

Automation & Control **Modicon Quantum** **automation platform**

Unity, Concept & ProWORX 32

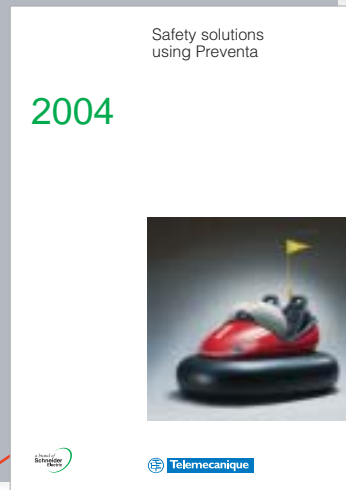
Catalogue
July

04





**Control and Protection,
Detection,
Automation,
Human/Machine dialogue,
Communication**

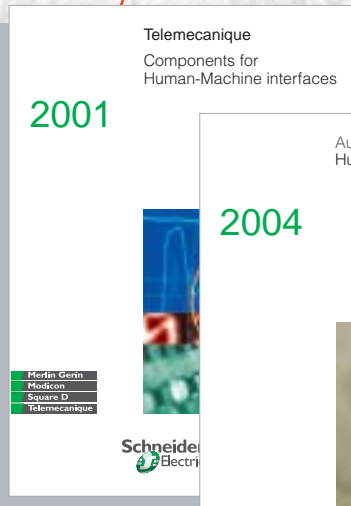


**Control and Protection,
Detection,
Automation,
Human/Machine dialogue**

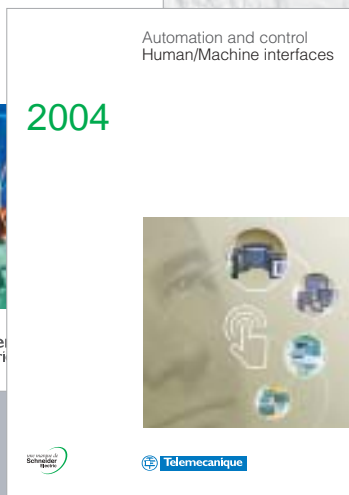


**Human/Machine dialogue
Communication**

Control and signalling units
Art. 28697 - MKTED299014EN



Terminals and display units
Art. 96949 - MKTED2040401EN

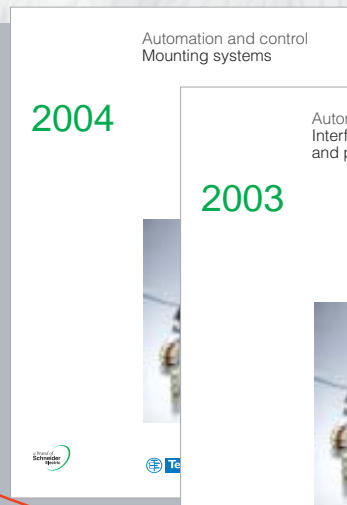


**Human/Machine dialogue
Supervision**

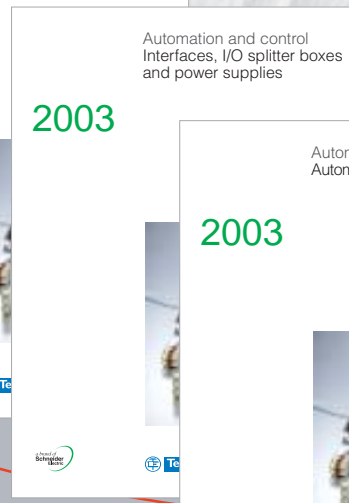
**An overview
of the product range**

**Control and protection,
Detection,
Automation,
Human/Machine dialogue,
Communication,
Supervision,
Panel-building and cabling
accessories**

To be issued



Art. 70263 - MKTED203113EN



Art. 70455 - MKTED204011EN



**Panel-building and cabling accessories
Automation**

AUTC201108140EN

Distributed I/O
Advantys STB

2003



Telemecanique

AUTC201104124EN

Modicon Momentum
automation platform

2002



Schneider
Electric

Art. 802621 - MKTED204071EN

Automation and control
Automation platform
Modicon Quantum
and Unity - Concept
Proworx software

2004



Schneider

Telemecanique

Art. 802625 - MKTED204072EN

Automation and control
Automation platform
Modicon Premium
and Unity - PL7 software

2004



Schneider

Telemecanique

Art. 70984 - MKTED204012EN

Automation platform
Modicon TSX Micro
and PL7 software

2004



Schneider

Telemecanique

Automation,
Communication

Art. 960015 - DIA1ED2040506EN

Automation and control
Telemecanique
The essential

2004



Schneider

Telemecanique

Art. 66692 - DIA7ED20310006EN

Motion control
Lexium

2004

Art. 61233 - DIA7ED2030902EN

Twin Line
Motion control

Art. 802660 - MKTED204091EN

2003

Soft starters and
variable speed drives

Art. 27501 - MKTED201001EN

2004

Motor starter solutions
Control and protection
components

2001



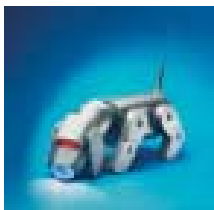
Schneider

Schneider
Electric

Art. 54752 - MKTED203031EN

Global Detection
Electronic and
electromechanical sensors

2003



Schneider

Telemecanique

Control and protection

Detection

Modicon Quantum automation platform

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Schneider Electric worldwide

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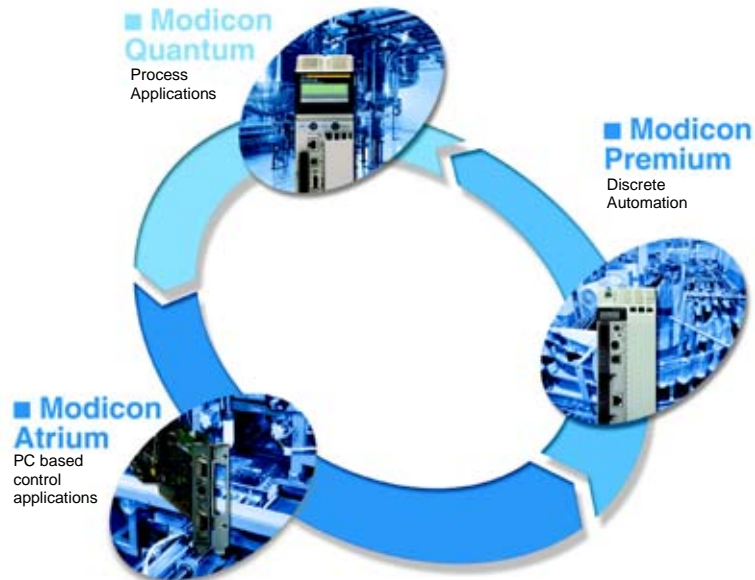
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Modicon Quantum automation platform

To the world of Telemecanique

Modicon automation platforms

A family of specialist automation platforms



Modicon is the family name for a set of complementary automation platforms. They are characterized by their extendable memory capacity and increasing execution speed.

Premium, an optimized platform for complex machinery, factory automation applications and infrastructure

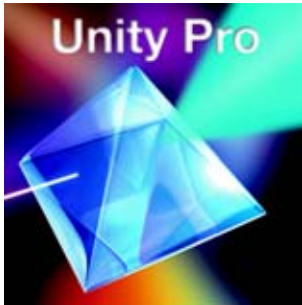
- Up to 7 Mb of program memory
- Compact size and high density I/O modules
- Extension racks for multirack architectures
- Extensive catalog of sensor/actuator buses, machine buses and fieldbuses
- Integrated Ethernet TCP/IP port on many CPUs
- Motion control, electronic cam, weighing and machine safety modules

Quantum, an optimized platform for batch/process applications, with high levels of availability

- Up to 7 Mb of program memory
- Powerful process control library
- Supports fieldbuses for batch/process applications
- Integrated Ethernet TCP/IP port on new CPUs
- High performance Hot Standby solution
- Special treatment to resist corrosive atmospheres

Atrium, the slot PLC meeting PC Based requirements

- All the functionality of a PLC integrated in a PC
- No compromise of ruggedness or HMI integration



Unity software

A new organizer environment for high end Modicon platforms

To complement the existing software catalog, Unity offers a common environment for Modicon Premium, Quantum and Atrium platforms. Based on the best standards in existing software offers, Unity is a high performance programming tool that can significantly increase productivity by means of:

- State-of-the-art functionality
- Optimum standardization enabling re-use of developments
- Numerous tools for testing the program and improving system operation
- New integrated diagnostic services

The Unity software catalog also offers specialist software representing another major step towards "Collaborative Automation":

- Management of distributed control architecture projects
- Design and generation of batch/process applications with PLC/HMI integration
- Openness to developments in C language or in VBA (Visual Basic for Applications)

Transparent Ready

Web technology serving automation solutions

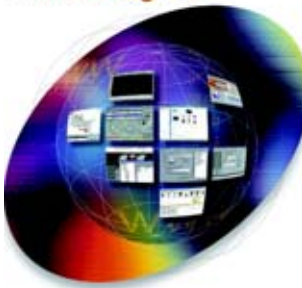
Let us introduce you to the world of Transparent Ready - a world where products are compatible, interoperable and easy to maintain.

With Transparent Ready, you can:

- Use Ethernet in infrastructures from field level to MES level
- Gain competitive advantage through the adoption of tried and tested technology
- Reduce downtime via Web-based diagnostics
- Create secure inter-factory communication worldwide
- Control costs through the use of standards



Collaborative Automation Partner Program



Collaborative Automation

The new world of automation

- Rather than opting for proprietary systems, Telemecanique has adopted market standards such as IEC languages, Ethernet TCP/IP, Modbus IDA, XML, OPC, IT standards, etc.
- Partnerships with recognized leading hardware and software specialists have been developed within the scope of the Collaborative Automation Partner Program in an effort to share technology more effectively.
- You will be assured of designing the best solution without compromising on ease of integration.



140 CPU 651 ●●

New CPUs

With Unity, the range has been complemented by new, faster CPUs with additional memory extension capability.

Extension of the range

- New high-performance 140 CPU 651 50 and 140 CPU 651 60 processors
- New entry level 140 CPU 311 10 processor
- High-performance 140 CPU 671 60 processor dedicated to Hot Standby redundant applications

Optimum execution speed

- Entry level 140 CPU 311 10 processor, 4 times faster than Concept (140 CPU11302)
- New CPU architecture with:
 - "Intel inside" Pentium dual processor structure
 - High-performance multitask structure
- Optimum performance with 140 CPU 651/671 ●● processors:
 - 52 ns for a Boolean instruction
 - 45 ns for a numerical instruction

Memory enhancements

- Program memory extension up to 7 Mb per PCMCIA card
- File storage on PCMCIA card
- Customizable program download to the PLC (with or without source code, binary, symbols, etc).

Communication enhancements

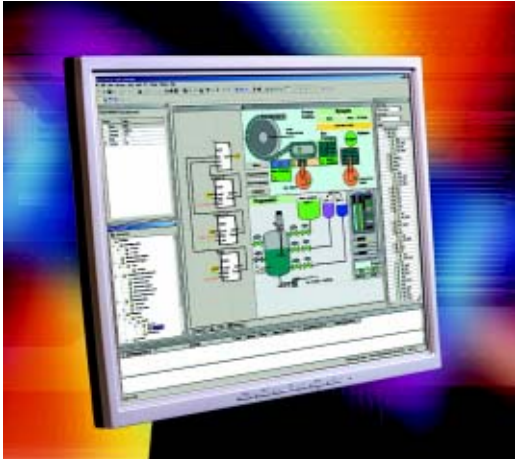
- USB programming port on high-end CPUs
- Integrated Ethernet port with active Web server and automatic E-mail transmission on event
- Enhanced Ethernet performance
- New Profibus DP V1 fieldbus partner module

High performance Hot Standby solution

- Plug and Play configuration
- Excellent switching performance (speed and application size)
- Keypad/display for diagnostics and control

Modicon Quantum automation platform

New features in Unity Quantum



New software

Unity Pro, a seamless continuation of Concept

Unity Pro has been designed primarily to ensure continuity with Concept in order to cut training costs to a minimum. In addition, the Concept IEC application converter is included as standard in Unity Pro.

ProWORX 32 remains the “easy to use” software chosen as the reference software for Modicon LL984 language.

Unity Pro boosts software productivity by means of

- Development made easier by:
 - a graphic hardware configuration
 - use of all editors in parallel while maintaining consistency of data
- Increased quality during testing and startup phases with the addition of new dedicated tools
- Reduction in machine downtimes during use:
 - direct access to the functional view and the function modules
 - runtime screens
 - integrated application diagnostics with tracking of operator actions
- Simplified integration of third-party tools:
 - hyperlinks to any level of the project
 - XML import/export on any project element
 - access to the Unity Pro database and server

Advanced Unity Pro specialist software

- Unity Studio has the task of structuring distributed applications where several applications and devices communicate with one another via Ethernet. Unity Studio is particularly suitable for the needs of the manufacturing industry and of infrastructure.
- Unity Application Generator (UAG) is specialist software for developing and generating process control applications. Unity Application Generator is particularly suitable for the needs of continuous control in batch/process industries.
- Unity Developer's Edition (UDE) is specialist software providing static or dynamic access to all Unity servers based on development in VBA, VB or C++.
- Unity EFB Toolkit is specialist software for development in C language of tailor-made functions destined for integration in Unity Pro function libraries.
- Unity SFC View is an Active X component designed for monitoring and diagnostics of SFC sequential applications from an HMI station.



1.1 - Quantum processors - Unity

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■ PCMCIA memory extension cards page 1/10

1.2 - Quantum processors - Concept/ProWORX 32

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■ Quantum processors

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Automation platform for Unity Pro software offer	Simple applications	Simple and complex applications	Complex applications
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Number of racks 2/3/4/6/10/16 slots	Local I/O	2 racks (1 main + 1 extension)	
	Remote I/O (RIO)	31 stations with 2 racks	
	Distributed I/O (DIO)	3 networks with 63 single-rack stations	
Maximum discrete I/O (1)	Local I/O	No limit (max. 27 slots)	
	Remote I/O (RIO)	31,744 input channels and 31,744 output channels	
	Distributed I/O (DIO)	8000 input channels and 8000 output channels per network	
Maximum analog I/O (1)	Local I/O	No limit (max. 27 slots)	
	Remote I/O (RIO)	1984 input channels and 1984 output channels	
	Distributed I/O (DIO)	500 input channels and 500 output channels per network	
Application-specific modules		Intrinsically safe I/O, high-speed counter, axis control, 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 232/485 Modbus slave RTU/ASCII ports	2 integrated RS 232 Modbus slave RTU/ASCII ports
	AS-Interface actuator/sensor bus	Limited number on local rack (max. 27 slots), 4 on remote rack (RIO), 2 on distributed rack (DIO)	
	Profibus DP/SERCOS MMS (2)	Profibus DP/SERCOS MMS, 2 "option" modules on local rack	Profibus DP/SERCOS MMS, 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	–	

Process control	Control loops (4)	20 to 40 programmable channels	40 to 80 programmable channels	60 to 100 programmable channels
Redundancy	Power supplies, remote I/O network, Modbus Plus modules, Ethernet TCP/IP modules			
Hot Standby availability	–			

Memory capacity without PCMCIA card	IEC program	400 Kb	800 Kb	2716 Kb
	Located data (State RAM)	20 Kb	128 Kb	
Memory extension with PCMCIA card	Program and data storage	–		
	Data storage	–		

Quantum CPU	140 CPU 311 10	140 CPU 434 12 U	140 CPU 534 14 U
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(1) Modbus Plus modules: Only the first 2 of the 6 modules feature the full range of functions.

(2) The maximum values for the number of discrete I/O and analog I/O are not cumulative.

(3) Usage values, including memory resources and processor power.

(4) The number of loops is limited according to their complexity (volume of associated data to be transferred from Normal to Standby).

(5) Profibus DP modules by our partner Prosoft.

Complex applications

Applications with redundancy (Hot Standby)



2 racks (1 main + 1 extension)
 31 stations with 2 racks (1 main + 1 extension)
 3 networks with 63 single-rack stations
 No limit (max. 26 slots)
 31,744 input channels and 31,744 output channels
 8000 input channels and 8000 output channels per network
 No limit (max. 26 slots)
 1984 input channels and 1984 output channels
 500 input channels and 500 output channels per network
 Intrinsically safe I/O, high-speed counter, axis control, interrupt inputs, serial link, accurate time stamping

6

1 integrated RS 232/485 Modbus slave RTU/ASCII port

Limited number on local rack (max. 26 slots), 4 on remote rack (RIO), 2 on distributed rack (DIO)

Profibus DP/SERCOS MMS, 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

1 integrated 100BASE-FX Hot Standby port,
6 "option" modules on local rack

1 port reserved for programming PC

20 to 60 programmable channels

> 60 programmable channels

> 60 programmable channels (5)

Power supplies, remote I/O network, Modbus Plus modules, Ethernet TCP/IP modules

–

Yes

512 Kb

768 Kb

128 Kb

Up to 7168 Mb

8192 Mb

140 CPU 651 50

140 CPU 651 60

140 CPU 671 60

1/9

(1) Modbus Plus modules: Only the first 2 of the 6 modules feature the full range of functions.

(2) The number of loops is limited according to their complexity (volume of associated data to be transferred from Normal to Standby).

(3) The maximum values for the number of discrete I/O and analog I/O are not cumulative.

(4) Usage values, including memory resources and processor power.

(5) Profibus DP modules by our partner Prosoft.

Modicon Quantum automation platform

Unity processors



Presentation

Modicon Quantum CPUs are a family of high-performance programmable controllers based on 486, 586 and Pentium processors, and are compatible with Unity Pro software. Some of the features implemented in these CPUs include:

- Superior scan times and I/O throughput.
- Ability to handle interrupts, timed and I/O based.
- Handling of Fast task, as well as a Master task.
- Memory expansion through PCMCIA cards.
- Multiple communication interfaces embedded in the CPU.
- A user-friendly diagnostic and operation LCD display on the front panel of high-end models.

The processors offered can be differentiated by their memory capacities, processing speeds and communication options.

Memory backup, protection and expansion

The CPUs store the application program in a battery-backed internal RAM. The battery is located on the front of the module and can be serviced while the CPU is running.

To protect the application program from inadvertent changes during operation, the processors feature a key switch on the front panel. This key switch can also be used to start and stop the CPU. The 140 CPU 311 10 processor only has a memory-protect slide switch.

A memory protection bit, to be set in configuration mode, is also available to lock any program modification (via the programming PC or downloads).

High-end processors 140 CPU 651 50/60 and 140 CPU 671 60 have 2 slots for a PCMCIA card:

- An upper slot (no. 0) to receive memory extension cards (programs, symbols, constants and/or data files).
- A lower slot (no. 1) to receive memory extension cards specific to the data files.

Built-in communication ports

Quantum CPUs support:

- Two Modbus RS 232 ports (Modbus RS 485 with 140 CPU 651 00 and 140 CPU 671 60 processors)
- One Modbus Plus port

Depending on the model, Quantum processors can include:

- A 10BASE-T/100BASE-TX Ethernet TCP/IP port (RJ45 connection)
- A USB port for connecting a programming terminal

LCD display

Some CPU models have an LCD display (2 lines of 16 characters) with brightness and contrast controls. Through a keypad and the display the CPUs can be diagnosed, some configuration parameters can be set and the CPUs can be started and stopped.

Hot Standby (redundancy)

The Quantum 140 CPU 671 60 processor is dedicated to managing Hot Standby functionality. It has an Ethernet 100 Mbps fiber optic link and the Hot Standby function can be diagnosed through the LCD display.

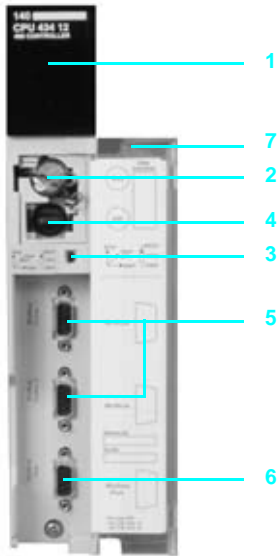
Quantum application design and installation

Installation of these Quantum processors requires:

- Unity Pro Large or Extra Large programming software. This software is compatible with the Premium platform.
- Optionally, as required:
 - The Unity Studio software suite, used to design distributed applications
 - Unity Application Generator (UAG) specialist software for modeling and generating process applications
 - Unity EFB toolkit software for developing EF and EFB function block libraries in C language
 - Unity SFC View software for display and diagnostics of applications written in Sequential Function Chart (SFC) language

Modicon Quantum automation platform

Unity processors



140 CPU 434 12U/534 14U

Description

Basic processors

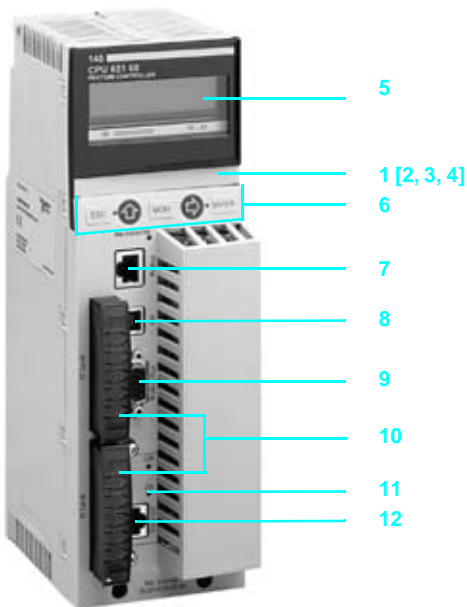
The **140 CPU 311 10**, **140 CPU 434 12U** and **140 CPU 534 14U** processor front panels comprise:

- 1 A display unit consisting of 7 LEDs:
 - ☐ Ready LED (green): the CPU has passed the power-up diagnostic tests
 - ☐ Run LED (green): the CPU has been started and is solving logic
 - ☐ Modbus LED (green): communications are active on the Modbus port
 - ☐ Modbus Plus LED (green): communications are active on the Modbus Plus port
 - ☐ Mem Prt LED (orange): write-protected memory (activated memory protection switch)
 - ☐ Bat Low LED (red): the battery needs replacing or is not present
 - ☐ Error A LED (red): indicates communications error on the Modbus Plus port
- 2 One backup battery slot
- 3 One slide switch for selecting the Modbus port communication parameters
 - ☐ One slide switch (140 CPU 311 10 model) to write-protect the memory.
- 4 One key-operated switch (140 CPU 434 12U/534 14U models):
 - ☐ Stop position: the programmable controller is stopped and program modifications are not authorized
 - ☐ Mem Prt position: the programmable controller is either stopped or is running and program modifications are not authorized
 - ☐ Start position: the programmable controller is either stopped or is running and program modifications are authorized
- 5 Two 9-pin female SUB-D connectors for connecting to the Modbus bus
- 6 One 9-pin female SUB-D connector for connecting to the Modbus Plus network
- 7 A removable, hinged door with customer identification label.

High-performance processors

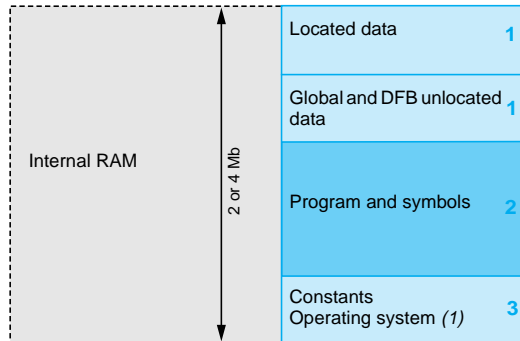
The **140 CPU 651 50**, **140 CPU 651 60** and **140 CPU 671 60** processor front panels comprise:

- 1 An LCD display cover, providing access to:
- 2 A key switch:
 - ☐ Unlocked: all system menu operations are able to be invoked and all changeable module parameters are able to be modified by the operator via the LCD and keypad, memory protection is off.
 - ☐ Locked: no system menu operations are able to be invoked and all changeable module parameters are read only, memory protection is on.
- 3 One backup battery slot.
- 4 One 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 One 9-pin female SUB-D connector for connecting to the Modbus Plus network.
- 10 Two slots for PCMCIA memory extension cards.
- 11 Two LEDs:
 - ☐ COM LED (green): indicates Ethernet activity (140 CPU 651 50/60 models), indicates Hot Standby primary or secondary station activity (140 CPU 671 60 model)
 - ☐ ERR LED (red): indicates Ethernet collision (140 CPU 651 50/60 models), indicates communications error between Hot Standby primary and secondary stations (140 CPU 671 60 model).
- 12 An RJ45 connector for connecting to the Ethernet network (140 CPU 651 50/60 model).
 - ☐ One MT-RJ fiber optic connector for interconnecting the primary and secondary PLCs in the Hot Standby architecture (140 CPU 671 60 model).



140 CPU 651 50/60

Processor without a PCMCIA memory card



Memory structure

The application memory is divided into memory areas physically distributed in the internal RAM memory and on 1 or 2 PCMCIA memory extension cards (only on 140 CPU 651 50/60 and 140 CPU 671 60 processors):

- 1 Application data area always in the internal RAM. This area is broken down into 2 types of data to be used according to the user's habits and choices:
 - Located data corresponding to data defined by an address (for example, %MW237) with which a symbol may 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 addresses are assigned automatically
 - DFB unlocated data corresponding to DFB user function blocks. The size of this object zone is limited only by the available memory in integrated RAM.

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

- 3 Constants area in the internal RAM or in 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 and 140 CPU 671 60 processors).

According to the application memory size requirements, two memory structures are possible depending on whether the Quantum processor (140 CPU 651 50/60 or 140 CPU 671 60 models) has 0, 1 or 2 PCMCIA memory extension cards:

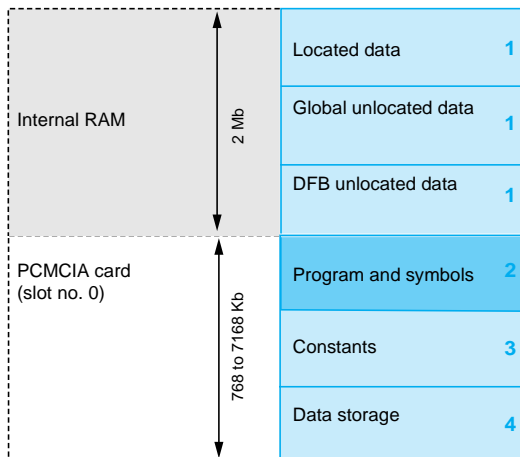
- Application in internal RAM, the application is completely loaded into the processor's battery-backed internal RAM (2), the capacity of which depends on the processor model.
- Application in the PCMCIA card, whereby the internal RAM is reserved for the application data. The PCMCIA memory card contains the program space (program areas, symbols and constants). Certain types of PCMCIA memory card also utilize the data file storage area.

The presence of the symbols area with the program area is optional. Having the application symbols database on the PLC means that, when connected to a programming terminal not containing any applications, all the elements needed to debug or upgrade this PLC are available within the PLC.

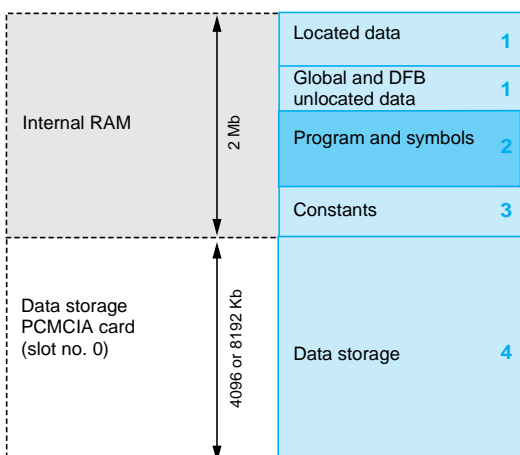
(1) Only for 140 CPU 311 10/434 12U/534 14U processors.

(2) The internal RAM memory is backed up by a cadmium nickel battery. The RAM memory cards are protected by a Lithium battery.

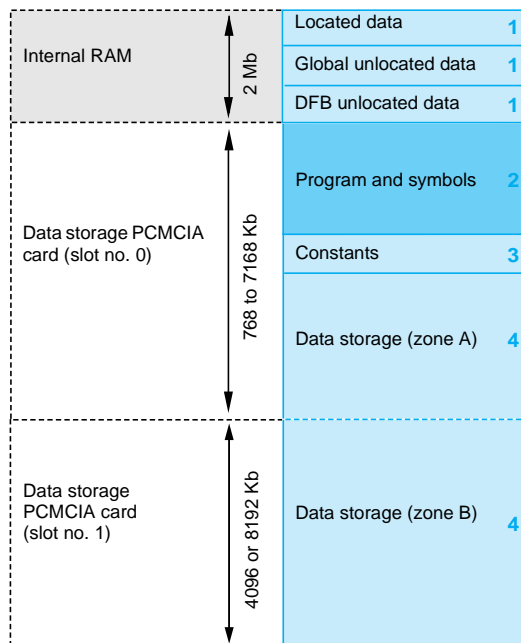
Processor with PCMCIA memory card in slot no. 0



Processor with data storage type memory card in slot no. 0



Processor with 2 PCMCIA memory cards in slots no. 0 and no. 1



Memory structure (continued)

Extension 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.
- The 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

Whatever the PLC memory structure:

- The application located in the internal RAM or in the PCMCIA card can be protected in order to prohibit its access (read or modify program) in online mode with Unity Pro.
- A memory protection bit, to be set in configuration mode, is also available to lock any program modification (via the programming terminal or downloads).

Quantum programmable controllers have been developed to comply with the main national and international standards in respect of the electronic equipment used in process automation. See pages 9/2 to 9/7 "Standards, certification and environmental conditions".

Characteristics and performance

Type of processor				140 CPU 311 10	140 CPU 434 12U	140 CPU 534 14U	140 CPU 651 50	140 CPU 651 60	140 CPU 671 60
Maximum configuration	No. of racks with 2/3/4/6/10/16 slots	Local I/O		2					
		Remote I/O		31 drops x 2 racks					
		Distributed I/O		63 drops x 1 rack/3 networks					
Inputs/Outputs	Discrete I/O (1)	Local I/O		Unlimited (27 slots max.)			Unlimited (26 slots max.)		
		Remote I/O		31,744 inputs and 31,744 outputs					
		Distributed I/O		8000 inputs and 8000 outputs per network					
	Analog I/O (1)	Local I/O		Unlimited (27 slots max.)			Unlimited (26 slots max.)		
		Remote I/O		1984 inputs and 1984 outputs					
		Distributed I/O		500 inputs and 500 outputs per network					
	Application-specific I/O			Intrinsic safety, counter, motion control I/O, high-speed interrupt inputs, serial link, accurate time stamping					
Communications	No. of option modules (in local rack)	Ethernet, Modbus Plus, Profibus DP, SERCOS, SY/Max		2	6				
	Maximum no. of Modbus connections			2 integrated RS (2)	2 integrated RS 232 Modbus/ASCII		1 integrated RS 232/485 Modbus/ASCII		
		Modbus Plus		1 integrated, 2 max. in local rack	1 integrated, 6 max. in local rack				
		Ethernet TCP/IP		2 max. in local rack	6 max. in local rack		1 integrated, 6 max. in local rack		
		Profibus DP		2 max. in local rack	6 max. in local rack				
		AS-Interface		Unlimited (27 slots max.) in local rack, 4 in remote drop, 2 in distributed drop			Unlimited (26 slots max.) in local rack, 4 in remote drop, 2 in distributed drop		
		USB		–			1 port reserved for programming PC		
Functions	Redundancy		Power supplies, remote I/O networks, Modbus Plus, Ethernet TCP/IP, CPUs						
	Process control		Yes						
	Hot Standby		–						Yes
Memory capacity without PCMCIA card	Internal RAM	Mb	2	4	2				
	Program and unlocated data (min.)	Kb	400	800	2716	512	768		
	Located data and config. (max.)	Kb	148	256					
Memory capacity with PCMCIA card	Program	Kb	–			7168			
	Configuration and located/unlocated data (max.)	Kb	–			512	1024		
Maximum size of memory object areas	Flash	Kb	1152			–			
	Located internal bits (%Mi)	bits	51,712	65,528					
	Located internal data	Kb	19.3	130					
	Unlocated internal data	Kb	548	1056	2972	512/768 (with/no PCMCIA)	1024		
Key switch	Start/Stop/Mem prot		–	Yes		–			
	Mem prot on/off		–	–			Yes		
Slide switch	Mem prot/off		Yes	–					
	Com port: ASCII/RTU/Mem		Yes			–			
Application structure	Master task		1 cyclic/periodic						
	Fast task		1 periodic						
	Auxiliary tasks		0					4	
	Interrupt tasks	Max. number		64			128		
		I/O Interrupt		64			128		
	Timer Interrupt		16			32			
Execution time for one instruction (3)	Boolean	µs	0.12...0.585		0.08...0.585	0.0525...0.075			
	On word	µs	0.12...0.585		0.08...0.585	0.045...0.06			
	On fixed-point arithmetic	µs	0.10...0.27		0.07...0.27	0.045...0.06			
	Floating point	µs	0.10...0.27		0.07...0.27	0.48...0.56	0.40...0.50		
No. of Kinstructions executed by ms	100% boolean	Kins/ms	1.86		1.97	10.28			
	65% boolean and 35% numerical	Kins/ms	2.49		2.61	9.91	10.07		
System overhead	MAST task	ms	1						
	FAST task	ms	0.2						

(1) The maximum values of number of discrete and analog I/O are not cumulative.

(2) 2 RS 232/485 Modbus/ASCII integrated links

(3) Threshold values according to the type of instructions.

Modicon Quantum automation platform

Unity processors



140 CPU 311 10



140 CPU 651 00

Unity CPUs

Processor	Coprocessor	Memory (max.)		Program with PCMCIA card.	Communication ports	Reference	Weight
		RAM	Program				
Clock speed							
MHz		Mb	Kb	Kb			kg
66	Built-in math processor	2	548	–	2 Modbus RS 232 1 Modbus Plus	140 CPU 311 10	–
	Built-in math processor	2	1056	–	2 Modbus RS 232 1 Modbus Plus	140 CPU 434 12U	–
133	Built-in math processor	4	2972	–	2 Modbus RS 232 1 Modbus Plus	140 CPU 534 14U	–
166	Yes, built-in Ethernet TCP/IP	2	768	7168	1 Modbus (1) 1 Modbus Plus 1 USB 1 Ethernet TCP/IP	140 CPU 651 50	–
266	Yes, built-in Ethernet TCP/IP	2	1024	7168	1 Modbus (1) 1 Modbus Plus 1 USB 1 Ethernet TCP/IP	140 CPU 651 60	–
					1 Modbus (1) 1 Modbus Plus 1 USB 1 Hot Standby port (100 Mbps)	140 CPU 671 60	–

(1) Modbus RS 232/RS 485 port.

PCMCIA memory extension cards

Quantum 140 CPU 651 50/60 and 140 CPU 671 60 processors can accept up to 2 memory extension cards. However, the useful memory capacity is limited to the maximum size defined for the processor model. See pages 1/10 and 1/11.

Connection cables

Description	Use		Length	Reference	Weight kg
	From processor	To PC port			
Connection cables for PC terminal	9-pin SUB-D Modbus port for 140 CPU 311 10, 140 CPU 434 12U, 140 CPU 534 14U	RS 232 (9-pin SUB-D connector)	3.7 m	990 NAA 263 20	0.300
			15 m	990 NAA 263 50	1.820
	RJ45 Modbus port for 140 CPU 601 00	RJ45 connector	1 m	110 XCA 282 01	—
			3 m	110 XCA 282 02	—
			6 m	110 XCA 282 03	—
	USB port for 140 CPU 601 00		USB port	3.3 m	UNY XCA USB 033
Connection cables for Modbus Plus network	9-pin SUB-D Modbus port for 140 CPU 311 10, 140 CPU 434 12U, 140 CPU 534 14U	Modbus Plus tap	2.4 m	990 NAD 211 10	—
			6 m	990 NAD 211 30	—
	9-pin SUB-D Modbus port for 140 CPU 601 00	Modbus Plus tap	2.4 m	990 NAD 218 10	—
			6 m	990 NAD 218 30	—
Adapter	RJ45 connector for 140 CPU 601 00	RS 232 (9-pin SUB-D connector)	—	110 XCA 203 00	—

Modicon Quantum automation platform

PCMCIA memory extension cards

1

1.1

Presentation

PCMCIA memory extension cards make it possible to extend the RAM memory capacity of high-performance Quantum processors.

Depending on the model, these cards are designed to accommodate:

- The program, symbols and constants of the application
- The additional data of the application
- Or both

PCMCIA memory extension cards

All the cards fit into PCMCIA slots in the Quantum 140 CPU 651 ●0/671 60 processors.

These cards provide three different storage types:

- Storage of the application: program, symbols and constants in a common space 512 Kb to 4096 Kb: TSX MFP P●●K/M for Flash EPROM memories.

- Storage of the application and additional data, comprising:

- ☐ application area from 192 Kb to 7 Mb
- ☐ data storage area 7 Mb to 0 Kb for additional data storage.

The limit between these 2 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 memory cards with 4 or 8 Mb.

These cards use 2 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 lifetime 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 extension cards in which the program is stored in SRAM memory (TSX MRP C●●K/M) allow you to perform program modifications in online mode.

A user with a processor fitted with a memory extension 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.

References

Quantum 140 CPU 651 50, 140 CPU 651 60 and 140 CPU 671 60 processors can receive the following memory extension cards.

There are two types of memory limit:

- One associated with the type of processor.
- One associated with the selected PCMCIA memory card.

The lowest of these two limits defines the memory capacity accessible to users for their applications.

PCMCIA memory extension cards

Description	Memory size Application	Data files	Reference	Weight kg
Configurable SRAM application/files memory extension	192...768 Kb	576...0 Kb	TSX MRP C768K	—
	192...1024 Kb	832...0 Kb	TSX MRP C001M	—
	192...1792 Kb	1600...0 Kb	TSX MRP C01M7	—
	192...2048 Kb	1856...0 Kb	TSX MRP C002M	—
	192...3072 Kb	2880...0 Kb	TSX MRP C003M	—
	192...7168 Kb	6976...0 Kb	TSX MRP C007M	—
Flash EPROM application memory extensions	512 Kb	—	TSX MFP P512K	—
	1024 Kb	—	TSX MFP P001M ▲	—
	2048 Kb	—	TSX MFP P002M ▲	—
	4096 Kb	—	TSX MFP P004M ▲	—
Configurable Flash EPROM and SRAM application/ files memory extensions	512 Kb	512 Kb	TSX MCP C512K ▲	—
	2048 Kb	1024 Kb	TSX MCP C002M ▲	—
SRAM files memory extensions (1)	—	4096 Kb	TSX MRP F004M ▲	—
	—	8192 Kb	TSX MRP F008M	—

Replacement parts

Description	Use	Type	Reference	Weight kg
Backup battery	SRAM PCMCIA memory card	Main	TSX BAT M02	0.010
		Auxiliary	TSX BAT M03	—
Handle	PCMCIA memory card	—	TSX P CAP	0.030

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

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 extension)	
	Remote I/O (RIO)	31 stations with 2 racks (1 main + 1 extension)	
	Distributed I/O (DIO)	3 networks with 63 single-rack stations	
Maximum discrete I/O (1)	Local I/O	1024 input channels and 1024 output channels (max. 27 slots)	
	Remote I/O (RIO)	31,744 input channels and 31,744 output channels	
	Distributed I/O (DIO)	8000 input channels and 8000 output channels per network	
Maximum analog I/O (1)	Local I/O	64 input channels and 64 output channels (max. 27 slots)	
	Remote I/O (RIO)	1984 input channels and 1984 output channels	
	Distributed I/O (DIO)	500 input channels and 500 output channels per network	
Application-specific modules		Intrinsically safe I/O, high-speed counter, axis control, 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 actuator/sensor bus	4 on local rack, 4 on remote rack (RIO), 2 on distributed rack (DIO)	
	INTERBUS Generation 3	–	3
	Generation 4	–	2
	Profibus DP/SERCOS MMS	Profibus DP/SERCOS MMS, 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 (3)	10 to 20 programmable channels	
Redundancy		Power supplies, remote I/O network, Modbus Plus modules, Ethernet TCP/IP modules	
Hot Standby availability	Hot Standby LL984	Yes	
	Hot Standby IEC	–	
Memory capacity	LL984 program (max.)	8 Kwords	16 Kwords
	IEC program (max.)	109 Kb	368 Kb
	Localized data I/O bits (max.)	8192 input bits and 8192 output bits	
	(State RAM) 16-bit I/O words (max.)	9999 I/O words	
Quantum CPU		140 CPU 113 02	140 CPU 113 03
Pages		1/17	

(1) The maximum values for the number of discrete I/O and analog I/O are not cumulative.

(2) CPU able to migrate from Concept to Unity Pro.

(3) Usage values, including memory resources and processor power.

Simple and complex applications

Complex applications



2 racks (1 main + 1 extension)
 31 stations with 2 racks (1 main + 1 extension)
 3 networks with 63 single-rack stations
 1024 input channels and 1024 output channels (max. 27 slots)
 31,744 input channels and 31,744 output channels
 8000 input channels and 8000 output channels per network
 64 input channels and 64 output channels (max. 27 slots)
 1984 input channels and 1984 output channels
 500 input channels and 500 output channels per network
 Intrinsically safe I/O, high-speed counter, axis control, 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
 Not limited on local rack (max. 27 slots), 4 on remote rack (RIO), 2 on distributed rack (DIO)
 3
 6
 Profibus DP/SERCOS MMS, 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

64 Kwords
 896 Kb
 64 Kbps I/O
 57 Kwords I/O

140 CPU 434 12 A
 (2)

140 CPU 534 14 A
 (2)

1/17



Presentation

Quantum CPUs, which are compatible with Concept and ProWORX software, are single-slot programmable controllers with built-in executive memory, application memory and communication ports. With all memory components on-board, you do not need extra chips or cartridges for configuration. Some of the Quantum CPU's are programmed with Unity.

Flash-based executive memory

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

Memory backup and protection

The CPUs store the application program in battery-backed RAM. The battery is located on the front of the module and can be serviced 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 goes on when this switch is activated.

Math coprocessor

For math-intensive applications, a math coprocessor is available on select CPU models. The 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

Controller write protection minimizes the possibility of a programmer inadvertently writing from a source controller to a memory area in a destination controller. Whatever data is not enabled is prevented from writing, both locally and over the network. This data protection option provides security against data transfer errors.

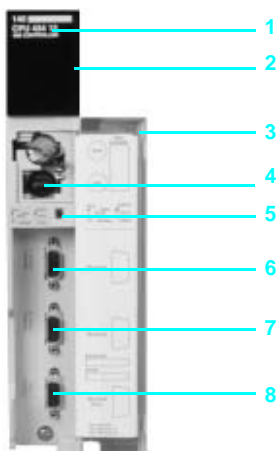
Communication ports

All CPUs support Modbus and Modbus Plus networking strategies. Simple 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).

The 140 CPU 434 12 A and 140 CPU 534 14A processors have 2 serial Modbus ports:

- Modbus port 1, with full modem interfacing ability.
- Modbus port 2, with RTS/CTS flow control (does not support modem connection).



Description

The 140 CPU 113 0● processor front panel comprises:

- 1 Model number and color code
- 2 LED array
- 3 Removable, hinged door and customer identification label
- 4 Battery slot
- 5 Two slide switches
- 6 One Modbus port
- 7 One Modbus Plus port A
- 8 One Modbus Plus port B

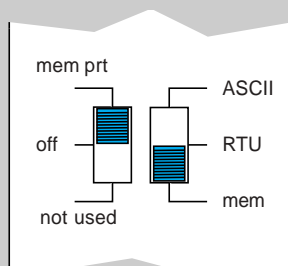
Nota : The 140 CPU 113 0● CPUs have one Modbus and one Modbus Plus communication port.

Slide switches

Each of the two slide switches has three-position functionality:

The left slide switch activates the memory write-protect. In the upper position, write protection is enabled; in the middle position, write protection is disabled.

The right slide switch determines the startup communication parameters for the Modbus port. The middle position, RTU, is the factory-set default. The upper position, ASCII, is for modem communications (1). If you need to set special startup parameters for the Modbus port – for example, if your Modbus address is not 1 – you can set application-specific parameters in memory and set the slide switch in the bottom position.



Language choices

Advanced IEC 61131-3 languages

Quantum's 5 IEC 61131-3 languages are:

- Sequential Functional Chart: provides overall structure and coordination for process or machine control applications.
- Function Block Diagram: particularly well suited to process control applications.
- Ladder Diagram: excellent for combinational and interlocking logic.
- Structured Text: higher level language which is a terrific solution for complex algorithms and data manipulation.
- Instruction List: low level language for optimizing the size of the program code generated.

984 Ladder Logic

A high performance, low level language whose application source code resides in the controller.

A full set of over 80 instructions is included with every Quantum CPU. The 984 instruction set ensures compatibility and easy integration paths for installed Modicon applications, including:

- Immediate I/O access and interrupt servicing
- Equation editor

(1) 2400 bps, even parity, 7 data bits, 1 stop bit, ASCII mode and address 1.

Characteristics

Module type			140 CPU 113 02	140 CPU 113 03	140 CPU 434 12A	140 CPU 534 14A
Processors			80186		80486	80586
Math coprocessor			No		Yes	
Clock speed		MHz	20		66	133
User logic	Max. IEC program		109 Kb	368 Kb	896 Kb	2.5 Mb
	Max. LL 984 program		8 Kwords	16 Kwords	64 Kwords	
Capacity	Bits	bps	8192 in/8192 out		64 K any mix	
	Registers	words	9999 max.		57 K max.	
	Extended memory	words	–		96 K	
Logic solve time (984 LL instructions)		ms/K	0.3...1.4		0.1...0.5	
Watchdog timer		ms	250 (software-adjustable)			
TOD clock accuracy		s/day	± 8 @ 0...60°C			
Local I/O	Maximum I/O words		64 I/64 Q			
Remote I/O (RIO)	I/O words/drop		64 I/64 Q			
	Number of drops		31			
	Number of networks		2			
Distributed I/O (DIO)	I/O words/drop		30 I/32 Q			
	I/O words/network		500 I/500 Q			
	Drops/network		63			
	Number of networks		3			
Battery	Type		Lithium			
	Service life	mAh	1200			
	Lifetime	yrs	10			
	Load current, typical	µA	5	7	14	
	Load current, max.	µA	110	210	420	
Communication ports	Modbus (RS 232)		1		2	
	Modbus Plus		1			
Maximum number of NOM, NOE, CRP or MMS modules			2		6	
Key switch			No		Yes	
Bus current required		mA	780	790	1250	
Approvals			UL 508, CSA 22,2-142, C UL, FM Class 1 Div. 2, C€			

Migration of Quantum CPUs

As both the 140 CPU 434 12A and 534 14A 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 6/25).

The 2 upgraded processors (140 CPU 434 12U/534 14U) are then equivalent to the corresponding Unity processors.

CPUs

Memory (total)	Coprocessors	Reference	Weight kg
256 Kbytes	No	140 CPU 113 02	0.300
512 Kbytes	No	140 CPU 113 03	0.300
2 Mbytes	Integrated	140 CPU 434 12A	0.850
4 Mbytes	Integrated	140 CPU 534 14A	0.850

Accessories

Description	Length	Reference (1)	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	—
Quantum automation series hardware reference guide	—	840 USE 100 0●	—

(1) Add one of the following digits at the end of the reference: **0**: English, **1**: French, **2**: German, **3**: Spanish.



2 - Backplanes, I/O architecture and power supply modules

Backplanes

- Backplanes
 - Presentation, description page 2/2
 - References page 2/3
 - Dimensions page 2/3

I/O architectures

- Presentation page 2/4
- Local I/O page 2/5
- Remote I/O
 - Presentation page 2/6
 - Topologies page 2/7
 - Characteristics page 2/9
 - References page 2/10
- Distributed I/O
 - Presentation page 2/12
 - Description page 2/13
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 - References page 2/15

Power supply modules

Selection guide: power supply modules page 2/16

- Power supply modules
 - Presentation, functions page 2/18
 - Description page 2/19
 - Characteristics page 2/20
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Presentation

The Modicon Quantum modules mount easily into backplanes in industry-standard electrical cabinets or on 19-inch racks. Optional mounting brackets are available for rack-mounting. A backplane provides the control signals and distributes the power necessary to operate the installed modules.

Description

Six different backplane models are available (with 2, 3, 4, 6, 10, or 16 slots). Backplane slots are universal (in other words, any module can fit into any slot). Almost all Quantum modules are designed to fit into single slots on a Quantum backplane.⁽¹⁾

There are no slot dependencies in a Quantum system, although we do recommend that power supply modules use the outermost slot position for optimum heat dissipation. The only limits on the backplane are available module power and addressing space. Any backplane may be used in any of the three system architectures supported by Quantum (standalone with local I/O, remote I/O or distributed I/O). Your service inventory can be reduced because there are no special backplanes for different I/O architectures.

In a Quantum system, module addressing and configuration is handled by panel software. There are no DIP switches or other hardware settings.

The backplanes 140 XBP 0●● 00 include:

- 1 A metal frame.
- 2 A backplane connector.
- 3 Tapped holes for affixing modules.
- 4 Mounting holes.
- 5 Grounding terminals.

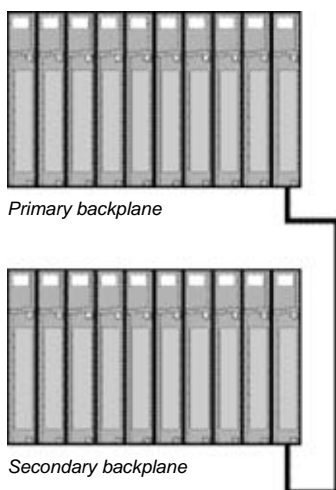
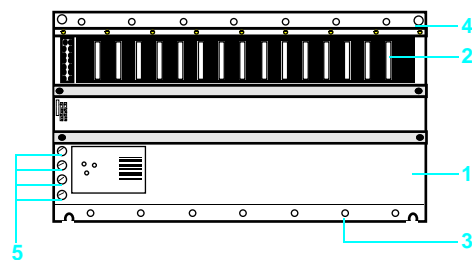
Backplane expander module

The 140 XBE 100 00 Quantum backplane expander module allows I/O in an adjacent, "secondary" backplane to communicate with the CPU or RIO drop adapter in the "primary" backplane over a custom communications cable. A backplane expander module must be installed in each backplane and each backplane should have its own power supply. The backplane expander cable transmits all the data communication signals between the two backplanes. Only a single backplane expander module can be added to each backplane.

The backplane expander module features the following flexible characteristics:

- The same 140 XBE 100 00 backplane expander modules are used for the primary and secondary backplanes. A complete backplane expander system consists of two 140 XBE 100 00 modules and an expander cable, available in 3, 6, and 9-foot lengths.
- The system can use any type of Quantum power supply. Each backplane can have a different type of power supply.
- Loss of power in the secondary backplane will not shut down the entire drop. Only modules located in the secondary backplane will lose power.
- Backplane expander modules can be located in any slot in the backplane, and do not have to be placed in corresponding slots in the primary and secondary backplanes.
- The backplane expander module is not recognized by the programming panel software. It appears as an unfilled slot in the I/O map.
- All Quantum backplane sizes are supported.
- The backplane expander system supports Local I/O, providing a low-cost way to expand to a second rack without moving to RIO.
- The backplane expander system supports Remote I/O, including full 31 Remote I/O drop support.
- The backplane expander module supports all existing Quantum digital and analog I/O modules, along with both Quantum high-speed counters.

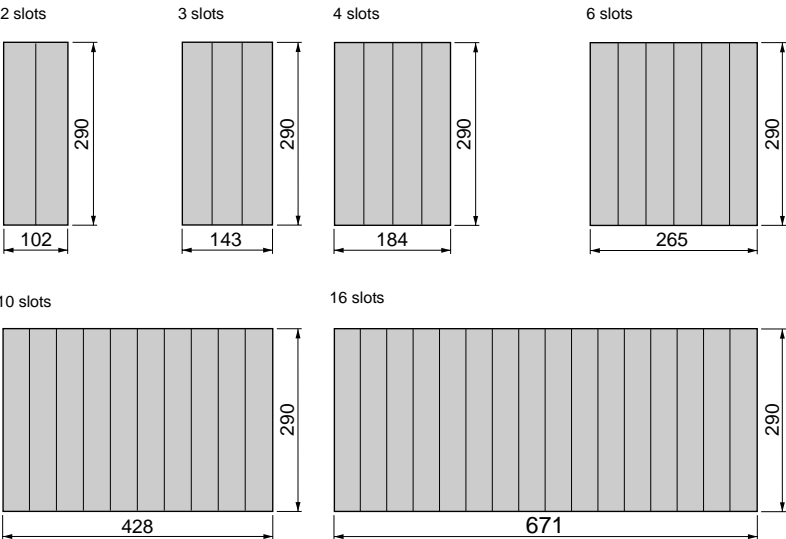
⁽¹⁾ Except 140 CPU 651●0/671 60 high performance processors and MMS SERCOS motion modules: requires 2 slots.



References			
Description	Number of slots	Reference	Weight kg (lb)
Racks for: Local I/O modules Remote I/O modules Distributed I/O modules	2	140 XBP 002 00	0.230 (0.5)
	3	140 XBP 003 00	0.340 (0.75)
	4	140 XBP 004 00	0.450 (1.0)
	6	140 XBP 006 00	0.640 (1.4)
	10	140 XBP 010 00	1.000 (2.2)
	16	140 XBP 016 00	1.600 (3.5)

Backplane accessories			
Description	Length	Reference	Weight kg (lb)
Backplane expander	–	140 XBE 100 00	–
Backplane expander cables	1 m	140 XCA 717 03	–
	2 m	140 XCA 717 06	–
	3 m	140 XCA 717 09	–
19 in front rail mounting bracket for 140 XBP 010 00	125 mm (4.92 in) depth	140 XCP 401 00	–
19 in rear rail mounting bracket for 140 XBP 010 00	20 mm (0.79 in) depth	140 XCP 402 00	–

Dimensions	
140 XBP 0●● 00	
Front view	

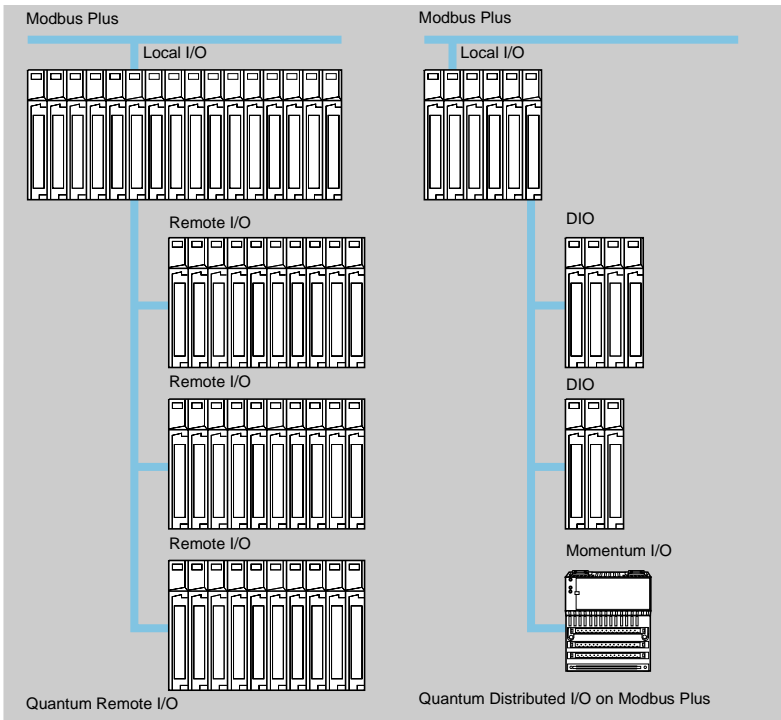


Deep with modules : 104 mm

Overview

The Modicon Quantum Automation Series provides a flexible architecture that ensures a cost-effective and high performance control solution, regardless of the configuration. From centralized systems to highly distributed systems to networked distributed control schemes, Quantum provides the right solution. Quantum I/O can be used in three major architectures to meet control system requirements:

- Local I/O.
- Remote I/O (RIO).
- Distributed I/O (DIO).



I/O architecture selection		Local I/O	Remote I/O	Distributed I/O
Media		–	Coax	Twisted pair
Maximum distance without repeaters		–	15,000 ft (4,572 m)	1,500 ft (457 m)
Speed		–	1.5 MHz	1 MHz
Scan synched I/O servicing		–	Yes	No
Hot standby support		No	Yes	No
Momentum I/O support		–	No	Yes
Modbus Plus compatible		–	No	Yes
Maximum	Drops per network	–	31	63
	I/O words per network	–	1,984 in/1,984 out	500 in/500 out
	Discretes per network	–	31,744 in/31,744 out	7,840 in/7,840 out
	Analogs per network	–	1,984 in/1,984 out	500 in/500 out
	I/O words per drop	64 in/64 out	64 in/64 out	30 in/32 out
	Discretes per drop	1024 in/1024 out	1024 in/1024 out	480 in/512 out
	Analogs per drop	64 in/64 out	64 in/64 out	30 in/32 out
Networks per controller		–	1	3
Typical backplanes		6, 10, 16 slots	10, 16 slots	2, 3, 4 slots

Local I/O

The Quantum automation platform provides local I/O support for control systems where the wiring is most effectively brought from the field to the main control cabinet. Local I/O can comprise as few as one I/O module or as many as 14 modules along with a programmable logic controller (a Quantum CPU) and a power supply module in a single backplane. Local I/O can support up to 1344 I/O points in a 1845 cm² (286 in²) panel space. Local I/O can also be expanded to a second backplane with the use of a backplane expander.

If required for the application, system option modules can also be installed in the local backplane. Available system option modules include RIO processors (one/CPU supported) or Modbus Plus network interfaces (two/CPU supported). All other available modules are considered and configured as I/O modules. Selection of the appropriate backplane depends on the required number of modules for the system. Backplanes are available in 2-, 3-, 4-, 6-, 10-, and 16-slot versions.

If required, communications and networking modules can be installed in the local backplane. Most communication and networking modules require the local CPU to be present.

Available Quantum communications and network modules include:

- Modbus Plus and Modbus modules.
- Ethernet modules for TCP/IP, SY/MAX.
- Remote I/O modules.
- Hot Standby modules (Concept/ProWORX).
- SERCOS multi-axis servo motion control modules.
- INTERBUS modules (Concept/ProWORX).
- Lonworks modules.
- Profibus DP modules.
- AS-Interface modules.

High performance interrupt functions

In certain applications, I/O needs to be updated faster than the normally scheduled scan time. Quantum provides interrupt I/O services for this type of applications. These services include time interrupt processing, interrupt input, and immediate I/O updates that support high-speed throughput of critical I/O located in the local backplane. The services are driven by instructions embedded in Quantum's Ladder logic 984 language. The instructions can be programmed via Unity Pro, Concept or ProWORX programming software; they update the I/O immediately within the CPU. Utilizing a subroutine section in the CPU, the updated I/O table can be used to update logic only, or write to any local output module.

Local I/O configuration rules

When you configure a local I/O system, consider the following four characteristics:

- Available backplane slots for modules.
- Available power for the installed modules.
- Available addressing words to configure the modules.
- Available option module slots.

A local I/O system can support up to 14 slots for option processors and I/O modules in a 16-slot backplane. Empty modules (140 XCP 500 00) are available to occupy unused slots.

Every CPU, option module and I/O module requires power from the backplane. To ensure a valid configuration, simply add up the required backplane current (in mA) for all modules in the local backplane, and ensure that the total current is less than that provided by the selected power supply.

A Quantum CPU in a local I/O drop can handle up to 64 input words and 64 output words of I/O addressing. A 16-bit input or output module is equal to one word. Simply add up the addressing requirements for each module to ensure that the limit is not exceeded.

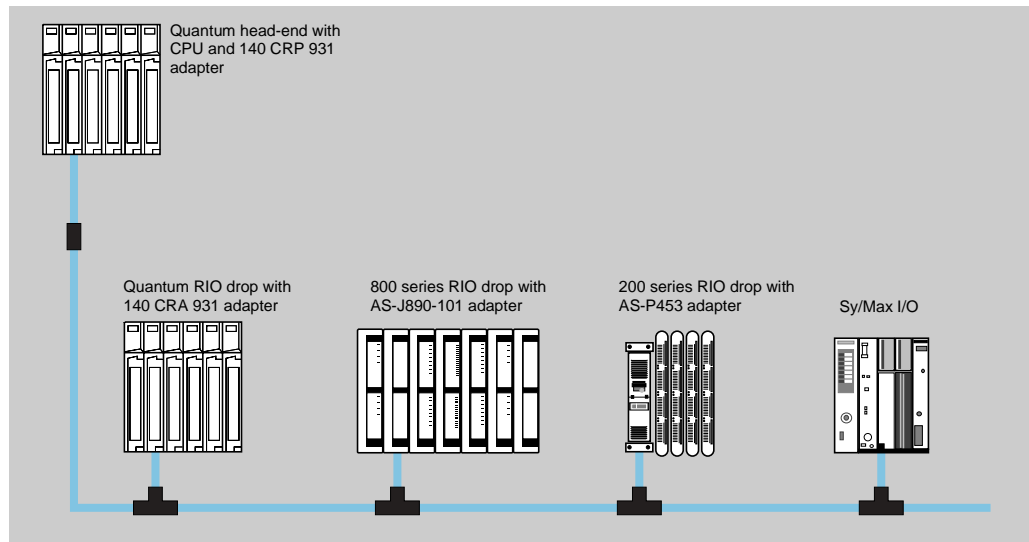
Modicon Quantum automation platform

I/O architectures
Remote I/O

Presentation

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

Based on the S908 remote I/O network technology, this network is compatible with existing installations of Modicon I/O products, including the 800 and 200 Series I/O modules and Sy/Max I/O. New installations can incorporate an installed base of these devices for reduced installation costs.



RIO architecture on a coaxial cabling scheme that provides long-distance capability, up to 4,572 km (15,000 ft) with CATV cable or longer with optional fiber optic cable. It is a high-performance network at 1,544 Mbit/s for high I/O data throughput. The RIO cable system consists of a linear trunk line, with line taps and drop cables running to each remote drop. Up to 31 remote drops are configurable. Each drop can support up to 128 I/O words (64 words in/64 words out).

Modicon segment scheduler

The Modicon segment scheduler complements the high performance of the RIO network by interleaving I/O servicing and logic solving to create the fastest system throughput available.

The segment scheduler breaks application programs into logical segments, then schedules I/O servicing to occur in conjunction with the segment's associated logic solving. Inputs are read prior to logic being solved and outputs are written after logic is solved. This eliminates the need to wait for an entire scan before outputs are set, giving a faster system response than comparable control systems. As a result, there is no performance penalty for using RIO - it is as fast as local I/O. For most systems, throughput of local or remote I/O can be estimated at no less than two times scan (assumes measurement of input and output times through 24 V d.c. modules). All analog and register values are updated automatically, as fast as discrete I/O, without user programming.

