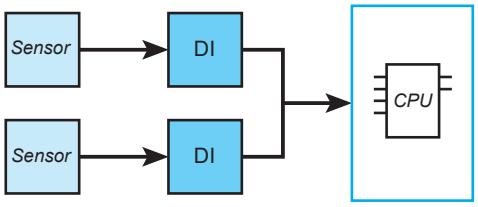
Modicon Quantum automation platform
Safety architectures

Discrete input modules

Redundant safety discrete inputs can be connected to 1 or 2 sensors. The 2 input channels should preferably be located on different input modules.
If a single sensor is used, the modules share the same process power supply. The wiring must be defined to suit the conditions of use of the modules (input characteristics on short circuit, open wire, 0 and 1 logic levels, voltage and current) as specified in the Quantum Hardware Reference Guide.

Block diagrams:



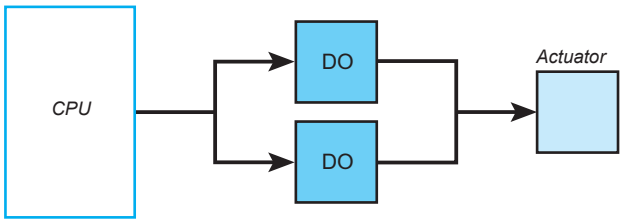


Function block S_DISIL2 can be used for selecting data from the 2 redundant discrete inputs and to supervise the state of the inputs.

Discrete output modules

For high availability discrete outputs, the 2 outputs must be on separate modules, wired in parallel and connected to 1 actuator.

Block diagram:



A function block is not necessary because the same signal from the CPU is connected to both outputs.

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Modicon Quantum automation platform
Hot Standby safety architectures

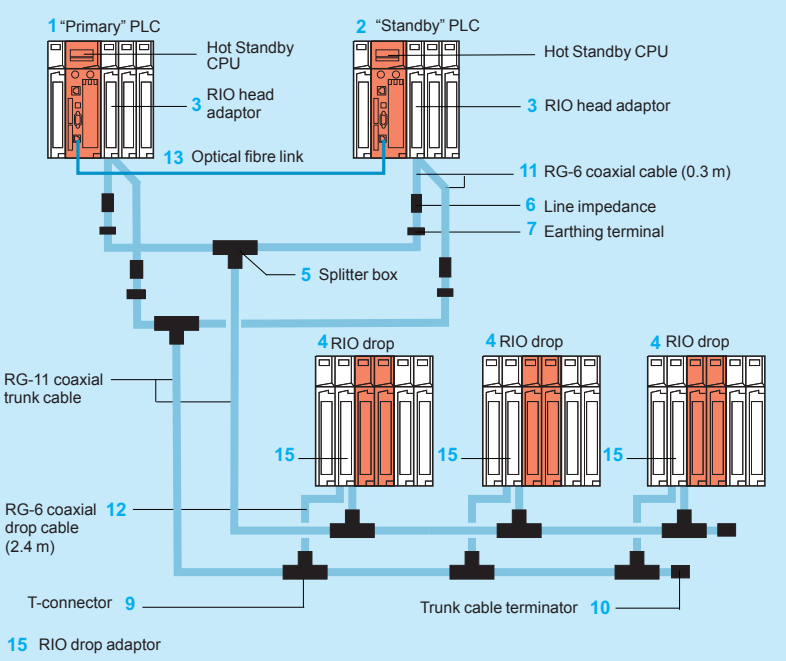
Hot Standby safety architecture
Remote I/O architecture (RIO)

These I/O drops, consisting of Quantum modules, are recognized and configured from the Unity Pro XL Safety software programming environment.

They feature synchronous scanning in relation to the scan time.

A splitter box 5 **MA 0186 100** is used to enable I/O exchanges between the RIO drops 4 and the "Primary" 1 and "Standby" 2 PLCs.
The line impedances 6 **52 0411 000** are used to maintain a suitable line when it is necessary to disconnect one of the I/O CPUs. The optional earthing terminals 7 **60 0545 000** are used to maintain the earthing of the coaxial cable in these conditions.

The availability of this I/O system is reinforced by using a dual-medium I/O wiring system.



***Note**: For items 1 to 15, see page 7/17.*

The components are available in kits.
For example, the configuration illustrated above can be created using:
- 1 splitter kit **140 CHS 320 00**
- 4 head adaptor connection kits **RPX KIT CRP**
- 6 drop kits **RPX KIT 6F**
- 1 RG-11 coaxial trunk cable: for example, a 320 m reel **97 5951 00**

(see page 2/27)

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Modicon Quantum automation platform
Hot Standby safety architectures

140 CPU 671 60S

References

Hot Standby safety CPU with Unity Pro XL Safety

Hot Standby CPU		Application memory (max.)		Optical fibre	Communication ports	Safety	Reference	Weight
Clock speed	Coprocessor	Available internal RAM (with located variables)	With PCMCIA card	Type and max. distance				
MHz		KB	KB					kg
266 MHz	Yes, integrated Ethernet TCP/IP, use reserved for Hot Standby	1024	7168	multimode 2 km	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Ethernet 100 Mbps port (dedicated Hot Standby port)	Yes	**140 CPU 671 60S**	–

140 NOE 771 11

Associated modules

Description	Type of architecture	Topology	Transparent Ready	No. *(2)*	Safety	Reference	Weight kg
RIO head adaptor	Remote I/O (RIO) and mixed I/O	Redundant cable	–	3	Non-interfering	**140 CRP 932 00**	–
RIO drop adaptor				15	Non-interfering	**140 CRA 932 00**	–
RIO drop optical fibre repeater*(3)*	Remote I/O (RIO)	Multimode optical fibre (single or redundant)	–	–	Non-interfering	**140 NRP 954 00**	–
		Single mode optical fibre (single or redundant)	–	–	Non-interfering	**140 NRP 954 01C**	–
Ethernet Modbus/TCP network module	Mixed	Bus or ring (copper or optical fibre)	Class C30	–	Non-interfering	**140 NOE 771 11**	–

(1) RS 232/RS 485 Modbus port.
(2) For item numbers, see page 7/16.
(3) Module can be declared and configured in Unity Pro XLSafety version 7.0 and later. This module can however be used with earlier versions of Unity Pro XLS without being declared.

***Note**: For all accessories and connections, see page 2/31.*

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Modicon Quantum automation platform
Safety CPUs

Automation platform for Unity Pro XL Safety software offer		Safety applications
Number of racks 3/4/6/10/16 slots	Local I/O	1 main rack
	Remote I/O (RIO)	31 drops x 1 rack
Maximum discrete I/O	Local I/O	No limit (max. 13 slots)
	RIO on S908 bus *(1)*	31,000 input channels and 31,000 output channels
Maximum analog I/O (1)	Local I/O	No limit (max. 13 slots)
	RIO on S908 bus *(1)*	230 input channels and 230 output channels
Application-specific modules		–
Number of communication modules (in local rack)	Ethernet TCP/IP	6 Ethernet 140 NOE 771 11 modules on local rack
Bus connections	Modbus	1 integrated RS 232/485 Modbus slave RTU/ASCII port
	AS-Interface actuator/sensor bus	–
	Profibus DP	–
Network connections	Modbus Plus	1 integrated port
	Ethernet TCP/IP	1 integrated port (10BASE-T/100BASE-TX), 6 “option” modules on local rack
	USB	1 port reserved for programming PC
Process control	Control loops	–
Redundancy		Power supplies, remote I/O network, Ethernet TCP/IP modules
Hot Standby CPU		–
Application structure	Master task	1 cyclic/periodic (20 ms min.)
	Fast task	–
	Auxiliary tasks	–
	Interrupt tasks	–
Number of Kinstructions executed per ms	100% Boolean	5.14 Kins/ms
	65% Boolean and 35% numeric	5.03 Kins/ms
Bus current required		2760 mA
Memory capacity without PCMCIA card	IEC program and data	1024 KB
Memory expansion with PCMCIA card	Program	Up to 7168 KB
	Data	1024 KB
	File storage	–
Functional safety certification		Certified by TÜV Rheinland as suitable for use in an SIL3 level safety function
Approvals		CE, UL, CSA, CSA Hazardous Location Class 1 Div 2, ATEX Zone 2/22 *(2)*
Type of Quantum CPU		**140 CPU 651 60S**
Page		7/23

(1) The maximum values for the number of discrete I/O and analog I/O are not cumulative.
(2) Only “Conformal Coating” versions, depending on the model, are certified ATEX Zone 2/22. For further information, see pages 10/2 to 10/9.

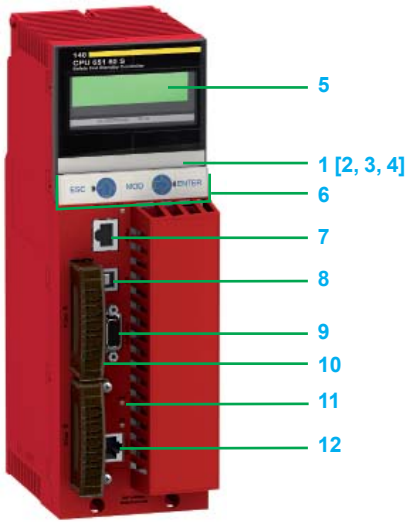
High-availability (Hot Standby) safety applications

1 main rack
31 drops x 1 rack
No limit (max. 13 slots)
31,000 input channels and 31,000 output channels
No limit (max. 13 slots)
230 input channels and 230 output channels
–
6 Ethernet 140 NOE 771 11 modules on local rack
1 integrated RS 232/485 Modbus slave RTU/ASCII port
–
–
1 integrated port
1 integrated port (10BASE-FX reserved for Hot Standby), 6 “option” modules on local rack
1 port reserved for programming PC
–
Power supplies, remote I/O network, Ethernet TCP/IP modules
Yes
1 cyclic/periodic (20 ms min.)
–
–
–
5.14 Kins/ms
5.03 Kins/ms
2500 mA
1024 KB
Up to 7168 KB
1024 KB
–
Certified by TÜV Rheinland as suitable for use in an SIL3 level safety function
CE, UL, CSA, CSA Hazardous Location Class 1 Div 2, ATEX Zone 2/22 *(2)*

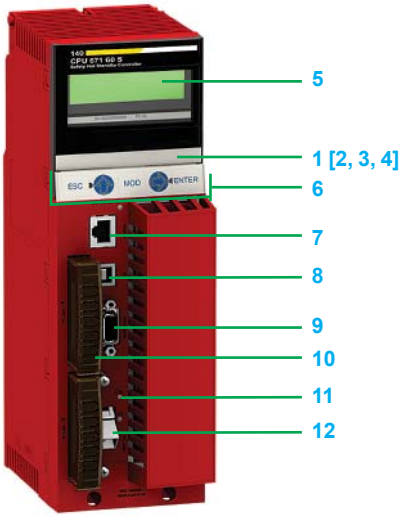
140 CPU 671 60S

7/23

Modicon Quantum automation platform
Safety CPUs



140 CPU 651 60S



140 CPU 671 60S

Description

Safety CPUs

140 CPU 651 60S and **140 CPU 671 60S** CPUs have the following on the front panel:

1 An LCD display cover, providing access to:

2 A key switch:
- Unlocked: all system operations can be invoked and all changeable module parameters can be modified by the operator via the LCD and keypad. The memory is not write-protected.
- Locked: no system operations can be invoked and all changeable module parameters are read-only. The memory is write-protected.

3 A backup battery slot *(1)*

4 A reset button (Restart)

5 An LCD display (2 lines of 16 characters) with brightness and contrast controls

6 A 5-button keypad with 2 LEDs *(ESC, ENTER, MOD, ⇧, ⇨)*

7 An RJ45 connector for connecting to the Modbus bus

8 A type B female USB connector for connecting the programming PC terminal

9 A 9-way female SUB-D connector for connecting to the Modbus Plus network

10 A slot for PCMCIA memory expansion cards (slot A)

11 Two LEDs:
- COM LED (green): activity on the Ethernet port (model 140 CPU 651 60S), activity on the Hot Standby primary or standby drop (model 140 CPU 671 60S)
- ERR LED (red): Ethernet frame collisions (model 140 CPU 651 60S), communication error between Hot Standby primary and standby drops (model 140 CPU 671 60S)

12 One connector:
- RJ45 for connection to the Ethernet network (model 140 CPU 651 60S)
- MT-RJ optical fibre connector for interconnecting the primary and standby PLCs in the Hot Standby architecture (model 140 CPU 671 60S)

(1) Internal RAM memory backup battery:
- Product reference: 990 XCP 980 00
- Type: Lithium 3 V ⎓
- Capacity: 1200 mAh
- Storage life: 10 years

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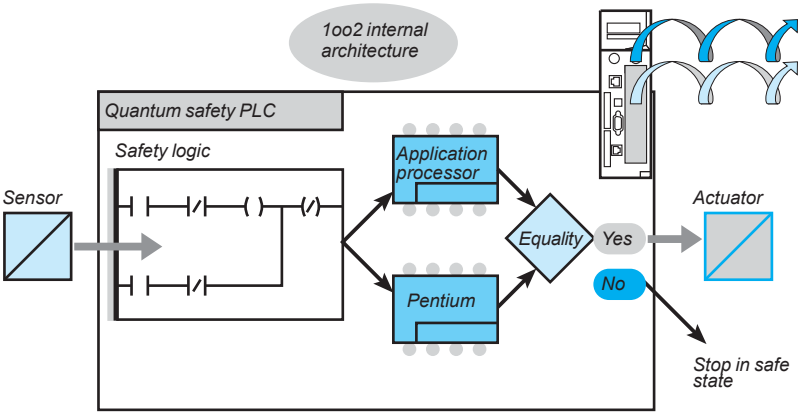
Modicon Quantum automation platform
Safety CPUs

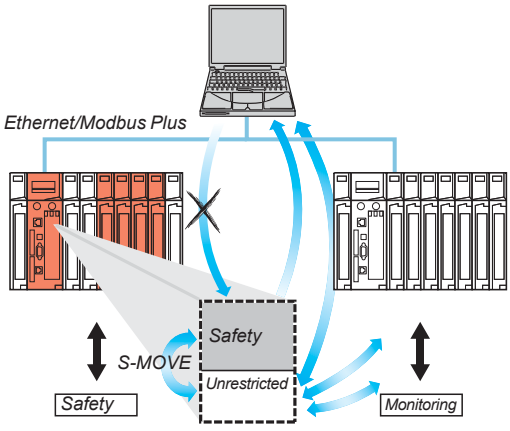
Operating principles - CPUs

Quantum safety CPUs have two processors which use different technologies.
Each one executes its safety program in its dedicated memory area. The results are analyzed at the end of each scan by two comparison mechanisms.
Each processor has its own fallback algorithm, which allows the system to be set to a so-called safe position if something goes awry when a function is being executed or if an error is detected. This dual processing is called a 1oo2 architecture (One out of Two).
The diagram below shows the internal architecture of a Quantum safety CPU:



Switch to fallback position configured

Combining processors in this way allows dual code generation and execution, offering the following advantages if an error is detected:
■ Both executable codes are generated independently.
The diversity of compilers allows routine errors to be detected during code generation.
■ The two generated codes are executed by two different processors.
The PLC is therefore able to detect both routine errors during code execution and random errors.
■ Both processors use independent memory areas.
The PLC can therefore detect random errors in the RAM memory.



Only the S-MOVE function block is capable of reading in the unrestricted memory area.

Safety memory

The Quantum safety PLC memory is divided into a safety area and an unrestricted area.
The safety memory area is write-protected. It is used to process safety-related data.
The unrestricted memory area is not write-protected. It is used to communicate with external devices.
Values in this area cannot be manipulated directly, only via specific function blocks.
As far as slot A is concerned, PCMIA memory cards can be used in the same way as with a standard PLC. They can contain applications, not data files (see page 7/22).
However, slot B cannot be used for safety projects.

Specific operating modes

The Quantum safety PLC has 2 specific operating modes:
■ Safety mode
■ Application and PLC maintenance mode

Safety mode

This is the Quantum safety PLC's default operating mode, in which all the safety functions are available to control the process.
It is a “restricted function” mode in which modification and maintenance activities are prohibited.Only stopping or starting the PLC, or placing it in maintenance mode, is authorized.

Modicon Quantum automation platform
Safety CPUs

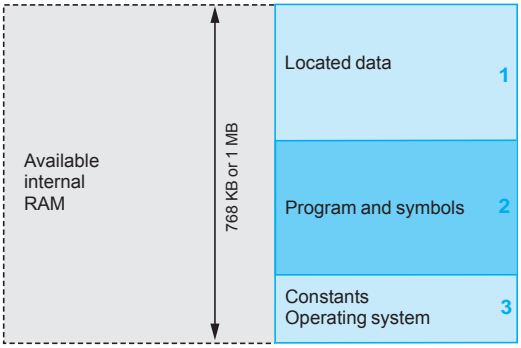
Specific operating modes (continued)

Maintenance mode

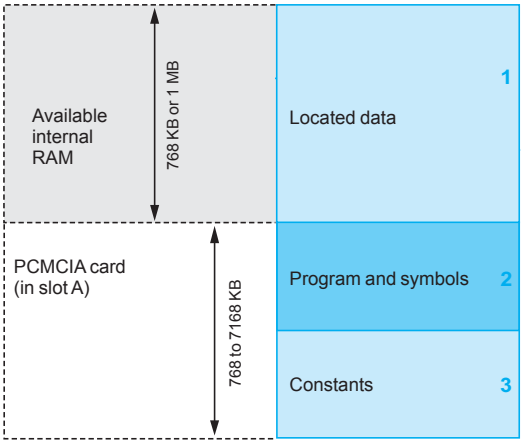
The Quantum safety PLC Maintenance mode is a temporary mode which is useful for modifying the project, debugging and maintaining the application program.
It provides the following functions:
- Changes can be downloaded
- Safety variables can be assigned and forced: limited to EBOOL variables
- It is possible to switch to safety mode while forcing is in progress

Memory structure

The application memory is divided into memory areas, physically distributed in the internal RAM memory and on 1 PCMCIA memory expansion card.



CPU without PCMCIA memory card



CPU with PCMCIA memory card in slot A

1 The application data area is always in the internal RAM.
It consists of global located data, corresponding to the data defined by an address (for example %MW237) with which a symbol can be associated.
2 Application program and symbols area in the internal RAM or in the PCMCIA memory card (descriptor, executable code for the tasks and application symbols database)
3 Constants area in the internal RAM or the PCMCIA memory card (constant words, initial values and configuration)

Depending on the requirements for application memory size, there are two possible ways to organize the memory according to whether or not the Quantum safety CPU is equipped with a PCMCIA memory expansion card:
- Application in the internal RAM, the application is entirely loaded in the internal RAM which is backed up *(1)* by the CPU (2 MB).
- Application in the PCMCIA card, the internal RAM is reserved for the application data. The PCMCIA memory card contains the program space (program, symbols and constants areas).

The presence of the symbols area with the program area is optional. The fact of having the application symbols database on the PLC means that, when it is connected to an empty programming PC (with no applications), all the elements needed to debug or upgrade this PLC are available.

Protecting the application

Whether located in the internal RAM or in the PCMCIA card, the application can be protected with a key switch (see page 7/20) in order to prohibit its access (read or modify program) online under Unity Pro XL Safety.

PCMIA cards for safety CPUs

Type	Program size KB	Data size KB	Reference
SRAM+FLASH	2048	1024	**TSX MCPC 002M**
SRAM+FLASH	512	512	**TSX MCPC 512K**
FLASH	1024	–	**TSX MFPP 001M**
FLASH	2048	–	**TSX MFPP 002M**
FLASH	4096	–	**TSX MFPP 004M**
FLASH	512	–	**TSX MFPP 512K**
SRAM	1024	832	**TSX MRPC 001M**
SRAM	2048	1856	**TSX MRPC 002M**
SRAM	3072	2880	**TSX MRPC 003M**
SRAM	7168	6976	**TSX MRPC 007M**
SRAM	1792	1600	**TSX MRPC 01M7**
SRAM	768	576	**TSX MRPC 768K**

(1) The internal RAM memory is backed up by a 3 V ⎓ lithium battery.

Modicon Quantum automation platform
Safety CPUs

140 CPU 651 60S

140 CPU 671 60S

Safety CPUs

Both these CPUs are certified by TÜV Rheinland as suitable for use in a safety function up to level SIL3. By default they have “Humiseal 1A33” coating which makes them suitable for operation in severe environments (see page 10/2).

CPU		Application memory (max.)		Communication ports	Optical fibre	Safety	Reference	Weight
Clock speed	Coprocessor	Available internal RAM (with located variables)	With PCMCIA card		Type and max. distance			
MHz		KB	KB		km			kg
266	Yes	768	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Ethernet TCP/IP	multi-mode 2	Yes	**140 CPU 651 60S**	–
		1024	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps) *(2)*	multi-mode 2	Yes	**140 CPU 671 60S**	–

PCMCIA memory expansion cards

Quantum **140 CPU 651 60S** and **140 CPU 671 60S** CPUs can take 1 memory expansion card (see list on page 7/22).

Connection cables and accessories

Description	Use		Length	Reference	Weight
	From processor	To PC port			kg
Connecting cables to the PC	Modbus port, RJ45 for: 140 CPU 6●1 60S	RJ45 connector	1 m	**110 XCA 282 01**	–
			3 m	**110 XCA 282 02**	–
			6 m	**110 XCA 282 03**	–
		USB port	0.4 m	**TSX C USB 232** *(3)*	0.145
	USB port for: 140 CPU 6●1 60S	USB port	3.3 m	**UNY XCA USB 033**	–
Connection cables for Modbus Plus network	Modbus Plus port, 9-way SUB-D for: 140 CPU 6●1 60S Straight connector	Modbus Plus tap *(4)*	2.4 m	**990 NAD 218 10**	–
			6 m	**990 NAD 218 30**	–
Modbus Plus/USB converter	Modbus Plus tap *(3)*	USB port	0.4 m	**TSX C USB MBP** *(5)*	0.186
Adaptor	RJ45 connector for 140 CPU 6●1 60S	RS 232 9-way SUB-D connector	–	**110 XCA 203 00**	–

TSX C USB 232

990 NAD 218 ●0

TSX C USB MBP

(1) RS 232/RS 485 Modbus port.
(2) Ethernet 100 Mbps port for multimode optical fibre.
(3) With the **TSX C USB 232** *converter, use the* **110 XCA 203 00** *adaptor and the* **110 XCA 282 0●** *cable.*
(4) Modbus Plus tap: **990 NAD 230 20/21** *(IP 20) or* **990 NAD 230 10** *(IP 65).*
(5) With the **TSX C USB MBP** *converter, use the* **990 NAD 211 10/30** *or* **990 NAD 218 10/30** *cable.*

CPUs: page 1/2 | I/O architectures: page 2/2 | I/O: page 3/2 | Communication: page 5/2 | Software: page 6/2

Modicon Quantum automation platform
Safety I/O modules

Type	**Discrete I/O**	
Voltage	**24 V ⎓ inputs**	**24 V ⎓ outputs**
Number of channels	16	
Number of groups	1	
Number of channels per group	16	
Logic	Positive *(sink)*	
I/O addresses	7 input words	4 output words and 7 input words
I/O characteristics	**Input limit values:** Voltage at state 1: 11...30 V ⎓ Voltage at state 0: 3...5 V ⎓ Current at state 1: ≥ 3.0 mA Current at state 0: ≤ 1.5 mA	**Max. load current:** Per point 0.65 A Per module: 10.4 A
Isolation between channels	–	
Bus current required	550 mA	350 mA
External power supply	19.2…30 V ⎓ *(1)*	
External fuse	Mandatory, 1 A fast-blow	Mandatory, 10 A max. fast-blow, dependent on the module load current
Functional safety certification	Certified by TÜV Rheinland as suitable for use in an SIL3 level safety function	
Approvals	CE, UL, CSA, CSA Hazardous Location Class 1 Div 2, ATEX Zone 2/22 *(2)*	
Model	**140 SDI 953 00S**	**140 SDO 953 00S**
Page	7/33	

(1) Always use an external sensor or preactuator power supply that does not reset automatically after breaking, type **ABL8 RPS 24100** *in manual mode (24 V ⎓, 10 A).*

(2) Only "Conformal Coating" versions, depending on the model, are certified ATEX Zone 2/22. For further information, see pages 10/2 to 10/9.

Analog inputs

–

8
8
1
–
13 input words
Input range: 4…20 mA **Resolution:** 16 bits (65536 points) **Update time:** 15 ms for all channels
500 V ∼ for 1 minute
400 mA
–
–
Certified by TÜV Rheinland as suitable for use in an SIL3 level safety function
CE, UL, CSA, CSA Hazardous Location Class 1 Div 2, ATEX Zone 2/22 *(2)*

140 SAI 940 00S

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Modicon Quantum automation platform
Safety I/O modules

140 SDI 953 00S

Presentation

The Modicon Quantum automation platform offers a complete range of discrete I/O modules designed to interface with a wide variety of devices. All these modules comply with the internationally recognized IEC electrical standards, which ensure their reliability in severe environments.

Fully software-configurable

All Quantum safety I/O modules are configured using Unity Pro XL Safety software. Software allocation of the module I/O addresses simplifies adding or changing modules on the configuration, without intervention on the application program.

Definition of fault behaviour for an output module

The Quantum platform gives you the ability to predefine how a discrete output will behave in the event of a fault, if the module stops being controlled for any reason. The outputs can be configured by the software so that they will:

- Go to state 0
- Go to a predefined safe state
- Stay in the same state as at the time of the fault

The safe state is: de-energized.
In the event of an internal module fault, the relevant channel(s) is(are) deactivated (set to 0).
The behaviour in the event of a fault can be defined for each output. When the module is changed, the fault behaviour specified earlier is transmitted to the replacement module.

Mechanical keying pins

It is possible to insert mechanical keying pins between the I/O module and its screw terminal block to to ensure that the correct connector/module combination is used. These keying pins have codes that are unique to each type of module. When a rack contains identical modules, secondary keying pins can be used for the connector/module combination. The keying pins are supplied with each I/O module.

I/O connectors

Each safety I/O module requires a 40-way screw terminal block **140 XTS 001 00/002 00**, to be ordered separately.
These connectors are identical for all discrete *(1)* and analog I/O modules (not compatible with intrinsically safe I/O modules).

Modicon Quantum automation platform
Safety I/O modules

I/O operating principles

The following three I/O modules are certified for creating the safety loop in a Quantum safety PLC solution:

140 SAI 940 00S	8 analog inputs
140 SDI 953 00S	16 x 24 V ⎓ discrete inputs
140 SDO 953 00S	16 x 24 V ⎓ discrete outputs

Each of these modules consists of two microprocessors executing the same program, sharing the same information, and checking one another from time to time.

Safety I/O module diagnostics

The table below shows the diagnostics run on the I/O modules:

Diagnostics	Analog inputs	Discrete outputs	Discrete inputs
Measurement out of range	Yes	–	–
Wiring broken	Yes (4-20 mA implicit) *(1)*	–	–
Process power supply fault	–	Yes	Yes
Overload	–	Yes	–

(1) Detection of 4…20 mA range overshoot only.

***Note**: The short-circuit is not detected on discrete input modules.*
(See the reference manual for Quantum discrete and analog I/O).

In addition, the Quantum safety PLC provides communication diagnostics between the safety CPU and the safety I/O modules, for example a CRC. The PLC therefore tests that:
- The data received is the data that was sent
- The data is updated

To manage disturbances such as EMC effects, which can corrupt data temporarily, it is possible to configure a maximum number of consecutive CRC errors for each module (between 0 and 3).

Diagnostics on power-up

On power-up, the safety I/O modules run an exhaustive self-test which lasts about 30 s. If these tests are negative, the modules deem there to be a malfunction and do not start. The inputs and outputs are set to 0. This self-test phase is indicated by the LEDs flashing quickly on the front of the modules.
In addition, if the external 24 V ⎓ power supply is not connected to the discrete I/O modules, the self-test is also negative, and the module does not start.

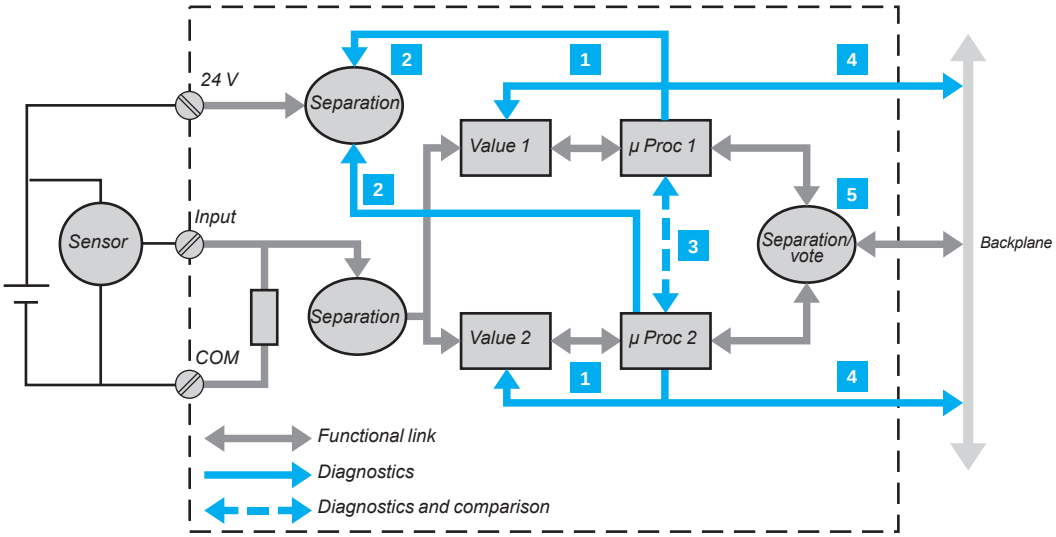
Diagnostics on overvoltage and undervoltage conditions

The I/O modules continuously supervise the voltages provided by the various system power supplies (rack power supply and process power supply).

Modicon Quantum automation platform
Safety I/O modules

Diagnostics of the safety discrete input module 140 SDI 953 00S

The diagram below illustrates the internal architecture of the Quantum safety discrete input module **140 SDI 953 00S**.



Each input channel uses a unique interface circuit and 2 independent inputs.

Safety function

The safety function of input module **140 SDI 953 00S** is to ensure that the state of the module inputs, when these are usable, is transmitted to the Quantum safety PLC CPU, within a guaranteed period.
The overall mechanism is designed so that whenever this transmission would be impossible, the Quantum CPU would be informed of this and would take the safety measures defined in its application.

7

Diagnostics of the safety discrete input module 140 SDI 953 00S (continued)

Internal diagnostics

As can be seen on the diagram above, apart from the input terminal block screw, and the connection to the backplane, the module is internally fully redundant.
The input is connected to two different measuring devices, each controlled by a microprocessor.
The + 24 V sensor supply voltage is also supplied to each of the two measurement channels, where its validity is tested. Each microprocessor stores data, then checks that the measuring systems have worked perfectly before sending them to the PLC CPU. Thus, each microprocessor:

1 Imposes levels 0 and 1 on its measuring system, and checks that the values read are indeed consistent with these levels.

2 Checks the presence of the + 24 V voltage, needed to validate the measurement.

3 Spies on the other microprocessor and checks that it has indeed complied with the diagnostic and measurement protocol. Both microprocessors exchange data and compare their measurement results. Then each one defines its response to the CPU by preparing a secure response frame containing the following data:
- Time-based data
- Identification of the module and its address
- CRC on 32 bits for transmission with maximum reliability. The maximum length of the data frame is 160 bits *(1)*. The ratio of these CRC and frame lengths is such that the risk of non-detection of a transmission error on the assembly is virtually zero.

4 The supply voltage from the backplane is also monitored. The module places itself in a safe fallback position in the event of undervoltage or overvoltage of this supply voltage.

For each input, both measurement channels must of course send the same data to the CPU. This is checked by the “vote” function 5 which eliminates any risk of degradation of the data between the microprocessor stage and the connection to the backplane.

Input channel error detection

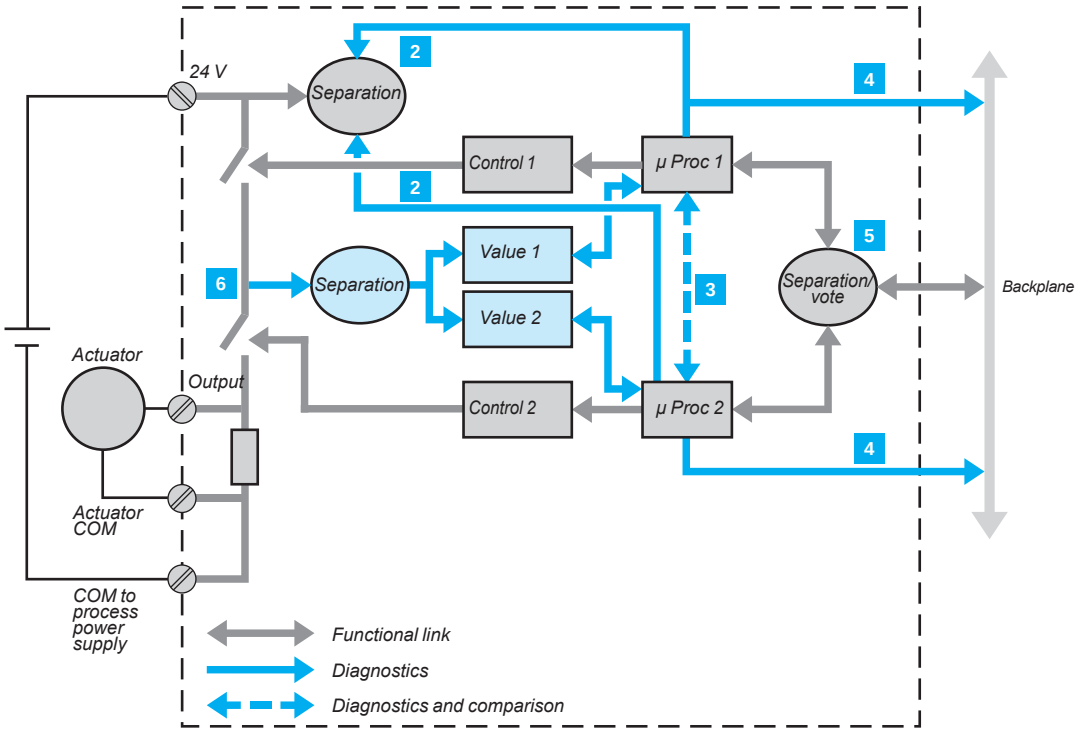
The digital input monitors the sensor power supply on the process side.
The external wiring is checked by measuring the leakage current.
The minimum current is 1 mA. If it does not reach this value, this is deemed to indicate an external failure due to a break in the circuit.
If a sensor with volt-free contacts is used, a 15 kΩ pull-up resistor is required at the +24 V to avoid detection of the circuit break.

(1) ***140 SDI 953 00S****: 64 bits.* ***140 SDO 953 00S****: 64 read bits, 32 write bits.*
140 SAI 940 00S*: 160 bits.*

7

Diagnostics of the safety discrete output module 140 SDO 953 00S

The diagram below illustrates the internal architecture of the Quantum safety discrete output module **140 SDO 953 00S**.



Safety function

Module **140 SDO 953 00S** is a discrete output module and its safety function is to ensure:
That the CPU control is actually applied to the output:
- If communication between the module and the CPU is regular and correct
- If the internal diagnostics confirm that the module is correctly integrated

In contrast, as soon as the internal diagnostics reveal the failure of a part of the system, the module is designed to ensure the channel switches safely to the fallback position, i.e. to apply a “0” command, zero voltage, the only one that can be guaranteed.

Internal diagnostics

Diagnostics 2 to 5 are identical to those of the discrete input module **140 SDI 953 00S** (see page 7/29).

Like all safety modules and CPUs, the **140 SDO 953 00S** module is internally fully redundant. The output is controlled by two different control devices. Each is controlled by a microprocessor.
The output stage is checked. Schematically, each output consists of two switches in series. The mid-point voltage 6 is assessed, and this data item is sent separately to each microprocessor. As there is only one situation where at point 6 the voltage can be floating point, both switches open, the mechanism checks with certainty the possibility of opening both switches, to create the safety function. Thus:
When the current PLC command is “0”, the module checks from time to time whether it is capable of controlling both switches in all possible combinations, except for a command at “1”.
When the current PLC command is “1”, all combinations are tested. The output changes to 0 briefly, for < 1 ms. This has no effect in industrial control where the controlled devices are motors or valves that are insensitive to disturbances in control lasting this long.