Compatibility with the 800 and 200 Series I/O products

For forward integration from existing Modicon systems, the Quantum Automation Series is compatible with the 800 and 200 Series I/O products. Using the same RIO head end interface, it connects to 800 Series I/O via the P890300 RIO adapter, and to 200 Series I/O via the P453/J290 and P451/J291 RIO adapters.

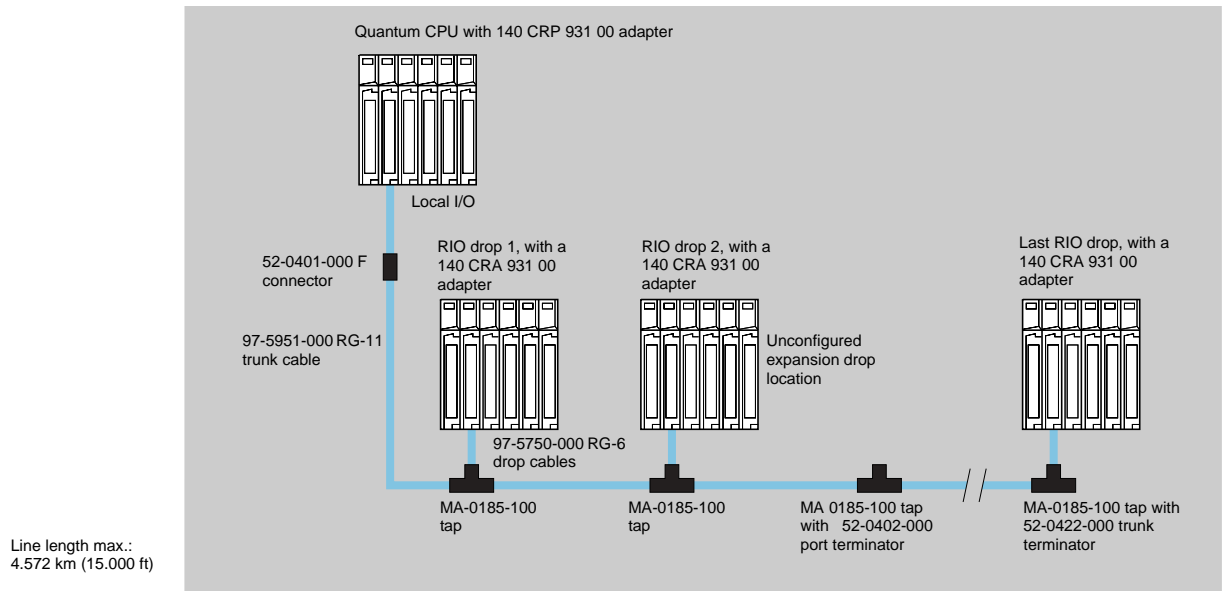
Other standard Modicon components are also compatible with this system, including network taps (MA-0185-100) and splitters (MA-0186-100). Quantum remote I/O also supports drops of Sy/Max I/O.

Rules of configuration

To ensure a valid configuration, add up the required backplane current (in mA) for all modules at each I/O remote location, and ensure the total is less than the available power in the selected power supply.

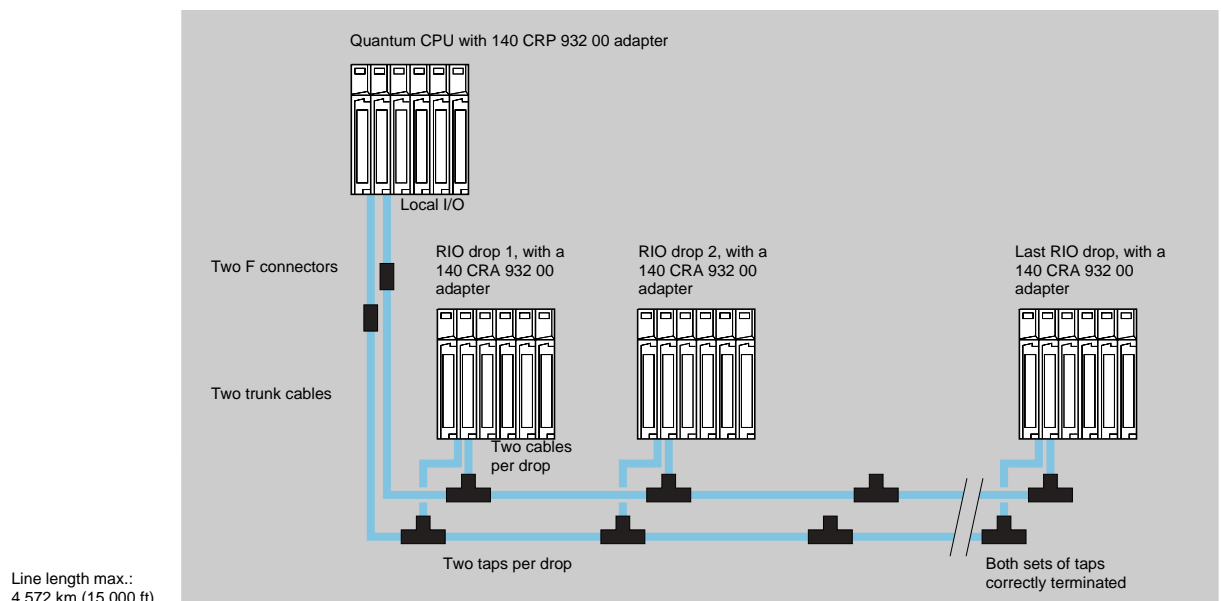
RIO cable topologies

A single-cable RIO topology



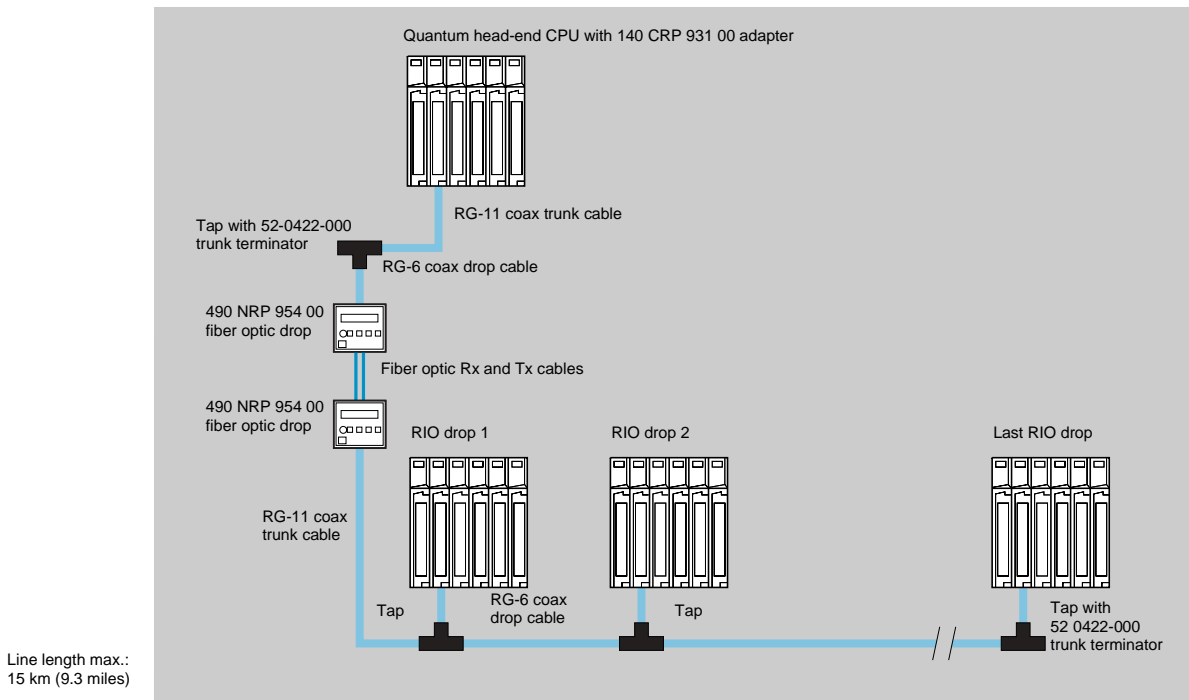
An MA-0185-100 tap is required for every drop on the system to electrically isolate the drop from the trunk and protect the system from impedance mismatches and cable disconnections. A minimum signal strength of 14dB is required between the trunk and each drop to ensure correct operation. The signal loss on the trunk cable as it crosses the tap is less than 1dB. A total of 35 dB is available from the head-end RIO processor. The entire cabling architecture must not exceed this system limit. For systems that require high availability, a redundant-cable option is available to protect the system from cable breaks and damaged connectors. With two cables connected between the host and each drop, a single cable break does not disrupt communications. If a cable break occurs, a health bit is set to indicate the problem node and faulty cable. For preventative maintenance, the system also provides retry counters for all communication transactions to all nodes. High retry counts on a cable in a specific node could indicate connection problems that can be scheduled and corrected prior to unwanted downtime.

A redundant-cable RIO topology



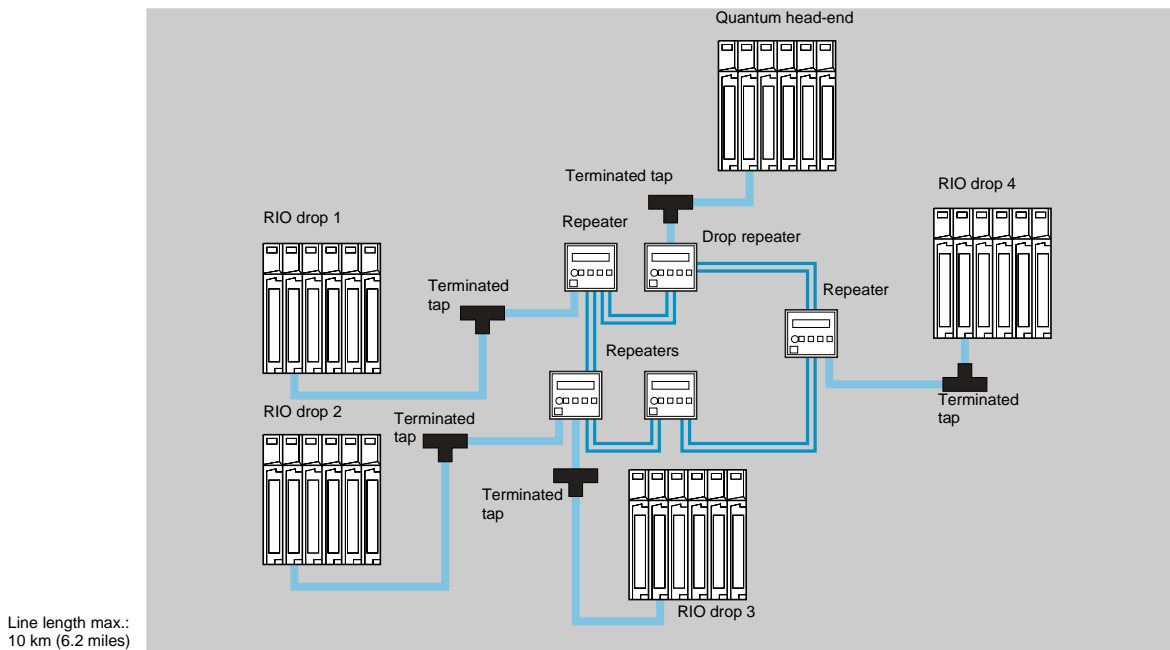
Point-to-point RIO communications with fiber optic repeaters

Fiber optic repeaters are available to enhance network noise immunity and increase cable distance to as much as 15 km (9.3 miles). These optic repeaters convert the twisted-pair cable to standard 62.5/125 μ m fiber optic while maintaining the full dynamic range of the network.



A “self-healing” ring topology with fiber optic repeaters

Multiple 490 NRP 954 00 fiber optic repeaters can be interconnected in a closed loop ring so that if a break occurs anywhere in the ring the network can reconfigure itself. The RIO signal is sent down both legs of the ring by the drop repeater to the head repeaters. When a signal is received on one Rx line, the other Rx channel is blanked, this prevents the same signal from being transmitted twice in the ring. The maximum length of fiber cable allowed in a self-healing ring is 10 km (32 000 ft).



Head-end and drop adapter characteristics

Model		140 CRP 931 00	140 CRP 932 00	140 CRA 931 00	140 CRA 932 00	
Type		Head-end		Drop adapter		
Drop type		Quantum, 200/500/800 series or Symax (any mix)		–		
I/O type		–		Quantum		
Modules/drop		31 drop adapters max.		27 I/O modules max.		
Words/drop		64 in/64 out words				
ASCII		2 ports per drop, 32 ports (16 drops), max. (requires use of AS-P892-000, AS-J892-101/102, or AS-J290-0X0 at the RIO drops).		–		
Coax termination	Ω	Internal 75				
Coax shield		Tied to chassis ground		Capacitor to ground		
Data transfer rate	Mbit/s	1.544				
Dynamic range	dB	35				
Isolation	≡	500 V coaxial cable, center conductor to ground				
Cable connections	Single cable	One “F” type female connector (right angle adapter)				
	Redundant cable	Two “F” type female connectors (right angle adapter)				
General	Holdup time		–		Software configurable NOTE: In the event of a communication loss with the remote processor, output modules during this time will retain their last operating state. Input module data will be held in the system controlling CPU. After this time, output modules will assume their predefined timeout states and inputs will be zeroed by the CPU.	
	Diagnostics		Power Up Memory check LAN controller check		Power Up and Runtime Executive checksum RAM address/data	
	Maximum number of CRP supported by the controller		1 head-end per Quantum CPU		–	
	Bus current requirement	mA mA	One channel: 600 Dual channel: 750			
	Power dissipation	W W	One channel: 3 Dual channel: 3.8			
Agency approvals			UL 508, CSA 22.2-142, cUL, FM Class 1 Div.2, c€			

Fiber optic cable considerations

To use a fiber optic link in a RIO network, consider the following when selecting fiber optic cable from a vendor:

- For most applications, 62.5/125 μm fiber is recommended because of its relatively low loss and low signal distortion. However, in high optical power applications, such as those that use splitters or star couplers, the 100/140 μm fiber should be used.
- Wherever possible, select a multiconductor cable. It is inexpensive; it provides a backup path in case a cable gets cut in the process of pulling it; and you can use the extra path for voice, video, or other communications.

Modicon Quantum automation platform

I/O architectures

Remote I/O

Adapter modules

Description	Cable	Reference	Weight kg (lb)
Quantum RIO head-end adapter (1 max.)	Single-cable	140 CRP 931 00	—
	Redundant-cable	140 CRP 932 00	—
Quantum RIO drop adapter (31 max.)	Single-cable	140 CRA 931 00	—
	Redundant-cable	140 CRA 932 00	—
RIO drop	Fiber optic	490 NRP 954 00	—

Connection cables

Description	Use/length	Reference	Weight kg (lb)
RG-6 coaxial quad shield cable (sold by the roll)	Drop cable 320 m (1000 ft)/roll	97 5750 000	—
RG-11 coaxial quad shield cable (sold by the roll)	Trunk cable 320 m (1000 ft)/roll	97 5951 000	—
Preassembled drop cable (with F connectors, self-terminating F adapter, and quad shield RG-6 cable)	15 m (50 ft)	AS MBII 003	—
	42 m (140 ft)	AS MBII 004	—

Backplane accessories ⁽¹⁾

Description	Use/length	Reference	Weight kg (lb)
Backplane expander module	—	140 XBE 100 00	—
Expander cables module	1 m	140 XCA 717 03	—
	2 m	140 XCA 717 06	—
	3 m	140 XCA 717 09	—

(1) For backplanes 12...16 slots, see page 2/3.

Modicon Quantum automation platform

I/O architectures

Remote I/O

Connection accessories

Description	Quantity	Reference	Weight kg (lb)
Tap (connects the drop cable to the trunk cable)	1	MA 0185 100	—
Heand-end repeater (a signal from a single cable for two-cable use) for ring topology	—	MA 0186 100	—
Tap terminator (for unused drop locations)	1	52 0402 000	—
Trunk terminator (for last tap on the network)	1	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 adapter for semi-rigid cable	1	52 0480 000	—
BNC connector for RG-6 cable	1	043509446	—
F-to-BNC adapter for RG-11 cable	1	52 0614 000	—
BNC jack to male F connector (with J890/J892 drop adapters)	1 j	52 0724 000	—

Cabling accessories

BNC in-line terminator		1	60 0513 000	—
Ground block		1	60 0545 000	—
Coaxial cable stripping tool	For RG-6 cable	1	490 RIO 004 00	—
	For RG-11 cable	1	490 RIO 0S4 11	—
Replacement blade pack	RG-6 cable	2 b	490 RIO 004 06	—
	RG-11 cable	—	Consult our regional sales office	—
Crimping tools	F connector on RG-6 cable	1	60 0544 000	—
	F connector on RG-11 cable	1	490 RIO 0C4 11	—
	BNC connector on RG-6 cable	1	043509432	—
Cable cutter		1	60 0558 000	—

Modicon Quantum automation platform

I/O architectures

Distributed I/O

Presentation

The Modicon Quantum platform DIO architecture (*Distributed I/O*) 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.

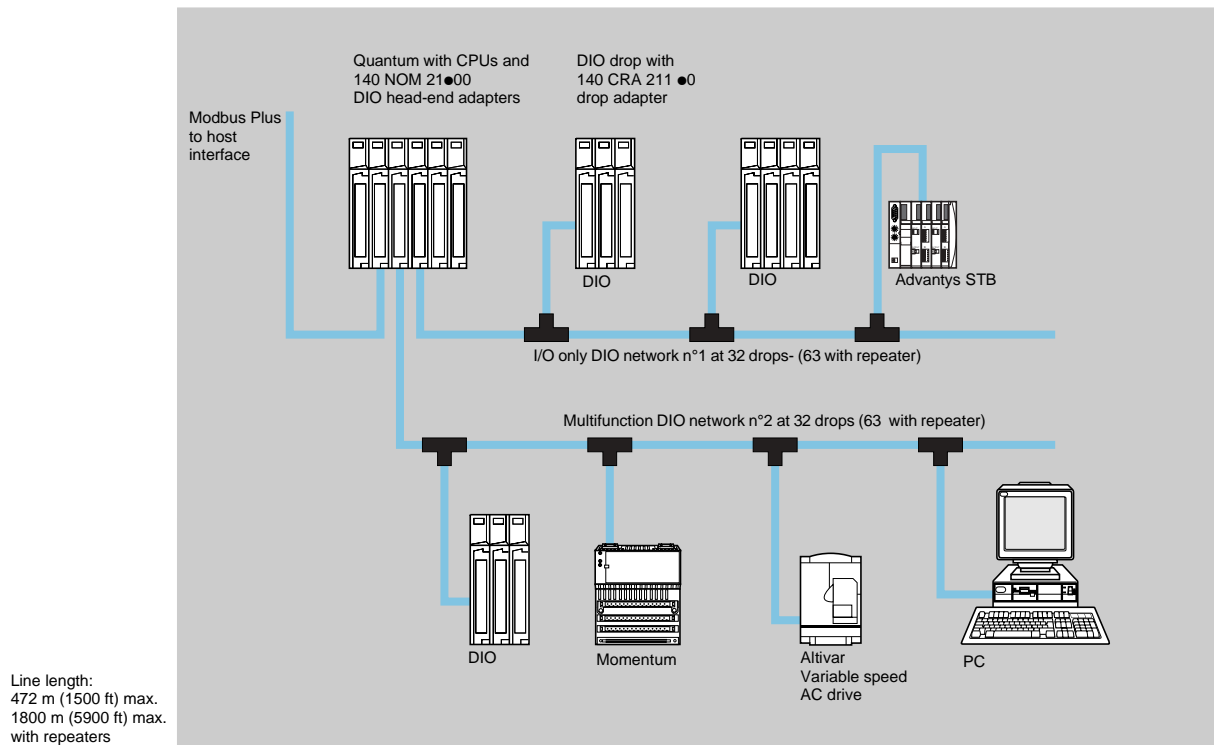
A special DIO drop adapters with a built-in power supply is used at each drop. The Quantum DIO drop adapter is specifically designed to link I/O modules to the head via twisted-pair shielded cable. A drop adapter also provides the I/O with power (maximum 3A) from a 24 V d.c. or 115/230 V a.c. source. DIO drops may also be powered by standard 8 A power supply modules. In this case the 3 A supply built into the drop adapter is not used.

The DIO architecture supports up to three network heads per CPU and up to 1800 m (6000 ft) per network (using RR85 repeaters). Even greater distances can be achieved using fiber optic repeaters.

The DIO architecture is based on Modbus Plus technology. Each DIO network can support 32 nodes over 472 m (1500 ft) (with repeaters, 64 nodes over 2000 m (6000 ft)). Up to three DIO networks are supported, one is native to the CPU itself, and the other two by adding optional 140 NOM 211 ●0/212 ●0 network interface modules into the local Quantum backplane. DIO can be combined with RIO in the same CPU system for significantly larger I/O counts.

All products that currently support Modbus Plus (for example IHM equipment) can coexist on the DIO network. For example, a programming panel can be connected to the DIO network to monitor and troubleshoot an operating control system from the remote site, without running a separate communication link.

Typical Multi-Network Distributed I/O System



Presentation (continued)

Using Modbus Plus for distributed I/O

Modbus Plus can be used as the fieldbus for a distributed I/O network under the control of a Quantum CPU. The Modbus Plus master at the head end of the network is a Quantum CPU with a built-in Modbus Plus interface or a 140 NOM 21● module. A 140 CRA 211 ● module must reside in each distributed I/O drop on the network. A 140 CRA 211 ● module acts as both a distributed I/O adapter and a power supply for the drop (no additional power supply modules are required). Each DIO drop can address up to 30 input words and 32 output words.

A single or redundant cable topology may be employed in the distributed I/O system. Depending on your system's requirements, one of the following module combinations can be used to set up a Modbus Plus-based DIO system:

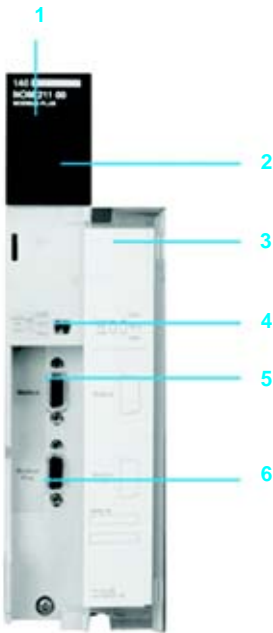
Head-end network n° 1	Head-end network n° 2 or n° 3	DIO drop	Type of DIO system
CPU with Modbus Plus	DIO adapter 140 NOM 211 00	140 CRA 211 10	Single cable with 115/230 V a.c. power at the drop
CPU with Modbus Plus	DIO adapter 140 NOM 211 00	140 CRA 211 20	Single cable with 24 V d.c. power at the drop
–	DIO adapter 140 NOM 212 00	140 CRA 212 10	Redundant cable with 115/230 V a.c. power at the drop
–	DIO adapter 140 NOM 212 00	140 CRA 212 20	Redundant cable with 24 V d.c. at the drop

Description

The 140 NOM 211/212 00 Modbus Plus for DIO network nb 2 or nb 3 (1) comprise on the front panel:

- 1 A model number and color code,
- 2 A LED Status indicators comprising:
 - Ready (green),
 - Fault (red),
 - Pwr ok (green),
 - Modbus + (green),
 - Error A (red),
 - Error B (red),
- 3 A removable, hinged door with customer identification label,
- 4 A microswitch,
- 5 A Modbus port,
- 6 A Modbus Plus.

(1) The Modbus Plus embedded in the 140 CPU processor is used for the D10 network nb 1.



Drop adapters characteristics

Model			140 CRA 211 10	140 CRA 212 10	140 CRA 211 20	140 CRA 212 20
Function			DIO drop interface ~ source voltage		DIO drop interface --- source voltage	
Cable connections			Single (1 port)	Redundant (2 ports)	Single (1 port)	Redundant (2 ports)
Input voltage			~ 85...276 V		--- 20...30 V	
Frequency range		Hz	47...63		—	
Input current		A	0.4 at ~ 115 V, 0.2 at ~ 230 V		1.6	
Inrush current		A	10 at ~ 115 V, 20 at ~ 230 V		30	
Power input		VA	50		—	
Buffer time			0.5 cycle at full load and minimum line voltage/frequency and less than 1 s between interrupts		Max.1 ms	
Fusing		A	1.5 external		2.5 external	
Bus output	Voltage	---	5,1 V			
	Current	A	3			
	Minimum load	A	0			
	Protection		Against over-current and over-voltage			
I/O words per DIO			30 I/32 O (two additional input words are reserved for I/O drop status)			
Typical backplanes			2, 3 or 4 positions			
Diagnostics startup	RAM		Yes			
	RAM address		Yes			
	Checksum		Yes			
	Processor		—			
Run time	RAM		Yes			
	RAM address		Yes			
	Checksum		Yes			
	Processor		—			
Field wiring			Terminal block, 7-pole (043 503 328 terminal block included)			
Power dissipation		W	11			


Head-end modules characteristics (Nb 2 and Nb 3) (1)				
Model		140 NOM 211 00	140 NOM 212 00	140 NOM 252 00
Function		DIO head-end interface		
Cable connection		Single copper (twisted-pair cable)	Redundant copper (twisted-pair cable)	Single fiber optic cable (2 TX/RX fibers)
Built-in communication ports		1 Modbus (RS 232) 1 Modbus Plus (RS 485)	1 Modbus (RS 232) 2 Modbus Plus (RS 485)	1 Modbus (RJ 45) 1 Modbus Plus (fiber optic cable)
Words		30 I/32 O (two additional input words are reserved for I/O drop status)		
Diagnostics	RAM	Yes		
	RAM address	Yes		
	Checksum	Yes		
	Processeur	Yes		
Bus current required		mA	780	750
Power dissipation		W	4	4
Data rate		Mbit/s	1	1
Pulse width distortion/jitter		ns	–	5 or better
Wavelength		nm	–	820
Power loss budget (including 3dB margin)	50/125 mm fiber	dB	–	6.5
	62,5/125 mm fiber	dB	–	11
	100/140 mm fiber	dB	–	16.5
Optical transmission	50/125 mm fiber	dBm	–	- 12.8...- 19.8
	62,5/125 mm fiber	dBm	–	- 9...- 16
	100/140 mm fiber	dBm	–	- 3.5...110.5
Rise/fall time		ns	–	20 or better
Optical receiver	Sensibility	dBm	–	30 or better
	Dynamique range	dB	–	20
	Detected silence	dBm	–	- 36

(1) Head-end Nb 0 is included in each 140 CPU (see pages 1/5 and 1/15).

References

Description	Medium	Number and type of ports	Reference	Weight kg
DIO drop adapters (including power supply)	Single	~ 115/230	140 CRA 211 10	–
		--- 24	140 CRA 211 20	–
	Redundant	~ 115/230	140 CRA 212 10	–
		--- 24	140 CRA 212 20	–
Quantum CPUs DIO head-end Nb 1	Single	–	140 CPU ●●● (1)	–
DIO head-end adapters Nb 2 et Nb 3	Single	Twisted-pair cable	140 NOM 211 00	–
	Redundant	Twisted-pair cable	140 NOM 212 00	–
	Single	Fiber optic cable	140 NOM 252 00	–

(1) See pages 1/9 and 1/17.

Type	Standalone			Summable
				
Input voltage	~ 100...276 V	== 20...30 V	== 100...150 V	~ 93...138 V or ~ 170...264 V
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
Output current	3.0 A max.			Standalone : 11 A at 60 °C (140 °F) Summable : 20 A at 60 °C (140 °F)
External fusing	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	1 ms	1/2 cycle at full load
Alarm relay contact	No			
Model	140 CPS 111 00	140 CPS 211 00	140 CPS 511 00	140 CPS 114 20
Page	2/21			

Summable

Redundant



\sim 20...30 V	\sim 48...60 V	\sim 93...138 V or \sim 170...276 V	\sim 20...30 V	\sim 48...60 V	\sim 100...150 V
–		47...63 Hz	–		
3.8 A max.		1.1 A at \sim 115 V 0.6 A at \sim 230 V	3.8 A max.		0.5 A at \sim 125 V
8.0 A		8 A at 60 °C (140 °F) (CPS 124 00) 11 A at 60 °C (140 °F) (CPS 124 20)	8.0 A		
5.0 A slow-blow	2.0 A medium time lag	2.0 A slow-blow	5.0 A slow-blow	2.0 A medium time lag	2.0 A slow-blow
1 ms	13 ms	1/2 cycle at full load	1 ms	13 ms	1 ms
Yes		140 CPS 124 00 : No 140 CPS 124 20 : Yes	Yes		No

140 CPS 214 00	140 CPS 414 00	140 CPS 124 ●0	140 CPS 224 00	140 CPS 424 00	140 CPS 524 00
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Presentation

Quantum power supply modules serve two purposes—they provide power to the system backplane and protect the system from noise and nominal voltage swings. All power supplies feature over-current and over-voltage 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 supplies ensure that the system has adequate time for a safe and orderly shutdown.

A power supply converts the incoming power source to a regulated +5 V d.c. to support the CPU, the local I/O and any communication option modules mounted in the backplane. Power between the field sensors/actuators and the Quantum I/O points is not provided by these power supply modules.

If your Quantum system is being used in a standalone (local I/O) or remote I/O control architecture, three types of power supplies are available:

- Low-power standalone power supplies.
- High-power summable power supplies.
- High-power redundant power supplies.

If your Quantum system is being used in a distributed I/O architecture, special low-power standalone power supplies, which are dedicated to distributed architectures and are integrated into distributed I/O adapter modules, are available. Distributed power supplies are described in the DIO architecture section of this catalog.

Functions

Standalone power supplies

A standalone power supply delivers 3 A of current to a Quantum backplane. When the control system has low-power requirements, a standalone power supply is an economical choice. Standalone supplies are available for 115/230 V a.c., 24 V d.c. and 125 V d.c. source voltages.

Summable power supplies

A summable power supply delivers 8 A or 11 A (depending on the model) of current to a Quantum backplane. Summable supplies can operate in either a standalone or summable mode. Whenever two summable supplies are combined in the same backplane, they automatically operate in summable mode—delivering 16 A or 20 A (depending on the model) of power to the backplane. In summable mode, the two supplies must be the same model and they should be placed in the left and right edge slots of the backplane for maximum life. If one of the two supplies fails, power is lost to the backplane.

If only one summable power supply is placed in a backplane, it functions in standalone mode—delivering 8 A or 11 A (depending on the model) to the backplane.

Summable power supplies are available for 115/230 V a.c., 24 V d.c. and 48/60 V d.c. source voltages.

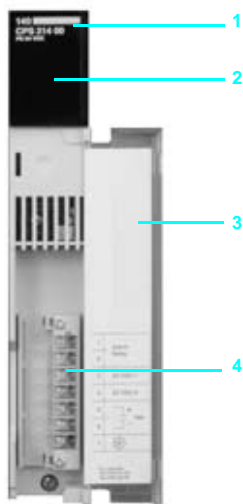
Redundant power supplies

A redundant power supply delivers 8 A or 11 A (depending on the model) of current to a Quantum backplane. For high-availability applications, two redundant power supplies in a backplane deliver 8 A or 11 A (depending on the model) of redundant current. In the event that one supply fails, the healthy one maintains the necessary power so that backplane processing and active communications are not affected. Each redundant supply has a status bit that can be monitored by the CPU's application program or by a supervisory system so that you respond quickly in the event of a power supply failure.

If additional power is required in a redundant power supply configuration, a third redundant supply module can be added to the backplane—increasing the total redundant power capacity to 16 A or 20 A (depending on the model). Should one of the three supplies fail, the two healthy modules will revert to the standard redundant mode—delivering 8 A or 11 A (depending on the model) of redundant current to the backplane.

A single redundant power supply module may be used as a standalone supply if you need to reduce your stockroom requirements.

Redundant power supplies are available for 115/230 V a.c., 24 V d.c., 48/60 V d.c. and 125 V d.c. source voltages.



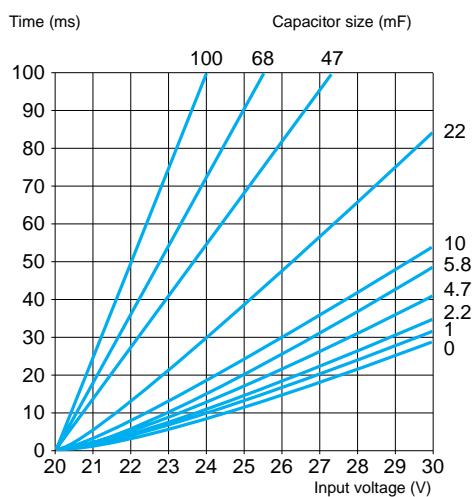
Description

The 140 CPS ●●● ●0 power supply modules comprise on front panel:

- 1 Model number and color code.
- 2 LED array.
- 3 Removable, hinged door and customer identification label.
- 4 Terminal block, 7 points (degree of protection < IP 20 rated).

To be ordered separately if necessary:

- 140 XTS 005 00 terminal block, 7 points (degree of protection < IP 20 rated).



Maximum power interruption

The buffer processing times for the 140 CPS 214 00/224 00/414 00/424 00 power supplies can be increased by adding V d.c. electrolytic capacitors at terminals 5 and 6. Respective capacitor ratings are shown in this diagram.

Modicon Quantum automation platform

Power supply modules

Characteristics

Model			140 CPS 111 00 standalone	140 CPS 114 20 summable	140 CPS 124 00 redundant
Input requirements	Input voltage	$\sim V$	100 ... 276	93 ... 132 or 170 ... 264	93 ... 138 or 170 ... 276
	Input frequency	Hz	47 ... 63		
	Input current	At $\sim 230 V$	A	0.2	0.75
		At $\sim 115 V$	A	0.4	1.3
	Inrush current	At $\sim 230 V$	A	20	19
		At $\sim 115 V$	A	10	38
	Rating	VA	50	130	
	External fusing	A	1.5 slow-blow	2.0 slow-blow	
	Input power interruption		1/2 cycle at full and minimum line voltage/frequency, and less than 1s between interrupts		
Output-to-bus	Harmonic distortion	%	Less than 10 of fundamental rms value		
	Voltage	$\equiv V$	5.1		
	Current	A	3 max., 0.3 min.	Summable: 20 at 60 °C (140 °F)	8 at 60 °C (140 °F)
				Standalone: 11 at 60 °C (140 °F)	11 at 60 °C (140 °F)
General	Protection		Over-current, over-range		
	Internal power dissipation	W	2.0 + (3 x I _{OUT}) where I _{OUT} is in A		

Model			140 CPS 211 00 standalone	140 CPS 214 00 summable	140 CPS 224 00 redundant
Requirement	Input voltage	$\equiv V$	20 ... 30		
	Input current	A	1.6	3.8 max	
	Inrush current	A	30	25 at $\equiv 24 V$, 14 at $\equiv 20 V$	
	Input ripple	$\equiv V$	–	94 ... 189 Hz	
	Input power interruption	ms	1.0 at $\equiv 20 V$	100 ms maxi with external condensator	
			20.0 at $\equiv 25 V$		
	External fusing (recommended)	A	2.5 slow-blow	5.0 slow-blow	
Output-to-bus	Voltage	$\equiv V$	5.1		
	Current	A	3 max., 0.3 min.	8.0	
	Protection		Over-current, over-range		
General	Surge withstand	$\equiv V$	–		2.3 x max rated input voltage for 1.3 ms
	Internal power dissipation	W	2 + (3 x I _{OUT}), where I _{OUT} is A	6 + (1.8 x I _{OUT}), where I _{OUT} is A	
	Alarm relay		No	Yes	
Agency approval			UL 508, CSA 22.2-142, c UL, FM Class 1 Div. 2, e		

Model			140 CPS 414 00 summable	140 CPS 424 00 redundant	140 CPS 511 00 standalone	140 CPS 524 00 redundant
Requirement	Input voltage	$\equiv V$	48 ... 60		100 ... 150	
	Input current	A	3.8 max		0.4	0.5 at $\equiv 125 V$
	Inrush current	A	14 at $\equiv 40 V$		10	28 at $\equiv 125 V$
	Input power interruption	ms	13.0 at $\equiv 48 V$		1.0 max	
	External fusing (recommended)	A	2.0, medium time lag		3/4 slow-blow	2 slow-blow
Output-to-bus	Voltage	$\equiv V$	5.1			
	Current	A	8.0		3 max, 0.3 min	8.0
	Protection		Over-current, over range			
General	Internal power dissipation	W	15.6 at 8 A	17.2 at 8 A	2 + (3 x I _{OUT}) where I _{OUT} is A	6 + (1.5 x I _{OUT}) where I _{OUT} is A
	Alarm relay		Yes		No	
Agency approval			UL 508, CSA 22.2-142, c UL, FM Class 1 Div. 2, c€			

References

Power supplies

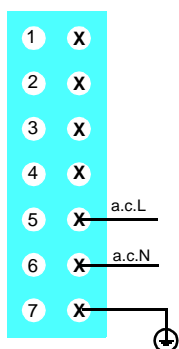
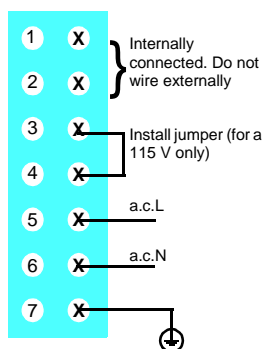
Input voltage/power	Output current	Type	Reference	Weight kg(lb)
~ 120/230 V	3 A	Standalone	140 CPS 111 00	0.650 (1.43)
~ 115/230 V	11 A	Summable	140 CPS 114 20	0.650 (1.43)
~ 120/230 V	8 A	Redondante	140 CPS 124 00	0.650 (1.43)
~ 115/230 V	11 A	Redondante	140 CPS 124 20	0.650 (1.43)
= 24 V	3 A	Standalone	140 CPS 211 00	0.650 (1.43)
	8 A	Summable	140 CPS 214 00	0.650 (1.43)
		Redondante	140 CPS 224 00	0.650 (1.43)
= 48...60 V	8 A	Summable	140 CPS 414 00	0.650 (1.43)
		Redondante	140 CPS 424 00	0.650 (1.43)
= 125 V	3 A	Standalone	140 CPS 511 00	0.650 (1.43)
	8 A	Redondante	140 CPS 524 00	0.650 (1.43)

Separate parts

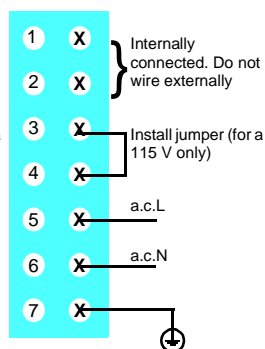
Input voltage/power	Degree of protection	Reference	Weight kg(lb)
Terminal block 7 points	IP 20	140 XTS 005 00	0.150 (0.33)

Wiring

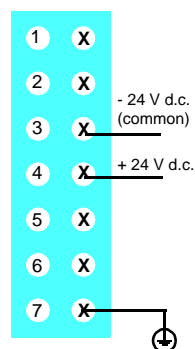
140 CPS 111 00

140 CPS 114 20
140 CPS 124 20

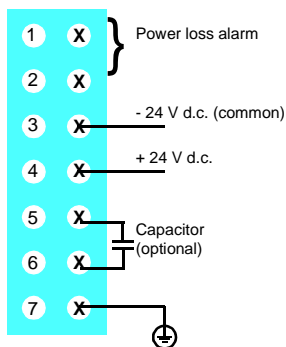
140 CPS 124 00



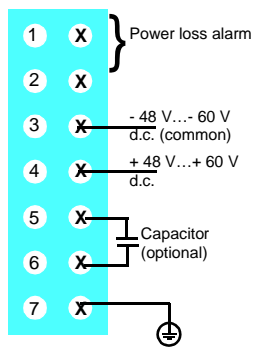
140 CPS 211 00



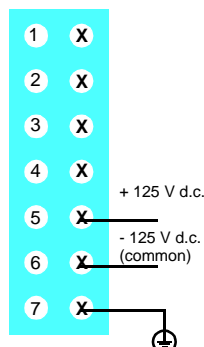
140 CPS 214/224 00



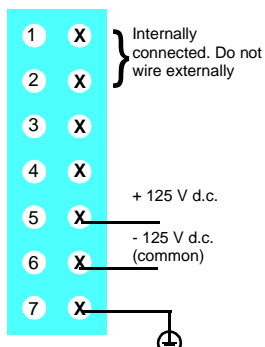
140 CPS 414/424 00



140 CPS 511 00



140 CPS 524 00



3.1 - Discrete I/O modules

Selection guide: Input modules page 3/2

Selection guide: Output modules page 3/6

Selection guide: Input/output modules page 3/10

■ Discrete I/O modules

□ Presentation, description page 3/12

□ Characteristics page 3/14

□ References page 3/26

□ Wiring page 3/28

3.2 - Analog I/O modules

Selection guide: I/O modules page 3/44

■ Analog I/O modules

□ Presentation, description page 3/46

□ Characteristics page 3/48

□ References page 3/55

□ Wiring page 3/56

3.3 - Distributed I/O

Selection guide: IP 20 distributed I/O system page 3/62

Selection guide: IP 67 splitter boxes and modules page 3/62

■ Discrete I/O IP 65 on INTERBus bus page 3/66


3.4 - Specialized I/O

■ Tego Power installation system

□ Presentation page 3/70

□ Associations with Modicon automation platforms page 3/72

Modicon Quantum automation platform
Discrete I/O
VDC input modules

Type	==		
Input voltage	5 V/TTL	24 V	
			
Number of points	32		
Number of groups	4		
Points/commun	8		
Isolation	By group		
Addressing requirements	2 input words		
Bus power required	170 mA	330 mA	
Logic	Source	Sink	Source
Model	140 DDI 153 10	140 DDI 353 00	140 DDI 353 10
Page	3/26		

3

3.1



toWORX

==

24 V	125 V	10...60V	20...30 V
------	-------	----------	-----------



96	24	16	32
----	----	----	----

6	3	8	4
---	---	---	---

16	8	2	8
----	---	---	---

By group			
----------	--	--	--

6 input words	2 input words	1 input word	2 input words	4 input words
---------------	---------------	--------------	---------------	---------------

270 mA	200 mA	300 mA	250 mA
--------	--------	--------	--------

Sink			
------	--	--	--


140 DDI 364 00 (1)	140 DDI 673 00	140 DDI 841 00	140 DDI 853 00	140 DSI 353 00
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3/26			
------	--	--	--

(1) Requires Telefast 2 connector, see page 8/9.



Modicon Quantum automation
platform
Discrete I/O
VAC input modules

Type	~			
Input voltage	24 V		48 V	
				
Number of points	16	32	16	32
Number of groups	16	4	16	4
Points/commun	1	8	1	8
Isolation	Individual points	By group	Individual points	By group
Addressing requirements	1 input word	2 input words	1 input word	2 input words
Bus power required	180 mA	250 mA	180 mA	250 mA
Logic	140 DAI 340 00	140 DAI 353 00	140 DAI 440 00	140 DAI 453 00
Model	3/26			

~

115 V

230 V



3

3.1




ProWORX

16		32		16	32
16	2	4	16	4	
1	8		1	8	
Individual points		By group		Individual points	By group
1 input word		2 input words		1 input word	2 input words
180 mA		250 mA		180 mA	250 mA
140 DAI 540 00	140 DAI 543 00	140 DAI 553 00	140 DAI 740 00	140 DAI 753 00	

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Modicon Quantum automation platform

Discrete I/O
VDC and relay output modules

Type		---							
Output voltage/Relay type		5 V/TTL		24 V		19.2...30 V			
									
Number of points		32				96			
Number of groups		4				6			
Points/common		8				16			
Maximum load	Current/point	75 mA		0.5 A		0.5 A			
	Current/group	600 mA		4 A		3.2 A			
	Current/module	2.4 A		16 A		19.2 A			
Addressing requirement		2 output words				6 output words			
Bus power required		350 mA		330 mA		250 mA			
Logic		Sink		Source		Sink		Source	
Model		140 DDO 153 10		140 DDO 353 0●		140 DDO 353 10		140 DDO 364 00 (1)	
Page		3/26							

(1) Requires Telefast connector, see page 3/67.



---		--- Verified Output	Relay	
10...60 V source	24...125 V source	10...30 V	Normally open	Normally open/Normally closed



16	12	32	16	8
2	2	4	16	8
8	6	8	1	
2 A	0.75 A	0.5 A	2 A	5 A
6 A	3 A	4 A	N/A	N/A
12 A	6 A	16 A	N/A	N/A
1 output word	1 input word 1 output word	2 input words 2 output words	1 output word	0.5 output word
160 mA	375 mA @ 6 points 650 mA @ 12 points	500 mA	1100 mA	560 mA
Source				

140 DDO 843 00	140 DDO 885 00	140 DVO 853 00	140 DRA 840 00	140 DRC 830 00
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3/26





Selection guide

Modicon Quantum automation platform
Discrete I/O
VAC output modules

Type	~	
Output voltage	24 ... 230 V	24 V ... 115 V



Number of points		16	
Number of groups		16	
Points/common		1	
Maximum load	Current/point	4 A @ 20-132 VAC, 3 A @ 170-253 VAC	4 A @ 20-132 VAC
	Current/group	N/A	N/A
	Current/module	16 A	16 A
Addressing requirement		1 output word	
Bus power required		350 mA	

Model	140 DAO 840 00	140 DAO 840 10
Page	3/26	

~

100...230 V	24...48 V	24...230 V
-------------	-----------	------------



16	32
----	----

4

4	8
---	---

4 A @ 85-132 VAC, 3 A @ 170-253 VAC	4 A @ 20-56 VAC	1 A
4 A	4 A	4 A
16 A	16 A	16 A

1 output word	2 output words
---------------	----------------

350 mA	320 mA
--------	--------

140 DAO 842 10	140 DAO 842 20	140 DAO 853 00
----------------	----------------	----------------

3/26





Selection guide

Modicon Quantum automation platform
Discrete I/O
VAC/VDC input/output modules

Output voltage	~ 85...132 V	≡ 19.2...30 V
----------------	--------------	---------------

Input voltage	~ 115 V	≡ 24 V
---------------	---------	--------



Number of points	16 input / 8 output	
------------------	---------------------	--

Number of groups	Two 8-point inputs Two 4-point outputs	
------------------	---	--

Maximum load	Current/point	4 A	0.5 A
	Current/group	4 A	2 A
	Current/module	8 A	4 A

Addressing requirement	1 input word 0.5 output word	
------------------------	---------------------------------	--

Bus power required	250 mA	330 mA
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Model	140 DAM 590 00	140 DDM 390 00
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Page	3/27	
------	------	--

19.2...156.2 V

156.2 V



4 input, 4 isolated output

One 4 point inputs
Four output points

4 A

N/A

16 A

1 input word
1 output word

350 mA

140 DDM 690 00

3/27

General

The Module Quantum Automation Series supports a full range of discrete I/O modules designed to interface with a wide variety of field devices. All modules meet internationally accepted IEC electrical standards that ensure reliability in harsh operating environments. For even better protection and extended life in extremely harsh environments, you can have your modules conformally coated.

Fully software-configurable

All Quantum I/O modules can be completely configured using Unity Pro, Concept or ProWORX. The ability to specify an I/O address for each module in software makes it easy to add or change modules in your configuration without physically changing the application program.

Defining the failure mode of an output module

Quantum gives you the ability to predefine how a discrete output point will respond if for any reason the module stops being serviced. You can configure the module in software so that the outputs:

- Turn off.
- Go to a predefined safe state.
- Hold the last value they received before the watchdog timer expired.

Failure modes can be defined on a point-by-point basis. In the event of a complete module failure, the fail state settings you have specified can be sent to the replacement module.

Mechanical keying for added security

Optionally, you can insert mechanical keys between the I/O module and the terminal strip to ensure that the field wiring and the module type are properly matched. Keying codes are unique for each module type. You can also implement mechanical keying for unique slot locations so that a rack full of similar modules with similar keying codes will not be incorrectly connected. Keys are shipped with the I/O modules. They do not need to be ordered separately.

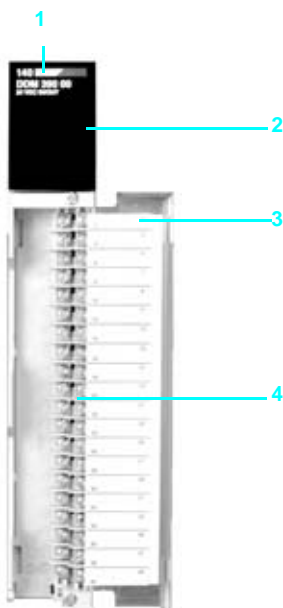
I/O connectors

Each I/O module requires an I/O connector (P/N 140 XTS 002 00), which has to be ordered separately. The same connector can be used with all modules, except for Intrinsically safe modules.

Description

140 D●● discrete I/O comprise on the front panel:

- 1 A model number and color code,
- 2 A LED indicator panel,
- 3 A removable, hinged door and customer identification label,
- 4 A 140 XTS 002 00 terminal block, 40-pole (to be ordered separately).



Modicon Quantum automation platform

Discrete I/O

Visual status and diagnostic information

Extensive LED information is available on each module. Information includes activity on the I/O points and specific module features such as field wiring fault indication and blown fuses. Visual indication of communication health is provided on an Active display, which can be used for troubleshooting.

32-point discrete I/O modules

	Active		F
1	9	17	25
2	10	18	26
3	11	19	27
4	12	20	28
5	13	21	29
6	14	22	30
7	15	23	31
8	16	24	32

LED	Color	Indication when on
Active	green	Bus communication is present
F	red	External fault detected
1...32	green	The respective input/output is turned on

16-Point discrete 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	Color	Indication when on
Active	green	Bus communication is present been detected
F	red	A fault (external to the module) has been detected
1...16	green	The indicated point or channel is turned on
1...16	red	There is a fault on the indicated point or channel

Discrete Bi-directional modules

	Active		F
1	1	1	
2	2	2	
		3	
		4	

LED	Color	Indication when on
Active	green	Bus communication is present
F	red	No voltage supply for outputs or inputs out of tolerance
1 and 2 left row	green	Output is turned on
1 and 2 middle row	red	Fault detected on the output point
1...4 right row	red	Fault detected on the input point

Characteristics

V a.c. input module characteristics

Model				140 DAI 540 00	140 DAI 543 00	140 DAI 553 00	140 DAI 740 00	140 DAI 753 00	
Number of inputs				16 16		32	16	32	
Number of groups				16	2	4	16	4	
Inputs/group				1	8	8	1	8	
Input voltage			~ V	115			230		
LEDs				Active 1...16 (green)		Active 1...32 (green)	Active 1...16 (green)	Active 1...32 (green)	
Addressing requirements			words	1 input		2 inputs	1 input	2 inputs	
Operating input	50 Hz	On	~ V	85...132			175...264		
		Off	~ V	0...20			0...40		
		Current	mA	11.1 max.			9.7 max.		
		Impedance	kΩ	14.4 capacitive			31.8 capacitive	32	
	60 Hz	On	~ V	79...132			165...264	165...264	
		Off	~ V	0...20			0...40		
		Current	mA	13.2 max.			11.5 max.		
		Impedance	kΩ	12 capacitive			26.5 capacitive	27	
Frequency range			Hz	47...63					
Maximum leakage current			mA	2.1			2.6		
Absolute maximum input	Continuous	~ V	132			264			
	10 s	~ V	156			300	312		
	One cycle	~ V	200			400			
Response time	Off - on	Minimum	ms	4.9					
		Maximum	ms	0.75 x line cycle					
	Off - on	Minimum	ms	7.3					
		Maximum	ms	12.3					
Isolation			~ V	1780 for 1 minute input- to-input 1780 for 1 minute input- to-bus	1780 for 1 minute group-to-group 1780 for 1 minute group-to-bus		1780 for 1 minute input- to-input 1780 for 1 minute input- to-bus	1780 for 1 minute group- to-group 1780 for 1 minute group- to-bus	
Bus current requirement			mA	180		250	180	250	
Power dissipation			W	5.5 max.		10.9 max.	5.5 max.	5 max.	
Fusing	Internal		–						
	External		User discretion						
Agency approvals				UL 508, CSA 22.2-142, C€, FM Class1 Div. 2, c UL					UL 508, CSA 22.2-142, C€, FM class1 Div. 2 (pending), c UL













Characteristics (continued)

V d.c. input module characteristics

Model		140 DDI 364 00	140 DSI 353 00
Number of inputs		96	32
Number of groups		6	4
Points/group		16	8
Input voltage		--- V 24	
LEDs		Active 1...32, 23...64, 65...96 (green) indicates input state	Active (2 green), Failure (1 red) 1...32 (green) indicates input state
Addressing requirements		96 points or 6 words	4 input words
Voltage	On voltage	--- V + 15...+ 30	11 min.
	Off voltage	--- V + 5	5 max.
	On current	mA 2.5 min.	2.5 min.
	Off current	mA 0.7 max.	1.2 max., 0.3 min.
Absolute maximum input	Continuous	--- V 30	
	Surge	--- V 50, dropping pulse	45 for 10 ms @ - 3...30
Response time	Off - On	ms 2 max.	2.2
	On - Off	ms 3 max.	3.3
Fault sensing		—	Broken wire detection below 0.15 mA Off current
Fault status		—	Broken wire detection for each input
Internal resistance		Ω 6.7	—
Isolation	Point to point	—	No
	Inputs to backplane	$\sim \text{V (rms)}$ —	Yes, 1780 for 1 minute, group to bus
	Group to group	$\sim \text{V (rms)}$ 500 for 1 minute	Yes, 500 for 1 minute
Operating temperature		$^{\circ}\text{C}$ ($^{\circ}\text{F}$) —	0...60 (32...140)
Bus current requirement		mA < 270	250
Power dissipation		W 1.35 + (0.13 x nbr of ON inputs)	—
External power supply		$\sim \text{V}$ 19.2...30	20...30 @ 20 mA per group
Agency approvals		—	UL 508, CSA 22.2-142, C€, FM Class1 Div. 2 (pending), c UL

Characteristics (continued)

V d.c. input module characteristics

Model			140 DDI 841 00		140 DDI 853 00		140 DDI 673 00		
Number of inputs				16		32		24	
Number of groups				8		4		3	
Points/group				2		8			
Input voltage			 V	10...60				88...150	
LEDs				Active 1...16 (green)		Active 1....32 (green)		Active 1....24 (green)	
Addressing requirements				1 input word		2 input words			
On state current	 12 V	mA	5...10				2.5 min. @ c 125 V		
	 24 V	mA	6...30						
	 48 V	mA	2...15						
	 60 V	mA	1...5						
Group supply/tolerance	 12 V / + / - 5 %	V	on state 9...12	off state 0...1.8	on state 9...12	off state 0...1.8	—		
	 24 V / - 15...+ 20 %	V	11...24	0...5	11...24	0...5	—		
	 48 V / - 15...+ 20 %	V	34...48	0...10	34...48	0...10	—		
	 60 V / - 15...+ 20 %	V	45...60	0...9	45...60	0...12.5	—		
Absolute maximum input			V	 75				~ 156.25 including ripple	
Response time	Off - on	ms	4				0.7 (defaults filter) 1.5 (optional filter)		
	On - off	ms	4				0.7 (defaults filter) 1.5 (optional filter)		
Switching frequency			Hz	100 max.				—	
Isolation	Group-to-group	V (rms)	 700 for 1 minute				~ 1780 for 1 minute		
	Group-to-bus	V	2500 for 1 minute						
Bus current requirement			mA	200		300		200	
Power dissipation			W	1 + (0.62 x # of points on)					
External power (U _s)			 V	10...60 (group supply), not required for this module					
Fusing	Internal		—						
	External		User discretion						
Logic				Sink					
Agency approvals				UL 508, CSA 22.2-142, C€, FM Class1 Div. 2, c UL					

Characteristics (continued)

V a.c. input module characteristics

Model				140 DAI 340 00	140 DAI 353 00	140 DAI 440 00	140 DAI 453 00		
Number of inputs					16	32	16	32	
Number of groups					16	4	16	4	
Points/group					1	8	1	8	
Input voltage				~ V	24	24	48		
LEDs					Active 1...16 (green)	Active 1...32 (green)	Active 1...16 (green)	Active 1...32 (green)	
Addressing requirements				words	1 input	2 inputs	1 input	2 inputs	
Operating input	50 Hz	On	~ V	14...30			34...56		
		Off	V	0...5			0...10		
		Current	mA	11.1 max.			9.8 max.		
		Impedance	kΩ	3.1 capacitive			6.8 capacitive		
	60 Hz	On	~ V	12...30			29...56		
		Off	V	0...5			0...10		
		Current	mA	13.2 max.			11.7 max.		
		Impedance	kΩ	2.6 capacitive			5.6 capacitive		
Frequency range				Hz	47...63				
Maximum leakage current				mA	1.9			1.7	
Absolute maximum input		Continuous	~ V	30			56		
		10 s	V	32			63		
		One cycle	V	50			100		
Response time	Off - On	Minimum	ms	4.9					
		Maximum	ms	0.75 x line cycle					
	On - Off	Minimum	ms	7.3					
		Maximum	ms	12.3					
Isolation				~ V	1780 for 1 minute input-to-input 1780 for 1 minute input-to-bus	1780 for 1 minute group-to-group 1780 for 1 minute group-to-bus	1780 for 1 minute input-to-input 1780 for 1 minute input-to-bus	1780 for 1 minute group-to-group 1780 for 1 minute group-to-bus	
Bus current requirement				mA	180	250	180	250	
Power dissipation				W	5.5 max.	10.9 max.	5.5 max.	10.9 max.	
Fusing		Internal		—					
		External		User discretion					
Agency approvals					UL 508, CSA 22.2-142, C€, FM Class1 Div. 2, c UL				

Characteristics (continued)

V d.c. input module characteristics

Model			140 DDI 153 10	140 DDI 353 00	140 DDI 353 10	
Number of inputs			32			
Number of groups			4			
Points/group			8			
Input voltage			$\overline{\text{V}}$	5 TTL	24	
LEDs			Active 1...32 (green) - indicates point status			
Addressing requirements			2 input words			
Operating input	Voltage on	$\overline{\text{V}}$	0.8	15...30	- 15...- 30 (reference from group supply)	
	Voltage off	V	4 min. @ $U_s = 5.5 \text{ V}$	- 3...+ 5	0...- 5 (reference from group supply)	
	Current on	mA	4.0 @ $U_s = 5.5 \text{ V}$ and $U_m = 0$	2.0 min.	2.5 min. @ $U = - 14 \text{ V}$	
	Current off	mA	–	0.5 max.		
Internal resistance			kΩ	7.5	2.5	2.4
Leakage current			mA	200 @ $U_s = 5.5 \text{ V}$ and $U_m = 4 \text{ V}$		
Absolute maximum input	Continuous	$\overline{\text{V}}$	5.5	30		
	1.0 ms	V	50 (decaying pulse)			
	1.3 ms	V	15 (decaying pulse)	56 (decaying pulse)	–	
Response time	Off - on	ms	250 max.	1000 max.		
	On - off	ms	500 max.	1000 max.		
Input protection			Resistor limited			
Isolation	Group-to-group	$\overline{\text{V (rms)}}$	500 for 1 minute			
	Group-to-bus	V (rms)	1780 for 1 minute			
Bus current requirement			mA	170	330	
Power dissipation			W	5	1.7 + (0.36 x # of points on)	1.5 + (0.26 x # of points on)
External power (U_s)			$\overline{\text{V}}$	4.5...5.5	–	19.2...30
Fusing	Internal		–			
	External		User discretion			
Logic				Source	Sink	Source
Agency approvals				UL 508, CSA 22.2-142, C€, FM Class1 Div. 2, c UL		

Characteristics (continued)

V a.c. output module characteristics

Model			140 DAO 840 00	140 DAO 842 10	140 DAO 842 20	140 DAO 853 00
Number of outputs			16	16		32
Number of groups			16	4		
Points/group			1	4		8
Voltage (rms)	Working	~ V	20...253	85...253	20...56	20...253
	Frequency	Hz	47...63			
	On state drop/point	~ V	1.5			
LEDs			Active 1...16 (green) - indicates point status	Active F 1...16 (green) - indicates points status 1 - 4, 5 - 8, 9 - 12, 13 - 16 (red) - indicates group blew a fuse or no field power		Active 1...32 (green) - indicates point status
Addressing requirements			1 output word			2 outputs words
Operating output (rms)	Working	~ V	20...253	85...253	20...56	–
	On state drop/point		1.5			–
Frequency range		Hz	47...63			
Absolute maximum output		~ V	300 for 10 s 400 for 1 cycle		63 for 10 s 100 for 1 cycle 111 peak for 1.3 ms	300 for 10 s 400 for 1 cycle
Minimum load current (rms)		mA	5			10
Maximum load current (rms)	Per point	A	4 continuous, 20...132 V 3 continuous, 170...253 V	4 continuous, 85...132 V 3 continuous, 170...253 V	4 continuous, 20...56 V	1 continuous, 20...253 V
	Four contiguous points	A	4 continuous	–		
	Per group	A	–	4 continuous		
	Per module	A	16 continuous			
	Off state leakage/ point (max)	mA	2.5 @ 230 V 2.0 @ 115 V 1.0 @ 48 V 1.0 @ 24 V	2.5 @ 230 V 2.0 @ 115 V	1.0	2 @ 230 V 1.1 @ 115 V 0.4 @ 48 V 0.2 @ 24 V
Maximum surge current (rms)	One cycle	A	Per point 30	Per point group 30 45	Per group 45	Per point 15
	Two cycles	A	20	20 30	30	12
	Three cycles	A	10	10 25	25	8
Applied DV/DT		~	400 V/ms			
Response time	Off - on	ms	.50 max. of one line cycle			
	On - off	ms	.50 max. of one line cycle			
Output protection (internal)			RC snubber suppression			
Isolation (rms)	Group-to-group	~ V	–	1000 for 1 minute, galvanically isolated		1780 for 1 minute
	Output-to-output	~ V	1500 for 1 minute	–		
	Output-to-bus	~ V	1780 for 1 minute			
Fault detection			–	Blown fuse detect, loss of field power		–
Bus current requirement		mA	350			320
Power dissipation		W	1.85 + (1.1 V x total module load current)			1.60 + (1.0 V x total module load current)
External power (rms)		~ V	–	85...253	20...56	–
Fusing	Internal		–	5 A fuse for each group		4 A, 250 V for each group
	External		5 A/point recommended (part # 043502405 or equivalent)	User discretion		
Agency approvals			UL 508, CSA 22.2-142, C€, FM Class1 Div. 2, c UL			

Characteristics (continued)

V a.c. and TTL output module characteristics

Model			140 DAO 840 10	140 DDO 153 10
Number of outputs			16 isolated	32 (four groups of 8)
LEDs			Active 1...16 (green) - indicates point status	Active F 1...32 (green) - indicates point status
Addressing requirements			1 output word	2 output words
Voltage (rms)	Working	V	~ 20...132	5 TTL
	Absolute maximum	~	156 for 10 s 200 for 1 cycle	—
	Frequency	Hz	47...63	—
	On state drop/point	~ V	1.5	—
Output ratings	On level	~ V	—	0.2 max. @75 mA sink
	Off level	~	—	V out = U _s - 1.25 V @ 1 mA source V out = U _s - 3.2 V (min) @ 1 mA, U _s = 4.5 V
Internal pullup resistor		Ω	—	440
Minimum load current (rms)		mA	5	—
Maximum load current (rms)	Each point	mA	4 continuous, 20...132 V	75 (sink)
	Each group	mA	—	600
	Any 4 contiguous pts	A	4 max. continuous for the sum of the four points	—
	Per module	A	16 continuous	2.4
	Off state leakage/points	mA	2 @ 115 V max. 1 @ 48 V max. 1 @ 24 V max.	—
Surge current maximum (rms)			Per point	
	One cycle	A	30	—
	Two cycles	A	20	—
	Three cycles	A	10	—
	Each point	mA	—	750 @ 500 μs duration (no more than 6 per minute)
Applied DV/DT		~	400 V/μs	—
Response time	Off - on		0.50 of one line cycle max.	250 μs (max.) resistive loads
	On - off		0.50 of one line cycle max.	250 μs (max.) resistive loads
Output protection (internal)			RC snubber suppression, varistor	Transient voltage suppression
Isolation (rms)	Output-to-output	~ V	1500 for 1 minute	—
	Group-to-group	~ V	—	500 for 1 minute
	Output-to-bus	~ V	1780 for 1 minute	—
Fault detection			—	Blown fuse detect, loss of field power
Bus current required		mA	350	—
Power dissipation		W	1.85 + 1.1 x total module load current	4
External power (U _s)		~ V	—	4.5...5.5 continuous
Absolute voltage (U _s) max		~ V	—	15 for 1.3 ms decaying voltage pulse
External power supply current		mA	—	400 + load current per point
Fusing	Internal		—	Yes
	External		Each output point must be fused with an external fuse. The recommended fuse is a 5 A fuse or any other fuse with an I ² t rating of less than 87	—
Agency approvals			UL 508, CSA 22.2-142, C€, FM Class1 Div. 2, c UL	

Characteristics (continued)

V d.c. output module characteristics

Model		140 DDO 364 00	140 DDO 885 00	140 DVO 853 00
Number of outputs		96	12	32
Number of groups		6	2	4
Points/group		16	6	8
LEDs		Active 32...64 1...32 (green) - indicates output state	Active Failure 1 red 1...12 (green) - indicates point or channel is On 1...12 (red) - indicates output point has an over-current condition	Active (1 green) Failure 1 red 1...32 (green) - indicates output state
Addressing requirements		96 points or 6 output words	1 output word and 1 input word	2 input words and 2 output words
Voltage	Output	--- V	24...125	10...30
	Absolute (max.)	--- V	—	50 for 1.0 ms decaying voltage pulse
	Working	--- V	19.2...156.2 including ripple	—
	On state drop/point	--- V	< 0.5 @ 0.5 A	0.4 @ 0.5 A
Maximum load current	Each point	A	0.5	0.5
	Each group	A	3.2	4.0
	Per module	A	19.2	16.0
Surge current maximum	Each point	A	2 (internally limited)	4 @ 1 ms pulse (no more than 6 per minute)
Response time (resistive loads)	Off - on	ms	< 0.1	1 typical, 2 max
	On - off	ms	< 0.1	1 typical, 2 max
Type of output		Electronic, protected against short circuit and overheating	—	—
Type of signal		---	Current source	—
Leakage current		mA	1 @ c 24 V	—
Output protection (internal)		Thermal overload and short circuit	Group varistor and individual point overcurrent sense	Transient voltage suppression short circuit protection
Load inductance maximum		Henry	0.5 @ 4 Hz switch frequency or: $L = \frac{0.5}{I^2 F}$ where: L = Load Inductance (Henry) I = Load Current (A) F = Switching Frequency (Hz)	No limit (internal diode protected)
Tungsten load maximum per point		W	46 @ c 130 V	0.5 @ 4 Hz switch frequency or: $L = \frac{0.5}{I^2 F}$ where: L = Load Inductance (Henry) I = Load Current (A) F = Switching Frequency (Hz)
			41 @ c 115 V	3 @ c 12 V
			8 @ c 24 V	6 @ c 24 V
Switching frequency		Hz	50 maximum	—
Isolation	Field-to-bus	\sim	500 for 1 minute	2500 for 1 minute
	Group-to-group	V (rms)	—	500 for 1 minute
	Group-to-bus		—	1780 for 1 minute
Fault	Detection		Group indication: loss of field power/faulted point (short circuit or overload)	Over current
	Sensing		Yes	Blown fuse, loss of power incorrect output state
	Reporting		Yes	—
Bus current requirement		mA	< 250	375 (6 points On) 650 (12 points On)
External power		--- V	19.2...30	—
Fusing	Internal		—	500
	External		User discretion	—
Power dissipation		W	7 (all points on)	1 + (0.77 x # points on)
Agency approvals			UL 508, CSA 22.2-142, C€, FM Class1 Div. 2 (pending), c UL	2.5 + (0.1x # points on) + (0.4 x total load current)

Characteristics (continued)

V d.c. output module characteristics

Model		140 DDO 353 00	140 DDO 353 10/ 140 DDO 353 01	140 DDO 843 00
Number of outputs		32 (4 groups of 8)		16 (2 groups of 8)
LEDs		Active F 1...32 (green) - indicates point status		Active 1...16 (green) - indicates point status
Addressing requirements		2 output words		1 output word
Voltage	Operating (max)	--- V	19.2...30	10.2...72
	Absolute (max)	--- V	56 for 1.3 ms decaying voltage pulse	72 (continuous)
	1.0 ms	--- V	–	50 decaying pulse
	on state drop/point	--- V	0.4 @ 0.5 A	1 max. @ 2 A
Maximum load current	Each point	A	0.5	2
	Each group	A	4	6
	Per module	A	16	12
	Off state leakage/point	mA	0.4 @ 30 V	1 @ 60 V max
Surge current maximum	Each point	A	5 @ 500 μ s duration (no more than 6 per minute)	7.5 @ 50 ms duration (no more than 20 per minute)
			DDO 353 10: 5 @ 1 ms duration (no more than 6 per minute). DDO 353 01: 2 (limited internally).	
Response time (resistive loads)	Off - on	ms	1 (max.)	1
	On - off	ms	1 (max.)	1
Output protection (internal)			Transient voltage suppression	Over voltage (suppression diode)
Load inductance maximum		Henry	0.5 @ 4 switch frequency or $L = \frac{0.5}{I^2 F}$ where: L = Load Inductance (Henry) I = Load Current (A) F = Switching Frequency (Hz)	–
Load capacitance maximum		μ F	50	–
Tungsten load maximum		W	–	DDO 353 10: 12 @ 24 V
Isolation	Group-to-group	---	500 V rms for 1 minute	700 V for 1 minute
	Output-to-bus	---	1780 V rms for 1 minute	–
	Group-to-bus	---	–	2500 V for 1 minute
Fault detection			Blown fuse detect, loss of field power	–
Bus current requirement		mA	330	330 (max)
Power dissipation		W	1.75 + (0.4 V x total module load current)	DDO 353 10: 2.0 + (0.4 V x total load current) DDO 353 01: 5 (all points)
External power		---	19.2...30 V	10...60 V
Fusing	Internal	A	5 per group	8 per group time-lag
	External	A	5 per group The group fuse is not guaranteed to protect each output switch for all possible overload conditions. 3 A per point recommended	8 per group The group fuse is not guaranteed to protect each output switch for all possible overload conditions. 2 A per point recommended
Logic			Source	DDO 353 10: sink DDO 353 01: source
Agency approvals			UL 508, CSA 22.2-142, C€, FM Class1 Div. 2, c UL	UL 508, CSA 22.2-142, C€, FM Class1 Div. 2, c UL

Characteristics (continued)

Relay output module characteristics

Model		140 DRA 840 00	140 DRC 830 00
Number of outputs		16 (normally open)	8 (normally open/normally closed pairs)
LEDs		Active 1...16 (green) - indicates point status	Active 1...8 (green) - indicates point status
Addressing requirements		1 output word	0.5 output word
Voltage	Working	\sim V 20...250 \equiv V 5...30 \equiv V 30...150 (reduced load current)	
Maximum load current	Each point	A 2 max., at \sim 250 V or \equiv 30 V @ 60°C ambient resistive load 1 tungsten lamp load 1 @ a power factor of 0.4 1/8 hp @ \sim 125/250 V	5 max., at \sim 250 V, \equiv 30 V @ 60°C ambient resistive load 2 tungsten lamp load 3 @ a power factor of 0.4 1/4 hp @ \sim 125/250 V
	Each point (30...150 V)	\equiv mA 300 (resistive load) 100 (L/R = 10 msec)	300 (resistive) 100 (L/R = 10 msec)
Maximum module current		A –	40
Minimum load current		mA 50	–
	Per point	A Note: Minimum load current if the contact is used at rated loads of \equiv 5...30 V or \sim 20...250 V 2 max., at \sim 250 V or \equiv 30 V @ 60°C ambient resistive load	
Maximum frequency (F)		Hz –	30 resistive loads or $F = \frac{0.5}{L}$ where: L = Load Inductance (Henry) $I^2 L$ I = Load Current (A)
Surge current maximum	Per point	A 10 capacitive load @ t = 10 ms	20 capacitive load @ t = 10 ms
Switching capability		VA 500 resistive load	1250 resistive load
Response time (resistive loads)	Off - on	ms 10 (max.)	
	On - off	ms 20 (max.)	
Relay contact life	Mechanical operations		10,000,000
	Electrical operations		200,000 (resistive load @ max. voltage and current) 100,000 (resistive load @ max. voltage and current)
	Electrical operations (\equiv 30...150 V)		100,000, 300 mA (resistive load) 50,000, 500 mA (resistive load) 100,000, 100 mA (L/R = 10 msec) 100,000 Interposing relay
Relay type	Relay type	Form A	Form C, NO / NC contacts
Contact protection		Varistor, 275 V (internal)	
Isolation	Channel-to-channel	V (rms) \sim 1780 for 1 minute	
	Field-to-bus	V (rms) \sim 1780 for 1 minute \equiv 2500 for 1 minute	
Bus current requirement		mA 1100	560
Power dissipation		W 5.5 + 0.5 x N = Watts (where N = the number of points on)	2.75 + 0.5 x N = Watts (where N = the number of points on)
External power		–	
Fusing	Internal	–	
	External	User discretion	
Agency approvals		UL 508, CSA 22.2-142, C€, FM Class1 Div. 2, c UL	

Characteristics (continued)

Combo module characteristics

Model				140 DAM 590 00		140 DDM 390 00		140 DDM 690 00		
Number of inputs						16 (2 groups of 8)			4 (1 group of 4)	
Number of outputs						8 (2 groups of 4)			4 isolated	
LEDs						Active F (red) - no power applied to the group(s) or blown fuse 1...16 (green - right two columns) - indicates input status 1...8 (green - left column) - indicates output status			Active F (red) - over current condition on any point 1...4 (green - left column) - indicates output point is turned on 1...4 (red - middle column) indicates output point has an over current condition 1...4 (green - right column) - indicates input point is turned on	
Addressing requirements						1 in/0.5 out word			1 in/1 out word	
Inputs	Operating voltage	On	V	~ 85...132 @ 50 Hz ~ 79...132 @ 60 Hz		--- +15...+30		--- 88 ... 156.2, including ripple		
		Off	V	~ 0...20		--- -3...+5		--- 0 ... +36		
		Impedance	kΩ	14.4 capacitive		2.5		—		
	Current	On	mA	11.1 max. @ 50 Hz 13.2 max. @ 60 Hz		2.0 min.		2.0 min.		
		Off	mA	0.5 max.		0.5 max.		1.2 max.		
	Maximum leakage current from an external device recognized as an off condition		mA	2.1		—				
	Absolute maximum input voltage	Continuous	V	~ 132		--- 30		--- 156.2 including ripple		
		10 s	~ V	156		1 max.		—		
		1 cycle	~ V	200		1 max.		—		
		1.3 ms	--- V	—		56 (decaying pulse)		—		
	Response time	Off - on	ms	min. 4.9 / max. 0.75 line cycle		—		0.5 or 1.5 depending on the filter		
		On - off	ms	min. 7.3/ max. 12.3		—		0.5 or 1.5 depending on the filter		
	Outputs	Voltage	Operating (max.)	--- V	—		19.2...30		19.2 ...156.2 including ripple	
			Absolute (max.)	--- V	—		56 for 1.3 ms decaying pulse		—	
On state drop/point			--- V	—		0.4 @ 0.5 A		0.75 @ 4 A		
Absolute maximum outputs		Continuous	~ V	85...132		—				
		10 s	~ V	156		—				
		1 cycle	~ V	200		—				
		On state drop/point	~ V	1.5		—				
Minimum load current (rms)		mA	5		—					
Maximum load current (rms)		Per point	A	4 continuous		0.5		4 continuous		
		Per group	A	4 continuous		2		—		
		Per module	A	8 continuous		4		16 continuous		
Off state leakage/point		mA	2 @ ~ 115 V (max)		0.4 @ --- 30 V					
Surge current maximum (rms)		One cycle	A	Per point 30	Per group 45	—				
		Two cycles	A	20	30	—				
		Three cycles	A	10	25	—				
		Per point	A	— —		5 for 500 μs (no more than 6/min)		30 for 500 ms		

Characteristics (continued)

Combo module characteristics

Model			140 DAM 590 00	140 DDM 390 00	140 DDM 690 00
Outputs (continued) Load inductance max	Henry	–	–	0.5 @ 4 Hz switch frequency or $L = \frac{0.5}{I \cdot F}$ where: L = load inductance I = load current (A) F = switching frequency (Hz)	For switching intervals ≥ 15 seconds per ANSI/IEEE C37.90-1978/1989): $L \leq \frac{9}{I^2}$ For repetitive switching: $L \leq \frac{0.7}{I^2 F}$ where: L = load inductance (Henry) I = load current (A) F = switching frequency (Hz)
Load capacitance max	µF	–	–	50	0.1 @ --- 150 V 0.6 @ --- 24 V
Applied DV/DT	V/µs	400	–	–	–
Output protection			RC snubber suppression (internal)		–
Common	Frequency	Hz	47 ... 63	–	–
I/O response time	On-off	ms	0.5 of 1 cycle max.	1 (max) resistive load output	–
	Off-on	ms	0.5 of 1 cycle max.	1 (max) resistive load output	–
Module protection	Inputs		–	Resistor-limited	
	Outputs		–	Transient voltage suppression (internal)	
Isolation	Group-to-group	~	1000 V for 1 min	500 V rms for 1 min	–
	Point-to-bus	~	1780 V for 1 min	–	–
	Group-to-bus	~	–	1780 V for 1 min	2500 V rms for 1 min
	Input group-to-output	~	–	–	1780 V rms for 1 min
	Output-to-output	~	–	–	1780 V rms for 1 min
Fault detection	Input		–		
	Output		Blown-fuse detect, loss of field power		Over current-each point
Bus current required	mA		250	330	350
Power dissipation	W		5.5 + 1.1 x total module load current	1.75 + 0.36 x input points on + 1.1 V x total output load currents	0.4 W x (1.0) x number of input points ON + (0.75) x total module output current
External power		~	85 ... 132 V for output groups	–	Not required for this module
Fusing	Input	Internal	–		
		External	User discretion		
	Output	Internal	5 A fuse for each group		
		External	User discretion	5 A for each group to protect the module from catastrophic failure. Not guaranteed to protect each out-switch for all possible over-load conditions—we recommend that each point be fused with a 1.25 A fuse.	Each output is protected by an electronic shutdown: For current output surges between 4 A and 30 A, the input point will shut down after 0.5 s. For current surges greater than 30 A, the output will shut down immediately.
Agency approvals			UL 508, CSA 22.2-142, CEC, FM Class1 Div. 2, c UL		

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Discrete I/O

References

Discrete input modules

Voltage	Description	Logic	Reference	Weight kg (lb)
~ 24 V	16 isolated inputs	–	140 DAI 340 00	0.300 (0.66)
	4 groups of 8 inputs	–	140 DAI 353 00	0.340 (0.75)
~ 48 V	16 isolated inputs	–	140 DAI 440 00	0.300 (0.66)
	4 groups of 8 inputs	–	140 DAI 453 00	0.300 (0.66)
~ 120 V	16 isolated inputs	–	140 DAI 540 00	0.310 (0.68)
	2 groups of 8 inputs	–	140 DAI 543 00	0.300 (0.66)
	4 groups of 8 inputs	–	140 DAI 553 00	0.330 (0.73)
~ 230 V	16 isolated inputs	–	140 DAI 740 00	0.350 (0.77)
	4 groups of 8 inputs	–	140 DAI 753 00	0.300 (0.66)
≡ 5 V TTL	4 groups of 8 inputs	Source	140 DDI 153 10	0.450 (0.99)
≡ 24 V	4 groups of 8 inputs	Sink	140 DDI 353 00	0.300 (0.66)
		Source	140 DDI 353 10	0.300 (0.66)
≡ 24 V	6 groups of 16 inputs	Sink	140 DDI 364 00	0.300 (0.66)
≡ 125 V	3 groups of 8 inputs	Sink	140 DDI 673 00	0.300 (0.66)
≡ 10...60 V	8 groups of 2 inputs	Sink	140 DDI 841 00	0.300 (0.66)
	4 groups of 8 inputs	Sink	140 DDI 853 00	0.295 (0.65)
≡ 24 V	4 groups of 8 inputs	Sink	140 DSI 353 00	0.300 (0.66)

Discrete output modules

Voltage	Description	Logic	Reference	Weight kg (lb)
~ 24...230 V	16 isolated outputs	–	140 DAO 840 00	0.485 (1.07)
~ 24...115 V	16 isolated outputs	–	140 DAO 840 10	0.485 (1.07)
~ 100...230 V	4 groups of 4 outputs	–	140 DAO 842 10	0.450 (0.99)
~ 24...48 V	4 groups of 4 outputs	–	140 DAO 842 20	0.450 (0.99)
~ 24...230 V	4 groups of 8 outputs	–	140 DAO 853 00	0.450 (0.99)
≡ 5 V TTL	4 groups of 8 outputs	Sink	140 DDO 153 10	0.450 (0.99)
≡ 24 V	4 groups of 8 outputs	Source	140 DDO 353 00	0.450 (0.99)
		Source Protected outputs (1)	140 DDO 353 01	0.450 (0.99)
		Sink	140 DDO 353 10	0.450 (0.99)
≡ 19.2...30V	6 groups of 16 outputs	Source	140 DDO 364 00	0.450 (0.99)
≡ 24...125V	2 groups of 6 outputs	Source	140 DDO 885 00	0.450 (0.99)
≡ 10...60 V	2 groups of 8 outputs	Source	140 DDO 843 00	0.450 (0.99)
≡ 150 V/~ 250V relay	16 relay outputs	"F"	140 DRA 840 00	0.410 (0.90)
	8 relay outputs	"O" and "F"	140 DRC 830 00	0.300 (0.66)
≡ 10...30 V	4 groups of 8 outputs	Source	140 DVO 853 00	0.300 (0.66)

(1) Protected against short-circuits and overloads by thermal supervision.

Modicon Quantum automation platform

Discrete I/O

References (continued)

Discrete combination I/O modules

Number of input/output	Number of input	Number of output	Reference	Weight kg (lb)
24	2 groups of 8 inputs ~ 125 V	2 groups of 4 outputs ~ 125 V	140 DAM 590 00	0.450 (0.99)
	2 groups of 8 inputs (1) --- 24 V	2 groups of 4 outputs (1) --- 24 V	140 DDM 390 00	0.300 (0.66)
8	1 group of 4 inputs (1) --- 125 V	4 isolated outputs (2) --- 125 V	140 DDM 690 00	0.300 (0.66)

Accessories

Description	Quantity	Reference	Weight kg
Terminal block, 40 points required for all modules (<IP 20 rated)	–	140 XTS 002 00	0.150
Terminal block, 40 points IP 20 – compatible I/O modules.	–	140 XTS 001 00	–
Dummy module without terminal block	–	140 XCP 500 00	–
Dummy module with cover	–	140 XCP 510 00	–
Jumper kit for terminal block	12	140 XCP 600 00	–
Discrete input simulator, 16 switches or the 140 DAI 540 00 and 140 DAI 740 00	–	140 XSM 002 00	–

Connecting cables for I/O modules fitted with HE 10 connectors

Description	Use	Length	Section	Reference	Weight kg
Connecting cables	2 HE 10 connectors or Telefast 2 system	0.5 m	0.324 mm ²	TSX CDP 053	0.085
		1 m	0.324 mm ²	TSX CDP 103	0.150
		2 m	0.324 mm ²	TSX CDP 203	0.280
		3 m	0.324 mm ²	TSX CDP 303	0.410
		5 m	0.324 mm ²	TSX CDP 503	0.670

Separate parts

Description	Quantity	Reference	Weight kg
Coding kit for terminal block	60	140 XCP 200 00	–

(1) Sink

(2) Sink or source.

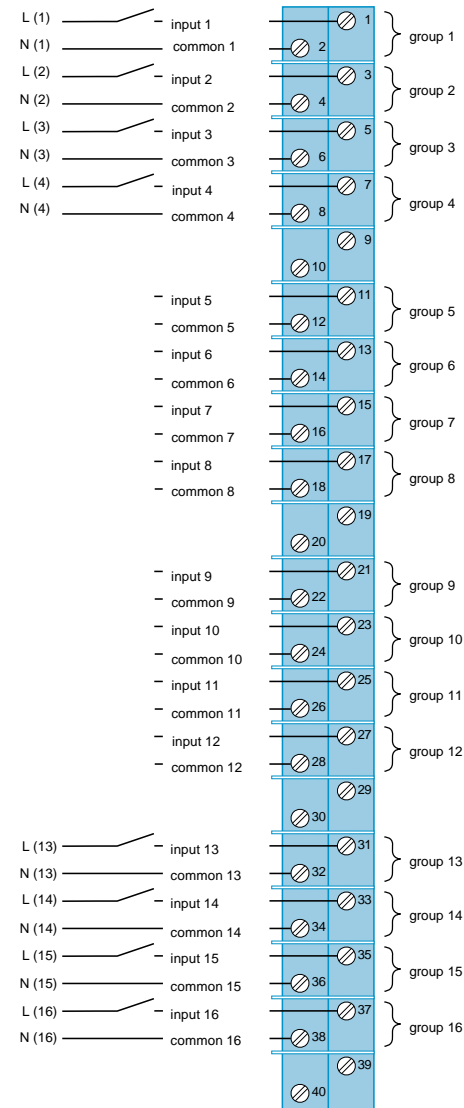
Modicon Quantum automation platform

Discrete I/O

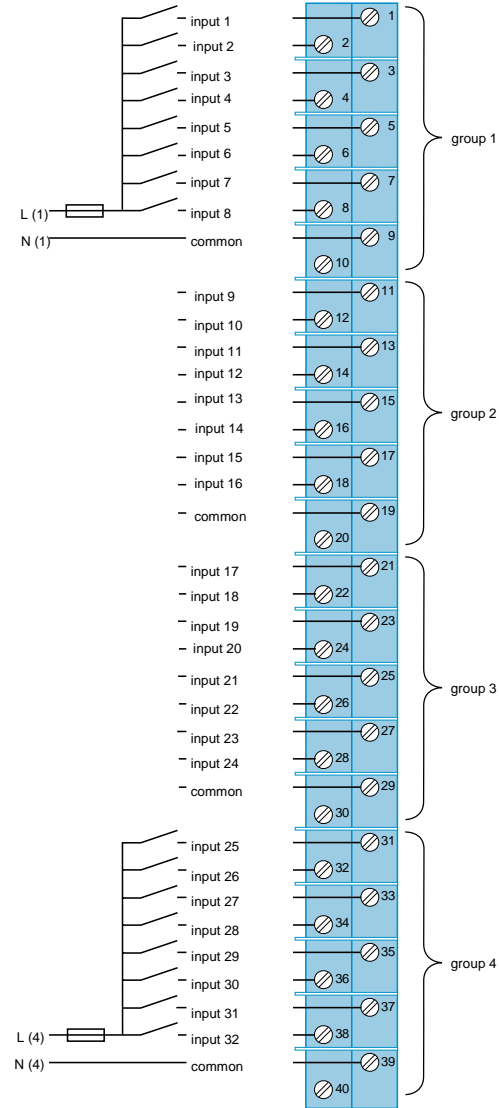
Input module wiring diagrams

Input modules

140 DAI 340 00/140 DAI 440 00/140 DAI 740 00



140 DAI 353 00/140 DAI 453 00



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3.1



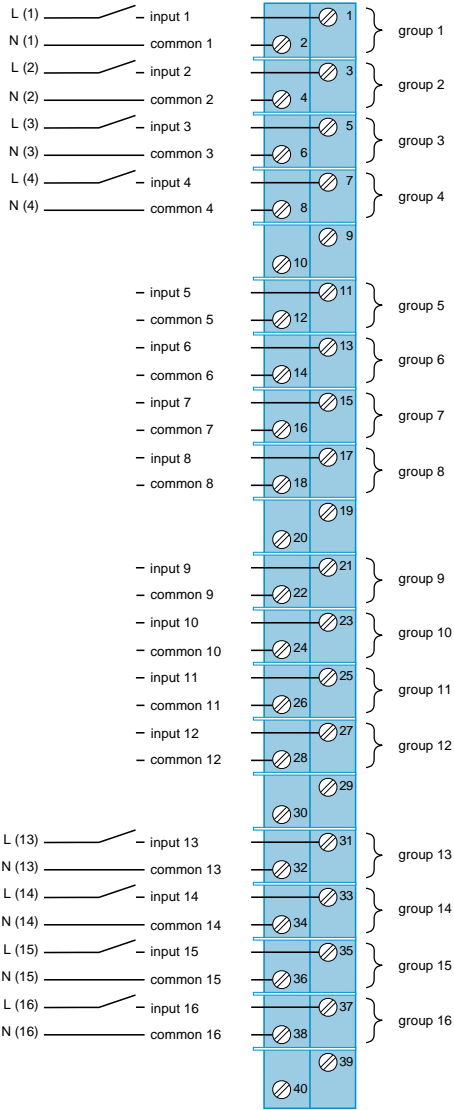
ProWORX

Modicon Quantum automation platform

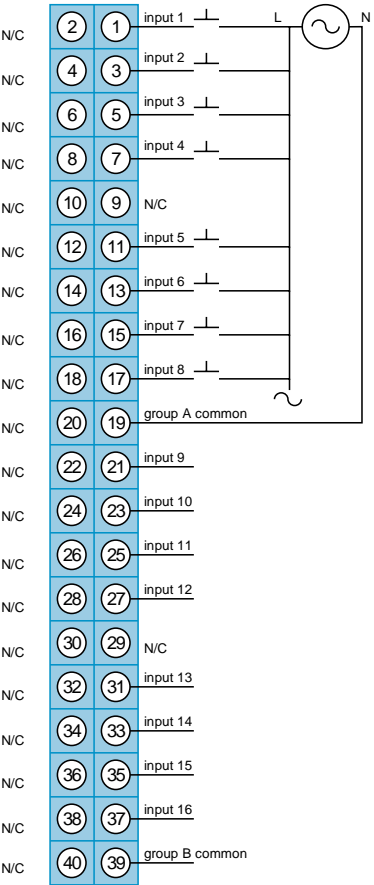
Discrete I/O
Input module wiring diagrams

Input modules

140 DAI 540 00



140 DAI 543 00



Modicon Quantum automation platform

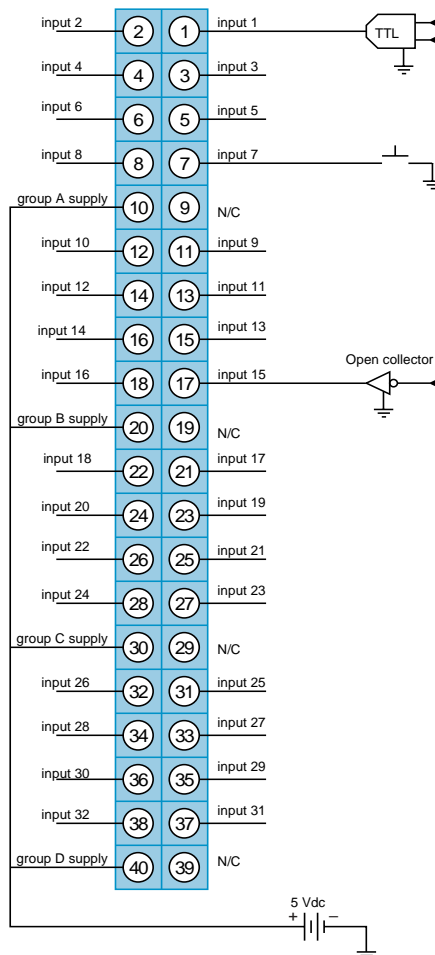
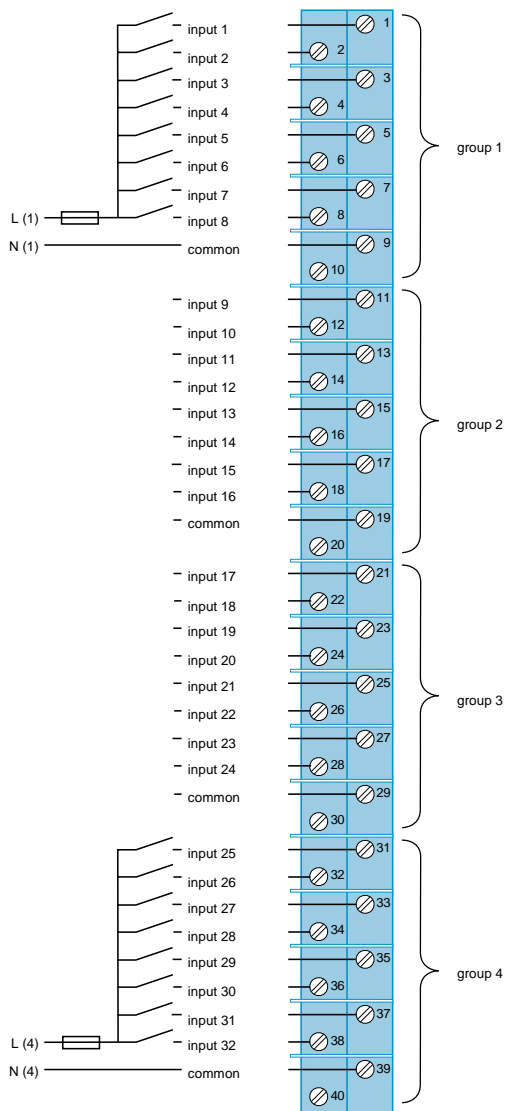
Discrete I/O

Input module wiring diagrams

Input modules

140 DAI 553 00/140 DAI 753 00

140 DDI 153 10



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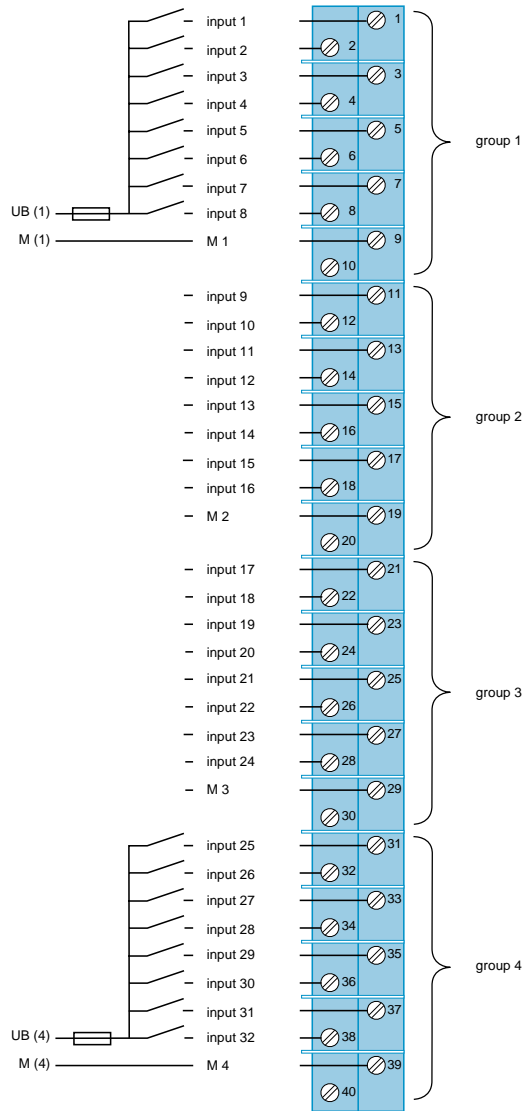
Modicon Quantum automation platform

Discrete I/O

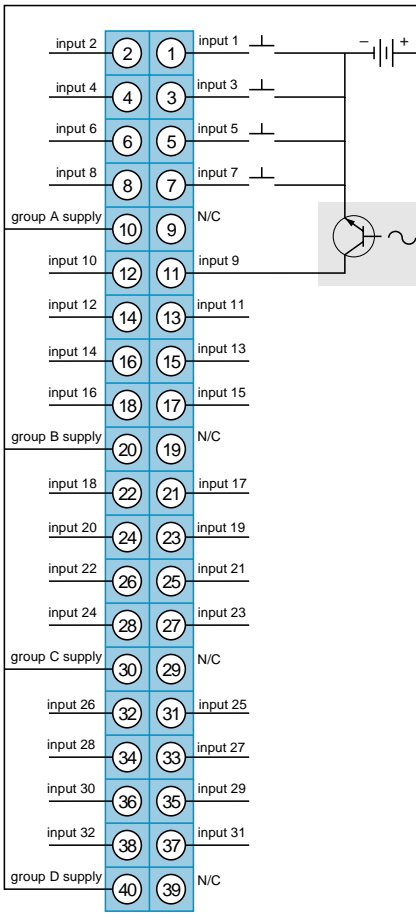
Input module wiring diagrams

Input modules

140 DDI 353 00



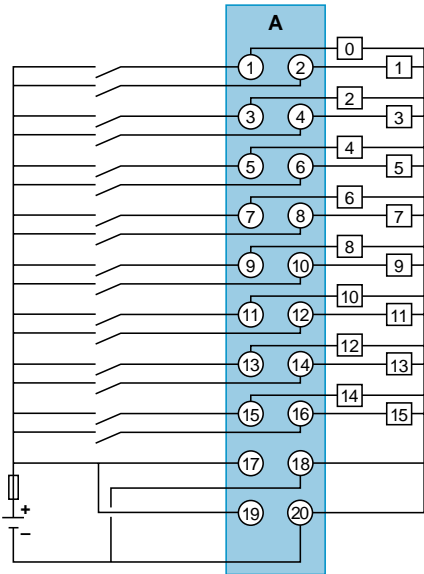
140 DDI 353 10



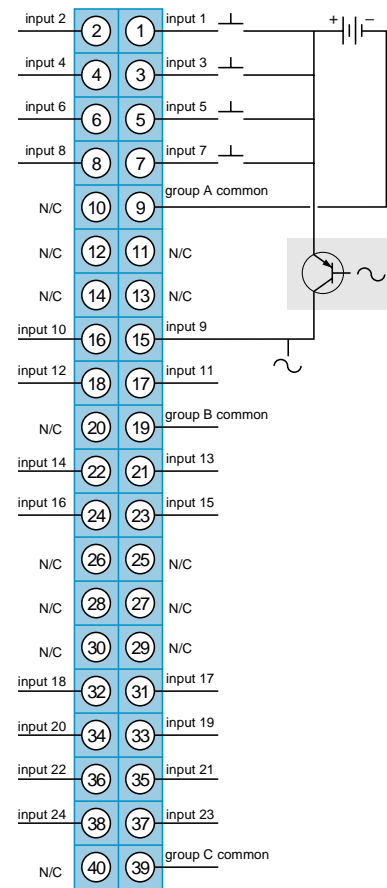
Input modules

140 DDI 364 00

140 DDI 673



Note : connection requires Telefast terminal block.



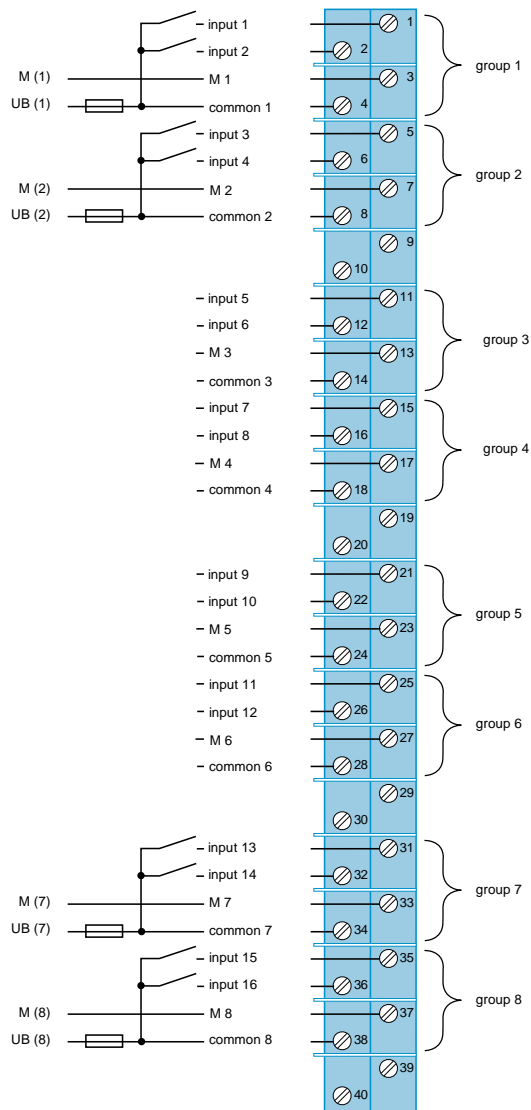
Modicon Quantum automation platform

Discrete I/O

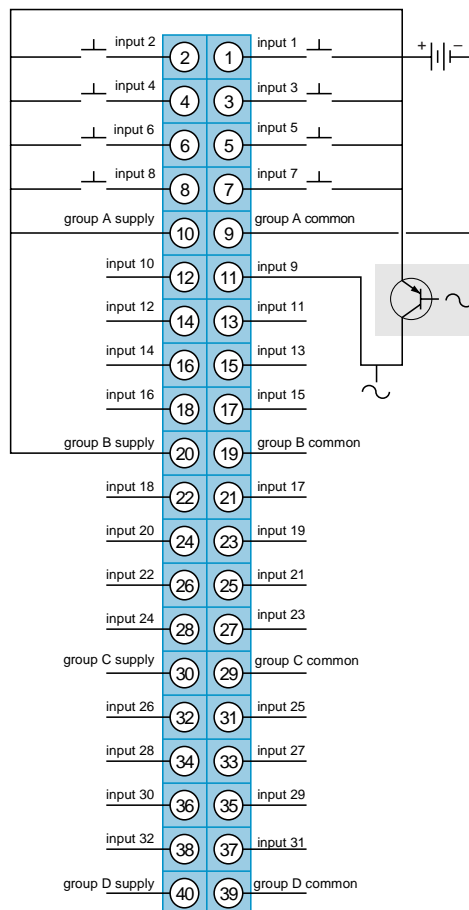
Input module wiring diagrams

Input modules

140 DDI 841 00



140 DDI 853 00

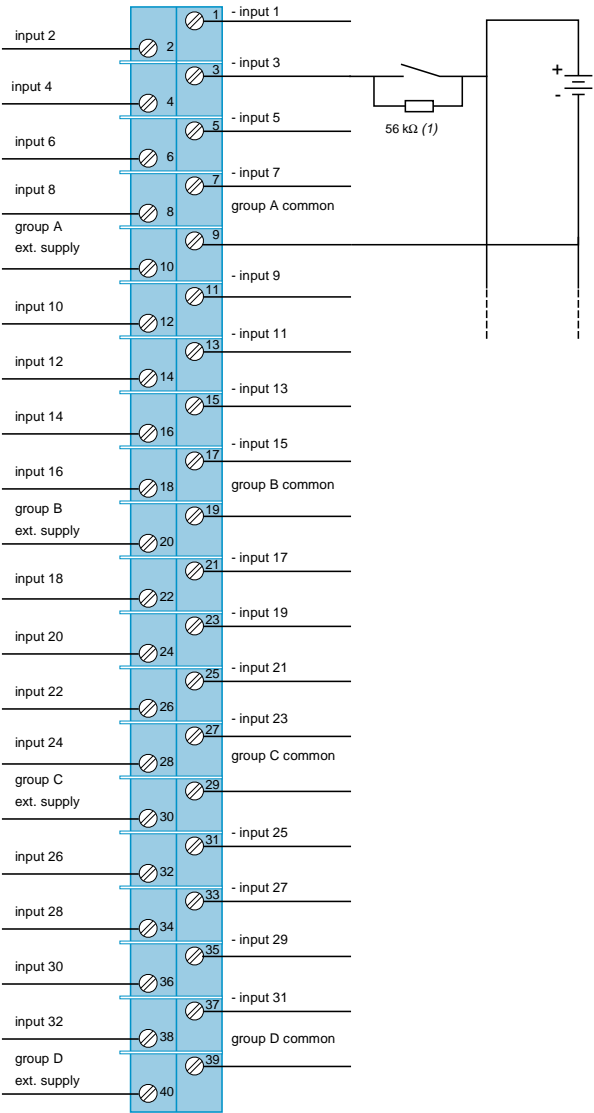


Modicon Quantum automation platform

Discrete I/O

Input module wiring diagrams

Input module
140 DSI 353 00



(1) Recommended resistor value for ~ 24 V.



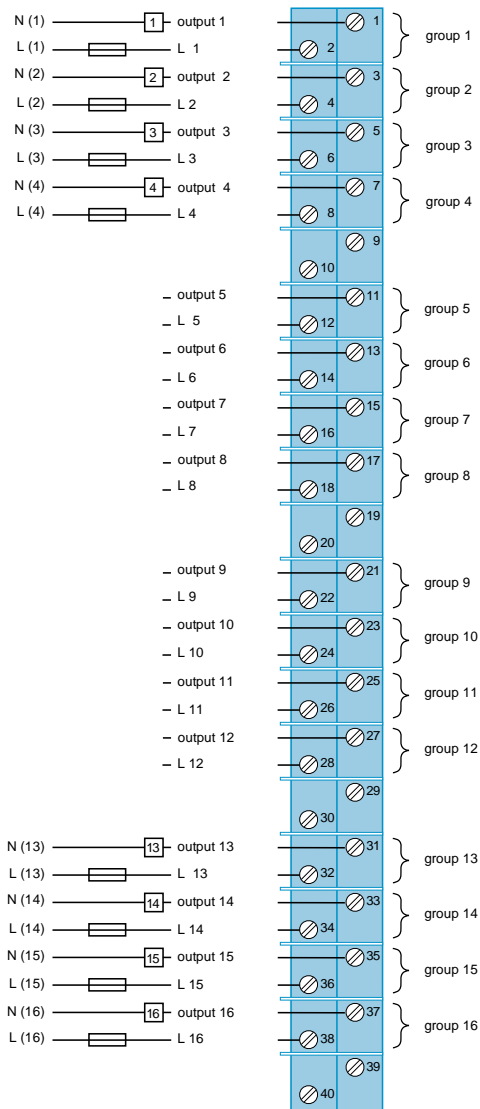
Modicon Quantum automation platform

Discrete I/O

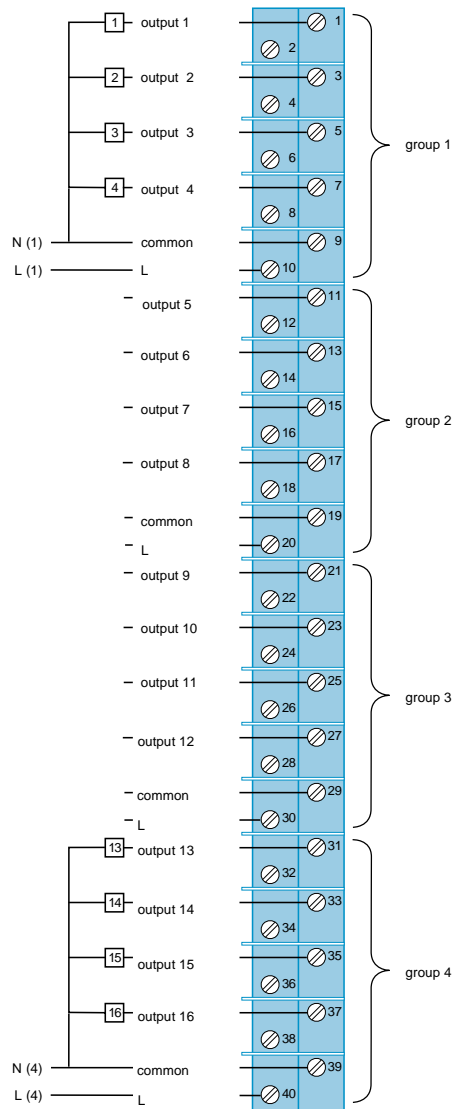
Output module wiring diagrams

Output modules

140 DAO 840 00/140 DAO 840 10



140 DAO 842 10/140 DAO 842 20



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Modicon Quantum automation platform

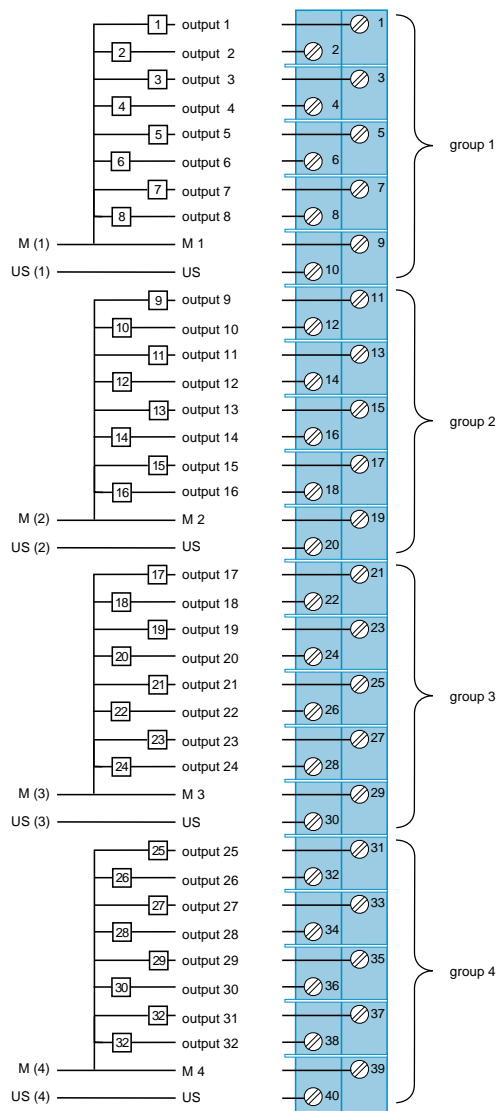
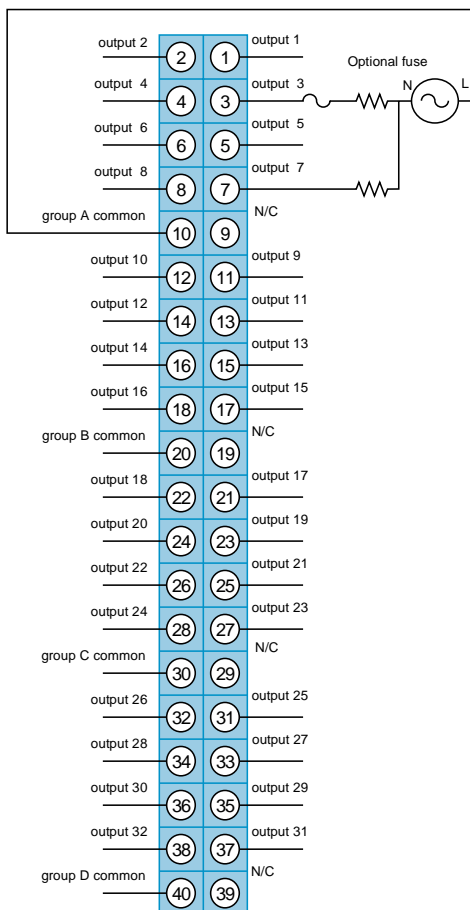
Discrete I/O

Output module wiring diagrams

Output modules

140 DAO 853 00

140 DDO 353 00/140 DDO 153 10/140 DDO 353 10



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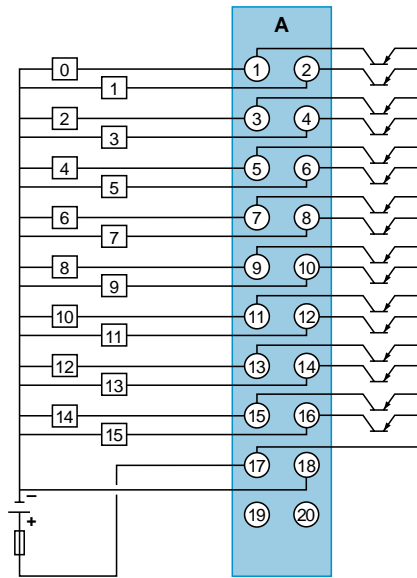
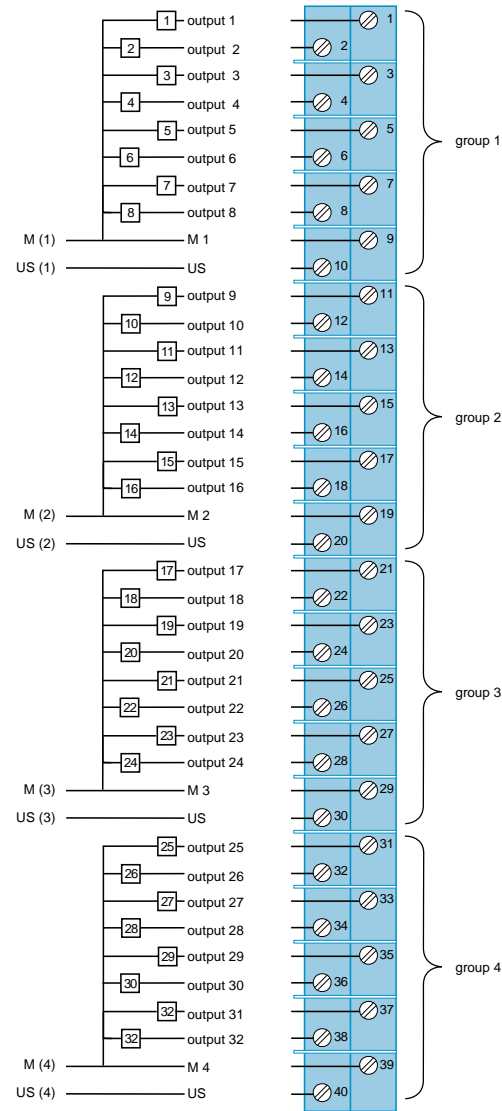
Modicon Quantum automation platform

Discrete I/O
Output module wiring diagrams

Output modules

140 DDO 353 01

140 DDO 364 00



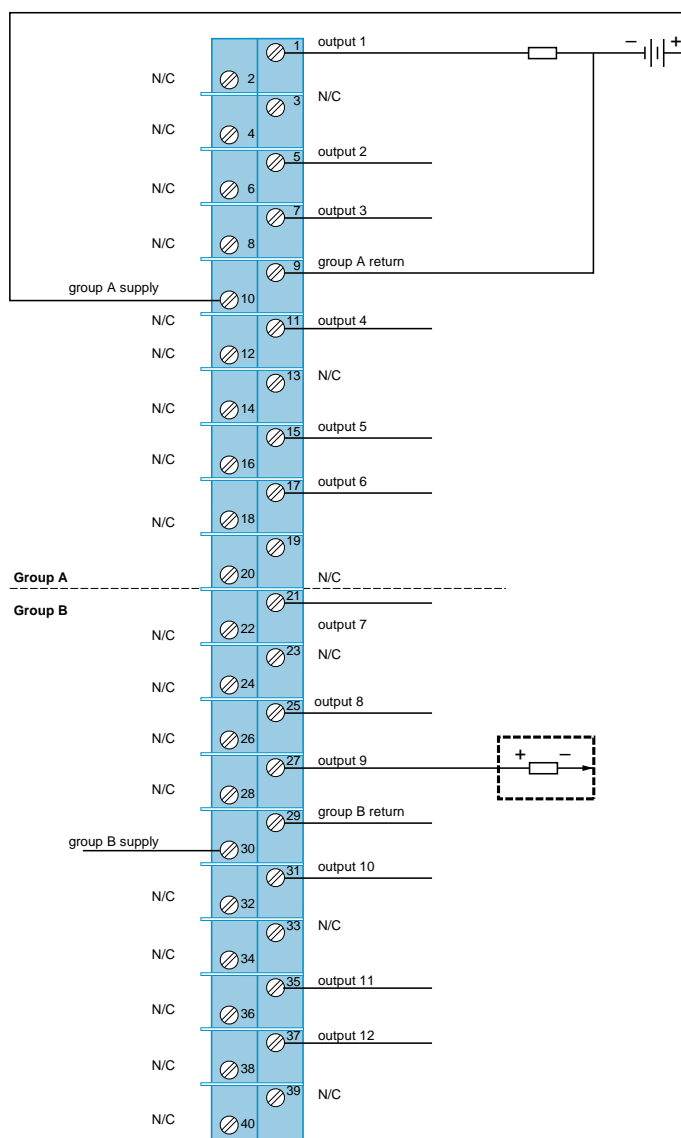
Modicon Quantum automation platform

Discrete I/O

Output module wiring diagrams

Output module

140 DDO 885 00



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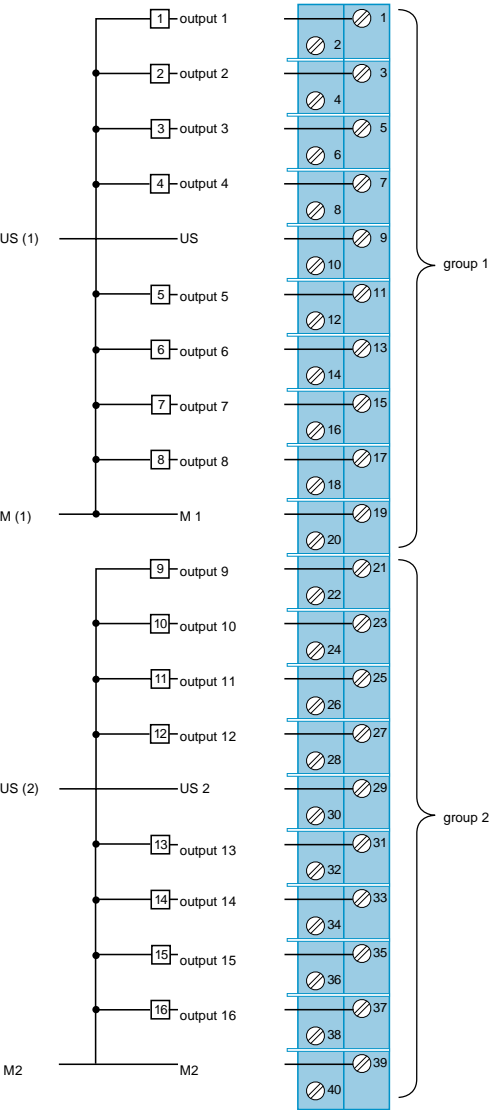
ProWORX

Modicon Quantum automation platform

Discrete I/O
Output module wiring diagrams

Output modules

140 DDO 843 00



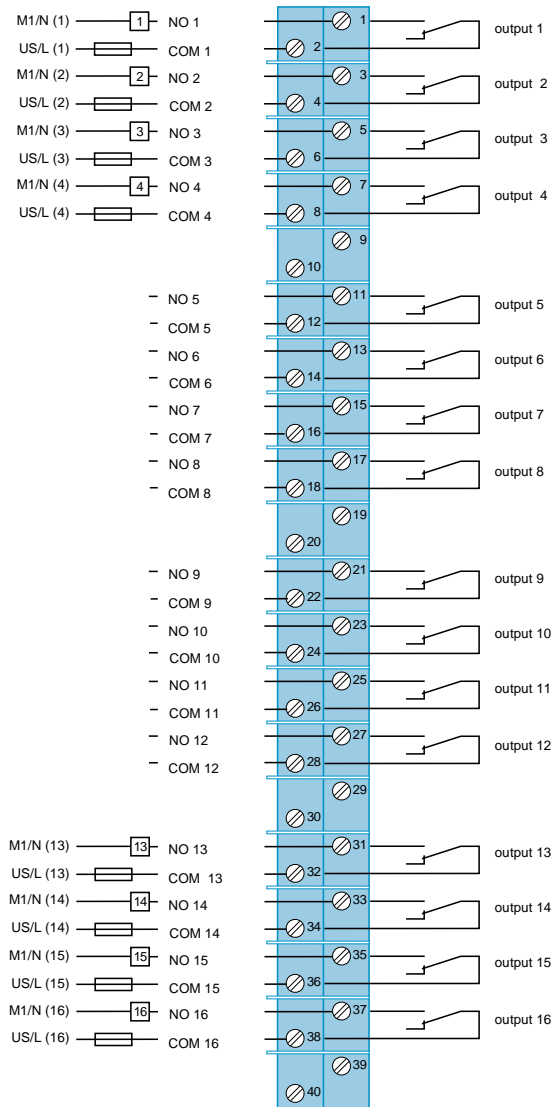
Modicon Quantum automation platform

Discrete I/O

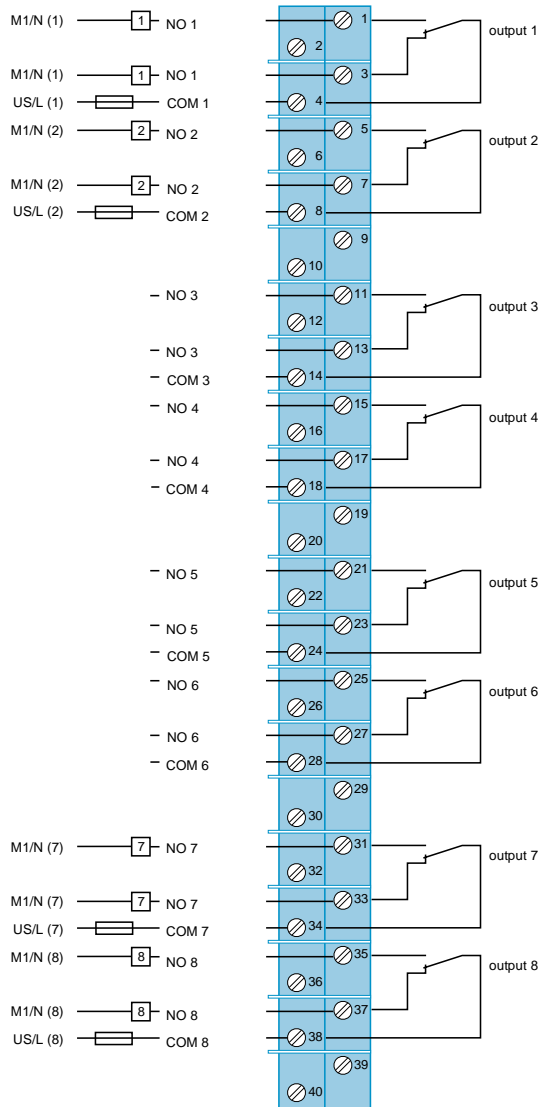
Relay output module wiring diagrams

Relay output modules

140 DRA 840 00



140 DRC 830 00



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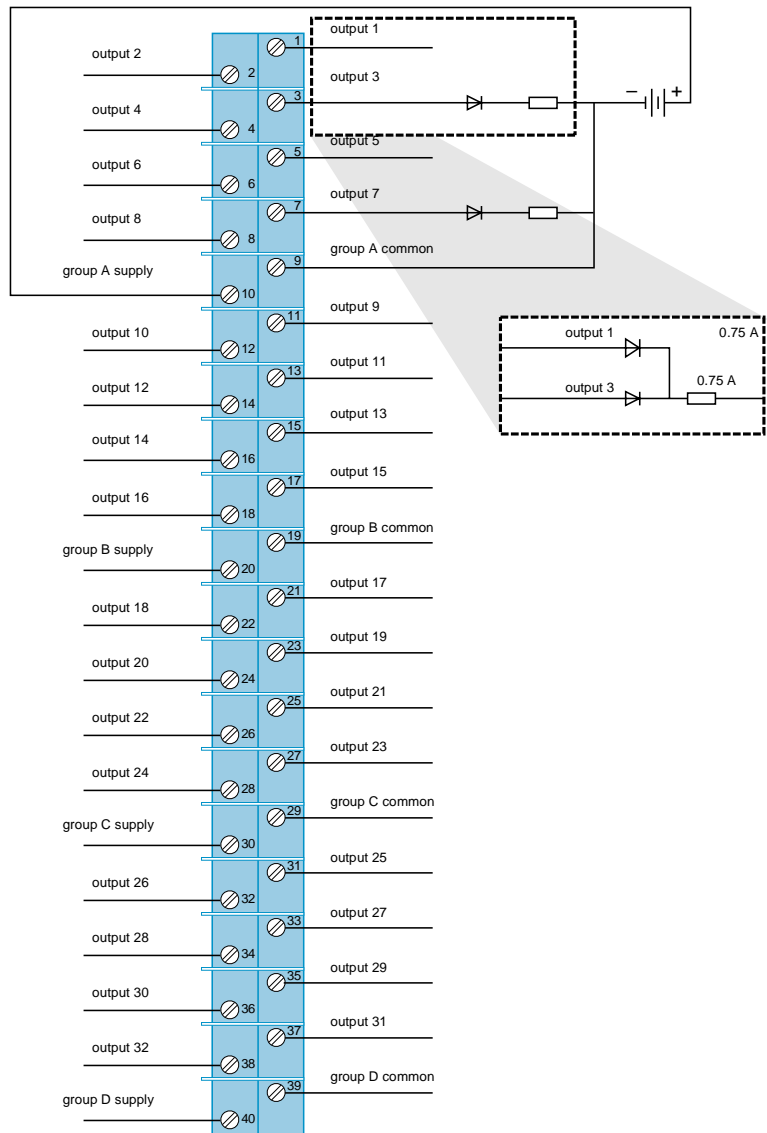
Modicon Quantum automation platform

Discrete I/O

Relay output module wiring diagrams

Relay output modules

140 DVO 853 00



Nota : When driving a load from different points, a blocking diode is required for each point. These diode (shown above) will present false fault reporting when only one of the points is commanded ON.