The diagram also shows the connection of the external 24 V ⎓ power supply, designed to ensure detection of any failure of the supply.

Modicon Quantum automation platform
Safety I/O modules

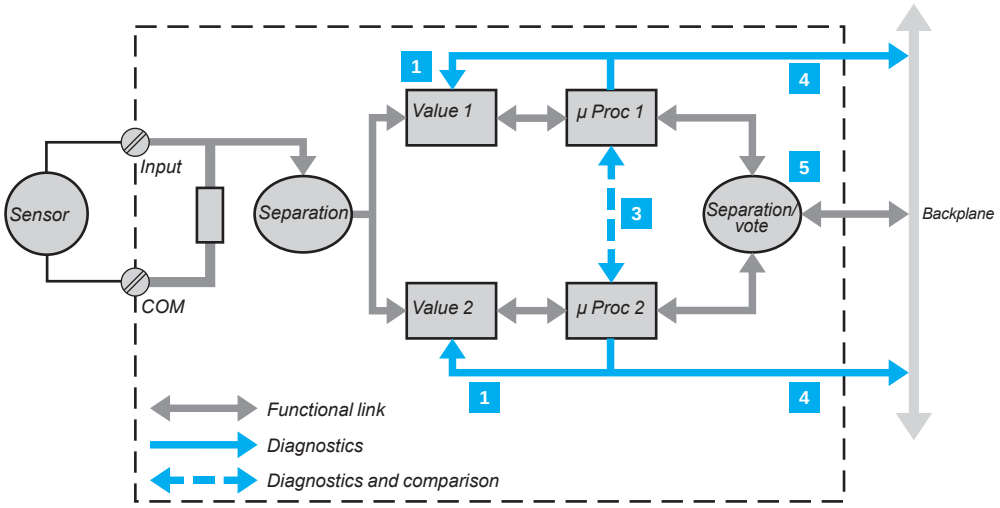
Timeout states

The discrete output module states in a *timeout* situation can be configured for both the following scenarios:
- Detection of incorrect operation of the Quantum safety PLC CPU
- Communication problem between the Quantum safety PLC CPU and the **140 SDO 953 00S** module

The 3 configurable states are:
- Hold last value
- Set to 0, i.e. safe state
- Set to 1

Diagnostics of the safety analog input module 140 SAI 940 00S

The diagram below illustrates the internal architecture of the Quantum safety analog input module **140 SAI 940 00S**.

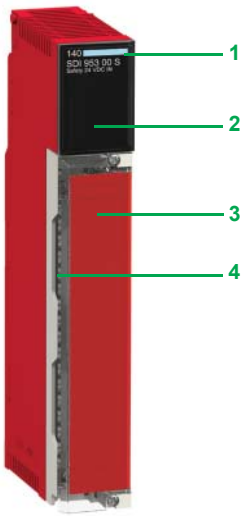


The interface on the process side consists of 8 independent isolated input channels. Each input is acquired by 2 identical circuits. Here it is a current analog input.

At 1: the measuring devices are regularly monitored for their capacity to measure, without error, 5 analog values between 4 and 20 mA.
The linearity of the measuring stages is checked at the same time.
The other mechanisms, 3 to 5, for diagnostics of the discrete input module **140 SDI 953 00S** are carried out.

The three input or output modules **140 SDI 953 00S**, **140 SDO 953 00S** and **140 SAI 940 00S**, are also designed with the same electronic and software subassemblies, with the aim of maximizing their reliability.

Modicon Quantum automation platform
Safety I/O modules



140 SDO 953 00S

Description

140 S●● discrete I/O modules have the following on the front panel:
1 Model number and colour code
2 A display block with LEDs
3 A removable hinged door and customizable identification label

To be ordered separately:
4 A 40-way screw terminal block **140 XTS 001 00/140 XTS 002 00**

Display and diagnostics

The LEDs provide a wealth of information about each of the modules.
This information includes both activity on the I/O points and characteristics specific to each module, such as indications of a wiring fault or blown fuse. Visual indication of the quality of the communication with the CPU is given by an “Active” display, which can be used for troubleshooting.

16-point I/O modules

Active		F	
1	9	1	9
2	10	2	10
3	11	3	11
4	12	4	12
5	13	5	13
6	14	6	14
7	15	7	15
8	16	8	16

LED	Colour	Meaning when on
Active	Green	Communication present on bus
F	Red	External fault detected
1…16	Green	The point concerned is activated
1…16	Red	There is a fault on the point indicated

Modicon Quantum automation platform
Safety discrete and analog I/O modules

140 SDI 953 00S

140 SDO 953 00S

140 SAI 940 00S

STB XSP 3000 + STB XSP 3010/3020

References

These three I/O modules are certified by TÜV Rheinland as suitable for use in an SIL3 level safety function. By default they have “Humiseal 1A33” coating which makes them suitable for operation in severe environments (see page 10/2).

Safety discrete input module

Voltage	Number of inputs	Description	Logic	Safety	Reference	Weight kg
24 V ⎓	16	1 group	Positive	Yes	**140 SDI 953 00S**	–

Safety discrete output module

Voltage	Number of outputs	Description	Logic	Safety	Reference	Weight kg
24 V ⎓	16	1 group	Positive	Yes	**140 SDO 953 00S**	–

Safety analog input module

Description	Range	Safety	Reference	Weight kg
8 channels 16 bits	4…20 mA	Yes	**140 SAI 940 00S**	–

Accessories

Description	Sold in lots of	Used for	Safety	Reference	Weight kg
40-way screw terminal block for I/O modules, degree of protection IP 20	–		Non-interfering	**140 XTS 001 00**	0.150
40-way screw terminal block for I/O modules, degree of protection < IP 20	–		Non-interfering	**140 XTS 002 00**	0.150
Pack of jumpers for 40-way screw terminal block	12		–	**140 XCP 600 00**	–
Earthing kit	1	Earthing the cable shielding. Kit comprises 1 bar (1 m long) and 2 lateral supports		**STB XSP 3000**	–
Terminal blocks for earthing kit	10	Cables, cross-section 1.5...6 mm²		**STB XSP 3010**	–
	10	Cables, cross-section 5...11 mm²		**STB XSP 3020**	–

Replacement parts

Description	Sold in lots of	Reference	Weight kg
Set of keying pins for 40-way screw terminal blocks	60	**140 XCP 200 00**	–

Modicon Quantum automation platform
Non-interfering modules

Type		Power supply module		Discrete input module
Input voltage		93…138 V ∿ or 170…276 V ∿	20… 30 V ⎓	24 V ⎓
Output voltage		5.1 V ⎓ (output to bus)		–
Main characteristics		■ Type of use: redundant ■ Output current to bus: 11 A at 60°C	■ Type of use: redundant ■ Output current to bus: 8.0 A at 10°C 6.0 A at 60°C	■ Module with 32 discrete inputs in 4 groups of 8 channels ■ Logic: positive *(sink)*
I/O addresses		–		2 input words
Bus current required		–		330 mA
Maximum load	Current per channel	–		
	Current per group	–		
	Current per module	–		
Functional safety certification		SIL3 certified	Non-interfering	Non-interfering
Approvals		UL 508, CSA 22.2-142, cUL, FM Class 1 Div 2, CE, ATEX Zone 2/22 *(1)*		UL 508, CSA 22.2-142, FM Class 1 Div 2, CE ATEX Zone 2/22 *(1)*
Type of module		**140 CPS 124 20**	**140 CPS 224 00**	**140 DDI 353 00**
Page		1/19 and 1/21		3/2 and 3/14

(1) Only "Conformal Coating" versions, depending on the model, are certified ATEX Zone 2/22. For further information, see pages 10/2 to 10/9.

Discrete output module	Analog input module	Analog output module	RIO head adaptor	RIO drop adaptor	Ethernet Modbus TCP network module
–	–				
24 V ⎓	–				
■ Module with 32 discrete inputs in 4 groups of 8 channels ■ Logic: positive *(source)*	■ 16 analog input channels, differential or common point ■ Ranges: 0…25 mA, 0…20 mA, 4…20 mA ■ Resolution: up to 25,000 points ■ Channel-to-channel operating voltage: 30 V ⎓ max.	■ 4 analog output channels ■ Range: 4…20 mA ■ Resolution: 12 bits ■ Isolation between channels: 500 V ∿ at 47…63 Hz or 750 V ⎓ for 1 minute	■ RIO Quantum head adaptor module, with redundant cable (2 channels) ■ Controls up to 31 RIO drops ■ Data transfer rate: 1.54 Mbps	■ RIO Quantum drop adaptor module, with redundant cable (2 channels) ■ Data transfer rate: 1.54 Mbps	■ Physical interface: 10 BASE-T/100 BASE-TX (copper cable) and 100 BASE-FX (optical fibre) ■ Access: CSMA-CD ■ Medium: shielded twisted pair cables or optical fibre cables ■ In safety application: Ethernet Peer-to-Peer and Global Data
2 output words	17 input words	4 output words	64 input words/64 output words per drop		
330 mA	360 mA	480 mA	750 mA		
0.5 A	–				
4 A	–				
16 A	–				
Non-interfering					
UL 508, CSA 22.2-142, FM Class 1 Div 2, CE ATEX Zone 2/22 *(1)*					
140 DDO 353 00	**140 ACI 040 00**	**140 ACO 020 00**	**140 CRP 932 00**	**140 CRA 932 00**	**140 NOE 771 11**
3/6 and 3/14	3/16 and 3/22	3/18 and 3/22	2/27		5/3 and 5/41

Modicon Quantum automation platform
Non-interfering modules

140 CPS 124 20

140 CRP 932 00

140 NOE 771 11

Non-interfering modules and racks (1)

The following Quantum non-interfering modules are fully compatible with the Quantum safety modules.

Power supply module

Input voltage	Output current	Type	Safety	Reference	Weight kg
115/230 V ∼	11 A	Redundant	SIL3 certified	**140 CPS 124 20**	0.650

Discrete input module

Description	Voltage	Modularity	Logic	Safety	Reference	Weight kg
4 groups of 8 inputs	**24 V ⎓**	32 inputs	Positive	Non-interfering	**140 DDI 353 00**	0.300

Discrete output module

Description	Voltage	Modularity	Logic	Safety	Reference	Weight kg
4 groups of 8 outputs	**24 V ⎓**	32 outputs	Positive	Non-interfering	**140 DDO 353 00**	0.450

Analog input module

Description	Range	Safety	Reference	Weight kg
16 high level channels 0…25,000 points, single-pole	0...20 mA 0...25 mA 4...20 mA	Non-interfering	**140 ACI 040 00**	0.300

Analog output module

Description	Range	Safety	Reference	Weight kg
4 current channels 12-bit	4...20 mA	Non-interfering	**140 ACO 020 00**	0.300

Modules

Description	Type of architecture	Topology	Transparent Ready	Safety	Reference	Weight kg
Quantum RIO head adaptor (1 max.)	Remote I/O (RIO) and mixed I/O	Redundant cable	–	Non-interfering	**140 CRP 932 00**	–
Quantum RIO drop adaptor (31 max.)					**140 CRA 932 00**	
Ethernet TCP/IP network module	Mixed	Bus or ring (copper Class C30 or optical fibre)		Non-interfering	**140 NOE 771 11**	0.345

Racks

Description	Number of positions	Safety	Reference	Weight kg
Racks for: **- Local I/O modules** **- Remote I/O modules** **- Distributed I/O modules**	6	Non-interfering	**140 XBP 006 00**	0.640
	10	Non-interfering	**140 XBP 010 00**	1.000
	16	Non-interfering	**140 XBP 016 00**	1.600

Conformal Coating non-interfering modules and racks

Non-interfering Quantum modules and racks are also available in a Conformal Coating version, for operation in severe environments.
These modules and racks with protective coating have an additional letter "**C**" at the end of their references (see pages 10/2 to 10/9).

(1) For non-interfering modules certified by TÜV Rheinland, please consult our website www.schneider-electric.com.

Modicon Quantum automation platform
Non-interfering modules

Accessories

Accessories for power supply module 140 CPS 124 20

Description	Degree of protection	Safety	Reference	Weight kg
7-way screw terminal block	IP 20	–	**140 XTS 005 00**	0.150

Accessories for mixed discrete I/O module

Description	Sold in lots of	Safety	Reference	Weight kg
40-way screw terminal block for I/O modules, degree of protection IP 20		Non-interfering	**140 XTS 001 00**	0.150
40-way screw terminal block for I/O modules, degree of protection < IP 20	–	Non-interfering	**140 XTS 002 00**	0.150
Empty module Without screw terminal block	–	–	**140 XCP 500 00**	–
Empty module with hinged cover Without screw terminal block	–	–	**140 XCP 510 00**	–
Pack of jumpers for 40-way screw terminal block	12	–	**140 XCP 600 00**	–
Discrete input simulator 16 switches for 140 DAI 540 00 and 140 DAI 740 00 modules	–	–	**140 XSM 002 00**	–
Set of keying pins for 40-way screw terminal blocks	60	–	**140 XCP 200 00**	–

Rack accessories

Description	Length/ Size	Safety	Reference	Weight kg
19" support for flush mounting a 140 XBP 010 00 rack	125 mm deep	–	**140 XCP 401 00**	–
19" support for surface mounting a 140 XBP 010 00 rack	20 mm deep	–	**140 XCP 402 00**	–

Earthing accessories

Description	Sold in lots of	Used for	Safety	Reference	Weight kg
Earthing kit	1	Earthing the cable shielding. Kit comprises 1 bar (1 m long) and 2 lateral supports	–	**STB XSP 3000**	–
Terminal blocks for earthing kit	10	Cables, cross-section 1.5...6 mm²	–	**STB XSP 3010**	–
	10	Cables, cross-section 5...11 mm²	–	**STB XSP 3020**	–

STB XSP 3000 +
STB XSP 3010/3020

7

Unity Pro

Unity Pro XL Safety

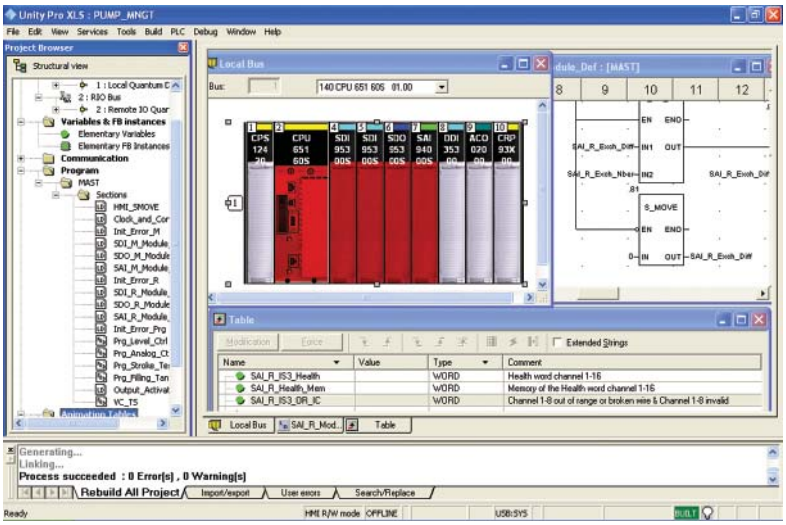
In addition to the functions of Unity Pro Extra Large, Unity Pro XL Safety provides a set of specific verification and protection function blocks to facilitate the creation and debugging of Quantum safety projects.
For a description of these characteristics and their setup, as well as the functional limitations provided for within the framework of SIL 3 certifiable safety projects according to IEC 61508, refer to the document entitled "*Quantum Safety PLC, Safety Reference Manual*" 01/2010, no. 3303879.03 approved by TÜV Rheinland and available on www.schneider-electric.com.

The Unity Pro XLS programming tool is certified compliant with the requirements of IEC 61508 for managing safety applications with Quantum **140 CPU 651 60S/671 60S** PLCs.
It offers the complete range of functions required to program a safety project:
- In-depth error diagnostics
- Project protection

During project creation, it is the selection of the Quantum processor that determines whether or not the project created will be a safety project.

Unity Pro XLS is capable of processing all Unity Pro application types:
No other programming tool is needed on the computer.

To program a safety project, Unity Pro XLS provides two IEC 61131-3 programming languages:
- Function Block Diagram (FBD)
- Ladder language (LD)



Safety program structure

A safety project must be programmed entirely in a master task (MAST).

It is not possible to:
- Program FAST, TIMER, INTERRUPT or AUX tasks
- Use subroutines (SR sections)

Unity Pro XL Safety (continued)

Language elements

Unity Pro XLS provides a set of specific, certified functions and function blocks. These are available in the “Unity Pro safety function block library”.
Moreover, most of the language elements are available:
- Elementary data types (EDTs): BOOL, EBOOL, BYTE, WORD, DWORD, INT, UINT, DINT, UDINT and TIME
- Simple tables, DFBs
- Direct addressing, for example, writing to %MW memory via a coil in Ladder language (LD)
- Located variables

Floating point instructions:
With Unity Pro XLS version 7.0 or later, numerical floating point instructions can be used.

Project verification options

Unity Pro XLS provides the following options for the checks performed by the language analyzer:
- Unused variables
- Variables written multiple times
- Unassigned parameters
- FB instances used multiple times
- Address overlapping

It is advisable to enable all verification options for a safety project.

Protecting the project

Unity Pro XLS provides protective functions against unauthorized access to safety projects, to the Quantum safety PLC, and to Unity Pro XLS itself.
- The application password, defined when the safety project was created, is requested:
  - When the safety application file is opened
  - Upon connection to the safety PLC

- The safety editor integrated in Unity Pro XLS is used to define the access rights and the list of authorized functions for each user, in particular:
  - Creation and modification of the application password
  - Activation of maintenance mode
- Adjustment of the auto-lock period

Functions and function blocks for safety applications

Unity Pro XLS provides a set of elementary functions (EFs) and elementary function blocks (EFBs) certified for use in safety applications:
- Standard functions certified for safety applications:
  - Mathematical functions and functions for manipulating data from the unrestricted memory area in the safety logic
  - Comparison functions
  - Logic functions, rotations, shift operations
  - Statistical functions
  - Timer and counter setup
  - Type conversions
- Specific functions for safety architectures:
  - High availability setup: choice of two inputs from a redundant discrete I/O module or a redundant analog input module
  - Hot Standby PLC redundancy setup: to cause the two processors involved in a Hot Standby configuration to change roles from primary to standby and standby to primary respectively. The objective is to verify the capacity of each processor to take over in case the other processor fails. With Unity Pro XLS, this function can very easily be programmed in the application by setting up the S_HSBY_SWAP elementary function from the library.

Unity Pro XL Safety (continued)

Special features and procedures

Software tool self-test

Unity Pro XLS provides the option of performing a self-test to verify that the software components installed have not been corrupted, for example, due to a hard disk failure. This self-test is based on a CRC calculation.

Unity Pro XLS checks the version and CRC of:
- Its DLLs
- The safety FFB library database
- The hardware catalogue database

Unity Pro XLS self-tests are performed on a user request, for example:
- After installing or uninstalling any program on the computer
- Before loading the final application program onto the safety PLC
- Before modifying the application program executed on the safety PLC

Time-stamping binary files

With Unity Pro XLS, every binary file generated for a safety project features a version management field that provides the date and time at which it was generated.
This information is useful for verifying the project.

Downloading a project to Unity Pro XLS

It is possible to download a safety project from the PLC to Unity Pro XLS under the following conditions:
- This must have been defined as an option for the safety project
- The user must know the application password to establish a connection to the safety PLC
- The safety PLC must be placed in maintenance mode to perform the download

Unrestricted memory

The unrestricted memory area contains bits and words that are not protected against write operations from external equipment such as HMI terminals and PLCs, etc.

- It is located at the beginning of the memory.
- Its size can be configured with Unity Pro XLS.
- Values cannot be used directly in the unrestricted memory area and can only be used in conjunction with specific function blocks S_MOVE_BIT and S_MOVE_WORD.

Unity Pro XLS checks in both the application edit and generation phases that only data from the unrestricted memory area is used at the input of the function blocks S_MOVE_BIT and S_MOVE_WORD.
Furthermore, Unity Pro XLS provides a useful list of cross references, allowing easy identification of the way in which variables are used and verification of the application of this rule.

***Note**: For safety applications, it is common practice to verify the correct transfer of data by writing the data twice (to two different variables) and then comparing them.*

Software
Unity Pro software
XL Safety

Unity Pro XL Safety version 7.0 software

For Modicon M340: All models
For Modicon Premium: **TSX 57 1●...6●1**
For Modicon Quantum: **140 CPU 311 10/434 12U/534 14U/651 50/651 60/652 60/671 60/672 60/672 61/651 60S/671 60S**
For distributed I/O: **Modicon ETB, TM7, OTB, STB, Momentum**

Unity Pro XL Safety version 7.0 software packages *(1)*

Description	Licence type	Reference	Weight kg
Unity Pro XL Safety software packages	Single (1 station)	**UNY SPU XFU CD 70**	–
	Group (3 stations)	**UNY SPU XFG CD 70**	–
	Team (10 stations)	**UNY SPU XFT CD 70**	–
	Site (≤ 100 users)	**UNY SPU XFF CD 70**	–
Software upgrades from: - Concept S, M, XL - PL7 Micro, Junior, Pro - ProWORX NxT Lite, Full - ProWORX 32 Lite, Full	Single (1 station)	**UNY SPU XZU CD 70**	–
	Group (3 stations)	**UNY SPU XZG CD 70**	–
	Team (10 stations)	**UNY SPU XZT CD 70**	–
	Site (≤ 100 users)	**UNY SPU XZF CD 70**	–

Software for Unity Pro, Unity Pro documentation

See page 6/20.

Accessories for connecting to the PC programming terminal

See page 6/21.

(1) For compatibility of Unity software/automation platforms and distributed I/O, refer to the selection guide on page 6/2.

Selection guide:
page 6/2

8 - HMI and supervision

Human Machine Interfaces

Magelis Small Panel selection guide 8/2
Magelis Optimum Advanced Panel selection guide 8/4
Magelis Advanced Panel selection guide 8/6
Magelis Panel PC and Magelis BOX PC selection guide 8/10
Magelis iDisplay flat screen selection guide 8/12
HMI software selection guide 8/14

Vijeo Citect (SCADA) supervisory software

■ **Presentation, licences** 8/16
■ **Architectures** 8/18
■ **References** 8/20

Vijeo Historian reporting software

■ **Presentation** 8/28
■ **Architectures** 8/29
■ **References** 8/30

OPC data server software

■ **Presentation** 8/32
■ **Time stamping system**
□ Presentation 8/33
□ Architectures 8/33
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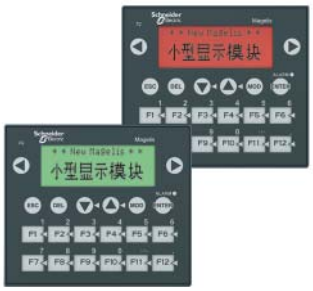
■ **Architectures** 8/35
■ **Setup** 8/37
■ **Functions** 8/38
■ **References** **8/39**

Operator dialogue terminals
Magelis Small Panels

Applications		**Display of graphic pages**		
Type of terminal		**Small Panels with touch screen**		
Display	Type	Monochrome STN LCD (200 x 80 pixels), backlit - Green, orange and red, or - White, pink and red	Colour QVGA TFT LCD (320 x 240 pixels)	
	Capacity	3.4" (monochrome)	3.5" (colour)	5.7" (colour)
Data entry		Via touch screen		
Memory capacity	Application	16 MB Flash		
	Expansion	–		
Functions	Maximum number of pages	Limited by internal FLASH EPROM memory capacity		
	Variables per page	Unlimited		
	Representation of variables	Alphanumeric, bitmap, bargraph, gauge, curves, buttons, LEDs		
	Recipes	32 groups of 64 recipes		
	Curves	Yes, with log		
	Alarm logs	Yes		
	Real-time clock	Access to the PLC real-time clock		
	Alarm relay	–		
	Buzzer	Yes		
Communication	Asynchronous serial link	RS 232C/RS 485 *(1)* RS 232C using Zelio protocol *(2)*	RS 232C/RS 485	
	Downloadable protocols	Uni-TE, Modbus and for PLC brands: Allen-Bradley, Omron, Mitsubishi, Siemens		
	Printer link	USB for serial or parallel printer		
	USB ports	1 host type A and 1 device type mini-B		
	Networks	1 Ethernet TCP/IP port (10BASE-T/100BASE-TX) *(3)*	1 Ethernet TCP/IP port (10BASE-T/100BASE-TX)	
Development software		Vijeo Designer (on Windows XP, Windows Vista and Windows 7)		
Operating system		Magelis		
References		**HMI STO 5●●**	**HMI STU 655**	**HMI STU 855**
Pages		Please consult the “Human/Machine Interface” catalogue		

(1) Only HMI STO 511/512.
(2) Only HMI STO 501.
(3) Only HMI STO 531/532.

8

Display of text messages and/or semi-graphic pages	Display of text messages and/or semi-graphic pages Control and configuration of data	
Small Panels with keypad	**Small Panels with keypad**	**Small Panels with touch screen and keypad**
		
Green backlit monochrome LCD, height 5.5 mm or Green, orange or red backlit monochrome LCD, height 4.34…17.36 mm	Green, orange or red backlit monochrome LCD, height 4.34…17.36 mm	Green, orange or red backlit monochrome matrix LCD (198 x 80 pixels), height 4…16 mm
2 lines of 20 characters or 1 to 4 lines of 5 to 20 characters (monochrome)	1 to 4 lines of 5 to 20 characters (monochrome)	2 to 10 lines of 5 to 33 characters (monochrome)
Via keypad with 8 keys (4 customizable)	Via keypad with ■ 12 function keys or numeric entry (depending on context) ■ 8 service keys	Via keypad with ■ 4 function keys ■ 8 service keys Via touch screen and keypad with ■ 10 function keys ■ 2 service keys
512 KB Flash		512 KB Flash EPROM
–		
128/200 application pages 256 alarm pages	128/200 application pages 256 alarm pages	200 application pages 256 alarm pages
40…50	40…50, bargraph, buttons, LEDs	50
Alphanumeric		Alphanumeric, bargraph, buttons, LEDs
–		
Yes		
Yes *(5)*	Yes	
Access to the PLC real-time clock	Access to the PLC real-time clock	
–		
–		Yes *(4)*
RS 232C/RS 485		
Uni-TE, Modbus and for PLC brands: Allen-Bradley, Omron, Mitsubishi, Siemens		
RS 232C serial link *(5)*		
–		
–		
Vijeo Designer Lite (on Windows 2000, Windows XP and Windows Vista)		
Magelis		
XBT N ●●●●	**XBT R ●●●**	**XBT RT ●●●**
Please consult the “Human/Machine Interface” catalogue		

(4) Only XBT RT511.
(5) Depending on model.

Operator dialogue terminals

Magelis™ GTO Optimum Advanced Panels

Applications		**Display of text messages, graphic objects and synoptic views Control and configuration of data**		
Type of terminal		**Optimum Advanced Panels, touch screen**		
Degree of protection (according to IEC 60529)		**IP 65 (IP 67 with addition of a cover)**		

Display	Type	Colour TFT LCD, backlit 320 x 240 pixels (QVGA)		Colour TFT LCD, backlit 800 x 480 pixels (WVGA)
	Capacity	3.5”	5.7”	7.0 Wide
Data entry		Via touch screen	Via touch screen	Via touch screen
	Static function keys	6 function keys (static or dynamic)	–	8 function keys (static or dynamic)
	Dynamic function keys		–	
	Service keys	–	–	–
	Alphanumeric keys	–	–	–
Memory capacity	Applications	64/96 MB Flash EPROM *(1)*		96 MB Flash EPROM
	Expansion	–	By 4 GB SD card (except HMI GTO2300)	
Functions	Maximum number of pages	Limited by internal Flash EPROM memory capacity	Limited by capacity of internal Flash EPROM memory or of SD card	
	Variables per page	Unlimited (8000 variables max.)		
	Representation of variables	Alphanumeric, bitmap, bargraph, gauge, tank, tank level indicator, curves, polygon, button, LED		
	Recipes	32 groups of 64 recipes comprising 1024 ingredients max.		
	Curves	Yes, with log		
	Alarm logs	Yes		
	Real-time clock	Built-in		
	Discrete I/O	–		
	Multimedia I/O	–		
Communication	Downloadable protocols	Uni-TE *(2)*, Modbus, Modbus TCP/IP *(1)* and for PLC brands: Mitsubishi, Omron, Allen-Bradley and Siemens		
	Asynchronous serial link	RS 232C (COM1) and RS 485 (COM2) except HMI GTO1310: RS 232C/485 (COM1)		
	USB ports	1 type A host connector + 1 mini-B connector		
	Buses and networks	Ethernet TCP/IP (10BASE-T/100BASE-TX) *(3)*, Modbus Plus and Fipway via USB gateway		
	Printer link	RS 232C (COM1) serial link *(4)* and USB port for parallel printer		
Development software		Vijeo Designer (on Windows XP and Windows 7)		
Operating system		Magelis (333 MHz RISC CPU)		
Type of terminal		**HMI GTO1300 HMI GTO1310**	**HMI GTO2300 HMI GTO2310**	**HMI GTO3510**
Pages		Please consult the “Human/Machine Interface” catalogue		

(1) Depending on model.
(2) Uni-TE version V2 for Twido controller and TSX Micro/Premium platform.
(3) Except HMI GTO1300 and GTO2300 (Modbus Plus and Fipway via USB gateway only).
(4) Except HMI GTO1310 (USB port for parallel printer only).

Display of text messages, graphic objects and synoptic views Control and configuration of data					
Optimum Advanced Panels, touch screen			**Optimum Advanced Panels, touch screen, “Stainless Steel” version**		
IP 65 (IP 67 with addition of a cover)			**IP 66K (Front panel with stainless steel frame) for food & beverage environment**		
Colour TFT LCD, backlit 640 x 480 pixels (VGA)	Colour TFT LCD, backlit 640 x 480 pixels (VGA)	Colour TFT LCD, backlit 800 x 600 pixels (SVGA)	Colour TFT LCD, backlit 320 x 240 pixels (QVGA)	Colour TFT LCD, backlit 640 x 480 pixels (VGA)	Colour TFT LCD, backlit 800 x 600 pixels (SVGA)
7.5”	10.4”	12.1”	5.7”	10.4”	12.1”
Via touch screen					
–					
–					
–					
–					
96 MB Flash EPROM					
By 4 GB SD card					
Limited by capacity of internal Flash EPROM memory or of SD card					
Unlimited (8000 variables max.)					
Alphanumeric, bitmap, bargraph, gauge, tank, tank level indicator, curves, polygon, button, LED					
32 groups of 64 recipes comprising 1024 ingredients max.					
Yes, with log					
Yes					
Built-in					
–					
–					
Uni-TE *(2)*, Modbus, Modbus TCP/IP *(1)* and for PLC brands: Mitsubishi, Omron, Allen-Bradley and Siemens					
RS 232C (COM1) and RS 485 (COM2)					
1 type A host connector + 1 mini-B connector					
Ethernet TCP/IP (10BASE-T/100BASE-TX), Modbus Plus and Fipway via USB gateway					
RS 232C (COM1) serial link and USB port for parallel printer					
Vijeo Designer (on Windows XP and Windows 7)					
Magelis (333 MHz RISC CPU)					
HMI GTO4310	**HMI GTO5310**	**HMI GTO6310**	**HMI GTO2315**	**HMI GTO5315**	**HMI GTO6315**
Please consult the “Human/Machine Interface” catalogue					

Operator dialogue terminals
Magelis™ GT, GK, GH and GTW Standard Advanced Panels

Applications		**Display of text messages, graphic objects and synoptic views Control and configuration of data**		
Type of terminal		**Touch screen Standard Advanced Panels**		
Display	Type	Backlit monochrome (amber or red mode) STN LCD (320 x 240 pixels) or TFT LCD	Backlit monochrome or colour STN LCD or backlit colour TFT LCD (320 x 240 pixels) or (640 x 480 pixels) *(3)*	Backlit colour STN LCD or colour TFT LCD (640 x 480 pixels)
	Capacity	3.8" (monochrome or colour)	5.7" (monochrome or colour)	7.5" (colour)
Data entry		Via touch screen		
	Static function keys	–		
	Dynamic function keys	–		
	Service keys	–		
	Alphanumeric keys	–		
Memory capacity	Applications	32 MB Flash EPROM	16 MB Flash EPROM *(3)*	32 MB Flash EPROM
	Expansion	–	By means of 128 MB, 256 MB, 512 MB, 1 GB or 2 GB CF card (except XBT GT2110)	
Functions	Maximum number of pages	Limited by internal Flash EPROM memory capacity	Limited by capacity of internal Flash EPROM memory or CF card memory	
	Variables per page	Unlimited (8000 variables max.)		
	Representation of variables	Alphanumeric, bitmap, bargraph, gauge, tank, tank level indicator, curves, polygon, button, LED		
	Recipes	32 groups of 64 recipes comprising 1024 ingredients max.		
	Curves	Yes, with log		
	Alarm logs	Yes		
	Real-time clock	Built-in		
	Discrete I/O	–		1 input (reset) and 3 outputs (alarm, buzzer, run)
	Multimedia I/O	–	*(3)*	1 audio input (microphone), 1 composite video input (digital or analogue video camera), 1 audio output (loudspeaker) *(1)*
Communication	Downloadable protocols	Uni-TE *(2)*, Modbus, Modbus TCP/IP *(1)* and for PLC brands: Mitsubishi, Omron, Allen-Bradley and Siemens		
	Asynchronous serial link	RS 232C/485 (COM1)	RS 232C/RS 422/485 (COM1) and RS 485 (COM2)	
	USB ports	1	1 *(3)*	1
	Bus and networks	–	Modbus Plus and Fipway with USB gateway, PROFIBUS DP and Device Net with optional card	
		Ethernet TCP/IP (10BASE-T/100BASE-TX) *(1)*		
	Printer link	USB port for parallel printer	RS 232C (COM1) serial link, USB port for parallel printer	
Development software		Vijeo Designer (on Windows XP Professional and Windows 7 Professional 32/64-bit)		
Operating system		Magelis (200 MHz RISC CPU)	Magelis (133 MHz RISC CPU) *(3)*	Magelis (266 MHz RIS CPU)
Type of terminal		**XBT GT11/13**	**XBT GT21/22/23/24/29**	**XBT GT42/43**
Pages		Please consult the “Human/Machine Interface” catalogue		

(1) Depending on model.
(2) Uni-TE version V2 for Twido controller and TSX Micro/Premium platform.
(3) For XBT GT 2430, 32 MB Flash EPROM, 1 sound output, 2 USB ports, 266 MHz RISC CPU.
(4) For XBT GT 5430.