Modicon Quantum automation platform

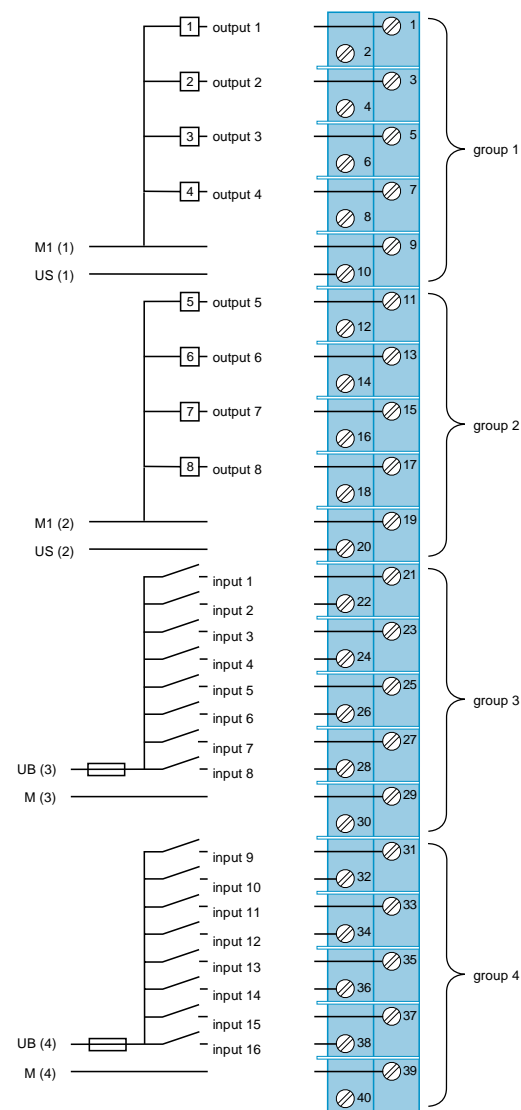
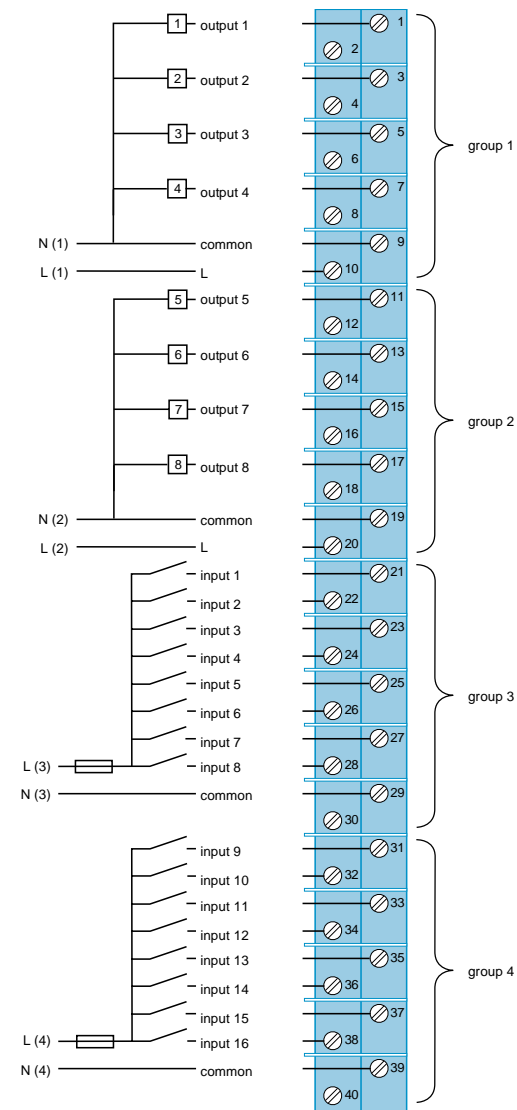
Discrete I/O

Combo module wiring diagrams

Combo modules

140 DAM 590 00

140 DDM 390 00



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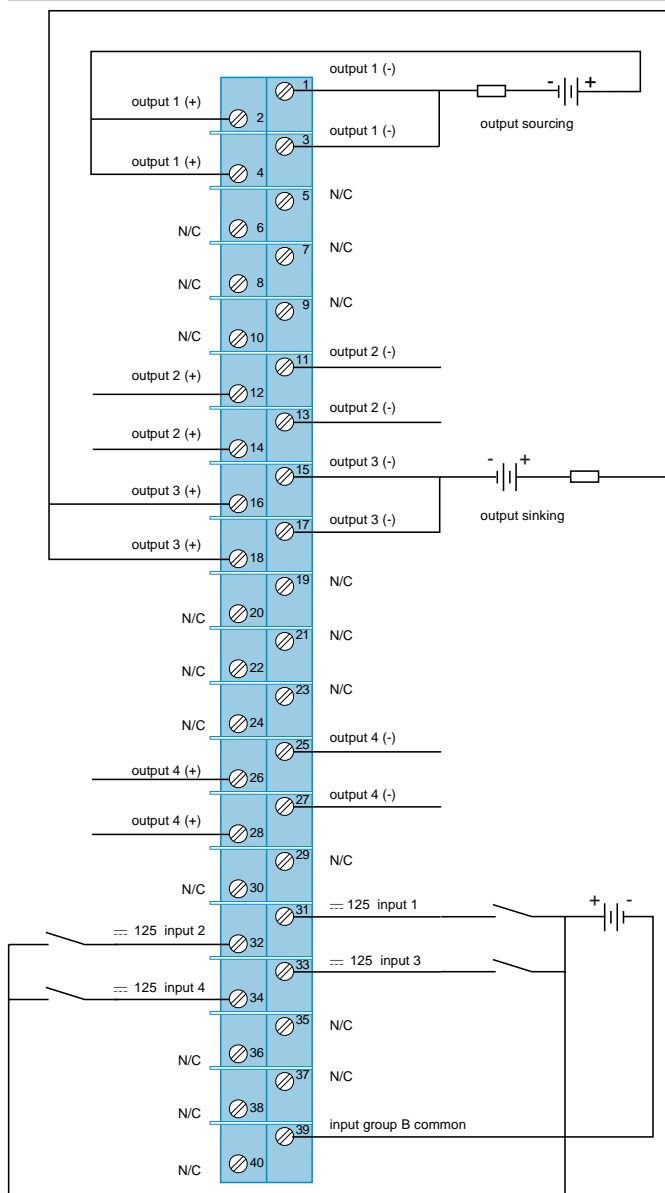
Modicon Quantum automation platform

Discrete I/O

Combo module wiring diagrams

Combo module

140 DDM 690 00




Caution:

The output points are not protected against reverse polarity. Reverse polarity will turn an output point ON.

Nota : Each output has terminals for multiple wire connections.
N/C = Not Connected.



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Type	Input modules					
						
	Number of channels		8	16 differential or 16 externally tied single	8	
	Operating range		4...20 mA 1...5 V	0...25 mA 0...20 mA 4...20 mA	0...25 mA, ±20 mA 4...20 mA 0...10 V, ± 10 V 0...5 V, ± 5 V 1...5 V	RTD (2-,3-, or 4-wire), Pt, Ni
	Interfaces		1			
	Resolution		12 bits	0...25 000 counts 0...20 000 counts 0...16 000 counts (default)	Up to 16 bits	12 bits + sign
	Isolation (channel-to-channel)		30 V	200 V	300 V peak-to-peak	
	Addressing requirement		9 input words	17 input words	9 input words	
	Bus power required		240 mA	360 mA	280 mA	200 mA
Module		140 ACI 030 00	140 ACI 040 00	140 AVI 030 00	140 ARI 030 10	
Page		3/55				

Input modules	Output modules	Combined I/O
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8	4	8	4	4 in/2 out
Thermocouples type B, E, J, K, R, S, T, mV	4...20 mA	0...25 mA 0...20 mA 4...20 mA	0...10 V, ± 10 V 0...5 V, ± 5 V	Multi-range in/current out
1				4 in/1 out
16 bits	12 bits	0...25 000 counts 0...20 000 counts 0...16 000 counts (default) 0...4095 counts	12 bits	16 in/12 out
~ 220 V @ 47...63 Hz or $\equiv 300$ V max.	~ 500 V @ 47...63 Hz or $\equiv 750$ V for 1 minute	–	~ 500 V for 1 minute	Input : $\sim \pm 40$ V max. Output : ~ 500 V $\equiv 750$ V for 1 minute
10 input words	4 output words	8 output words	4 output words	5 input words 2 output words
280 mA	480 mA	550 mA	700 mA	350 mA

140 ATI 030 00	140 ACO 020 00	140 ACO 130 00	140 AVO 020 00	140 AMM 090 00
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Modicon Quantum automation platform

Analog I/O

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3.2



ProWORX

Description

The Modicon Quantum automation platform supports a full range of analog I/O modules designed to interface with a wide variety of field devices. All modules meet internationally accepted IEC electrical standards that ensure reliability in harsh operating environments. For even better protection and extended life in extremely harsh environments, you can have your modules conformally coated.

Fully software-configurable

All Quantum I/O modules can be completely configured using Unity Pro, Concept or ProWORX. The ability to specify an I/O address for each module in software makes it easy to add or change modules in your configuration without physically changing the application program.

I/O Map zooming

Analog and special-purpose modules frequently require that you specify particular modal or operational parameters for different functions in addition to the standard I/O addressing requirements. Quantum's ability to configure multi-function modules via software eliminates the need for traditional hardware DIP switches or complex application programming. A software capability called I/O Map zooming allows you to zoom into a setup screen where you can initialize or change the module's operating parameters. This I/O Map zoom technique is used on multi-function analog input modules, high-speed counters, single-axis motion modules and temperature-sensing modules such as thermocouples and RTDs.

Defining the failure mode of an output module

Quantum gives you the ability to predefine how an analog output channel will respond if for any reason the module stops being serviced. You can configure the module in software so that the output channels:

- Go to zero.
- Go to a predefined safe state.
- Hold the last value they received before the watchdog timer expired.

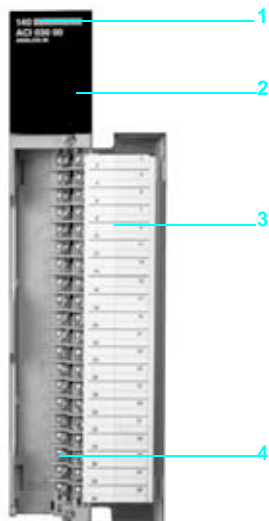
Failure modes can be defined on a channel-by-channel basis. In the event of a complete module failure, the fail state settings you have specified can be sent to the replacement module.

Mechanical keying for added security

Optionally, you can insert mechanical keys between the I/O module and the terminal strip to ensure that the field wiring and the module type are properly matched. Keying codes are unique for each module type. You can also implement mechanical keying for unique slot locations so that a rack full of similar modules with similar keying codes will not be incorrectly connected. Keys are shipped with the I/O modules. They do not need to be ordered separately.

I/O connectors

Each I/O module requires an I/O connector (P/N 140 XTS 002 00), which can be ordered separately. The same connector can be used with all modules, except for intrinsically safe modules.



Description

The front panel of 140 A●I/A●O/AMM analog input or output modules comprises:

- 1 A model number and color code.
- 2 A LED indicator panel.
 - Active (green): bus communication is present been detected,
 - F (red): a fault (external to the module) has been detected,
 - 1...16 (green): the indicated point or channel is turned on,
 - 1...16 (red): there is a fault on the indicated point or channel.
- 3 A removable, hinged door and customer identification label.
- 4 A terminal block,40-pole (140 XTS 002 00) must be ordered separately.



Input module characteristics

Model		140 ACI 030 00	140 AVI 030 00
Number of channels		8 differential	
Addressing requirements		9 input words	
Input ranges (selectable on a per channel basis)	Bipolar	–	± 10 V, ± 5 V, ± 20 mA
	Unipolar	–	0...10 V, 0...5 V, 0...20 mA
	Unipolar w/offset	–	1... 5 V, 4...20 mA
Voltage input	Linear measuring range	1...5 V	(input range) x 1.024
	Absolute maximum	V	50
	Impedance	MΩ	> 20
Current input	Linear measuring range	mA	4...20, (input range) x 1.024
	Absolute maximum	mA	25
	Impedance	Ω	250 ± 0.03%
Absolute accuracy error @ 25° C (voltage mode)	Typical	± 0.05% of full scale	± 0.03%
	Maximum	± 0.1% of full scale	± 0.05% of full scale
Linearity		± 0.04%	± 0.008%
Accuracy drift w/temperature	Typical	± 0.0025% of full scale / °C	± 0.0015% of full scale / °C
	Maximum	± 0.005% of full scale / °C	± 0.004% of full scale / °C
Common mode rejection		dB	> - 72 @ 60 Hz, > - 80 @ 60 Hz
Input filter			Single pole low pass, - 3 dB cutoff @ 15 Hz, ± 20%, Single pole low pass, - 3 dB cutoff @ 847 Hz, ± 20%
Isolation	Channel-to-bus	z	1000 V, 3000 Vpp, for 1 minute, 750 V, ~ 500 V rms, for 1 minute
	Channel-to-channel	z	30 V max., 200 V, ~ 135 V rms max.
Update time		ms	5 for a all channels, 10 for a all channels
Fault detection			Broken wire (4...20 mA mode) or under voltage range (1...5 V), Broken wire in 4...20 mA mode, Out of range @ 1...5 V
Bus current requirement		mA	240, 280
Power dissipation		W	2, 2.2
External power			–
Resolution		bits	12, 16 for ± 10 V, 0...10 V, 15 for ± 5 V, 0...5 V, ± 20 mA, 0...20 mA, 14 for 1...5 V, 4...20 mA
Agency approvals			UL 508, CSA 22.2-142, FM Class1 Div.2, C€, cUL (pending), UL 508, CSA 22.2-142, FM Class1 Div.2, C€, cUL

Input module characteristics

Model			140 ARI 030 10	140 ACI 040 00
Number of channels			8	16 differential or 16 externally tied single ended
Addressing requirements			9 input words	17 input words
RTD types (configurable)				
IEC platinum American platinum Nickel	Pt 100, Pt 200, Pt 500, Pt 1000	°C	- 200... + 850	–
	Pt 100, Pt 200, Pt 500, Pt 1000	°C	- 100... + 450	–
	Ni 100, Ni 200, Ni 500, Ni 1000	°C	- 60... + 180	–
Measurement current	Pt 100, Pt 200, Ni 100, Ni 200	mA	2.5	–
	Pt 500, Pt 1000, Ni 500, Ni 1000	mA	0.5	–
Input impedance		MΩ	>10	250 Nominal
Module ranges and resolution			0.1 °C	0.0...25 mA, 0...25,000 counts 0.0...20 mA, 0...20,000 counts 4.0...20 mA, 0...16,000 counts (default range) 4.0...20 mA, 0...4,095 counts
Accuracy error @ 25 °C			–	± 0.125% of full scale
Linearity (0 ... 60 °C)			± 0.01% of full scale ± 0.5 °C	± 12 µA max. 4...20 mA range, 0...4,095 counts ± 6 µA max. 0...25 mA range, 0...25,000 counts ± 6 µA max. 0...20 mA range, 0...20,000 counts ± 6 µA max. 4...20 mA range, 0...16,000 counts
Absolute maximum input		mA	–	30
Absolute drift w/temperature		°C	± 0.5 (25 °C) ± 0.9 (0...60 °C)	Typical: 0.0025% of full scale Maximum: 0.0050% of full scale
Isolation	Channel-to-channel		300 V peak-to-peak	–
	Channel-to-bus		~ 1780 V @ 47...63 Hz for 1 minute or = 2500 V for 1 minute	~ 1780 V for 1 minute
Working voltage		==	–	30
Input filter			–	Single pole low pass, - 3 dB cutoff @ 34 Hz, ± 25%
Common mode rejection			–	> - 90 dB @ 60 Hz
Update time (all channels)	2-wire/4-wire	ms	640	15 for all 16 channels
	3-wire	s	1.2	–
Fault detection			Out of range or 8 red LEDs to indicate broken wire conditions	Open circuit in 4 ... 20 mA mode. Specific channel is identified when an open circuit is detected and is reported back to the controller in the 17th input Word.
Bus current requirement		mA	200	360
Power dissipation		W	1	5.0
Agency approvals			UL 508, CSA 22.2-142, FM Class1 Div.2, C€, cUL	UL 508, CSA 22.2-142, FM Class1 Div.2, C€, cUL (pending)

Input module characteristics

Model		140 ATI 030 00	
Number of channels			8
Addressing requirements			10 input words
TC types and ranges	J	°C	- 210 ... +760
	K	°C	- 270 ... +1370
	E	°C	- 270 ... +1000
	T	°C	- 270 ... + 400
	S	°C	- 50 ... +1665
	R	°C	- 50 ... +1665
	B	°C	- 130 ... +1820
Millivolt ranges		mV	- 100 ... +100 (1) - 25... + 25 (1)
TC resistance /Max Source Resistance		W	200 max. for rated accuracy
Input impedance		MΩ	> 1
Input filter			Single low pass @ nominal 20 Hz, plus notch filter @ 50/60 Hz
Normal noise rejection		dB	120 min. @ 50 or 60 Hz
Cold junction compensation (CJC)			Internal CJC operates between 0 ... 60 °C (errors are included in the accuracy specification). The connector door must be closed. Remote CJC can be implemented by connecting a thermocouple (which monitors the external junction block temperature) to channel 1. Types of thermocouples J, K, and T are recommended for remote CJC.
Resolution	TC ranges		Choice of : 1 °C (default), 0.1 °C, 1 °F, 0.1 °F
	Millivolt ranges		100 mV range, 3.05 μV (16 bits) 25 mV range, 0.76 μV (16 bits)
TC absolute accuracy	Types J, K, E, T		± 2 °C plus ± 0.1% of reading
	Types S, R, B		± 4 °C plus ± 0.1% of reading
Millivolt absolute accuracy	@ 25 °C		± 20 μV ± 0.1 % of reading
	Accuracy drift w/temperature		0.15 μV / °C + 0.0015% of reading / °C max
Isolation	Channel-to-bus		~ 1780 V @ 47... 63 Hz for 1 minute or ≡ 2500 V for 1 minute
	Channel-to-channel		~ 220 V @ 47... 63 Hz or ≡ 300 V max.
Update time (all channels)		s	1
Fault detection			8 red LEDs to indicate out of range or broken wire conditions
Bus current requirement		mA	280
Power dissipation		W	1.5
External power			—
Agency approvals			UL 508, CSA 22.2-142, FM Class1 Div.2, C€, cUL

(1) Open circuit detect can be disabled on these ranges.

Output module characteristics (continued)

Model		140 ACO 020 00	140 AVO 020 00
Number of channels		4	
Addressing requirements		4 out words	
Loop voltage	===	12...30 V	—
Loop resistance		$R_{min}^{(1)} = \frac{V_{Loop} - 30 \text{ Vdc}}{0.02 \text{ A}}$ $R_{max} = \frac{V_{Loop} - 7 \text{ Vdc}}{0.02 \text{ A}}$ No external resistor is required for loop voltage supply < === 30 V (2)	* For a loop supply less than 30 volts, R_{min} is zero ohms.
Internal voltage drop	===	7 V min., 30 V max. @ 20 mA	—
Voltage output ranges	Bipolar	—	± 10 V (min. load resistance = 1 kΩ) (Jumper between reference - control terminals) ± 5 V (min. load resistance = 500 Ω) (Jumper between reference - control and output - R terminals)
	Unipolar	—	0...10 V (min. load resistance = 1 kΩ) (Jumper between output - R terminals) 0...5 V (min. load resistance = 500 Ω) (Jumper between output - R and control - R terminals)
Output current		—	± 10 mA max any range (outputs are short circuit-proof)
Source resistance		—	0.1 Ω
Resolution		12 bits	
Accuracy error @ 25 °C		± 0.20% of full scale	± 0.15% of full scale
Linearity		±1 LSB	
Accuracy drift w/temperature	Typical	± 0.004% of full scale / °C	—
	Maximum	± 0.007% of full scale / °C	—
	Unipolar ranges	—	0.003% of full scale / °C typical 0.005% of full scale / °C max.
	Bipolar ranges	—	0.004% of full scale / °C typical 0.007% of full scale / °C max.
Isolation	Channel-to-channel	~ 500 V @ 47...63 Hz or --- 750 V for 1 minute	~ 500 V @ 47...63 Hz for 1 minute
	Channel-to-bus	~ 1780 V @ 47...63 Hz or --- 2500 V for 1 minute	~ 1780 V @ 47...63 Hz for 1 minute
Update time	ms	3 for all channels (simultaneous update)	3 for all channels
Setting time	µs	900 to ± 0.1% of the final value	700 to ± 0.1% of the final value (max.)
Fault detection		Open circuit in 4...20 mA mode. Specific channel is identified when an open circuit is detected through the red channel LED	—
Wire length	m	—	400 max.

(1) For a loop voltage supply < 30 V: $R_{min} = 0 \Omega$.
 (2) Up to 60 V with an external loop resistor.

Output module characteristics

Model		140 ACO 020 00	140 AVO 020 00	140 ACO 130 00	
Number of channels			See page 3/53		8
Addressing requirements		Words	See page 3/53		8 output
Module ranges and resolution			See page 3/53		0...25 mA, 0...25,000 counts 0...20 mA, 0...20,000 counts 4...20 mA, 0...16,000 counts (default range) 4...20 mA, 0...4,095 counts
Loop voltage		≡ V	See page 3/53		6 ... 30 max
Internal voltage drop		≡ V	See page 3/53		6 min, 30 max. @ 25 mA
Accuracy error @ 25 °C			See page 3/53		± 0.2% of full scale
Linearity			See page 3/53		± 4 µA 0...25 mA, 0 ... 25,000 counts ± 4 µA 4...20 mA, 0...16,000 counts ± 12 µA 4...20 mA, 0...4,095 counts ± 4 µA 0...20 mA, 0...20,000 counts
Absolute drift w/temperature			See page 3/53		Typical: 0.004% of full scale Maximum: 0.007% of full scale
Isolation	Channel-to-channel		See page 3/53		None
	Field-to-bus		See page 3/53		~ 1780 V for 1 minute
Update time		ms	See page 3/53		5 for all 8 channels
Settling time full scale step change		ms	See page 3/53		1.6 to 5% of the final value 3.2 to 0.1%of the final value
Fault detection			See page 3/53		Open circuit in 4...20 mA mode. Specific channel is identified by the red channel LED. Also reported back to the controller in the I/O MAP status byte.
Bus current required		mA	480	700	550
Power dissipation		W	5.3 max.	4.5 max.	5.0
External power			See loop voltage on previous page	Not required for this module	See loop voltage above
Fusing	Internal		–		
	External		–	0.063 A, 250 V (1) Fuse type : 3 AG fast acting	–
Voltage Monitor	Range		1...5 V (main current loop must be active)	–	
	Scaling		$V_{out} \text{ (Volts)} = I_{loop} \text{ (mA)} \times 0.25$	–	
	Output impedance	Ω	300 typical	–	
	Wire length	m	1 max	–	
Agency approvals			UL 508, CSA 22.2-142, FM Class1 Div.2, C€, cUL		UL 508, CSA 22.2-142, FM Class1 Div.2, C€, cUL (pending)

(1) An internal fuse is required on the master override signal when it is connected to an external source.

Combo module characteristics

Model		140 AMM 090 00			
Number of input channels			4 input/2 isolated output		
Addressing requirements			5 input words/2 output words		
Inputs operating ranges	Bipolar	\equiv	± 10 V	± 5 V, ± 20 mA	–
	Unipolar	\equiv	0...10 V	0...5 V, 0...20 mA	–
	Unipolar w/offset	\equiv	–		1...5 V, 4...20 mA
Resolution		bits	16 in/12 out 16 for $\pm \equiv 10$ V, $\equiv 0...10$ V. 15 for $\pm \equiv 5$ V, $\equiv 0...5$ V, ± 20 mA, 0...20 mA. 14 for $\equiv 1...5$ V, 4...20 mA		
Voltage	Linear measuring range		2.4% over and under range		
	Absolute maximum	\equiv V	± 50		
	Impedance in range	M Ω	> 10		
	Impedance over range	Ω	> 0.5		
Current	linear measuring range	\equiv	+ 2.4% over range, and - 9.6% under range		
	Absolute maximum	mA	± 25		
	Impedance	Ω	250		
Absolute accuracy error @ 25° C (voltage mode)	Typical		± 0.03 %		
	Maximum		± 0.05 % of full scale		
Linearity			Monotonic ± 1 LSB		
Offset	0...60 °C	%/°C	± 0.0014 of full scale max.		
Gain shift	0...60 °C		± 0.002 of full scale max.		
Common mode rejection		dB	> 80 @ 50 or 60 Hz		
Input filter		dB	- 3 @ 21 Hz (± 20 %), single-pole low-pass		
Operating voltage	Channel-to-channel	\equiv V	± 40 max.		
Isolation	Channel-to-bus		~ 500 V, $\equiv 750$ V, for 1 minute		
	Input channel-to-output channel		~ 500 V, $\equiv 750$ V, for 1 minute		
Update time		ms	320 for 4 channels		
Fault detection			Open circuit in 4...20 mA range, or over range, or under range in bipolar modes only.		



Combo module characteristics

Model		140 AMM 090 00	
Outputs	Loop voltage	≡	7...30 V; up to 60 V with an external resistor
	Loop resistance		$R_{MIN} = \frac{V_{Loop} - 30 V_{dc}}{0.020 A}$ (1) $R_{MIN} = \frac{V_{Loop} - 7 V_{dc}}{0.020 A}$
Internal voltage drop		≡ V	7 min, 30 max @ 20 mA
Resolution		bits	12
Accuracy error			± 0.20% of full scale @ 25°C
Linearity			Monotonic +1 LSB
Accuracy error 0...60 °C	Typical	%/°C	± 0.004 of full scale
	Maximum	%/°C	± 0.007 of full scale
Isolation	Channel-to-channel		~ 500 V, ≡ 750 V, for 1 minute
	Channel-to-bus		~ 500 V, ≡ 750 V, for 1 minute
	Output channel-to-input channel		~ 500 V, ≡ 750 V, for 1 minute
Update time		ms	15 for 2 channels
Settling time		μs	900 to ± 0.1% of the final value
Fault detection			Open circuit indicator light and status byte
External power			See loop voltage above
Voltmeter monitor	Range		1...5 V (main current loop must be active)
	Scaling		Iout (mA) x 0.250 = Vout (V)
	Output impedance	Ω	300 typical
	Max wire length	m	1
Common		words	5 in /2 out
Bus current required		mA	350
Fusing	Internal		—
	External		User discretion
Agency approvals			UL 508, CSA 22.2-142, FM Class1 Div.2, C€, cUL

(1) No R_{MIN} is required for loop voltage less than a 30 V.

3

3.2



ProWORK

Modicon Quantum automation platform

Analog I/O

Analog input modules

Description	Range	Reference	Weight kg (lb)
8 channels, 12-bit, single-pole	4 ... 20 mA or \sim 1 ... 5 V	140 ACI 030 00	0.300 (0.66)
16 channels, 0...25,000 counts max.	0 ... 20 mA 0 ... 25 mA 4 ... 20 mA	140 ACI 040 00	0.300 (0.66)
8 channels, 13-bit, RTD	Ni or Pt 100, 200, 500, 1000	140 ARI 030 10	0.300 (0.66)
8 channels, 16-bit, thermocouple	Type J, K, E, T, S, R, B and mV	140 ATI 030 00	0.300 (0.66)
8 channels, 16-bit, two-pole	\pm 10 V, \pm 5 V, 0...10 V, 0...5 V, 1...5 V, or \pm 20 mA, 0...20 mA, 4...20 mA	140 AVI 030 00	0.300 (0.66)

Analog output modules

Description		Reference	Weight kg (lb)
4 channels, 12-bit	4 ... 20 mA	140 ACO 020 00	0.300 (0.66)
8 channels, 0...25,000 counts	0 ... 20 mA 0 ... 25 mA 4 ... 20 mA	140 ACO 130 00	0.300 (0.66)
4 channels, 12-bit	\pm 5 V, \pm 10 V 0...5 V, or 0...10 V	140 AVO 020 00	0.300 (0.66)

Analog I/O module

Description		Reference	Weight kg (lb)
4 inputs, 2 outputs	\pm 5 V, \pm 10 V, 0...5 V, 0...10 V, 1...5 V, or \pm 20 mA, 4 ... 20 mA, 0...20 mA	140 AMM 090 00	0.900 (1.98)

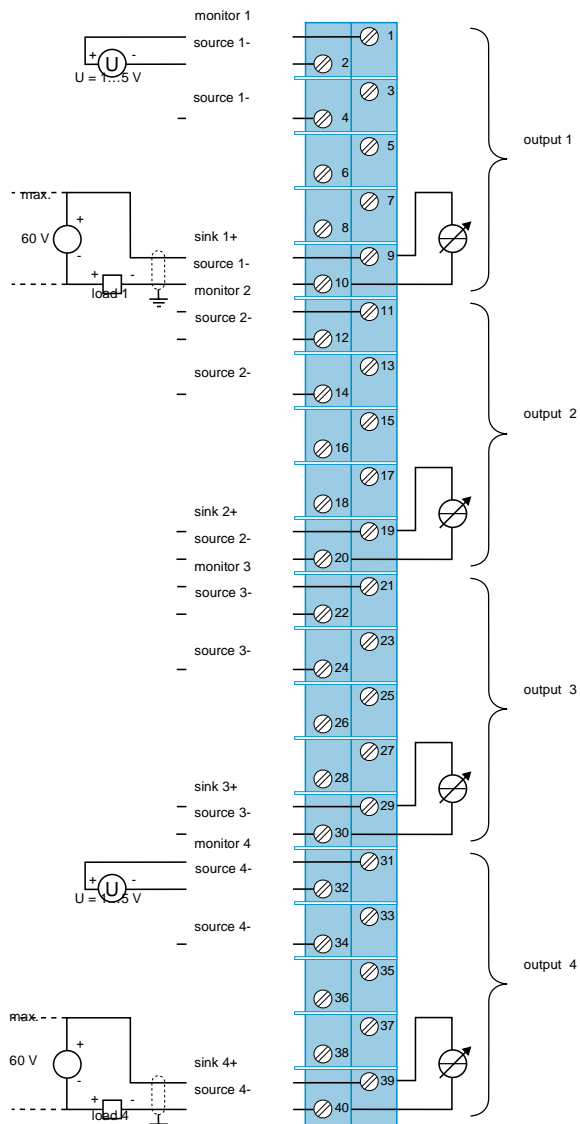
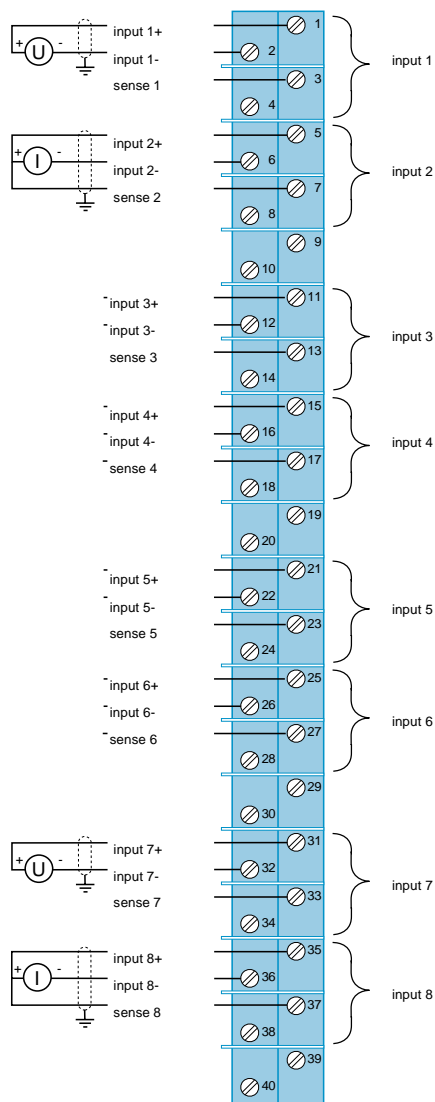
Accessories

Description	Sold in lots of	Unit reference	Weight kg (lb)
Terminal block, 40 points required for all modules	—	140 XTS 002 00	0.150 (0.33)
Terminal block, 40 points (IP 20) for I/O analog modules	—	140 XTS 001 00	—
Coding kit for terminal block	60	140 XCP 200 00	—
Analog I/O simulator, one 0...5 V meter and two 10-turn potentiometers for 140 A●I 030 00 input modules, 140 A●O 020 00 output modules, 140 AMM 090 00 I/O modules	—	140 XSM 010 00	—

Wiring diagrams

140 ACI 030 00

140 ACO 020 00



3

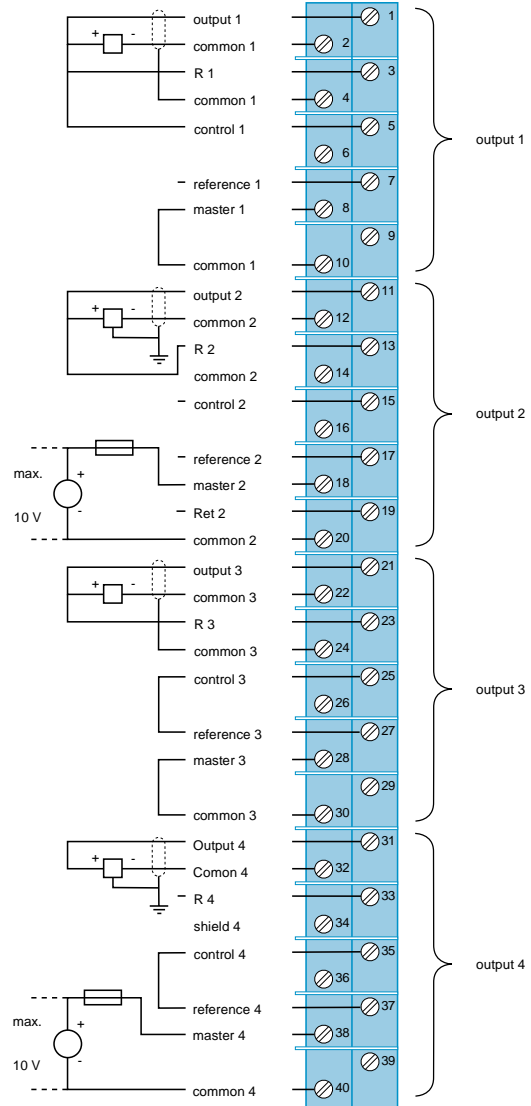
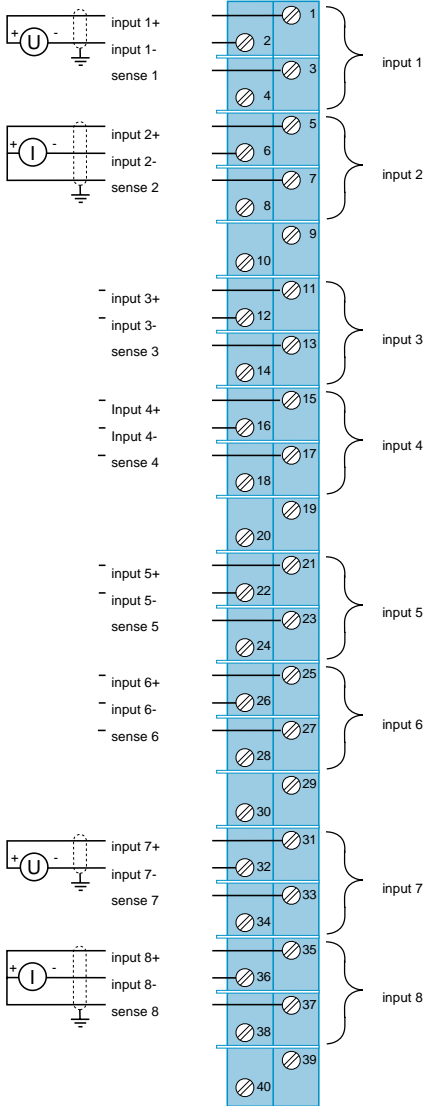
3.2

ProWORK

Wiring diagrams

140 AVI 030 00

140 AVO 020 00



The various wiring options are:
 channel 1 for 0...+ 5 V d.c.,
 channel 2 for 0...+ 10 V d.c.,
 channel 3 for - 5...+ 5 V d.c.,
 channel 4 for - 10...+10 V d.c.

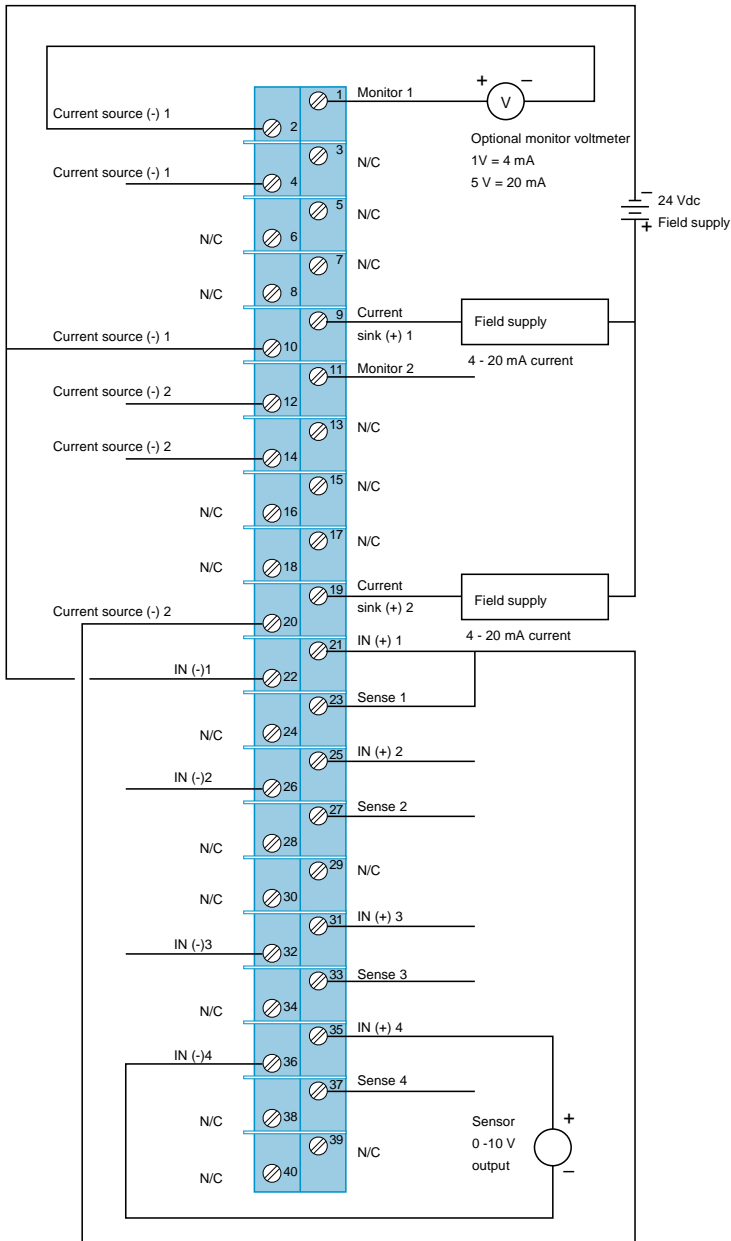
3

3.2

ProWORX

Wiring diagrams

140 AMM 090 00



Output Section 2 Channels Typical Wiring Outputs

Channel 1 - The output shows a connection to an external field device and optional monitor.

Channel 2 - The output shows a connection to an external field device and the input of channel 1.

Input Section 4 Channels Typical Wiring Inputs

Channel 1 - Channel 1 shows 4 - 20 mA current input controlled by output section channel 2.

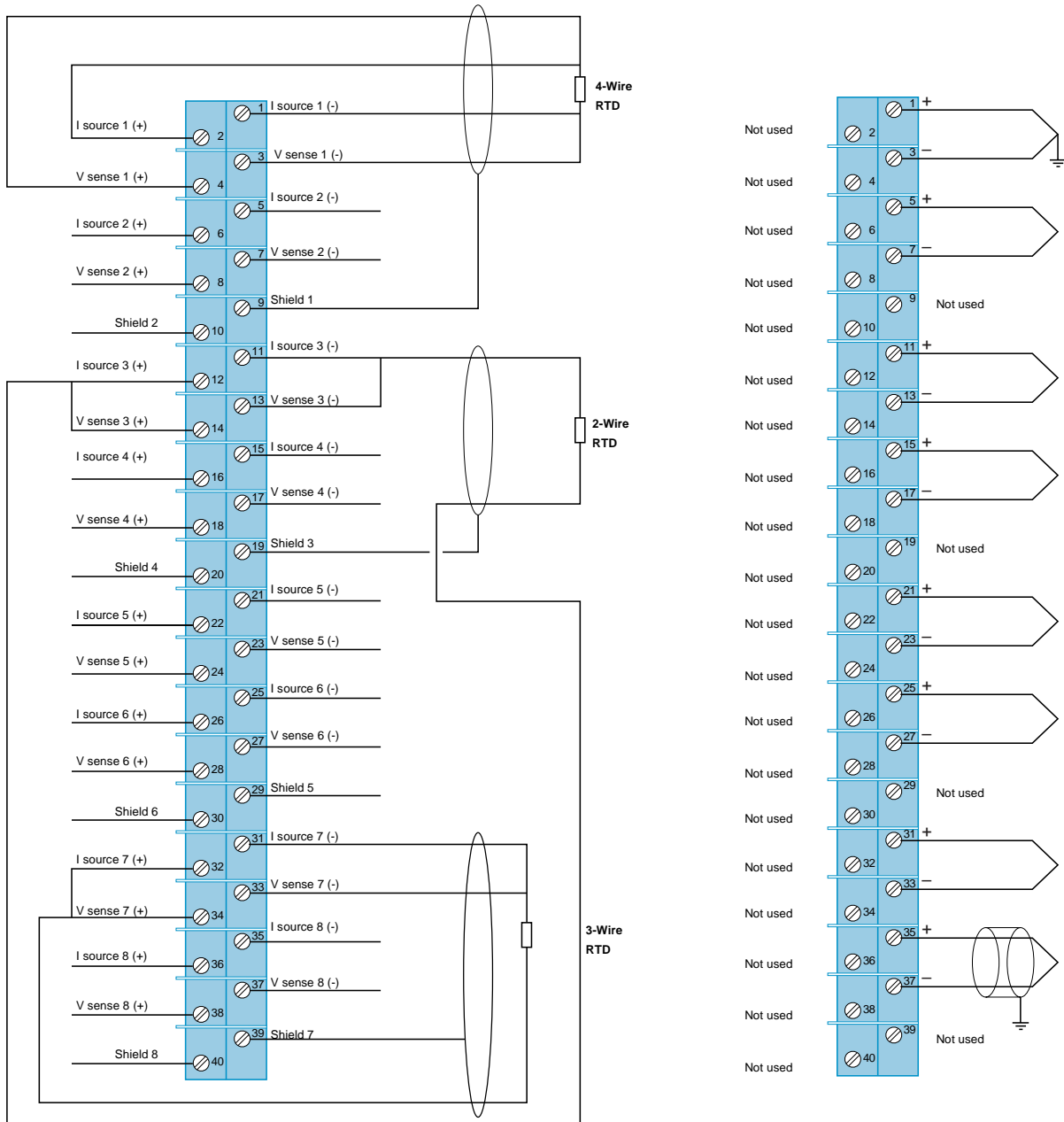
Channel 4 - The input shows a connection to a voltage output sensor.

- Pins 1...20 are outputs
- Pins 21...40 are inputs
- N / C = Not Connected
- Jumpers are required between IN (+) and SENSE terminals for all current input ranges.

Wiring diagrams

140 ARI 030 10

140 ATI 030 00



■ The module is calibrated per:
IEC Publication 751 for platinum RTDs: $100\ \Omega @ 0\ ^\circ\text{C}$, $\text{TCR}(a) = 0.00385\ \Omega/\Omega/^\circ\text{C}$
DIN 43760 for nickel RTDs
American Platinum RTDs:
 $100\ \Omega @ 0\ ^\circ\text{C}$, $\text{TCR}(a) = 0.00392\ \Omega/\Omega/^\circ\text{C}$

■ Terminals labeled shield are not connected internally; shields should be grounded at the field device end.

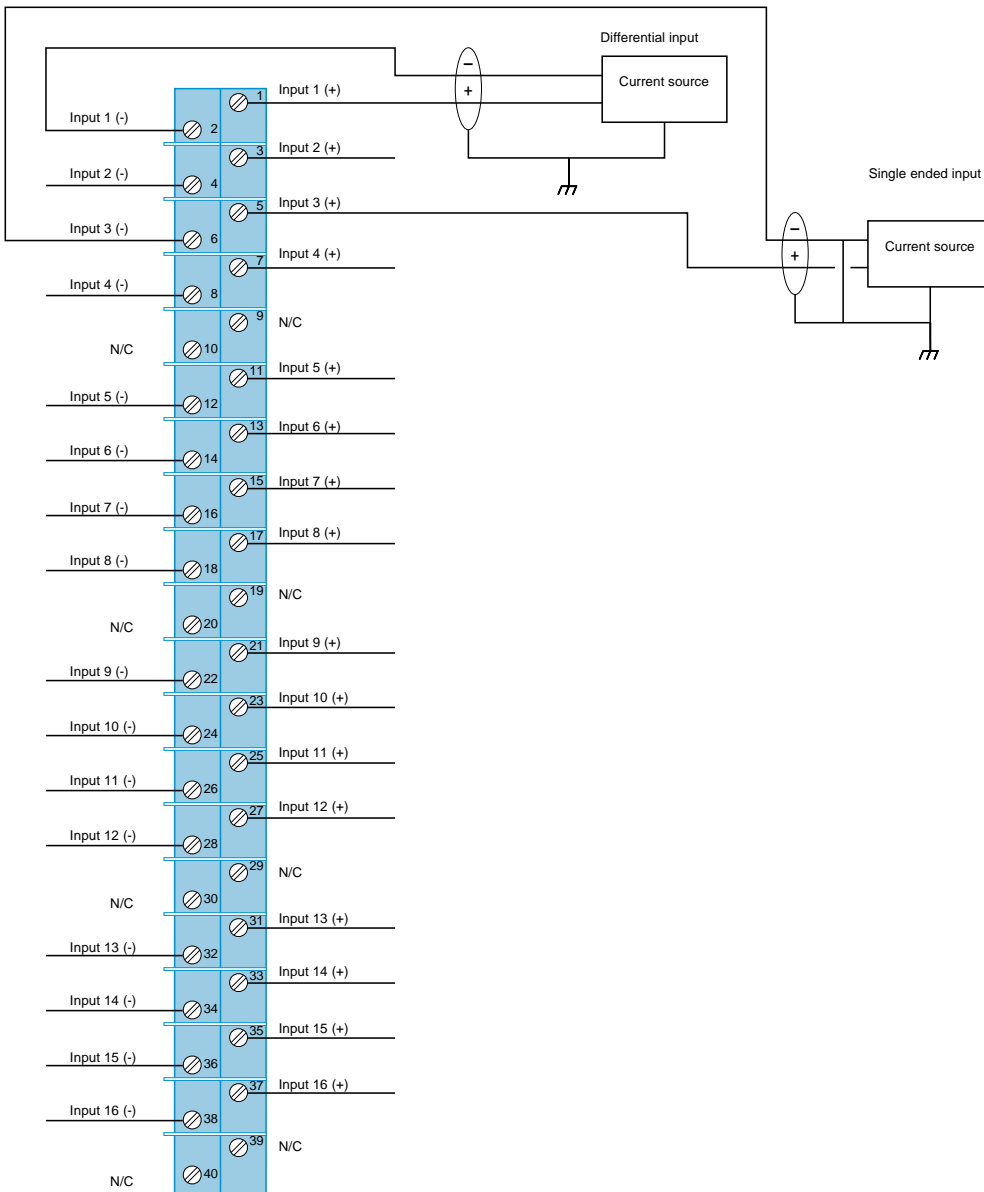
■ When using 2-wire configurations, the temperature equivalent of twice the lead resistance of one leg must be subtracted from the temperature reading.

■ Either shielded or unshielded TCs may be used. (The user should consider using shielded wire in a noisy environment.) Shielded types should have a shield tied to earth ground near the signal source end.

■ Connections marked **Not used** are not electrically connected within the module. These points are used as a thermal link to ambient air. They are not recommended as electrical tie points as this could affect the accuracy of cold junction compensation.

Wiring diagrams

140 ACI 040 00



■ Either shielded or unshielded signal cables may be used. In noisy environments, twisted shielded cable is recommended. Shielded cable should have a shield tied to earth ground near the signal source end.

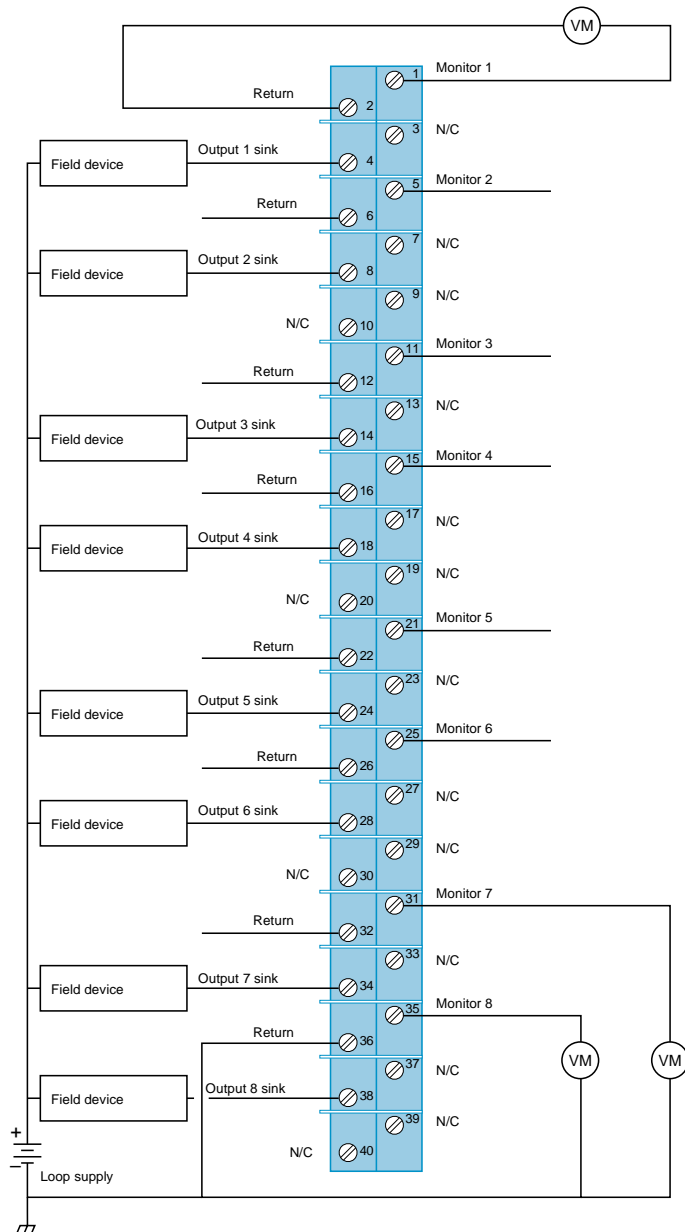
■ Unused inputs may cause the activation of the F LED. To avoid this occurrence, the unused channels should be configured in the 0 to 25 mA range.

■ The maximum channel-to-channel working voltage cannot exceed ± 30 V.

N/C = Not Connected

Wiring diagrams

140 ACO 130 00



- VM is an optional voltmeter that can be connected to read voltage that is proportional to the current. Wiring to this terminal is limited to 1 meter maximum.
- Either shielded or unshielded signal cables may be used. In noisy environments, twisted shielded cable is recommended. Shielded cable should have a shield tied to earth ground near the signal source end.
- Unused outputs may cause the activation of the F (fault) LED. To avoid this occurrence, it is recommended that the unused channels be configured in the 0 to 25 mA range.
- All terminals labeled "Return" are common inside the module.
- N / C = Not Connected.
- At power up, the channel outputs are all at 0 (zero) current.

Applications

Momentum distributed I/O



Type of bus or network

Ethernet
Modbus Plus
Fipio
DeviceNet
Profibus DP
INTERBUS

Max. number per connexion points

1 base

Max. number of connexion points

126 to 512 points depending on the type of bus or network

Discrete inputs/outputs

Number of channels

16 I, 32 I, 8 O, 16 O, 32 O, 10 I/8 O, 16 I/8 O, 16 I/12 O et 16 I/16 O

Input voltage

--- 24 V, ~ 120 V and ~ 230 V

Output voltage

--- 24 V, ~ 120 V and ~ 230 V and relaiy

Analogue inputs/outputs

Bases 4 I, 8 I, 16 I and 4 O

Counting

Base 2 channels 10 kHz/200 kHz

Other types

6 I/3 O ~ 120 V and 1 Modbus port module
M1 processeur module (programming under Concept or ProWORX)

Type of distributed I/O

170 AD●

Pages

Consult our catalogue "Momentum automation platform"

Advantys OTB distributed I/O



Ethernet
CANopen
Modbus SL (RS 485)

1 module + 7 Twido I/O expansion modules

12 I/8 O, 8 I, 16 I, 8 O, 16 O, 4 I/4 O and 16 I/8 O

— 24 V, ~ 120 V

— 24 V and relay

Modules 4 I, 8 I, 2 O et 2 I/1 O

—

—

OTB 1●O DM9LP ▲

Consult our catalogue "Advantys OTB distributed I/O"

Advantys STB distributed I/O solution



Ethernet
CANopen
Modbus Plus
Fipio
DeviceNet
Profibus DP
INTERBUS

32 modules

2 I, 4 I, 6 I, 2 O, 4 O, 6 O

— 24 V, ~ 115 V and ~ 230 V

— 24 V, ~ 115/230 V and relay

Modules 2 I and 2 O

Module 1 channel 40 kHz

Parallel interface module for Tego Power applications
Parallel interface module for TeSys modèle U starter-controllers

STB D●●/A●●

Consult our catalogue "Advantys STB distributed I/O"



Modicon Quantum automation platform

IP 65/67 splitter boxes and modules

Splitter box and module type	Passive splitter boxes	Monobloc I/O splitter boxes and modules
	Telefast, ABE9 splitter boxes	Advantys, FTB splitter boxes



Fielbus type	—	CANopen DeviceNet Profibus DP INTERBUS
Number of inputs/outputs	8 I/O, 16 I/O	16 I, 8 I + 8 O, 12 I + 4 O, 16 I/O, 8 I + 8 I/O
Type of signal	--- 24 V digital	
Functions	Connection of 1 to 16 sensors/actuators	
Type of input/output connectors	M12	
Degree of protection	IP 67	
Housing type	Plastic	Plastic and metal
Module type	ABE 9	FTB 1
Pages	Consult our catalogue "IP 67 splitter boxes"	

Monobloc I/O splitter boxes and modules

170 ED●, I/O modules



Modules on AS-Interface cabling system



Modular I/O splitter boxes

Advantys, FTM splitter boxes



3

INTERBUS

16 I or 16 O

AS-Interface

4 I or 2 I
4 O or 2 O

4 I

4 I or 2 I
4 O or 2 O

Connection of 1 to 8 sensors/actuators

M8

M12

M8

IP 67

Plastic

ASI ME●
+ ASI B●

ASI MMO●

XZ S●A

Consult our catalogue
"AS-Interface cabling system"

CANopen DeviceNet Profibus DP

8 I, 16 I, 8 I/O and 16 I/O discrete
4 I or 4 O analogues

--- 24 V discrete and analogue

Connection of 1 to 256 sensors/actuators per bus
module

M8 and M12

FTM 1▲

Consult our catalogue "IP 67 splitter boxes"
▲ Available 1st half 2004

3.3



ProWORX

Presentation

Decentralising the I/O meets the requirements of both users and machine manufacturers while maintaining performance comparable with that of a centralised structure.

Momentum dust and damp proof distributed I/O modules (IP 65) are used to create, via the INTERBUS bus, distributed control systems, which offer increased availability of installations. They also offer the possibility of locating the I/O interfaces close to the process or machines, in harsh environments (water jets, dust, etc).

These 170 ED● modules must be controlled by an INTERBUS master module, such as the TSX IBY 100 Premium PLC module or TSX IBX 100 coprocessor. They are only connected to an installation remote bus. The installation remote bus terminal module is used for the tap link to this installation remote bus.

Momentum dust and damp proof distributed I/O modules with 16 x --- 24 V inputs or 16 x 0.5 A/ --- 24 V outputs offer:

- Compact interface elements.
- Easy setup and connection.

Momentum dust and damp proof distributed I/O modules have been designed to conform with the main international standards concerning electronic industrial control equipment:

- Specific requirements for programmable controllers: operating characteristics, immunity, ruggedness, safety etc.
- NF C 63 850, IEC 1131 2.
- Immunity to electrostatic discharges: IEC 801.2 level 4.

These products, marked CE, satisfy the requirements of the European directives and conform to the applicable harmonised standards.

These products are approved by the INTERBUS club.

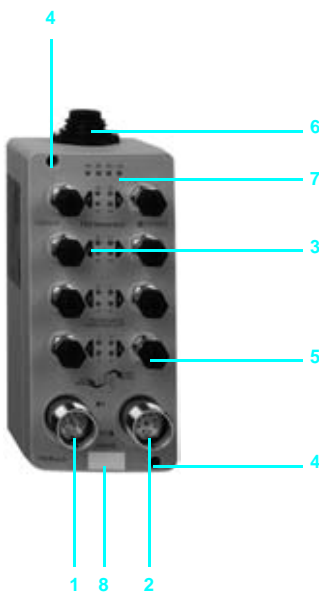
Description

Momentum dust and damp proof distributed I/O modules 170 ED● 346 00 are monobloc type in an IP 65 casing and comprise :

- 1 A 9-way connector for connection to the installation remote bus (in).
- 2 A 9-way connector for connection to the installation remote bus (out).
- 3 16 status indicator lamps for inputs or outputs.
- 4 Two holes for fixing the module on a mounting plate.
- 5 Eight connectors for input or output channels.
- 6 A --- 24 V auxiliary power supply connector (for the 170 ED0 346 00 output module).
- 7 Three or four diagnostics indicators (depending on the model).
- 8 Space for self-adhesive identification label.

Connector to be ordered separately:

- For output modules, TBX BAS 10 dust and damp proof power supply connector.



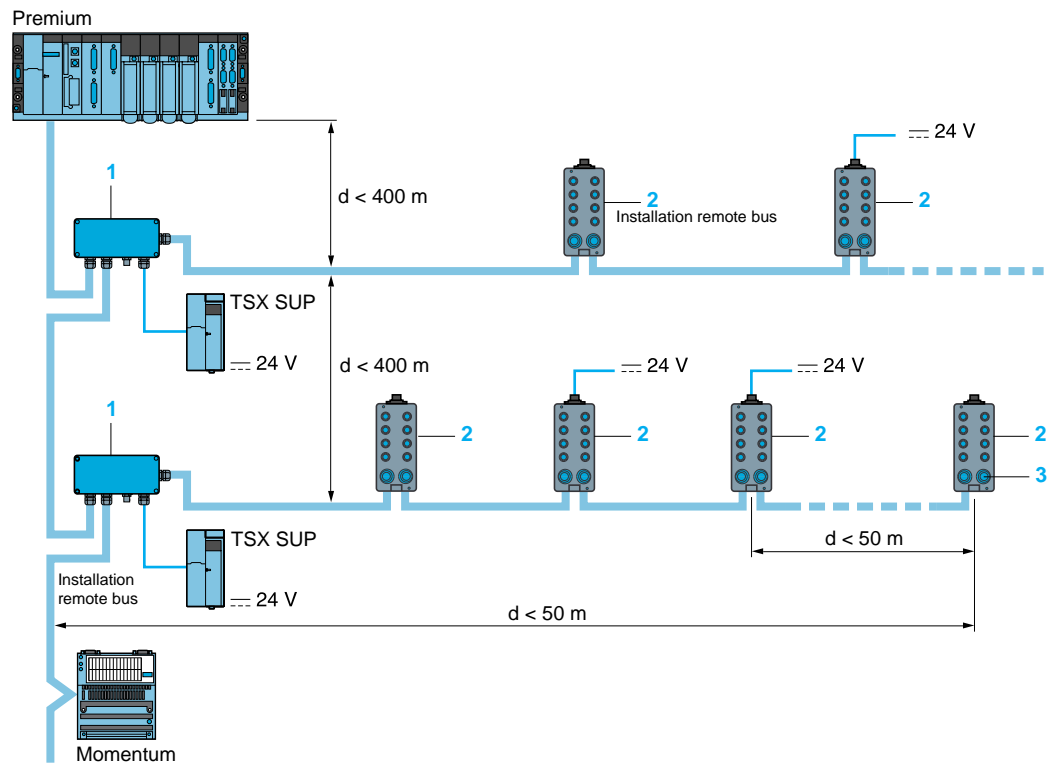
Connection principle

Momentum dust and damp proof distributed I/O modules are connected to the installation remote bus of an INTERBUS bus. This installation remote bus is a tap link of the remote bus to which a $\sim 24\text{ V}$ power supply is added via an installation remote bus terminal module.

The number of I/O modules on the installation remote bus is limited by the current consumption of the modules and connected sensors. Total consumption should not exceed 4.5 A. The current consumption of the actuators is not included in the calculation, since these are supplied separately.

The maximum length of the installation remote bus cable is:

- Between the installation remote bus terminal module and the first I/O module: 50 m.
- Between two I/O modules: 50 m.
- Between the installation remote bus terminal module and the last I/O module: 50 m.



- 1 Installation remote bus terminal module 170 ENO 396 00.
- 2 Dust and damp proof distributed I/O module 170 ED● 346 00.
- 3 Sealing plug 170 XTS 050 00.

Type of input module				170 EDI 346 00
Modularity				16
Nominal input values	Voltage		--- V	24
	Current		mA	100 (0 % active inputs), 640 (100 % active inputs)
	Sensor supply (ripple included)		--- V	19.2...30
Input limit values	At state 1	Voltage	V	≥ 11
		Current	mA	2.5...10
	At state 0	Voltage	V	< 5
		Current	mA	< 2
Input impedance				kΩ 3.6
Logic				Positive
Response time	Change from state 0 to state 1		ms	5
	Change from state 1 to state 0		ms	5
Dissipated power	Per module		W	1.9 (0 % active inputs), 2.5 (100 % active inputs)
	Per channel		W	0.3
Compatibility with INTERBUS output module				Yes
Isolation	Dielectric strength between inputs and earth		--- V	750 for 1 min
	Insulation resistance		MΩ	> 10 at $\text{--- } 500 \text{ V}$
Temperature	Operation		°C	0...60
	Storage		°C	- 25...+ 70
Relative humidity	Without condensation			5...95 %
Altitude			m	0...2000
Degree of protection				IP 65
Type of output module				170 EDO 346 00
Modularity				16
Loads	Voltage		--- V	24
	Nominal current		A	0.5
Limit values	Voltage (ripple included)		--- V	19.2...30
Logic				Positive
Response time	Change from state 0 to state 1		ms	5
	Change from state 1 to state 1		ms	5
Leakage current	At state 0		mA	< 1
Residual voltage	At state 1		V	< 0.5
Built-in protection	Against short- circuits			Yes (thermal)
	Against overloads			Automatic reset
Typical currents consumed	Mains power supply		mA	200 (0 % active outputs), 380 (100 % active outputs)
	Auxiliary power supply		mA	180 (0 % active outputs), 220 (100 % active outputs)
Dissipated power	Per module		W	1.9 (0 % active outputs), 3 (100 % active outputs)
Compatibility with INTERBUS input module				Yes
Isolation	Dielectric strength between inputs and earth		--- V	750 for 1 min
	Insulation resistance		MΩ	> 10 at $\text{--- } 500 \text{ V}$
Temperature	Operation		°C	0...60
	Storage		°C	- 25...+ 70
Relative humidity	Without condensation			5...95 %
Altitude			m	0...2000
Degree of protection				IP 65



170 EDI 346 00



170 EDO 346 00

References

Dust and damp proof monobloc distributed discrete I/O modules

Type of module	Operating voltage	Modularity (nb of chan.)	IEC 1131 2 Conformity	Reference (1)	Weight kg
Inputs	24 V (pos.log.)	16 isolated inputs	Type 1	170 EDI 346 00	0.520
Outputs	24 V	16 protected 0.5 A outputs	Yes	170 EDO 346 00	0.580

Accessoires de raccordement

Description	Use	Reference (1)	Weight kg
Installation remote bus terminal module (1)	Tap-off from remote bus to installation remote bus Enables communication of distributed I/O and INTERBUS master module	170 ENO 396 00	—
Sealing plug	To be fitted at end of installation remote bus	170 XTS 050 00	0.140
Dust and damp proof power supply connector for output module	24 V preactuator power supply for 170 EDO 346 00 output module	TBX BAS 10	0.120

Connection cables

Description	Length	Reference (1)	Weight kg
Installation remote bus cables preformed with dust and damp proof M23 connectors, composite pure material	0.4 m	TSX IBI CP DD9 004	—
	1 m	TSX IBI CP DD9 010	—
	3 m	TSX IBI CP DD9 030	—
	7 m	TSX IBI CP DD9 070	—
	12 m	TSX IBI CP DD9 120	—
	25 m	TSX IBI CP DD9 250	—

Documentation

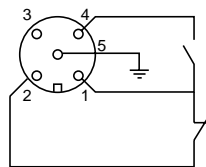
Description	Language	Reference	Weight kg
Installation manual	English	870 USE 100 00	—

(1) Product supplied with multilingual Quick Reference Guide .

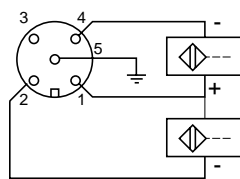
Connections, dimensions, mounting

170 EDI 346 00 inputs

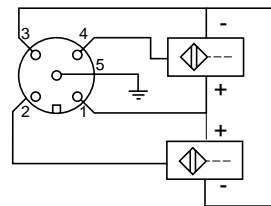
Mechanical contacts



2-wire sensors

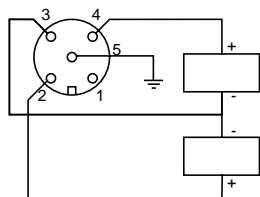


3-wire sensors

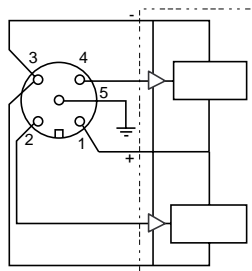


170 EDO 346 00 outputs

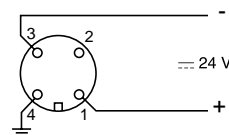
Direct wiring



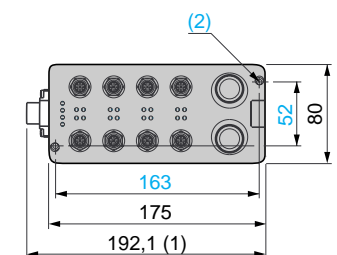
Wiring with amplification



Preactuator supply via TBX BAS 10 connector



Dimensions, mounting



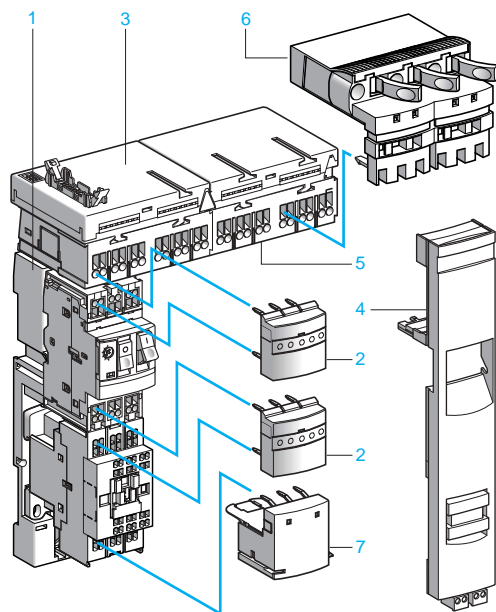
(1) For 170 EDO 346 00 module.

(2) 2 holes for M4 x 16 screws.

Modicon Quantum automation platform

Installation system

Tego Power for motor starter components



General presentation

Tego Power is a modular system which standardises and simplifies the implementation of motor starters with its prewired control and power circuits. Installation of a motor starter is therefore quick, simple, safe and flexible, with no wires needed for connection. In addition, this system enables the motor starter to be customised at a later date, reduces maintenance time and optimises panel space by reducing the number of terminals and intermediate interfaces and the amount of ducting.

Quickfit technology for TeSys motor starter components with spring terminals is designed for use with model d contactors (9 to 25 A) and with GV2-ME motor circuit-breakers.

System using Quickfit technology, for TeSys motor starters with spring terminals

The motor starters concerned are those formed by combining:

- GV2-ME circuit-breakers,
- with 9 to 25 A model d contactors (LC1).

Consisting of simple parts, Tego Power with Quickfit technology can be used to build motor starter assemblies up to 11.5 kW/400 V.

The main components which make up this range are:

■ For the power circuit

- a **power kit** comprising, for each starter, a plate **1** for mounting the contactor and the circuit-breaker and two power connection modules **2**,
- a **power splitter box 5** for 2 or 4 starters,
- an **upstream terminal block 6** for a power supply up to 63 A (16 mm²),
- a **downstream terminal block 7** for connection of the motor power supply cables and the earth cables (6 mm²).

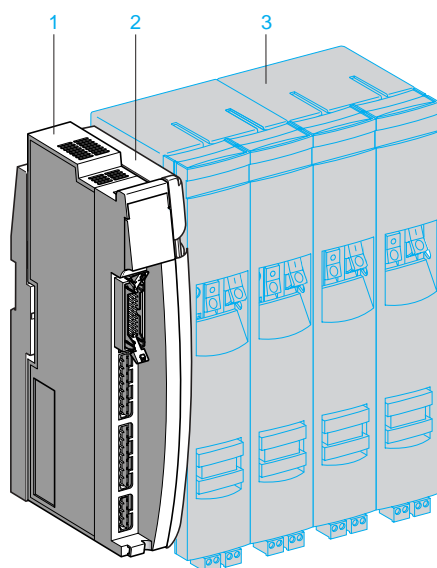
■ For the control circuit

- a **control splitter box 3** for 2 or 4 starters, with control-command data on HE 10 connector. The data on 4 to 8 starters can be fed back directly to the PLC via an 8I/8O or 16I/8O Telefast cable, or to a fieldbus module (AS-Interface, Fipio, CANopen, DeviceNet, INTERBus, Profibus) (see opposite page).
- a **control circuit connection module 4** which plugs directly into the contactor and the circuit-breaker on each starter. This module concentrates the motor starter control-command data. It incorporates the circuit-breaker status data in the prewiring of the contactor control circuit.

Modicon Quantum automation platform

Installation system

Tego Power for motor starter components



Communication modules

General

Communication modules are used to send I/O data from a Tego Power motor starter configuration to the PLC.

The communication module is selected according to the type of connection required:

- either in parallel mode (modules, terminal blocks or HE 10),
- or in serial mode on the bus (AS-Interface bus, INTERBus, Fipio, Profibus DP, CANopen or DeviceNet modules).

Modules in a TeSys motor starter system with spring terminals

Motor starters can be connected to a PLC or a bus in two ways:

- by direct connection from the control splitter box **3** with 4 starters, using one HE 10 connector (8I/8O) or two HE 10 connectors (16I and 8O),
- by a Tego Power module **1** using an **APP 2CX** adapter plate **2**.



Modicon Quantum automation platform

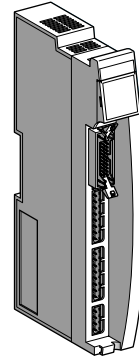
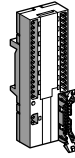
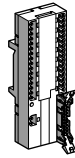
Tego Dial/Tego Power installation system

Tego Dial for Human-Machine interfaces and Tego Power for motor power-starter components

Automation platform

Tego Dial components

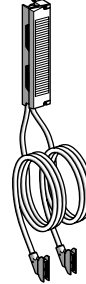
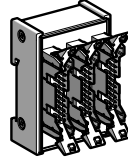
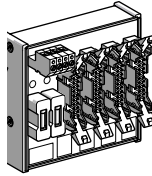
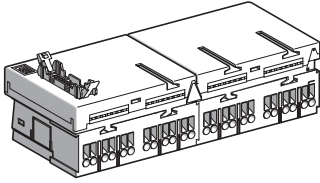
Tego Power components



Type	Modularity of connection to the PLC	Compatible I/O modules	Tego Dialbase 8 I/8 O	Tiego Dialbase 16 I	Communication module or control splitter box with 8 I/8 O
			APE 1B24M	APE 1B24E	APP 1CH, APP 2R4H1/H3
TSX Micro platform					
Tego Dial	8 inputs + 8 outputs	TSX DMZ 16DTK	1		
	16 inputs + 16 outputs	TSX DMZ 64DTK	1 (1)		
	16 inputs	TSX DMZ 64DTK/28DTK		1	
Tego Power	8 inputs + 8 outputs	TSX DMZ 16DTK			1
	16 inputs + 16 outputs	TSX DMZ 64DTK			1
Premium platform					
Tego Dial	16 inputs + 16 outputs	TSX DEY 16FK/32D2K/64D2K TSX DSY 32T2K/64T2K	1 (1)		
	16 inputs	TSX DEY 16FK/32D2K/64D2K			
Tego Power	16 inputs + 16 outputs	TSX DEY 32D2K/64D2K/16FK TSX DSY 32T2K/64T2K			1
Quantum platform					
Tego Dial	32 inputs + 32 outputs	140 DDI 353 00/10, 140 DDI 853 00, 140 DD0 353 00/10	1 (1)		
	32 inputs	140 DDI 353 00/10, 140 DDI 853 00		1	
Tego Power	32 inputs + 32 outputs	140 DDI 353 00/10, 140 DDI 853 00 140 DD0 353 00/10			1
Advantys STB discrete I/O					
Tego Power	16 inputs + 8 outputs	STB EPI 1145			

(3) For the connection of a second Dialbase APE 1B24M, use 2 x TSX DP 003 connecting cables.

Connection accessories



Control splitter box 16 I/16 O	Control splitter box	Splitter box 16 I + 16 O in 2 x (8E + 8S)	Splitter box 16 to 2 x 8	Telefast connecting cables		
APP 2RH2/H4		APE 1R1628	ABE 7ACC 02	TSX CDP ●●3	ABF M32H●●0	STB XCA 300●
				1		
		1		2		
		1				
				1		
		1 (2)		3		
1			1 (3)	3		
		1		2		
				2		
		1 (2)		3		
1			1 (3)	3		
		1		1	2	
					1	
		1 (2)		1	2	
1			1 (3)	1	2	
	APP 2R2E (2 motor-starters)	APP 2R4E (4 motor-starters) (4)				1

(4) 8 I + 8 O remain available. To connect a second APP 1CH module or APP 2●●● 8 E + 8 S control splitter box, use a additional TSX CDP ●●4 cable.
 (5) 8 O remain available on ABE 7ACC02. To connect them a second AAP 2●●● 16 I/8 O control splitter box, use a additional TSX CDP ●●3 cable.
 (6) For 8 motor-starters, to use 2 APP 2R4E control and power splitters.



4.1 - Intrinsically safe I/O*Selection guide: I/O modules* page 4/2

- Intrinsically safe I/O module
 - Presentation, description page 4/4
 - Characteristics page 4/5
 - References page 4/9
 - Wiring page 4/10

4.2 - Counter and special purpose modules*Selection guide: modules* page 4/16

- High-speed counter modules page 4/18
- Latch/interrupt module page 4/22
- Accurate time stamping page 4/26
- LonWorks communication module (Concept/ProWORX 32) page 4/30
- Quantum-Sy/Max integration page 4/32

4.3 - Motion control*Selection guide: Lexium motion control* page 4/34

- Lexium offer, presentation page 4/36
- Single-axis motion control module for servomotors page 4/38
- SERCOS motion control modules for servomotors page 4/42

4.4 - Hot Standby system (Unity Pro)

- Presentation/architecture page 4/50
- Functions page 4/53
- Description page 4/55
- Characteristics/references page 4/56

4.5 - Hot Standby system (Concept/ProWORX 32)

- Presentation/description page 4/58
- Topologies page 4/59
- Characteristics/references page 4/60

Modicon Quantum automation platform

Intrinsically safe I/O

Type

Analog input modules



Number of channels

8

Operating range

RTD:
Platinum - 200 °C to + 850 °C (-328 to 1562 °F)
Nickel - 60 °C to + 180 °C (-40 to 356 °F)
Thermocouple:
Types J,K,E,T,S,R,B
-100...+100 mV, -25...+25 mV

Current input
4...20 mA
0...20 mA
0...25 mA

Resolution

RTD: 12 bits plus sign (0.1 °C)
TC: 1 °C (default) 0.1 °C, 1 °F, 0.1 °F

Up to 25,000 counts

Isolation (channel to bus)

1780 VAC @ 47...63 Hz or 2500 VDC for 1 min.

Accuracy error at 25 °C (77 °F)

RTD: ± 0.5 °C (32.9 °F)
TC: (types J,K,E,T) ± 2 °C, ± 0.1 % of reading
types S,R,B) ± 4 °C, ± 0.1 % of reading

Typical: ± 0.05 % of full scale;
maximum: ± 0.1 % of full scale

Bus power required

400 mA

1.5 A

Addressing requirement

10 input words

9 input words

Type of module

140 AI 330 00

140 AI 330 10

Page

4/9

4

4.1



ProWORX

Intrinsically safe
Analog output module



Intrinsically safe
Discrete input module



Intrinsically safe
Discrete output module



4

4.1

4...210 mA (0 to 4095)
4...20 mA (0 to 16,000)
0...20 mA(0 to 20,000)
0...25 mA(0 to 25,000)

15 bits within 4...20 mA

No load voltage: 8 VDC
Short circuit current: 8 mA
Switching point: 1.2 mA...2.1 mA
Switching hysteresis: 0.2 mA

—

Load current max:
each point: 45 mA @ 11 VDC
each module: 360 mA
Off state leakage per point: 0.4 mA
Output voltage 24 VDC (open)

± 0.2% of full scale

2.5 A

400 mA

2.2 A, full load

8 output words

0.5 output words

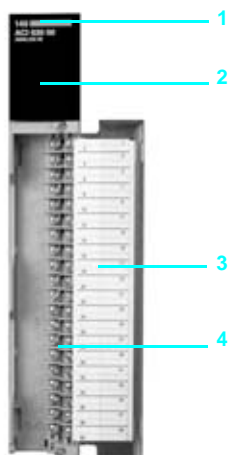
0.5 output words

140 AIO 330 00

140 DII 330 00

140 DIO 330 00

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Presentation

The Quantum Automation Platform supports a full range of intrinsically safe I/O modules designed to interface with a wide variety of field devices.

Intrinsic safety is a technique for ensuring that electrical energy supplied to circuits in a hazardous area is too low to ignite volatile gases either by spark or by thermal means. Intrinsically safe circuits use energy-limiting devices, known as intrinsically safe barriers, to prevent excess electrical energy from being applied to electrical equipment located in the hazardous area. These galvanically isolated barriers prevent the module from releasing sufficient energy to ignite volatile gases or vapors in the hazardous area.

Galvanic isolation, in the form of opto-isolators and DC/DC converters, is provided between the field side output circuitry and the Quantum bus circuitry. The DC/DC converters provide intrinsically safe power to field devices located in hazardous areas. No external field power is required where these modules are installed.

I/O intrinsically safe modules are designed to fit into a standard Quantum backplane. They can be mounted in any slot position in any slot size (3...16 slots) Quantum 140 XBP 000 00 backplane.

I/O connectors

Each intrinsically safe I/O module requires an I/O connector (140 XTS 332 00). The connector's field wiring terminal strip is color-coded blue to identify it as an intrinsically safe connector. The terminal strip is keyed to prevent the wrong connector from being applied to the module.

Wiring considerations

Intrinsically safe wiring between the intrinsically safe I/O modules and the field devices located in the hazardous area must be separated from all other wiring. This can be accomplished by any one of the following methods:

- Separate blue wire ducts, raceways, or conduits
- Grounded metal or insulated partitions between the intrinsically safe and non-intrinsically safe wiring
- A separation of two inches (50 mm) of air space between the intrinsically safe and non-intrinsically safe wiring. With this method, intrinsically safe and non-intrinsically safe wires must be tied in separate bundles to maintain the required separation.

Description

The 140 AII/AIO/DII/DIO 330 00 intrinsically safe modules comprise in front panel:

- 1 A model number and color code.
- 2 A LED indicator panel.
- 3 A removable, hinged door and customer identification label.
- 4 Terminal block, 40-pole. (To be ordered separately).

RTD/resistance and thermocouple/millivolt Input module

Model			140 All 330 00 (RTD)		140 All 330 00 (Thermocouple)	
Numbers of channels				8		
LEDs				Active-1 (Green) F-1 (Red) 1 ... 8 (Red) - Indicated channel is out of range (includes broken wire & short circuit conditions)		
RTD types (configurable)	Platinum (American & European)	PT 100, PT 200, PT 500, PT 1000	°C	- 200 to + 850	–	
	Nickel	N 100, N 200, N 500, N 1000	°C	- 60 to + 180	–	
Ranges TC (1)	J		°C	–	- 210 ... + 760	
	K		°C	–	- 270 ... + 1370	
	E		°C	–	- 270 ... + 1000	
	T		°C	–	- 270 ... + 400	
	S		°C	–	- 50 ... + 1665	
	R		°C	–	- 50 ... + 1665	
	B		°C	–	- 130 ... + 1820	
	Millivolt		mV	–	- 100 ... + 100 (2) - 25 ... + 25	
	Measurement current	PT 100, PT 200, N 100, N 200		mA	2.5	–
PT 500, PT 1000, N 500, N 1000		mA	0.5	–		
TC circuit resistance/max source resistance			Ω	–	200 max. for rated accuracy	
Input impedance			MΩ	> 10	> 1	
Input filter				–	Single low pass @ nominal 20 Hz. Plus notch filter at 50/60 Hz	
Normal noise rejection			dB	> 100 @ 50/60 Hz	120 dB min. @ 50 or 60 Hz	
Cold junction compensation (CJC)				–	Internal CJC operates 0 ... 60° C (errors are included in the accuracy specification). The connector door must be closed. Remote CJC can be implemented by connecting the TC (which monitors the external junction block temperature) to channel 1.Types J, K, and T are recommended for best accuracy.	
Linearity				± 0.003% of full scale (0 to 60° C)	–	
Resolution	RTD			12 bits + sign (0.1° C)	–	
	TC			–	Choice of : 1°C (default), 0.1°C, 1 °F, 0.1°F	
	Millivolt			–	± 100 mV range, 3.05 µV (16 bits) ± 25 mV range, 0.76 µV (16 bits)	

(1) All TC ranges have an open TC detect and upscale. This results in a reading 7FFFh or 32767 decimal when an open TC is detected

(2) Open circuit detect can be disabled on these ranges.



RTD/resistance and thermocouple/millivolt Input module

Model		140 AII 330 00 (RTD)		140 AII 330 00 (Thermocouple)
Absolute accuracy	RTD	°C	± 0.5 (25 °C) ± 0.9 (0 ... 60 °C)	–
	TC		–	Absolute accuracy includes all errors from the internal CJC, TC curvature, offset plus gain, for module temperature of 0 ... 60 °C. User supplied TC errors not included. For type J and K, add 1.5 °C inaccuracy for temperatures below -100 °C. Type B cannot be used below 130 °C.
	Types J, K, E, T	°C	–	± 2 °C + 0.1% of reading
	Types S, R, B	°C	–	± 4 °C + 0.1% of reading
	Millivolt @ 25 °C	µV	–	± 20 µV + 0.1% of reading
Accuracy error @ 25 °C	Typical		± 0.05% of full scale	–
	Maximum		± 0.1% of full scale	–
Accuracy drift w/temperature		µV/°C	–	0.15 µV/°C + 0.0015% of reading/°C maximum
Update Time (all channels)	3-wire	s	1.35 Sec	–
	2 or 4-wire	ms	750 m Sec	–
	TC/millivolt	s	–	1 Sec
Isolation	Channel-to-channel		–	
	Channel-to-bus		~ 1780 @ 47-63 or --- 2500 V for 1 minute	
Bus current required		mA	400	
Fault detection			Out of range or broken wire conditions	
External power			–	
Power dissipation		W	2	
Hot swap			Not allowed per intrinsic safety standards	
Fusing			Internal-not user accessible	
Programming software			Unity Pro, Concept version 2.2 or higher	
Agency approvals			CSA 22.2-142, FM Class1 Div.2, C€, cUL	

4

4.1



ProWORK

Current input and analog output modules

Model		140 AII 330 10	140 AIO 330 00
Number of channels		8	
Linear measuring range		mA 4...20 0...20 0...25	—
Absolute maximum input		mA 25 internally limited	—
Input impedance		Ω $100 \pm 0.1\%$ between V + and signal terminals	—
Resolution		4...20 mA, 0 to 4,095 counts 4 ...20 mA, 0 to 16,000 counts 0 ...20 mA, 0 to 20,000 counts 0 ...25 mA, 0 to 25,000 counts	15 bits within 4...20 mA
Loop resistance		Ω —	500 maximum
Ranges		mA —	4...20 (0 to 4095) 4 ...20 (0 to 16,000) 0...20 (0 to 20,000) 0...25 (0 to 25,000)
Available voltage		Terminals V+, V-, : --- 14.5 V @ 25 mA Terminals V+, signal : --- 13.6 V @ 20 mA	—
Accuracy error @ 25 °C	Typical	$\pm 0.05\%$ of full scale	$\pm 0.2\%$ of full scale
	Maximum	$\pm 0.1\%$ of full scale	—
Accuracy drift w/temperature	Typical	$\pm 0.0025\%$ of full scale / °C	40 PPM/ °C
	Maximum	$\pm 0.005\%$ of full scale / °C	70 PPM/ °C
Linearity		+ 0.003% of full scale	± 1 LSB
Common mode rejection		>100 dB @ 50/60 Hz	—
Input filter		Single pole low pass, - 3 dB cutoff @ 15 Hz, $\pm 20\%$	—
Update time (for all channels)		ms 750	4
Settling time		ms —	1 ms to $\pm 0.1\%$ of the final value
Voltmeter monitor specifications	Range	V —	0.250...1.250
	Scaling	—	$V_{out} \text{ (Volts)} = I_{loop} \text{ (mA)} \times 0.0625$
	Output impedance	Ω —	62.5 typical
	Wire length	m —	1 maximum
Isolation	Channel-to-channel	—	—
	Channel-to-bus	A 1780 V @ 47-63 Hz or --- 2500 V for 1 minute	A 1780 V RMS for 1 minute
Bus current required		A 1.5	2.5
Fault detection		Broken wire (4 ... 20 mA mode)	Open circuit in 4 ... 20 mA range
External power		—	—
Power dissipation		W 7.5	12.5
Hot swap		Not allowed per intrinsic safety standards	
Fusing		Internal-not user accessible	
Programming software		Unity Pro, Concept, version 2.2 or higher, ProWORX	
Agency approvals		UL 508, CSA 22.2-142, FM Class1 Div.2, c€	



Digital input and output module

Model		140 DII 330 00	140 DIO 330 00
Number of points		8 input	8 output
Output voltage		V	24 (open)
Operating voltages & currents	No load voltage (between input + and input -)	\sim V	8
	Short circuit current	mA	8
	Switching point	mA	1.2 ... 2.1
	Switching hysteresis	mA	0.2
Switching frequency		Hz	100 maximum
Maximum load current	Each point	mA	—
	Per module	mA	—
	Off state leakage/point	mA	—
Response (resistive loads)	Off-on	ms	1
	On-off	ms	1
	Output protection (internal)		—
Internal resistance		K Ω	2.5
Input protection			Resistor limited
Isolation	Channel-to-channel		—
	Channel-to-bus		\sim 1780 V, 47-63 Hz or \sim 2500 V for 1 minute
Bus current required		A	0.4
Fault detection			Resistor limited
External power			—
Power dissipation		W	2
Hot swap			Not allowed per intrinsic safety standards
Fusing			Internal-not user accessible
Programming software			Unity Pro, Concept, version 2.2 or higher, ProWORX
Agency approvals			UL 508, CSA 22.2-142, cUL, C ϵ

4

4.1



ProWORX

Modicon Quantum automation platform

Intrinsically safe I/O

Intrinsically safe input modules

Description/resolution	Range	Reference	Weight kg (lb)
8 channels, up to 25,000 counts (4096...2500 points)	4 ... 20 mA, 0 ... 20 mA, 0 ... 25 mA	140 AII 330 10	0.300 (0.66)
8 channels, 12-bits plus sign, RTD	Ni or PT 100, 200, 500, 1000	140 AII 330 00	0.300 (0.66)
8 channels, 12-bits plus sign, thermocouple	Types J, K, E, T, S, R, B and	mV 140 AII 330 00	0.300 (0.66)
8 channels	1.2 mA ... 2.1 mA switch pt. current	140 DII 330 00	0.300 (0.66)

Intrinsically safe output modules

Description/resolution	Range	Reference	Weight kg (lb)
8 analog channels, 15-bit	4 ... 20 mA, 0 ... 20 mA, 0 ... 25 mA	140 AIO 330 00	0.300 (0.66)
8 I/O DIO, 12-bit	± 5 V, ± 10 V 0 ... 5 V, or 0 ... 10 V	140 DIO 330 00	0.450 (0.99)

Accessories

Description	Reference	Weight kg (lb)
Connector 40-points; blue color (IP20 rated)	140 XTS 332 00	0.150 (0.33)

User Documentation (contained in Quantum Hardware Reference Guide) **840 USE 100 00** —

4

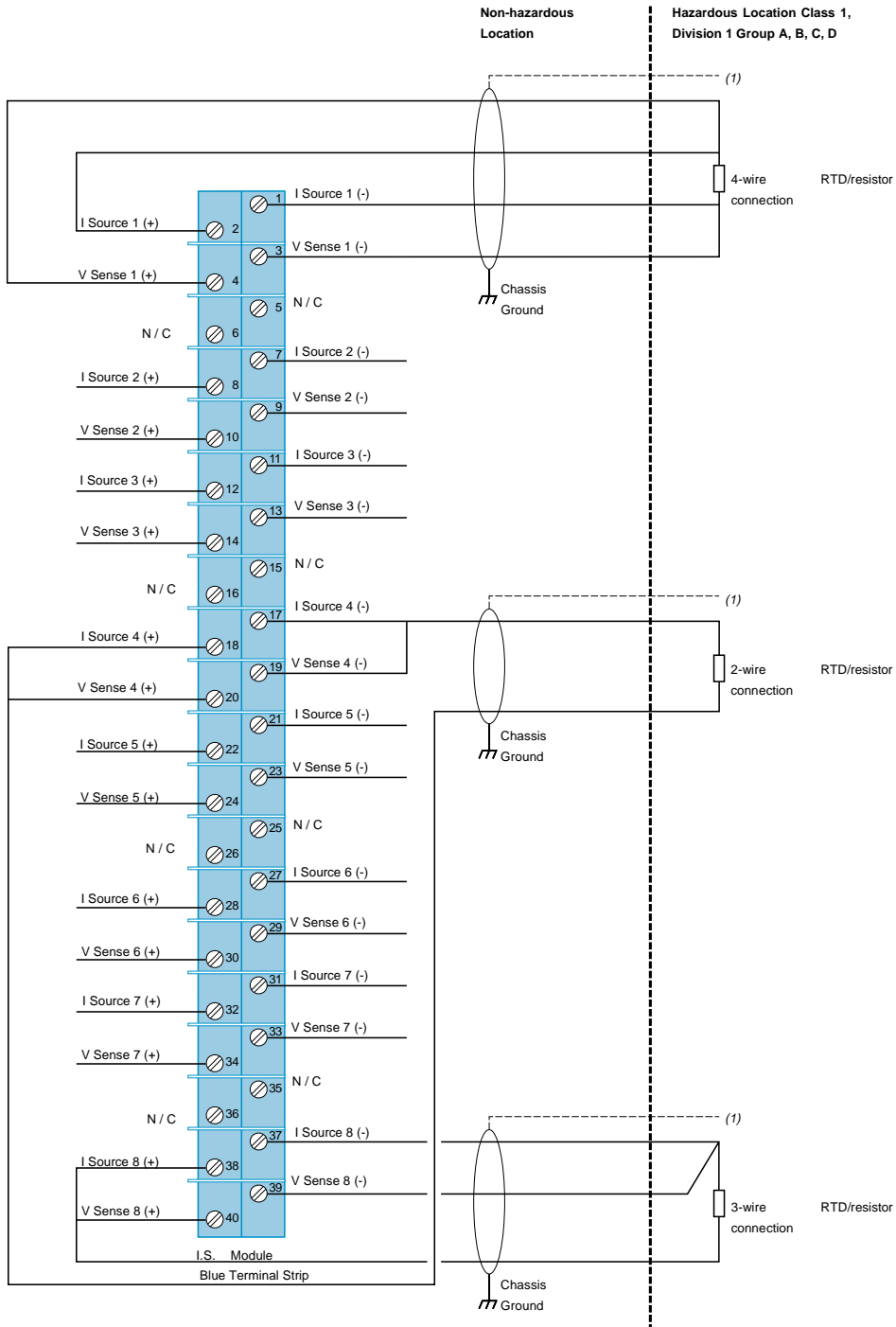
4.1



ProWORK

RTD/resistance input module wiring diagram

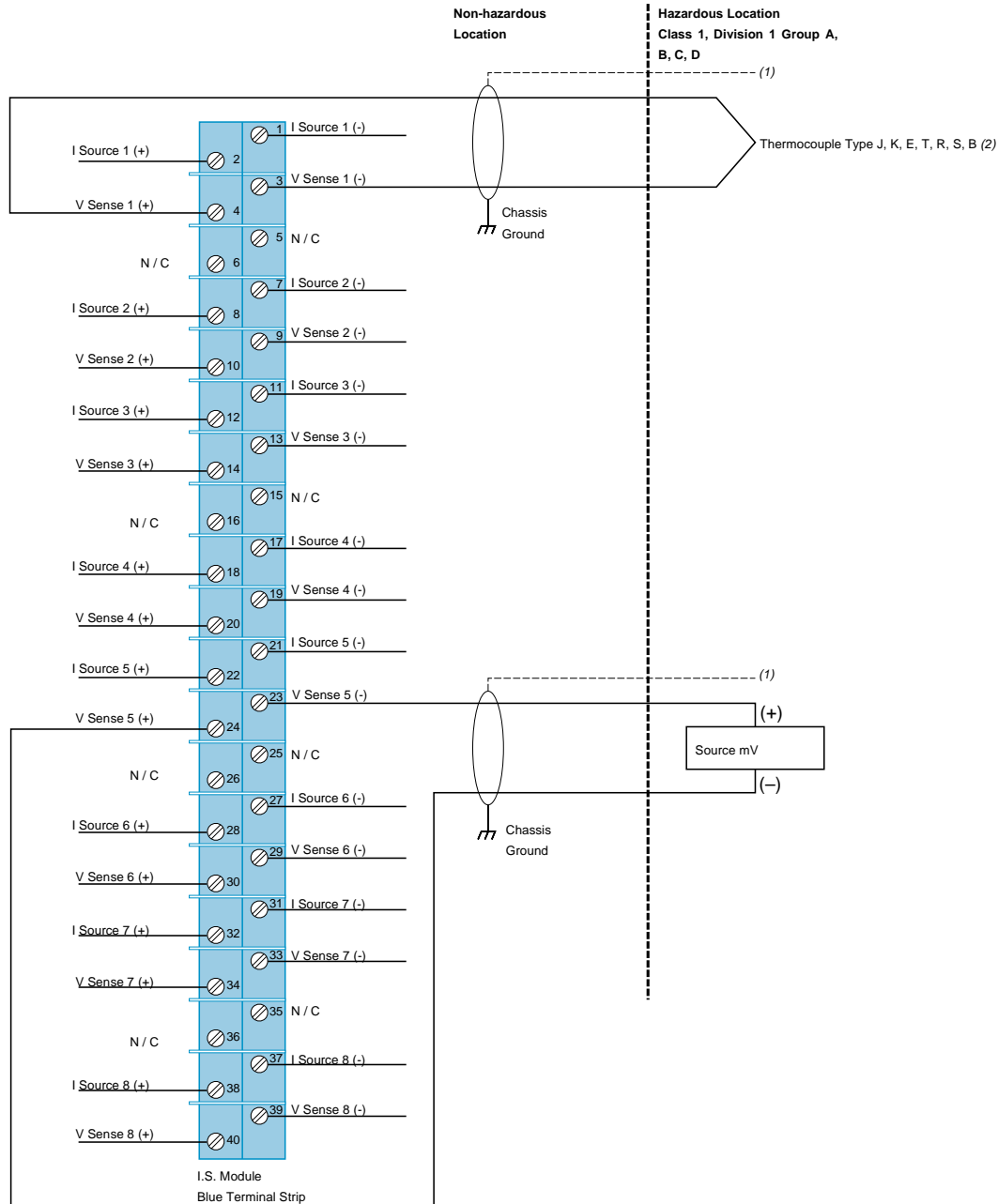
140 All 330 00



(1) Only shielded twisted pair cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.

RTD/resistance input module wiring diagram

140 All 330 00



4

4.1



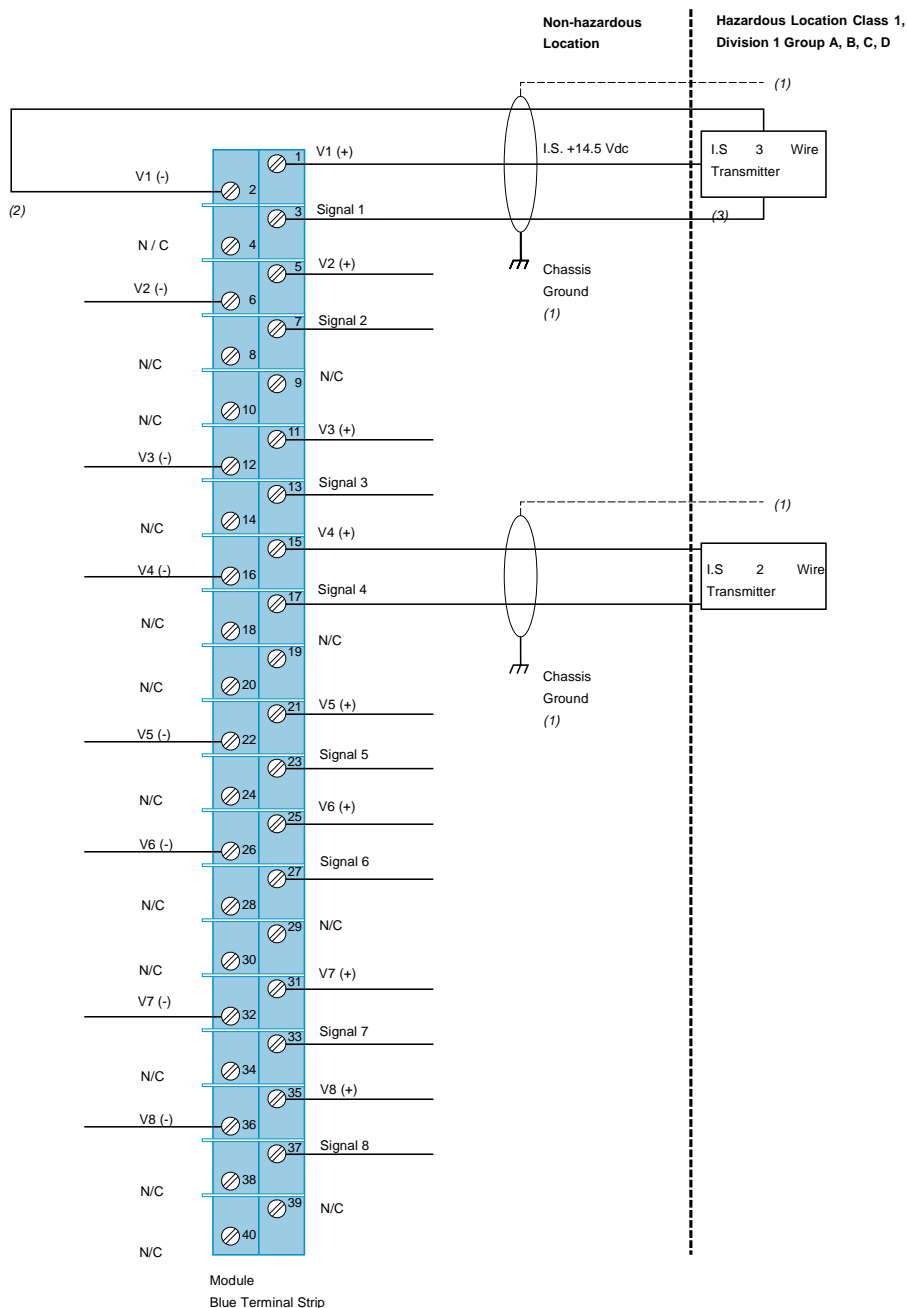
ProWORX

(1) Only shielded twisted pair cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.

(2) Pins marked "N/C" (Not Connected) are not electronically connected to the module.

Digital input module wiring diagram

140 All 330 10



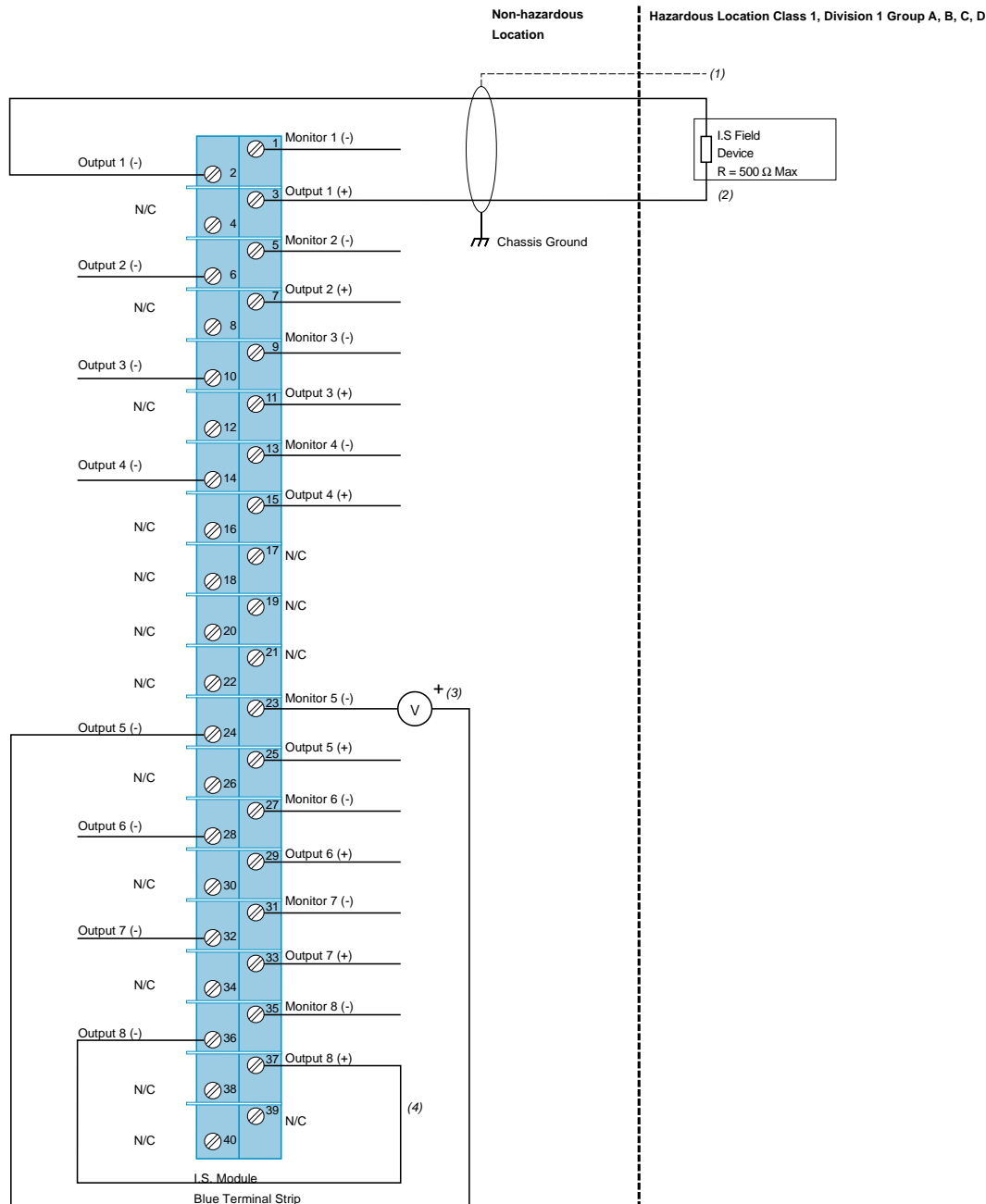
(1) Only shielded twisted pair cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.

(2) A dropping resistor of 100 Ohms is across the Signal and V (-) pins of each channel. V(-) is internally connected to I.S. ground.

(3) Three (3) wire transmitters should be provided power **only** from the module. An external power supply **should not** be used.

Analog output module wiring diagram

140 AIO 330 00



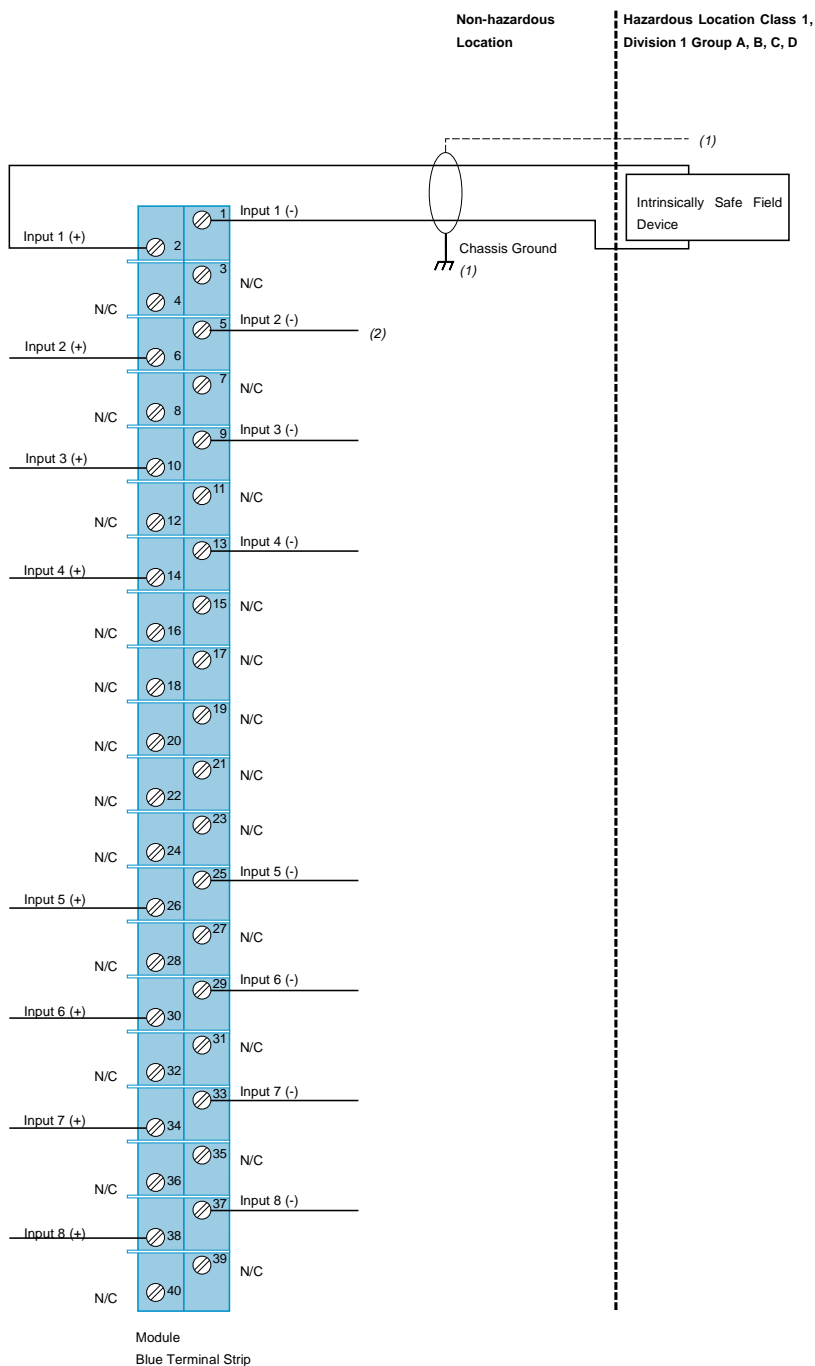
- (1) Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the module end.
- (2) More than one device can be connected as long as they have differential input and total input resistance is less than 500 ohms.
- (3) The voltmeter is optional and reads voltage proportional to the current. Length of wiring to this terminal is limited to 1 Meter.
- (4) Unused channels will show open loop unless outputs are shorted as shown for channel 8.



ProWORX

Digital input module wiring diagram

140 DII 330 00

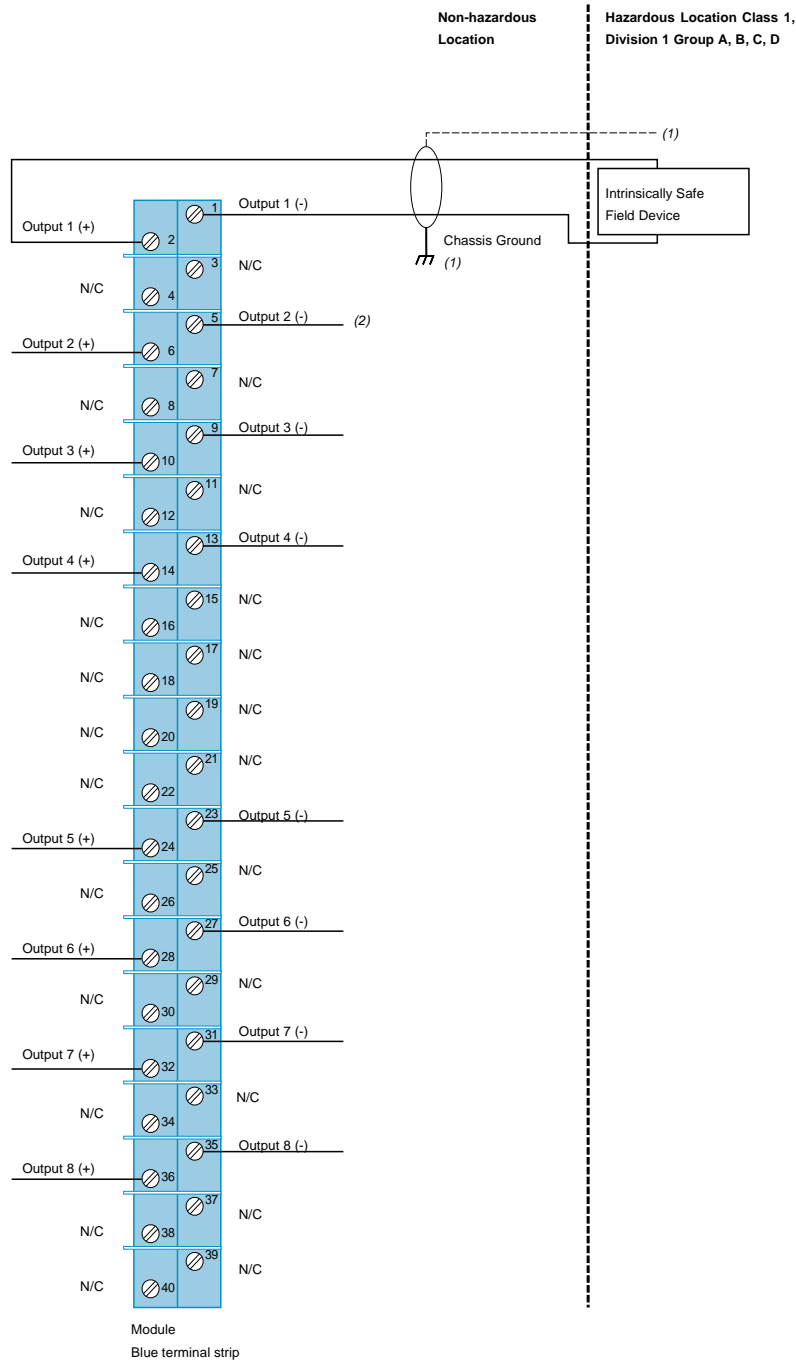


(1) Only shielded twisted pair cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.

(2) All "Input" (-)s are connected together internally.

Digital output module wiring diagram

140 DIO 330 00



4

4.1



ProWORK

(1) Only shielded twisted pair cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.
 (2) All "Output" (-)s are connected together internally.

Type		High-speed counter modules	
		<div>   </div>	
4	Functions	5 channels for incrémental encoder <ul style="list-style-type: none"> - Frequency on counter inputs 100 kHz (≐ 5 V) or 20 kHz (≐ 24 V) - Counting 16 bits (65635 points) or 32 bits (2 147 483 647 points) - 8 outputs ≐ 24 V 	5 channels for incrémental encoder <ul style="list-style-type: none"> - Frequency on counter inputs 500 kHz (≐ 5/24 V) - Counting 16 bits (65635 points) or 32 bits (2 147 483 647 points) - 4 outputs ≐ 24 V
4.2	Unity Pro software compatibility	Yes	
	Adressing requirement (words)	13 in/13 out	6 in/6 out
	Bus current required	250 mA	650 mA
	Model	140 EHC 105 00	140 EHC 202 00
	Pages	4/19	



Latch/interrupt module



- 16 channels \pm 24 V

3 operating modes:

- Interrupt handling mode on rising edge or falling edge (priority order : depends on addressing module and No. of channel module)
- Automatic latch/unlatch mode on rising edge (30 μ s min.) or falling edge (130 μ s min.)
- High-speed input mode on rising edge (30 μ s min.) or falling edge (130 μ s min.)

"Time Stamp" system Clock synchronization module



1 DCF input \pm 24 V for GPS external time receiver (470 GPS 001 00) or DCF external time receiver (DCF 77E)

- Clock synchronisation (day of week, month, year) and time data (ms, min, hour)
- Periodic or event time stamping

"Time Stamp" system Multifunction input module



32 discrete inputs \pm 24...125 V

- Response time 0...255 ms (configurable)

5 operating modes:

- Discrete inputs processed cyclically
- Event inputs (4096 time-stamped events by module)
- Counting inputs 32 bits, 500 Hz
- Periodic time stamping
- Time-delayed switching

Yes

16 in

400 mA

140 HLI 340 00

4/24

—

300 mA

140 DCF 077 00

4/29

—

300 mA

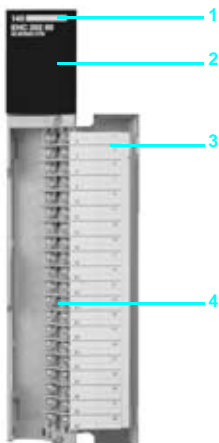
140 ERT 854 10

4

4.2



ProWORX



Presentation

The Quantum Automation Series offers two processor-controlled high-speed counter modules—the 140 EHC 105 00 and the 140 EHC 202 00. These modules independently count pulses at speeds much faster than a Quantum CPU alone can handle. They automatically report the count to the CPU on every scan, and, if the counter is placed in the local backplane, they can update the CPU asynchronously to the scan (via the IMOD instruction in 984 ladder logic).

140 EHC 105 00 module

The 140 EHC 105 00 is a five -channel counter, with four operating modes that can be configured for the channels. The module is best suited for the incremental high-speed counting of pulses up to 100 kHz at 5 V d.c. or 20 kHz at 24 V d.c. The operating mode for each channel can be configured easily via the I/O map zoom screen in Unity Pro, Concept or ProWORX 32. Operating modes can be set on the channels as follows:

- 32-bit event counters on any or all channels, with a latched or timed output modes specified.
- A 32-bit difference counter that uses two channels/function—the difference between the counts on each channels is reported to the CPU. A module can be set to handle two difference counters, two channels/function.
- 16-bit repeat counters on any or all channels; the counter repeats the count after it hits a setpoint.
- 32-bit rate counters on any 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 prior to the setpoint in up-count/down-count 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 a terminal count, either latched or as a one-shot.
- Output inverted for leading edge/trailing edge applications.
- Output turns on after a specified time delay from a terminal count, with a time range up to 16 383 ms.

140 EHC 202 00 module

The 140 EHC 202 00 is a 2-channel module best suited for high-speed counting applications up to 500 kHz or for applications that require a quadrature counter interface. The operating mode for each channel can be configured easily via the I/O map zoom screen in Unity Pro, Concept or ProWORX 32. Operating modes can be set on the channels as follows:

- 16-bit counters on one or both channels with two outputs, configurable for incremental or quadrature mode.
- A 32-bit counter that uses both channels with two outputs, configurable for 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-sample mode for incremental or quadrature encoders.

When the counter configuration includes outputs, each can be triggered by a setpoint or by a programmable count prior to the setpoint in up-count/down-count operations. Each of the outputs can be configured as follows:

- Output latched on at setpoint.
- Output latched on at a terminal count.
- Output timed on at setpoint, with a time range of 0 ... 16 383 ms (only one of the four possible outputs can be configured for this mode).
- Output timed on at a terminal count, with a time range of 0...16 383 ms (only one of the four possible outputs can be configured for this mode).

Description

- 1 A model number and color code,
- 2 A LED indicator panel,
- 3 A removable, hinged door and customer identification label,
- 4 A terminal block, 40-pole 140 XTS 002 00/001 00, to be ordered separately.



Characteristics

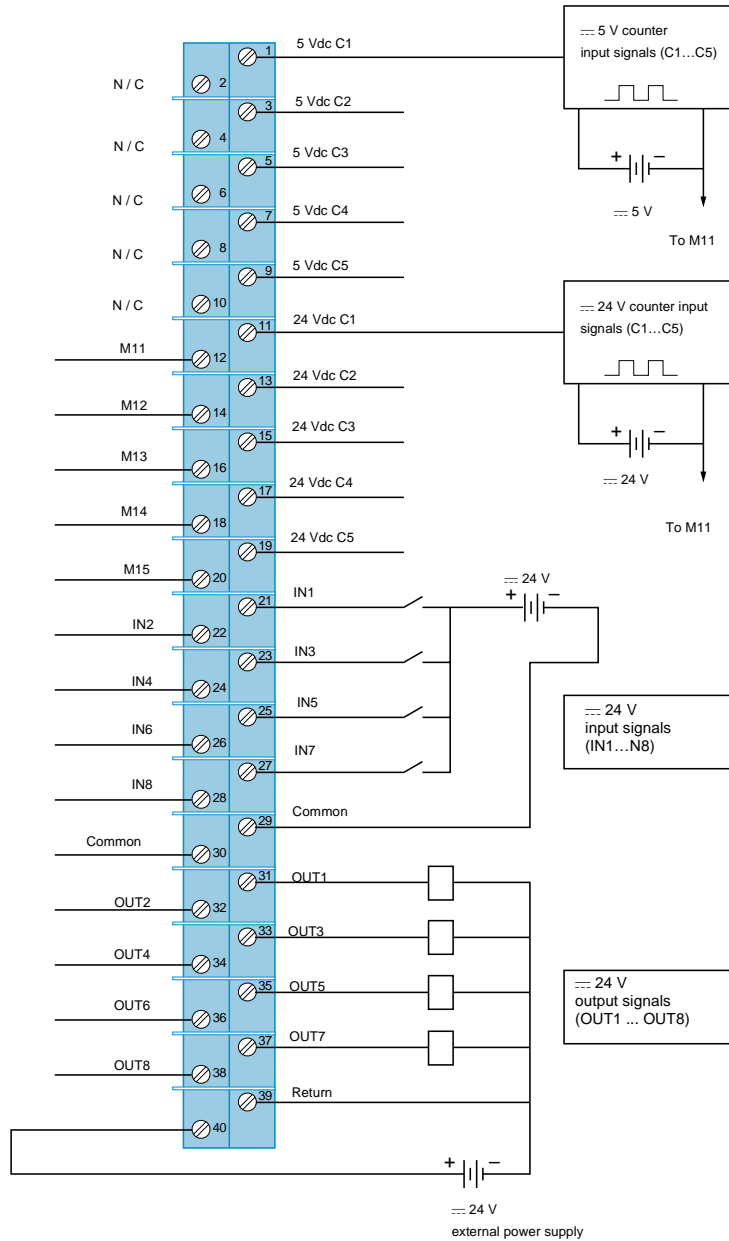
Model			140 EHC 105 00	140 EHC 202 00
Number of channels			5	2
Number of inputs			8	–
Number of outputs			8	4 (2/channel)
Addressing requirement			12 in/12 out words	6 in/6 out words
Data Formats	16-bit counter	dec	65 535	
	32-bit counter	dec	2 147 483 647	
Counter inputs	Input current	mA	7	–
	Duty cycle		1:1	–
	Operating mode		Discrete incremental counter	Incremental or quadrature
	Input voltage	---	30 V max continuous	
Discrete inputs	Operating modes		–	Incremental or quadrature
	Input voltage	---	–	30 V max continuous
	Input current	mA	5	–
	Input resistance	kΩ	–	10
Input threshold single-ended mode	--- 5 VREF	---	–	0...2.0 V on state 3.5...5.0 V off state
	--- 12 VREF	---	–	0...0 V on state 7.0...2.0 V off state
	--- 24 VREF	---	- 3.0...+ 5.0 V off state/15.0...30.0 V on state	0...11.0 V on state 13.0...24.0 V off state
Differential mode			---	1.8 minimum
Discrete outputs	FET switch on	---	20...30 V	Supply - 0.4 V
	FET switch off	---	0 V (ground reference)	
	Load current	mA	210/output max	500/output max
	Off state leakage	mA	0.1 max @ --- 30 V	0.4 max @ 30 V
	On state voltage drop	---	1.25 V @ 0.5 A	0.4 V @ 0.5 A
	Output protection		–	36 V transorb for transient voltage suppression
Miscellaneous	Isolation	~	500 V rms channel-to-bus for 1 minute	1780 V rms channel-to-bus for 1 minute
	Fault detection		Loss of output field power; output short circuit	Blown fuse detect; loss of 1A, 1B 2A, 2B output field power
	Power dissipation	W	≥ 6	4 + (0.4 x total module load current)
	Bus current required	mA	250	650
	External power supply	---	19. 2...30 V, 24 V nominal, 60 mA + load current for each output	19. 2...30 V, 24 V nominal, 50 mA + load current for each output
	Fusing	Internal External	A User discretion	2.5 (P/N 043503948 or equivalent)
Backplane support			Local, remote and distributed	

References

Description	Reference	Weight kg (lb)
Counter module, 5 channels, counter frequency, max. 100 kHz	140 EHC 105 00	0.350 (0.75)
Counter module, 2 channels Max. counter frequency, 500 KHz	140 EHC 202 00	0.350 (0.75)
Terminal block, 40-pole, < IP 20 rated	140 XTS 002 00	0.150 (0.33)
Terminal block, 40-pole, IP 20 rated	140 XTS 001 00	0.150 (0.33)
140 EHC 105 00 high-speed counter user guide	840 USE 443 00	–
140 EHC 202 00 contained in Quantum hardware reference guide	840 USE 100 00	–

High-speed counter modules wiring diagram

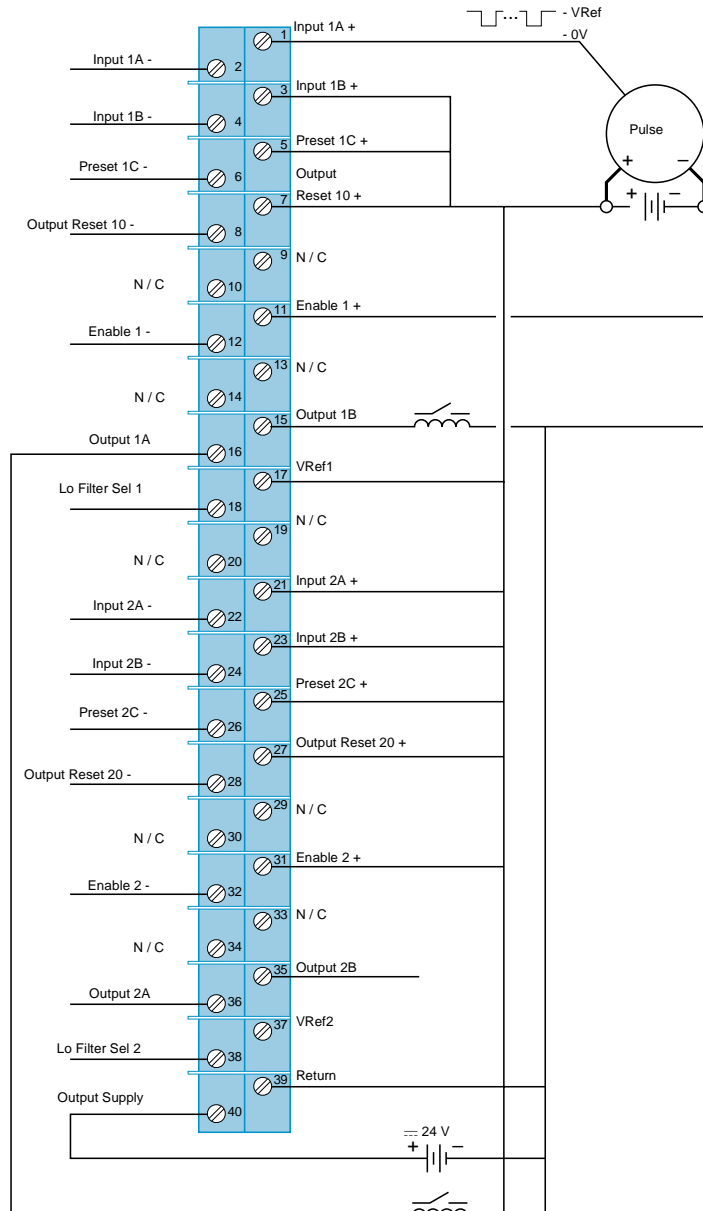
140 EHC 105 00



- N / C = Not Connected
- Terminals 29 and 30 are common and are jumpered together

High-speed counter modules wiring diagram

140 ECH 202 00



Basic wiring diagram showing single ended connections for:

Terminal 1 Pulse encoder input (sinking device)

Terminal 3 Input 1B count UP direction

Terminal 5 Unused hardware Preset tied high

Terminal 7 Output Reset tied high, not required; outputs not used

Terminal 11 Hardware enabled (software enable also required using predefined Modzooom or 4X register)

Terminal 17 Required VRef+ connection

Terminal 21, 23, 25, 31, 37 Counter 2 not used. These terminals must be connected VRef+

Terminal 39 Required Output Supply Return

Terminal 40 Required Output Supply



Presentation

The Quantum 140 HLI 340 00 module is a multipurpose, high-performance device that combines hardware/latch/interrupt capabilities for use in time-critical applications. It can be used only in the local backplane, not in remote or distributed drops.