Display of text messages, graphic objects and synoptic views
Control and configuration of data

Touch screen Standard Advanced Panels

Backlit colour STN LCD or colour TFT LCD (640 x 480 pixels or 800 x 600 pixels) *(4)*	Backlit colour TFT LCD (800 x 600 pixels)	Backlit colour TFT LCD (1024 x 768 pixels)
10.4" (colour)	12.1" (colour)	15" (colour)
Via touch screen		
–		
–		
–		
–		
32 MB Flash EPROM		
By means of 128 MB, 256 MB, 512 MB, 1 GB or 2 GB CF card		
Limited by capacity of internal Flash EPROM memory or CF card memory		
Unlimited (8000 variables max.)		
Alphanumeric, bitmap, bargraph, gauge, tank, tank level indicator, curves, polygon, button, LED		
32 groups of 64 recipes comprising 1024 ingredients max.		
Yes, with log		
Yes		
Built-in		
1 input (reset) and 3 outputs (alarm, buzzer, run)		
1 audio input (microphone), 1 composite video input (digital or analogue video camera), 1 audio output (loudspeaker) *(1)*		
Uni-TE *(2)*, Modbus, Modbus TCP/IP *(1)* and for PLC brands: Mitsubishi, Omron, Allen-Bradley and Siemens		
RS 232C/RS 422/485 (COM1) and RS 485 (COM2)		
2		
Modbus Plus with USB gateway		
Ethernet TCP/IP (10BASE-T/100BASE-TX)		
RS 232C (COM1) serial link, USB port for parallel printer		
Vijeo Designer (on Windows XP Professional and Windows 7 Professional 32/64-bit)		
Magelis (266 MHz RIS CPU)		
XBT GT52/53/54	**XBT GT63**	**XBT GT73**
Please consult the “Human/Machine Interface” catalogue		

Operator dialogue terminals
Magelis™ GT, GK, GH and GTW Standard Advanced Panels

Applications		**Display of text messages, graphic objects and synoptic views Control and configuration of data**	
Type of terminal		**Standard Advanced Panels with keypad**	
Display	Type	Colour TFT LCD (320 x 240 pixels) or monochrome STN	Colour TFT LCD (640 x 480 pixels)
	Capacity	5.7" (monochrome or colour)	10.4" (colour)
Data entry		Via keypad and/or touch screen (configurable) and/or by industrial pointer	
	Static function keys	10	12
	Dynamic function keys	14	18
	Service keys	8	
	Alphanumeric keys	12	
Memory capacity	Application	16 MB Flash EPROM	32 MB Flash EPROM
	Expansion	By means of 128 MB, 256 MB, 512 MB, 1 GB or 2 GB CF card	
Functions	Maximum number of pages	Limited by capacity of internal Flash EPROM memory or CF card memory	
	Variables per page	Unlimited (8000 variables max.)	
	Representation of variables	Alphanumeric, bitmap, bargraph, gauge, tank, tank level indicator, curves, polygon, button, LED	
	Recipes	32 groups of 64 recipes comprising 1024 ingredients max.	
	Curves	Yes, with log	
	Alarm logs	Yes	
	Real-time clock	Built-in	
	Discrete I/O	–	1 input - 3 outputs
	Multimedia I/O	–	–
Communication	Downloadable protocols	Uni-TE *(2)*, Modbus, Modbus TCP/IP *(1)* and for PLC brands: Mitsubishi, Omron, Allen-Bradley and Siemens	
	Asynchronous serial link	RS 232C/RS 422/485 (COM1) RS 485 (COM2)	
	USB ports	1	2
	Bus and networks	Modbus Plus, Fipway with USB gateway, PROFIBUS DP and Device Net with optional card Ethernet TCP/IP (10BASE-T/100BASE-TX)	
	Printer link	RS 232C (COM1) serial link, USB port for parallel printer	
Development software		Vijeo Designer (on Windows XP Professional and Windows 7 Professional 32/64-bit)	
Operating system		Magelis (CPU 266 MHz RISC)	
Type of terminal		**XBT GK 21/23**	**XBT GK 53**
Pages		Please consult the “Human/Machine Interface” catalogue	

(1) Depending on model.
(2) Uni-TE version V2 for Twido controller and TSX Micro/Premium platform.

Display of text messages, graphic objects and synoptic views Control and configuration of data			
Portable Standard Advanced Panels	**Open touch screen Standard Advanced Panels**		
Colour TFT LCD (640 x 480 pixels)	Colour TFT LCD (800 x 600 pixels)	Colour TFT LCD (800 x 600 pixels)	Colour TFT LCD (1024 x 768 pixels)
5.7" (colour)	10.4" (colour)	12" (colour)	15" (colour)
Via touch screen	Via touch screen		
11	–		
–	–		
–	–		
–	–		
32 MB Flash EPROM	2 GB CF system card included with terminal, expandable to 4 GB		
By means of 128 MB, 256 MB, 512 MB, 1 GB or 2 GB CF card *(3)*			
Limited by capacity of internal Flash EPROM memory or CF card memory			
Unlimited (8000 variables max.)			
Alphanumeric, bitmap, bargraph, gauge, tank, tank level indicator, curves, polygon, button, LED			
32 groups of 64 recipes comprising 1024 ingredients max.			
Yes, with log			
Yes			
Built-in			
–			
1 audio output			
Uni-TE (2), Modbus, Modbus TCP/IP and for PLC brands: Mitsubishi, Omron, Rockwell Automation and Siemens	Uni-TE *(2)*, Modbus, Modbus TCP/IP *(1)* and for PLC brands: Mitsubishi, Omron, Allen-Bradley and Siemens		
RS 232C/RS 422-485 (COM1)	RS 232C (COM1)	RS 232C (COM1)	RS 232C (COM1)
1	2+1 frontal	4+1 frontal	2+1 frontal
–	Modbus Plus with USB gateway		
1 Ethernet port (10BASE-T/100BASE-TX)	2 Ethernet ports *(4)* (10BASE-T/100BASE-TX/1 GB)		
–	RS 232C (COM1) serial link, USB port for parallel printer		
Vijeo Designer (on Windows XP Professional and Windows 7 Professional 32/64-bit)			
Magelis (266 MHz RISC CPU)	Windows XP Embedded		
XBT GH 2460/ XBT GH 2460B *(5)*	**XBT GTW 5354**	**XBT GTW 652**	**HMI GTW 7354 HMI GTW 73545** *(6)*
Please consult the “Human/Machine Interface” catalogue			

(1) Depending on model.
(2) Uni-TE version V2 for Twido controller and TSX Micro/Premium platform.
(3) Except for HMI GTW●●●● with 4 GB SD memory card.
(4) Except on XBT GTW652 with 1 Ethernet TCP/IP port (10BASE-T/100BASE-TX) and 1 Ethernet TCP/IP port (10BASE-T/100BASE-TX/1 GB).
(5) Version without Emergency stop button.
(6) Version with stainless steel front panel.

Industrial PCs
Magelis *i*PCs certified for automation
Magelis Panel PC and Magelis BOX PC

Type of Magelis *i*PC		**Magelis Panel PC**		
		Optimum range	**Universal range**	
Industrial environments		**Maintenance-free**	**Maintenance-free**	**Standard**
Fanless		★★★★★	★★★★★	★★★★★
Diskless		★★★★★	★★★★★	–
Sizes of colour touch screen and front panel bezel material		□ 10.4" Aluminium bezel □ 15" Aluminium or Stainless steel bezel	□ 15" Aluminium or Stainless steel bezel □ 19" Aluminium bezel	
CPU *(1)*	Processor	Intel® ATOM™ Z510 (1.1 GHz)	Intel® ATOM™ N270 (1.6 GHz)	
	PCI slot(s)	0	0 or 2	
	Storage	Compact Flash card (SLC technology) and integrated SD card reader	Compact Flash card (SLC technology) or Flash disk (SLC technology SSD)	Hard disk
	RAM	1 GB	1 or 2 GB	
Operating system		Windows® Embedded Standard 2009	Windows® Embedded Standard 2009 or Windows® XP Professional SP3	Windows® XP Professional SP3
Supply voltage	Aluminium bezel versions	24 V ⎓	24 V ⎓ or 100…240 V ∿	
	Stainless steel bezel versions	–	24 V ⎓	
Standards and certifications		□ CE □ cULus □ cULus Haz Loc □ ATEX II 3 Gas and Dust Zone 2/22 (Optimum range 15" Stainless steel bezel version only) □ ATEX II 3 Dust Zone 22 (Universal range 15" Stainless steel bezel version only) *(2)* □ EN 1672-2 Food and beverage processing machines and FDA 21CFR 177.206 specific seals (Stainless steel bezel versions only) ...		
Marine certification		□ Bridge Class (only 24 V ⎓ Magelis Panel PC with 15" or 19" touch screen and Aluminium bezel)		–
Software		Vijeo Designer Run Time Demo (21-day trial version). Unlimited licence, to be ordered separately (VJDSNRTMPC). Vijeo Citect, depending on the model		
References	Aluminium bezel versions	**HMI PWC● ●●●●●**	**HMI PUC● ●●●●●** **HMI PUF● ●●●●●**	**HMI PUH● ●●●●●**
	Stainless steel bezel versions	**HMI PVC7 D0E01**	**HMI PTF7 D2P01**	**HMI PTH7 D2P01**
Pages		Please consult the "Human/Machine Interface" catalogue		
Other made-to-order configurations		See configured Magelis Panel PC. Please consult the "Human/Machine Interface" catalogue		

(1) For other options available (interface for backup battery, 3rd serial port, etc.) in made-to-order configuration, please consult the "Human/Machine Interface" catalogue.
(2) ATEX certification pending.
(3) See pages 8/12 and 8/13.

Magelis Panel PC		Magelis BOX PC			
Performance range		Universal range		Performance range	
Harsh	Standard	Maintenance-free	Standard	Harsh	Standard
–	–	★★★★★	–	–	–
★★★★★	–	★★★★★	–	★★★★★	–
□ 15" Aluminium or Stainless steel bezel □ 19" Aluminium bezel		Aluminum Compatible with all screens in the Magelis *i*Display range			
Intel® Core™ 2 Duo P8400 (2.26 GHz) + Intel® GM45 chipset		Intel® ATOM™ N270 (1.6 GHz)		Intel® Core™ 2 Duo P8400 (2.26 GHz) + Intel® GM45 chipset	
0 or 2		1 or 2		2 or 5	
Flash disk (SLC technology SSD)	Hard disk	Compact Flash card (SLC technology) or Flash disk (SLC technology SSD)	Hard disk	Flash disk (SLC technology SSD)	Hard disk
2 or 4 GB		1 or 2 GB		2 or 4 GB	
Windows® 7 Ultimate 64-bit		Windows® Embedded Standard 2009 or Windows® XP Professional SP3	Windows® XP Professional SP3	Windows® 7 Ultimate 64-bit	
24 V ⎓ or 100…240 V ∿		24 V ⎓			
100…240 V ∿		–			
□ CE □ cULus □ cULus Haz Loc □ ATEX II 3 Dust Zone 22 (Stainless steel bezel versions only) *(2)* □ EN 1672-2 Food and beverage processing machines and FDA 21CFR 177.206 specific seals (Stainless steel bezel versions only) …		CE cULus cULus Haz Loc ATEX II 3 Dust Zone 22 *(2)* …			
–		Bridge Class	–		
Vijeo Designer Run Time Demo (21-day trial version). Unlimited licence, to be ordered separately (VJDSNRTMPC) Vijeo Citect, depending on the model					
HMI PPF● ●●●●●	**HMI PPH● ●●●●●**	**HMI BUCN ●●●●●** **HMI BUFN ●●●●●**	**HMI BUHN ●●●●●**	**HMI BPFD ●●●●●**	**HMI BPHD ●●●●●**
–	**HMI PRH7 A2701**	**–**	**–**	**–**	**–**
Please consult the “Human/Machine Interface” catalogue					
See configured Magelis Panel PC. Please consult the “Human/Machine Interface” catalogue		See configured Magelis BOX PC. Please consult the “Human/Machine Interface” catalogue			

Industrial PCs

Magelis™ iDisplay screens certified for automation

15” and 19” flat screens

Industrial PCs		Magelis iDisplay flat screens	
Model		**15” touch screens**	**15” touch screen and keypad**
Screen	Type	15” colour TFT LCD	
	Definition	XGA 1024 x 768	
	Number of colours	16,777,216	
	Brightness	≥ 200 cd/m² adjustable	
	Backlighting service life	50,000 hours	
Touch screen		Analog resistive, 35 million cycles	
Keypad		–	70 standard IBM keys 2 x 20 user function keys
I/O ports	On the front panel	1 x USB 2.0 type A	
	Other	1 x VGA video (analog RGB, 15-way male SUB-D) 1 x DVI-D video (analog RGB, 24-way male DVI-D) 1 x USB 2.0 type B 1 x COM1 (RS 232C, 9-way male SUB-D)	
Standards and certifications		UL 508, CSA, IEC 61131-2	cULus Haz Loc Class I Div 2 (ANSI/ISA 12.12.01, UL 1604, CSA 22.2 n° 213) / UL 1604, UL 508, IEC 61131-2
Supply voltage		100…240 V ∿ (98...264 V), according to EN 61131-2	24 V ⎓ (19,2...28,8 V) / 100…240 V ∿
Consumption		120 VA max.	17 A (typical inrush current 30 A max.) / 200 VA max.
Degree of protection		IP 65 for the front of the screen IP 20 for the sides and back of the screen	
Dimensions	Overall dimensions (W x H x D)	395 x 294 x 60 mm	483 x 365 x 31 mm
	Cut-out (W x H)	383.5 x 282.5 (+1, -0) mm	441.5 x 313.5 (+1, -0) mm
Environment	Operating temperature	0...50°C, according to EN 61131-2 and UL	
	Vibration resistance	Conforming to JIS B 3501 and IEC 61131-2 standards: ■ 5...9 Hz, 3.5 mm fixed amplitude ■ 9...150 Hz: constant acceleration of 1 g (9.8 m/s²) ■ X, Y, Z directions tested 10 times (100 minutes)	
Type		**MPC YT5 0NAN 00N**	**HMI DID 7DT0** / **MPC NB5 0NAN 00N**
Pages		Please consult the “Human/Machine Interface” catalogue	

Magelis *i*Display flat screens

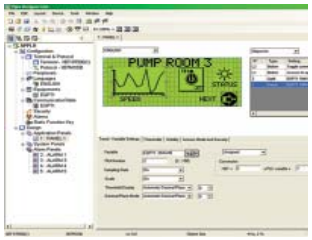
19” touch screen

19” colour TFT LCD
SVGA 1280 x 1024
16,777,216
≥ 200 cd/m² adjustable
50,000 hours
Analog resistive, 35 million cycles
–
1 x USB 2.0 type A
1 x VGA video (analog RGB, 15-way male SUB-D) 1 x DVI-D video (analog RGB, 24-way male DVI-D) 1 x USB 2.0 type B 1 x COM1 (RS 232C, 9-way male SUB-D)
UL 508, CSA, IEC 61131-2
100…240 V ∿ (85...265 V), according to EN 61131-2
200 VA max.
IP 65 for the front of the screen IP 20 for the sides and back of the screen
460 x 390 x 65 mm
419.5 x 352.5 (+1, -0) mm
0...50°C, according to EN 61131-2 and UL
Conforming to JIS B 3501 and IEC 61131-2 standards: ■ 5...9 Hz, 3.5 mm fixed amplitude ■ 9...150 Hz: constant acceleration of 1 g (9.8 m/s²) ■ X, Y, Z directions tested 10 times (100 minutes)

MPC YT9 0NAN 00N

Please consult the “Human/Machine Interface” catalogue

HMI software

Applications		**Traditional architecture, HMI executed on PC platform or dedicated terminal** **Configuration software for operator dialogue applications**
		
Compatible products	Type	Magelis™ XBT N/R/RT Small Panels *(1)*
	Maximum number of targets	1
	Operating system on terminals	Proprietary Magelis
Functions	Reading/writing of PLC variables	Yes
	Display of variables	Yes
	Data processing	–
	Sharing of variables between HMI applications	–
	Saving of variables to external database	–
Internationalization		–
Development of graphic applications	Native library of graphic objects	Yes
	Curves and alarms	Yes *(2)*
	Scripts	–
Communication between HMI application and PLCs		Via I/O drivers: Schneider Electric or third party protocols (Mitsubishi, Omron, Rockwell Automation, Siemens) *(3)*
Uploading of applications		Yes
Simulation of HMI applications		Yes
Recipe management		–
Report and barcode printing		–
Screen capture		–
Access security		Linked to user profiles
Interface languages		Screens, online help and documentation in electronic format available in 6 languages: English, French, German, Italian, Simplified Chinese and Spanish
OS compatibility		Windows XP Professional, Windows Vista Business (32-bit), Windows 2000 Professional
Software type		**Vijeo Designer ™ Lite**
Page		Please consult the “Human/Machine Interface” catalogue

(1) All Magelis XBT and Magelis GTO terminals behave transparently on restoration of power.
(2) Depending on compatible product.
(3) See protocols supported (please consult the “Human/Machine Interface” catalogue).

Traditional architecture, HMI executed on PC platform or dedicated terminal

Configuration software for operator dialogue applications

Magelis™ STO/STU Small Panels Magelis™ XBT GT/GK/GH/GTW and Magelis™ GTO Advanced Panels *(1)* Magelis™ industrial PCs
32
Proprietary for Magelis STO/STU, Magelis XBT GT/GK/GH and Magelis GTO Windows XP embedded for Magelis GTW
Yes, up to 8000 internal and external variables
Yes
Yes, using expression editor or Java programming
Up to 300 variables between 8 terminals, without router PLC Proprietary protocol above TCP/IP
Yes, with the Intelligent Data Service extension
Up to 15 languages supported by 34 western alphabets, 4 Asian alphabets and 2 middle eastern alphabets embedded in the application
Yes
Yes, with log
Java
Via I/O drivers: Schneider Electric or third party protocols (Mitsubishi, Omron, Rockwell Automation, Siemens) *(3)*
Yes
Yes
Yes, up to 32 groups, 1024 ingredients for 256 recipes per group, proprietary or CSV format, complete multilingual support for labels and ingredients
On the fly alarms, log data. Up to 9999 active alarms, record or logs Main barcode types supported: UPC-A, UPC-E, JAN/EAN8, JAN/EAN13, ITF, CODE39, CODE93, CODE128, CODABAR (NW-7)
Yes, for Magelis XBT GT (XBT GT 1105 and higher), Magelis GTO and Magelis industrial PCs. JPEG format
Linked to user profiles
Screens, online help and documentation in electronic format available in 7 languages: English, French, German, Italian, Brazilian Portuguese, Simplified Chinese and Spanish
Windows XP Professional, Windows 7 Business (32-bit and 64-bit)

Vijeo Designer ™

Please consult the “Human/Machine Interface” catalogue

Software
Supervisory control and data acquisition software (SCADA)
Vijeo Citect

Vijeo Citect

Presentation

Vijeo Citect™ is the operating and monitoring component of Schneider Electric's PlantStruxure™.

With its powerful display capabilities and its operational features, it delivers actionable insight faster, enabling operators to respond quickly to process disturbances, thereby increasing their efficiency. With its easy-to-use configuration tools and powerful features you can quickly develop and implement solutions for any size application.

Vijeo Citect offers the functions of a modern supervisor. Its distributed client-server architecture is applicable to a multitude of applications in the following markets:

- Oil & Gas
- Mining, Minerals, Metals
- Water & Wastewater
- Power
- Food and beverage

Its flexibility also makes it suitable for numerous other application areas, such as infrastructures.

Redundancy

Vijeo Citect offers total redundancy for all the components of the system. The redundancy functions are fully integrated in the system, providing exceptional performance and intuitive configuration.

Server licence

Vijeo Citect is available:

- In a **Client-Server** architecture, for configurations ranging from 75 points to an unlimited number of points
- In a **stand-alone** version called **Vijeo Citect Lite**, for configurations of 100 to 1200 points (see page 8/20).

Vijeo Citect includes the installation (without registration) of the OFS software, Schneider Electric's integrated OPC server. This server can only be used with Vijeo Citect software.

The OFS software provides access to the structured variables and assists to provide system consistency. This is one of the major benefits of Schneider Electric integration.

Server licences **VJC NS 1011 ●●** are purchased according to the number of points to be processed, not according to the number of I/O *(1)*.

A point expansion offer is also available to increase the number of:

- Client points: **VJC NS 1020 ●●-●●**
- Server points: **VJC NS 1011 ●●-●●**

as required *(2)*.

(1) Vijeo Citect counts all the variables exchanged with external devices, such as PLCs.
(2) If the server or client is upgraded, the keys must be reprogrammed.

Architectures:
pages 8/18 ...

References:
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Client licences

Four types of Client licence are available:

- **Control Client**, **VJC NS 1020 ●●**: used by operators accessing the Vijeo Citect server via a local connection
- **View Only Client**, **VJC NS 1030 ●●**: for users needing to view the Vijeo Citect application via a local connection, but not needing to control the system
- **Web Control Client**, **VJC NS 1022 ●●**: similar to the Control Client, but via a Web browser
- **Web View Only Client**, **VJC NS 1032 ●●**: similar to the View Only Client, but via a Web browser.

Static, floating and redundant client licences

A Client licence can be static, floating or redundant depending on requirements:

- **Static Client licence**: For operators needing access to the system at all times, irrespective of the number of connections already established by other clients.

A static Client licence provides permanent access to the system, as it physically resides in the key plugged into the client PC.

- **Floating Client licence**: Users who occasionally need to use a Client for operator tasks can purchase Floating licences. Connections will be allowed until the number of valid licences is reached. Floating Client licences are stored on the key plugged into the server.
- **Redundant Client licence**: Redundant Client licences **VJC NS 10●● 88** are intended solely for the standby server in a redundant configuration. They are used to ensure that the Client licences purchased are available.

Development workshop

The development workshop **VJC 1099 ●●** comprises hardware components such as the DVD, hardware keys, installation guide and storage boxes.

The rules for use are as follows:

- Each server requires a hardware USB key in order to operate
- The server key is also used to store the floating client licences
- The key controls the number of points that can be used
- The key is programmed to operate up to a predetermined version

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Software
Supervisory control and data acquisition software (SCADA)
Vijeo Citect

Single-station architecture

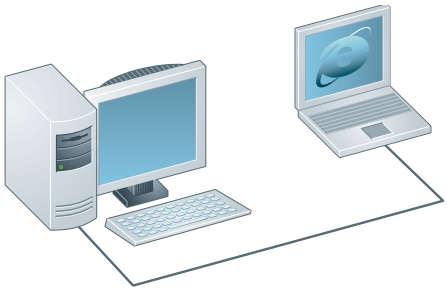
Architectures

Single station stand-alone SCADA system, 5000 points

Development workshop
- 1 x **VJC 1099 22**, hardware delivery of the DVD with USB key

Server licence
- 1 x **VJC NS 1011 14**, Server licence for 5000 points, including Control Client licence

Client licence
- Not required (included in the server licence)



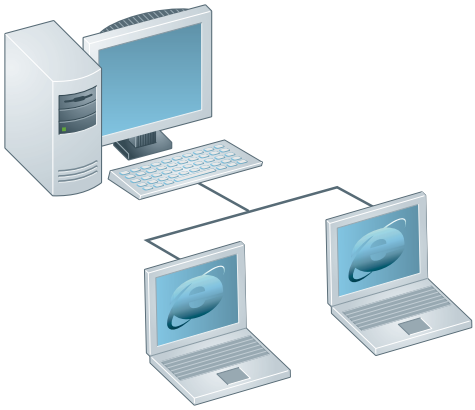
Single-server architecture with Web View Only Client access

Remote Server system with remote access via the Web

Development workshop
- 1 x **VJC 1099 22**, hardware delivery of the DVD with USB key

Server licence
- 1 x **VJCNS 1011 15**, Server licence for 15000 points, including Control Client licence

Client licence
- 1 x **VJCNS 1032 99**, Web View Only Client licence



Single-server architecture with
1 Web Control Client and 1 Web View Only Client

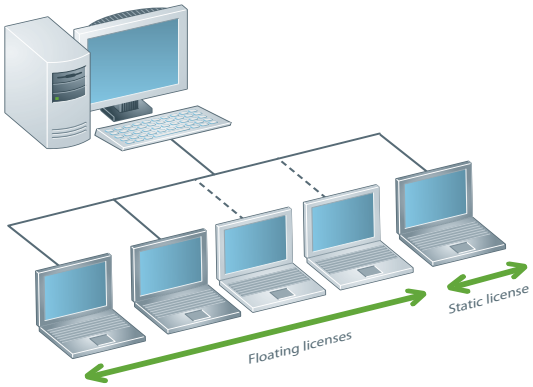
Networked Server system with remote Web Clients

E.g. Networked Server system, 500 points, with 2 remote Clients via the Web, one Web Control Client and one Web View Only Client

Development workshop
- 1 x **VJC 1099 22**, hardware delivery of the DVD with USB key

Server licence
- 1 x **VJC NS 1011 12**, Server licence for 500 points, including Control Client licence

Client licences
- 1 x **VJC NS 1022 12**, Web Control Client licence for 500 points
- 1 x **VJC NS 1032 99**, Web View Only Client licence



Single-server architecture with
2 floating Control Client licences and 1 static licence

Networked server system with floating and static access

E.g. Networked server system, 5000 points, with 5 Client PCs and 3 Client licences, 2 of which are floating and 1 static

Development workshop
- 1 x **VJC 1099 22**, hardware delivery of the DVD with USB key
- 1 x **VJC 1099 21**, additional USB key for static Client

Server licence
- 1 x **VJC NS 1011 14**, Server licence for 5000 points, including Control Client licence (local Control Client type on the server PC)

Client licences
- 3 x **VJC NS 1020 14**, Control Client licences for 5000 points

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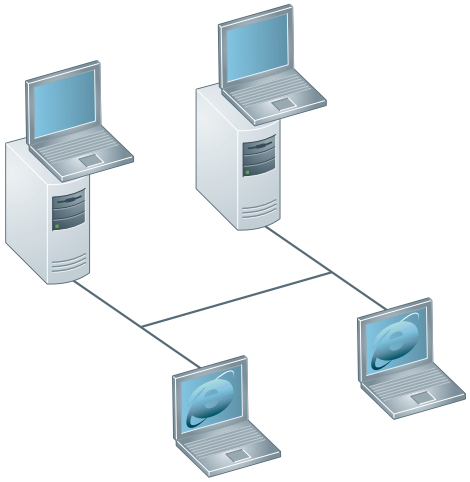
Software
Supervisory control and data acquisition software (SCADA)
Vijeo Citect



Redundant architecture with 2 Control Clients on servers and 2 Web View Only Clients

Architectures (continued)

Redundant Server with Server Control Clients and Web View Only Clients

E.g. Redundant server, 1500 Points, with 2 Control Client licences on the servers and 2 Web View Only Client licences

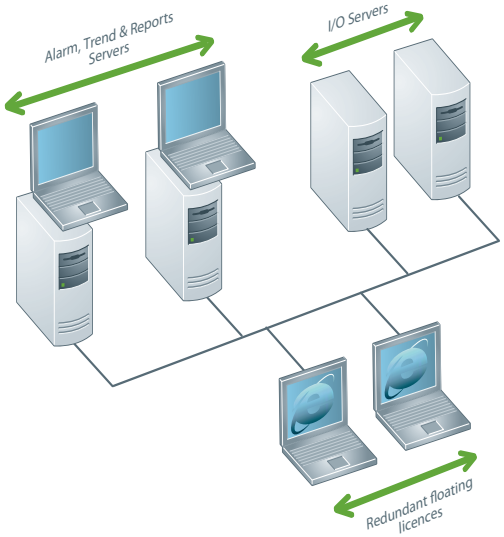
Development workshop
- ■ 1 x **VJC 1099 22**, hardware delivery of the DVD with USB key (Primary Server key)
- ■ 1 x **VJC 1099 21**, additional USB key (Standby Server key)

(rule: 1 key per Server)

Server licences
- ■ 2 x **VJC NS 1011 13**, Server licences for 1500 points, including Control Client licences:
  - □ The first Server acts as the Primary Server
  - □ The second server acts as the Standby Server
  - □ One licence is placed on each key (Primary and Standby)

Client licences
- ■ 2 x **VJC NS 1032 99**, Web View Only Client licences
  - □ Both licences are placed on the Primary Server key

Redundant Client licence
- ■ 2 x **VJC NS 1032 88**, redundant Web View Only Client licences
  - □ Floating redundant licences for Web View Only Client licences
  - □ Both licences are placed on the Standby Server key



Redundant architecture, separate ATR and I/O Servers, with 2 Server Control Clients and 2 Web View Only Clients

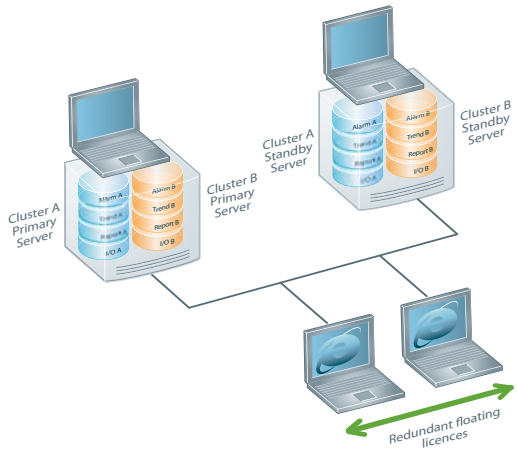
Redundant Alarm, Trend, Reports Servers (1500 points) and redundant I/O Servers (1500 points) with 2 Control Clients and 2 Web View Only Clients

Development workshop
- ■ 1 x **VJC 1099 22**, hardware delivery of the DVD with USB key (Primary Server key)
- ■ 3 x **VJC 1099 21**, additional USB keys (one per Server) (Standby Server key)

Server licence
- ■ 4 x **VJC NS 1011 13**, Server licences for 1500 points, including Control Client licence:
  - □ Two pairs of redundant Servers: one I/O Server redundant pair, one ATR Server redundant pair
  - □ The first Server in each pair acts as the Primary Server
  - □ The second Server acts as the Standby Server
  - □ One licence is placed on each key (Primary and Standby)

Client licence
- ■ 2 x **VJCNS 1032 99**, Web View Only Client licences
  - □ Both licences are placed on the ATR Primary Server key

Redundant Client licence
- ■ 2 x **VJCNS 1032 88**, redundant Web View Only Client licences
  - □ Redundant floating licences for Web View Only Client licences



Redundant architecture, 2 clusters with 2 Web View Only Clients

Redundant Servers (1500 points) with 2 Logical Server Clusters and 2 Web View Only Clients

Development workshop
- ■ 1 x **VJC 1099 22**, hardware delivery of the DVD with USB key (Primary Server key)
- ■ 1 x **VJC 1099 21**, additional USB key (one per Server) (Standby Server key)

Server licence
- ■ 2 x **VJC NS 1011 13**, Server licences for 1500 points, including Control Client licence:
  - □ One pair of redundant Servers, two clusters on each server
  - □ The first server contains Cluster A (ATR & I/O Server) and Cluster B (ATR & I/O Server) Primary Servers
  - □ The second server contains Cluster A and Cluster B Standby Servers
  - □ One licence is placed on each key (Primary and Standby)

Client licence
- ■ 2 x **VJCNS 1032 99**, Web View Only Client licences
  - □ Both licences are placed on the ATR Primary Server key

Redundant Client licence
- ■ 2 x **VJCNS 1032 88**, Redundant Web View Only Client licences
  - □ Redundant floating licences for Web View Only Client licences
  - □ Both licences are placed on the ATR Standby Server key

Software
Supervisory control and data acquisition software (SCADA)
Vijeo Citect

VJC 1099 ●2

Development workshop - Vijeo Citect Box and keys

The **VJC 1099 ●2** Vijeo Citect Box comprises:

- 1 DVD with the Vijeo Citect software
- A Schneider Electric drivers pack
- An installation guide
- A hardware key for USB port

Additional keys are also supplied in the Vijeo Citect Box.

Development workshop - Vijeo Citect Box

Description	Type of key included	Reference	Weight kg
Vijeo Citect Box with USB key	USB	**VJC 1099 22**	0.410

Additional Vijeo Citect keys

Designation	Target licence	Reference	Weight kg
Additional Vijeo Citect USB key Supplied in Vijeo Citect Box	Redundant Server and static (non-floating) licences	**VJC 1099 21**	0.200
Vijeo Citect 10 Pack USB keys Supplied in Vijeo Citect Box	Blank keys and not licenced	**VJC 1099 20** *(1)*	1.500

Vijeo Citect Software

Designation	Target licence	Reference	Weight kg
Vijeo Citect Software DVD - 50 Pack	Not licenced	**VJC 1099 18**	2.200

Vijeo Citect

Vijeo Citect Lite, stand-alone

The Vijeo Citect Lite stand-alone licence is available for 100 to 1200 points.
The Vijeo Citect Lite licence is a simple solution for stand-alone applications.
Lite licenses cannot connect to any third party software or client stations. Further it cannot be made redundant.

Vijeo Citect Lite licence

Designation	Number of points	Reference	Weight kg
Vijeo Citect Lite Stand-alone: no connectivity Key to be ordered separately	100	**VJC NS 3011 56**	–
	150	**VJC NS 3011 11**	–
	300	**VJC NS 3011 27**	–
	600	**VJC NS 3011 59**	–
	1200	**VJC NS 3011 50**	–

(1) The 10 Pack Vijeo Citect keys **VCJ 1099 20** *is not programmed.*

Vijeo Citect Lite, stand-alone (continued)

Vijeo Citect Lite Point Expansion

The references below are used for increasing the number of Vijeo Citect Lite points available or to upgrade Lite Server to Full Server.

The licence point count expansion is achieved in steps. For example, if a licence is upgraded from 100 points to 600 points, 3 part numbers will be ordered to upgrade from 100 points to 150 points, 150 points to 300 points and 300 points to 600 points.

Designation	Number of points	Reference	Weight kg
Vijeo Citect Lite Point Expansion (number of points)	100 to 150	**VJC NS L56-L11**	–
	150 to 300	**VJC NS L11-L27**	–
	300 to 600	**VJC NS L27-L59**	–
	500 or 600 to 1200	**VJC NS L59-L50**	–
Vijeo Citect Lite Point Expansion (Lite server to Full server)	Lite 150 to Full 150	**VJC NS L11-F11**	–
	Lite 300 to Full 500	**VJC NS L27-F12**	–
	Lite 600 to Full 1500	**VJC NS L59-F13**	–
	Lite 1200 to Full 1500	**VJC NS L50-F13**	–

Vijeo Citect Server

The Vijeo Citect Server full system licences are segmented according to the number of points.

Redundant system

- For a redundant system simply order 2 Vijeo Citect Server licences
- No other option is required for the Servers
- The programmed USB key must be ordered separately

Vijeo Citect Server licence

Designation	Number of points	Reference	Weight kg
Vijeo Citect Server Full version Key to be ordered separately	75	**VJC NS 1011 10**	–
	150	**VJC NS 1011 11**	–
	500	**VJC NS 1011 12**	–
	1500	**VJC NS 1011 13**	–
	5000	**VJC NS 1011 14**	–
	15000	**VJC NS 1011 15**	–
	Unlimited	**VJC NS 1011 99**	–

Vijeo Citect Server Point Expansion

The references below are used for increasing the number of points on the Server.

The licence point count expansion is achieved in steps. For example, if a licence is upgraded from 75 points to 1500 points, 3 part numbers will be ordered to upgrade from 75 points to 150 points, 150 points to 500 points and 500 points to 1500 points.

Designation	Number of points	Reference	Weight kg
Vijeo Citect Server Point Expansion	75 to 150	**VJC NS 1011 10-11**	–
	150 to 500	**VJC NS 1011 11-12**	–
	500 to 1500	**VJC NS 1011 12-13**	–
	1500 to 5000	**VJC NS 1011 13-14**	–
	5000 to 15000	**VJC NS 1011 14-15**	–
	15000 to unlimited	**VJC NS 1011 15-99**	–

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Software
Supervisory control and data acquisition software (SCADA)
Vijeo Citect

Vijeo Citect Control Client

Vijeo Citect Control Client licences are intended for operators. They are segmented according to the number of points to be displayed. There are two types:

- Floating licence, residing on the Server key
- Static licence, requiring a separate key on the client PC.

Redundant system

- The number of floating Clients ordered is added to the Primary Server key
- For the Standby Server, the same number of redundant Control Client licences, **VJC NS 1030 88**, must be ordered

Vijeo Citect Control Client licence

Designation	Number of points	Reference	Weight kg
Vijeo Citect Control Client licence	75	**VJC NS 1020 10**	–
	150	**VJC NS 1020 11**	–
	500	**VJC NS 1020 12**	–
	1500	**VJC NS 1020 13**	–
	5000	**VJC NS 1020 14**	–
	15000	**VJC NS 1020 15**	–
	Unlimited	**VJC NS 1020 99**	–
Vijeo Citect redundant Control Client licence	Floating licence only	**VJC NS 1020 88**	–

Vijeo Citect View Only Client

Vijeo Citect View Only Client licences are available for users who need to view the application, without controlling it. Licenses for these clients are segmented according to the number of points displayed. There are two types:

- Floating licence, residing on the Server key
- Static licence, the hardware key being plugged into the Client station.

Redundant system

- The number of floating Clients ordered is added to the Primary Server key
- For the standby server, the same number of redundant View Only Client licences, **VJC NS 1030 88**, must be ordered

Vijeo Citect View Only Client licence

Designation	Number of points	Reference	Weight kg
Vijeo Citect View Only Client licence	Unlimited	**VJC NS 1030 99**	–
Vijeo Citect redundant View Only Client licence	Floating licence only	**VJC NS 1030 88**	–

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Vijeo Citect Web Control Client

Vijeo Citect Web Control Client licences are intended for users who need full control of the application but prefer the flexibility of access via a Web connection. These client licences are segmented according to the number of points displayed and must be floating type (residing on the key plugged into the server).