The module has 16 independently programmable 24 V d.c. inputs (with source or sink field devices). When it is programmed via 984 ladder logic or IEC, the module takes advantage of several special interrupt-handling instructions (IMOD, ITMR, IE, ID and BMDI) and an immediate I/O (IMIO) instruction to update its inputs asynchronously with respect to normal I/O scanning. The inputs are also updated at the end of the logic segment as part of the normal logic solving process.

The 140 HLI 340 00 module is channel-configurable to any of three operating modes:

- MOD interrupt handling mode.
- Automatic latch/unlatch mode.
- High-speed input mode.

Functions

IMOD interrupt mode

In IMOD interrupt mode, a physical real-world interrupt signal will stop the CPU from solving the main application program and active a subroutine called an interrupt handler. Interrupt data coming to the CPU is serviced nearly instantaneously. Handshaking on the local backplane guarantees that the interrupt data will be solved. Each input can be configured to cause an interrupt whenever it is turned on, off or both. Multiple interrupts on the same local backplane are priority-handled in the following manner:

- Two interrupts on two different 140 HLI 340 00 modules in the same backplane generate interrupts simultaneously, the slot position in the backplane determines its priority. An interrupt from the module in slot #3 has priority over an interrupt generated by the module in slot #4 ... 16.
- If two interrupts from the same 140 HLI 340 00 module are generated simultaneously, the number of the inputs generating the interrupts determines their priority. An interrupt generated by input #1 would have priority over all other interrupts.
- If an interrupt occurs while another interrupt handler is being serviced, the CPU will take into account the new interrupt, finish servicing the current interrupt handler, then service the next-priority interrupt.

Latch mode

A latch 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. The inputs cannot generate interrupts in latch mode.

The latching feature is used in applications where the input time pulse is shorter than the CPU's scan time. Data from latch inputs is serviced using the normal I/O update method with no special user programming required.

If a **140 HLI 340 00** module is configured in split mode (where some inputs are latched and others are used for interrupts), any latch input data is read and cleared at the interrupt service time and may not be valid at the end of scan.

In order to latch an input on, the signal pulse must be at least 30 µs long. To latch an input off, the signal pulse width must be at least 130 µs long.

Functions (continued)

High-speed input mode

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

Data from high-speed inputs is serviced via normal I/O updating methods and is updated at the end of a segment of programme. These inputs are often considered auxiliary process inputs to an interrupt operation that requires some combination of interrupts, latches and normal inputs. Response times for high-speed inputs are as fast as 30 µs from off to on and 130 µs from on to off.

Interrupts

Timer-based interrupts

Another major form of interrupt processing available in the Quantum Automation Series can be accomplished by using the CPU's internal clock to generate interrupt signals based on timing (this method of interrupt generation does not require the presence of additional hardware such as the 140 HLI 340 00 module). The interrupt timing is user-programmable.

These timer interrupts can be used when the application program needs to see or update data events at extremely predictable or regular intervals and when the servicing period is faster than the CPU's scan time. Timer interrupts can be programmed down to 1 ms (the resolution of the CPU clock). Be aware, however, that if your interrupt handler is longer than 1 ms and you ask the CPU to generate an interrupt that calls this routine every 1 ms, you will overrun the watchdog timer and stop the controller.

Built-in 984LL and IEC interrupt logic instructions

The Quantum CPU handles both timer interrupts and interrupts generated by the 140 HLI 340 00 module in the same manner—by executing the interrupt handler in the subroutine segment of the 984 ladder logic application or the corresponding IEC logic (Concept 2.6 and later). The logic in the interrupt handler determines what steps need to occur to handle the interrupt. The IMIO (immediate I/O) instruction can be used to read additional inputs or write additional outputs in the interrupt handler. IMIO instructions can read or write real-world I/O information from the local backplane.

For example, if an interrupt has been generated and the interrupt handler logic needs to acquire the current value in a high-speed counter module, the IMIO instruction can be activated to read the position asynchronous to the scan. This information could then be used by the interrupt handler to make a logical decision based on current value. At the end of the interrupt handler routine, the information can be used to update a local backplane output module.

A984LL programme is broken down into sections called segments. Real-world inputs are read just prior to segments being solved, and real-world outputs are written just after the segment is solved. This happens in a parallel process where I/O is updated during the scan of the Quantum CPU. Within a Quantum CPU, there can be up to 32 segments of ladder logic that form the boundaries for logic and define the limits of the programme for logic solving during normal I/O servicing.





ProWORX

Interrupts (continued)

Interrupts allow I/O to be updated within a segment, not at the end of the segment as is normally done. When an interrupt occurs, an ITMR or IMOD instruction provides the CPU with a pointer to a specific subroutine designed to service that interrupt. Subroutines reside in separate segments of ladder logic, and individual subroutines may be called into service multiple times in a single scan or only once over many scans.

To ensure rapid execution of interrupt handler subroutines, certain ladder logic instruction must not be used within them. The following instructions inside an interrupt handler will cause the subroutine to abort:

- MSTR (for reading and writing over a Modbus Plus network.)
- ASCII READ/WRIT strings PCFL (floating point process control library.)
- Equation networks.
- T1.0, T0.1 and T.01 timers.
- User loadables.

Performance

How interrupts impact scan time

For most applications, the impact of interrupt handlers on scan time is minimal even when interrupts are generated multiple times per scan. Interrupt handlers allow critical part of the application to be serviced faster than the overall application. However, be aware that you can overtax the CPU's ability to service 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 duty cycle (the amount of time an interrupt requires for servicing) is critical to analyzing scan time impact.

The amount of time it takes to solve an interrupt handler subroutine can be calculated by adding the instruction execution times for the logic in the subroutine. The overhead for adding an IMOD or ITMR instruction to the CPU is 60 µs/scan; this is the amount of time it takes the CPU to constantly check to see if a timer has been triggered or if a hardware interrupt needs processing time. There is no incremental overhead for adding a second IMOD or ITMR instruction to the CPU.

General performance

Interrupt handler performance is measured from the time the input signal arrives at the input module to the time an output point is commanded to change state. The measurement takes into consideration module latency times, CPU overhead for servicing interrupts, and the size of the interrupt handler.

Characteristics

Model		140 HLI 340 00	
Number of input points			16 isolated
Operating voltages	On	==	15...30 V
	Off	==	- 3 ... + 5 V
Operating currents	On	mA	2.0...8.0
	Off	mA	0...0.5
Absolute maximum input		==	30 V continuous
Response	On-off	µs	30 max
	Off-on	µs	130 max
Input protection		==	30 V reverse polarity
Isolation	Point-to-point	~	500 V rms for 1 min
	Point-to-bus	~	1780 V rms for 1 min
Bus current requirement		mA	400
Power dissipation		W	2.0 + (0.3 x number of points on)
Fusing	Internal		None
	External		User discretion
Backplane support			Local only

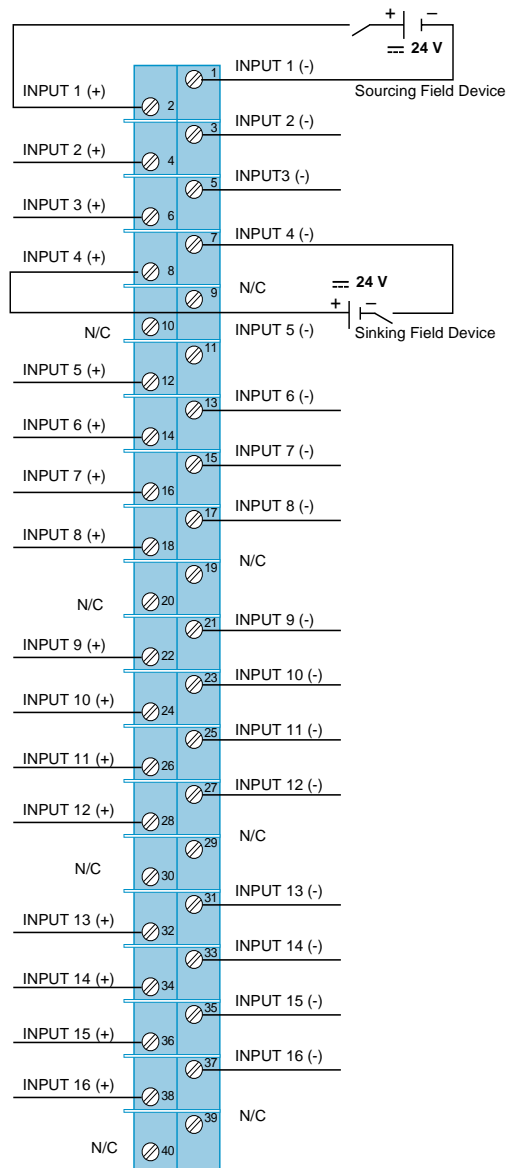
Modicon Quantum automation platform

Latch/interrupt module

References

Description	Nr. of channels	Functions	Reference	Weight kg (lb)
Latch/interrupt module	16 I --- 24 V	Interrupt Latching Fast inputs	140 HLI 340 00	—
140 HLI 340 00 Interrupt module user guide	—	—	840 USE 112 00	—

Latch/interrupt module wiring diagram
140 HLI 340 00



(1) Either shielded or unshielded signal cables may be used (the user should consider using shielded wire in a noisy environment). Shielded types should have a shield tied to earth ground near the signal source end.

Presentation

Both the 140 DCF 077 00 PLC clock synchronization module and the 140 ERT 854 10 multifunction input module are designed for time and date stamped event logging applications.

The 140 DCF 077 00 PLC clock synchronization module provides the application program with accurate time and date stamped information, so that it can be associated with the occurrence of an event. The accuracy of discrimination therefore depends directly on the scan time.

This module is designed for the following areas of application:

- Time and date stamping of events
- Periodic time and date stamping of process values
- Time-based tables

The 140 ERT 854 10 multifunction input module 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.

This module is designed for the following areas of application:

- Status monitoring on discrete inputs
- Time and date stamped event logging
- Counting

Where necessary, the 140 ERT 854 10 multifunction input module offers the PLC application an image of the external clock fitted on this module. This user will be able to use this date/time information for the following areas of application:

- Periodic time and date stamping of process values
- Time-based tables

Operation

For the PLC clock synchronization module or for the 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 GPS or 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, for example, by the 470 GPS 001 00 receiver CPU.

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, for example, via a DCF 77E receiver.

The 140 DCF 077 00 PLC clock synchronization module provides the Quantum automation platform with the following time-based data:

- Milliseconds, minutes, hours
- Day of week, day of month
- Month, year

This module is able to perform the following tasks:

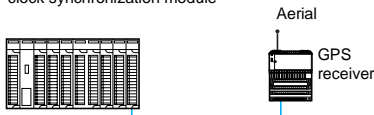
- Time and date stamping of process states and messages in real time
- Periodic time and date stamping of process values, measurements and/or counter values
- Time-based tables: adjustment of actuator commands

The 140 ERT 854 10 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

2

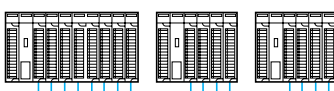
PLC rack with a clock synchronization module



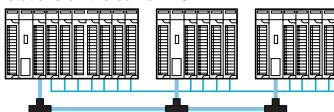
Configuration 1
All ERT 854 10 modules on the same PLC



Configuration 2
ERT 854 10 modules on several PLCs



Configuration 3
ERT 854 10 modules on several RIO stations on the same PLC



Operation (continued)

■ **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 10 multifunction input modules can be installed on the same rack, local or remote.

If the PLC configuration includes a 140 ERT 854 10 multifunction input module, it is not necessary to install a 140 DCF 077 00 PLC clock synchronization module for the application to have accurate date/time information.

Description

Description of the 140 DCF 077 00 PLC clock synchronization module

The 140 DCF 077 00 PLC clock synchronization module front panel comprises:

- 1 Module number and color code
- 2 A display unit consisting of 7 LEDs:
 - **R** (green): module running
 - **Active** (green): communication on the bus
 - **F** (red): fault
 - **DCF 77** (green): reception of date/time information, flashes in time with the input signal
 - **Status** (yellow): lights up once the signal supplied by the time receiver has been synchronized
 - **Error 1** (red): lights up when the signal supplied by the time receiver has not been synchronized for at least 60 minutes
 - **Error 2** (red): lights up when the signal supplied by the time receiver has not been synchronized
- 3 A standard Quantum module casing
- 4 An identification label (slipped inside the module door)
- 5 A flap for accessing the connectors and the terminal block
- 6 A reset button
- 7 A screw terminal block for connecting the external supply voltage, and also the signal provided by the time receiver (connector supplied with the module)
- 8 A module fixing screw

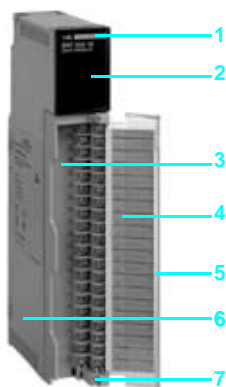
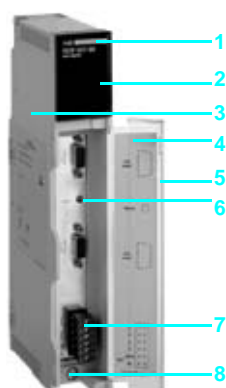
Description of the 140 ERT 854 10 multifunction input module

The 140 ERT 854 10 multifunction input module front panel comprises:

- 1 Module number and color code
- 2 A display unit consisting of 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 (to be ordered separately)
- 4 An identification label (slipped inside the module door)
- 5 An access flap for the connection block
- 6 A standard Quantum module casing
- 7 A module fixing screw

To be ordered separately:

- A screw connection block with 40 terminals **140 XTS 002 00**
- A backup battery holder (optional) for **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 10 multifunction input modules (a module has one Quantum-format slot per rack)



Characteristics of the PLC clock synchronization module

Module type		140 DCF 077 00	
Power supply	DCF receiver link	--- V	24, max. 30 mA
	Internal, via the system bus	--- V	5, max. 300 mA
DCF input	Number		1
	Input voltage	--- V	24
	Insulation		Optocoupler
Processor	Micro-controller		80C32-25
	Clock frequency	MHz	22.1184
Memories	RAM	Kb	256, for data and the program + 2 for the DPM (? ? ?)
	Flash	Kb	128, for the program and the firmware
Connection	Time receiver (DCF or GPS)		1 plug-in connector with 6 screw terminals

Characteristics of the multifunction input module

Module type		140 ERT 854 10	
Power supply	Reference voltage, for each group of inputs	--- V	24...125 (max. 18...256), current consumption per group: max. 3 mA
	Internal, via the system bus	--- V	5, max. 300 mA
	Current consumption for data backup	mA	0.07 max, drawn on the batteries in the 140 XCP 900 00 module
Process inputs	Number		32, divided into 2 groups
	Input supply voltage	--- V	24...125
	Insulation between channels and bus		Yes
	Insulation between groups of channels		Yes (optocoupler)
	Anti-bounce filtering		Configurable from 0 to 255 ms
	Inversion of input states		Configurable
	Maximum cable length	m	400 with unshielded cable, 600 with shielded cable
	Level of switching	Nominal input voltage --- V	24 48 60 125
		Min. current/signal at state "1" mA	6 2.5 2.5 1
	Level 0 (OFF state)		Nominal 0% of the reference input voltage for the group, max. + 15%, min. - 5%
	Level 1 (ON state)		Nominal 100% of the reference input voltage for the group, max. 125%, min. 75%
Clock signal input	Number		1 input, data format complying with standard DCF 77, controlled for example by a DCF 77E receiver, or by a 470 GPS 001 00 receiver
	Input power supply	--- V	24
	Insulation		Optocoupler
	Resolution (time and date stamping)	ms	1
	Current required	mA	5
Connection	Process inputs		By a screw terminal block, 40 terminals (140 XTS 002 00)

Modicon Quantum automation platform

Accurate time stamping

PLC clock synchronization module and multifunction input module



140 DCF 077 00



140 ERT 584 10

References

Description	Functions	Reference	Weight kg
PLC clock synchronization module	Receives a DCF 77 signal Supplies the PLC application program with the current time and date stamped information: milliseconds, minutes, hours, day, date, month, year	140 DCF 077 00	0.450
Multifunction input modules	32 discrete inputs, supplied at between \sim 24 V and 125 V Status logging Counting 500 Hz	140 ERT 854 10	0.450

Separate parts

Description	Functions	Reference	Weight kg
DFC 77 clock signal receiver/generator	Receives, demodulates and amplifies the DCF 77 signal (built-in aerial)	DCF 77E (1)	–
	Receives a GPS satellite signal and converts it to DCF 77 format	470 GPS 001 00 (1)	–
GPS aerial	For 470 GPS 001 00 receiver	470 GPA 001 00 (1)	–
GPS aerial cable (12 m long)	Connection between 470 GPA 001 00 aerial and 470 GPS 001 00 receiver	470 XCA 646 00 (1)	–
Cable for PC (3 m long)	Connection between PC and 470 GPS 001 00 receiver for configuration	470 XCA 323 00 (1)	–
Screw connection block (40 terminals)	Connection of the 140 ERT 854 10 module inputs	140 XTS 002 00	–
Backup battery holder module	For backing up logs operated by 140 ERT 854 10 module(s)	140 XCP 900 00	–

(1) To order this product, contact our partner OHP:

OHP Automatisierungssysteme GmbH

Gutenbergstr. 16
D-63110 Rodgau 1
Germany

Tel: +49 6106 8 49 55 -0

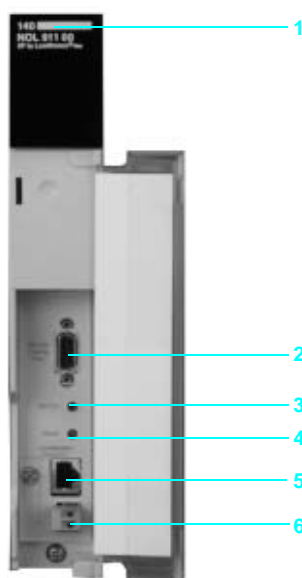
Fax: +49 6106 8 49 55 20

E-mail: info@ohp.de

Web: www.ohp.de



ProWORX



Presentation

Modicon Quantum automation platforms provide support for LonWorks by means of its NOL option module, the 140 NOL 911 10. LonWorks technology is a local operating network developed by Echelon Corporation as an open control architecture that follows the seven-layer collision avoidance OSI model for networking. As an OSI compliant device, communication messaging is very open. It is also non-deterministic by design. As such, LonWorks has been well received within the building automation business, which is compatible with over 2,500 vendors, primarily building automation devices and products. Both Motorola and Toshiba support LonWorks chip technology, which gets embedded within the device.

This network is made up of nodes that can talk to each other on a peer-to-peer network. Within each node there exists all the necessary elements needed to make that node operate and talk:

- a processor called a Neuron
- transceiver
- I/O interface
- communication interface
- complete user program.

Each node manages a small number of local I/O points, and contains the necessary Neuron program to support that device, from I/O management to event processing, message passing, and distributed data objects. The end devices which contain the Neuron chip normally come to the user already programmed with an industry standard program for that device type.

This standard program is called an SNVT or Standard Network Variable Type. Users or OEMs can customize the device's Neuron program by creating a CNVT, or Custom Network Variable Type, using Neuron® C programming language and tools.

The Quantum control system can utilize the LonWorks technology to enable customers to tie the industrial process, controlled by Quantum, to the building automation system. Such tight cooperation between the process and plant allow for tighter overall control and integration of all aspects of the industrial process, now inclusive of the plant itself. The large number of vendors who support the LonWorks technology within their devices ensures simple and cost effective connectivity.

The NOL module supports up to 240 SNVTs, as well as user-defined CNVTs, which are mapped to native Quantum variables providing transparent integration of LonWorks data with the Quantum application program. Multiple modules may be present in the same Quantum controller for highly flexible architecture choices.

Description

The front panel of 140 NOL 911 10 Lon Works communications modules comprises:

- 1 A LED display,
- 2 An RS-232 serial configuration port,
- 3 A service pin,
- 4 A reset button,
- 5 An auxiliary LonWorks communications port (1),
- 6 A primary LonWorks communications port.

(1) Not intended to be connected to any public telecommunications network.

Characteristics

Model			140 NOL 911 10
Temperature range	Operating	°C	0...+ 60
	Storage	°C	- 40...+ 85
Operating humidity range			20...95%, non-condensing at 0...60 °C
Ventilation			Convection only
Shocks			15 gn half sine, 11 millisecond duration
Vibrations			IEC68-2-6, sinusoidal 10Hz to 150Hz (operating) .075mm amplitude, 1.0 gn 10 sweeps
Flammability			PCB material UL-94V0. UL recognized components
Emissions	Radiated		Compliance to EN55011, class A
	Conducted		All systems AC mains tested per EN55011, class A, group 1
ESD Immunity			Compliance to IEC 1000-4-2, 8kV air discharge, 4kV contact discharge, both polarities
Susceptibility	Radiated RF		Compliance to IEC 1000-4-3, 80MHz to 1,000MHz: 10V/m test level, 80% AM @ 1kHz. Also 1.89 GHz PM @ 100 Hz, 50% duty cycle
	Conducted RF		Compliance to IEC 1000-4-6, table 1, test level 3. Use of ferrite clamp preferred.
	Fast transient		Compliance to IEC 1000-4-4, table 1, test level 3. Capacitive clamp preferred for use on communications ports.
	Electrical surge		Compliance to IEC 1000-4-5, table 1, installation class 3.5 surges each line, line-line and line-earth. Use of capacitive test clamp preferred.
Voltage dips, interruptions, and voltage variations			Compliance to IEC 1000-4-11. Voltage deviations to be applied to system AC mains input line.
Input voltage			Module draws power from the Quantum backplane for operation. No external power required.
Power consumption			250 milliamps typical, with 400 milliamps maximum (surge at power up) from the Quantum backplane.

References

Transceiver type	Configuration	Rate	Reference	Weight kg (lb)
TP/XF-78	Linear topology, twisted pair, transformer isolated	78 Kbit/s	140 NOL 911 10	0.900 (2.0)
140 NOL 911 10 User guide			840 USE 109 00	0.900 (2.0)



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 logic-solve 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).
- The high availability of hot standby control.
- A wide variety of choices from our Partners Collaborative Automation.

Upgrading strategies

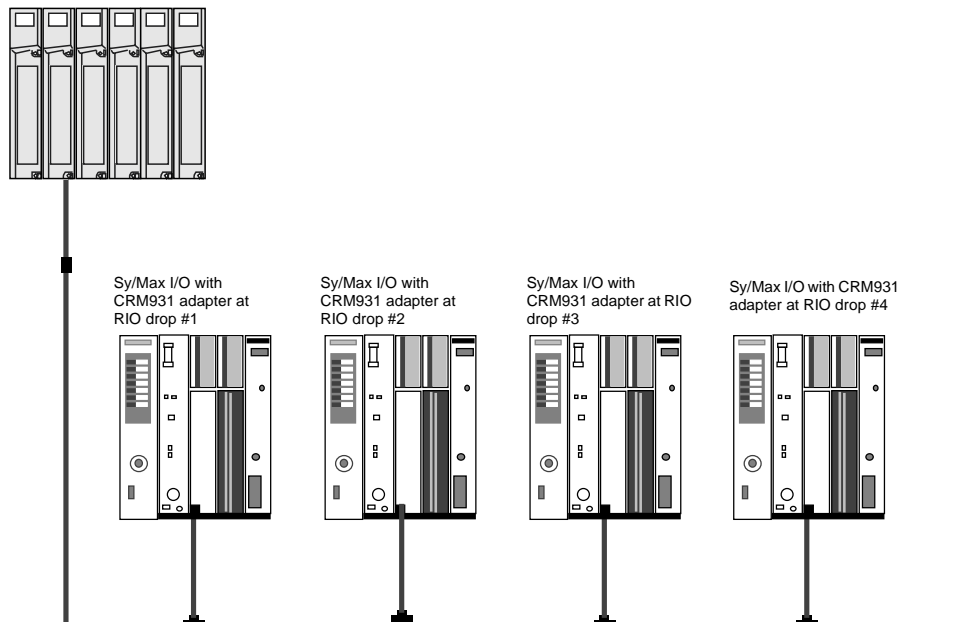
Upgrading Sy/Max processors

Modicon's Ladder Translation Service takes existing Sy/Max application programs and converts them into 984 ladder logic. The translations include comments and rung and ladder header files as well as fully functioning application logic. Contact our regional agency to know the availability of this service.

Upgrading Sy/Max I/O networks

A Class 8030 Type CRM931 remote I/O adapter can be placed in slot #1 of a Sy/Max remote I/O drop. This adapter enables Class 8030 discrete and intelligent I/O in that drop to operate under the control of a Quantum CPU over a Quantum RIO coaxial cable network. The 8030 CRM931 adapter can reside in any Class 8030 Type RRK-100, -200 or -300 register rack or any Class 8030 Type HRK-100, -150, or -200 digital rack.

Quantum head-end with CPU and RIO adapter



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

Each drop has 128 addressable registers (64 in and 64 out).

Presentation (continued)

Upgrading strategies (continued)

Sy/Max communication networks

The NW BM85Y422 Modbus Plus-to-Sy/Max gateway provides a bridge for information exchange between Sy/Max or PowerLogic® systems and a Modbus Plus local area network. Modbus Plus gives the system connectivity to many HMI, motion and 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 pinout to Sy/Max devices. Each RS 422 port supports communications from 300...14.4 Kbaud. DIP (switch settings determine the gateway's mode of operation) configuration mode or protocol conversion mode. Configuration mode allows you to program communication parameters (baud and time-out values, for example) and store them in the gateway's Flash memory. Gateway parameters can be set in any of three ways:

- with an ASCII panel or a PC that has a terminal emulation program on serial port Nr.1.
- with MSTR ladder logic instructions.
- with Sy/Max TREAD or TWRTE instructions via serial ports Nr. 2, 3 or 4.

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

Characteristics

Model			8030CRM931	NW-BM85Y422
Electrical	Current on Sy/Max power supply	mA	750 typical, 900 max	—
	Undervoltage lockout circuit		Halts and resets the module and removes it from the RIO network when d.c. supply falls below approximately 4.6 V	—
	Power		—	~ 115/230 V or ~ 24 V
Ambient temperature	Operational	°C (F)	0...60	0...60
	Storage	°C (F)	- 25...80	- 40...80
	Humidity	%	5...95 noncondensing	0...95 noncondensing
Agency compliance			UL 508, CSA C22-2, FM Class 1 division 2	UL ML file number 532F (industrial control equipment) CSA ML file number LR326 C€

References

Description	Connection type	References	Weight kg (lb)
Quantum RIO adapter module (1)	—	8030CRM931	—
Modbus Plus-to-Sy/Max NIM gateway	—	NW-BM85Y422	—
Niobrara Modbus Plus-to-Sy/Max NIM brige module	BNC Ethernet 2 RS 485 ports	MEB TCP D (1)	—
Niobrara Modbus Plus-to-Sy/Max NIM brige module	—	MEB TCP T (1)	—

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



Applications

Single-axis Motion module for servomotors. Compatible with Lexium servodrive through an analog interface



Drive interface

Counter inputs: incremental encoder, ± 5 V, (RS 422) 2 channels
Encoder feedback : ± 10 V, 12 bits

Programming Methodology

Using MMDS motion configuration software, with Concept or ProWORX 32 software

Features

Multiplication of counter frequency (x4)
Automatic brake control
Configurable discrete I/O inputs (including one high-speed input)
Configurable discrete/analog I/O outputs

Axis Count

1 real axis
1 remote axis (for master signal)

Special Functions

Master/slave position capture
Synchronization of master/slave axes
Point lock

Model

140 MSB 101 00

Page

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Multi-axis Motion control modules for servomotors. Compatible with Lexium servodrive via SERCOS link



Via SERCOS link

Library of Motion Function Block under Concept software

The development of all other special function is possible with the assistance of our application services

Electronic gearing

Multi-axis interpolation

Cam profiles execution from Register Table

With MMF Start programmer's kit

- 8 real axes
- 4 imaginary axes
- 4 remote axes
- 4 coordinate sets (with linear interpolation of 8 axes maximum)
- 4 follower sets
- Cam profiles

The evolution, up to

- 16 real axes

- 22 axes/axis sets

is possible with the Motion Open C kit requiring the assistance of our Application Department

With MMF Start programmer's kit

- 8 real axes
- 4 imaginary axes
- 4 remote axes
- 4 coordinate sets (with linear interpolation of 8 axes maximum)
- 4 follower sets
- Cam profiles

The evolution, up to

- 22 real axes

- 32 axes/axis sets

is possible with the Motion Open C kit requiring the assistance of our Application Department

Point lock position and point lock time

Measure part

Count probe

Fast index

Registration move

Rotary knife

141 MMS 425 01

141 MMS 535 02

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Modicon Quantum automation platform

Lexium motion control Presentation

Analog setpoint or digital link mode

Stand alone mode with integral position indexer

The axis control offer is intended for machines which simultaneously require high performance servo motion control, associated with PLC sequential control.

Position control system

Modicon Premium and Modicon Quantum automation platforms offer a range of interfaces including axis control modules providing a position control function. These modules are:

- Analog output modules:
 - TSX CAY, multi-axis control (2 to 4 axes) for Premium,
 - 140 MSB, single-axis control for Quantum
- Modules with SERCOS digital link:
 - TSX CSY, controls up to 16 servodrives for Premium,
 - 141 MMS, controls up to 22 servodrives for Quantum.

Lexium MHDA servodrive

Lexium servodrives provide solid state switching, current (or torque), speed and position control.

Three types of servodrive, each available in 7 current ratings (1.5, 3, 6, 10, 20, 40 and 70 A permanent rms), are available:

- ± 10 V analog setpoint, controlled by position control module of PLC.
- Stand alone mode with integral position indexer, controlled by:
 - discrete inputs/outputs (1),
 - CANopen bus,
 - Modbus Plus network, Fipio bus or Profibus DP bus (1).
- SERCOS high speed digital link (1) allows Lexium servodrives to be controlled by PLC position control module.

Lexium brushless motors

Brushless motors are synchronous, 3-phase motors. They are equipped with a built-in sensor which can be a resolver or a SinCos Hiperface absolute encoder. They are provided with or without holding brake. Two ranges of motors are available:

SER motors

They are equipped with Neodymium Iron Borium (NdFeB) magnets and provide a high power density within a confined space, as well as large velocity dynamic that meet all machine requirements. They have:

- IP 41 or IP 56 protection.
- With or without gearbox. These gearboxes are offered with three speed reduction ratios 3:1, 5:1 and 8:1.
- Smooth shaft end (2) (for the model without gearbox) or with key (for the model with gearbox).

BPH motors

Their design, with samarium cobalt permanent magnets, ensures perfect rotation even at low speed. Depending on the model, they have:

- IP 65 or IP 67 protection (IP 54 for BPH 055 motor).
- Keyed or smooth shaft ends.

Configuration and installation

Motion control applications are designed and installed using:

- PL7 Junior/Pro (for Premium PLCs) software.
- Concept (for Quantum PLCs) software.
- Unity Pro (for Premium or Quantum PLCs) software.

Unilink user software, in association with Lexium servodrives, provides configuration and adjustment of the parameters for these servodrives.

(1) Requires use of an optional card (one slot available per MHDA servodrive).

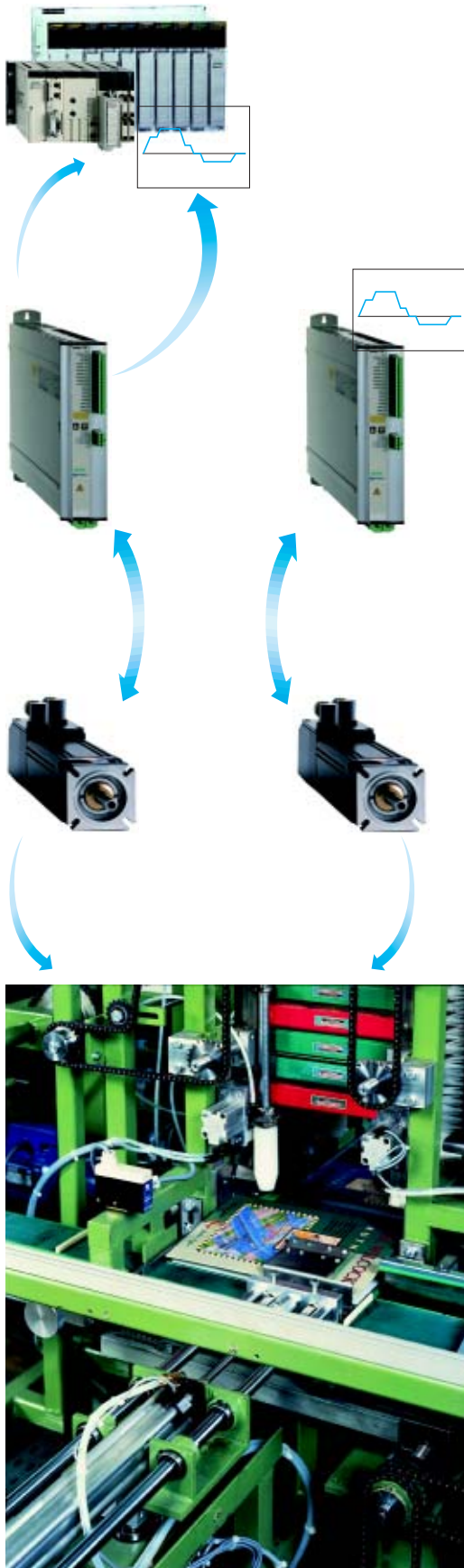
(2) Shaft end with key for the model without a gearbox, please contact our Regional Sales Office.

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YoWORX



Modicon Quantum automation platform

Lexium motion control

Association of brushless motors and Lexium servodrives

SER brushless motors (IP 41 or IP 56)		Digital Lexium MHDA servodrives							Lexium BPH brushless motors (IP 65 or IP 67)	
						 				
		MHDA 1004●00 1.5 A rms	MHDA 1008●00 3 A rms	MHDA 1017●00 6 A rms	MHDA 1028●00 10 A rms	MHDA 1056●00 20 A rms	MHDA 1112A00 40 A rms	MHDA 1198A00 70 A rms		
		0.4/1.1 Nm							8,000 rpm	BPH 0552 S
		0.9/1.9 Nm	1.3/3.4 Nm						6,000 rpm	BPH 0751 N
SER 39A 4L7S	6,000 rpm	1.1/2.5 Nm	1.1/4 Nm							
SER 39B 4L3S	6,000 rpm		2.2/4.4 Nm	2.2/8.0 Nm						
		1.3/2.5 Nm	2.3/4.8 Nm						6,000 rpm	BPH 0752 N
SER 39C 4L3S	6,000 rpm		2.9/4.7 Nm	2.9/9.4 Nm						
			3.7/7.2 Nm	4.3/13.4 Nm					6,000 rpm	BPH 0952 N
SER 3BA 4L3S	6,000 rpm			4.6/9.2 Nm	4.6/15.3 Nm					
SER 3BA 4L5S	6,000 rpm		4.6/8.2 Nm	4.6/15 Nm						
				6.0/13.4 Nm	6.0/20.3 Nm				6,000 rpm	BPH 0953 N
SER 3BB 4L3S	6,000 rpm			6.6/12 Nm	6.6/20 Nm					
SER 3BB 4L5S	6,000 rpm			6.6/15.8 Nm	6.6/25 Nm					
				7.4/13.6 Nm	7.4/19.3 Nm				6,000 rpm	BPH 1152 N
				6.8/13.5 Nm	10.5/19 Nm				6,000 rpm	BPH 1153 N
SER 3BC 4L5S	6,000 rpm			10/17 Nm	10/28 Nm					
SER 3BC 4L7S	3,000 rpm		10/16 Nm	10/32 Nm						
					11.4/18 Nm	12/30 Nm			4,000 rpm	BPH 1422 N
SER 3BD 4L5D	6,000 rpm				13.4/29 Nm					
SER 3BD 4L7S	3,000 rpm			13.4/24 Nm	13.4/38 Nm					
					14.5/24 Nm	17/42 Nm			4,000 rpm	BPH 1423 N
						25/37.5 Nm			4,000 rpm	BPH 1902 N
						36/57 Nm			4,000 rpm	BPH 1903 K
						46/76.2 Nm			4,000 rpm	BPH 1904 K
							75/157 Nm		4,000 rpm	BPH 1907 K
							90/163 Nm	100/230 Nm	4,000 rpm	BPH 190A K

1.1/2.5 Nm For a SER motor, the 1st value corresponds to continuous stall torque max., the 2nd value corresponds to peak stall torque max.

1.3/3.4 Nm For a SER/Lexium BPH motor, the 1st value corresponds to continuous stall torque max., the 2nd value corresponds to peak stall torque max.

Example: The **SER 3BB 4L3S** motor associated with the **MHDA1017** servodrive meets the requirements of applications requiring a 6.6 Nm continuous stall torque max, 12 Nm peak stall torque max. and 6,000 rpm mechanical speed.

Modicon Quantum automation platform

140 MSB 101 00 single-axis motion module for servomotors

Presentation

The 140 MSB 101 00 single-axis motion module is designed for applications with one axis requiring a strong integration with the sequential program of the machine. The analog output of this module can drive the speed reference of the Lexium MHDA servodrive, or any other servodrive with an analog interface. See characteristics on page 4/39.

The module, using encoder feedback input, receives a signal from an incremental encoder which represents the position of the machine axis. After calculation, this information, depending on the movement driven by the application program, delivers a speed reference of ± 10 V to the servodrive.

The 140 MSB 101 00 module is designed as follows:

- 8 digital inputs of 24 VDC, configurable in stops or in motion-specific functions. The inputs not used in the axis control application can be used as standard inputs for the application program.
- 3 outputs of 24 VDC and one ± 10 V analog output, which can be programmed as a real-time image of the internal parameters of the axis under control.

These inputs and outputs require an external 24 V power supply. The module includes a ± 10 V analog input.

The incremental encoder's multiplication of impulses is integrated in the 140 MSB 101 00 module, which accepts a second auxiliary encoder feedback signal as an image of the master axis.

The 690 MCB 000 00 breakout box allows connection between the 141 MSB 101 00 motion module and the Lexium MHDA servodrive, to simplify the system cabling.

Description

The 140 MSB 101 00 is comprised of:

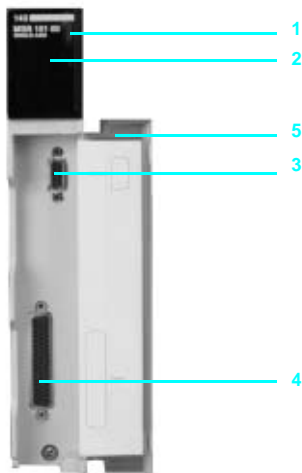
- 1 A rugged outer rugged shell ensures the following:
 - PCB card support.
 - closing and locking of module into position.
- 2 Module diagnostic LEDs, including a digital Modbus status indicator.
- 3 A SUB-D 9 connector for RS 232 Modbus link.
- 4 A SUB-D 50 port for connection to the servodrive.
- 5 A clear access door to hold the user label.

4

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YoWORX



Operating characteristics

Axe	Type		Automatic control of linear, rotary, or continuous axes Synchronization of master/slave speed and position
	Number		1 real axis, 1 remote axis
	Positioning range	Maximum	4 294 967 296 points (32 bits)
		Units	inches, mm or other units
	Speed	Range	1...4 294 967 296 points (32 bits)
		Units	counts/s, inches/s, mm/s, rpm...
	Update	Position loop	ms 1
Controls		Speed loop	ms 0.5
	Motion		Homing, absolute, relative, or continuous movement 28 traversing programs 650 flash memory commands
	Environnement		Encoder interface, position captures (stops)
Register words	Motion		Logical stops, loop position control, point window
			3 input words and 4 output words

Electrical characteristics

Encoder feedback (2 channels)	Incremental encoder	Type		Differential
		Voltage	V	5 ± 20 %
		Impedance	W	> 500 at 5 V nominal
		Frequency x 1	kHz	200 nominal, 500 maximum
		Frequency x 4	kHz	2000 maximum (internal counting)
		Maximum system accuracy		0.5 arc/minute, encoder-dependent
Servo interface	Analogue outputs	Type		Bipolar
		Range	V	+ 10,24
		Resolution		11 bits + sign
	Drive-enable output	Voltage	V	24 nominal, 30 maximum
		Current	mA	500 (resistive maximum under 30 V)
	Drive-fault input			True high, 5 V TTL-compatible
I/O	Discrete inputs	Number		7
		Voltage	V	24 + 20 %
	Discrete outputs	Number		3
		Voltage	V	24 + 20 %
		Current	mA	150 maximum
	Analog inputs	Voltage	V	± 10.24
		Resolution		9 bits + sign
		Impedance	kΩ	30
	Analog outputs	Voltage	V	± 10.24
		Maximum current	mA	3
		Resolution		11 bits + sign
	High-speed input	Position capture time	ms	250
		Pulse width	ms	25
		Time between two captures	ms	20 minimum
	OT inputs			Dry contact
Communication ports	Serial ports	Type		RS 232 D
		Protocol		Modbus slave
		Baud rate	Bits/s	300...9600, software selectable
Power requirements	From the backplane			V 5 V - 1000 mA
	External (power process)			V 24 V + 20 % at - 500 mA max (for auxiliary I/O)

Modicon Quantum automation platform

140 MSB 101 00 single-axis motion module for servomotors

References

All types of Quantum CPUs support the 140 MSB 101 00 single-axis motion module. The module performs the same regardless of rack selected (primary, RI/O, or DI/O).

Designation	For	Encoder inputs	Functions	Reference	Weight kg
Motion module for one controlled axis	Servodrive via analog reference	2 encoder inputs --- 5 V, 500 kHz	Closed-loop control of linear, rotary and continuous axes. Synchronization of master-slave axes.	140 MSB 101 00	0.450

Connection accessories					
Designation	Use	No. (1)	Reference	Weight kg	
Breakout box (2)	Connection between the 141 MSB 101 00 module and the servodrive: speed reference, auxiliary I/O, and simulated encoder feedback	3	690 MCB 000 00	—	

Connector cables					
Designation	Use	No. (1)	Length	Reference	Weight kg
Supplied cables	Connection between the 140 MSB 101 00 module and the 690 MCB 000 00 breakout box. Cable comes with SUB-D 50 connectors on each end.	4	0,3 m (1 ft)	690 MCI 000 01	—
			0,9 m (3 ft)	690 MCI 000 03	—
			1,8 m (6 ft)	690 MCI 000 06	—
	Connection between the breakout box 690 MCB 000 00 and Lexium MHDA servodrive (simulated encoder feedback). Cable comes with SUB-D 9 connector on one end	5	6 m (20 ft)	690 MCI 002 06	—

Configuration software			
Designation	Description	Reference	Weight kg
MMDS configuration and programming software	Configuration and programming software for the 140 MSB 101 00 motion module Use with ProWORX 32 or Concept	SW MMDS 1DB	0.525

(1) See page 4/41 for key.
(2) For **CE** conformity, you must order the breakout box field wiring kit (690 MCB 101 00).

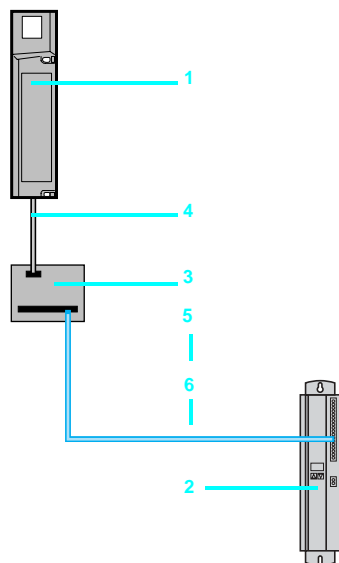


140 MSB 101 00



Modicon Quantum automation platform

140 MSB 101 00 single-axis motion module for servomotors



Connections

- 1 140 MSB 101 00: single-axis motion module 140 MSB 101 00.
- 2 MHDA 1●●●N00/A00: Lexium servodrive for Lexium SER or BPH motor.
- 3 690 MCB 000 00: breakout box (speed reference, auxiliary I/O, and simulated encoder feedback).
- 4 690 MCI 000 0●: breakout box cable (0● indicates cable length).
- 5 690 MCI 002 06: cable with connector for simulated encoder feedback.
- 6 Cable (not included; flying lead cable with connections to terminal strips on each end).



Modicon Quantum automation platform

SERCOS 141 MMS motion control modules

Presentation

SERCOS MMS motion control modules are used to build a distributed automation solution, tightly integrating axis command applications with control applications, based on Quantum PLCs. The motion control modules and Quantum CPUs communicate either through the Quantum backplane or via the Modbus Plus network. The data transfer is transparent, and does not need any additional application program.

The physical interface between the motion control module and speed servodrives is provided by the SERCOS network, using fiber optic cable. This optic link is entirely digital, and provides communication parameters for the tuning, diagnostics and operation of both motion control modules and servodrives.

SERCOS offer

The SERCOS offer, based on the Quantum platform contains:

- Two multi-axis modules, 141 MMS 425 01/535 02, that can drive up to 8 real axes ⁽¹⁾, each one connected to a Lexium servodrive using the SERCOS ring network.

All these modules perform the trajectory calculation, synchronization or interpolation of several axes.

- Lexium MHDA (with optional SERCOS card) servodrives with a SERCOS digital link from 1.5 A to 70 A. These drives manage the position, speed and torque loops, and convert the power that drives the motor. Feedback from the motor sensors or external encoders (such as usual position and actual speed) are sent to the servodrive.

- SER/Lexium BPH brushless motors. These devices are equipped with magnets which deliver a high power-to-weight ratio, resulting in a wide range of speed within low overall dimensions.

The Lexium range includes all necessary accessories (filter chokes, braking resistors, etc.) and connection elements.

Quantum motion modules

The 141 MMS SERCOS motion modules are double-width Quantum modules. They provide high-performance motion control functions, while being integrated with the Quantum PLC and via a real-time multi-task system.

In addition to communicating with the Quantum CPU via the internal bus, each 141 MMS module has a Modbus Plus communications port. The availability of program libraries simplifies configuration of the motion controls for high-performance applications requiring highly dynamic and high-precision position tracking algorithms.

SERCOS motion control built into Quantum PLCs

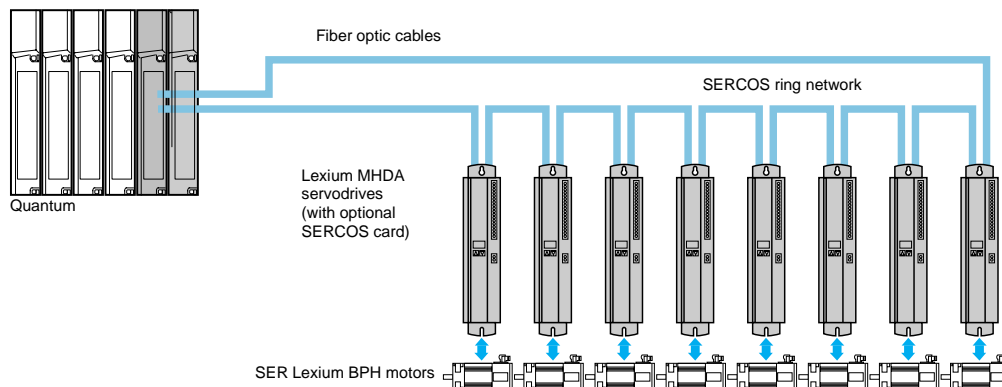
This integration is used to fulfill motion control applications requiring a large number and great diversity of inputs and outputs. The solution makes it possible to share a single database between the Quantum CPU and the SERCOS motion control module. The SERCOS ring network corresponds to a widely developed standard used in closed-loop position and speed applications. It complies with the European standard EN 61491.

The SERCOS solution, compared to analog interface solutions, offers the following benefits:

- Efficient diagnostics, supplied in the motion control modules and the Quantum CPU, can send feedback to the upper levels of the control hierarchy for action. This minimizes machine downtime.
- The distributed architecture significantly reduces cabling costs and simplifies the installation.
- The SERCOS digital network eliminates the low-resolution analog interface (12 or 14-bits) between the servodrive and the motion control module.
- Fiber optic connections increase immunity from electromagnetic interference found in harsh industrial environments.
- It is easy to expand the number of axes in one machine using the ring network.

(1) The use of the Motion Open C kit (requiring the assistance of our applications team) enables you to extend the capacities of these modules: 141 MMS 425 01, up to 16 real axes and 141 MMS 535 02, up to 22 real axes.

SERCOS architecture



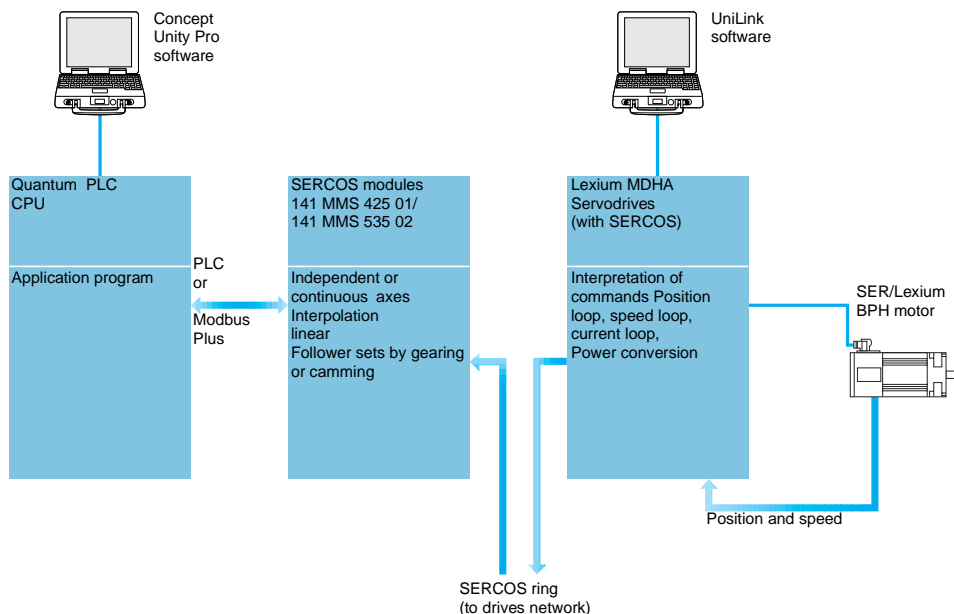
SERCOS (SERial Communication System) is a communication standard defining the digital link (medium and exchange protocol) between the motion control module and intelligent servodrives. It is defined by European standard EN 61491.

The use of SERCOS distributed architecture enables the connection of input/output devices (position encoder, Emergency stop, etc.) directly with the intelligent servodrives, thereby reducing connection costs.

The fiber optic digital medium enables high-speed exchange (2 or 4 M bauds), yet provides a high level of noise immunity in high-interference industrial environments.

System overview

The system overview presents the various functions performed by the different parts of the multi-axis control system.



System overview (continued)

Concept or Unity Pro software (via the Modbus Plus communications port) enable you to:

- Register the SERCOS 141 MMS module(s) in the Quantum module configuration table.
- Configure functions and parameterize used axes.
- Program activities in the PLC application.
- Adjust parameters through operating codes (parameters for 141 MMS module, and Lexium MHDA servodrives) (1).
- Test and update the application.

The UniLink software via the PC port of the Lexium MHDA servodrive allows you to:

- Define the Lexium MHDA drive and SER/Lexium BPH motor types.
- Adjust the Lexium MHDA drive parameters, save them into the drive's EEPROM memory and store them on a PC.

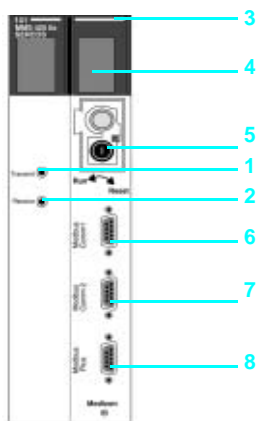
Description

The 141 MMS ●●5 0● double-width SERCOS axis modules are equipped with:

- 1 A SMA-type connector, marked Tx, for connecting the servodrives using the SERCOS ring fiber optic transmission cable.
- 2 A SMA-type connector, marked Rx, for connecting the servodrives using the SERCOS ring fiber optic reception cable.
- 3 Hard outer casing, performing the following functions:
 - Electronic card support.
 - Attachment and locking of the module in its slot.
- 4 Module diagnostics indicator lamps:
 - READY: when lit, indicates the module as successfully passed power-up tests.
 - RUN lamp:
 - Steady, indicates the motion controller is in run mode, the SERCOS ring is complete, and the motion controller is accepting commands from the PLC to control the servodrives.
 - Blinking, indicates that the motion controller is attempting to go into run mode, but the SERCOS ring has not been established due to a physical disconnection or an incorrect address setting.
 - Off, indicates the motion controller is stopped.
 - MODBUS PLUS: normal Modbus Plus indicator codes.
- 5 A RUN/ RESET keyswitch.
- 6 COM 1 port with SUB-D 9 connectors - for Schneider Electric use only.
- 7 COM 2 port with SUB-D 9 connectors - for Schneider Electric use only.
- 8 Modbus Plus port with SUB-D 9 connectors.

(1) Lexium MHDA servodrive equipped with AM0 SER 001V000 SERCOS option card.

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1.3



YoWORX

Functional characteristics of modules 141 MMS 425 01/535 02

Type of module		141 MMS 425 01		141 MMS 535 02	
Software kit		396 MMC 500 04	With the assistance of our application services (1)	396 MMC 500 04	With the assistance of our application services (1)
Number of axes		–	22 max	–	32 max
Type of axes	Actual axes (connected to Lexium drives)	8	16	8	22
	Imaginary axes	4	Up to 22 axes/sets of axes	4	Up to 32 axes/sets of axes
	Remote axes	4, for interpretation of remote position by encoder	Up to 22 axes/sets of axes	4, for interpretation of remote position by encoder	Up to 32 axes/sets of axes
Set of axes	Coordinates	4 allowed in each group for the linear interpolation of up to 8 axes (max.)	Up to 22 axes/sets of axes	4 allowed in each group for the linear interpolation of up to 8 axes (max.)	Up to 32 axes/sets of axes
	Followers	4 groups up to 8 axes maximum	Up to 22 axes/sets of axes	4 groups up to 8 axes maximum	Up to 32 axes/sets of axes
Cam profile		8 profiles which can be changed from PLC registers	Any number up to the memory limitation of 64 K points on all cam profiles	8 profiles which can be changed from PLC registers	Any number up to the memory limitation of 64 K points on all cam profiles

Main functions

Programming	Movements	Homing, absolute, relative, or continuous Immediate movement, or queued, toward a given position Speed override possible
	Special functions	<ul style="list-style-type: none"> ■ Point lock position and point lock time: synchronizes a Slave axis with a Slave position target and a Master position target using parameters ■ Measure part: measures the distance between two edges on a discrete input on the drive. This can be applied to a real or auxiliary axis (position measurement via external encoder) ■ Count probe (2): counts the edges on a discrete input on the drive within a period of time ■ Fast index (2): starts a movement on an event. ■ Registration move (2): position reading on the edge of a discrete input on the drive ■ Rotary knife: cuts using a rotary knife. Synchronizes a circular axis on a linear axis and controls a discrete output on the drive
	Other special functions	The development of all other special functions is possible with the use of a Motion Open C kit requiring the assistance of our application services (1).
	Stop/start functions	Rapid stop, stop following configured deceleration profile Temporary stop Restart of stopped movement
Configuration/adjustment	SERCOS ring	Bus cycle time, traffic on the bus, optical power on the fiber, SERCOS loop diagnostics
	Acceleration/deceleration	Ramp values, ramp type (rectangular, triangular, and trapezoidal), unit choices, maximum acceleration adjustment
	Speed	Speed units, default speed, maximum speed, speed modulation coefficient
	Other setting	Target window, rollover, software limits
	Groups of Slave axes	Tracking of master axis by ratio or by cam (cam profile), threshold position of tracking master, value of the Bias during synchronization of an axis, monitoring of Master/Slave positions, master offset for a slave axis
	Groups of coordinate axes	Linear interpolation
	Cam profile	Values of a point existing from a cam profile, number of points (5,000 maximum), type of interpolation, table addresses
	State of an activity or axis	Movement in acceleration, in deceleration, in homing, servodrive fault...
	Diagnostics	Drive fault, tracking error, overvoltage, undervoltage, current overload, power supply fault

(1) Please consult our Regional Sales Offices.

(2) Special functions require version 1.2 of the MMFStart 396 MMC 500 04 multi-axis programming kit.

Electrical characteristics of modules 141 MMS 425 01/535 02

Type of module			141 MMS 425 01	141 MMS 535 02
Processor		MHz	66	133
PLC registers			10 000	60 000
Memory	Application	Mb	2	4
	Static RAM	Mb	2	4
	Dynamic RAM	Mb	8	8
SERCOS network	Nature		Industrial support complying with standard EN 61491	
	Topology		Ring	
	Medium		Fiber optic cable	
	Baud rate	M bauds	4	
	Cycle time	ms	2 to 4, configurable	
	Number of segments		9 max	23 max
	Length of segment	m	38 max with plastic fiber optic cable 150 max with glass fiber optic cable (230 µm)	
Communication ports	Serial links	Number	2 RS 232 D	
		Protocol	Modbus slave	
		Data rate	300...9600	
	Network interface		1 Modbus Plus	
Consumption		mA	2000 at --- 5 V	2500 at --- 5 V



Modicon Quantum automation platform

SERCOS 141 MMS motion control modules

References

Any of the Quantum PLC processors can be used with the SERCOS 141 MMS motion modules. To obtain optimum performances, the cycle time of the Quantum processor should not exceed 10 ms. The maximum number of 141 MMS modules in a configuration depends on the processor type:

Type of processors	140 CPU 113 02	140 CPU 113 03	140 CPU 434 12A	140 CPU 534 14A
Maximum number of MMS, NOE or NOM modules	2	2	6	6

Description	Functions	Number of axes with: 396 MMC 500 04 Programmer's kit	Motion Open C kit (1)	Reference	Weight kg
Multi-axis control modules	SERCOS digital servodrive control	8 real axes 4 imaginary axes 8 sets of axes	16 real axes 22 axes/sets of axes	141 MMS 425 01	0.520
		8 real axes 8 imaginary axes 8 sets of axes	22 real axes 32 axes/sets of axes	141 MMS 535 02	0.520

Connection accessories

Description	Connection	Length	Reference	Weight kg
Plastic fiber optic cables fitted with SMA-type connectors (curvature radius: 25 mm minimum)	Lexium MHDA 1●●●N00, MHDA 1●●●A00 servodrive	0.3 m (1 ft)	990 MCO 000 01	0.050
		0.9 m (3 ft)	990 MCO 000 03	0.180
		1.5 m (5 ft)	990 MCO 000 05	0.260
		4.5 m (15 ft)	990 MCO 000 15	0.770
		16.5 m (55 ft)	990 MCO 000 55	2.830
		22.5 m (75 ft)	990 MCO 000 75	4.070
		37.5 m (125 ft)	990 MCO 001 25	5.940

Set of plastic fiber optic connections

Description	Composition	Reference	Weight kg
Set of fiber optic cables and SMA-type connectors (2)	12 SMA-type connectors 12 insulating sleeves Plastic fiber optic cable, length 30 m	990 MCO KIT 01	—
Equipment for installation of fiber optic cables	Tools for making up cables to required length from a 990 MCO KIT 01 kit Includes stripping tool, crimping pliers, 25 W/110 V cutting tool, and instructions for use	990 MCO KIT 00	—

(1) The Motion Open C kit requires the assistance of our applications services. Consult our Regional Sales Offices.

(2) Connectors to be used exclusively for connecting SERCOS motion control modules in the same electrical cabinet.



141 MMS 425 01



141 MMS 535 02

References (continued)

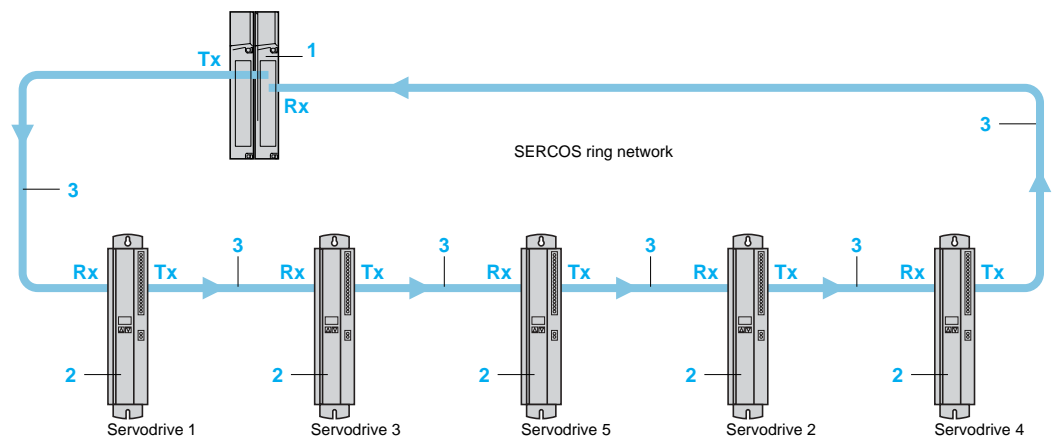
Concept programming and configuration software

Description	Type of user license	Reference	Weight kg
Concept packages Concept XL version 2.6	Single-user license	372 SPU 474 01 V26	–
	3-user license	372 SPU 474 11 V26	–
	10-user license	372 SPU 474 21 V26	–
	Network license	372 SPU 474 31 V26	–

SERCOS multi-axis motion control software

Designation	Description	Reference	Weight kg
Multi-Axis MMF start programmer's kit	Concept library and MMF Start Shared data base creation Backup and restoration functions for maintenance personnel. Configuration software.	396 MMC 500 04	–

Connections



- 1 141 MMS 425 01/535 02: Quantum multi-axis control module.
 - 2 MHDA 1●●●N00/A00: Lexium drives (equipped with the optional SERCOS card AM0 SER 001V000) for SER/Lexium BPH motor.
 - 3 990 MCO 000●●●: plastic fiber optic cables fitted with SMA-type connectors.
- Tx Transmission.
Rx Reception.

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 critical process applications, in terms of their control/command system.

At the center 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 processor, specially designed for Hot Standby architectures with Unity Pro software. This processor is a double-slot module that combines the Central Processor Unit function with that of the redundant coprocessor in the same enclosure.