Redundant system

- The number of floating Clients ordered is added to the Primary Server key
- For the Standby Server, the same number of redundant Web Control Client licences, **VJC NS 1030 88**, must be ordered

Vijeo Citect Web Control Client licence

Designation	Number of points	Reference	Weight kg
Vijeo Citect Web Control Client licence	75	**VJC NS 1022 10**	–
	150	**VJC NS 1022 11**	–
	500	**VJC NS 1022 12**	–
	1500	**VJC NS 1022 13**	–
	5000	**VJC NS 1022 14**	–
	15000	**VJC NS 1022 15**	–
	Unlimited	**VJC NS 1022 99**	–
Vijeo Citect redundant Web Control Client licence	Floating licence only	**VJC NS 1022 88**	–

Vijeo Citect Web View Only Client

Vijeo Citect Web View Only Client licences are intended for users who need to view the application via a Web connection, without controlling the system. These Client licences are segmented according to the number of points displayed and must be floating type (the licences reside on the key plugged into the Server).

Redundant system

- The number of floating Clients ordered is added to the Primary Server key
- For the Standby Server, the same number of redundant View Only Client licences, **VJC NS 1032 88**, must be ordered

Vijeo Citect Web View Only Client licence

Designation	Number of points	Reference	Weight kg
Vijeo Citect Web View Only Client licence	Unlimited	**VJC NS 1032 99**	–
Vijeo Citect redundant Web Only Client View licence	Floating licence only	**VJC NS 1032 88**	–

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Software
Supervisory control and data acquisition software (SCADA)
Vijeo Citect

Control Client Point Expansion

The references below are used for increasing the number of points on:

- The Server holding the hardware key, for floating licences
- The Client holding the hardware key, for static licences

The licence point count expansion is achieved in steps. For example, if a licence is upgraded from 75 points to 1500 points, 3 part numbers will be ordered to upgrade from 75 points to 150 points, 150 points to 500 points and 500 points to 1500 points.

Vijeo Citect Control Client Point Expansion

Designation	Number of points	Reference	Weight kg
Vijeo Citect Control Client Point Expansion	75 to 150	**VJC NS 1020 10-11**	–
	150 to 500	**VJC NS 1020 11-12**	–
	500 to 1500	**VJC NS 1020 12-13**	–
	1500 to 5000	**VJC NS 1020 13-14**	–
	5000 to 15000	**VJC NS 1020 14-15**	–
	15000 to unlimited	**VJC NS 1020 15-99**	–

View Only Client Point Expansion

The reference below is used for increasing the number of points on:

- The Server holding the hardware key, for floating licences
- The Client holding the hardware key, for static licences

Vijeo Citect View Only Client Point Expansion

Designation	Number of points	Reference	Weight kg
Vijeo Citect View Only Client Point Expansion	Unlimited	**VJC NS 1030 99-99**	–

Web Control Client Point Expansion

The references below are used for increasing the number of points on the Server holding the hardware key.

Vijeo Citect Web Control Client Point Expansion

Description	Number of points	Reference	Weight kg
Vijeo Citect Web Control Client Point Expansion	75 to 150	**VJC NS 1022 10-11**	–
	150 to 500	**VJC NS 1022 11-12**	–
	500 to 1500	**VJC NS 1022 12-13**	–
	1500 to 5000	**VJC NS 1022 13-14**	–
	5000 to 15000	**VJC NS 1022 14-15**	–
	15000 to unlimited	**VJC NS 1022 15-99**	–

Web View Only Client Point Expansion

The reference below is used for increasing the number of points on the Server holding the hardware key.

Vijeo Citect Web View Only Client Point Expansion

Designation	Number of points	Reference	Weight kg
Vijeo Citect Web View Only Client Point Expansion	Unlimited	**VJC NS 1032 99-99**	–

Connections, miscellaneous

The references below are used to expand the connection licences.

Designation	Reference	Weight kg
OPC Server licence	**VJC 1041 88**	–
CtAPI licence	**VJC 1042 88**	–

Vijeo Citect - Specific drivers

The Vijeo Citect offer includes a large number of drivers as standard.
However, for copyright reasons, some drivers have a specific reference and must be ordered separately.
The purchase of a specific driver includes access to the appropriate technical support for the driver for one year.

Designation	Protocol	Reference	Weight kg
Vijeo Citect specific driver	IEC 60870-5-104	**VJC NS 3051 41**	–
	PSDirect ETH	**VJC NS 3051 40**	–
	PSDirect MPI	**VJC NS 3051 42**	–

Note: *Before ordering a Vijeo Citect specific driver, please contact our Customer Care Centre.*

Reprogramming for a Vijeo Citect licence transfer

Each time a licence has to be transferred from an existing key to another key, transfer fees are applicable and the reference **VJC 1094 01** must be ordered (licence transfer token).

Examples of cases in which these fees are applicable:

- Transfer of a Client licence from a static key to a floating licence on a Server
- Transfer of an existing floating licence to a new static key

These fees are also applicable when transferring licence(s) to a replacement key.

If a new key is required, you must order a new hardware key **VJC 1099 ●●**.

Designation	Reference	Weight kg
Reprogramming for Vijeo Citect licence transfer	**VJC 1094 01**	–

Driver Development Kit

The driver development kit includes:

- The latest release of Vijeo Citect, example source code, utilities and other Vijeo Citect files required in developing a Citect driver.
- A hardware key that will allow runtime up to 8 hours and is a 42,000 pt. single user licence.
- Access to “Citect Drivers Developers” area on Citect DriverWeb at scadasupport.citect.com/driverweb.

Designation	Reference	Weight kg
Driver Development Kit	**VJC 1092 06**	–

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Software
Supervisory control and data acquisition software (SCADA)
Vijeo Citect

Conversion of third-party applications

Conversion tools help to convert legacy applications (such as Monitor Pro) or other third-party applications to Vijeo Citect. These programs convert the tag database and graphic information to make them compatible with Vijeo Citect :

■ **Page Import** tool is targeted at customers who wish to perform the entire engineering portion of the legacy system migration themselves. The systems integrators are required to perform the engineering themselves.

■ **Basic Sytem Conversion** tool is targeted at customers who want the new system to simply replace the legacy system without major changes. It includes an initial generic engineering component to produce a fully compiled Vijeo Citect project that is ready for Factory Acceptance Tests.

More details of the coverage provided by these conversion tools can be found in our internet site www.schneider-electric.com.

Designation	Legacy System supported	Reference	Weight kg
Basic System Conversion (minimum 10 pages)	Tier 1 *(1)*	**VJC 1090 81**	–
	Tier 2 *(2)*	**VJC 1090 82**	–
	Tier 3 *(3)*	**VJC 1090 83**	–
Page Import (minimum 10 pages)	All Tiers	**VJC 1090 88**	–

Loan of Vijeo Citect keys *(4)*

Designation	Content	Reference	Weight kg
Loan of single Vijeo Citect key	- 1 Server licence, unlimited number of points, VJC NS 1011 99 - 1 Scheduler, VJC 9032 88	**VJC 1095 11**	–
Loan of multiple Vijeo Citect keys	- 1 Server licence, unlimited number of points, VJC NS 1011 99 - 5 Floating Control Client licences, VJC NS1020 99 - 5 Floating View Only Client licences, VJC NS1030 99 - 2 Floating Web Control Client licences, VJC NS1022 99 - 2 Floating Web View Only Client licences, VJCNS1032 99 - 1 Scheduler, VJC 9032 88	**VJC 1095 12**	–

(1) Tier 1 = FactoryLink 5 to 6.x, MonitorPro 2, Fix32, Genesis32, Cimplicity, Moore APACS, Wonderware 5.x to 9.x.

(2) Tier 2 = iFIX 3.5, Delta V (Fix32 & iFIX 3.5), RSView32 6.4, FactoryLink 7.5, MonitorPro 7.2 & 7.6, VijeoLook 2.6, WinCC 6.0, Wizcon.

(3) Tier 3 = iFIX 4.5, DeltaV (iFIX 4.5), Telvent OASyS DNA / 6.x, Telvent OASyS 5.x, Telvent Vector (RTView & Ovision), Honeywell TDC3000, Vigile.

(4) Available for customers requiring temporary access to a key. The hardware key must be returned at the end of the loan period. Provides eight days' continuous use. Also requires an additional Vijeo Citect Box USB key, **VJC 1099 ●●**, *to obtain the hardware key. The quantity corresponds to the number of months of the loan.*

Software
Supervisory control and data acquisition software (SCADA)
Vijeo Citect

Vijeo Citect

Vijeo Citect training

Schneider Electric offers a suite of Educational Services designed for end users, engineers, systems integrators and educational establishments. Our courses and programs provide you with hands-on experience, leaving you feeling confident enough to design and configure your own system using Vijeo Citect. Courses include instructor-led, online, self-paced and onsite offerings.

These courses have been developed to assist customers in achieving maximum productivity from using Vijeo Citect.

Training Manuals

Designation	Reference	Weight kg
Vijeo Citect Configuration Training Manual - EN	**VJC 1093 10-02-00**	–
Vijeo Citect CICODE Training Manual - EN	**VJC 1093 20-02-00**	–
Vijeo Citect Architecture and Redundancy Training Manual - EN	**VJC 1093 30-02-00**	–
Vijeo Citect Upgrade Training Manual - EN	**VJC 1093 50-02-00**	–
Vijeo Citect Customization Training Manual - EN	**VJC 1093 70-02-00**	–
Vijeo Citect Diagnostics and Troubleshooting Manual - EN	**VJC 1093 90-02-00**	–

Self-Paced Training Kits

Designation	Reference	Weight kg
Vijeo Citect Configuration SPTK - EN	**VJC 1093 10-01-00**	–
Vijeo Citect CICODE SPTK - EN	**VJC 1093 20-01-00**	–
Vijeo Citect Customization SPTK - EN	**VJC 1093 70-01-00**	–

E-Learning

Designation	Reference	Weight kg
Vijeo Citect SCADA Overview	**VJC 3093 31-00-00**	–

Exams

Designation	Reference	Weight kg
Vijeo Citect Configuration Exam	**VJC 3093 50-00-00**	–
Vijeo Citect CICODE Fundamentals Exam	**VJC 3093 51-00-00**	–
Vijeo Citect Architecture and Redundancy Exam	**VJC 3093 52-00-00**	–
Vijeo Citect Customization and Design Exam	**VJC 3093 53-00-00**	–
Vijeo Citect Upgrade Exam	**VJC 3093 54-00-00**	–
Vijeo Citect Examination Re-sit	**VJC 3093 55-00-00**	–
Vijeo Citect Diagnostics and Troubleshooting Exam	**VJC 3093 56-00-00**	–

Academic Agreements

The references below are intended for educational institutions for training students in Vijeo Citect.

Designation	Reference	Weight kg
Vijeo Citect Academic Agreement - 12 months (10 keys) *(1)*	**VJC 3093 17**	–
Vijeo Citect Academic Agreement - 12 months renewal (10 keys) *(1)*	**VJC 3093 22**	–

(1) Academic Agreements must be included with each order for the ogistics team in Sydney to process the order. Any incomplete orders (with no Academic Agreement) will be rejected. This is only for tertiary education institutions. Licenses are valid for 12 months, each agreement must be renewed every year.

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Software
Vijeo Historian reporting software

Presentation

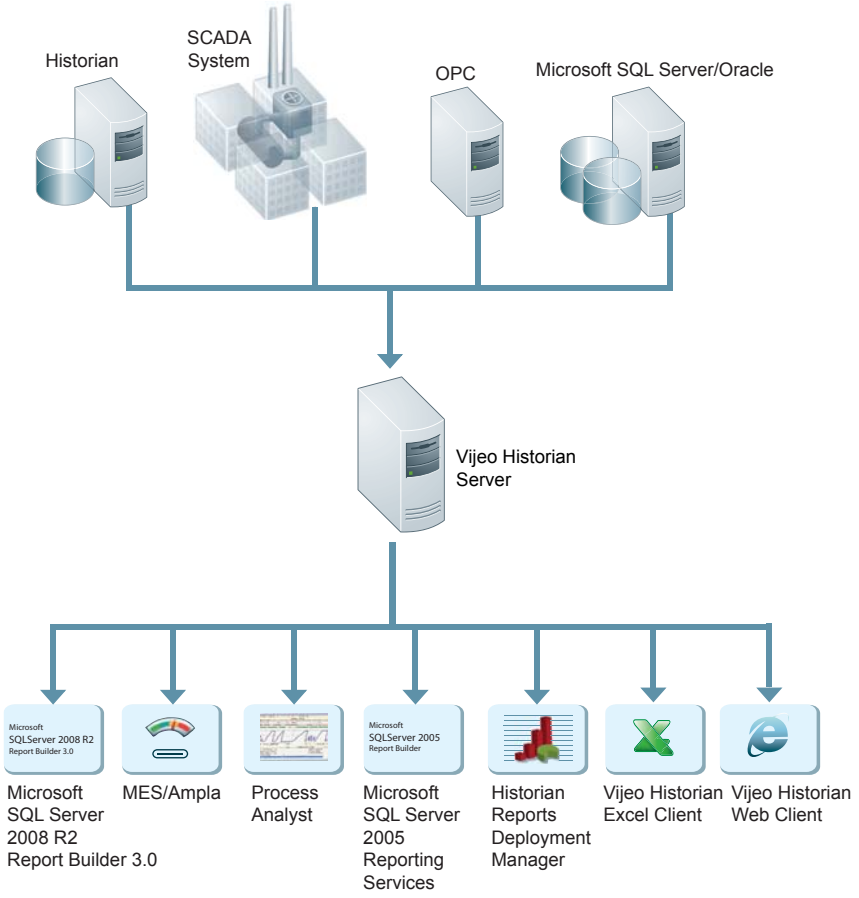
Vijeo Historian

Vijeo Historian™ is the information management component of Schneider Electric's PlantStruxure™.
It comprises of the historian and portal functions of the solution, enabling you to store data accurately for long-term reporting while connecting your production and business systems through its active data transfers and simple, easy-to-use reporting functions.

Vijeo Historian helps your plant and your IT personnel optimize their operational efficiency by providing a powerful enterprise-wide reporting tool that collects, stores and delivers meaningful reporting data from multiple disparate systems.

Comprising of historian and portal functionalities, Vijeo Historian enables you to store data accurately for long-term reporting whilst also giving you the option of displaying and accessing the information via the Vijeo Historian portal, Microsoft (TM) Excel, Microsoft Reporting Services or Microsoft Report Builder 3.0.

Visualization



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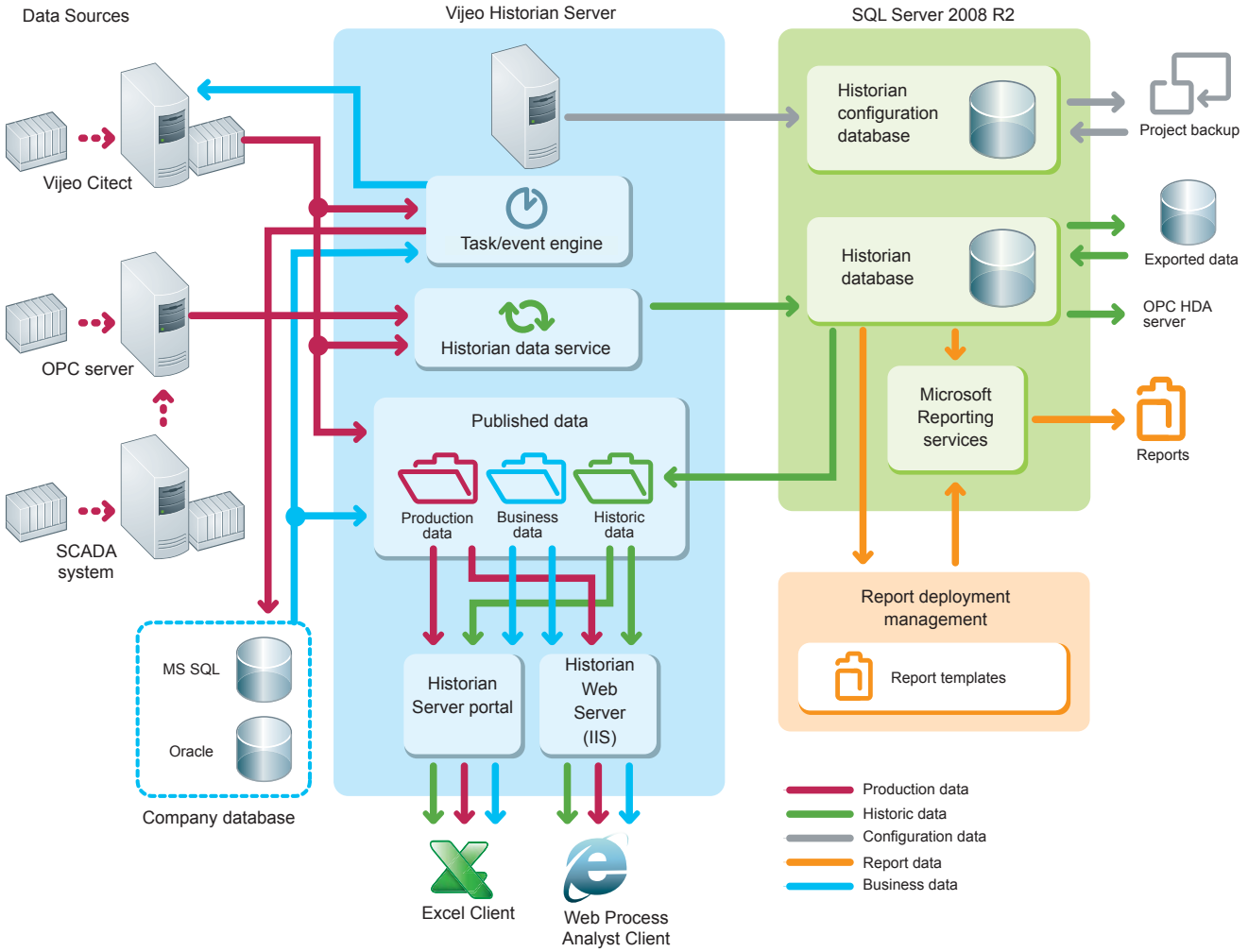
Vijeo Historian architecture



Functions

Applications

- Business managers can access meaningful, concise production system information from the plant floor in a familiar format they use for their financial or other business reports, to help them make strategic decisions to optimize operational performance.
- Plant managers can drill down into information or problem areas to improve production efficiency or reduce spurious alarms.
- Corporate and plant personnel can quickly and easily create and access meaningful reports in a familiar format and create a single view of operation.

Data sources supported

Vijeo Historian supports the following data sources:

- Vijeo Citect SCADA servers: CitectSCADA 7 or later
- OPC Clients: OPC DA V2, OPC DA V3
- Oracle V8 or later
- Microsoft SQL Server 2005 or later

Vijeo Historian Web Client and Excel Client

Vijeo Historian also provides two client tools to make it easier to view and manage the information issued by the Historian Server:

- Using the **Web Client** you can display plant information from your control systems and the historian via the Intranet/Internet simply by using a browser such as Internet Explorer.
- The **Excel Client** can also access linked information from the SCADA system or the historian directly in Microsoft Excel. The Excel Client user can select from the same plant hierarchy as the Web Client and request the values of any item within the tree structure.

Security

Once logged on, users can only access the published folders, data and Favourites for which they have permission.
Passwords are encrypted and user privileges are validated for data requests.

Licence keys

The licences are programmed on a USB or parallel key, which is plugged into the PC running the Vijeo Historian software.

Vijeo Historian

Development Workshop

The Vijeo Historian Box includes:
- Vijeo Historian DVDs including OPC/HDA Server and Reports Deployment Manager
- A booklet
- Hardware key.

The software can be downloaded from our website www.schneider-electric.com.
The Vijeo Historian Box is needed for delivery of the hardware key.
Additional keys will be shipped in the Vijeo Historian Box.
The key can be programmed for Vijeo Historian, Vijeo Citect or both.
We recommend using a separate key for Vijeo Citect and Vijeo Historian.

Description	Type of key included	Reference	Weight kg
Vijeo Historian Box with USB key	USB	**VJH 2099 22**	–
Vijeo Historian Box with parallel key	Parallel	**VJH 2099 12**	–
Vijeo Historian 10 Pack with USB key	USB	**VJH 2099 20** *(1)*	–
Additional USB key	USB	**VJH 2099 21** *(2)*	–
Additional parallel key	Parallel	**VJH 2099 11** *(2)*	–

Loan license

Description	Content	Reference	Weight kg
Vijeo Historian Loan licence	■ 1 x **VJH NS 2110 15** Vijeo Historian 15000 points and Data transfer licence ■ 5 x **VJH NS 2122 00** Portal Only Client Access Licence (CAL) ■ 5 x **VJH NS 2120 00** Historian Only Client Access Licence (CAL) ■ 5 x **VJH NS 2043 20** Microsoft SQL Database Connector (1 per database system)	**VJH 2095 03**	–

Vijeo Historian and Data Transfers

The Vijeo Historian and Data transfer licences are based on the amount of data being stored. The number of points is the maximum number of tags being logged and stored in the system. The number of alarms stored is unlimited, i.e. 150 tags stored - **VJH NS 2110 11**.

Description	Number of points	Reference	Weight kg
Vijeo Historian and Data transfer licences	150	**VJH NS 2110 11**	–
	500	**VJH NS 2110 12**	–
	1500	**VJH NS 2110 13**	–
	5000	**VJH NS 2110 14**	–
	15000	**VJH NS 2110 15**	–
	50000	**VJH NS 2110 16**	–

Vijeo Historian and Data Transfer upgrade

The references below are used for increasing the number of points on the Vijeo Historian and data transfer licences.

Description	Number of points	Reference	Weight kg
Vijeo Historian and Data transfer upgrade licences	150 to 500	**VJH NS 2110 11-12**	–
	500 to 1500	**VJH NS 2110 12-13**	–
	1500 to 5000	**VJH NS 2110 13-14**	–
	5000 to 15000	**VJH NS 2110 14-15**	–
	15000 to 50000	**VJH NS 2110 15-16**	–
	50000 to 100000	**VJH NS 2110 16-45**	–
	100000 to unlimited	**VJH NS 2110 45-99**	–

(1) Contains 10 individual Vijeo Historian Boxes (10 x **VJH 2099 22***).*
*(2) Additional keys must include a Vijeo Historian Box (***VJH 2099 22** *or* **VJH 2099 12***).*

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Client Acces Licenses (CALs)

Data from the Historian can be viewed in several ways:

- **Portal CALs**: Portal CALs are required to use the Web and Excel Clients provided with the Historian.

These CALs can be ordered either per user/device or per server (CPU).

- **Historian CALs**: Historian CALS are NOT required if a site purchases Microsoft SQL Server 2008 R2 independently. If a site uses the MS SQL Server 2008 R2 shipped with Vijeo Historian, then Historian CALs are required under the following circumstances:
  - Using any of the standard reports with Historian Reports Deployment Manager
  - Accessing the Historian using Microsoft Reporting Services
  - Using the Web or Excel Clients
  - Accessing the Historian via Stored Procedures or SQL queries
  - Any direct or indirect (via other applications) to access Historian data

Client Access License per user/device		
Description	**Reference**	**Weight kg**
Historian and Portal - Client Access License (CAL)	**VJH NS 2124 00**	–
Portal Only - Client Access License (CAL)	**VJH NS 2122 00**	–
Historian Only - Client Access License (CAL)	**VJH NS 2120 00**	–
Client Access License per CPU		
Historian and Portal Server CAL per server CPU	**VJH NS 2125 00**	–
Portal Only Server CAL per server CPU	**VJH NS 2123 00**	–
Historian Server CAL per server CPU	**VJH NS 2121 00**	–

Control system connectors

Data can be collected from:

- Vijeo Citect: Unlimited connections included
- OPC DA: Reference **VJH NS 2043 23** ordered per connection.

Historian database can be connected to other databases for up/downloading.

- SQL Connector: One MS SQL Server connector included. Additional SQL connectors **VJH NS 2043 20** ordered separately.
- Oracle connector **VJH NS 2043 21**

Connectivity can be made to Ampla or any MES system using OPC/HDA Client. Vijeo Historian has an OPC/HDA server included free.

Description	Reference	Weight kg
Microsoft SQL Database connector (1 per database system)	**VJH NS 2043 20**	–
Oracle Database connector (1 per database system)	**VJH NS 2043 21**	–
OPC DA connector V2 and V3 (1 per database system)	**VJH NS 2043 23**	–

License transfer reprogramming

Every time a licence is transferred from an existing key to another key, the licence transfer fee is charged. Examples of when this fee is applied include:

- Transfer of a licence from one key to another
- Removal of a licence from an existing key (when not transferring to another key)
- Re-issue of licence for a replacement key.

Removal or downgrade (licence type or point count) of licences on a key will require a key swap where a new key is issued and the existing key must be returned. Removal or downgrade of a licence does not provide any refund or credit.

When moving a licence to an existing key that already contains a licence (or licences), the licence being moved must be the same point count as the existing licence.

Note: When placing an order, please indicate the key numbers and details in the special instructions.

Note: This provides only a new authorization code. If a new key is required then you also need to purchase a new hardware key (**VJC 1099 ●●**).

Description	Reference	Weight kg
License transfer fee	**VJC 1094 01**	–

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Presentation:
page 8/28

Software
OPC data server software
OPC Factory Server

Presentation

Based on the OLE for Process Control (OPC) standard, Schneider Electric's OPC Factory Server (OFS) software allows “client” software applications, such as supervisors/SCADA and customized interfaces, to access the data of Schneider Electric automation system and electrical distribution devices connected to networks or fieldbuses in real time. It also allows communication with third-party devices supporting Modbus and Modbus/TCP protocols.

At the heart of the Transparent Ready offer, OFS enables simpler, more open and transparent communication between your software applications and your devices. These are just some of the advantages that ensure a complete interoperability solution that is central to your process.

In version V3.3, the OFS data server integrates the most recent specifications of the OPC Foundation:
- **OPC-DA** (OPC Data Access)
- **.NET API interface**
- **OPC XML-DA V1.0** (OPC XML Data Access)

The OFS V3.3 offer is available in two levels:
- **OFS Small:** Data server for 1000 items *(1)*, that does not support the OPC XML-DA protocol
- **OFS Large:** Complete data server

Devices and protocols supported

OFS software is a multi-device data server: It allows simultaneous use of several communication protocols, and it provides client applications with a set of services for accessing control system items that may be local or remote, via physical address or via symbol.

Devices supported:
- Modicon Quantum, Premium, M340, Micro, Compact and Momentum PLCs
- Schneider Electric TSX Series 7 and April Series 1000 PLCs
- Modbus serial devices connected via Schneider Electric gateways: TSX ETG 10●●, EGX ●●● etc. ranges
- Uni-Telway serial devices connected via Schneider Electric gateways (TSX ETG 1010)

Networks and protocols supported:
- Modbus: Modbus serial, Modbus Plus, Modbus/TCP
- X-Way/Uni-TE: Uni-Telway, Fipway, ISAway, PCIway

Openness

The development of specialized interfaces is simpler with OFS V3.3 software, which is aimed at two types of user in particular:

- **End users** who want either to interface their supervision or Human Machine Interface applications with Schneider Electric equipment, or to develop applications on a PC (supervisory control screens, Excel tables, etc.) requiring access to control system data.

- **Suppliers of control system or industrial data processing software** (supervision, Human Machine Interfaces, etc.) seeking to develop, within their standard products, an OPC Client interface capable of accessing data in Schneider Electric equipment via the OFS server.

(1) Item: A variable, structure, table, etc. in the Unity Pro application.

Architectures: page 8/35 | Setup: page 8/37 | Functions: page 8/38 | References: page 8/39

Software
OPC data server software
OPC Factory Server
Time stamping system

Presentation

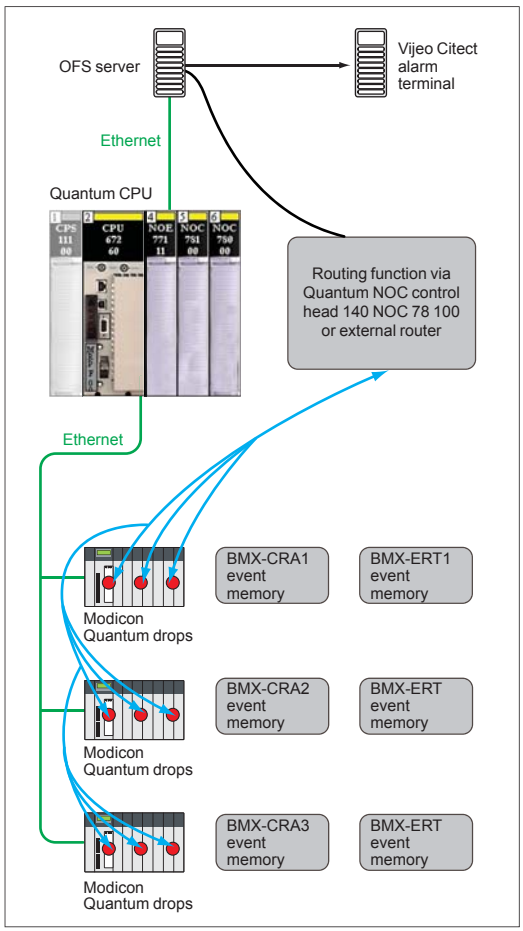
The time stamping system is a complete solution providing a sequence of events that are time-stamped at source, enabling the user to analyze the source of any abnormal behaviour in an automated system.

The SOE (system of events) is displayed in the alarm log or in the list of events for a client such as a SCADA.

Each event in the SOE is a change of value (transition) of a discrete I/O detected by a time stamping module.

Advantages

Using the time stamping system has the following advantages:
- No PLC programming
- Direct communication between the time stamping modules and the client. If the time stamping modules are in a Quantum Ethernet I/O drop, the bandwidth of the PLC communication is not used
- Consistency of the I/O values between the process (time stamping modules) and the client
- Consistency is maintained irrespective of the operating mode
- Consistency is based on the following characteristics:
  - A buffer is available to store events in each time stamping module. Storage of events is stopped when the buffer is full
  - Rising and falling edges are stored for each discrete I/O
  - Advanced diagnostics functions:
    - Indication of an unknown SOE on the client
    - Information on the time management associated with each time stamping event
- No loss of events under normal operating conditions
- Management of Hot Standby configurations on the PLC and/or SCADA redundancy



Example of a Time stamping architecture

Composition of a time stamping architecture

BMX CRA 312•0 module

This time stamping module can be at the source of any discrete I/O signal located in the drop with a resolution of 10 ms.
To ensure no event is lost, all events are stored and kept in a buffer located in the product until OFS takes them.
The synchronization of the CRA module does not use the NTP protocol.

BMX ERT 1604T module

This module has 16 discrete inputs which carry out the time stamping at source outputs with a resolution of 1 ms.
To ensure no event is lost, all events are stored and kept in a buffer located in the product until OFS takes them.
This module can be placed either in an RIO drop, or in a local rack equipped with a BMX CRA 31210 module.
The CRA module is synchronized via the DCF 77 or IRIG-B standards.

OFS V3.40

OFS V3.40 is used to access events stored in the various buffers in the architecture and to place them in the SCADA via the standard OPC DA protocol.

Vijeo Citect V7.30

Vijeo Citect V7.30 receives events transmitted by OFS and displays them in the SOE or in the list of alarms.

Software
OPC data server software
OPC Factory Server
Time stamping system

Performance

Function	Event source module	Value
Duration of time stamping between two identical source modules in the same rack	**BMX ERT 1604T**	1.6 < duration of time stamping < 3.3 ms
	BMX CRA 312 ●0	10 ms
Duration of time stamping between two different inputs in the same source module	**BMX ERT 1604T**	1 ms
	BMX CRA 312 ●0	1 scan
Maximum number of events scanned	**BMX ERT 1604T**	400 events *(1)*
	BMX CRA 312 ●0	2048 events *(1)*
Maximum number of I/O and memory available	**BMX ERT 1604T**	16 discrete inputs on module
		512 events in internal buffer
	BMX CRA 312 ●0	256 discrete I/O configured
		4000 events in internal buffer
Maximum number of source modules in an Ethernet remote I/O drop	**BMX CRA 312 ●0**	1 per drop
	BMX ERT ●●●●	9 per drop
Maximum number of event sources controlled	**BMX ERT ●●●●**	500 sources per second *(1)*

(1) The maximum value depends on the performance of the overall system. It is not an absolute value and must be consistent.

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Software
OPC data server software
OPC Factory Server

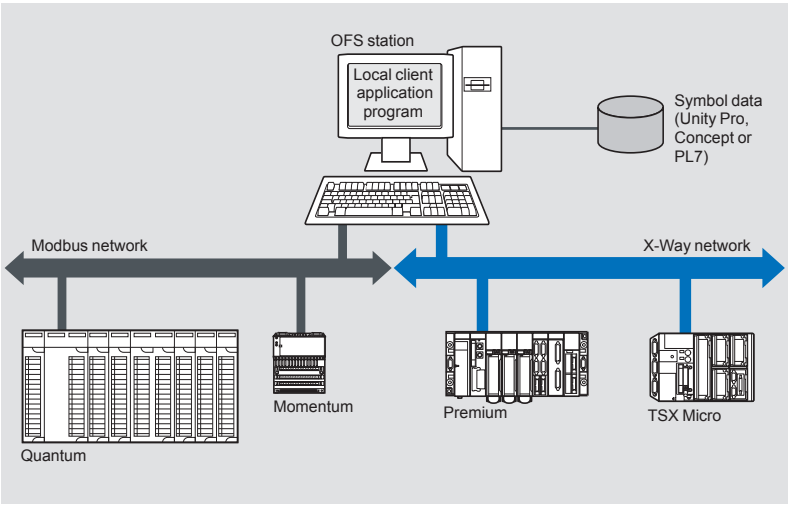
OPC Factory Server: Home page

Supported architectures

The OFS server allows four access modes:
- A purely local mode
- Remote access from an OPC-DA client
- Remote access from an OPC .NET client
- Remote access from an OPC XML-DA client

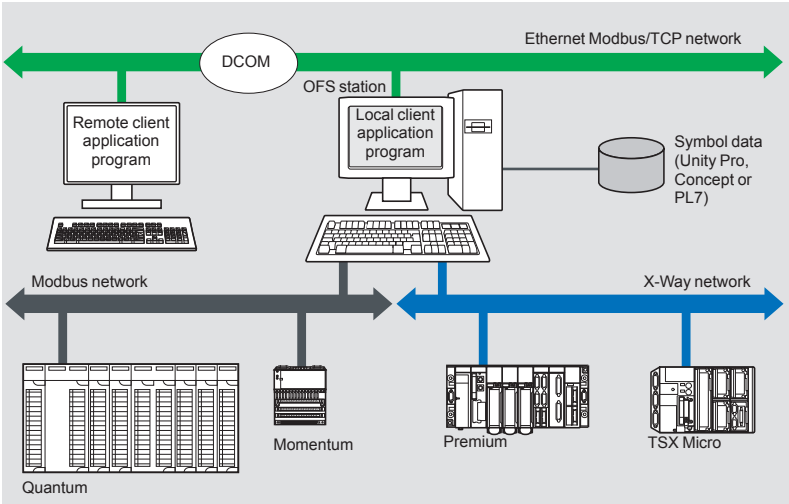
Local access

The client application program and the OFS server are on the same PC.



Remote access from an OPC-DA client

The client application program and the OFS data server are on remote stations. Communication between the client station and the OFS server is conducted through the DCOM layer (Microsoft) via the OPC-DA protocol.



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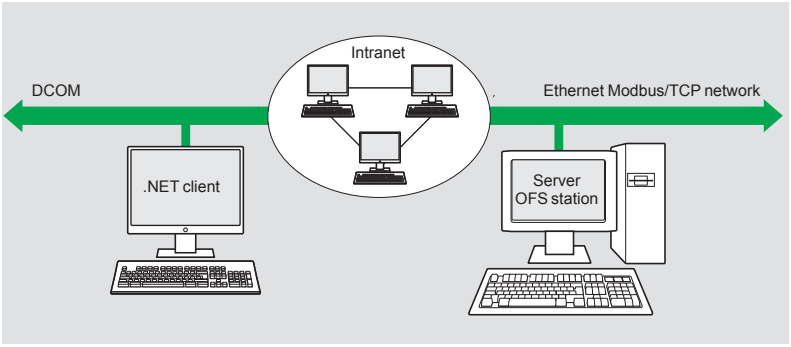
Software
OPC data server software
OPC Factory Server

Supported architectures (continued)

Remote access from an OPC .NET client

The .NET client application and the OFS data server are on remote stations. Communication between the client station and the OFS server is conducted through the DCOM layer (Microsoft) via the OPC-DA protocol.