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 fiber optic link (100 Mbps) integrated in the CPU.

This fiber optic link (62.5/125 multimode) can be extended to 2 km without any additional special 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 they have changed over, 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 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

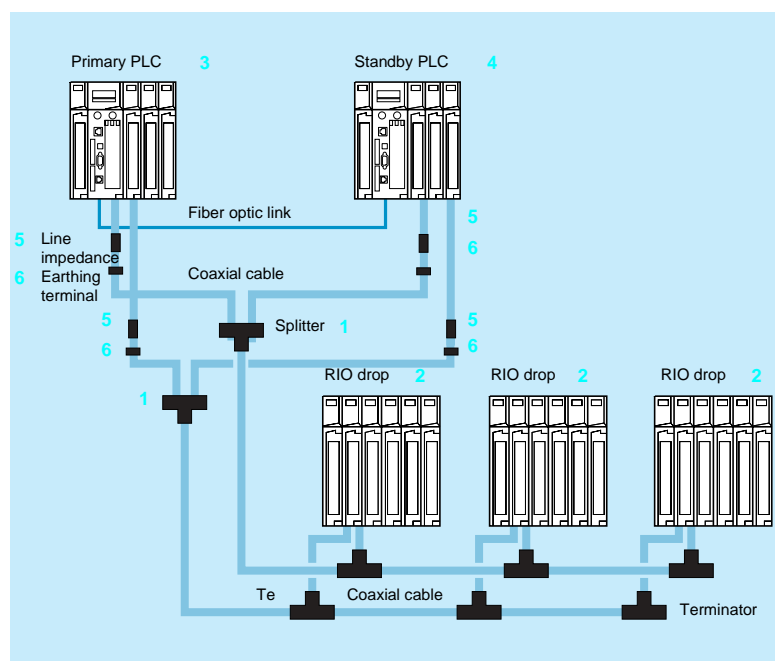
Architecture

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.

These I/O drops, consisting of Quantum modules, are recognized and configured from the Unity Pro software programming environment. They benefit from scanning which is in synchrony with the scan time. A splitter box **1** (MA 0186 100) is used to exchange the RIO drop **2** I/O with the "Primary" **3** and "Standby" **4** PLCs. The line impedances **5** (990 XCA 656 09) can be used to maintain a suitable line when it is necessary to disconnect one of the I/O CPUs. The optional earthing terminals **6** (60 0545 000) 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 a (dual) optical ring, using optical transceivers.



4

4.4

Modicon Quantum automation platform

Hot Standby system
Unity Pro

Architecture (continued)

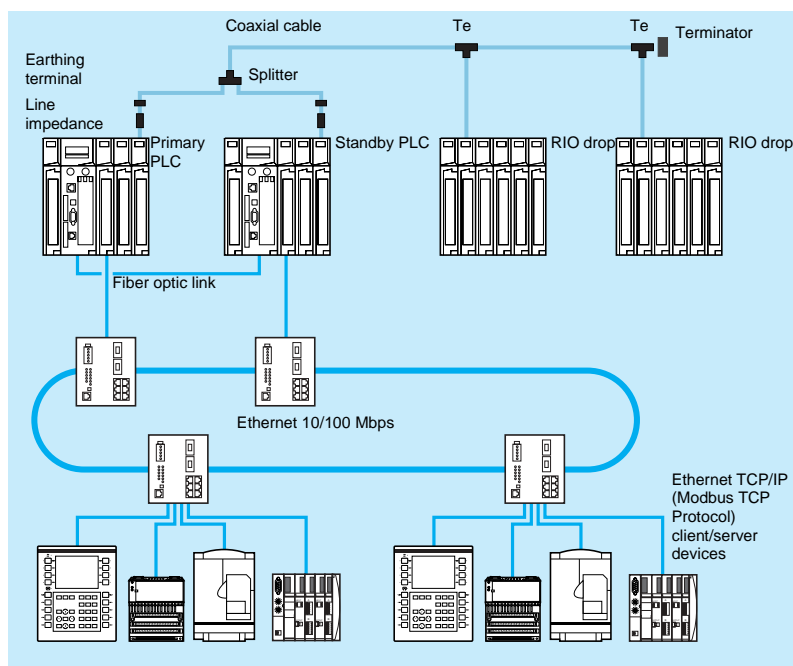
Non time-critical processes: mixed architecture

For processes where times are less critical, from the point of view of the delay in controlling the I/O, it is possible to adopt a mixed architecture, combining both distribution of RIO type I/O (Remote I/O) on at least one drop and distribution of devices on Ethernet TCP/IP.

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

With regard to client-server type exchanges, between the PLC module and devices communicating in Modbus TCP protocol, the I/O Scanning mechanism is ideal. This can be used to define up to 128 periodic read or write exchanges via the configuration, on tables of word type variables, on these target devices. This I/O Scanning mechanism is a function available as standard with Quantum 140 NOE 771 01 and 140 NOE 771 11 Ethernet modules. This function also works in a Quantum Hot Standby architecture with Unity Pro.

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 fiber optic, as appropriate.



Functions

■ Application program memory space

All the memory space reserved for the application program can be managed by the Hot Standby system with Unity Pro. With an embedded RAM memory of 768 Kb, the RAM memory for the 140 CPU 671 60 processor, dedicated to Hot Standby applications, can be increased to 7.168 Mb by the addition of a PCMCIA format memory card.

■ Configuration

Installation of the application program does not differ fundamentally from installing a simple PLC program. It essentially uses the information provided by a dedicated dialog box, entered at the configuration stage.

■ Mini-terminal on front panel

The 140 CPU 671 60 processor, like any Quantum CPU, comes in the form of a dual-slot module, and offers a mini-terminal at the top of the front panel. Equipped with an LCD screen and browse buttons, it has a special sub-menu for the standby system. It can be used for example to check the status of the PLC machine, to force it into connected or disconnected mode, with regard to the standby system.

■ 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 dialog 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 this redundant system is given by a Status Register, which is also carried by a system word.

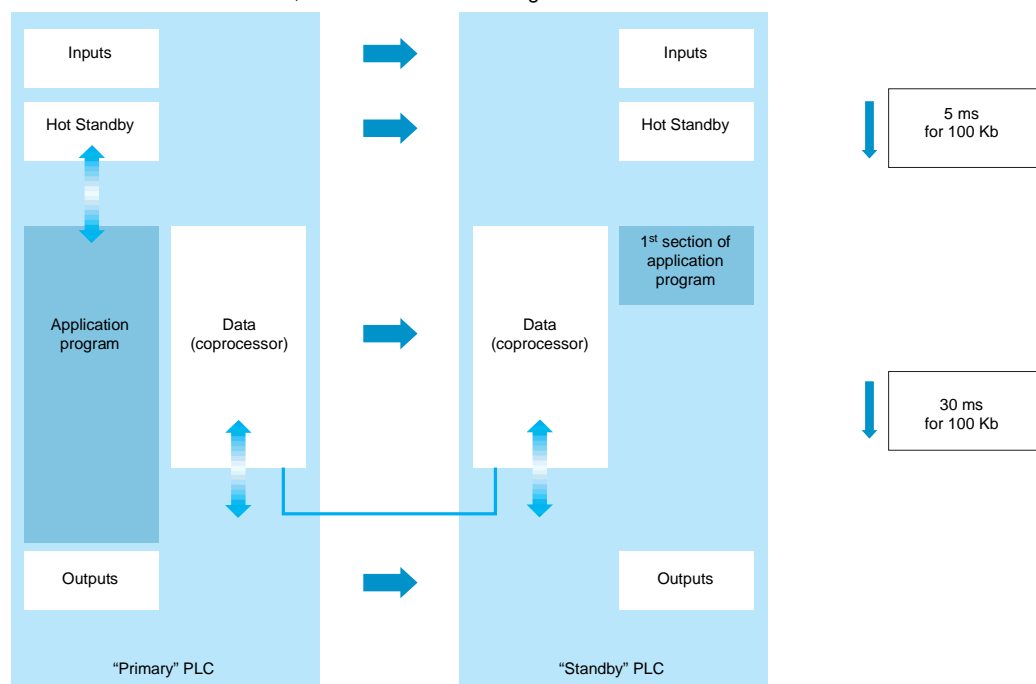
■ Function blocks

Standard function blocks are made available in the Unity Pro programming environment, making it possible to operate in read/write mode on the Command Register and in read mode on the Status Register, by identifying individually 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 fiber optic link, at the same time as the content of the tables that are images of the input and output states. 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, not less than 512 Kb can be transferred.

The principle of exchanges, as well as exchange times according to the volume of data, are described in the diagram below:



Functions (continued)

■ Monitoring of program discrepancies

The majority of redundant PLC applications expect identical application programs on both CPUs. To this end, a comparison is made of the resident user program on both PLCs. It takes place immediately on power-up, and is repeated constantly while the redundancy system remains connected. By default, the "Standby" PLC will disconnect itself from the redundancy system as soon as a difference in program is detected. In order to maximize control/command system availability, including during interventions on the user program, it is however possible, via the configurator dialog box or via the command register, to authorize the continued connection of the redundancy system with applications whose program code and/or database are different.

■ Ensuring consistency of the content of the PLC memories

On powering up the secondary PLC rack, consistency of the content of the PLC memory in relation to that of the primary PLC rack is ensured automatically (Plug and Play) in some cases. Specially when this secondary PLC is empty, or even when it contains a different configuration. At the end of the transfer, the redundancy system is connected, the primary PLC then takes the "Primary" role and the secondary the "Standby" role.

The user can upgrade the Standby PLC via the mini-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 a programming terminal. This function is also available via a Command Register bit.

■ Upgrading operating systems

A Command Register bit, accessed from the configuration dialog box of the Hot Standby system, is used for sequential upgrading of the operating systems of both PLC machines, while maintaining control of the process by the application program.

■ Automatic exchange of communication port addresses

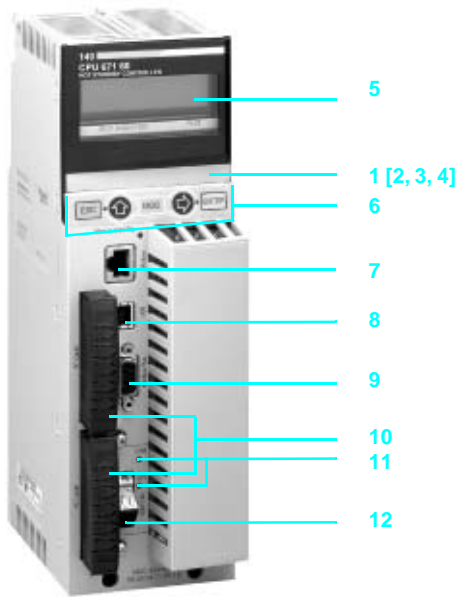
When the redundancy system changes over, the respective addresses of the equivalent communication ports are exchanged automatically on the "Primary" and "Standby" PLCs. This exchange of addresses is unconditional for Ethernet and Modbus Plus ports. It occurs conditionally for the local Modbus port on the 140 CPU 671 60 processor. This function (automatic exchange of the communication port addresses) greatly simplifies the task of the developer on supervisory control systems (HMI, SCADA, etc). In effect, a data 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 remote I/O or mixed I/O), the Hot Standby system automatically manages the exchange mechanisms between the I/O and the PLC performing the "Primary" function.

Modicon Quantum automation platform

Hot Standby system
Unity Pro



140 CPU 671 60



Description of the 140 CPU 671 60 processor

The 140 CPU 671 60 processor front panel comprises:

- 1 An LCD display cover, providing access to:
- 2 A key switch:
 - ☐ Unlocked: All system menu operations are able to be invoked and all changeable module parameters can be modified by the operator via the LCD and keypad, memory protection is off.
 - ☐ Locked: No system menu operations are able to be invoked and all changeable module parameters are read only, memory protection is on.
- 3 One battery backup slot
- 4 One reset button (Restart)
- 5 An LCD display (2 lines of 16 characters) with adjustable brightness and contrast controls
- 6 A 5-button keypad with 2 LEDs (*ESC*, *ENTER*, *MOD*, \uparrow , \Rightarrow)
- 7 An RJ45 connector for connecting to the Modbus bus
- 8 A type B female USB connector for connecting the programming PC terminal
- 9 One 9-pin female SUB-D connector for connecting to the Modbus Plus network
- 10 Two slots for PCMCIA memory extension 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 One MTRJ fiber optic connector for interconnecting the primary and secondary PLCs in the Hot Standby architecture

Mini operator dialog terminal

The mini operator dialog terminal, located on the front of the 140 CPU 671 60 processor, offers the user direct indication (RUN, STOP, No Conf) of 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 following browse buttons:

- ☐ ESC
- ☐ ENTER
- ☐ MOD
- ☐ \uparrow
- ☐ \Rightarrow

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 redundancy system.

It is possible to display (**State** sub-menu) the connected/disconnected state (with regard to redundancy) of the PLC which the user is working on, and this sub-menu also offers the option of forcing (**Mode** sub-menu) this PLC in connected/disconnected 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 memory in the "Primary" PLC to that of the "Standby" PLC, for updating.

Characteristics

Type of processor			140 CPU 671 60
Dimensions	Number of slots	Primary	2
		Standby	2
Microprocessor			Pentium 266 MHz
Memory backup	Battery	Type	3 V Lithium
		Service	mAh 1200
		Retention	years 10, with 0.5% loss of capacity per year
		Power off charge	μA 14 typical, 420 max.
Calendar clock	Drift		s/day 8.0 to 60°C
Maximum configuration	No. of racks with 2/3/4/6/10/16 slots	Main drop(s)	1 "Primary" rack/1 "Standby" rack
		Remote drops	31 I/O drops x 2 racks (primary rack + extension rack)
Inputs/Outputs	No. of discrete I/O points	Remote I/O drops	64 input words + 64 output words per I/O drop ie. 1024 inputs and 1024 outputs per I/O drop (max.) ie. 31,744 inputs and 31,744 outputs in total (max.)
		Remote I/O drops	64 input words + 64 output words per I/O drop ie. 64 inputs and 64 outputs per I/O drop (max.) ie. 1984 inputs and 1984 outputs (max.)
	Special purpose modules		Intrinsic safety I/O, high-speed counting, ASCII, accurate time stamping
	No. of optional modules		6
Communications	Max. no. of ports	Ethernet, Modbus Plus	1 port integrated in the Quantum CPU (RS 232/485)
		Modbus	4 on remote rack (drop)
		As-Interface	1 port integrated in the Quantum CPU
		Modbus Plus	6 ports max. on additional modules
	Ethernet		1 x 100 Mbps port integrated in the Quantum CPU used exclusively for the Primary/Standby link 6 x 10/100 Mbps ports max. on additional modules
Functions	USB		1 programming port only
	Mini operator dialog terminal		Integrated on the front panel
	Redundancy		Power supplies (option), RIO wiring (option), Modbus Plus (option)
	Process control		Yes
Memory	Hot Standby		Redundant coprocessor integrated in the Quantum CPU Primary/Standby link on integrated 100 Mbps fiber optic port
	Configuration data - max.	Kb	128
	Program	Kb	768 possible extension to 7168 with PCMCIA card (upper slot)
	Unlocated variables + internal data	Kb	512 max.
	Located variables (max.) (RAM State)	Kb	128
	Located internal bits (%Mi)	bits	64 K all I/O combinations
	File storage	Mb	Up to 8 Mb on PCMCIA card (lower slot)
Application structure	Master task (FAST)		1 cyclic/periodic
	Fast task (FAST) (2)		1 periodic (4)
	Auxiliary task (2)		4 (4)
	Software interrupt task (3)		32 (4)
Execution time for one instruction (1)	Boolean		μs 0.0525...0.075
	On words or fixed point arithmetic		μs 0.0450...0.060
	On floating point		μs 0.400...0.500
No. of Kinstructions executed per ms (1)	100% Boolean		Kinst/ms 10.28
	65% Boolean and 35% numerical		Kinst/ms 10.07
System overhead	Master task (FAST)		ms 1
	Fast task (FAST)		ms 0.2

(1) Variable values according to the type of instruction.

(2) It is recommended that only a MAST task is used for Hot Standby applications with Unity Pro. The use of FAST and AUX tasks is not however totally prohibited. Nonetheless, if you wish to do so, an exhaustive detailed analysis of the possible effects of their use should be undertaken.

(3) Resorting to a multi-task organization may involve modifications of the image data tables within a single scan, even during transfer of data from Primary to Standby; as a matter of principle, these modifications take place asynchronously in relation to the PLC scan cycle. For these reasons, it is therefore recommended that only a MAST task is used for Hot Standby applications with Unity Pro.

(4) Use not recommended with the Hot Standby system.

Modicon Quantum automation platform

Hot Standby system

Unity Pro

References

Hot Standby CPU with Unity Pro

Hot Standby CPU		Memory (max.)			Communication ports	Reference	Weight kg
Clock speed	Coprocessor	RAM	Program (with located variables)	Program with PCMCIA card.			
266 MHz	Yes, integrated Ethernet TCP/IP, use reserved for Hot Standby	2 Mb	896 Kb	7168 Kb	1 Modbus (1) 1 Modbus Plus 1 USB 1 Ethernet 100 Mbps port, used as Hot Standby port	140 CPU 671 60	—

Associated modules

Description	Topology	Reference	Weight
RIO central control unit modules	Simple cable	140 CRP 931 00	—
	Redundant cable	140 CRP 932 00	—

Accessories

Description	Use/composition	Length	Reference	Weight
Splitter	Tee for joining sections of coaxial cable coming from 2 central control unit modules (140 CRP 93● 00). Constitutes the start of the RIO I/O backbone.	—	MA 0186 100	—
Line impedance for coaxial cable RG-6/RG-11	Impedance for RIO coaxial cable. Used to maintain a suitable RIO line on disconnection of the cable coming from the central control unit (140 CRP 93● 00). Connection at both ends on female connector.	—	990 XCA 656 09	—
Earthing terminal for coaxial cable RG-6/RG-11	Earthing terminal for RIO coaxial cable. Used to maintain earthing of the RIO line on disconnection of the cable coming from the central control unit (140 CRP 93● 00). Connection at both ends on female connector.	—	60 0545 000	—
Jumpers for fiber optic cable	62.5/125 multimode fiber optic cable, equipped with MT-RJ connectors. Designed to connect the 100 Mbps Ethernet ports of 140 CPU 671 60 processors ("Primary" and "Standby"), in order to make up the data update channel.	3 m	490 NOR 000 03	—
		5 m	490 NOR 000 05	—
		15 m	490 NOR 000 15	—

(1) Modbus RS 232/RS 485 port

Presentation

The Hot Standby option, compatible with Concept and ProWORX software, provides Quantum series CPUs with the high dependability that security-critical applications demand. Central to the system is a standby controller—a second Quantum system configured identically with the primary control system with special hot standby modules mounted in both backplanes. The standby controller uses a high-speed fiber optic link to constantly maintain the current system status of the primary controller. In the event of an unexpected failure in the primary controller, system control automatically switches over to the standby controller. Critical processes running on a remote I/O network remain intact, unaffected by controller hardware failures. The result is higher productivity with reduced down-time.

At the beginning of every primary controller scan, the current register and I/O state table is transferred to the standby controller across a secure, high-speed fiber optic link. If switchover is triggered, the standby controller takes control of the system with up-to-date I/O and register status for a bumpless, controlled transfer with minimal process impact. At switchover, the standby controller becomes the primary controller and, when the downed controller is restored to good health, it becomes the standby.

Most applications demand that identical logic programs reside in the two controllers. User logic comparisons between the two controllers are performed at startup and during runtime. By default, the standby controller is taken offline if a logic mismatch is detected. It is possible to allow logic mismatches to coexist for high availability during maintenance periods. If minor process changes are required. The user can make them without disturbing standby operations.

In the event that the standby controller does not have the application program, it can be copied from the primary controller. Copying the program is a simple two-step procedure that uses the keyswitch and update button on the front of the standby controller. This task can be accomplished by a maintenance person without the use of a programming panel.

For ease of ordering and installation, Schneider offers three preconfigured kits for hot standby applications.

- The 140 CHS 210 00 kit includes all the products necessary to add the hot standby to an existing system.
- The other two kits, 140 CHS 410 10 and 140 CHS 410 20, contain hot standby, backplanes, power supplies, and Quantum controllers.

Description

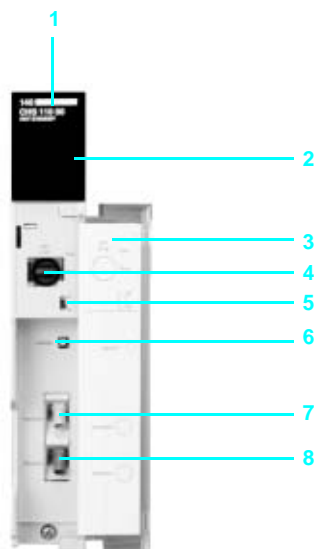
The Hot Standby module 140 CHS 110 00 comprises on the front panel:

- 1 A model number and color code.
- 2 A LED array.
 - Ready (green) - module has completed start-up diagnostic ,blinks to indicate transmission errors.
 - Com Act (green) - communicating with I/O bus, blinks to indicate transmission errors).
 - Primary (green) - module controls the process.
 - Com Err (red) - indicates transmission errors, or connection interrupted.
 - Standby (amber) - module in standby mode; blinks during the update process.
- 3 A removable, hinged door and customer identification label.
- 4 A selector switches.
- 5 A micro switch.
- 6 An update pushbutton.
- 7 A fiber optic transmit cable connector.
- 8 A fiber optic receive cable connector.

4

4.5

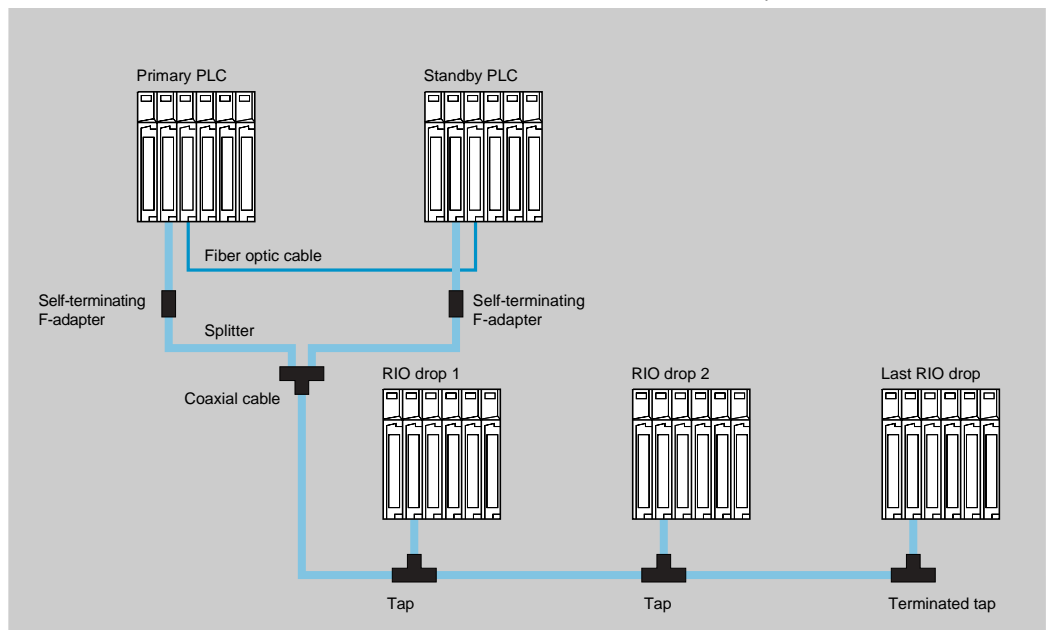
ProWORX



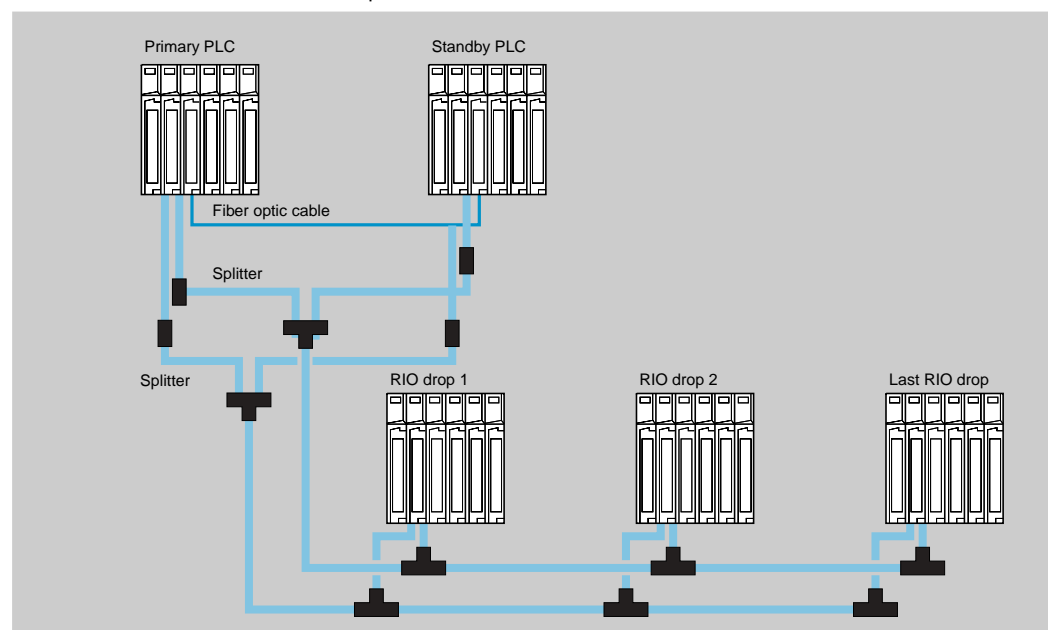
Hot standby cable topologies

A hot standby system controls the I/O drops on a remote I/O (RIO) network. The local backplanes for the primary and standby controllers each require a Quantum CPU, an RIO head-end adapter module and a 140 CHS 110 00 Hot Standby module. Critical I/O should never be used in the local backplane because it will not be switched over when primary control shifts from one controller to the other.

The two 140 CHS 110 00 Hot Standby modules are connected to each other by a special fiber optic cable. This link allows the standby controller to maintain the current system status of the primary controller. The two RIO head-end adapter modules connect to the RIO trunk cable via an MA-0186-100 splitter.



A hot standby system can also support a redundant RIO cable topology. The coaxial cables running from the two cable ports on the 140 CRP 932 00 head-end adapters in the two controllers are connected to the redundant RIO cable by separate MA-0186-100 splitters.



Characteristics		
Model		140 CHS 110 00
Common ports		2 connectors (transmit and receive) for fiber optic link
RFI immunity (per IEC 60801-3)	MHz	27...1000, 10 V/m
Bus current	mA	700 (typical)
Electrostatic discharge (per IEC 60801-2)	kV	8 air, 4 contact
Compatibility	Software	ProWORX NxT V2.0 or Concept Version ≥ 2.0
	Quantum CPUs	All, 984 ladder logic; IEC, 140 CPU 434 12A/534 14A
Input/output type		Quantum, 800 Series, and Sy/Max (remote I/O only)
Fiber optic ports		1 transmit; 1 receipt
Programming software		ProWORX NxT V2.0 or Concept Version ≥ 2.0
Quantum controllers		All, 984 ladder logic; IEC, 140 CPU 434 12A/534 14A
CHS loadable software requirements		Version ≥ 2.0
Loadable function block performance		CHS blocks (included with le kit Hot Standby 140 CHS 210 00)
Switchover time	ms	13 to 48 for hot standby to assume control after primary fault detected
Scan impact communications	ms	3 + 6 per kB of configured state RAM
CHS communications rate	Mbit/s	10
Cables between Quantum systems		3, fiber optic
Current requirements		700

4

4.5



Modicon Quantum automation platform

Hot Standby modules Concept - ProWORX 32

References

Description	Components	Reference	Weight kg (lb)
Hot Standby module	–	140 CHS 110 00	1.06 (2.33)
Hot Standby kit for open configuration	2 CHS Hot Standby modules 1 fiber optic (3m) hot standby cable 1 CHS loadable software package 1 S908 terminator kit CHS installation manual	140 CHS 210 00	–
Hot Standby kit for Quantum CPU 140 113 02	2 140 CPU 113 02 Quantum CPUs, 2 140 CHS 110 00 Hot Standby processors 2 140 CRP 931 01 remote I/O processors 2 140 CPS 111 00 power supplies 2 140 XBP 006 00 backplanes 1 CHS loadable software package 1 fiber optic (3m) hot standby cable 1 S908 terminator kit CHS installation manual	140 CHS 410 10	–
Hot Standby kit for Quantum CPU 113 03	2 140 CPU 113 03 Quantum CPUs, 2 140 CHS 110 00 Hot Standby processors 2 140 CRP 931 01 remote I/O processors 2 140 CPS 111 00 power supplies 2 140 XBP 006 00 backplanes 1 CHS loadable software package 1 fiber optic (3m) hot standby cable 1 S908 terminator kit CHS installation manual	140 CHS 410 20	–
User documentation	Quantum Hot Standby System Planning and Installation Guide	840 USE 106 00	–

Associated modules

Description	Topology	Reference	Weight kg
RIO head-end adapter module	Single cable	140 CRP 931 00	–
	Redundant cable	140 CRP 932 00	–

Accessories

Description	Use/component	Length	Reference	Weight kg
Splitter	Tee for joining sections of coaxial cable coming from 2 central control unit modules (140 CRP 93● 00). Constitutes the start of the RIO I/O backbone.	–	MA 0186 100	–
Line impedance for coaxial cable RG-6/RG-11	Impedance for RIO coaxial cable. Used to maintain a suitable RIO line on disconnection of the cable coming from the central control unit (140 CRP 93● 00). Connection at both ends on female connector.	–	990 XCA 656 09	–
Earthing terminal for coaxial cable RG-6/RG-11	Earthing terminal for RIO coaxial cable. Used to maintain earthing of the RIO line on disconnection of the cable coming from the central control unit (140 CRP 93● 00). Connection at both ends on female connector.	–	60 0545 000	–

Selection guide networks and buses page 5/2

5.1 - Ethernet TCP/IP network - Transparent Ready

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 - FactoryCast Web server page 5/10
 - FactoryCast HMI Web server page 5/12
- Ethernet TCP/IP communication services
 - Presentation page 5/18
 - Standard Ethernet services page 5/19
 - I/O Scanning service page 5/22
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 - Global Data service page 5/24
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 - SMTP electronic mail notification service (Unity Pro) page 5/26
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- Ethernet infrastructure ConneXium wiring system
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5.2 - AS-Interface bus

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5.3 - Network and fieldbus

- Modbus Plus network
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 - Connections page 5/56
 - References page 5/58
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- INTERBUS fieldbus (Concept/ProWORX) page 5/62

5.4 - Serial link

- Asynchronous serial link module page 5/64

Type of network and bus	Ethernet TCP/IP Modbus TCP	Modbus Plus network
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Physical interface	10BASE-T/ 100BASE-TX (copper cable)	10BASE-T/100BASE-TX (copper cable) 100BASE-FX (fiber optic cable)	Single or dual (redundant) copper cable Fiber optic cable
Access method		CSMA-CD	Token ring
Data rate	10/100 Mbps	10/100 Mbps (copper cable), 100 Mbps (fiber optic cable)	1 Mbps
Medium	Shielded twisted pair cables	Shielded twisted pair cables Fiber optic cable	Twisted pair






Functions, main services	<ul style="list-style-type: none"> - Standard Web service - Modbus TCP messaging - I/O Scanning services - Global Data - FDR client - SNMP management - SMTP services (e-mail) 	<ul style="list-style-type: none"> - Standard Web/FactoryCast service depending on model - Modbus TCP messaging - I/O Scanning services - Global Data depending on model - FDR client - SNMP management - SMTP services (e-mail) depending on model 	<ul style="list-style-type: none"> - FactoryCast HMI active Web service - Modbus TCP messaging - SNMP agent 	<ul style="list-style-type: none"> - Reading/writing of variables - Global Data service - Peer Cop service - Distributed I/O (DIO) service
--------------------------	--	--	--	--

Compatibility	CPU	Unity CPUs	All CPUs
	Software	Unity Pro V2.0	Unity Pro V2.0 Concept ProWORX 32

Power consumption	–	1000 mA	1300...3800 mA depending on 140 CPU model 780 mA for 140 NOM
-------------------	---	---------	---

Type of module	140 CPU 651 50/60 1 integrated port	140 NOE 771 ●●	140 NWM 100 00	140 CPU 1 integrated port 140 NOM 2●● 00
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Pages or website	1/9	5/33	1/9, 1/17 and 5/58
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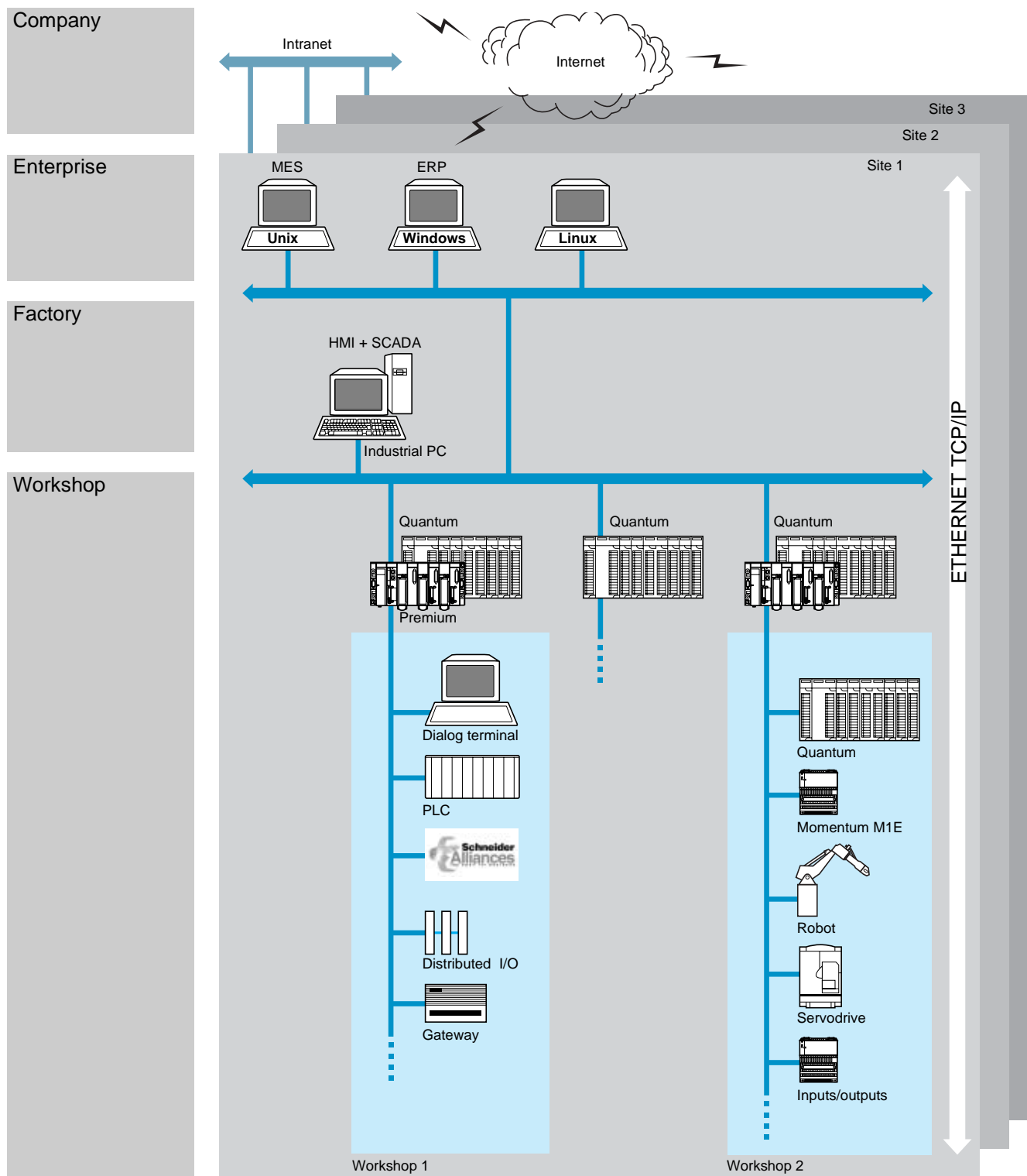
AS-Interface actuator/sensor bus	Modbus SL bus	Profibus DP V0 bus	Profibus DP V1 bus	INTERBUS bus	Asynchronous serial links
					
2-wire unshielded cable	Single copper cable	Single RS 485 cable		Single RS 485 cable (full-duplex)	2 non-isolated RS 232 channels
Master/slave, M2 profile (AS-Interface V1)	Master/slave	Class 1 master		Generation 3 or 4 master depending on model	–
167 Kbps	19.2 Kbps	9.6 Kbps...12 Mbps depending on distance (1200...100 m without repeaters)		500 Kbps	19.2 Kbps
Ribbon cable	Shielded twisted pair cable	Shielded twisted pair or fiber optic cable		Fiber optic shielded twisted pair cable	Shielded cable
<ul style="list-style-type: none"> - Standard addressing with 31 slaves (4I/4Q "discrete") - Local diagnostics (slave devices, channel status, etc.) 	<ul style="list-style-type: none"> - Modbus slave protocol - Reading/writing of PLC variables - Programming - Download - 1 or 2 RS 232/485 ports depending on model - Modbus master protocol - Max. 247 slaves 	<ul style="list-style-type: none"> - Cyclic I/O exchange - Broadcast communication - Multicast communication 	<ul style="list-style-type: none"> - Cyclic exchanges (4096 discrete inputs/4012 discrete outputs) - Acyclic communication for parameter transmission (in parallel with cyclic exchanges) - Management of fallback modes - "Sync and Freeze" modes - Extended diagnostics 	<ul style="list-style-type: none"> - Cyclic I/O exchanges (256 subscriber, 4096 I/O) - Configuration check - PCP V1.5 or V2.0 protocol depending on model - Remote bus technology 	<ul style="list-style-type: none"> - Reading/writing of ASCII sequences, 7 or 8 bits, controlled by PLC application program - Application of message formats to character strings - Integrated command interpreter
All CPUs				All CPUs except 140 CPU 113 02 (2)	All CPUs
Unity Pro V2.0 Concept ProWORX 32	Unity Pro V2.0 Concept ProWORX 32	Concept V2.2 (min.) ProWORX 32 Configuration software: SyCon	Unity Pro V2.0 Concept V2.6 (min.) ProWORX 32 Configuration software: AnyBus NetTool (1)	Generation 3: Concept V2.2 (min.) and ProWORX 32 Configuration software: ULEX Generation 4: Concept V2.5 (min.) Configuration software: SyCon	Unity Pro V2.0 Concept V2.2 (min.) ProWORX 32
250 mA	1300...3800 mA depending on 140 CPU model 780 mA for 140 NOM	800 mA	1000 mA	800 mA	300 mA
140 EIA 921 00	140 CPU 1 or 2 integrated ports 140 NOM 2●● 00	140 CRP 811 00	PTQ DPM MV1 (1)	140 NOA 611 10 (generation 3) 622 00 (generation 4)	140 ESI 062 10
5/47	1/9, 1/17 and 5/58	5/61	www.prosoft-technology.com	5/63	5/65

(1) Products by our partner Prosoft Technology (e-mail: prosoft@prosoft-technology.com).

(2) Generation 4 module, 140 NOA 622 00: Only compatible with 140 CPU 113 03/434 12A/534 14A CPUs.

Modicon Quantum automation platform

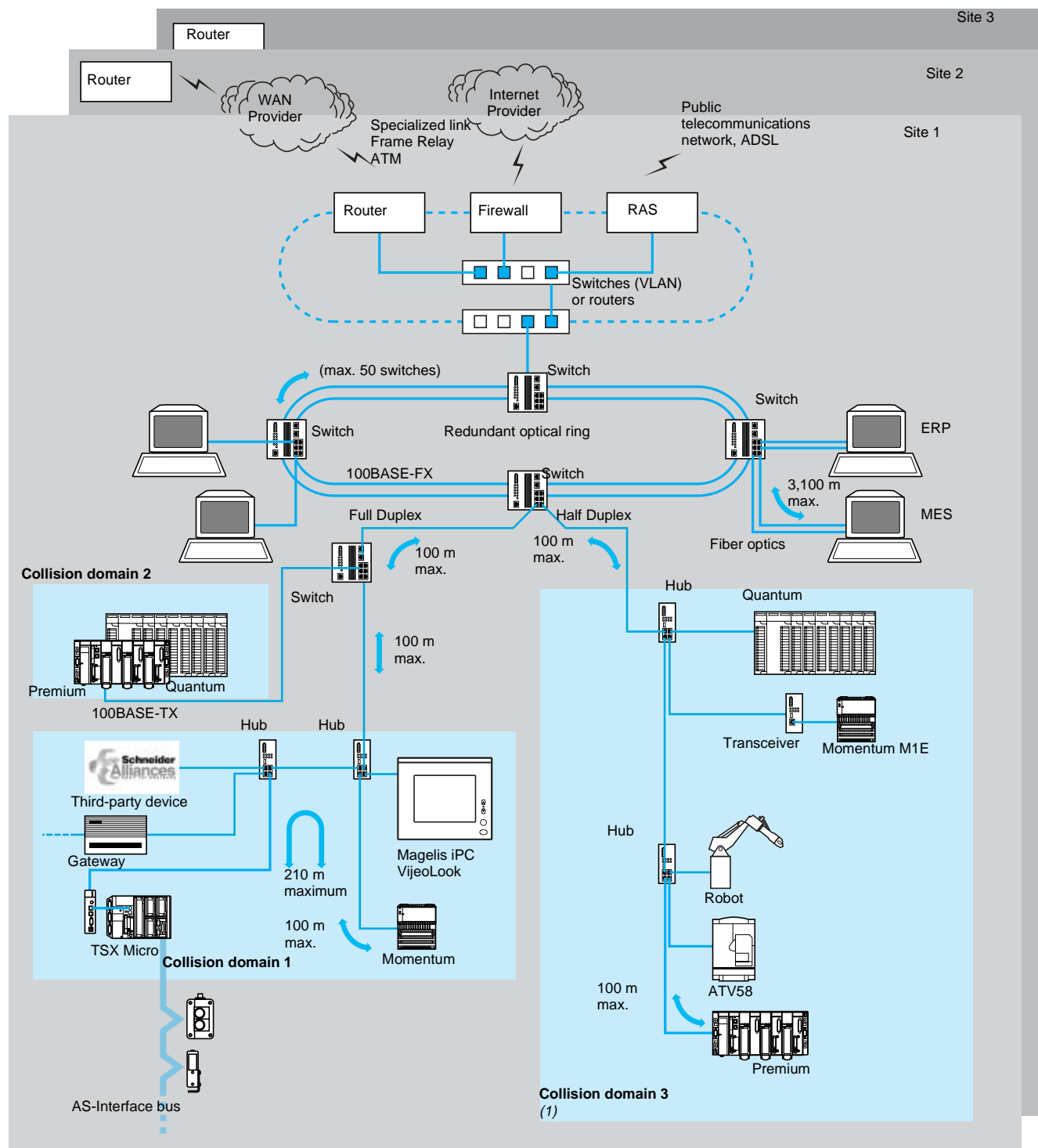
Ethernet TCP/IP network, Transparent Ready
Logical Ethernet communication architecture



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

Modicon Quantum automation platform

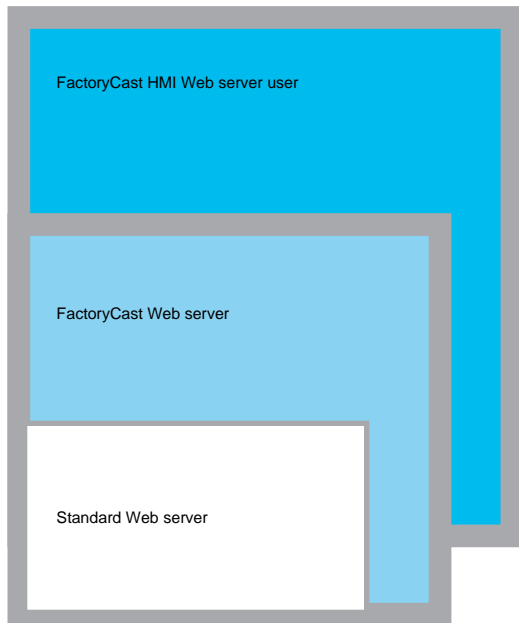
Ethernet TCP/IP network, Transparent Ready
Physical Ethernet communication architecture



(1) In general, several collision domains should be defined in order to increase the architecture surface and improve performance. See pages 5/34 to 5/39.

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Embedded Web servers



Ethernet TCP/IP PLC module services

Presentation

In line with the Transparent Ready approach, TSX Micro, Premium, Quantum, Momentum, Advantys STB distributed I/O and ATV drive automation platforms provide transparent access to data in realtime using Web-based technologies via their Ethernet TCP/IP or FactoryCast communication module.

The Transparent Ready communication modules in automation platforms integrate Ethernet TCP/IP services (Modbus TCP/IP messaging, SNMP network management functions, etc.) and provide the following Web functions:

- Standard Web server
- FactoryCast Web server
- FactoryCast HMI Web service

Standard Web server

Standard Web services can be used to execute diagnostic and maintenance functions on automation system installations locally or remotely using a simple Internet browser:

- PLC system and I/O module diagnostics, PLC error display ("Rack Viewer" pages ready to use)
- Display and adjustment of PLC variables ("Data Editor" pages ready to use)

The embedded Web server is a realtime PLC 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 Internet browser that supports the integrated Java code. The standard functions provided by the Web server are supplied "ready to use" and therefore do not require any programming at either PLC level or at the level of the PC device supporting the Internet browser.

FactoryCast Web server

In addition to providing standard Web services, the FactoryCast Web server can be used to control and monitor automation system installations both locally and remotely. The following functions are available:

- Management of system alarms and PLC application with partial or global acknowledgment ("ready to use" pages for the "Alarm Viewer" function)
- Application graphics diagnostics (customized graphical views created by the user using the "Graphic Data Editor" function)
- Graphics control via animated Web pages created by the user and stored in the FactoryCast module

FactoryCast Web servers can also be used to customize control, diagnostics and maintenance interfaces via user-defined Web pages and Web pages transferred to the module using FactoryCast configuration software (maximum available memory required is 8 Mb).

FactoryCast HMI Web server

In addition to the FactoryCast Web functions, the FactoryCast HMI Web server provides HMI Web functions, which are executed in the module itself:

- Realtime HMI database management, independent of the PLC processor
- Arithmetic and logical calculations based on HMI data
- Connectivity with relational databases
- Transmission of electronic messages (e-mail)

FactoryCast HMI is an active Web server, which can be used to execute HMI functions integrated in a PLC module. This eliminates the need for communication via polling to update the HMI/SCADA database.

In FactoryCast HMI modules, the HMI functions are executed without affecting the PLC application program and therefore the cycle time.



Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Embedded Web servers

Selection of Telemecanique Transparent Ready modules ⁽¹⁾

Products		Reference	Web server integrated		
			Standard Class B20	FactoryCast Class C20/C30	FactoryCast HMI Class D10
Quantum automation platform	Processors	140 CPU 651 50			
		140 CPU 651 60			
	Modules	140 NOE 771 01			
		140 NOE 771 11			
		140 NWM 100 00			
Premium automation platform	Processors	TSX P57 2623 M			
		TSX P57 2823 M			
		TSX P57 3623 M			
		TSX P57 4823 M			
		TSX P57 1634 M			
		TSX P57 2634 M			
		TSX P57 3634 M			
		TSX P57 4634 M			
		TSX P57 5634 M			
	Modules	TSX ETY 4103			
		TSX ETY 110WS			
		TSX ETY 5103			
		TSX WMY 100			
TSX Micro automation platform	Modules	TSX ETZ 410			
		TSX ETZ 510			
Momentum automation platform	M1E processors	171 CCC 960 20			
		171 CCC 960 30			
		171 CCC 980 20			
		171 CCC 980 30			
	Module	170 ENT 110 01			
		170 ENT 110 02			
Advantys STB distributed I/O		STB NIP 2212			
Altivar ATV 38/58 variable speed drive	Card	VW3 A58310			

FactoryCast is a range of PLC modules associated with their configuration software and combines the following features:

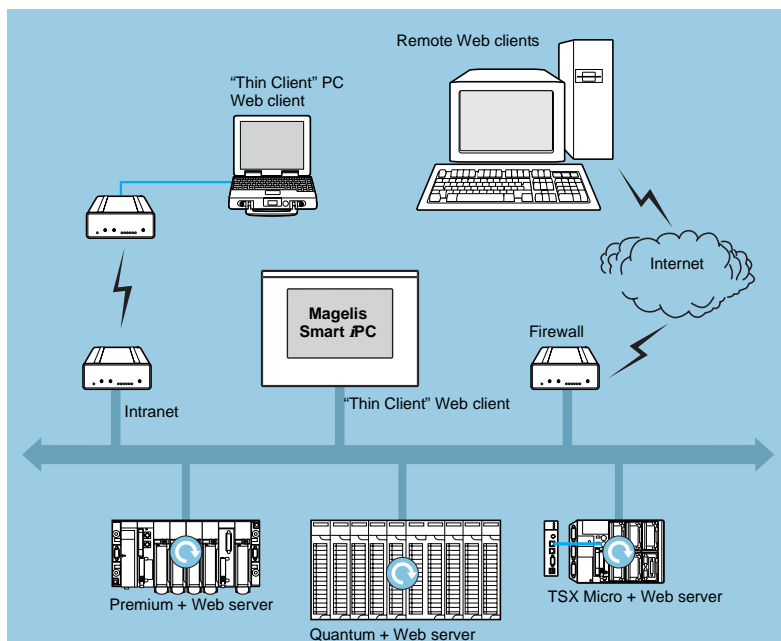
- Realtime communication functions based on Ethernet TCP/IP
- Predefined Web pages, which enable advanced installation diagnostics
- The capacity to store dynamic user-defined Web pages

⁽¹⁾ Electrical Distribution products of Merlin Gerin.

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Embedded Web servers, standard Web services

Standard Web services



“Rack Viewer” and “Data Editor” functions are supported by the Ethernet TCP/IP modules of the following:

- TSX Micro platform
- Premium platform
- Quantum platform
- Momentum platform
- Advantys STB distributed I/Os
- FactoryCast modules

See module reference on page 5/7.

These functions can be accessed using a standard Internet 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.

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Embedded Web servers, standard Web services



Quantum hardware configuration

“Rack Viewer” PLC diagnostics function

The “Rack Viewer” function (PLC rack display) can be used for PLC system and I/O diagnostics. It displays the following in realtime:

- LED status on the front panel of the PLC
- The PLC version
- The hardware configuration of the PLC including the status of the system bits and words
- Detailed diagnostics of all I/O module channels or application-specific channels in the configuration



Premium main rack hardware configuration

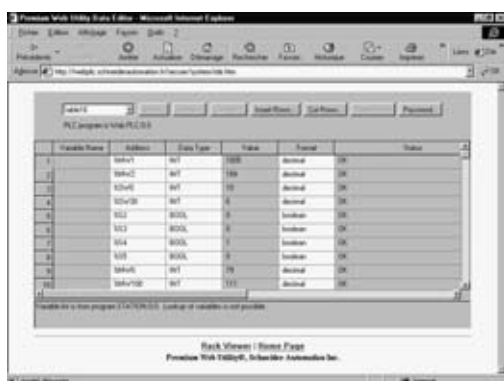
“Data Editor” read/write function for PLC data and variables

The “Data Editor” function can be used to create tables of animated variables for realtime read/write access to lists of PLC data.

The variables to be displayed can be entered and displayed either symbolically (S_Pump 234) or by their address (%MW99).

These variables only support write access if this option has been enabled using the FactoryCast configuration software. A second password must be entered and verified when writing a value to a variable.

Various animation tables containing specific application variables to be monitored or modified can be created by the user and saved in the Ethernet TCP/IP module.

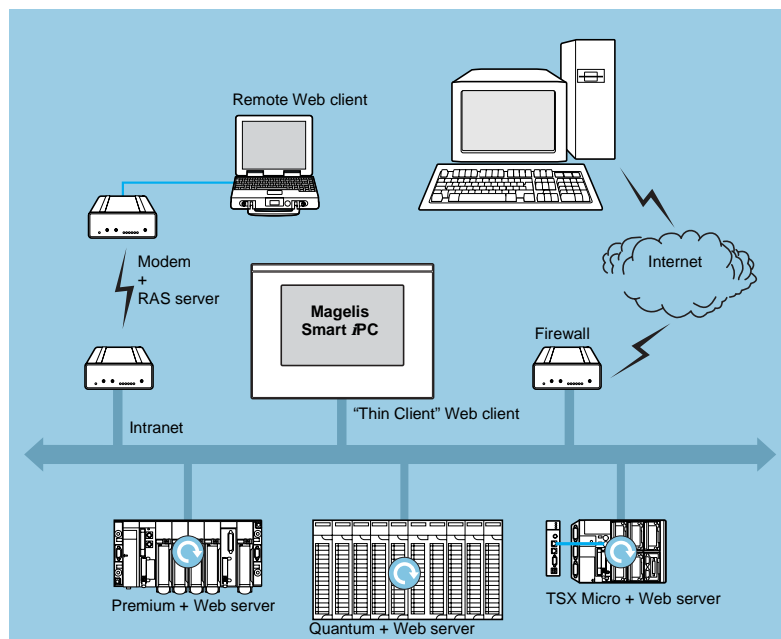


Variables table

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Embedded Web servers, FactoryCast Web server

FactoryCast Web server



In addition to standard Web services, FactoryCast modules (see selection table on page 5/6) support the following functions:

- Alarm Viewer
- Creation and display of graphical views via an online graphics editor (Graphic Data Editor supplied)
- Hosting and display of Web pages created by the user

FactoryCast configuration software (supplied with FactoryCast modules) is required for the last 2 functions.

Alarm Viewer function

“Alarm Viewer” is a ready-to-use password-protected function. Based on the diagnostics buffer managed in the PLCs (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).

This function can be used to process alarms (display, acknowledgment 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).

Alarm Viewer page

The diagnostics viewer is a Web page comprising a list of messages, which displays the following information for each alarm:

- Its state
- The type of associated diagnostic function block (DFB)
- Its geographical area
- The dates and times of the occurrence/removal of a fault.

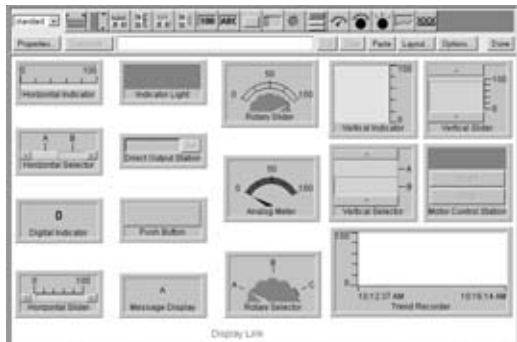


Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Embedded Web servers, FactoryCast Web server

FactoryCast Web server (continued)

Graphic Data Editor function



This function can be used to create graphical views online, animated by PLC variables.

These views are created using a library of graphic objects, which are predefined by simple copy/paste operations. The object parameters are set according to user requirements (color, PLC variables, labels, etc.). The graphic objects provided, which are the basic elements of the view, are as follows:

- Analog and digital indicators
- Horizontal and vertical bar charts
- Boxes for displaying messages and entering values
- Pushbutton boxes
- Functions for recording trends
- etc.

The views created can be saved in the FactoryCast modules.

These customized graphic objects can be reused in user Web pages that have been created using standard software for editing HTML pages.

Function for hosting and displaying user Web pages



In addition, FactoryCast Web modules have 8 Mbytes of memory (1), which is accessed in the same way as a hard drive and can be used to host user-defined Web pages.

These Web pages can be created using any standard tool (2) that enables creation and editing in HTML format. These pages can be enhanced by inserting animated graphic objects linked to PLC variables. These animated objects are provided in the Graphic Data Editor supplied with FactoryCast.

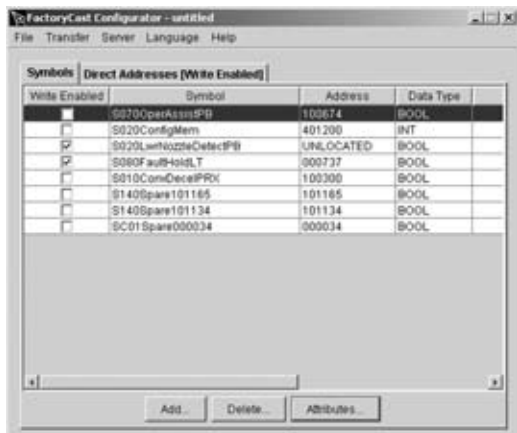
The Web pages created can be used, for example, to:

- Display and modify all PLC variables in realtime
- Create hyperlinks to other external Web servers (documentation, suppliers, etc.)

This function is particularly suitable for creating graphic screens used for the following purposes:

- Display, monitoring, diagnostics
- Generation of realtime production reports
- Maintenance help
- Operator guides

Configuration software for FactoryCast Web servers



The configuration software for FactoryCast Web servers is supplied on CD-ROM with every FactoryCast module (TSX Micro, Premium or Quantum).

The software is used for the configuration and administration of the Web server embedded in these modules. The software is compatible with Windows 95/98, Windows 2000, Windows NT 4.0 and Windows XP operating systems. It offers the following functions:

- Access security management
- Definition of user names and associated passwords for accessing Web pages
- Definition of access to variables authorized for modification
- Saving/restoration of an entire website
- Transfer of Web pages created locally by the user on their PC workstation to the FactoryCast module and vice versa.

(1) Memory is not affected in the event of power outages or if the PLC is reinitialized.

(2) For example, Microsoft FrontPage.

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Embedded Web servers, FactoryCast HMI Web server

FactoryCast HMI Web services

The FactoryCast HMI range comprises two Web server modules embedded in the PLC (one for the Premium platform and one for the Quantum platform) and FactoryCast HMI application development software (to be ordered separately).

These modules have the same Web functions as FactoryCast modules, namely:

- Ethernet TCP/IP communication functions:
 - TCP/IP messaging service with Modbus TCP and Uni-TE TCP protocols
 - SNMP agent for standardized network management, which supports standard MIB II and private Transparent Ready MIB.

- Standard Web and FactoryCast services:

- "Rack Viewer" PLC diagnostics functions, see page 5/7
- "Data Editor" read/write functions for PLC variables, see page 5/7
- "Alarm Viewer" alarm display functions, see page 5/10
- "Graphic Data Editor" online graphical editor functions, see page 5/11
- Function for hosting and displaying user Web pages, see page 5/10

FactoryCast HMI modules also provide the following specialized HMI Web services:

- Realtime database management specific to the module, combining PLC data acquisition and the management of local internal variables.
- Arithmetic and logical calculations for pre-processing data.
- E-mail with automatic transmission triggered by a specific process event.
- Connection to the SQL Server, MySQL and Oracle relational databases for archiving data for tracking or logging.

By simply setting parameters, the FactoryCast HMI application development software can be used to set up these functions in an intuitive and user-friendly way. A simulation mode, which is integrated in the software, can be used to test the operation of the FactoryCast HMI application without a module and without the need for a physical connection to a PLC, thereby simplifying debugging.



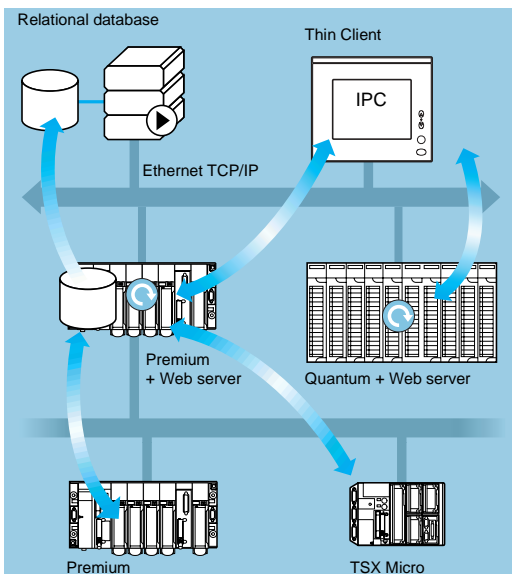
Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Embedded Web servers, FactoryCast HMI Web server

Architectures

FactoryCast HMI Web servers can be integrated in various architectures:

- Installations that require a flexible and cost-effective HMI solution.
- "Hybrid" architectures supplementing conventional SCADA systems.
- Architectures where a direct link is required between automation systems and information management levels (IT link).



Flexible Web 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.

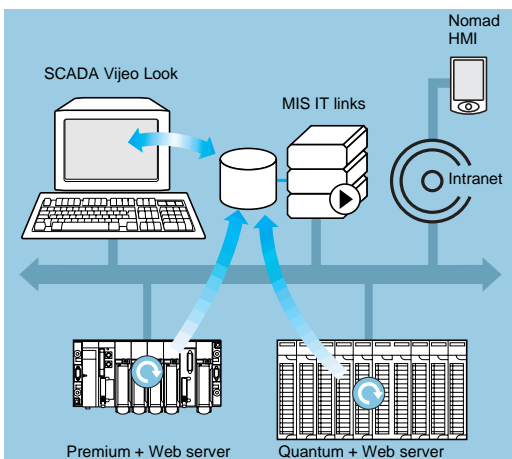
These architectures consist of:

- Several PLCs networked on Ethernet, which have FactoryCast HMI Web server modules.
- One or more PC terminals with "Thin Client" interface equipped with a simple Web browser.
- If necessary, a relational database in which FactoryCast HMI can archive data directly 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).
- 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 of data archiving done from source.



Hybrid architectures

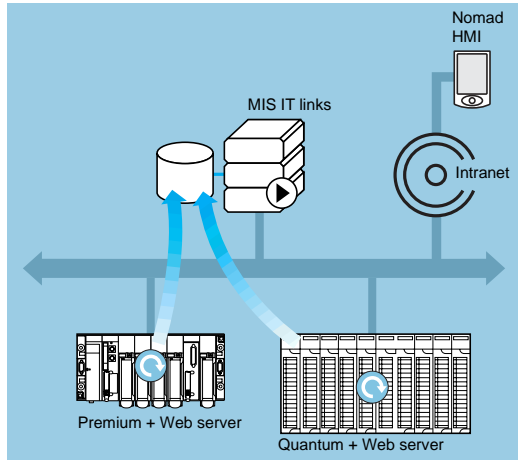
In this type of architecture, FactoryCast HMI supplements conventional SCADA systems. SCADA Vijeo Look or Monitor Pro software meets the requirement for centralizing information for global supervision from a central site.

Combining a FactoryCast HMI solution and a conventional SCADA solution enables:

- Simplification of the SCADA application by locating some of the SCADA processing 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 capacities.
- "Nomadic" stations to be connected to the Intranet or Internet via "Thin Client" PC or PDA devices.