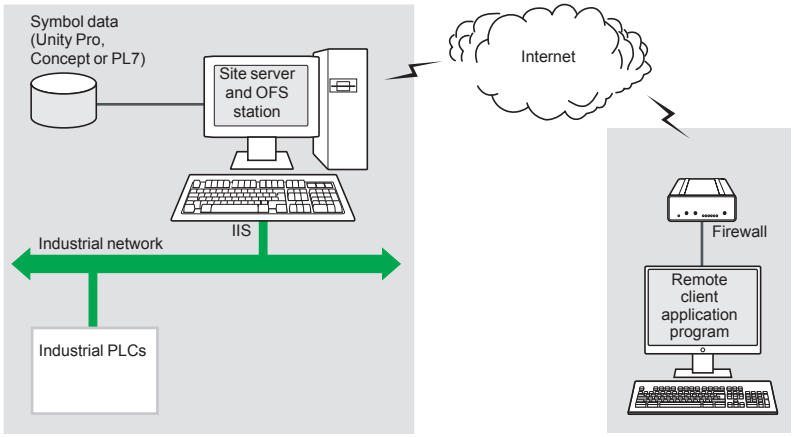


The .NET Microsoft compatibility of the OFS server has been developed to allow an OPC .NET client to access OFS server items on an Intranet network via the OPC .NET API interface.

This interface ensures interoperability between existing OPC applications and applications developed in the standard .NET environment.

Remote access from an OPC XML-DA client via HTTP

The client application program and the OFS server are on remote stations, using the SOAP protocol to communicate via the Internet in conformity with the OPC XML-DA V1.01 specification of the OPC Foundation.
The OFS data server is based on an HTTP server installed on the same station.



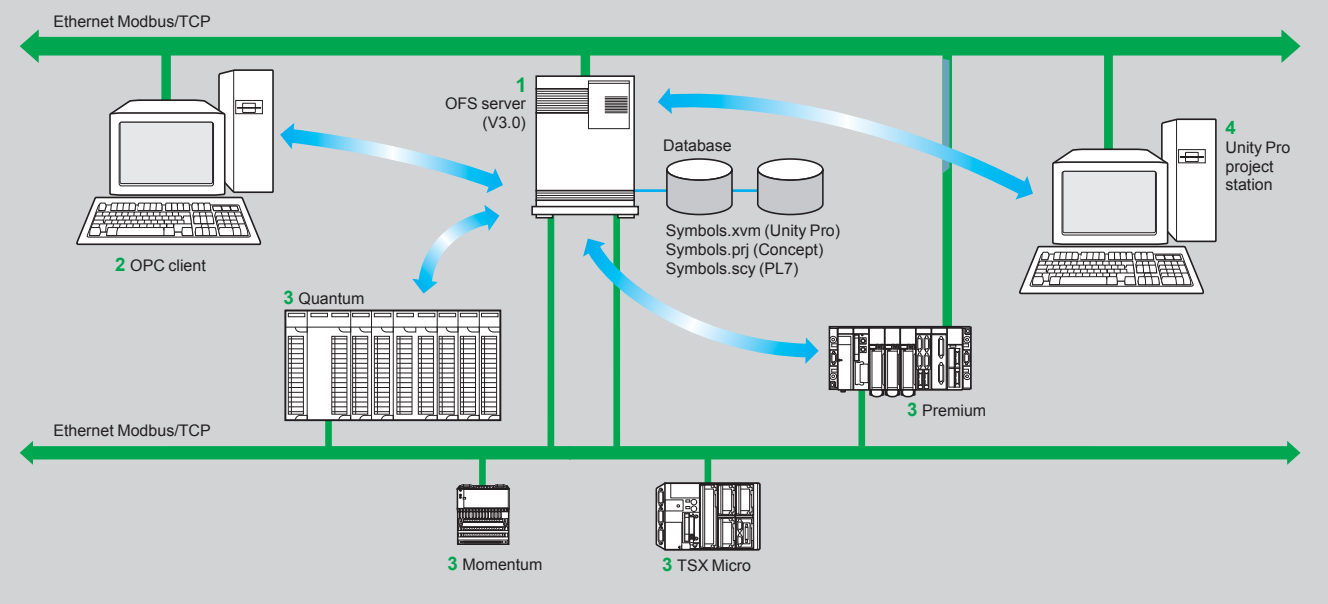
The OPC XML-DA V1.0 specifications are designed to overcome the limitations of COM/DCOM by providing:
- An OPC interface for Windows and non-Windows client applications
- Beyond the Intranet perimeter, remote access via the Internet through firewalls

The OPC XML-DA specification is based on Web Services standards such as SOAP, XML and WSDL *(1)*. A SOAP client can access data on the OFS server via Intranet or Internet using the SOAP protocol in conformity with the OPC XML-DA V1.01 specification of the OPC Foundation.

(1) SOAP: Simple Object Access Protocol
XML: Extensible Markup Language
WSDL: Web Services Description Language

Software
OPC data server software
OPC Factory Server

Setup



The OFS server **1** is at the centre of the data exchanges. It ensures that variables exchanged between the OPC client **2** and the PLC **3** are consistent, in one of three ways using a symbol (or variables) database:

■ The variables database is either the Unity Pro project **4** or the Concept project. In both these cases, Unity Pro or Concept needs to be installed on the OFS server station.

■ Or the variables database is an export file (SCY for PL7, XVM for Unity Pro). PL7 and Unity Pro are not required in either of these cases.

■ Or the variables database is the PLC itself. In this case neither Unity Pro nor an export file is needed. This does not apply to Momentum and TSX Micro PLCs.
If an inconsistency is detected (following online modification of the PLC program for example), OFS resynchronizes itself automatically as a background task, without breaking communication between the PLC and the OPC client.
For this function the following minimum versions are required:
- □ OFS V3.35
- □ Unity Pro V6.0
- □ Modicon Premium V2.9, M340 V2.3 and Quantum V3.0 PLCs

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Software
OPC data server software
OPC Factory Server

Function
Development of client applications

OFS software has 4 types of interface:

■ **OLE Automation interface (OPC-DA)**
Particularly suitable for end users, this enables the development of OPC client applications in Visual Basic, in Visual Basic for Excel, and in C++.

■ **OLE Custom interface (OPC-DA)**
Used primarily by suppliers of automated control system or industrial IT products, this interface enables the development of applications in C++ in order to access the OFS software OPC server. It is aimed at software development experts in particular, so that they can integrate the client application into their standard products. This is the interface with the highest performance, in terms of access time to data stored in the OPC server. It requires extensive knowledge of C++ programming to set up.

■ **OPC .NET API wrapper interface**
The .NET Microsoft compatibility of the OFS data server gives an OPC .NET client standard access to items on the OFS server via an Intranet network, thus ensuring greater interoperability with standard .NET environments.

Note: *In this case, communication between the OPC .NET client and the OFS server is conducted through the DCOM layer (or COM layer in a local configuration) via the OPC-DA protocol.*

■ **OPC XML-DA interface** *(1)*
The OPC XML-DA V1.0 specifications are designed to overcome the limitations of the OPC-DA specification and COM/DCOM by providing:
□ An interface for Windows and non-Windows client applications
□ Remote access via the Internet through firewalls (beyond the Intranet perimeter)

The OPC XML-DA specification is based on Web Services standards such as SOAP, XML, WSDL. A SOAP client can access data on the OFS server via Intranet or Internet using the SOAP protocol in conformity with the OPC XML-DA V1.01 specification of the OPC Foundation.

(1) Only available with the Large version of OPC Factory Server V3.3.

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Software
OPC data server software
OPC Factory Server

OPC Factory Server

References

OFS V3.3 software is designed for PC compatible stations (minimum configuration: Pentium 566 MHz processor, 128 MB RAM) running Windows 2000 Professional *(1)*, Windows XP Professional, Windows 7 (32-bit) *(3)* or Windows server 2008 *(3)*.

The OFS V3.3 offer comprises:
- OPC server software
- OPC server simulator (for debugging the application when no PLCs are present)
- OFS server configuration software
- An example of OPC client for setting up applications
- The setup documentation on CD-ROM

Supplied on CD-ROM, the software operates independently on a PC. It interfaces with the variables export files generated by PL7, ProWORX, Concept and Unity Pro software.
It also provides a direct dynamic link to the Unity Pro and Concept applications *(2)*.

OFS V3.3 software is available in two versions:
- **Small version TLX CD S●OFS 33**
  - Maximum of 1000 items
  - All protocols supported with the exception of OPC XML-DA
  - Single station and 10-station site licences
- **Large version TLX CD L●OFS 33**
  - Full version
  - Single station, 10-station and 200-station site licences

OPC Factory Server V3.4 Small

Description	Licence type	Reference	Weight kg
OPC Factory Server V3.4 Small software	Single station	**TLX CD SUOFS 34** ▲	–
	10-station	**TLX CD STOFS 34** ▲	–

OPC Factory Server V3.4 Large

Description	Licence type	Reference	Weight kg
OPC Factory Server V3.4 Large software Full version	Single station	**TLX CD LUOFS 34** ▲	–
	10-station	**TLX CD LTOFS 34** ▲	–
	200-station	**TLX CD LFOFS 34** ▲	–

(1) Must be updated with Service Pack 1 or higher.
(2) Requires Concept software version > 2.0 to be installed on the same station.
(3) OFS is compatible with both these operating systems from version V3.34 or later.

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▲ Available 4th quarter 2012.

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Connection interfaces

Modicon Telefast ABE 7 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	TSX Micro, Modicon Premium, Modicon Quantum, Modicon M340			
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 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	**ABE 7H●●E●00**	**ABE 7H16C●●**	**ABE 7H●●R1● ABE 7H●●R50**	**ABE 7H●●R2●**	**ABE 7H●●S21**
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(1) For Modicon TSX Micro and Modicon Premium PLCs

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			
Passive connection sub-bases		Plug-in electromechanical or solid state relays	
–		No	Yes
24 V ⎓			
24 V ⎓		24 V ⎓ (solid state) 5... 24 V ⎓, 230 V ∿ (electromechanical)	
0.5 A	0.5 A	5 A (E.M.), 2 A (solid state)	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	
ABE 7H16CM11	**ABE 7H16CM21**	**ABE 7P16M111**	**ABE 7R16M111**
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Connection interfaces

Modicon Telefast ABE 7 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					
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	ABE 7R08S216●	ABE 7R●●S1●●	ABE 7R●●S2●●	ABE 7R16T111	ABE 7P16T111	ABE 7P16T2●●● ABE 7P08T3●●●
Pages	9/12			9/13	9/14	

(1) For TSX Micro and Modicon Premium PLCs

Discrete outputs				Discrete inputs or outputs			
Universal				Universal			
TSX Micro, Modicon Premium, Modicon Quantum, Modicon M340							
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)	–	
ABE 7R16T2●●	**ABE 7R16T3●●**	**ABE 7S●●S2B●**	**ABE 7H16F43**	**ABE 7H16R3●**	**ABE 7H16S43**	**ABE 7S16E2●●E**	**ABE 7P16F31●**
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Connection interfaces

Modicon Telefast ABE 7 pre-wired system

Analog and application-specific sub-bases

Applications	Analog signals and special functions				
Compatibility	TSX Micro: □ TSX 37 22 □ TSX CTZ●A	Modicon Premium: □ TSX CTY●A □ TSX CAY●1	Modicon Premium: □ TSX ASY810 □ TSX AEY1600 TSX A●Y800 Modicon M340: □ BMX AMI 0800 □ BMX AMI 0810 □ BMX AMO 0802 Modicon Quantum: □ 140 AVI 030 00 □ 140 ACI 030 00 □ 140 ACI 040 00 □ 140 ACO 130 00	Modicon Premium: □ TSX ASY410 □ TSX AEY420 Modicon M340: □ BMX AMO0410 Modicon Quantum □ 140 AVO 020 00 □ 140 ACO 020 00	Modicon M340: □ BMX ART 0414 □ BMX ART 0814 Modicon Premium: □ TSX AEY1614
Type of signal	Counter inputs and analog I/O	Counter inputs Axis control Position control	Analog inputs Current/Voltage Pt 100	Analog outputs Current Voltage	Analog inputs
Functions	Passive connection, point-to-point with shield continuity				Connection of cold junction compensation or provision, distribution of isolated power supplies
Modularity	1 counter channel or 8 analog inputs + 2 analog outputs		8 channels	4 channels	4 channels
Control voltage	24 V ⎓				–
Output voltage	24 V ⎓				–
Output current per channel	25 mA				–
No. of terminals per channel	2		2 or 4	2 or 4	2 or 4
Connector type	15-way SUB-D + 9-way SUB-D		25-way SUB-D		25-way SUB-D
Terminal block Removable	No		No		No
Terminal block Terminal type	Screw		Screw		Screw
Type of device	**ABE 7CPA01**		**ABE 7CPA02**	**ABE 7CPA21**	**ABE 7CPA412** **ABE 7CPA410**
Pages	9/16				

Modicon Premium: □ TSX AEY800 □ TSX AEY1600 Modicon Quantum: □ 140 AVI 030 00 □ 140 ACI 030 00 □ 140 ACI 040 00	Modicon Premium: □ TSX AEY810 Modicon M340: □ BMX AMI 0800 □ BMX AMI 0810 □ BMX AMO 0802 Modicon Quantum: □ 140 AVI 030 00 □ 140 ACI 030 00 □ 140 ACI 040 00	Modicon Premium: □ TSX CAY●1, □ TSX CTY●A	Modicon Premium: □ TSX AEY1614	Modicon Premium: □ TSX PAY2●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
ABE 7CPA03	**ABE 7CPA31●**	**ABE 7CPA11**	**ABE 7CPA12**	**ABE 7CPA13**
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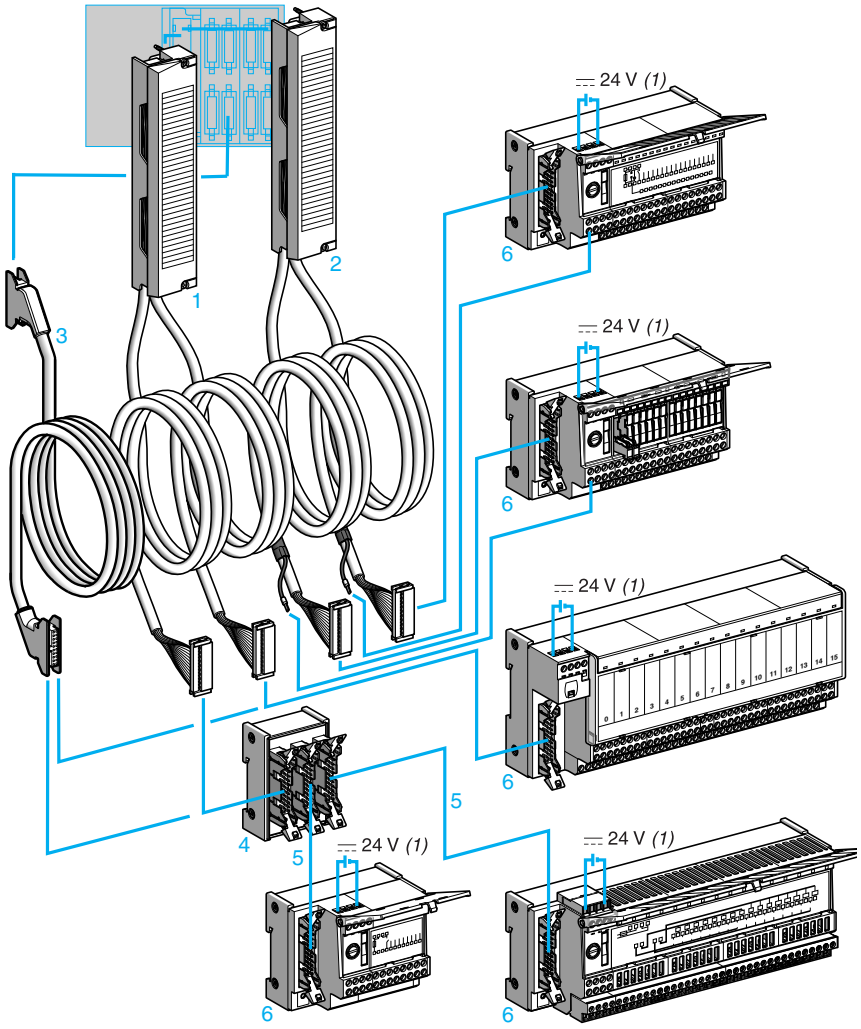
Modicon Quantum automation platform

Modicon Telefast ABE 7 pre-wired system

Cordsets for Modicon Quantum platform



1-2 Cabled connectors combining a standard screw terminal block, two multicore (AWG 22) cables and two 20-way HE 10 connectors. Two types of cabled connector are available:
- **ABF M32H●●0** 1 cabled connectors for I/O modules (32 channels) on the Modicon Quantum platform, with 2 HE 10 connectors each integrating 16 channels
- **ABF M32H●●1** 2 cabled connectors for I/O modules (32 channels) on the Modicon Quantum platform, with 2 HE 10 connectors each integrating 16 channels and an external power supply with a direct connection to the terminal marked *(1)* on the sub-bases 6

ABF M0●S20● cabled connectors for analog I/O modules (4, 8 or 16 channels) on the Modicon Quantum platform equipped with a standard screw terminal block and a 25-way SUB-D connector at the other end

3 Cordsets (AWG 22) equipped with a 20-way HE 10 connector **TSX CDP 053/●03** for 96-channel I/O modules (connected on six 20-way HE 10 connectors)

4 **ABE 7ACC02** splitter box (16 to 2 x 8 channels) for use with 8-channel sub-bases

5 A single type of cable equipped with 20-way HE 10 connectors, irrespective of the 8 or 16-channel modularity. The HE 10 connectors can be moulded **TSX CDP●●●** or insulation piercing **ABF H20H●●●**.

6 8 and 16-channel connection sub-bases from the Modicon ABE 7 range

(1) The 24 V ⎓ power supply of Quantum I/O modules must only be connected via Telefast ABE 7 sub-bases. The 0 V ⎓ connections must be equipotential.

Modicon Quantum automation platform

Modicon Telefast ABE 7 pre-wired system
I/O modules for Modicon Quantum platforms and Telefast ABE 7 sub-bases

Quantum I/O modules													
		24 V ⎓ discrete I/O						Analog I/O					
		Inputs	Outputs		Inputs	Outputs		Inputs		Outputs			
		32 I	32 O		96 I	96 O		8 I	16 I	4 O		8 O	
	140	DDI 353 00 DDI 853 00	DDO 353 00		DDI 364 00	DDO 364 00		AVI 030 00 ACI 030 00	ACI 040 00	AVO 020 00	ACO 020 00	ACO 130 00	
Cabled connectors	ABF	M32 H●●0		M32 H●●1	–			M08 S201	M16 S201	M04 S200	M04 S201	M08 S202	
Cordsets	TSX	–			CDP 053/●03			–					
Passive sub-bases													
8 channels	ABE 7H08R●●	(1)			(1)								
	ABE 7H08S21				(1)								
16 channels	ABE 7H16R●●/H16C●●												
	ABE 7H16S21												
	ABE 7H16R23	(2)											
	ABE 7H16F43												
	ABE 7H16S43	(3)											
Input adaptor sub-bases													
16 channels	ABE 7S16E2B1●/7P16F31●●												
	ABE 7P08T330		(1)										
Output adaptor sub-bases													
8 channels	ABE 7S08S2●●					(1)							
	ABE 7R08S●●●/7P08T330		(1)			(1)							
16 channels	ABE 7R16S●●●												
	ABE 7R16T●●●/7P16T●●●												
	ABE 7S16S●●●												
Sub-bases for analog I/O													
4 channels	ABE 7CPA21												
8 channels	ABE 7CPA02								(4)				
	ABE 7CPA03								(4)				
	ABE 7CPA31								(4)				

ABF M●● cabled connectors
TSX CDP ●●● cordsets

***Note**: For for harsh environments, **Telefast ABE 9** IP67 passive splitter boxes can be used in combination with I/O modules on the Modicon Quantum platform. Main characteristics:*
- 8/16 I/O channels
- Connection of 1 to 16 sensors/actuators
- M12 I/O connectors
- Connection to the PLC by connector or by multicore cable
- IP67 degree of protection
- Plastic case
Please consult our website www.schneider-electric.com.

*(1) With the **ABE 7ACC02** splitter sub-base (16 channels as 2 x 8).*
*(2) With **140 DDI 353 00** module only.*
*(3) With **140 DDI 853 00** module only.*
*(4) 2 **ABE 7CPA●●** sub-bases are required.*

Connection interfaces
Modicon Telefast ABE 7 pre-wired system
Passive connection sub-bases

ABE 7H20E●●●

ABE 7H16C21

ABE 7H16CM21

Passive connection sub-bases for discrete signals

Optimum "Economy" sub-bases

Function	No. of channels	No. of terminals per channel	No. of terminals on row number	For PLCs	Length of PLC connection cable	Type of connection	Reference	Weight kg
Input or output	16	1	2	Modicon TSX Micro Modicon Premium	1 m	Screw	**ABE 7H20E100**	0.330
					2 m	Screw	**ABE 7H20E200**	0.410
					3 m	Screw	**ABE 7H20E300**	0.480
				Modicon M340	– *(1)*	Screw	**ABE 7H34E000**	0.150
					1 m	Screw	**ABE 7H34E100**	0.330
					2 m	Screw	**ABE 7H34E200**	0.410
					3 m	Screw	**ABE 7H34E300**	0.480
				Siemens S7	1.5 m	Screw	**ABE 7H32E150**	0.360
					3 m	Screw	**ABE 7H32E300**	0.460

Optimum "Miniature" sub-bases

Function	No. of channels	No. of terminals per channel	No. of terminals on row number	LED per channel	Polarity distribution	Type of connection	Reference	Weight kg
Input or output	16	1	1	No	No	Screw	**ABE 7H16C10**	0.160
				Yes	No	Screw	**ABE 7H16C11**	0.160
		2	2	Yes	0 or 24 V	Screw	**ABE 7H16C21**	0.205
		3	3	Yes	0 or 24 V	Screw	**ABE 7H16C31**	0.260
Input and output *(2)*	16	1	1	Yes	No	Screw	**ABE 7H16CM11**	0.160
		2	2	Yes	0 or 24 V	Screw	**ABE 7H16CM21**	0.200

(1) Sub-base supplied without cordset.
(2) 8 I + 8 Q: these products have 2 common connections which enable inputs and outputs to be connected to the same sub-base at the same time.

ABE 7H●●R1●

Passive connection sub-bases for discrete signals (continued)

Universal sub-bases

Function	No. of channels	No. of terminals per channel	No. of terminals on row number	LED per channel	Polarity distribution	Isolator (I) Fuse (F) per channel	Type of connection	Reference	Weight kg
Input or output	8	1	1	No	No	–	Screw	**ABE 7H08R10**	0.187
				Yes	No	–	Screw	**ABE 7H08R11**	0.187
		2	2	Yes	0 or 24 V	–	Screw	**ABE 7H08R21**	0.218
						I	Screw	**ABE 7H08S21**	0.245
	12	1	1	No	No	–	Screw	**ABE 7H12R10**	0.274
				Yes	No	–	Screw	**ABE 7H12R11**	0.274
			2	No	No	–	Screw	**ABE 7H12R50**	0.196
		2	2	No	0 or 24 V	–	Screw	**ABE 7H12R20**	0.300
				Yes	0 or 24 V	–	Screw	**ABE 7H12R21**	0.300
						I	Screw	**ABE 7H12S21**	0.375
	16	1	1	No	No	–	Screw	**ABE 7H16R10**	0.274
				Yes	No	–	Screw	**ABE 7H16R11**	0.274
			2	No	No	–	Screw	**ABE 7H16R50**	0.196
		2	2	No	0 or 24 V	–	Screw	**ABE 7H16R20**	0.300
				Yes	0 or 24 V	–	Screw	**ABE 7H16R21**	0.300
						I	Screw	**ABE 7H16S21**	0.375
		3	3	No	0 or 24 V	–	Screw	**ABE 7H16R30**	0.346
				Yes	0 or 24 V	–	Screw	**ABE 7H16R31**	0.346
Input type 2 *(1)*	16	2	2	Yes	0 or 24 V	–	Screw	**ABE 7H16R23**	0.320
Input	16	2	1	Yes	24 V	I, F *(2)*	Screw	**ABE 7H16S43**	0.640
Output	16	2	1	Yes	0 V	I, F *(2)*	Screw	**ABE 7H16F43**	0.640

(1) For TSX Micro, Modicon Premium.
(2) With LED to indicate blown fuse.

Connection interfaces

Modicon Telefast ABE 7 pre-wired system

Adaptor sub-bases with fixed relays and removable terminal blocks

ABE 7H16E2●●

Adaptor sub-bases with fixed solid state relays, removable terminal blocks

Universal input sub-bases with solid state relays

Number of channels	No. of terminals per channel	Isolation of PLC/ Operative part	Voltage	Type of connection	Reference	Weight kg
16	2	Yes	⎓ 24 V	Screw	**ABE 7S16E2B1**	0.370
				Spring	**ABE 7S16E2B1E**	0.370
			⎓ 48 V	Screw	**ABE 7S16E2E1**	0.370
			∿ 48 V	Screw	**ABE 7S16E2E0**	0.386
			∿ 110 V	Screw	**ABE 7S16E2F0**	0.397
			∿ 230 V	Screw	**ABE 7S16E2M0**	0.407
				Spring	**ABE 7S16E2M0E**	0.407

Universal output sub-bases with solid state relays

Number of channels	Isolation of PLC/ Operative part	Output voltage	Output current	Fault detection signal *(1)*	Type of connection	Reference	Weight kg
16	No	24 V ⎓	0.5 A	Yes *(2)*	Screw	**ABE 7S16S2B0**	0.405
					Spring	**ABE 7S16S2B0E**	0.405
				No	Screw	**ABE 7S16S1B2**	0.400
					Spring	**ABE 7S16S1B2E**	0.400

Optimum and Universal output sub-bases with electromechanical relays

ABE 7R08S216

Number of channels	Number of contacts	Output current	Polarity distribution/ operative part	Type of connection	Reference	Weight kg
8	1 N/O	2 A	Contact common per group of 4 channels	Screw	**ABE 7R08S111**	0.252
	Latching	2 A	Volt-free	Screw	**ABE 7R08S216**	0.448
	1 N/O	5 A	Volt-free	Screw	**ABE 7R08S210**	0.448
16	1 N/O	2 A	Contact common per group of 8 channels	Screw	**ABE 7R16S111**	0.405
				Spring	**ABE 7R16S111E**	0.405
	1 N/O	5 A	Volt-free	Screw	**ABE 7R16S210**	0.405
				Spring	**ABE 7R16S210E**	0.405
			Common per group of 8 channels on both poles	Screw	**ABE 7R16S212**	0.400

(1) A fault on a sub-base output Qn will set PLC output Qn to safety mode, which will be detected by the PLC.
(2) Can only be used with modules with protected outputs.

Connection interfaces

Modicon Telefast ABE 7 pre-wired system

Input/output adaptor sub-bases for or with plug-in relays

ABE 7R16M111

ABE 7R16T210

Adaptor sub-bases with plug-in relays

Universal input sub-bases for solid state relays, supplied without relays

Number of channels	No. of terminals per channel	For relay type	Isolation of PLC/ Operative part	Input connection	Type of connection	Reference	Weight kg
16	2	ABS 7E ABR 7 ABS 7S33E	Yes	Volt-free	Screw	**ABE 7P16F310**	0.850
				Polarity distribution	Screw	**ABE 7P16F312**	0.850

Optimum and Universal output sub-bases, supplied with electromechanical relays *(1)*

Number of channels	Relay width	Relay type supplied	Number and type of contacts	Polarity distribution/operative part	Reference	Weight kg
16	5 mm	ABR 7S11	1 N/O	Contact common per group of 4 channels	**ABE 7R16T111**	0.600
				Contact common per group of 4 output channels + 2 common input terminals	**ABE 7R16M111** *(2)*	0.600
	10 mm	ABR 7S21	1 N/O	Volt-free	**ABE 7R16T210**	0.735
				Common on both poles *(3)*	**ABE 7R16T212**	0.730
		ABR 7S23	1 C/O	Volt-free	**ABE 7R16T230**	0.775
				Contact common *(3)*	**ABE 7R16T231**	0.730
	12 mm	ABR 7S33	1 C/O	Volt-free	**ABE 7R16T330**	1.300
				Common on both poles *(4)*	**ABE 7R16T332**	1.200
		ABR 7S37	2 C/O	Volt-free	**ABE 7R16T370**	1.300

(1) The sub-bases are supplied as standard with electromechanical relays, all or part of which can be replaced by solid state relays of the same width (it is possible to combine these different technologies on a single sub-base).
(2) Two connection methods are available, enabling inputs and outputs to be connected to the same sub-base at the same time.
(3) Per group of 8 channels.
(4) Per group of 4 channels.

Connection interfaces
Modicon Telefast ABE 7 pre-wired system
Output adaptor sub-bases for plug-in relays

ABE 7P16T2●●

Output adaptor sub-bases for plug-in relays

Optimum and Universal output sub-bases for solid state relays and/or electromechanical relays *(1)*

No. of channels	Relay width	For relay type	Isolator per channel	Fuse per channel	Polarity distribution/ operative part	Type of connection	Reference	Weight
	mm							kg
16	5 mm	ABR 7S11 ABS 7SC1B	No	No	Contact common per group of 4 channels	Screw	**ABE 7P16T111**	0.550
	10 mm	ABR 7S2● ABS 7SA2● ABS 7SC2● ABE 7ACC20	No	No	Volt-free	Screw	**ABE 7P16T210** *(2)*	0.615
							ABE 7P16T230 *(2)*	0.655
				Yes	Volt-free	Screw	**ABE 7P16T214**	0.675
				No	Common on both poles *(3)*	Screw	**ABE 7P16T212**	0.615
				Yes	Common on both poles *(3)*	Screw	**ABE 7P16T215**	0.670
8	12 mm	ABR 7S33 ABS 7A3● ABS 7SC3●● ABE 7ACC21	No	No	Volt-free	Screw	**ABE 7P08T330**	0.450
16	12 mm	ABR 7S33 ABS 7A3● ABS 7SC3●● ABE 7ACC21	No	No	Volt-free	Screw	**ABE 7P16T330**	0.900
					Common on both poles *(4)*	Screw	**ABE 7P16T332**	0.900
		ABR 7S33 ABS 7A3M ABS 7SC3E ABE 7ACC21	No	Yes	Volt-free	Screw	**ABE 7P16T334**	0.900
			Yes	Yes	Common on both poles *(4)*	Screw	**ABE 7P16T318**	1.000

(1) Not equipped with relays.
(2) With relay ABR 7S21 for sub-base ABE 7P16T210, with relay ABR 7S23 for sub-base ABE 7P16T230●.
(3) Per group of 8 channels.
(4) Per group of 4 channels.

Connection interfaces

Modicon Telefast ABE 7 pre-wired system

Plug-in relays

571152

ABS 7SC1B

Plug-in solid state relays

Relay width	Functions	Input circuit		Output circuit		Unit reference	Weight
		Current	Nominal voltage	Current	Nominal voltage	Order in multiples of 4	kg
5 mm	Output	⎓	24 V	2 A	24 V ⎓	**ABS 7SC1B**	0.010
10 mm	Output	⎓	24 V	0.5 A	5…48 V ⎓	**ABS 7SC2E**	0.016
					24…240 V ∿	**ABS 7SA2M**	0.016
12 mm	Input	⎓	5 V TTL	–	24 V ⎓	**ABS 7EC3AL**	0.014
			24 V Type 2	–	24 V ⎓	**ABS 7EC3B2**	0.014
			48 V Type 2	–	24 V ⎓	**ABS 7EC3E2**	0.014
		50 Hz ∿	48 V	–	24 V ⎓	**ABS 7EA3E5**	0.014
		60 Hz ∿	110…130 V	–	24 V ⎓	**ABS 7EA3F5**	0.014
		50 Hz ∿	230…240 V	–	24 V ⎓	**ABS 7EA3M5**	0.014
	Output	⎓	24 V	2 A Self-protected	24 V ⎓	**ABS 7SC3BA**	0.016
				1.5 A	5…48 V ⎓	**ABS 7SC3E**	0.016
				1.5 A	24…240 V ∿	**ABS 7SA3MA**	0.016

Plug-in electromechanical relays

Relay width	Control voltage	Output current *(1)*	Number of contacts	Order in multiples	Unit reference	Weight kg
5 mm	24 V ⎓	5 A (Ith)	1 N/O	4	**ABR 7S11**	0.005
10 mm	24 V ⎓	5 A (Ith)	1 N/O	4	**ABR 7S21**	0.008
			1 C/O	4	**ABR 7S23**	0.008
12 mm	2 V ⎓	10 A (Ith)	1 C/O	4	**ABR 7S33**	0.017
		8 A (Ith)	2 C/O	4	**ABR 7S37**	0.017
	48 V ⎓	8 A (Ith)	1 C/O	4	**ABR 7S33E**	0.017

816476

ABR 7S2●

816474

ABR 7S3●

Accessory

Description	Reference	Weight kg
Extractor for 5 mm miniature relay	**ABE 7ACC12**	0.010

Connection interfaces

Modicon Telefast ABE 7 pre-wired system

Connection sub-bases for analog channels and application-specific channels

ABE 7CPA01

ABE 7CPA11

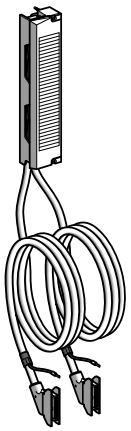
ABE 7CPA 21/410/412

Connection sub-bases for counter and analog channels

Functions	For PLCs	Compatible modules	Type of connection on Telefast end	Type of connection	Reference	Weight kg
Analog and counter	TSX Micro	Analog and integrated counter TSX 37 22 TSX CTZ●A	15-way SUB-D	Screw	**ABE 7CPA01**	0.300
Counter, axis control, position control	Modicon Premium	TSX CTY●A TSX CAY●1	15-way SUB-D	Screw	**ABE 7CPA01**	0.300
Connection of absolute encoder with parallel output	Modicon Premium	TSX CTY●A TSX CAY●1	15-way SUB-D	Screw	**ABE 7CPA11**	0.330
Distribution of 4 thermocouples	Modicon M340	BMX ART 0414 BMX ART 0814	25-way SUB-D	Screw	**ABE 7CPA412**	0.180
Distribution of 16 thermocouples	Modicon Premium	TSX AEY1614	25-way SUB-D	Screw	**ABE 7CPA12**	0.300
Passive distribution of 8 analog EIS channels on screw terminals, with shield continuity	Modicon Premium	TSX ASY810 TSX AEY1600 TSX A●Y800	25-way SUB-D	Screw	**ABE 7CPA02**	0.290
	Modicon M340	BMX AMI 0800 BMX AMI 0810 BMX AMO 0802				
	Modicon Quantum	140 AVI 030 00 140 ACI 030 00 140 ACI 040 00 140 ACO 130 00				
Provision and distribution of protected isolated power supplies for 4 analog input channels	Modicon M340	BMX AMI 0410	25-way SUB-D	Screw	**ABE 7CPA410**	0.180
Distribution of 4 analog output channels	Modicon Premium	TSX ASY410 TSX AEY420	25-way SUB-D	Screw	**ABE 7CPA21**	0.210
	Modicon M340	BMX AMO 0410				
	Modicon Quantum	140 AVO 020 00 140 ACO 020 00				
Distribution and supply of 8 analog input channels with limitation of each current loop	Modicon Premium	TSX AEY800 TSX AEY1600	25-way SUB-D	Screw	**ABE 7CPA03**	0.330
	Modicon Quantum	140 AVI 030 00 140 ACI 030 00 140 ACI 040 00				
Distribution and supply of 8 analog input channels isolated from one another with 25 mA/ channel limitation	Modicon Premium	TSX AEY810	25-way SUB-D	Screw	**ABE 7CPA31**	0.410
	Modicon M340	BMX AMI 0800 BMX AMI 0810 BMX AMO 0802		Spring	**ABE 7CPA31E**	0.410
	Modicon Quantum	140 AVI 030 00 140 ACI 030 00 140 ACI 040 00				
Safety	Modicon Premium	TSX PAY2●2	25-way SUB-D	Screw	**ABE 7CPA13**	0.290

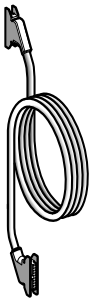
Connection interfaces
Modicon Telefast ABE 7 pre-wired system
Cabled connectors for Modicon Quantum I/O modules

816500



ABF M32H●●1

570464



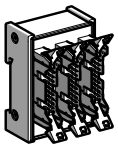
TSX CDP ●03

Cabled connectors for Modicon Quantum I/O modules

Type of signal	I/O modules	Type of connector	Gauge	Cross-section	Length	No. of channels	Reference	Weight
			AWG	mm²	m			kg
Inputs and relay outputs	See page 9/9	2 x 20-way HE 10	22	0.324	1.5	2 x 16	**ABF M32H150**	0.650
					3	2 x 16	**ABF M32H300**	1.150
0.5 A outputs	See page 9/9	2 x 20-way HE 10 + external power supply	22	0.324	1.5	2 x 16	**ABF M32H151**	0.650
					3	2 x 16	**ABF M32H301**	1.150
Inputs or outputs (96 channels)	140 DDI 364 00 140 DDO 364 00	2 x 20-way HE 10	22	0.324	0.5	6 x 16	**TSX CDP 053**	0.085
					1	6 x 16	**TSX CDP 103**	0.150
					2	6 x 16	**TSX CDP 203**	0.280
					3	6 x 16	**TSX CDP 303**	0.410
					5	6 x 16	**TSX CDP 503**	0.670
Analog inputs	140 AVI 030 00 140 ACI 030 00	1 x 25-way SUB-D	24	0.22	2	8	**ABF M08S201**	0.600
	140 ACI 040 00	2 x 25-way SUB-D	24	0.22	2	16	**ABF M16S201**	0.620
Analog outputs	140 AVO 020 00	1 x 25-way SUB-D	24	0.22	2	4	**ABF M04S200**	0.450
	140 ACO 020 00	1 x 25-way SUB-D	24	0.22	2	4	**ABF M04S201**	0.450
	140 ACO 130 00	1 x 25-way SUB-D	24	0.22	2	8	**ABF M04S202**	0.450

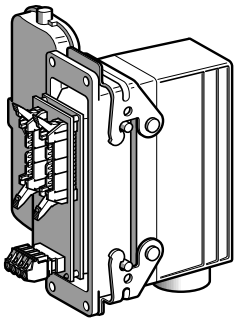
Connection interfaces
Modicon Telefast ABE 7 pre-wired system
Accessories for connection sub-bases

816483



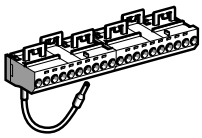
ABE 7ACC02

816480



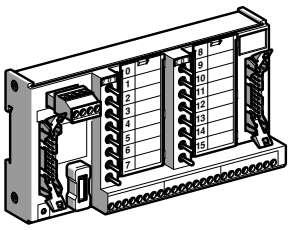
ABE 7ACC80 + ABE 7ACC81

816481



ABE 7BV20

580700



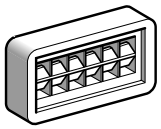
ABE 7TES160

Accessories

Description	No. of channels	Characteristics	Order in multiples of	Unit reference	Weight kg
Kit for fixing on solid plate	–	–	10	**ABE 7ACC01**	0.008
Splitter sub-base	–	16 as 2 x 8 channels	1	**ABE 7ACC02**	0.075
Redundant output sub-base	–	16 as 2 x 16 channels	1	**ABE 7ACC10**	0.075
Redundant input sub-base	–	16 as 2 x 16 channels	1	**ABE 7ACC11**	0.075
Plug-in continuity blocks	–	Width 10 mm	4	**ABE 7ACC20**	0.007
		Width 12 mm	4	**ABE 7ACC21**	0.010
Enclosure feedthrough with CNOMO M23 connector (1 x 20-way HE 10 connector, PLC end)	16	19-way	1	**ABE 7ACC82**	0.150
Impedance adaptor for compatibility Type 2	–	Used with ABE 7ACC82 and ABE 7ACC83	1	**ABE 7ACC85**	0.012
IP 65 cable gland	–	For 3 cables	5	**ABE 7ACC84**	0.300
Additional snap-on terminal blocks (shunted terminals)	8	10 screw terminals	5	**ABE 7BV10**	0.030
	16	20 screw terminals	5	**ABE 7BV20**	0.060
I/O simulator sub-base	16	For display, forcing, inhibition, continuity	1	**ABE 7TES160**	0.350
Self-adhesive marker tag holder	–	For 6 characters	50	**AR1 SB3**	0.001
Quick-blow fuses 5 x 20, 250 V, UL	–	0.125 A	10	**ABE 7FU012**	0.010
		0.5 A	10	**ABE 7FU050**	0.010
		1 A	10	**ABE 7FU100**	0.010
		2 A	10	**ABE 7FU200**	0.010
		4 A	10	**ABE 7FU400**	0.010
		6.3 A	10	**ABE 7FU630**	0.010

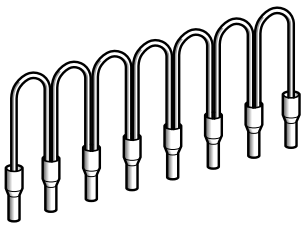
Connection interfaces
Modicon Telefast ABE 7 pre-wired system
Accessories for connection sub-bases

816479



AR1 SB3

816484



ABE C08R●●●

Commoning link accessories

Description	For common	Colour	Distance between cable ends	Reference	Weight kg
Commoning links Modularity 8 x 1 mm²	Coil	White	12 cm	**ABF C08R12W**	0.020
			2 cm	**ABF C08R02W**	0.010
	~	Red	12 cm	**ABF C08R12R**	0.020
			2 cm	**ABF C08R02R**	0.010
	⎓	Blue	12 cm	**ABF C08R12B**	0.020
			2 cm	**ABF C08R02B**	0.010

Power supplies and transformers Phaseo

Regulated switch mode power supplies

Power supplies		Regulated switch mode power supplies ABL 8MEM, ABL 7RM: 7 to 60 W - Rail mounting ABL 8REM, ABL 7RP: 60 to 144 W - Rail mounting			
Nominal input voltage		~ 100...240 V ⎓ 120...250 V			
Connection to worldwide line supplies	United States - 120 V (phase-to-neutral) - 240 V (phase-to-phase)	Single-phase (N-L1) connection or 2-phase (L1-L2) connection			
	Europe - 230 V (phase-to-neutral) - 400 V (phase-to-phase)	Single-phase (N-L1) connection			
	United States - 277 V (phase-to-neutral) - 480 V (phase-to-phase)	–			
Undervoltage control		Yes			
Protection against overloads and short-circuits		Yes, voltage detection. Automatic reset on elimination of the fault			
Diagnostics relay		–			
Compatibility with function modules		–			
Power reserve (Boost)		1.25 to 1.4 In for 1 minute, depending on model (for ABL 8MEM)			No
Output voltage		⎓ 5 V	⎓ 12 V	⎓ 24 V	⎓ 48 V
Output current	0.3 A			**ABL 8MEM24003**	
	0.6 A			**ABL 8MEM24006**	
	1.2 A			**ABL 8MEM24012**	
	2 A		**ABL 8MEM12020**		
	2.5 A			**ABL 7RM24025**	**ABL 7RP4803**
	3 A			**ABL 8REM24030**	
	3.5 A				
	4 A	**ABL 8MEM05040**			
	5 A		**ABL 7RP1205**	**ABL 8REM24050**	
	6 A				
	10 A				
	20 A				
	30 A				
	40 A				
Pages		9/24	9/24 and 9/26		9/26

Regulated switch mode power supplies			
ABL4: 85 to 960 W - Compact - Rail mounting			Function modules ABL 8DCC: converters ⎓/⎓
∼ 100…230 V	∼ 120 V or ∼ 230 V	∼ 400…500 V	⎓ 24 V
Single-phase (N-L1) connection	Single-phase (N-L1) connection or 2-phase (L1-L2) connection	–	–
–	Single-phase (N-L1) connection	3-phase (L1-L2-L3) connection	–
–	–	3-phase (L1-L2-L3) connection	–
No	No	No	–
Yes, current limitation Automatic reset on elimination of the fault			Yes, current limitation
Yes	Yes	Yes	Yes, depending on model
Yes with buffer module, battery and battery check modules, redundancy module and discriminating downstream protection module			
Depending on model: 1.5 to 1.7 In for 5 to 30 seconds			No

⎓ 24 V			⎓ 5 V	⎓ 7...12 V
				ABL 8DCC12020 *(1)*
ABL 4RSM24035				
ABL 4RSM24050				
			ABL 8DCC05060 *(1)*	
	ABL 4RSM24100			
	ABL 4RSM24200	**ABL 4WSR24200**		
		ABL 4WSR24300		
		ABL 4WSR24400		

9/28 *(2)*

(1) Converter module ⎓/⎓, must be used with a Phaseo power supply.
(2) Certain offers can not be marketed in certain countries, please consult your "Customer Care Centre".

9

Power supplies and transformers Phaseo

Regulated switch mode power supplies
Rectified power supplies

Power supplies		Regulated switch mode ABL 1REM/1RPM: 60 to 240 W - Mounting on panel	
Input voltage		100...240 V ∿ 120...370 V ⎓	
Connection to world-wide line supplies	United States - 120 V (in phase-to-neutral) - 240 V (in phase-to-phase)	Single-phase (N-L1) or 2-phase (L1-L2) connection	
	Europe - 230 V (in phase-to-neutral) - 400 V (in phase-to-phase)	Single-phase (N-L1) –	
	United States - 277 V (in phase-to-neutral) - 480 V (in phase-to-phase)	Single-phase (N-L1) –	
IEC/EN 61000-3-2 conformity		Yes for ABL 1RP, not applicable for ABL1REM24025/12050	
Protection against undervoltage		–	
Protection against overloads and short-circuits		Yes, voltage detection. Automatic restart on elimination on the fault	
Diagnostic relay		–	
Compatibility with function modules		–	
Power reserve (Boost)		No	
Output voltage		12 V ⎓	24 V ⎓
Output current	0.5 A		
	1 A		
	2 A		
	2.5 A		**ABL 1REM24025**
	3 A		
	4 A		
	4.2 A		**ABL 1R●M24042**
	4.8 A		
	5 A	**ABL 1REM12050**	
	6 A		
	6.2 A		**ABL 1R●M24062**
	8.3 A	**ABL 1RPM12083**	
	10 A		**ABL 1R●M24100**
	15 A		
	20 A		
	30 A		
	40 A		
	60 A		
Pages		Please consult our website www.schneider-electric.com	

Rectified and filtered		Regulated switch mode	
ABL 8FEQ/8TEQ: 12 to 1440 W - Mounting on panel or rail - For severe application		**ASI ABL: Power supplies for AS-Interface cabling system**	
		/	
230 V ∼ and 400 V ∼	400 V ∼	100...240 V ∼	
–		Single-phase (N-L1) connection	
Single-phase (N-L1) or 2-phase (L1-L2) connection	3-phase (L1-L2-L3) connection	Single-phase (N-L1) connection	
–		–	
Yes		No	Yes
No		–	Yes
Yes depending on model, by fuse	Yes, by external protection	Yes	
No		–	
No		–	
No		No	
24 V ⎓		30 V ⎓	24 V ⎓
ABL 8FEQ24005			
ABL 8FEQ24010			
ABL 8FEQ24020			
		ASI ABLB3002 **ASI ABLD3002** *(1)* **ASI ABLM3024** *(2)*	
			ASI ABLM3024 *(2)*
ABL 8FEQ24040			
		ASI ABLB3004 **ASI ABLD3004** *(1)*	
ABL 8FEQ24060			
ABL 8FEQ24100	**ABL 8TEQ24100**		
ABL 8FEQ24150			
ABL 8FEQ24200	**ABL 8TEQ24200**		
	ABL 8TEQ24300		
	ABL 8TEQ24400		
	ABL 8TEQ24600		
Please consult our website www.schneider-electric.com		9/34	

(1) With earth fault detection.
(2) One output 30 V ⎓ and one output 24 V ⎓ ± 5 %.

Phaseo power supplies and transformers

Regulated switch mode power supplies ABL 8MEM, ABL 7RM

7 to 60 W - Rail mounting

ABL 8MEM●●●●● *Zelio Logic*

Regulated switch mode power supplies ABL 8MEM, ABL 7RM

The ABL 8MEM, ABL 7RM power supply offer is designed to provide the DC voltage necessary for the control circuits of automation system equipment consuming 7 to 60 W in 5, 12 and 24 V ⎓.

Comprising six products, this range meets the needs encountered in industrial, commercial and residential applications. These compact electronic switch mode power supplies provide a quality of output current that is suitable for the loads supplied and compatible with the **Zelio Logic** range and the smallest **Modicon M340**, **Premium** and **Quantum** configurations.

Clear guidelines are given on selecting the upstream protection devices which are often used with them, and thus a comprehensive solution is provided that can be used in total safety.

ABL 8MEM/7RM power supplies can be connected in phase-to-neutral (N-L1) or in phase-to-phase *(1)* (L1-L2). They deliver a voltage that is precise to 3%, whatever the load and whatever the type of line supply, within a range of 85 to 264 V ∿.

Conforming to IEC standards and UL, CSA and TUV certified, they are suitable for universal use. The inclusion of overload and short-circuit protection makes downstream protection unnecessary if discrimination is not required.

Due to their low power, ABL 8MEM/7RM power supplies consume very little harmonic current and thus are not subject to the requirements of standard IEC/EN 61000-3-2 concerning harmonic pollution.

All ABL 8MEM/7RM power supplies have protection devices to ensure optimum performance of the automation system with an automatic reset mode on elimination of the fault.

All products are equipped with an output voltage adjustment potentiometer to compensate for any line voltage drops in installations with long cable runs.

These power supplies also have a cable run inside the case so that the outputs can be connected at the top or bottom of the product as required.

These power supplies are designed for direct mounting on 35 mm ⊔ rails, or on a mounting plate using their retractable fixing lugs.

There are six references available in the Phaseo ABL 8MEM/7RM range:

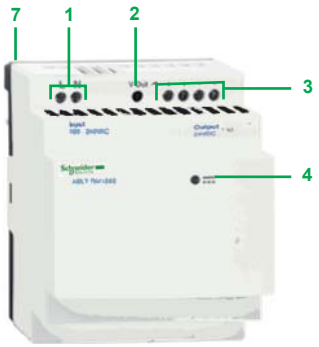
■ **ABL8MEM24003**	7 W	0.3 A	24 V ⎓
■ **ABL8MEM24006**	15 W	0.6 A	24 V ⎓
■ **ABL8MEM24012**	30 W	1.2 A	24 V ⎓
■ **ABL7RM24025**	60 W	2.5 A	24 V ⎓
■ **ABL8MEM05040**	20 W	4 A	5 V ⎓
■ **ABL8MEM12020**	25 W	2 A	12 V ⎓

(1) 240 V ∿ nominal.

Description

ABL 8MEM●●●●

ABL7RM24025



1 2.5 mm² screw terminal for connection of the incoming AC voltage
2 Output voltage adjustment potentiometer
3 2.5 mm² screw terminal for connection of the output voltage
4 LED indicating presence of the DC output voltage
5 Duct for throughwiring of the output voltage conductors at the bottom (except for model ABL 7RM24025)
6 Clip-on marker tag (except for model ABL 7RM24025)
7 Retractable fixing lugs for panel mounting

Phaseo power supplies and transformers

Regulated switch mode power supplies ABL 8MEM, ABL 7RM

7 to 60 W - Rail mounting

Selection of protection on the power supply primaries

Type of line supply	100 to 240 V ∿ single-phase		
Type of protection	Thermal-magnetic circuit breaker		gG fuse
	GB2 (IEC) *(1)*	C60N (IEC) C60N (UL/CSA)	
ABL 8MEM05040	GB2 ●●07 *(2)*	24581 24517	2 A
ABL 8MEM12020			
ABL 8MEM24003			
ABL 8MEM24006			
ABL 8MEM24012			
ABL 7RM24025	GB2 ●●08 *(2)*	24582 24518	3 A

(1) UL pending
(2) Complete the reference by replacing ●● with:
CB: *for single-pole circuit-breaker with magnetic trip threshold 12 to 16 In*
CD: *for single-pole + neutral circuit-breaker with magnetic trip threshold 12 to 16 In*
DB: *for 2-pole circuit-breaker with magnetic trip threshold 12 to 16 In*
CS: *for single-pole circuit-breaker with magnetic trip threshold 5 to 7 In*

References

ABL 8MEM05040/12020/24012

ABL 8MEM24003/24006

ABL 7RM24025

Input voltage	Secondary			Reset	Conformity to standard IEC/EN 61000-3-2 *(1)*	Reference	Weight kg
	Output voltage	Nominal power	Nominal current				
Single-phase (N-L1) **or 2-phase** (L1-L2) **connection**							
100…240 V -15%, + 10% 50/60 Hz	5 V ⎓	20 W	4 A	Automatic	Not applicable	**ABL 8MEM05040**	0.195
	12 V ⎓	25 W	2 A	Automatic	Not applicable	**ABL 8MEM12020**	0.195
	24 V ⎓	7 W	0.3 A	Automatic	Not applicable	**ABL 8MEM24003**	0.100
		15 W	0.6 A	Automatic	Not applicable	**ABL 8MEM24006**	0.100
		30 W	1.2 A	Automatic	Not applicable	**ABL 8MEM24012**	0.195
		60 W	2.5 A	Automatic	Not applicable	**ABL 7RM24025**	0.255

Description	Use	Order in multiples of	Unit reference	Weight kg
Clip-on marker tags	Replacement parts for ABL 8MEM power supplies	100	**LAD 90**	0.030

(1) Due to their power < 75 W, **ABL 8MEM/7RM** *power supplies are not subject to the requirements of standard IEC/EN 61000-3-2.*

Phaseo power supplies and transformers

Regulated switch mode power supplies ABL 8REM, ABL 7RP

60 to 144 W - Rail mounting

ABL 8REM24030 *Twido*

Switch mode power supplies: range ABL 8REM/7RP

The ABL 8REM/7RP power supply offer is designed to provide the DC voltage necessary for the control circuits of automation system equipment consuming 60 to 144 W in 12, 24 and 48 V ⎓. Comprising four products, this range meets the needs encountered in industrial, commercial, and residential applications. With phase-to-neutral (N-L1) or phase-to-phase *(1)* (L1-L2) connection, these slim electronic switch mode power supplies provide a quality of output current that is suitable for the loads supplied and compatible with both the **Twido** range and the smallest **Modicon M340**, **Premium** and **Quantum** configurations, making them ideal partners.
Their simplified characteristics in comparison with the **ABL 8RP/8WP** offer also make them the low-cost solution for applications less affected by problems with the line supply, such as harmonic pollution and outages. Clear guidelines are given on selecting the upstream protection devices which are often used with them, and thus a comprehensive solution is provided that can be used in total safety.

The ABL 8REM/7RP range of Phaseo power supplies delivers a voltage that is precise to 3%, whatever the load and whatever the type of line supply, within a range of 85 to 264 V ∿. Conforming to IEC standards and UL, CSA and TUV certified, they are suitable for universal use. The inclusion of overload and short-circuit protection makes downstream protection unnecessary if discrimination is not required.

ABL 8REM power supplies do not have an anti-harmonic filter and do not satisfy the requirements of standard IEC/EN 61000-3-2 concerning harmonic pollution.
ABL 7RP power supplies, however, are equipped with a PFC *(Power Factor Correction)* filter, thus ensuring compliance with standard IEC/EN 61000-3-2.

All ABL 8REM/7RP Phaseo power supplies have protection devices to ensure optimum performance of the automation system with an automatic reset mode on elimination of the fault.
In the event of an overload or short-circuit, the integrated protection interrupts the current supply before the output voltage drops below 19 V ⎓. The protection device resets itself automatically on elimination of the fault, which avoids having to take any action or change a fuse.

All products are equipped with an output voltage adjustment potentiometer to compensate for any line voltage drops in installations with long cable runs.
These power supplies are designed for direct mounting on 35 and 75 ⊔ rails.

There are four references available in the ABL 8REM/7RP Phaseo range:

■ **ABL 8REM24030**	72 W	3 A	24 V ⎓
■ **ABL 8REM24050**	120 W	5 A	24 V ⎓
■ **ABL 7RP1205**	60 W	5 A	12 V ⎓
■ **ABL 7RP4803**	144 W	3 A	48 V ⎓

Description

1 2.5 mm² enclosed screw terminals for connection of the input voltage (single-phase N-L1, phase-to-phase L1-L2 *(1)*)
2 Protective glass flap
3 Input voltage status LED (orange)
4 Output DC voltage status LED (green)
5 Locking catch for the glass flap (sealable)
6 Clip-on marker tag
7 Output voltage adjustment potentiometer
8 2.5 mm² enclosed screw terminal block for connection of the DC output voltage

(1) 240 V ∿ nominal

Phaseo power supplies and transformers

Regulated switch mode power supplies ABL 8REM, ABL 7RP

60 to 144 W - Rail mounting

Selection of protection on the power supply primaries

Type of line supply	100 V ∼			240 V ∼		
Type of protection	Thermal-magnetic circuit breaker		gG fuse	Thermal-magnetic circuit breaker		gG fuse
	GB2 (IEC) *(1)*	C60N (IEC) C60N (UL)		GB2 (IEC) *(1)*	C60N (IEC) C60N (UL)	
ABL 7RP1205	GB2 ●●06 *(2)*	24580 24516	2 A	GB2 ●●06 *(2)*	24580 24516	1 A
ABL 8REM24030	GB2 ●●07 *(2)*	24581 24517	2 A	GB2 ●●06 *(2)*	24580 24516	1 A
ABL 8REM24050	GB2 ●●07 *(2)*	24581 24517	2 A	GB2 ●●06 *(2)*	24580 24516	1 A
ABL 7RP4803	GB2 ●●07 *(2)*	24581 24517	2 A	GB2 ●●06 *(2)*	24580 24516	1 A

(1) UL pending
(2) Complete the reference by replacing ●● with:
CB: for single-pole circuit-breaker with magnetic trip threshold 12 to 16 In
CD: for single-pole + neutral circuit-breaker with magnetic trip threshold 12 to 16 In
DB: for 2-pole circuit-breaker with magnetic trip threshold 12 to 16 In
CS: for single-pole circuit-breaker with magnetic trip threshold 5 to 7 In

ABL 8REM/7RP range of Phaseo regulated switch mode power supplies

ABL 7RP1205/4803

ABL 8REM24030

ABL 8REM24050

Input voltage	Secondary			Reset	Conformity to standard IEC/EN 61000-3-2	Reference	Weight kg
	Output voltage	Nominal power	Nominal current				
Single-phase (N-L1) or phase-to-phase (L1-L2) connection							
100...240 V ∼ - 15%, + 10% 50/60 Hz	12 V ⎓	60 W	5 A	Automatic or manual	Yes	**ABL 7RP1205**	1.000
	24 V ⎓	72 W	3 A	Automatic	No	**ABL 8REM24030**	0.520
		120 W	5 A	Automatic	No	**ABL 8REM24050**	1.000
	48 V ⎓	144 W	2.5 A	Automatic or manual	Yes	**ABL 7RP4803**	1.000

9

Power supplies and transformers Phaseo

Regulated switch mode power supplies ABL4

85 to 960 W - Compact - Rail mounting

Presentation

The range

The Phaseo regulated switch mode power supplies ABL4 offer is designed to provide the DC voltage necessary for the control circuits of automation system equipment consuming 85 W to 960 W on ⎓ 24 V.
Comprising 7 products, this range of power supplies meets the needs encountered in industrial applications.
Using electronic switch mode technology, these power supplies provide a quality of output current that is suitable for the loads supplied and compatible with the following ranges:

- Twido programmable controllers,
- Modicon logic controllers M238 and M258,
- Modicon motion controllers LMC 058,
- automation platforms M340, Premium and Quantum.

Due to their high overload withstand, the power supplies ABL4 are the power supply solution for stepper motors, servo motors and integrated drives.
When used with function modules ABL8B/RED/D/P, they ensure continuity of service in the event of power outages or application malfunctions. In addition, the ABL 4RSM24200 model can be used in a redundant power supply without an additional redundancy module due to its integrated diode.

Their high effectiveness enables us to offer power supplies that are among the smallest on the market, thus considerably reducing the space required in enclosures.

Compatibility with distribution systems

Power supplies ABL4 must be connected in phase-to-neutral, phase-to-phase *(1)* for the ABL 4R, and in 3-phase for the ABL 4W.

They deliver a voltage that is precise to within ± 1% whatever the load and whatever the type of line supply, within the following ranges:

- ∿ 90…264 V for the ABL 4RSM24035 and ABL 4RSM24050,
- ∿ 90…132 V and ∿ 185…264 V for the ABL 4RSM24100 and ABL 4RSM24200,
- ∿ 340…550 V for the ABL 4W.

Standards and certifications

Conforming to IEC standards and UL certified, the power supplies ABL4 are suitable for universal use: they can be used to supply Protection Extra Low Voltage (PELV) or Safety Extra Low Voltage (SELV) circuits in compliance with standard IEC/EN 60364-4-41 due to their double insulation between the input circuit (connected to the line supply) and the output circuit and their internal device limiting the output voltage to less than 60 V in the event of an internal fault.

Diagnostics

The operation of the power supply ABL4 can be checked using 2 LEDs located on the front face.
A normally open contact (NO) relay also enables checking of the output voltage compliance (contact closed if the output voltage exceeds 90% of the nominal voltage).

Protection

Power supplies ABL4 have the following continuous protection *(2)*:

- protection against overvoltages on the output circuit,
- thermal protection,
- protection against overcurrents and short-circuits on the output circuit.

Mounting

Power supplies ABL4 are mounted on Omega (⊔ 35 mm) rail.

(1) Only on certain American line supplies.
(2) With automatic restarting.

Power supplies and transformers Phaseo

Regulated switch mode power supplies ABL4

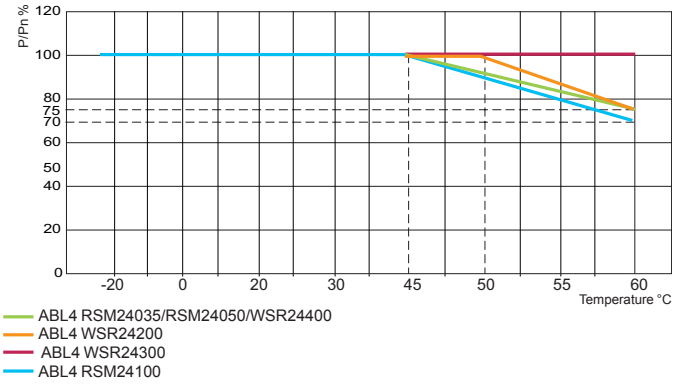
85 to 960 W - Compact - Rail mounting

Characteristics

Derating

The ambient temperature is a determining factor which limits the power that an electronic power supply can deliver continuously. If the temperature around the electronic components is too high, their life will be significantly reduced.
The nominal ambient temperature for power supplies ABL4 is, depending on the reference, 45, 50 or 60°C. Above this temperature, derating is necessary up to a maximum temperature of 60°C.

The adjacent graph shows the power as a percentage of the nominal power that the power supply can deliver continuously, in relation to the ambient temperature.



In all cases, there must be adequate convection around the products to assist cooling.
There must be sufficient clearance around power supplies ABL4: refer to instruction sheet supplied with each power supply and, also, downloadable from www.schneider-electric.com

Temporary overcurrents

Power supplies ABL4 have an energy reserve allowing them to supply the application, according to the references, from 150% to 170% of the nominal current for 5 seconds and up to 30 seconds, whilst guaranteeing an output voltage higher then 90% of the nominal voltage.

Power supply	Maximum temporary overcurrent	Maximum time of temporary overcurrent
ABL 4RSM24035	170% of nominal current	30 seconds
ABL 4RSM24050	160% of nominal current	30 seconds
ABL 4RSM24100	150% of nominal current	30 seconds
ABL 4RSM24200 **ABL 4WSR24●00**	150% of nominal current	5 seconds

The time interval between each overcurrent cannot be less than 10 seconds.
When the overcurrent value exceeds the reserve energy value or when the overcurrents are too closely spaced or when the overcurrent is prolonged (depending on the reference), more than 5 seconds and up to 30 seconds, the power supply switches to protection mode.

Behaviour in event of overcurrents and short-circuits

In the event of overcurrent or short-circuit, the power supply ABL4 switches to protection mode and periodically attempts a reset (“Hiccup” mode) until the fault disappears. Once the output circuit load conditions return to normal, the power supply automatically resets.

Power supply	Periodic reset frequency type
ABL 4RSM24035 **ABL 4RSM24050** **ABL 4RSM24100**	Variable: depends on the overcurrent value and the ambient temperature. In the event of a short-circuit (output voltage close to 0 V), the current is established for 50 ms approximately every 1.8 seconds.
ABL 4RSM24200 **ABL 4WSR24●00**	Fixed: the current is established for 5 seconds every 15 seconds either in the event of an overcurrent or a short-circuit.

Connecting in parallel

In order to increase the current available, the outputs of two power supplies with identical references can be connected in parallel.
To obtain equitable sharing of the current between the two power supplies, the following precautions must be taken into account:
- Use two power supplies bearing the same date code and same reference.
- Adjust the output voltages so as to obtain the same voltage value, to within plus or minus 20 mV, 10 minutes after power-up with a load consumption of less than 20% connected on each power supply output.
- Connect one of the “+” terminals and one of the “-” terminals of each power supply to a terminal using wires of the same length and diameter.
- Use wires with the largest cross-section as possible.

The maximum usable current is 1.8 times the nominal current of the power supply.
Redundancy of the power supply ABL 4RSM24200 can be achieved without adding a specific module, due to the specific diode that is integrated in these products.
For other power supply references, redundancy module ABL 8RED24400 must be used.
Additional technical information on www.schneider-electric.com

Power supplies and transformers Phaseo

Regulated switch mode power supplies ABL4

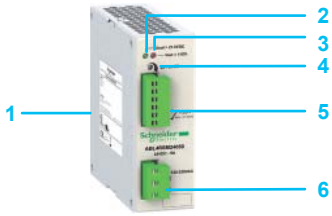
85 to 960 W - Compact - Rail mounting

Characteristics (continued)

Selection of protection on the power supply primaries

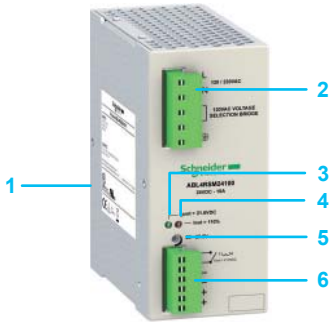
Power supply	Type of protection		
	Miniature circuit-breakers C60N (Icn > 1.5 kA)	**Fuses**	**Class CC fuses with rejection system**
	Zone in which equipment used		
	Rest of the world		USA & Canada
ABL 4RSM24035	4 A curve C	4 A time-lag	6 A
ABL 4RSM24050	4 A curve C	4 A time-lag	6 A
ABL 4RSM24100	6 A curve C	6.3 A time-lag	6 A
ABL 4RSM24200	16 A curve C 10 A curve D	15 A time-lag	10 A
ABL 4WSR24200	3 x 10 A curve C	3 x 3.15 A time-lag	3 x 10 A
ABL 4WSR24300	3 x 10 A curve C	3 x 5 A time-lag	3 x 10 A
ABL 4WSR24400	3 x 10 A curve C	3 x 6.3 A time-lag	3 x 10 A

Description



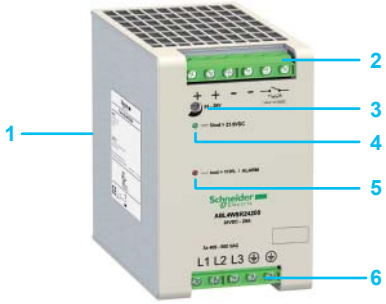
The regulated switch mode power supplies ABL 4RSM24035 and ABL 4RSM24050 comprise:

1 Spring clip for Omega (⊔ 35 mm) rail.
2 Output voltage status LED (green).
3 Output circuit overcurrent LED (red).
4 Output voltage adjustment potentiometer.
5 Removable screw terminal block for connection of the DC output voltage and diagnostics contact.
6 Removable screw terminal block for connection of the AC input voltage on single-phase *(1)*.



The regulated switch mode power supplies ABL 4RSM24100 comprise:

1 Spring clip for Omega (⊔ 35 mm) rail.
2 Removable screw terminal block for connection of the AC input voltage (on single-phase) *(1)*) and for connection of 120/230 V selection link.
3 Output voltage status LED (green).
4 Output circuit overcurrent LED (red).
5 Output voltage adjustment potentiometer.
6 Removable screw terminal block for connection of the DC output voltage and diagnostics contact.



The regulated switch mode power supplies ABL 4RSM24200, ABL 4WSR24200, ABL 4WSR24300 and ABL 4WSR24400 comprise:

1 Spring clip for Omega (⊔ 35 mm) rail.
2 Enclosed screw terminals for connection of the DC output voltage and diagnostics contact.
3 Output voltage adjustment potentiometer.
4 Output voltage status LED (green).
5 Output circuit overcurrent and alarm LED (red).
6 Enclosed screw terminals for connection of the AC input voltage:
- single-phase connection for ABL 4RSM24200 *(1)*,
- 3-phase connection for ABL 4W●●●●.

(1) Connection between 2 phases only on certain American line supplies.

Power supplies and transformers
Phaseo
Regulated switch mode power supplies
ABL4
85 to 960 W - Compact - Rail mounting

ABL 4RSM24050

ABL 4RSM24100

ABL 4WSR24200

ABL 8BUF24400

ABL 8BBU24200

ABL 8RED24400

Phaseo regulated switch mode power supplies ABL4, 85 to 960 W

Input voltage	Secondary			Reset	Reference	Weight
	Output voltage	Nominal power	Nominal current			kg
Single-phase (N-L1) *connection (1)*						
∼ **100…230 V** - 10%, + 15%	⎓ 23…27.4 V	85 W	3.5 A	Automatic	**ABL 4RSM24035**	0.500
		120 W	5 A	Automatic	**ABL 4RSM24050**	0.500
∼ **120 V** - 25%, + 10% and ∼ **230 V** - 20%, + 15%	⎓ 23…27.4 V	240 W	10 A	Automatic	**ABL 4RSM24100**	0.800
	⎓ 24…27.8 V	480 W	20 A	Automatic	**ABL 4RSM24200** *(2)*	1.300
3-phase (L1-L2-L3) connection						
∼ **400…500 V** - 15%, + 10%	⎓ 24…27.8 V	480 W	20 A	Automatic	**ABL 4WSR24200**	1.300
		720 W	30 A	Automatic	**ABL 4WSR24300**	1.300
		960 W	40 A	Automatic	**ABL 4WSR24400**	1.300

Function modules for continuity of service *(3)*

Function	Use	Description	Reference	Weight kg
Continuity after a power outage *(5)*	Holding time 100 ms at 40 A and 2 s at 1 A	Buffer module	**ABL 8BUF24400**	1.200
	Holding time 9 min at 40 A...2 hrs at 1 A (depending on use with a battery check module-battery unit and load) *(4)*	Battery check module, output current 20 A	**ABL 8BBU24200**	0.500
		Battery check module, output current 40 A	**ABL 8BBU24400**	0.700
		Battery module, 3.2 Ah *(6)*	**ABL 8BPK24A03**	3.500
		Battery module, 7 Ah *(6)*	**ABL 8BPK24A07**	6.500
		Battery module, 12 Ah *(6)*	**ABL 8BPK24A12**	12.000
Continuity after a malfunction	Paralleling and redundancy of the power supply to ensure uninterrupted operation of the application excluding AC line failures and application overcurrents	Redundancy module	**ABL 8RED24400**	0.700
Discriminating downstream protection	Electronic protection (1...10 A overcurrent or short-circuit) of 4 output terminals from an ABL4 power supply	Protection module with 2-pole breaking *(7) (8)*	**ABL 8PRP24100**	0.270

Converters ⎓ / ⎓ *(3)*

Primary *(9)*		Secondary		Reference	Weight
Input voltage	Power supply module output current	Output voltage	Nominal current		kg
⎓ **24 V - 9%,+ 24%**	2.2 A	⎓ 5...6.5 V	6 A	**ABL 8DCC05060**	0.300
	1.7 A	⎓ 7...15 V	2 A	**ABL 8DCC12020**	0.300

Separate and replacement parts

Description	Use	Composition	Unit reference	Weight kg
Fuse assemblies	Discriminating Protection module ABL 8PRP24100	4 x 5 A, 4 x 7.5 A and 4 x 10 A	**ABL 8FUS01**	–
	Battery ABL 8BKP24A●●	4 x 20 A and 6 x 30 A	**ABL 8FUS02**	–
Clip-on marker labels	All products except ABL 8PRP24100	Sold in lots of 100	**LAD 90**	0.030
	Discriminating Protection module ABL 8PRP24100	Sold in lots of 22	**ASI20 MACC5**	–
Rail mounting kit	Battery module ABL 8BPK2403	–	**ABL 1A02**	–
EEPROM memory	Backup and duplication of ABL8 BBU24●00 battery check module parameters	–	**SR2 MEM02**	0.010

(1) 2-phase connection possible on certain American line supplies.
(2) Power supply reference **ABL 4RSM24200** *has an integrated redundancy diode.*
(3) For use with power supply ABL4.
(4) Compatibility table for battery check module-battery unit with holding time depending on the load.
More technical information on www.schneider-electric.com
(5) Appendices, see page 9/32.
(6) Supplied with 20 or 30 A fuse depending on the model.
(7) Supplied with four 15 A fuses.
(8) Local reset via pushbutton or automatic reset on elimination of the fault.
(9) Voltage from power supply ABL4.

Power supplies and transformers Phaseo

Regulated switch mode power supplies

Function modules: solutions to power outages

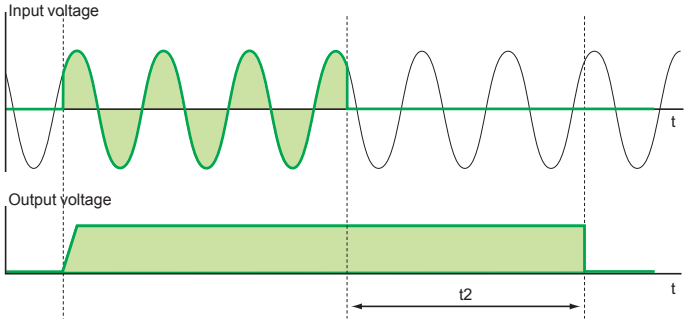
Selection grid

Continuity of service: Voltage holding in the event of a power outage (continued)

For applications that are sensitive to unintended stopping, the **ABL 8** range of Function modules offers a solution comprising:

- Electronic switch mode power supply and Buffer module for holding times t2 up to two seconds
- Electronic switch mode power supply, Battery control module and Battery module for holding times t2 of between two seconds and a few hours

These solutions are used to supply voltage after loss of the line supply, thus enabling saving of current values or fallback of some actuators supplied with 24 V ⎓.
The table below indicates the possible holding times according to the equipment combinations and the current required.



Holding current	Holding time t2																										
	Seconds								Minutes															Hours			
	0.1	0.2	0.5	1	2	5	10	30	1	2	3	4	5	6	7	8	9	10	15	20	30	40	50	1	2	3	5
1 A	1	1	1	1	1	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+5	2+5
2 A	1	1	1	1	1	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+5	2+6	2+6
3 A	1	1	1	1	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+5	2+5	2+5	2+6	2+6	2+6 +6
4 A	1	1	1	1	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+5	2+5	2+5	2+5	2+6	2+6 +6	2+6 +6
5 A	1	1	1	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+5	2+5	2+5	2+6	2+6	2+6 +6	2+6 +6	
6 A	1	1	1	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+5	2+5	2+5	2+6	2+6	2+6	2+6 +6	2+6 +6	
7 A	1	1	1	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+5	2+5	2+5	2+5	2+5	2+6	2+6	2+6	2+6	2+6 +6		
8 A	1	1	1	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+5	2+5	2+5	2+5	2+5	2+5	2+5	2+6	2+6	2+6	2+6 +6	2+6 +6		
10 A	1	1	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+5	2+5	2+5	2+5	2+5	2+5	2+5	2+6	2+6	2+6 +6	2+6 +6	2+6 +6			
15 A	1	1	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+4	2+5	2+5	2+5	2+5	2+5	2+6	2+6	2+6	2+6	2+6 +6	2+6 +6	2+6 +6				
20 A	1	1	2+5	2+5	2+5	2+5	2+5	2+5	2+5	2+5	2+5	2+5	2+6	2+6	2+6	2+6	2+6	2+6	2+6 +6	2+6 +6	2+6 +6						
25 A	1	3+5	3+5	3+5	3+5	3+5	3+5	3+5	3+5	3+5	3+5	3+6	3+6	3+6	3+6	3+6	3+6 +6	3+6 +6	3+6 +6	3+6 +6							
30 A	1	3+5	3+5	3+5	3+5	3+5	3+5	3+5	3+5	3+5	3+6	3+6	3+6	3+6 +6	3+6 +6	3+6 +6	3+6 +6	3+6 +6	3+6 +6	3+6 +6							
35 A	1	3+5	3+5	3+5	3+5	3+5	3+5	3+5	3+5	3+6	3+6	3+6	3+6 +6	3+6 +6	3+6 +6	3+6 +6	3+6 +6	3+6 +6	3+6 +6								
40 A	1	3+6	3+6	3+6	3+6	3+6	3+6	3+6	3+6	3+6	3+6	3+6 +6	3+6 +6	3+6 +6	3+6 +6	3+6 +6	3+6 +6	3+6 +6									

Function modules	Reference	Code
40 A Buffer module	**ABL 8BUF24400**	1
20 A Battery control module	**ABL 8BBU24200**	2
40 A Battery control module	**ABL 8BBU24400**	3
3.2 Ah Battery module	**ABL 8BPK24A03**	4
7 Ah Battery module	**ABL 8BPK24A07**	5
12 Ah Battery module	**ABL 8BPK24A12**	6

Note: *Several Buffer modules (up to a maximum of three) can be connected in parallel to increase the immunity time. The times given in the table above (boxes marked 1) should be multiplied by the number of modules used (2 or 3).*

Power supplies and transformers Phaseo

Regulated switch mode power supplies

Substitution of ABL8RP/WP by ABL4

Substitution of Phaseo ABL8RP/WP power supplies by Phaseo ABL4 power supplies

For the majority of applications, power supplies ABL4 easily replace power supply models ABL8RP/WP due to:
- □ the reduced size of the ABL4 (up to - 56% in volume),
- □ tested compatibility with the function modules ABL8B/RED/8D/8P,
- □ the presence of a diagnostics contact on all models,
- □ a higher withstand to temporary overcurrents than the equivalent ABL8 RP/WP power supplies.

However, for some applications the following points must be checked before substituting ABL8RP/WP power supplies by ABL4 power supplies:

Equivalent ABL8 and ABL4 power supplies		Points to be checked related to the application	Installation differences
ABL 8RPS24030	**ABL 4RSM24035**	■ Input voltage limits: □ ABL4: 90..264 V □ ABL8: 85..550 V	■ Input and output terminals reversed
ABL 8RPS24050	**ABL 4RSM24050**	■ Resetting of protection: □ ABL4: automatic □ ABL8: selectable, automatic or manual ■ ABL4 does not conform to IEC 61000-3-2 *(1)*	
ABL 8RPS24100	**ABL 4RSM24100**	■ Input voltage limits: □ ABL4: 90..264 V □ ABL8: 85..550 V ■ Resetting of protection: □ ABL4: automatic □ ABL8: selectable, automatic or manual ■ ABL4 does not conform to IEC 61000-3-2 *(1)*	■ 120/230 V voltage selection □ ABL4: by link □ ABL8: by terminal
ABL 8RPM24200	**ABL 4RSM24200**	■ Resetting of protection: □ ABL4: automatic □ ABL8: selectable, automatic or manual ■ ABL4 does not conform to IEC 61000-3-2 *(1)*	■ Input and output terminals reversed ■ 120/230 V voltage selection □ ABL4: by link □ ABL8: by terminal
ABL 8WPS24200	**ABL 4WSR24200**		
ABL 8WPS24400	**ABL 4WSR24400**		■ Input and output terminals reversed

(1) Standard IEC/EN 61000-3-2 defines the harmonic limits of the input current that can be produced by equipment such as regulated switch mode power supplies ABL4 or ABL8. This standard is only applicable to electrical or electronic devices that are intended for connection to low voltage public distribution systems. This is rarely the case in industrial applications.

Power supplies and transformers Phaseo

Regulated switch mode power supplies ASI ABL

Power supplies for AS-Interface cabling system

Power supplies for AS-Interface cabling system

Consistent with the standard Phaseo line, the range of **ASI ABL** power supplies is designed to deliver a ⎓ voltage, as required by AS-Interface cabling systems. Three versions are available to meet all needs encountered in industrial applications, in enclosures, cells or floor-standing enclosures. These single-phase, electronic, switch mode power supplies guarantee the quality of the output current, in accordance with the electrical characteristics and conforming to standard EN 50295.

ASI ABLB3002

ASI ABLB300●

Operating on a 100 to 240 V ∿ supply, this power supply delivers a voltage of 30 V ⎓. Available in 2.4 and 4.8 A ratings, the outgoing terminal block allows the cable to be connected separately to the AS-Interface interface modules and to the AS-Interface master. Input and output LEDs allow fast and continuous diagnostics.

ASI ABLD3004

ASI ABLD300●

Operating on a 100 to 240 V ∿ supply, this power supply delivers a voltage of 30 V ⎓. Available in 2.4 and 4.8 A ratings, it allows diagnosis and management of earth faults on AS-Interface interface modules. In the event of an earth fault, the Phaseo power supply stops dialogue on the AS-Interface cabling system and puts the installation in a fallback condition. Restarting is only possible after deliberate acknowledgement of the fault. Two inputs/outputs enable dialogue with a processing unit. The outgoing terminal block is used to connect the AS-Interface cable separately to the interface modules and master modules. Input, output and earth fault LED's allow fast and continuous diagnostics.

ASI ABLM3024

ASI ABLM3024

Operating on a 100 to 240 V ∿ supply, this product provides two separate power supplies, which are totally independent in the way they operate.
Two output voltages - 30 V/2.4 A (AS-Interface line supply) and 24 V/3 A - are available, so making it possible to supply the control equipment without an additional power supply. Input and output LEDs allow fast and continuous diagnostics.

Power supplies and transformers Phaseo

Regulated switch mode power supplies ASI ABL

Power supplies for AS-Interface cabling system

Selection of protection on the power supply primaries

Type of mains supply	~ 115 V single-phase			~ 230 V single-phase		
Power supply	**Thermal-magnetic circuit-breaker** *(1)*		**Gg fuse**	**Thermal-magnetic circuit-breaker** (2-pole)		**Gg fuse**
ASI ABLB3002	GB2 ●B07	MG24517 *(2)*	2 A	GB2 DB06	MG24516 *(2)*	2 A
ASI ABLB3004	GB2 ●B08	MG24518 *(2)*	4 A	GB2 DB07	MG17453 *(2)*	2 A
ASI ABLD3002	GB2 ●B07	MG24517 *(2)*	2 A	GB2 DB06	MG24516 *(2)*	2 A
ASI ABLD3004	GB2 ●B08	MG24518 *(2)*	4 A	GB2 DB07	MG17453 *(2)*	2 A
ASI ABLM3024	GB2 ●B07	MG24517 *(2)*	2 A	GB2 DB06	MG17453 *(2)*	2 A

(1) Single-phase protection, replace ● by C; 2-pole protection, replace ● by D.
(2) UL certified circuit breaker.

References

ASI ABL●3002

Input voltage	Secondary			Auto-protect reset	Earth fault detection	Reference	Weight
	Output voltage	Nominal power	Nominal current				kg
Single phase (N-L1) **or 2-phase** (L1-L2)							
~ **100…240 V** - 15 %, + 10 % 50/60 Hz	⎓ 30 V	72 W	2,4 A	Auto	No	**ASI ABLB3002**	0.800
		144 W	4,8 A	Auto	No	**ASI ABLB3004**	1.300
		72 W	2,4 A	Auto	Yes	**ASI ABLD3002**	0.800
		144 W	4,8 A	Auto	Yes	**ASI ABLD3004**	1.300
	⎓ 30 V	72 W	2,4 A	Auto	No	**ASI ABLM3024**	1.300
	⎓ 24 V	72 W	3 A				

10 - Appendices and services

Treatment for severe environments, “Conformal Coating” modules

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Modicon Quantum automation platform

Treatment for severe environments
“Conformal Coating” modules

Presentation

Protective treatment of Modicon Quantum PLCs

Modicon Quantum PLCs comply with “**TC**” (Treatment for all Climates) treatment requirements.

For installations in industrial production workshops or environments corresponding to “**TH**” (Treatment for hot and humid environments), PLCs must be housed in enclosures providing at least IP 54 protection as specified by standard IEC/EN 60529 or an equivalent level of protection according to NEMA 250.

These PLCs themselves have an IP 20 protection index *(1)*.
They can therefore be installed without an enclosure in reserved access areas that do not exceed **pollution level 2** (control room with no dust-producing machinery or activity). **Pollution level 2** does not take account of more severe environments such as those where the air is polluted with dust, fumes, corrosive or radioactive particles, vapours or salts, moulds, insects, etc.

Treatment for more severe environments

If the Modicon Quantum automation platform has to be used in a severe environment, the “*Conformal Coating*” offer provides CPU and power supply modules, I/O modules and racks with “***Humiseal 1A33***” coating on their electronic cards.

This treatment improves the cards' insulation qualities and their resistance to:
- Condensation
- Dusty atmospheres (conducting foreign particles)
- Chemical corrosion, in particular during use in sulphurous atmospheres (oil refinery, purification plant, etc.) or atmospheres containing halogens (chlorine, etc.)

This protection, combined with appropriate installation and maintenance, enables Modicon Quantum products to be used in harsh chemical environments such as types **3C2** and **3C3** described in standard IEC/EN 60721-3-3 or types **G3** and **GX** described in standard ISA-S71.04.

The functional and electrical characteristics of the coated modules are identical to those of the non-coated versions. Consult the selection guides or the references pages in this catalogue (chapter 1…chapter 5).

To order modules and racks with Conformal Coating protection, please refer to references pages 10/3 to 10/9 (for coated products, add the letter “**C**” at the end of the standard reference).

ATEX IECEx certification consists of a detailed procedure for the testing and inspection of equipment made to be used in potentially hazardous areas. The results obtained after this procedure enable an ATEX certificate to be issued, together with a report confirming and demonstrating that the product can be used safely in potentially explosive environments (in line with the given parameters).

For Modicon Quantum, some “Coated” modules which can be used in a Unity system are now certified ATEX IEC-EX with the following standards:
- IEC/EN 60079-0
- IEC/EN 60079-15
- IEC/EN 60079-31

ATEX level “II 3 GD” certified products will have the following information on their identification plates:

II: for surface industries only

3: Category 3 equipment, for use in areas in which explosive environments caused by gases, vapours, mists or air/dust mixtures are unlikely to occur, or if they do occur, are likely to do so only infrequently and for a short period only (less than 10 hours a year). This equipment can be used in zones 2/22.

G-D: for gas and dust.

The PLC configuration must be placed in a location providing at least IP54 protection (insulated enclosure) for 3G and Gc materials and IP6X for category 3D and Dc equipment when used in zones 2/22.

Items located in a hazardous zone 2/22 or outside ATEX zones can be connected to the PLC configuration intrinsically with no safety barrier. Certified modules can also be connected in hazardous zones 1/21 or 0/20 using intrinsic, external safety barriers.

1) Any slot in **TSX RKY ●●** *racks that is not occupied by a module must be fitted with a* **TSX RKA 02** *screw-on protective cover (sold in lots of 5).*

Modicon Quantum automation platform

Treatment for severe environments

“Conformal Coating” CPUs

140 CPU 434 12UC

140 CPU 65● ●0C

Standard “Conformal Coating” Unity CPUs

CPU		Application memory (max.)		Communication ports	Safety	Certified ATEX Zone 2/22	Reference	Weight
Clock speed	Coprocessor	Available internal RAM (with located variables)	Program with PCMCIA card					
MHz		KB	KB					kg
66	Built-in math	548	–	2 Modbus RS 232 1 Modbus Plus	–	Yes	**140 CPU 311 10C**	–
	Built-in math	1056	–	2 Modbus RS 232 1 Modbus Plus	–	Yes	**140 CPU 434 12UC**	–
166	Yes, built-in Ethernet TCP/IP	768	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Ethernet TCP/IP	–	Yes	**140 CPU 651 50C**	–
266	Yes, built-in Ethernet TCP/IP	1024	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Ethernet TCP/IP	–	Yes	**140 CPU 651 60C**	–
		1024	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Ethernet TCP/IP	–	Yes	**140 CPU 651 60S**	–
		3072	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Ethernet TCP/IP	–	Yes	**140 CPU 652 60C**	–
		1024	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps) *(2)*	–	Yes	**140 CPU 671 60C**	–
		1024	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps) *(2)*	–	Yes	**140 CPU 671 60S**	–
		3072	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps) *(2)*	–	Yes	**140 CPU 672 60C**	–
		3072	7168	1 Modbus *(1)* 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps) *(3)*	–	Yes	**140 CPU 672 61C**	–

Migrating Quantum CPUs

As both the **140 CPU 434 12AC** and **140 CPU 534 14BC** Quantum CPUs are compatible with Concept or ProWORX software, they can be upgraded to be compatible with the Unity Pro software without any hardware modification. This process of migrating from Concept to Unity Pro is achieved by updating the CPU operating system.
This update is performed with the aid of the OS-Loader tool included with Unity Pro (see page 6/13).

The upgraded **140 CPU 434 12AC** CPU is then equivalent to the corresponding Unity CPU **140 CPU 434 12UC.**

Note: *Migration of the* **140 CPU 534 14BC** *CPU requires version ≥ 3.0 of the Unity Pro software.*

Standard “Conformal Coating” Concept/ProWORX CPUs *(4)*

Memory (total)	Coprocessors	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
256 KB	No	–	–	**140 CPU 113 02C**	0.300
512 KB	No	–	–	**140 CPU 113 03C**	0.300
2 MB	Integrated	–	–	**140 CPU 434 12AC**	0.850
4 MB	Integrated	–	Yes	**140 CPU 534 14BC**	0.850

(1) RS 232/485 Modbus port. For connection cables and accessories: see page 1/9.

(2) Ethernet 10/100 Mbps port for multimode optical fibre. For connection cables and accessories: see page 2/37.

(3) Ethernet 10/100 Mbps port for single mode optical fibre. For connection cables and accessories: see page 2/37.

(4) For accessories, see page 1/15.

Modicon Quantum automation platform

Treatment for severe environments
"Conformal Coating"
racks, power supplies, memory cards

"Conformal Coating" racks

Description	Number of slots	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
Racks for:					
- Local I/O Modules	3	–	–	**140 XBP 003 00C**	0.340
	4	–	Yes	**140 XBP 004 00C**	0.450
- Remote I/O Modules	6	Non-interfering	Yes	**140 XBP 006 00C**	0.640
	10	Non-interfering	Yes	**140 XBP 010 00C**	1.000
- Distributed I/O Modules	16	Non-interfering	Yes	**140 XBP 016 00C**	1.600

"Conformal Coating" rack expansion module *(1)*

Description	Length/ dimensions	Certified ATEX Zone 2/22	Reference	Weight kg
Rack expansion module	–	–	**140 XBE 100 00C**	–

.

"Conformal Coating" power supply modules *(2)*

Input voltage	Output current	Type	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
120/230 V ∿	3 A	Standalone	–	–	**140 CPS 111 00C**	0.650
115/230 V ∿	11 A	Summable	–	–	**140 CPS 114 20C**	0.650
115/230 V ∿	8 A	Redundant	–	–	**140 CPS 124 00C**	0.650
115/230 V ∿	11 A	Redundant	Non-interfering	–	**140 CPS 124 20C**	0.650
24 V ⎓	3 A	Standalone	–	–	**140 CPS 211 00C**	0.650
	8 A	Summable	–	Yes	**140 CPS 214 00C**	0.650
		Redundant	–	Yes	**140 CPS 224 00C**	0.650
48…60 V ⎓	8 A	Summable	–	–	**140 CPS 414 00C**	0.650
		Redundant	–	–	**140 CPS 424 00C**	0.650
125 V ⎓	3 A	Standalone	–	–	**140 CPS 511 00C**	0.650
	8 A	Redundant	–	–	**140 CPS 524 00C**	0.650

"Conformal Coating" PCMCIA memory expansion cards *(3)*

140 CPU 651 50C, **140 CPU 651 60C, 140 CPU 671 60C, 140 CPU 672 60C** and **140 CPU 672 61C** Quantum CPUs can take the following memory expansion cards.
There are two types of memory limit:
- One associated with the type of CPU
- One associated with the chosen model of PCMCIA memory card

The lower of these two limits defines the memory capacity that is accessible to the user for the application.

Description	Memory size		Certified ATEX Zone 2/22	Reference	Weight kg
	Application	Data file			
Application/ configurable data file SRAM memory expansion	192…1024 KB	832…0 KB	–	**TSX MRP C001MC**	0.076
	192…3072 KB	2880…0 KB	–	**TSX MRP C003MC**	0.076
	192…7168 KB	6976…0 KB	–	**TSX MRP C007MC**	0.076

TSX MRP/MCP/MRP ●●●●C

(1) For accessories, see page 1/17.
(2) For separate parts, see page 1/21.
(3) For replacement parts, see page 1/5.

Modicon Quantum automation platform

Treatment for severe environments
"Conformal Coating"
I/O architectures

"Conformal Coating" remote I/O (RIO) modules (1)

Description	Cable	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
Quantum RIO head adaptor (1 max.)	Single cable	–	Yes	**140 CRP 931 00C**	–
	Redundant cable	Non-interfering	Yes	**140 CRP 932 00C**	–
	Redundant cable	Non-interfering	Yes	**140 CRP 312 00C**	–
Quantum RIO drop adaptor (31 max.)	Single cable	–	Yes	**140 CRA 931 00C**	–
	Redundant cable	Non-interfering	Yes	**140 CRA 932 00C**	–
	Redundant cable	–	Yes	**140 CRA 312 00C**	–

RIO drop optical fibre repeater (2)

Description	Cable	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
RIO drop optical fibre repeater *(3)*	Multimode optical fibre (single or redundant)	–	Yes	**140 NRP 954 00C**	–
	Single mode optical fibre (single or redundant)	–	–	**140 NRP 954 01C**	–

"Conformal Coating" distributed I/O (DIO) modules

Description	Medium	Type of medium	Certified ATEX Zone 2/22	Reference	Weight kg
DIO head-end adaptors no. 2 and no. 3 *(4)*	Single	Twisted pair cable	–	**140 NOM 211 00C**	–
	Redundant	Twisted pair cable	Yes	**140 NOM 212 00C**	–
	Single	Optical fibre cable	Yes	**140 NOM 252 00C**	–

Description	Medium	Built-in power supply	Certified ATEX Zone 2/22	Reference	Weight kg
DIO drop adaptors	Single	115/230 V ∿	–	**140 CRA 211 10C**	–
		24 V ⎓	Yes	**140 CRA 211 20C**	–
	Redundant	115/230 V ∿	–	**140 CRA 212 10C**	–
		24 V ⎓	Yes	**140 CRA 212 20C**	–

(1) For connection cables and rack accessories, see page 2/27.
(2) For topologies, see pages 2/28 and 2/29.
(3) Module declarable and configurable in Unity Pro Small/Medium/Large/Extra Large version 6.0 and later.
(4) For Modbus Plus network cables and accessories, see pages 5/84 to 5/89. For presentation, see page 5/80.

Modicon Quantum automation platform

Treatment for severe environments
"Conformal Coating"
discrete I/O modules

"Conformal Coating" discrete input modules (1)

Voltage	Modularity	Description	Logic	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
5 V ⎓ TTL	32 inputs	4 groups of 8 inputs	Negative	–	Yes	**140 DDI 153 10C**	0.450
24 V ⎓	32 inputs	4 groups of 8 inputs	Positive	Non-interfering (2)	Yes	**140 DDI 353 00C**	0.300
			Negative	–	Yes	**140 DDI 353 10C**	0.300
	96 inputs	6 groups of 16 inputs	Positive	–	–	**140 DDI 364 00C**	0.300
	32 inputs	4 groups of 8 inputs	Positive	–	–	**140 DSI 353 00C**	0.300
10…60 V ⎓	16 inputs	8 groups of 2 inputs	Positive	–	–	**140 DDI 841 00C**	0.300
	32 inputs	4 groups of 8 inputs	Positive	–	–	**140 DDI 853 00C**	0.295
125 V ⎓	24 inputs	3 groups of 8 inputs	Positive	–	–	**140 DDI 673 00C**	0.300
24 V ∿	16 inputs	No common point	–	–	–	**140 DAI 340 00C**	0.300
	32 inputs	4 groups of 8 inputs	–	–	–	**140 DAI 353 00C**	0.340
48 V ∿	16 inputs	No common point	–	–	–	**140 DAI 440 00C**	0.300
	32 inputs	4 groups of 8 inputs	–	–	–	**140 DAI 453 00C**	0.300
115 V ∿	16 inputs	No common point	–	–	–	**140 DAI 540 00C**	0.310
	16 inputs	2 groups of 8 inputs	–	–	–	**140 DAI 543 00C**	0.300
	32 inputs	4 groups of 8 inputs	–	–	–	**140 DAI 553 00C**	0.330
230 V ∿	16 inputs	No common point	–	–	–	**140 DAI 740 00C**	0.350
	32 inputs	4 groups of 8 inputs	–	–	–	**140 DAI 753 00C**	0.300
24 V ∿	16 inputs	No common point	Positive	–	Yes	**140 SDI 953 00S**	0.300

"Conformal Coating" discrete output modules (1)

Voltage	Modularity	Description	Logic	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
5 V ⎓ TTL	32 outputs	4 groups of 8 outputs	Negative	–	–	**140 DDO 153 10C**	0.450
24 V ⎓	32 outputs	4 groups of 8 outputs	Positive	Non-interfering (2)	Yes	**140 DDO 353 00C**	0.450
			Positive (3)	–	Yes	**140 DDO 353 01C**	0.450
			Negative	–	–	**140 DDO 353 10C**	0.450
	96 outputs	6 groups of 16 outputs	Positive	–	–	**140 DDO 364 00C**	0.450
10…30 V ⎓	32 outputs	4 groups of 8 outputs	Positive	–	–	**140 DVO 853 00C**	0.300
10…60 V ⎓	16 outputs	2 groups of 8 outputs	Positive	–	–	**140 DDO 843 00C**	0.450
24…125 V ⎓	12 outputs	2 groups of 6 outputs	Positive	–	–	**140 DDO 885 00C**	0.450
Relay 20…250 V a 5…150 V c	16 outputs	No common point	1 "NO" contact	–	Yes	**140 DRA 840 00C**	0.410
	8 outputs	No common point	2 "NC" and "NO" contacts	–	–	**140 DRC 830 00C**	0.300
24…48 V ∿	16 outputs	4 groups of 4 outputs	–	–	–	**140 DAO 842 20C**	0.450
24…115 V ∿	16 outputs	No common point	–	–	–	**140 DAO 840 10C**	0.485
24…230 V ∿	16 outputs	No common point	–	–	–	**140 DAO 840 00C**	0.485
	32 outputs	4 groups of 8 outputs	–	–	–	**140 DAO 853 00C**	0.450
100…230 V ∿	16 outputs	4 groups of 4 outputs	–	–	–	**140 DAO 842 10C**	0.450
24 V ∿	16 inputs	No common point	Positive	–	Yes	**140 SDO 953 00S**	0.450

(1) For accessories, connection cables, replacement parts, see page 3/15.
(2) Version ≥ 1.
(3) Outputs protected against short-circuits and overloads by thermal monitoring.

Modicon Quantum automation platform

Treatment for severe environments

"Conformal Coating" discrete I/O modules and analog I/O modules

"Conformal Coating" discrete mixed I/O modules (1)

No.	Inputs	Outputs	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
24 I/O	**16 x 24 V ⎓ inputs** 2 groups of 8, positive logic	**8 x 24 V ⎓ outputs** 2 groups of 4, positive logic	–	Yes	**140 DDM 390 00C**	0.300
	16 x 125 V ∿ inputs 2 groups of 8	**8 x 125 V ∿ outputs** 2 groups of 4	–	–	**140 DAM 590 00C**	0.450
8 I/O	**4 x 125 V ⎓ inputs** 1 group of 4, positive logic	**4 outputs** **24…125 V ⎓** No common point, positive or negative logic	–	–	**140 DDM 690 00C**	0.300

"Conformal Coating" analog input modules (2)

Description	Range	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
8 high level channels 12-bit, unipolar	4...20 mA 1 ... 5 V	–	Yes	**140 ACI 030 00C**	0.300
16 high level channels 0…25,000 points, unipolar	0...20 mA, 0...25 mA 4...20 mA	Non-interfering	Yes	**140 ACI 040 00C**	0.300
8 RTD channels 13-bit	Ni 100, Ni 200, Ni 500, Ni1000, Pt 100, Pt 200, Pt 500, Pt1000	–	–	**140 ARI 030 10C**	0.300
8 thermocouple and low level channels 16-bit	Types J, K, E, T, S, R, B ± 25 mV, ± 100 mV	–	–	**140 ATI 030 00C**	0.300
8 high level channels 16-bit, bipolar	± 20 mA, 0…20 mA, 4…20 mA ± 10 V, ± 5 V, 0…10 V, 0…5 V, 1…5 V	–	Yes	**140 AVI 030 00C**	0.300

"Conformal Coating" analog output modules (2)

Description	Range	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
4 current channels 12-bit	4...20 mA	Non-interfering	Yes	**140 ACO 020 00C**	0.300
8 current channels 0…25,000 points	0...20 mA 0...25 mA 4...20 mA	–	Yes	**140 ACO 130 00C**	0.300
4 high level voltage channels 12-bit	± 5 V, ± 10 V 0…5 V, 0…10 V	–	Yes	**140 AVO 020 00C**	0.300
8 current channels 16-bit	4...20 mA	–	Yes	**140 SAI 940 00S**	0.300

"Conformal Coating" mixed analog I/O modules (2)

Description	Range	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
4 input channels, 14…16-bit	± 20 mA, 0…20 mA, 4…20 mA ± 5 V, ± 10 V, 0…5 V, 0…10 V, 1…5 V	–	Yes	**140 AMM 090 00C**	0.300
2 output channels 12-bit	4…20 mA				

(1) For accessories, connection cables, replacement parts, see page 3/15.
(2) For accessories, see page 3/23.

Modicon Quantum automation platform

Treatment for severe environments
“Conformal Coating” high-speed counter, high-speed inputs, Hot Standby system

“Conformal Coating” high-speed counter modules

Description	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
Counter module, 5 channels of 100 kHz max.	–	–	**140 EHC 105 00C**	0.350
Counter module, 2 channels of 500 kHz max.	–	–	**140 EHC 202 00C**	0.350

“Conformal Coating” high-speed input interrupt module

Description	Number of channels	Functions	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
High-speed input interrupt module	16 x 24 V ⎓ inputs	Interrupts, latching, high-speed inputs	–	–	**140 HLI 340 00C**	–

140 NOE 771 ●1C

“Conformal Coating” Unity Hot Standby system *(1)*

Associated modules

Description	Type of architecture	Topology	Transparent Ready	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
RIO head adaptor modules	Remote I/O (RIO) and and mixed I/O	Single cable	–	–	Yes	**140 CRP 931 00C**	–
		Redundant cable	–	Non-interfering	Yes	**140 CRP 932 00C**	–
RIO drop adaptor	–	Single cable	–	–	Yes	**140 CRA 931 00C**	–
		Redundant cable	–	Non-interfering	Yes	**140 CRA 932 00C**	–
Ethernet TCP/IP network modules	Mixed	Bus or ring (copper or optical fibre)	Class B30	–	Yes	**140 NOE 771 01C**	0.345
			Class C30	Non-interfering	Yes	**140 NOE 771 11C**	0.345

“Conformal Coating” Concept/ProWORX Hot Standby system *(2)*

Description	Components	Safety	Certified ATEX Zone 2/22	Reference	Weight kg
Hot Standby module	–	–	Yes	**140 CHS 110 00C**	1.06
Hot Standby kit	2 Hot Standby modules 1 optical fibre cable (3 m) 1 (CHS) downloadable function block 1 S908 connection kit 1 installation manual	–	Yes	**140 CHS 210 00C**	–

(1) For optical fibre cables for Hot Standby architecture, connection kits and accessories, see page 2/37.
(2) For associated modules and accessories, please consult our website www.schneider-electric.com.

Modicon Quantum automation platform

Treatment for severe environments
“Conformal Coating” intrinsically safe,
high-speed counter inputs and outputs, high-speed inputs

Ruggedized Profibus DP network gateway (1)

Description	Protocols	Physical layer	Certified ATEX Zone 2/22	Reference	Weight kg
Profibus Remote Master (PRM) module	Modbus TCP	1 Ethernet switch 2 x 10BASE-T/100BASE-TX ports	–	**TCS EGPA23F14K**	–
	Profibus DP V1 and Profibus PA (via gateway)	1 isolated RS 485 Profibus DP port			

“Conformal Coating” AS-Interface cabling system (2)

140 EIA 921 00C

Description	Number per Quantum PLC	Profile	Max. number of I/O	Certified ATEX Zone 2/22	Reference	Weight kg
AS-Interface master module for Quantum PLCs	4 per local drop 4 per remote drop (RIO) 2 per distributed drop (DIO)	AS-Interface M2	31 discrete devices, i.e. 248 I/O	–	**140 EIA 921 00C**	0.450

“Conformal Coating” Modbus Plus communication devices (3)

Description		Medium	Type	Certified ATEX Zone 2/22	Reference	Weight kg
Quantum Modbus Plus	**DIO drop adaptors** (including power supply)	Single	115/230 ∼	–	**140 CRA 211 10C**	–
			24 ⎓	Yes	**140 CRA 211 20C**	–
		Redundant	115/230 ∼	–	**140 CRA 212 10C**	–
			24 ⎓	Yes	**140 CRA 212 20C**	–
	DIO head-end adaptors no. 2 and no. 3	Single	Twisted pair cable	–	**140 NOM 211 00C**	–
		Redundant	Twisted pair cable	Yes	**140 NOM 212 00C**	–
		Single	Optical fibre cable	Yes	**140 NOM 252 00C**	–

“Conformal Coating” asynchronous serial link module (4)

140 ESI 062 10C

Description	Characteristic	Certified ATEX Zone 2/22	Reference	Weight kg
ASCII serial link module with 2 RS 232 C ports	19.2 Kbps	–	**140 ESI 062 10C**	0.300
Backup battery holder module	2 type C lithium batteries, 3 V	–	**140 XCP 900 00C**	–

Accessories

Description	Certified ATEX Zone 2/22	Reference	Weight kg
40-way terminal block for fieldbus (IP20)	Yes	**140XTS00100**	–
40-way terminal block for fieldbus	Yes	**140XTS00200**	–
Empty module	Yes	**140XCP50000**	–

(1) Conformal Coating and extended operating temperatures between -25 and +70°C.
(2) For separate parts, see page 5/79.
(3) For Modbus Plus gateways and repeaters, and PC interface cards, see pages 5/80 to 5/89.
(4) For cables, see page 5/93.

Modicon Quantum automation platform

Standards, certifications and environmental conditions

Standards and certifications

Modicon Quantum PLCs have been developed to comply with the main national and international standards relating to electronic equipment for industrial automation systems.

- ■ Requirements specific to PLCs: functional characteristics, immunity, resistance, safety, etc: IEC/EN 61131-2, CSA 22.2 No. 142, UL 508
- ■ Merchant navy requirements from the main international bodies: ABS, BV, DNV, GL, LR, RINA, etc
- ■ Compliance with European Directives:
  - □ Low voltage: 2006/95/EC
  - □ Electromagnetic compatibility: 2004/108/EC
- ■ Electrical characteristics and self-extinguishing capacity of insulating materials: UL 746C, UL 94
- ■ Hazardous areas:
  - □ CSA 22.2 No. 213, Class I, Division 2, groups A, B, C and D
  - □ FM 3610, Class I, Division 2, groups A, B, C and D
- ■ Specific requirements for safety CPUs and modules:
  - □ IEC 61508
  - □ IEC 62021

Characteristics

Operating conditions and requirements relating to the environment

Temperature	**Operation**	**°C**	0...+60 (IEC/EN 61131-2: +5...+55) *(1)*
	Storage	**°C**	-40...+85
Relative humidity	**Operation**	**%**	0…95 non-condensing
	Storage	**%**	0…95 non-condensing (according to IEC 61131-2) at 60°C (140°F)
Altitude		**m**	0…5000 max. during operation. For altitudes > 2000 m, the max. temperature of 60°C must be reduced by 6°C for each additional 1000 m

Protective treatment of Modicon Quantum PLCs

Modicon Quantum PLCs comply with "**TC**" *(Treatment for all Climates)* treatment requirements.
For installations in industrial production workshops or environments that correspond to "**TH**" *(Treatment for hot and Humid environments)* treatment, the PLCs must be housed in enclosures providing at least IP 54 protection as specified by IEC 60664 and NF C 20 040.

These PLCs themselves have an **IP 20 protection index** *(2)*.
They can therefore be installed without an enclosure in reserved access areas that do not exceed **pollution level 2** (control room with no dust-producing machinery or activity). Pollution level 2 does not take account of more severe environments, such as those where the air is polluted with dust, fumes, corrosive or radioactive particles, vapours or salts, moulds, insects, etc.

(1) **TSX P57 0244/104/154M** *and* **TSX P57 454/4634/554/5634M** *CPUs: 0…+57°C (or 0…+67°C with* **TSX FAN** *fan modules) when certain I/O modules are mounted in the slot next to the above-mentioned CPUs.*
(2) If a slot is not occupied by a module, it must be fitted with a protective cover **TSX RKA 02**.

Modicon Quantum automation platform

Standards, certifications and environmental conditions

Environmental tests

Description of test	Standards	Levels
Immunity to Low Frequency (LF) interference (CE) *(1)*		
Voltage and frequency variation	IEC/EN 61131-2	0.9/1,10 Un; 0.95/1.05 Fn for 30 min; 0.8 Un/0.9 Fn for 5 s; 1.2 Un/1.1 Fn for 5 s
DC voltage variation	IEC/EN 61131-1	0.85 Un...1.2 Un for 30 min with 5% ripple (peak values)
Third harmonic	IEC/EN 61131-2	10% Un; 0°/5 min...180°/5 min
Short interruptions	IEC/EN 61131-2	10 ms with power supply ~; 1 ms with power supply ⎓
Voltage dips and pick-ups	IEC/EN 61131-2	Un-0-Un; Un for 60 s; 3 separate cycles of 10 s Un-0-Un; Un for 5 s; 3 separate cycles of 1 to 5 s Un-0.9 Udl; Un for 60 s; 3 separate cycles of 1 to 5 s

Un: nominal voltage
Fn: nominal frequency
Udl: undervoltage detection level

Description of test	Standards	Levels
Immunity to High Frequency (HF) interference (CE) *(1)*		
Electrical fast transients/Bursts	IEC 61000-4-4	Power supply ~/⎓: 2 kV in wired mode/common mode Discrete I/O > 48 V: 2 kV in common mode; other ports: 1 kV in common mode
Hybrid surge	IEC 61000-4-5	2 kV between shielding and earth
Electrostatic discharge	IEC 61000-4-2	4 kV contact, 8 kV air
Radiated electromagnetic field	IEC 61000-4-3	10 V/m; 80 MHz...2 GHz Sinusoidal amplitude modulation 80%/1 kHz
Conducted interference, induced by radiated fields	IEC 61000-4-6	3 V: 0.15 MHz...80 MHz Sinusoidal amplitude modulation 80%/1 kHz
Electromagnetic emissions (CE) *(1) (2)*		
Interference voltage	IEC 61000-6-4 EN 55011 IEC 61131-2	Class A 150 kHz...500 kHz quasi-peak 79 dB (µV); average 66 dB (µV) 500 kHz...30 MHz quasi-peak 73 dB (µV); average 60 dB (µV)
Field interference	IEC 61000-6-4 EN 55011 IEC 61131-2	Class A, measurement at 10 m 30 MHz...230 MHz quasi-peak 40 dB (µV); 230 MHz...1 GHz quasi-peak 47 dB (µV)
Immunity to climatic variations		
Dry heat	IEC 60068-2-2 Bd	60°C for 16 hrs
Cold	IEC 60068-2-1 Ad	0°C for 16 hrs
Damp heat, steady state	IEC 60068-2-30 Ca	60°C with 93% relative humidity/96 hrs
Damp heat, cyclic	IEC 60068-2-3 Db	[55°C (E.O)] - 25°C with 93...95% relative humidity; 2 cycles: 12 hrs/12 hrs
Change of temperature, cyclic	IEC 60068-2-14 Nb	0...60°C/5 cycles: 6 hrs/6 hrs *(3)*
Resistance to climatic variations		
Dry heat, non-operating	IEC 60068-2-2 Bb	85°C for 96 hrs
Cold, non-operating	IEC 60068-2-1 Ab	-40°C for 96 hrs
Damp heat, non-operating	IEC 60068-2-30 Db	25...60°C with 93...95% relative humidity; 2 cycles: 12 hrs/12 hrs
Thermal shock, non-operating	IEC 60068-2-14 Na	-40...85°C; 2 cycles: 3 hrs/3 hrs

(1) Devices must be installed and wired in accordance with the instructions in the "Earthing and electromagnetic compatibility with PLCs" manual, electronic version in PDF format supplied on CD-ROM with the Unity Pro software packages or included on DVD reference **UNY USE 909 CD M** *(see page 6/20).*

(2) These tests are carried out with no enclosure, with the devices ***fixed on a metal grid*** *and wired in accordance with the recommendations in the manual.*

(3) **TSX P57 0244/104/154M** *and* **TSX P57 454/4634/554/5634M** *CPUs: 0...+57°C (or 0...+67°C with* **TSX FAN** *fan modules) when certain I/O modules are mounted in the slot next to the above-mentioned CPUs.*

(CE) *Tests required by the CE European Directives and based on standard IEC/EN 61131-2.*

Environmental tests (continued)

Description of test	Standards	Levels
Immunity to mechanical stress *(1)*		
Sinusoidal vibration	IEC/EN 60068-2-6 Fc	5...150 Hz/3.5 mm amplitude/1 g, cross-over frequency 9 Hz Endurance: 10 cycles of 1 octave/min per axis
	IACS E10 (marine)	3...100 Hz/1 mm amplitude/0.7 g, cross-over frequency 13.2 Hz Endurance: 90 min/axis, amplification coefficient < 10
Shocks	IEC 60068-2-27 Ea	15 g-11 ms; 3 shocks/direction/axis
Resistance to mechanical stress		
Controlled position free fall	IEC 60068-2-31 Ec	30° or 10 cm/2 falls
Random free fall, equipment in packaging	IEC 60068-2-32 method 1	1 m/5 falls
Safety of equipment and personnel *(2)*		
Dielectric strength and insulation resistance (CE)	UL 508, FM 3610 CSA 22-2 No. 142 IEC 61131-2	2 U + 1000 V/1 min. > 10 MΩ
Temperature rise	IEC 61131-2/UL 508 CSA 22-2 No. 142 and No. 213 FM 3610	Ambient temperature: 60°C
Electrical continuity (CE)	UL 508 CSA 22-2 No. 142	< 0.1 Ω/30 A/2 min
Leakage current (CE)	IEC 61131-2	< 3.5 mA fixed device
Protection provided by enclosures (CE)	CSA 22-2 No. 142 IEC 61131-2 UL 508	IP 20
Resistance to impacts	CSA 22-2 No. 142 IEC 61131-2/UL 508 FM 3610	500 g sphere: fall from 1.3 m

*(1) These tests are carried out with no enclosure, with the devices **fixed on a metal grid** and wired in accordance with the recommendations in the manual.*
(2) The devices must be installed and wired in accordance with the instructions given in the manual "Electromagnetic Compatibility of Industrial Networks and Fieldbuses" **TSX DG KBL E**.

(CE) *Tests required by the CE European Directives and based on standard IEC/EN 61131-2.*

Modicon Quantum automation platform

Standards, certifications and environmental conditions

When a control system has to operate in a corrosive environment, Quantum modules can be ordered with a special treatment. This treatment will extend the life of the module and enhance its environmental resistance capabilities.

Gas flow rate (power on)

Standard	Pollutant	Parts/ billion	Quantum protection level
EIA 364-65 level III	Cl_2	20 (± 5)	Conforms to the standard
	NO_2	200 (± 50)	Exceeds the standard (1250 parts/billion)
	H_2S	100 (± 20)	Conforms to the standard
ISA-S71.04GX severe	Cl_2	10	Exceeds the standard (1250 parts/billion)
	NO_2	1250	Conforms to the standard
	H_2S	50	Exceeds the standard (1250 parts/billion)
	SO_2	300	Conforms to the standard

Humidity (during operation)

Standard	Concentration (%)	Quantum protection level
IEC 60068-2-30	93 at 60°C	Conforms to the standard

Salt mist (not during operation)

Standard	Concentration (%)	Quantum protection level
IEC 60068-2-11	5 (± 1)	Exceeds the standard (5.7%)

Mould resistance

Standard	Quantum protection level
MIL-I-46058C	Designed to conform to the standard

Cyclic temperature variations (during operation)

Standard	Cycles	Quantum protection level
IEC/EN 60068-2-14	100 at 0…60°C	Conforms to the standard

Dust (not during operation)

Standard	Pollutant	Weight (%)	Quantum protection level
EIA 364-TP1 (pending)	Silica	36	Conforms to the standard
	Calcite	29	Conforms to the standard
	Iron oxide	12	Conforms to the standard
	Alumina	8	Conforms to the standard
	Gypsum	5	Conforms to the standard
	Paper fibre	3	Conforms to the standard
	Cotton fibre	3	Conforms to the standard
	Polyester fibre	2	Conforms to the standard
	Carbon black	1	Conforms to the standard
	Human hair	0.5	Conforms to the standard
	Cigarette ash	0.5	Conforms to the standard

For an exhaustive list of Modicon Quantum products available with special “Conformal Coating” treatment: see pages 10/3 to 10/9.

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Ethernet network
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Presentation

The ConneXium Industrial Ethernet Offer is comprised of a complete family of products and tools required to build the infrastructure of an Industrial Ethernet network. In the following pages, information for the proper design of a network and the selections of its components is offered.

Office Ethernet versus Industrial Ethernet

There are three main areas of differentiation between Ethernet applications in an office environment and Ethernet applications in an Industrial environment, they are:
- Environment
- Layout (not physical layer specification)
- Performance

Contrary to the office environment and even though ISO/IEC is working on it, there are not yet clearly defined specifications for Ethernet devices targeted to Industrial applications. The specifications of what it is called Industrial Ethernet are defined by different agencies or entities based upon its nature and based upon what the automation market has traditionally used.

The environmental specifications of Industrial Ethernet devices are today defined by the traditional agencies that define the environmental specifications for standard industrial devices (UL, CSA, CE, ...).

The IEEE 802.3 defines the physical layer specifications of the Ethernet network (types of connectors, distance between devices, number of devices, ...) while the 11801 (similarly to the TIAEIA 568B, and CENELEC EN 50173) provide installers the layout guidelines.

The performance specifications are actually being worked on by ISO/IEC.

Ethernet 802.3 principles

The Ethernet 802.3 Link Layer is based on a collision detection mechanism (CSMA CD): every node whose information has collided on the network realizes the collision and re-sends the information.
The process of re-sending information causes delays in its propagation and could affect the application.

A collision domain is a group of Ethernet end devices interconnected by hubs or repeaters (devices that receive information and send it out to all their other ports, no matter where the destination device is connected): it means that all devices will be affected by collisions.

With the availability of full duplex switches (devices that receive information and send it out just through the port to which the destination device is connected) the collision domains have disappeared.

Therefore, for industrial automation applications it is strongly recommended to use in every case full duplex switches to interconnect devices. In this way the collision domains will be eliminated completely.

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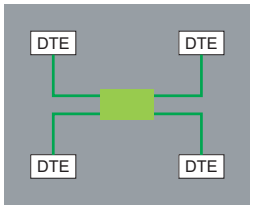


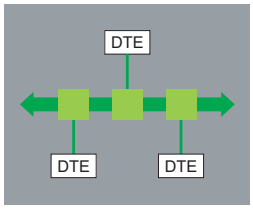
Different network topologies

Star topology

In a star topology, all devices are connected though an intermediate device.

Ethernet Star
In an Ethernet star the intermediate device may be a **hub** or a **switch**. Star is the commonly used topology in corporate networks and as of today is adopted in almost every automation application. As mentioned previously, for industrial Ethernet applications the use of full duplex switches as central device rather than hubs is strongly recommended.

Deploying Star topologies with ConneXium
With any of the hubs and switches offered by the ConneXium offer, star topologies can be implemented.

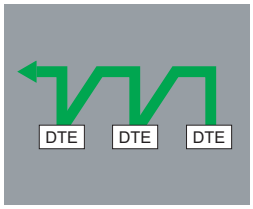


Bus topology

The bus is one of the most adopted topologies in traditional industrial automation networks. A single trunk cable connects all the devices on the network usually via passive or active T-connectors, or directly chained (daisy chain). Devices usually can be installed anywhere along the bus.

Ethernet Bus
An Ethernet bus can be deployed by interconnecting **hubs** and/or **switches** in line and considering every one of them as the connection for a drop device. A limited number of hubs and an unlimited number of switches can be interconnected to achieve this purpose.

Deploying Bus topologies with ConneXium
With any of the hubs and switches offered by the ConneXium offer bus topologies can be implemented.
Specially suitable for this purpose are the switches with 1 or 2 fiber optic ports:
- The 2 fiber optic ports switches could be for connection of inline devices.
- The single fiber optic port switches could be used for the connection of end line devices.



Daisy chain topology

Daisy chain -along bus- is the other most adopted topology in traditional industrial automation networks. Cable segments interconnect multiple devices, being the devices “part ” of the network cable.

Ethernet daisy chain
Daisy chain is not today a very common Ethernet topology, but it will soon become one of the most popular ones when enough quantity of devices is made available.
In Ethernet daisy chain the devices have:
- **2 Ethernet ports** and
- **1 embedded switch**.

Schneider Electric is releasing to the Industrial market Industrial Ethernet devices to be connected in daisy chain architectures.

Deploying daisy chain topologies
To deploy daisy chain topologies, no hubs or switches are required. All devices have an embedded switch.
Dual port Ethernet at the device level is an absolute integral component for daisy chain topologies.
One port of the device connects to one port of the neighboring device on either side of the device. These neighboring connections make up the daisy chain.

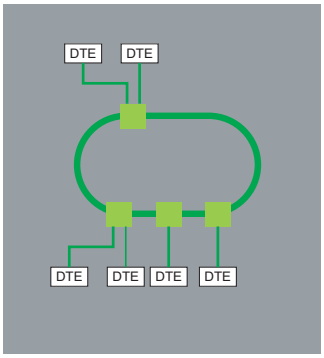
Ethernet switches can be employed in a daisy chain topology when multiple scan chains are in use by the controlling device. It is expected that the Ethernet switch will be located near the controlling device with the different scan chains emanating from the switch.

Different network topologies (continued)

Daisy chain topology (continued)

Limitations of daisy chain:
Limitations of daisy chain to insure the operational integrity of the network and meet performance metrics, are:
- Dual port Ethernet devices only support 10 Mbit/s and/or 100 Mbit/s operational speeds and must use one or the other.
- The network will operate only as fast as the slowest device that is connected to the network
- In order to improve network traffic latency the numbers of devices in a single scan chain, has been limited to 32 devices. Limiting a single scan chain to 32 devices the time for a round trip of a packet through the daisy Chain is expected less than 5 milliseconds.

The maximum packet latency of a packet passing through any device in a scan chain is no more than 10 µs.



Ring topology

In a ring topology, all devices or network infrastructure components are connected in a loop. Through this type of topology, a type of network redundancy is achieved.

Ethernet Ring
Ethernet rings are usually the backbones of applications in which high availability is required. If ring topology is required then switches that support this feature should be ordered.

Deploying Ring topologies using ConneXium.
The ConneXium line offers hubs and switches that allow the deployment of single and coupled self-healing rings. There is additional information about this topic page 10/19.

Distance limitations and number of devices per segment

Based upon the 802.3, the distance limits and the numbers of devices in cascade are the following:

Type	Maximum segment length *(1)*	Maximum segment length (offered by ConneXium devices)	Maximum number of hubs in cascade	Maximum number of switches in cascade
10BASE-T	100 m	100 m	4	Unlimited
100BASE-TX	100 m	100 m	2	Unlimited
1000BASE-T	100 m	100 m	–	Unlimited
10BASE-FL	2000 m	3100 m *(2)*	11 (fiber ring)	–
100BASE-FX	412 m/2000 m	4000 m with multimode fiber, 32.500 m with monomode fiber *(3)*	–	Unlimited
1000BASE-SX	275 m	–	–	Unlimited

(1) Based on 802.3, full duplex/half duplex.
(2) Depends on the optical fiber budget and fiber attenuation.
(3) Depends on the optical fiber budget and fiber attenuation, typical specification is 2 km for multimode and 15 km for monomode.

Physical Media

The Ethernet 802.3 defines the Physical Layer. A summary of the most common ones are shown below:

Type	Data rate	Cable type		Connector type	
		Defined by 802.3	Recommended by Schneider Electric	Defined by 802.3	Recommended by Schneider Electric
10BASE-T	**10 Mbit/s**	CAT 3 - UTP	CAT 5E - STP	RJ45	RJ45
100BASE-TX	**100 Mbit/s**	CAT 5 - UTP	CAT 5E - STP	RJ45	RJ45
1000BASE-T	**1 Gbit/s**	CAT 5 - UTP	CAT 5E - STP	RJ45	RJ45
10BASE-FL	**10 Mbit/s**	Two multimode fiber optic cables typically 62.5/125 µm fiber, 850 nm light wavelength	Two multimode fiber optic cables typically 62.5/125 µm fiber, 850 nm light wavelength	ST	ST
100BASE-FX	**100 Mbit/s**	Two multimode optical fibers typically 62.5/125 µm multimode fiber, 1300 nm light wavelength	Two multimode optical fibers typically 62.5/125 µm multimode fiber, 1300 nm light wavelength	ST	SC
		–	Two monomode optical fibers typically 9/125 µm multimode fiber, 1300 nm light wavelength	–	SC
1000BASE-SX	**1 Gbit/s**	Two 62.5/125 or 50/125 multimode optical fibers, 770 to 860 nm light wavelength	Two 62.5/125 µm or 50/125 m multimode optical fibers , 1300 nm light wavelength	SC	LC
1000BASE-LX	**1 Gbit/s**	–	Two 9/125 µm monomode optical fibers, 1300 nm light wavelength	–	LC

Nota : *The above are the specifications defined by IEEE 802.3. However some of the cables are no longer being developed. For instance, for 10BASE-T and 100BASE-TX, a CAT-5E cable is used.*

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Management

The Ethernet devices in general (end devices and the cabling devices) devices may be divided in two categories: unmanaged and managed devices:
■ **The unmanaged** devices are those which there is no possibility to configure or control any of the parameters of the device.
■ **The managed** devices are those which there is possibility to configure or control the parameters of the device (manage them) and to access to its internal information.

The ConneXium product line offers both types of devices.

There is also a third category of devices not specifically defined but is important to understand the difference. These devices only allow access to its information but can not be controlled and/or configured. Usually these devices are considered in the category of managed devices.

Managed devices

The managed devices offer the following features:
■ **Traffic optimization and filtering,** goal is to increase the bandwidth, or the traffic capacity in a network (some of the features in this area are message and port priority, flow control, multicast filtering, broadcast limiting, IGMP snooping, Vlan, etc.).
■ **VLAN,** a virtual LAN (VLAN) consists of a group of network participants in one or more network segments who can communicate with each other as if they belonged to the same LAN.
VLANs are based on logical (instead of physical) links. The biggest advantage of VLANs is their possibility of forming user groups based on the participant function and not on their physical location or medium.
Since broad/multicast data packets are transmitted exclusively within a virtual LAN, the remaining data network is unaffected. VLAN can also serve as a security mechanism to block unwanted Unicast messages.
■ **Security,** feature that helps the user protect the switch from unauthorized access that could result in changes in its configuration and impact the traffic going through the switch (some of the features in this area are port security, read/write community name, etc.).
User can also set up the switch so that it blocks messages coming from unauthorized “devices” source addresses connected to the switch.
■ **Time Synchronization,** feature that allows all the devices in the network to be synchronized on time.
■ **Network Redundancy,** to develop high availability applications.
■ …

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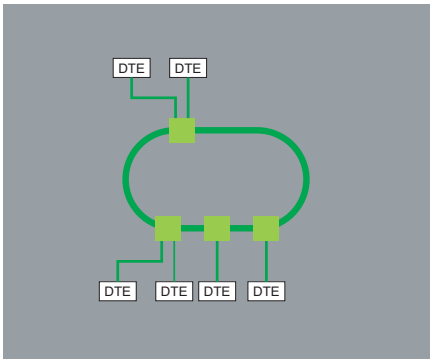
Redundancy

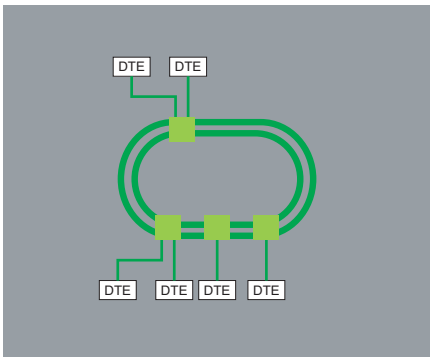
To develop high availability applications, “redundancy” in the networking infrastructure is the answer. By implementing a single ring architecture, or a coupled ring one, can protect themselves against losses of network segments.



Single Ring

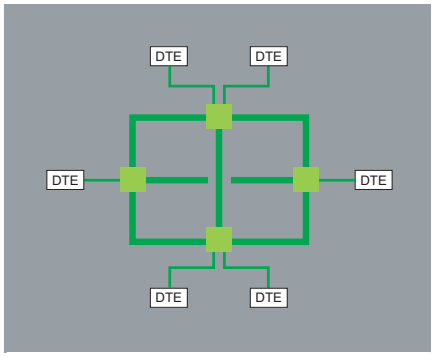
The first level of redundancy is achieved by implementing a single ring. The ConneXium switches allow the set up of backbone ring configurations.

The ring is constructed using the HIPER-Ring ports. If a section of the line fails, a ring structure of up to 50 switches transforms back to a line-type configuration within 0.5 seconds.



Dual Ring

The second level of redundancy is achieved by implementing a dual ring. The control intelligence built into the ConneXium switches allows the redundant coupling of HIPER-Rings and network segments.



Mesh topology using the rapid “Spanning Tree” protocol

A third level of redundancy can be achieved by implementing a mesh topology.
In simple terms,“Spaning Tree” is a protocol that ensures a single path for the signal, when multiple paths exist. If the active path is broken, the “Spanning Tree” protocol enables one of the alternatives paths.

The ConneXium switches offer the possibility.

Some countries require certain electrical components to undergo certification by law. This certification takes the form of a certificate of conformity to the relevant standards and is issued by the official body in question. Where applicable, certified devices must be labelled accordingly. Use of electrical equipment on board merchant vessels generally implies that it has gained prior approval (i.e. certification) by certain shipping classification societies.

Abbreviation	Certification body	Country
CSA	Canadian Standards Association	Canada
C-Tick	Australian Communications and Media Authority	Australia, New Zealand
GOST	Scientific research institute for GOST standards	Russia
UL	Underwriters Laboratories	USA

Abbreviation	Classification authority	Country
IACS	International Association of Classification Societies	International
ABS	American Bureau of Shipping	USA
BV	Bureau Veritas	France
DNV	Det Norske Veritas	Norway
GL	Germanischer Lloyd	Germany
LR	Lloyd's Register	UK
RINA	Registro Italiano Navale	Italy
RMRS	Russian Maritime Register of Shipping	Russia
RRR	Russian River Register	Russia
CCS	China Classification Society	China

The tables below provide an overview of the situation as at 1st June 2010 in terms of which certifications (listed next to their respective bodies) have been granted or are pending for our automation products.
Up-to-date information on which certifications have been obtained by products bearing the Schneider Electric brand can be viewed on our website: **www.schneider-electric.com**

Product certifications

Certified
Certification pending

	Certifications								
	UL	**CSA**	**ACMA** (C-Tick)	**GOST**	**Hazardous locations** *(1)* **Class I, div 2**	IEC Ex *(6)*	**TÜV Rheinland**	**SIMTARS**	**AS-Interface**
	USA	Canada	Australia	Russia	USA, Canada			Australia	Europe
Modicon OTB	■	■			■				
Modicon STB	■	■	■	■	FM	Zone 2 *(2)(5)*			
Modicon Telefast ABE 7	■	■	■						
ConneXium	■	■			*(2)*				
Magelis iPC/GTW	*(3)*		■	*(2)*	UL *(3)*	Zone 22 *(2)*			
Magelis XBT GT	■	*(2)*	■	*(2)*	CSA/UL *(2)*	Zone 2/22 *(2)(5)*			
Magelis XBT GK	*(3)*	■	■	■	CSA/UL				
Magelis XBT N/R/RT	■	■	■	■	CSA/UL	Zone 2/22 *(2)(5)*			
Magelis HMI STO/STU	*(2)(3)*		■	*(2)*	UL *(2)(3)*	*(2)*			
Modicon M340	■	■	■	■	CSA	Zone 2/22 *(2)(8)*			*(2)*
Modicon Momentum	■	■	■						
Modicon Premium	■	■	■	*(2)*	CSA			*(2)*	*(2)*
Modicon Quantum	■	■	■	*(2)*	FM *(2)*	Zone 2/22 *(2)*			
Modicon Quantum Safety	■	■	■	*(2)*	CSA	Zone 2/22 *(2)*	SIL 2, SIL 3 *(7)*		
Preventa XPSMF							SIL 3 *(7)*		
Modicon TSX Micro	■	■	■	■	■			■	*(2)*
Phaseo	*(3)*	■	■	■					
Twido	*(4)*	*(4)*		■	CSA/UL *(4)*				*(2)*

(1) Hazardous locations: According to UL 1604, ANSI/ISA 12.12.01, CSA 22.2 No. 213 and FM 3611, certified products are only approved for use in hazardous locations categorized as Class I, division 2, groups A, B, C and D, or in non-classified locations.
(2) Depends on product; please visit our website: www.schneider-electric.com.
(3) North American certification cULus (Canada and USA).
(4) Except for AS-Interface module TWD NOI 10M3, CE only.
(5) For zones not covered by this specification, Schneider Electric offers a solution as part of the CAPP (Collaborative Automation Partner Program). Please consult our Customer Care Centre.
(6) Refer to the instructions supplied with each ATEX and/or IECEx certified product.
(7) According to IEC 61508. Certified by TÜV Rheinland for integration into a safety function of up to SIL 2 or SIL 3.
(8) Can be used in gassy mines under certain conditions.

Merchant navy certifications

Certified / Certification pending	Shipping classification societies										
	ABS	BV	DNV	GL	KRS	LR	RINA	RMRS	RRR	PRS	CCS
	USA	France	Norway	Germany	Korea	Great Britain	Italy	Russia	Russia	Poland	China
Modicon OTB											
Modicon STB	*(1) (2)*	*(2)*	*(2)*	*(2)*		*(2)*	*(2)*	*(2)*	*(2)*		
Modicon Telefast ABE 7											
ConneXium											
Magelis iPC/GTW			*(2)*	*Bridge (2)*							
Magelis XBT GT	*(2)*	*(2)*	*(2)*	*(2)*		*(2)*	*(2)*	*(2)*	*(2)*		
Magelis XBT GK											
Magelis XBT N/R											
Magelis XBT RT											
Magelis HMI STO/STU		*(2)*									
Modicon M340								*(2)*	*(2)*		
Modicon Momentum											
Modicon Premium											
Modicon Quantum											
Modicon TSX Micro											
Phaseo											
Twido											

(1) Also covers US Navy requirements **ABS-NRV** part 4.
(2) Depends on product; please visit our website: www.schneider-electric.com.

EC regulations

European Directives

The open nature of the European markets assumes harmonization between the regulations set by the member states of the European Union. European Directives are texts whose aim is to remove restrictions on free circulation of goods and which must be applied within all European Union states.
Member states are obligated to incorporate each Directive into their national legislation, and to simultaneously withdraw any regulations that contradict it.
Directives - and particularly those of a technical nature with which we are concerned - merely set out the objectives to be fulfilled (referred to as “essential requirements”). Manufacturers must take all necessary measures to ensure that their products conform to the requirements of each Directive applicable to their equipment.
As a general rule, manufacturers certify compliance with the essential requirements of the Directive(s) that apply to their products by applying a CE mark. The CE mark is affixed to our products where applicable.

Significance of the CE mark

The CE mark on a product indicates the manufacturer's certification that the product conforms to the relevant European Directives; this is a prerequisite for placing a product which is subject to the requirements of one or more Directives on the market and allowing its free circulation within European Union countries. The CE mark is intended for use by those responsible for regulating national markets.
Where electrical equipment is concerned, conformity to standards indicates that the product is fit for use. Only a warranty by a well-known manufacturer can provide assurance of a high level of quality.
As far as our products are concerned, one or more Directives are likely to apply in each case; in particular:

- The Low Voltage Directive (2006/95/EC)
- The Electromagnetic Compatibility Directive (2004/108/EC)
- The ATEX CE Directive (94/9/EC)

Dangerous substances

These products are compatible with:

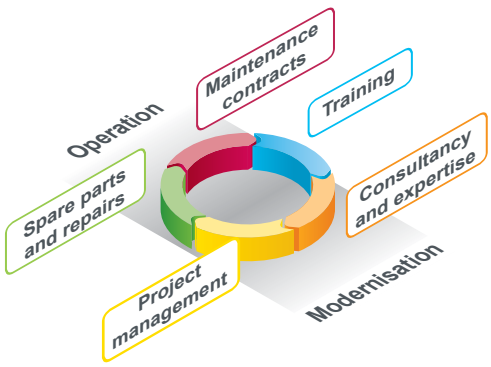
- The WEEE Directive (2002/96/EC)
- The RoHS Directive (2002/95/EC)
- The China RoHS Directive (Standard SJ/T 11363-2006)
- The REACH regulations Directive (EC 1907/2006)

Note: *Documentation on sustainable development is available on our website www.schneider-electric.com (product environmental profiles and instructions for use, ROHS and REACH directives) .*

End of life (WEEE)

End of life products containing electronic cards must be dealt with by specific treatment processes.
When products containing backup batteries are unusable or at end of life they must be collected and treated separately. Batteries do not contain a percentage by weight of heavy metals above the limit specified by European Directive 2006/66/EC.

A dedicated services offer for your installed base
Operation services



You can rely on the competency and efficiency of our experts for effective maintenance, upgrading and modernisation of your facilities.

Our services offer is structured around two phases of your installation life cycle:
- Operation:
  - Spare parts and repairs
  - Maintenance contracts
  - Training
- Modernisation:
  - Consultancy and expertise
  - Project management

Customization services are also available to accommodate your specific requirements.

Operation services

Spare parts and repairs

Everything you need to get your equipment back to work as quickly as possible

We are able to respond very quickly to all requests for spare parts, exchanges and repairs to your installed automation equipment (automation platforms, Human Machine Interfaces, drives, distributed I/O):
- Supply of tested, certified and compatible spare parts
- Assurance that repaired parts will be of the same quality as new products
- Availability of our teams to respond to your requests 24/7
- Standard replacements or fast exchange service for certain parts with the option to receive the replacement product the next business day

Maintenance contracts

Improving and guaranteeing the long-term reliability and performance of your installations

We provide a contract solution to fulfil your logistical, technical, human and financial requirements. This solution is based around the following services:
- Hotline with priority access to our group of experts
- Software via the Internet with access to the latest upgrades of the most recent software
- Spare parts stock - a Schneider Electric owned stock of spare parts on your site or in one of our warehouses
- On-site assistance with guaranteed servicing time *(1)*
- Extended warranty offering up to 5 years manufacturer warranty on all installed equipment ranges on your site *(1)*
- Maintenance & Modernisation Consultancy providing analysis of existing systems and proposal of a detailed improvement plan *(1)*
- Modernisation - a complete process to update your legacy systems based upon your specific requirements *(1)*

(1) Also available as a stand alone offer. Please consult our Customer Care Centre.

Training

Dedicated training plans to allow you to acquire the necessary competencies to optimize productivity of your installed base

We are committed to providing your teams with the necessary competencies to operate more effectively, make the operations more secure and optimize the efficiency of your installed equipment:
- Identification of your needs by systematic analysis of the competency and functions of your teams
- Proposal of a set of training modules covering your entire installed automation equipment base
- Preparation of customized modules to suit your needs (content, schedule, etc.).

***Note**: To check availability of services required, please contact our Customer Care Centre.*

A dedicated services offer for your installed base

Modernisation services
Customization services

Modernisation services

Consultancy and expertise

With our M2C (Maintenance & Modernisation Consultancy) offer, we help you check the state of your installed base by:
- Defining the scope and depth of the analysis in collaboration with you
- Collecting the technical data without shutting down production
- Analyzing and identifying avenues for improvement
- Producing a recommendation plan

Customer benefits:
- Reduction in the impact of failures
- Limited number of failures
- Improved performance

The M2C (Maintenance & Modernisation Consultancy) offer

Proven expertise, tools and methods to give you a clear vision of the improvement opportunities and guide you toward a successful modernisation project

Our experts will analyze your existing systems, propose an action plan and deploy the appropriate solutions.

■ **Process consultancy**

Based on audit implementation dedicated to your application, our consultants will help you assess opportunities, define various solutions, estimate budgets and draw up a deployment plan.

■ **Installed base consultancy**

For preventive maintenance operations or in case of failures or malfunctions, our tools and methods can be used for diagnosis and control of critical automation functions, such as communication networks, high-power drives and process control automation.
A detailed report with comments is submitted as part of our service.

Project management

Professional tools, methods and a proven experience in project management to reduce risks and improve performance.

Our services are provided by experienced project managers who have a precise knowledge of the evolution of our equipment and use efficient tools and methods with proven effectiveness to:
- Limit production down time by using our conversion and software/hardware migration solutions
- Improve performance of existing tools by:
  - Analyzing the performance levels to be achieved and designing, validating and implementing the new architecture
  - Updating your application following modernisation of your equipment
- Provide long-term support by ensuring:
  - The design and deployment of a standardized solution for projects spanning several production sites
  - A contractual approach that provides a change from the usual investment process, combining maintenance of existing facilities and scheduled modernisation
  - Training of maintenance teams on the operation of the new system

Wide range of migration offers

Solution		Change the CPU	Keep the I/O racks & wiring	Change the I/O racks & keep the wiring	Migrate your application	Manage your project	Execute your project
Platform *(1)*	TSX47 to TSX107	⊖	⊖	⊖	⊖	⊖	⊖
	April series 1000			⊖	⊖	⊖	⊖
	Modicon ●84, compact	⊖	⊖	⊖	⊖	⊖	⊖
	April SMC				⊖	⊖	⊖
	Merlin Gerin PB				⊖	⊖	⊖
	AEG	⊖	⊖	⊖	⊖	⊖	⊖
	Symax	⊖			⊖	⊖	⊖

⊖ Service available

(1) Our migration service offer also includes SCADA, Human Machine Interfaces, drives, communication networks and distributed I/O.

Customization services

We are able to meet your specific requirements and provide you with adapted products:
- Protective coating for Human Machine Interfaces, automation platforms and distributed I/O modules for use in harsh environments
- Customized cable lengths to match your specific needs
- Customized front panels for Human Machine Interfaces

***Note**: To check availability of services required, please contact our Customer Care Centre.*

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Schneider Electric Industries SAS

www.schneider-electric.com

Head Office
35, rue Joseph Monier
F-92500 Rueil-Malmaison
France

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Design: Schneider Electric
Photos: Schneider Electric
Printed by:

MKTED2120701EN

ART. 838886

September 2012

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Modicon Quantum automation platform

2012