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Embedded Web servers, FactoryCast HMI Web server

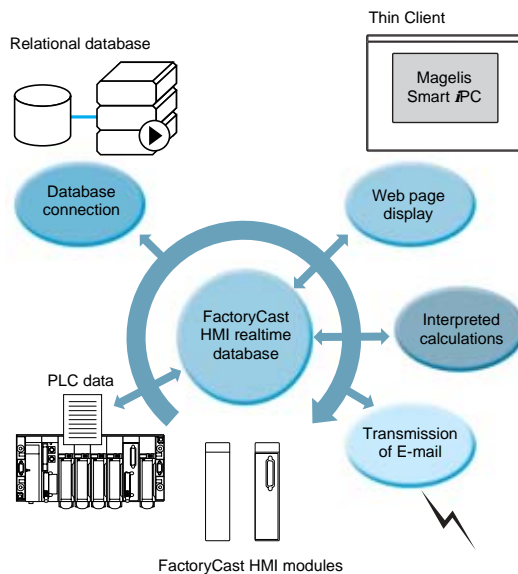


Direct links with the information management levels

In this type of architecture FactoryCast HMI eliminates the need for intermediate devices (gateways), which are expensive to install and maintain, by establishing a direct link between the automation levels and the global information management levels (MES, ERP, etc).
The PLC directly archives information from the automation system in relational databases, which allows a "collaborative" automation system to be set up, making it easier to share data in real time.

This solution results in:

- Simplified architectures
- Lower installation, development and maintenance costs
- Increased reliability of information (the data is collected at source)
- Greater availability of data archiving



Specialized HMI services

PLC acquisition and realtime database

With an internal architecture similar to that of an HMI/SCADA system, FactoryCast HMI modules manage their own variable database in realtime, 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 realtime database are updated using the automation system 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 frequency of acquisition (period at which this variable is updated).

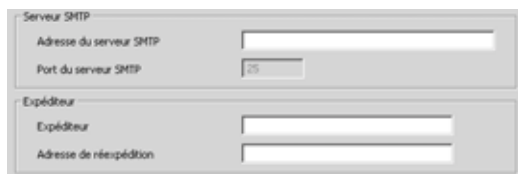
Note: A FactoryCast HMI application running in a Premium configured FactoryCast HMI module can access also the remote PLC variables in the architecture via a transparent network (X-Way/Uni-TE transparent protocols).

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

Specialized HMI services (continued)

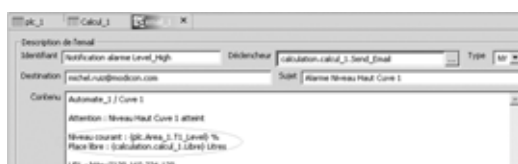
E-mail transmission



The FactoryCast HMI module can, on a specific event, send E-mail 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.

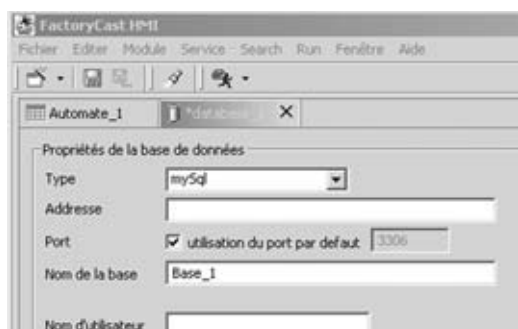


When an E-mail is sent to a destination E-mail address, it must pass through an SMTP (*Simple Mail Transfer Protocol*) server. This server receives the E-mail and waits for the recipient to acknowledge it. The E-mail service is compatible with all SMTP servers. A return address can be defined should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

Characteristics:

- Configuration of the SMTP server: Compatible with all SMTP servers
- Maximum number of E-mail: 100
- Contents of E-mail messages: Free text with embedded dynamic variable values (from the PLC) and hypertext links (unlimited)

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

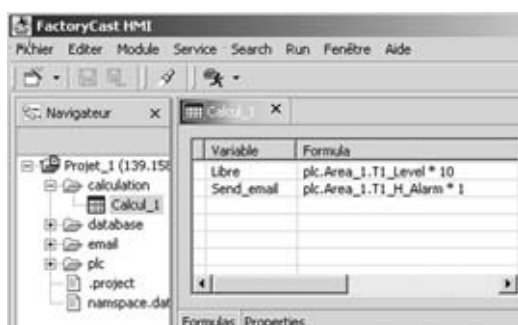
This connection enables all internal or process data to be archived so that it can be logged and traced.

The data can be archived (written) periodically and/or on a specific event. These variables can either be from PLCs (I/O bits, internal bits, internal words and registers) or local to the module. The FactoryCast HMI "Roll Over" function checks 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 automatically creates a table in the database if one does not already exist

Calculation functions



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

This calculation function is provided in the form of spreadsheets where the formulae are defined in cells. The 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.

Modicon Quantum automation platform

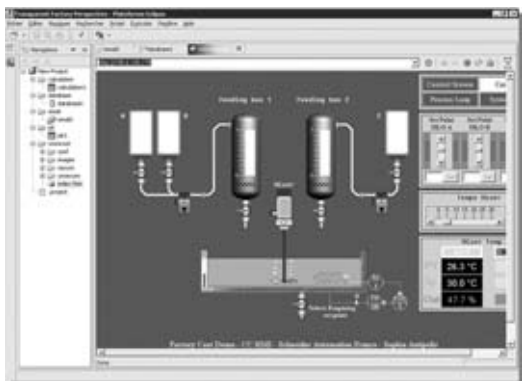
Ethernet TCP/IP network, Transparent Ready
Embedded Web servers, FactoryCast HMI Web server



FactoryCast HMI application development software

FactoryCast HMI application development software, referenced TLX CD FCHMI V1M, provides multiproject management and complete control of FactoryCast HMI applications, during both the development and the debugging phases, thanks to the online mode and simulation mode (operational when the system is offline) options.

This software enables the intuitive and user-friendly setup of HMI functions by simply setting parameters using a tree structure of the application and can be used for complete management of the Web site:



■ Setting parameters for HMI functions:

- Configuration of PLC interfaces: Import symbol databases and set parameters for the acquisition period
- Configuration of spreadsheets
- Configuration of E-mail
- Configuration of connections to databases

■ Management of the Web site:

- Management of the Web site tree structure (creation/deletion of HTML folders and files)
- Management of default Web site pages
- Management of user Web site pages (1)
- Graphic object editor for animating Web pages
- Launch of the system editor for HTML pages (FrontPage or similar)
- Up/downloading/comparison of Web pages in online mode
- Debugging of Web pages in online mode or in simulation mode (including animations and Java beans)

■ Simulation mode

The application and the Web site (including animations and Java beans) can be debugged in either online or simulation mode, which enables operation to be tested without a FactoryCast HMI module and without a physical connection to a PLC, thus simplifying debugging.

An integrated graphics editor in the FactoryCast HMI software can be used to easily customize the following graphic objects: bar charts, gauges, LEDs, curves, cursors, operator input fields, alphanumeric display fields, buttons, etc.

User Web pages are created graphically using an external HTML editor (FrontPage or similar, not supplied).

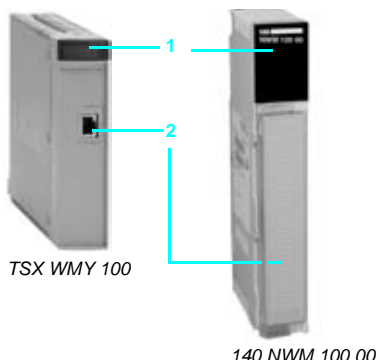
FactoryCast HMI includes a plug-in for FrontPage 2000. This plug-in makes it easier to set up animations, which enable PLC variables to be accessed in realtime in the HTML pages created by the user. They are created in the HTML editor by simply inserting customized graphic objects (FactoryCast Java beans).

(1) Creation of user Web pages: User Web pages created in the FactoryCast HMI environment are actual animated supervision screens and can be used to monitor your process. Based on HMI Web technology, they enable realtime access to PLC variables thanks to the FactoryCast graphic objects library (FactoryCast Java beans).

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Embedded Web servers, FactoryCast HMI Web server

Description



The TSX WMY 100 (for Premium platform) and 140 NWM 100 00 (for Quantum platform) modules are equipped with the following on the front panel:

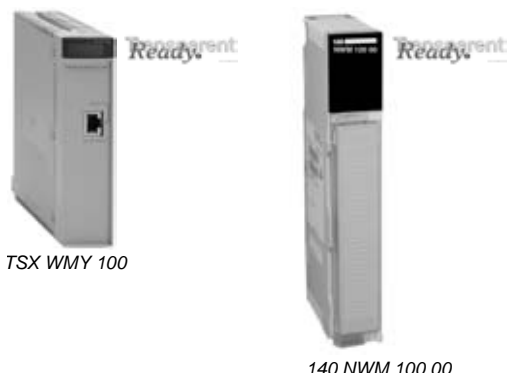
- 1 A display block, which indicates the module status and the transmission status of the Ethernet TCP/IP network.
- 2 An RJ45 connector (with Premium/Quantum) and an MTRJ connector for a 100BASE-FX interface (with Quantum).

To be ordered separately: Accessories and connecting cables, see Ethernet ConneXium wiring system (see page 5/40).

Characteristics

FactoryCast HMI module type		TSX WMY 100	140 NWM 100 00
Modicon automation platform		Premium	Quantum
Communication services			
Interface		10BASE-T/100BASE-TX	100BASE-TX and 100BASE-FX
Connection type		Point-to-point connection (via a standard RJ45 connector), which enables the formation of a (10BASE-T/100BASE-TX) star network (the stations are linked to ConneXium hubs or switches).	
Number of stations		64 stations maximum per network	
Transmission speed		10/100 Mbit/s with automatic speed recognition	
Ethernet communication services			
Network management		SNMP agent, supports standard MIB II and private Transparent Ready MIB	
TCP/IP services	Uni-TE	<div><input type="checkbox"/> Client/server mode</div> <div><input type="checkbox"/> Client/server requests of 256 bytes (synchronous mode)</div> <div><input type="checkbox"/> Client/server requests of 1 K byte (asynchronous mode)</div>	–
	Modbus	<div><input type="checkbox"/> Client/server mode</div> <div><input type="checkbox"/> Asynchronous requests of 256 bytes</div>	
X-Way services		<div><input type="checkbox"/> X-Way inter-network routing</div> <div><input type="checkbox"/> X-Way/Uni-Telway routing</div> <div><input type="checkbox"/> Module diagnostics</div>	–
Web server services			
Embedded Web server	Standard services	<div><input type="checkbox"/> “Rack Viewer” PLC diagnostics</div> <div><input type="checkbox"/> “Data Editor” access to PLC data and variables</div>	
	FactoryCast services	<div><input type="checkbox"/> “Alarm Viewer” alarm display</div> <div><input type="checkbox"/> “Graphic Data Editor” graphic object editor</div> <div><input type="checkbox"/> Display of user Web pages (8 Mb available)</div>	
	FactoryCast HMI services	<div><input type="checkbox"/> HMI database (1000 variables, maximum)</div> <div><input type="checkbox"/> E-mail transmission (100, maximum)</div> <div><input type="checkbox"/> Connection to SQL Server, MySQL and Oracle databases: connection to 3 databases max., 10 tables maximum in write mode per database;</div> <div><input type="checkbox"/> Interpreted arithmetic and logical calculations</div> <div><input type="checkbox"/> Simulator for debugging the HMI application offline</div>	

References



Ethernet TCP/IP Transparent Ready modules

Embedded Web server	Name and description	Speed	Reference	Weight kg
FactoryCast HMI	FactoryCast HMI Premium module	10/100 Mbit/s	TSX WMY 100	0.340
	FactoryCast HMI Quantum module	100 Mbit/s	140 NWM 100 00	–

FactoryCast HMI installation software (to be ordered separately)

Name and description	Use	Operating system	Reference	Weight kg
Multilingual FactoryCast HMI (1)	Development and debugging of the HMI application	Windows 2000, Windows XP	TLX CD FCHMI V1M	0.340

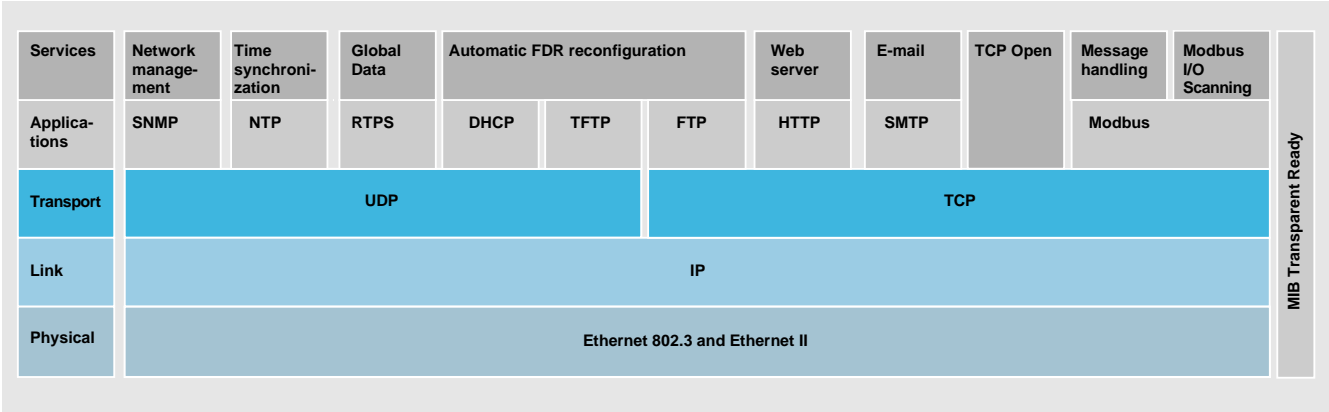
(1) Includes documentation in electronic format.

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Ethernet TCP/IP communication service

Presentation

Transparent Ready products allow transparent communication on a single Ethernet TCP/IP network.



In addition to universal Ethernet services (HTTP, BOOTP/DHCP, FTP, etc), the Transparent Ready device communication services designed for use in automation applications include:

- Modbus TCP messaging for class 10, 20 or 30 devices.
- I/O Scanning service for class 30 devices.
- FDR (Faulty Device Replacement) for class 10, 20 or 30 devices.
- SNMP (Simple Network Management Protocol) network administration for class 20 or 30 devices.
- Global Data, for class 30 devices.
- Pass band management for class 30 devices (see performance levels on pages 5/28 to 5/31).
- NTP (Network Time Protocol) time synchronization for class 30 devices.
- Notification of SMTP events via E-mail for class 30 devices.
- TCP Open, optional, for class 30 devices.

The following pages present the various options available through all of these services in order to facilitate the optimum choice of solutions when defining a system integrating Transparent Ready devices.

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Ethernet TCP/IP communication service

Functions

Standard Ethernet services

HTTP "Hypertext Transfer Protocol" (RFC1945)

The HTTP protocol (Hypertext Transfer Protocol) is used for transmitting Web pages between a server and a browser. HTTP has been used on the Web since 1990.

Web servers embedded into Ethernet TF devices are at the heart of the Transparent Ready concept, and are used to provide easy access to devices anywhere in the world from a standard browser such as Internet Explorer or Netscape Navigator.

BOOTP/DHCP (RFC1531)

BOOTP/DHCP is used to automatically provide the devices with the IP parameters. This avoids having to manage the addresses of each device individually.

Management is instead performed in a dedicated IP address server.

DHCP protocol (Dynamic Host Configuration Protocol) is used to automatically assign the devices their configuration parameters. DHCP is an extension of BOOTP. DHCP protocol is made up of 2 components:

- One for providing the IP network address,
- One for providing the IP parameters specific to the device from a DHCP server.

Telemecanique devices can be:

- BOOTP clients allowing automatic recovery of an IP address from a server,
- BOOTP servers enabling a device to distribute IP addresses to the network stations.

Telemecanique uses standard BOOTP/DHCP protocols for its Faulty Device Replacement service (FDR).

FTP "File Transfer Protocol" (RFCs 959, 2228, et 2640)

File Transfer Protocol (FTP) provides basic file sharing elements. Many systems use FTP protocol to exchange files between devices.

Transparent Ready devices implement FTP for transferring certain data to or from devices, in particular when downloading firmware or user Web pages.

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Ethernet TCP/IP communication service

Functions (continued)

Standard Ethernet services (continued)

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. Depending on the network used, it provides the following time precisions based on the UTC:

- Several milliseconds on a local area network (LAN).
- Several tens of milliseconds on a wide area network (WAN).

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 E-mail server.

SNMP "Simple Network Management Protocol" (RFCs 1155, 1156 et 1157)

The Internet community developed standard SNMP for managing the different components of a network through a single system. The network management system can exchange data with SNMP agent devices. This function enables the manager to view the status of the network and devices, modify their configuration and feed back alarms in the event of failure.

Transparent Ready devices are SNMP-compatible and can be integrated naturally in a network managed via SNMP.

COM/DCOM "Distributed Component Object Model"

COM/DCOM (Distributed Component Object Model) or OLE (Object Linking and Embedding) is the name of the technology used in Windows components. This enables Windows applications to communicate transparently.

These technologies are used in the OFS Data server software.



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

Example of Modbus TCP/IP function codes supported for accessing data and diagnostics

Functions (continued)

Modbus communication standard

Modbus, the industrial communication standard since 1979, has been combined with Ethernet TCP/IP, which supports the Internet revolution, to make Modbus TCP/IP, a completely open Ethernet protocol. The development of a connection to Modbus TCP/IP requires no proprietary component or license purchase.

This protocol may be easily combined with any device supporting a standard TCP/IP communication stack. Specifications can be obtained free of charge from the website: www.modbus-ida.org.

Modbus TCP, simple and open

The Modbus application layer is very simple and universally recognized. Thousands of manufacturers are already implementing this protocol. Many have already developed a Modbus TCP/IP connection and many products are currently available. The simplicity of Modbus TCP/IP enables any small field team, such as an I/O module, to communicate over Ethernet without the need for a powerful micro-processor or a lot of internal memory.

Modbus TCP, high-performance

Because of the simplicity of its protocol and the high speed of 100 M bits/s Ethernet, Modbus TCP/IP delivers excellent performance. This means it is possible to use this type of network in real-time applications such as I/O Scanning.

Modbus TCP/IP, one standard

An identical application protocol is used for Modbus serial link, Modbus Plus or Modbus TCP. This therefore makes it possible to route messages from a network to another without changing protocol.

As Modbus is implemented above the TCP/IP layer, users can also benefit from the IP routing which enables devices located anywhere in the world to communicate without having to worry about the distance between them.

Schneider offers an entire range of gateways for interconnecting a Modbus TCP/IP network to already existing Modbus Plus or Modbus serial link networks. For further details, consult our regional sales office.

The IANA institute (Internet Assigned Numbers Authority) has assigned Schneider port TCP 502 (Well known port), which is reserved for the Modbus protocol. This protocol will shortly be also subject to an RFC (Request For Comments), documents which form standard references within the Internet community.

Modbus TCP/IP characteristics

Maximum size of data:

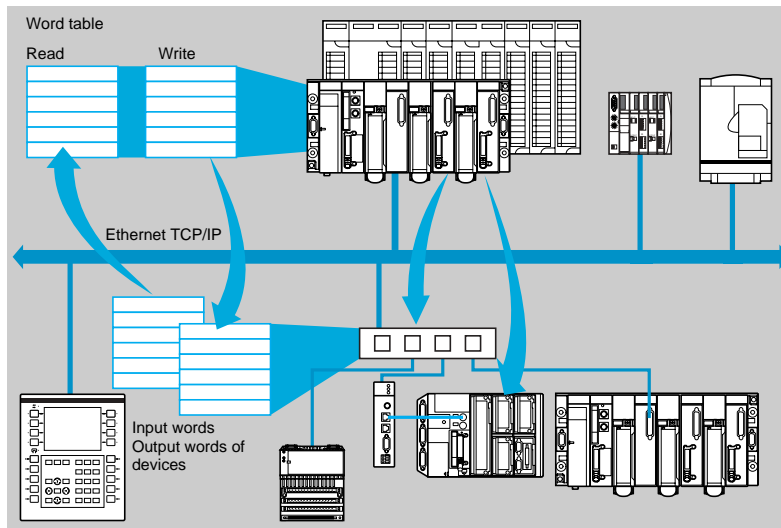
- Read: 125 words or registers.
- Write: 100 words or registers.

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Ethernet TCP/IP communication service

Functions (continued)

I/O Scanning service



The I/O Scanning service can be used to manage the exchange of distributed I/Os on the Ethernet network after a simple configuration operation, with no need for special programming.

The I/Os are scanned transparently by means of read/write requests according to the Modbus Master/Slave protocol on the TCP/IP profile. This principle of scanning via a standard protocol enables communication with any device which supports a Modbus server on TCP/IP.

This service can be used to define:

- An %MW word zone reserved for reading inputs.
- An %MW word zone reserved for writing outputs.
- Refresh periods independent of the PLC scan.

During operation, the module:

- Manages the TCP/IP connections with each of the distributed devices.
- Scans the devices and copies the I/Os into the configured %MW word zone.
- Feeds back status words so that correct operation of the service can be monitored from the PLC application.
- Applies the preconfigured fallback values in the event of a communication problem.

An offer of hardware and software products which enable the I/O Scanning protocol to be implemented on any type of product which can be connected to the Ethernet network (please consult: www.modbus-ida.org).

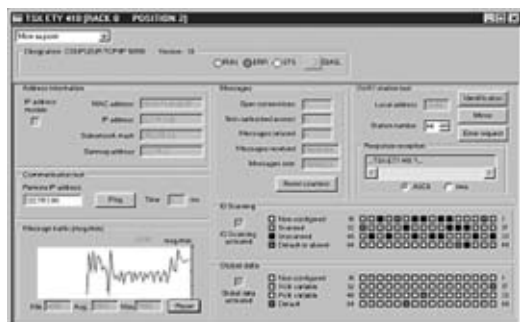
Characteristics:

- Each station can exchange a maximum of 120 words.
- Maximum size in the PLC managing the service:
 - 2 K words %MW in inputs and 2 K words %MW in outputs with manager PLC (64 stations max.),
 - 4 K words %MW in inputs and 4 K words %MW in outputs with manager PLC (128 stations max.).

I/O Scanning service diagnostics

I/O Scanning service diagnostics can be performed in 3 ways:

- By the application program from a data field specific to the PLC.
- From the debugging screen in the installation software.
- From the PLC system diagnostics function viewed with the Internet browser on a PC station.



Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Ethernet TCP/IP communication service

Functions (continued)

Replacement service for faulty devices (*Faulty Device Replacement*)

The Faulty Device Replacement service uses the standard BOOTP, DHCP, file management and TFTP technologies with the objective of simplifying Ethernet device maintenance.

It enables a faulty device to be replaced by a new product while guaranteeing its detection, reconfiguration, and automatic restart by the system, without difficult manual intervention.

The principal steps are:

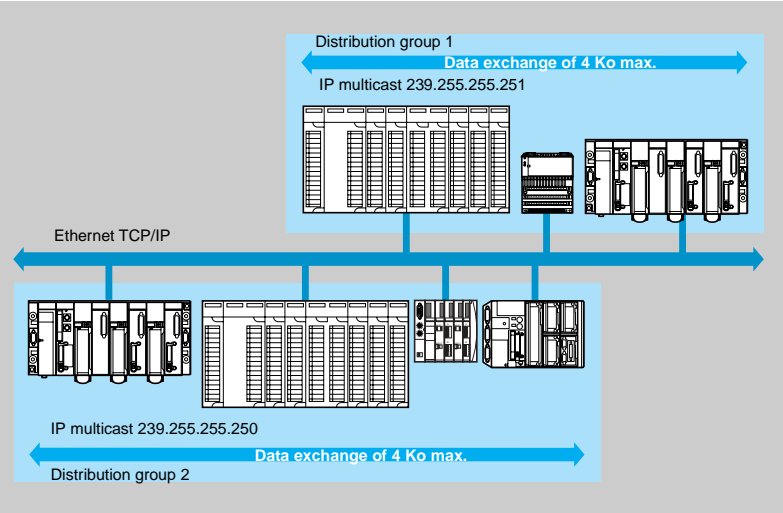
- A device using the FDR service is faulty.
- Another similar device is taken from the maintenance pool, preconfigured with the "role_name" (or identifier) of the device that is out of service, then reinstalled on the network.
- The FDR server can be:
 - Premium processor with embedded Ethernet,
 - Quantum processor with embedded Ethernet,
 - Premium Ethernet module: TSX ETY,
 - Quantum Ethernet module: 140 NOE 771,
 detects the new addition, configures its IP address and transfers all configuration parameters to it.

The substituted device verifies if all the parameters are indeed compatible with its own characteristics, then switches to operating mode.



Functions (continued)

Global Data service



The Global Data service ensures data exchanges in real time between stations belonging to the same distribution group. It is used to synchronize remote applications, or share a common database among several distributed applications. The exchanges are based on a standard producer/consumer protocol, guaranteeing optimal performance while maintaining a minimum network load. This RTPS (Real Time Publisher Subscriber) protocol is promoted by the IDA (Interface For Distributed Automation) organization, and has already been adopted as a standard by several manufacturers.



Characteristics: A maximum of 64 stations can participate in Global Data within the same distribution group. Each station can:

- Publish one 1024-byte variable. The publication period can be configured from 1 to n periods of the MAST task of the processor.
- Subscribe to between 1 and 64 variables. Validity for each variable is controlled by Health Status Bits, linked to a refresh timeout configurable between 50 ms and 1 s. Access to a variable element is not possible. The total size of the subscribed variables reaches 4 K contiguous bytes.

In order to optimize Ethernet network performance further still, Global Data can be configured with the "multicast filtering" option, which together with switches in the ConneXium range, perform data broadcasting only on Ethernet ports, where there is a Global Data service subscriber station. If these switches are not used, Global Data is transmitted in "multicast" on all switch ports

Global Data service diagnostics

The diagnostics screens use a color code to show Global Data status:

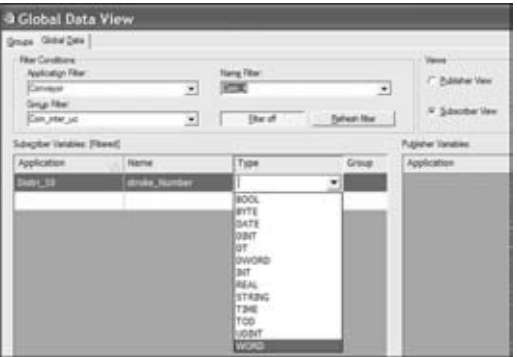
- Configured/not configured/faulty.
- Published/subscribed.

Unity Studio software suite: single Global Data entry point

The Unity Studio software suite is the key component required on design office workstations used for designing and structuring distributed industrial automation projects.

The Unity Studio Global Data view enables the definition of Global Data distribution groups and the configuration of settings for published and subscribed station variables. During generation at each station level, this setting configuration is saved automatically to station files, thereby ensuring:

- Guaranteed consistency of communication between the distributed applications in question.
- Maximum productivity with respect to station configuration tasks.
- Minimized risk of errors.



Editeur de Global Data

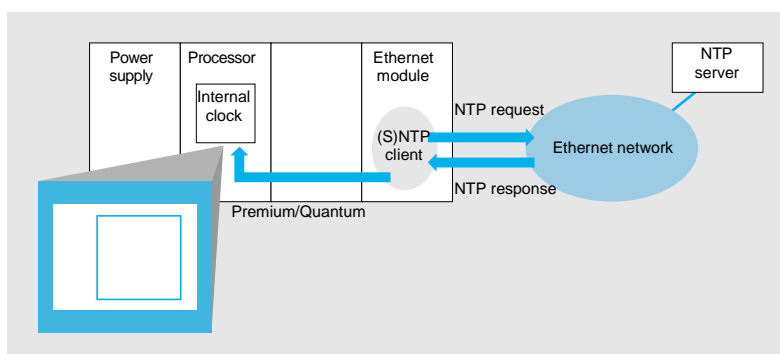
Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
Ethernet TCP/IP communication service

Functions (continued)

NTP time synchronization service

Presentation



The time synchronization service is based on the NTP (*Network Time Protocol*) which is used to synchronize the time of a client or a server on Ethernet TCP/IP from a server or another reference time source (radio, satellite, etc).

Operation

The Ethernet TCP/IP communication modules in the Modicon Quantum Unity V2 and Premium Unity V2 automation platforms have an NTP client component. These modules can connect to an NTP server using a client request (unicast), in order to update their local time. The module clock is updated periodically (1 to 120 seconds) with an error of less than 10 ms for standard processors and less than 5 ms for high performance processors. If the NTP server cannot be reached, the Ethernet TCP/IP module switches to a standby NTP server.

Unity module and processor used		Predicted typical time service precision		
Ethernet modules	Ethernet modules with Unity processor	Clock synchronisation (1)	Event synchronisation	Time stamping (2)
TSX ETY 4103 TSX ETY 5103	TSX P57 0244M TSX P57 104M TSX P57 204M TSX P57 304M	± 1 ms typical ± 10 ms max.	= Clock synchronisation precision	= Clock synchronisation precision
	TSX P57 404M TSX P57 504M	± 1 ms typical ± 5 ms max.	+ Fast task time	+ I/O time
140 NOE 771 01 140 NOE 771 11	140 CPU 311 10 140 CPU 434 12U 140 CPU 534 14U	± 1 ms typical ± 10 ms max.	+ I/O time	
	140 CPU 651 50 140 CPU 651 60 140 CPU 671 60	± 1 ms typical ± 5 ms max.		

(1) Time difference between field input and central NTP server.

(2) Assuming input connected to the interrupt module.

The PLC processor clock is therefore itself updated with a precision of 5 ms for standard processors and 1 ms for high performance processors. A function block is available for reading this clock. In each PLC application, events or variables can be time-stamped.

The Ethernet module is configured via a Web page. The time zone can be configured. A time synchronization service (NTP) diagnostic Web page is also available.

Information on the time synchronization service (NTP) is also available in the Transparent Ready private MIB, which can be accessed via the SNMP network management service (see above).

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready Ethernet TCP/IP communication service

Functions (continued)

Electronic mail notification SMTP service

Introduction

This simple mail notification service is a programmed service that allows PLC applications to report by exception conditions monitored by the PLC. The automation controller can automatically and dynamically create electronic mail to alert specified users with data, alarms and events - whether the recipients are local or remote.

Note: This service is available on the latest Premium and Quantum Ethernet modules & CPUs, when operating with Unity Pro software. A more comprehensive mail service, independent of the PLC application, is available on the FactoryCast HMI active web server modules (see page 5/15).

Usage

A simple yet powerful mechanism is used. Predefined email headers are linked together with the body of the mail which is created dynamically from the latest information in the automation application.

The user logic program can trigger the message based on a predefined event or condition. Using a function block, one of 3 predefined headers is selected and an email message with variable information and text (up to a maximum of 240 bytes) is created and sent directly from the PLC.

Each of the three mail headers contains these common predefined items –email recipient list, sender name and subject. This information can be defined and updated by an authorized administrator using the configuration web pages.

Message creation and delivery

The PLC application selects the appropriate header. The system architect may define the mail headers to indicate differing importance levels. For example :

- Header 1 could be “URGENT problem reported by PLC 10”,
- Header 2 might be “WARNING at substation 10”,
- Header 3 could be “INFO message from water system”.

Differing lists of recipients between the three headers help to ensure that the right information quickly flows to the right recipients. The application can then add pertinent information to the body of the mail message such as the specific device, process or location.

Completed mail is then sent to an electronic mail server for expeditious distribution to the interested parties. These recipients could be engineers, managers, process owners etc.

Security

Each mail message can be protected by an optional login and password that is authenticated by the SMTP mail server. If, for additional security, the site's mail installation has changed the TCP port number from the default of 25, the port number can be changed in the PLC email configuration (via secured web page access).

Configuration

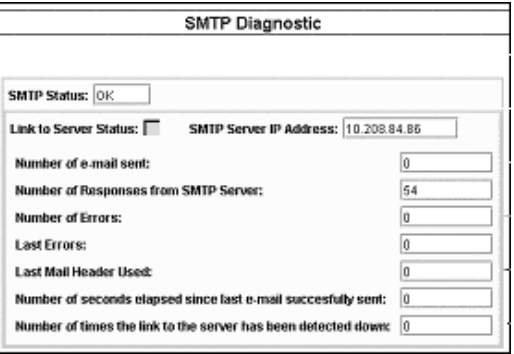
An authorized administrator can use a web page to easily configure the mail service. For each of the three mail headers, the sender, recipient list and subject message can be defined. The electronic mail server connection information such as IP address and security information can also be set from the web page.

Diagnostics

As all other Ethernet services in Premium and Quantum systems, the Mail Service has a Diagnostic Web page showing the complete, up to the second, status.

Remote Monitoring

These products provide diagnostic information for remote management applications following the SNMP network management standard. Information for the mail service is included in the Schneider Electric private MIB which is publicly available.



Functions (continued)

SNMP service protocol

The SNMP (Simple Network Management Protocol) protocol is used, from a network management station, to monitor and control all Ethernet architecture components and thus ensure rapid diagnostics if a problem occurs.

It is used to:

- Query devices such as computer stations, routers, switches, bridges or terminal devices (DTE) in order to view their status.
- Obtain statistics for the network on which the devices are connected.

This management software respects the traditional Client/Server model. However, in order to avoid confusion with other communication protocols using this terminology, we prefer to use the expression:

- Network manager for the Client application running on the computer station.
- SNMP agent for the server application that runs on the device.

Transparent Factory can be managed by any SNMP network manager, including HP Openview or IBM Netview.

Standard SNMP (Simple Network Management Protocol) is used to access configuration and management objects included in the MIB (Management Information Base) for the devices. These MIBs must comply with certain standards in order to be accessed by all managers on the market. However, depending on the device complexity, manufacturers can add certain objects to the private databases.

The Transparent Factory private MIB includes management objects specific to the Telemecanique offer. These objects simplify installation, implementation, and maintenance for Transparent Factory products in an open environment using standard network management tools.

The Transparent Factory products support 2 SNMP network management levels:

- Standard MIB II, a first level of network management, can be accessed via this interface. It lets the manager identify the devices forming the architecture and retrieve general information on the configuration and operation of the Ethernet TCP/IP interfaces.
- MIB Transparent Factory interface; management of the Transparent Factory devices is improved via this interface. This MIB includes a set of data that enables the network management system to supervise all the Transparent Factory services. The Transparent Factory private MIB can be downloaded from the Web server from any Ethernet Transparent Factory module in a PLC.

Selecting the communication architecture

When selecting an architecture, it is advisable to take performance into account at the earliest possible stage.

For this, the designer must:

1 Have a clear idea of his needs as regards:

- ☐ 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 precise performance level between any 2 points on an architecture is dependent on the weakest link in the chain, which can be:

- ☐ a function of the hardware,
- ☐ but also a function of the applications (size, architecture, OS, machine power, etc.) which are often poorly defined at this stage of project.

3 Select the most suitable architecture.

The objective of the following pages is to answer the second point by explaining the performance of the different components which constitute an Ethernet architecture, concentrating on the following 2 aspects:

- Processing capacity in terms of volume of exchanges (see pages 5/29 and 5/30).
- Application response time (see page 5/31).

Introduction

As in any communication system, the performance of an Ethernet architecture is linked to numerous parameters which depend on the:

■ Hardware used:

- ☐ network bandwidth,
- ☐ resources of module or CPU with Ethernet embedded,
- ☐ processor resources (PLC, PC or other CPUs).

■ Application services used:

- ☐ Modbus (or Uni-TE) industrial messaging handling service,
- ☐ Global Data service, data scanning between PLC,
- ☐ I/O Scanning service, data scanning of distributed I/O,
- ☐ Others (Web access, TCP Open communication).

The difficulty in determining the correct size of an architecture is due to the fact that the majority of these parameters are linked.

Nota : For purposes of simplification, the values shown in the tables which follow have been reduced. If these are adhered to, correct operation of the architecture is ensured. If the performance levels obtained are not sufficient, please consult our Regional Sales Office for a more detailed study.

Nota : The performance levels indicated depend relatively little on the size of messages. Limiting factors have much more to do with the number of messages. It is therefore necessary to group as much useful information as possible within the same message using the most suitable Modbus request.

Processing capacity in terms of volume of exchanges

The methodology presented below in 4 steps can be used to determine the message processing capacity on Ethernet TCP/IP.

Step 1: calculation of exchanges necessary for the application

Using the tables below, calculate the exchanges necessary for the application, i.e. for each station on the architecture and for each service used, the number of messages to be transmitted and received per second.

Messages transmitted per second from		Station A	Station B	Station N	Total number of messages received per station
Messages per second sent to	Station A				R1
	Station B				R2
	Station N				Ri
Total number of messages transmitted per station		E1	E2	Ei	Network load $Cru = \sum [R1...Ri, E1...Ei]$
Not applicable					

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready Performances

Step 2: station processor processing capacity, system requests

Using the table below, compare the total number of messages received via the Modbus and Uni-TE service for each station (value R1, R2 or Ri) with the station processor processing capacity.

If the result of this initial calculation is positive, go to step 3.

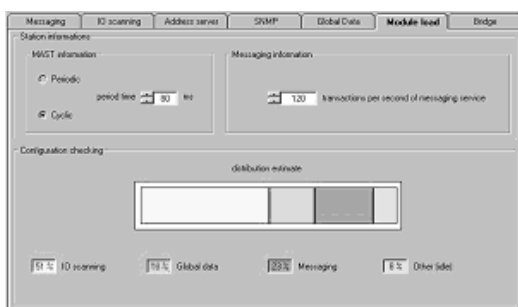
Premium or Atrium platform	Messages being received	Messages being transmitted
Communication by EFs or EFBs (PL7 or Unity Pro)		
Modbus requests (1)	TSX 57 10	4 mes/cyc
	TSX 57 20	8 mes/cyc
	TSX 57 30	12 mes/cyc
	TSX 57 40	16 mes/cyc
	TSX 57 50 (2)	16/20 mes/cyc
Quantum platform	Messages being received	Messages being transmitted
Communication by EFs or EFBs (Concept, ProWORX or Unity Pro)		
Modbus requests (1)	CPU 113 02/03 (3)	4 mes/cyc
	CPU 311 10 (2)	4 mes/cyc
	CPU 434 12●	4 mes/cyc
	CPU 534 14●	4 mes/cyc
	CPU 651 ●0 (2)	4 mes/cyc
	CPU 671 60 (2)	4 mes/cyc

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

Step 3: bus or network module 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 bus or network processing capacity shown below. If the result of this second calculation is positive, go to step 4.

Processing capacity of Ethernet connections	Premium Ethernet TCP/IP			Quantum Ethernet TCP/IP	
	TSX ETY 110/210 TSX ETY 110WS	TSX ETY 4103/5103 TSX WMY 100 (5) TSX P57 10/20/30/40	TSX P57 50	140 NOE 771 ●● 140 NWM 100 00 (5)	140 CPU 65 150/160 140 CPU 67 160
Message transactions	60 transactions/s	450 transactions/s	500 transactions/s	350 transactions/s	350 transactions/s
Scanning I/O polling	Service not available	2000 transactions/s	2000 transactions/s	2000 transactions/s	2000 transactions/s
Global Data subscriptions		800 transactions/s	800 transactions/s	800 transactions/s	800 transactions/s



Characteristics summary

- Modbus requests:
 - 125 words or registers in read access,
 - 100 words or registers in write access.
- Global Data: 1024-word published variable, subscription to a maximum of 64 variables, with a maximum size of 2 K %MW.
- I/O Scanning with maximum size in the PLC managing the service:
 - 2 K %MW in input and 2 K %MW in output with manager PLC limited to 64 stations,
 - 4 K %MW in output and 4 K %MW in output with manager PLC limited to 128 stations (TSX P57 50, 140 CPU 65 150/160 and 140 CPU 67 160).

(1) A temporary overload on several PLC cycles, due, for example, to an adjustment terminal or the temporary connection of an Internet browser, is acceptable.

(2) Only with Unity Pro.

(3) Only with Concept/ProWORX.

(4) With Unity Pro version V2.0, 1 message/cycle with version V1.0.

(5) I/O Scanning and Global Data services are not available for TSX WMY 100 and 140 NWM 100 00.

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready Performances

Step 3: bus or network module processing capacity (continued)
Network bandwidth management in the Ethernet TCP/IP modules

The bandwidth management service shows load level for the Ethernet module. This enables the user to monitor any drift and anticipate possible problems. Ethernet module load is indicated in 3 ways:

- Anticipated load in the PL7 configuration screen.
- Actual load in the PL7 diagnostics/debugging screen, as well as in Web diagnostics pages. The load is displayed as a bar graph, animated in real time.
- In the SNMP interface for access to the SNMP network manager. The bandwidth is shown as a percentage for each of the following services:
 - Modbus (and Uni-TE) message handling.
 - I/O Scanning.
 - Global Data.
 - Other.



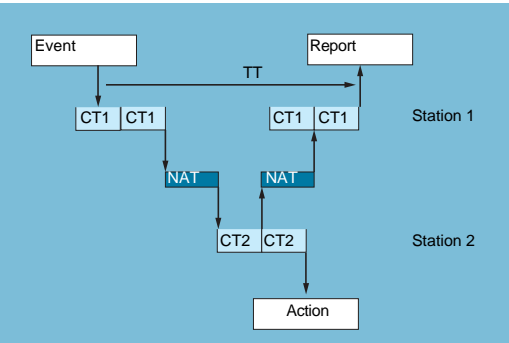
Step 4: network load

In spite of the large bandwidth of an Ethernet Network (100 Mbit/s), the user must ensure that the actual application load does not exceed 25 to 30 % of the hypothetical network capacity. If this should occur, this load must be reduced via a switched architecture (use of switches). See page 5/38.

Application response time
For the Modbus (or Uni-TE) messaging handling service

PLC-module processor exchanges are synchronous with the PLC cycle, in the same manner as the input/output exchanges. When an event appears, (input switching to 1 for example), a message can only be transmitted after this input has been taken into consideration (start of the following cycle) and the PLC program has been executed, i.e. approximately 1.5 cycles after the event has appeared.

Network access time (NAT) shown in the table below as ms, totals the module transit time and the delay before the message can be transmitted across the network.



Processing Modbus message requests	Premium Ethernet TCP/IP		Quantum Ethernet TCP/IP	
	TSX ETY 110/210 TSX ETY 110WS	TSX ETY 4103/5103 TSX WMY 100 TSX P57 10...57 50	140 NOE 771 ●● 140 CPU 113/311 ●● 140 CPU 434/534 1●	140 CPU 65 150/160 140 CPU 67 160
Network access time NAT	< 25 ms	< 10 ms	< xx ms	< 10 ms

Transaction time TT includes the delay between the transmission of a message from a client station 1, its reception by a server station 2, processing the request, sending back the response and its acceptance by station 1 (update of an output for example). As the block diagram above shows:

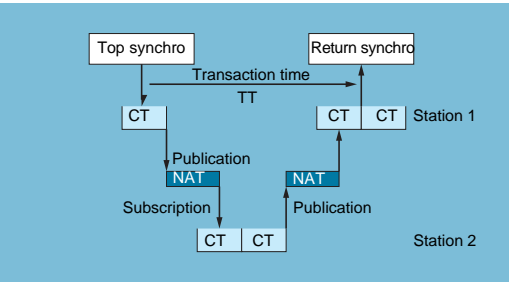
- The duration of the transaction will be between:
$$TT = 2 \times CT1 + 2 \times NAT < TT < 4 \times CT1 + CT2 + 2 \times NAT$$
- Average duration is:
$$TT_{ave} = 3 \times CT1 + 0.5 \times CT2 + 2 \times NAT$$

For the Global Data service

The transaction time (TT) includes the delay between publication of a Global Data by station 1, its reception and processing by remote station 2 and its retransmission to the initial station 1:

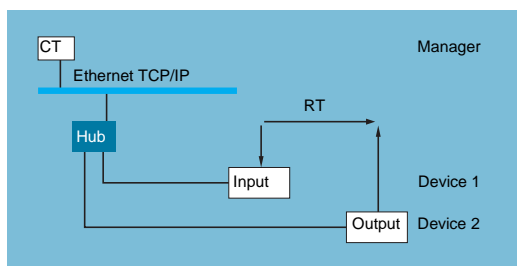
For an exchanged variable:

- If $CT < 5$ ms, transaction time: $TT = 5$ to $6 \times CT$
- If $CT \geq 10$ ms, transaction time: $TT = 3 \times CT$



Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready Performances

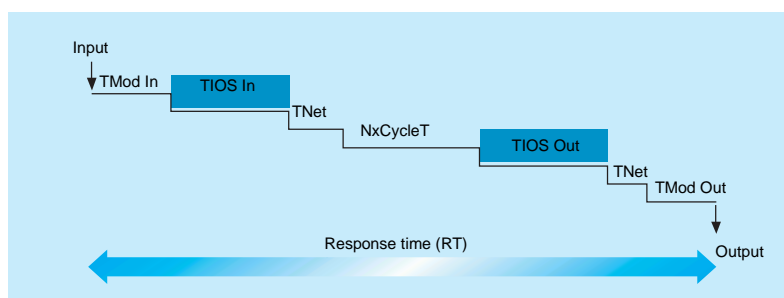


Application response time (continued)

I/O Scanning service

The RT application response time include the delay between getting data from a remote input and up dating remote output. It includes PLC application treatment time.

This RT response time is composed of following parameters:



- TMod In and TMod Out: response time of the read/written device excluding the input circuit transition (TMod depends of the device, but commonly between 1 to 8 ms).
- TIOS In and TIOS Out: time between two scanning of the same read device ($0.3 \text{ ms} \times \text{number of device scanned}$ and at least the pooling rate configured. TIOS is executed in parallel of the CPU cycle time, so could be hidden for the RT response time).
- N: number of PLC CPU cycles.
- CycleT: CPU cycle time.
- Tnet: propagation time on the network (depending of the application, but commonly Tnet is 0.05 ms at 10 Mbit/s and 0.005ms at 100 Mbit/s).

The RT response time could be estimated using the following formulas:

- TRmin, minimal response time with TIOS hidden and 1 CycleT:

$$TR_{min} = T_{mod} In + 0 \times T_{IOS} In + T_{net} + 1 \times CycleT + 0 \times T_{IOS} Out + T_{net} + T_{mod} Out$$

- TRtypic, typical response time (with 0,5 TIOS hidden and 2 CycleT:

$$TR_{typic} = T_{mod} In + 0.5 \times T_{IOS} In + T_{net} + 2 \times CycleT + 0.5 \times T_{IOS} Out + T_{net} + T_{mod} Out$$

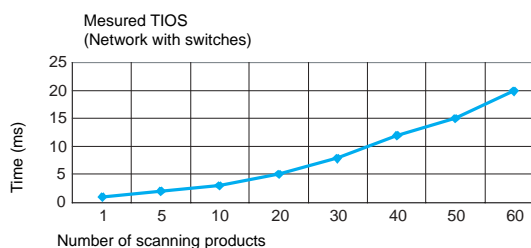
- TRmax, maximal response time with TIOS not hidden and 3 CycleT:

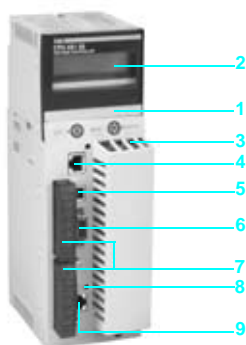
$$TR_{max} = T_{mod} In + T_{IOS} In + T_{net} + 3 \times CycleT + T_{IOS} Out + T_{net} + T_{mod} Out$$

The TMod In and TMod out response time are shown below:

Type of distributed I/O	Response time	Mini	Typical	Maxi
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 or TMod Out	4 ms	6 ms	8 ms
Advantys STB NIP 2212	TMod In or TMod Out	2 ms	3 ms	4 ms

The TIOS In and TIOS Out times mesured between two scanning are shown below:





Description

The 140 CPU 651 50 and 140 CPU 651 60 processors have 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 5-button keypad with LEDs (ESC, ENTER, MOD, Îl, =>).
- 4 An RJ45 connector for connection to the Modbus bus.
- 5 A type B female USB connector for connecting the programming PC.
- 6 A 9-way female SUB-D connector for connection to the Modbus Plus network.
- 7 Two slots for PCMCIA memory extension cards.
- 8 Two LEDs marked COM and ERR.
- 9 An RJ45 connector for connection to the Ethernet network.

Characteristics

Type of module		Unity Pro software	140 CPU 651 50	140 CPU 651 60
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 PLC variables	
	Standard Ethernet TCP/IP communication service		Modbus TCP messaging (read/write data words)	
	Ethernet TCP/IP advanced communication services	I/O Scanning	Yes (between 128 stations)	
		Global Data	Yes	
		FDR client	Automatic assignment of IP address and network parameters	
		SMTP e-mail notification	Yes	
Structure		SNMP network administrator	Yes	
		Pass band management	Yes	
	Physical interface		10BASE-T/100BASE-TX (RJ45)	
	Data rate		10/100 Mbps with automatic recognition	
	Medium		Twisted pair	
	No. of discrete I/O		Local: 26 slots, decentralized: 31744 I/31744 Q, distributed: 8000 I/8000 Q/network	
	No. of analog I/O		Local: 26 slots, decentralized: 1984 I/31984 Q, distributed: 500 I/500 Q/network	
Quantum processor	Max. no. of communication modules		6 in local rack	
	Max. memory capacities	Program	7168 Kb	
		Localized/non-localized data	512 Kb	1024 Kb (768 Kb with no PCMCIA card)
		Data storage	8192 Kb	
	Operating temperature		0...+ 60°C	
	Relative humidity		10...95% non condensing during operation	
	Degree of protection		IP 20	
LED indicators	Power supply		Via the power supply of the rack supporting the processor	
	Conformity to standards		UL 508, cUL, CSA 22.2-142, FM Class 1 Division 2, C€	
	LED indicators		Activity on the Ethernet port (COM), collision detection (ERR)	

References



140 CPU 651 50/60

Description	Processor clock frequency	Program/data capacity (1)	Reference	Weight kg
Processors 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	—

(1) With PCMCIA card.

For further information: Please consult our "Modicon Quantum and Unity software automation platform" catalog.



Presentation

Ethernet 140 NOE 771 ●1/NWM 100 00 Ethernet network modules are single format modules for installing in the local rack slots 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 processor.

Description

The front panel of TCP/IP 140 NOE 771 01/771 11 and 140 NWM10000 Ethernet 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 for 100BASE-FX optical interface (MT-RJ).
- 3 A standard (RJ45) connector for 10BASE-T/100BASE-TX interface.

Characteristics

Type of module		140 NOE 771 00	140 NOE 771 10	140 NOE 771 01	140 NOE 771 11	140 NWM 100 00
Transparent Ready services	Class	B20	C20	B30	C30	D10
	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	Editor for creating Web page mimics	–	Yes	–	Yes
		User Web page hosting (available size)	–	Yes	–	Yes (8 Mb)
	FactoryCast HMI active Web server		– Yes (1)			
	Standard Ethernet TCP/IP communication services		Modbus TCP messaging (read/write data words)			
	Ethernet TCP/IP advanced communication services	I/O Scanning	Yes	–	Yes (between 128 stations)	–
		Global Data	–	–	Yes	–
		FDR server	–	–	Automatic assignment of IP address and network parameters	–
		NTP time synchronization	Yes		Yes	–
SMTP e-mail notification		Yes		Yes	–	
SNMP network administrator		Yes			SNMP agent	
Pass band management		–		Yes	–	
Redundancy service		Compatible with Hot Standby redundant architecture –				
Structure	Physical interface	10BASE-T/100BASE-TX (RJ45) or 100BASE-FX (MT/RJ)				
	Data rate	10/100 Mbit/s				
	Medium	Twisted pair/optical fiber				
Network module	Operating temperature	0...+ 60°C				
	Relative humidity	10...95% non condensing during operation				
	Degree of protection	IP 20				
	Power supply	Via the power supply of the rack supporting the processor				
	Conformity to standards	UL 508, cUL, CSA 22.2-142, FM Class 1 Division 2, C€				
	LED indicators	Rack operational (Active), module ready (Ready), network active (Link) Ethernet network status (Run), download mode (Kernel), Full-duplex mode (Fduplex) Transmission/reception activity (TxAct/RxAct), 10 Mbps or 100 Mbps data rate (10MB/100MB) Collision detection (Coll), Ethernet module fault (Fault)				

(1) Database management, arithmetic and logic calculations, automatic e-mail transmission on process event, connection to relational databases.

References



140 NOE 771 ●1/NWM 100 00

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 10	0.345
		B30	140 NOE 771 01	0.345
		C30	140 NOE 771 11	0.345
		D10	140 NWM 100 00	0.345

Presentation

Industrial Ethernet networks can use various standards. In each case, a set of rules must be respected when determining what topology will be produced and with what performance level.

The ConneXium offer comprises a complete family of industrial products used to build a network architecture: hubs, switches, transceivers and cables. Wiring rules pertaining to the ConneXium offer are described on pages 5/34 to 5/39.

Characteristics

General characteristics for industrial Ethernet standards

Standard	Date rate (Mbit/s)	Medium	Type of connector	Useable bandwidth (on automation network)	Advantages
10BASE5	10	Thick coaxial cable (yellow)	15-way SUB-D (AUI)	8 %, i.e. 800 Kbit/s	Cost, Ethway compatibility
10BASE-T	10	Twisted shielded pair (SFTP) (1)	RJ45	8 %, i.e. 800 Kbit/s	Cost
10BASE-FL	10	Fibre optic (generally 62.5/125 multimode 1300 µm (2))	ST or MT-RJ	8 %, i.e. 800 Kbit/s	Immunity, confidentiality
100BASE-TX	100	Shielded twisted pair (SFTP)	RJ45	40 %, i.e. 40 Mbit/s	Data rate (x 50)
100BASE-FX	100	Fibre optics	SC or MT-RJ	40 %, i.e. 40 Mbit/s	Immunity

(1) SFTP cables (Shielded and Foiled Twisted Pair) are available in 2 versions:

- UL 1581 vertical tray, NFC 32070 level C1, IEC 332-1.
- Reaction to fire compliant with NFC 32 070 # class C2 and IEC 332-1, Low Smoke Zero Halogen (LSZH) and UL 1581 VW1.

(2) The multimode fiber is Low Smoke Zero Halogen as per HD.624-7, with reaction to fire complying with NFC 32 070 # class C2 and IEC 332-1.

Installation principles

The Ethernet 802.3 Link Layer is based on a collision detection mechanism (CSMA CD). Each station (DTE, Data Terminal Equipment) sends its data when necessary and verifies if the frame has been correctly propagated. If a collision with a frame sent by another station is detected, the station repeats the message after a timeout, which increases the network load and thus the probability that another collision will occur.

The transceivers or hubs (repeaters) are used to regenerate the signal once the physical limits of the medium have been reached. They also propagate collisions, if there are any.

Because of the transmission time needed to send data from one end of the network to the other, a maximum network length exists, beyond which collisions might not be detected by the sender. For this reason, and for each technology, a network size limit has been set. This is described as the "maximum network diameter" within a same collision domain.

Architectures in a same collision domain

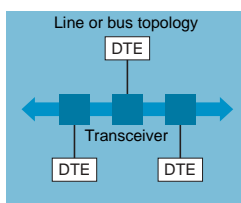
Various architectures may exist, depending on each standard:

- Line or bus topology, using transceivers.
- Star network topology, using hubs.
- Tree network topology, using hubs.

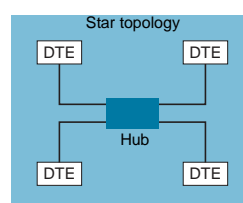
Transceivers are also used for transmitting signals between 2 dissimilar media such as fiber optic and twisted pair cables.

In addition, the hubs (or concentrators) are also used to transmit signals among several media (ports).

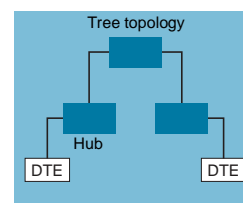
The transceivers and hubs are “plug and play” devices.



10BASE5



10BASE-T, 10BASE-F,
100BASE-TX, 100BASE-FX



10BASE-T, 10BASE-F,
100BASE-TX, 100BASE-FX

Note: in the information that follows, the terms “hubs” and “repeaters” are used interchangeably.

Rule 1: to respect the “maximum network diameter” within a same collision domain

Depending on the Ethernet standard employed, the network size can vary. To define the correct architecture, the 2 constraints of maximum segment length and maximum network diameter must be respected. The Schneider Electric ConneXium performances make it possible, in some situations, to surpass the limits of the 802.3 standard.

Ethernet standard	Maximum segment length (physical limit)		Maximum network diameter (limited by collisions)	
	According to standard 802.3	With ConneXium products	According to standard 802.3	With ConneXium products
10BASE5	500 m (50 m for a drop cable)		1.800 m (2.800 m with fiber optic segment)	
10BASE-T	100 m		500 m	1.000 m
10BASE-FL or mixed (FL and T)	2.000 m	3.100 m (1)	2.500 m	3.100 m (1)
100BASE-TX	100 m		200 m	
100BASE-FX in Half Duplex	412 m		228 m or 412 m between 2 DTE devices	
100BASE-FX in Full Duplex	2.000 m	3.000 m with multimode 15.000 m with monomode (1)	228 m or 412 m between 2 DTE devices	

(1) Depends on the optical budget and fiber attenuation.

Installation rules (continued)

Rule 2: for each technology, respect the following rules within the same collision domain

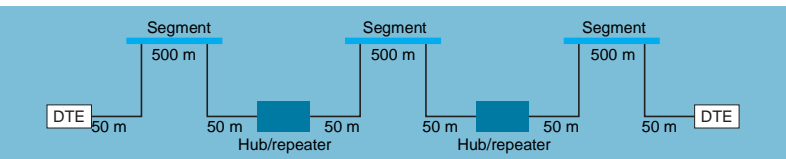
10BASE5

Between 2 DTE (Data Terminal Equipment) devices, a maximum of 2 repeaters or 1 repeater with 2 half-repeaters (half-repeaters ensure transmission between a copper and a fiber optic medium):

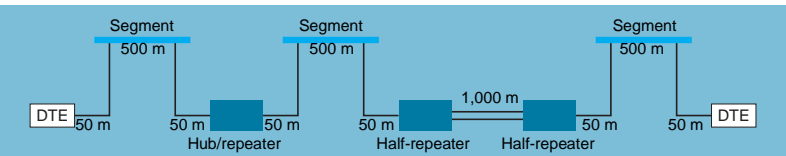
- Drop cable, 50 m length max.,
- One segment, 500 m length max.,
- Between 2 fiber optic half-repeaters, 1000 m length max.

Examples:

- All copper, 1,800 m length max.



- Mixed copper/fiber optic, 2,800 m length max.



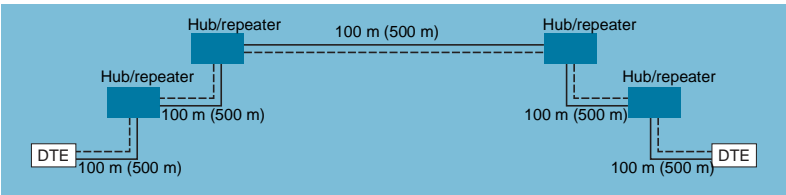
10BASE-T/10BASE-F

Between 2 DTE devices, a maximum of 5 segments and 4 hubs (or repeaters).

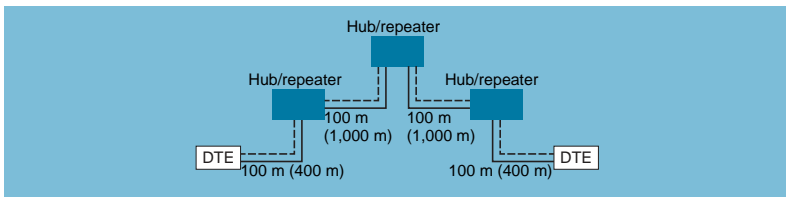
- Topology of 5 segments and 4 hubs (or repeaters): each 10BASE-FL segment must have a length of < 500 m.
- Topology of 4 segments and 3 hubs (or repeaters): the 10BASE-FL inter-repeater segments must have a length of < 1,000 m, and the 10BASE-FL segments between hub and DTE devices must have a length of < 400 m.

Examples:

In the following 2 topologies, distances are usually given for the 10BASE-T standard, with distances for the 10BASE-F standard within parentheses.



Maximum 500 m in 10BASE-T, 2,500 m in 10BASE-F.



Maximum 400 m in 10BASE-TX, 2,800 m in 10BASE-FX

Installation rules (continued)

Rule 2: for each technology, respect the following rules within the same collision domain (continued)

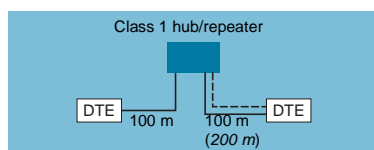
100BASE-TX/100BASE-FX

This Ethernet standard defines 2 classes of hubs (or repeaters):

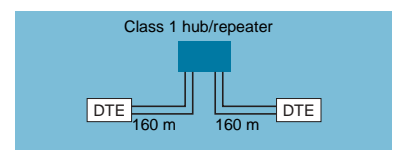
- Class 1 hubs: Maximum of 1 hub in a same collision domain.
- Class 2 hubs (for ConneXium repeaters): Maximum of 2 hubs in a same collision domain.

Examples:

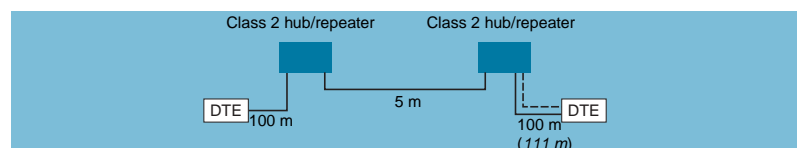
In the following 4 topologies, distances are usually given for the 100BASE-TX standard, with distances for the 100BASE-FX standard within parentheses.



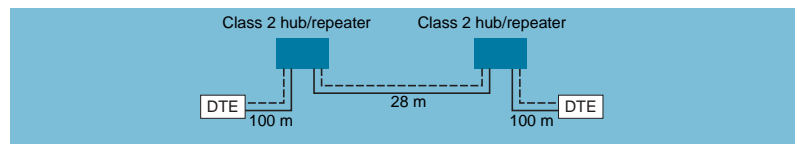
200 m max. in 100BASE-TX, 300 m in mixed



320 m max. in 100BASE-FX



205 m max. in 100BASE-TX, 216 m in mixed



228 m max. in 100BASE-FX

Architectures with several collision domains

Switched devices enable the limits of the above-described architectures to be increased. Switches are used for communicating between 2 or more collision domains. Communication for the upper layers is guaranteed among the different ports and collisions at the link layer level are not propagated (filtering).

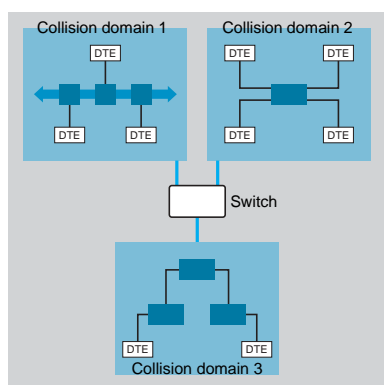
Switches are “plug and play” devices that can be remotely administered via SNMP or HTTP. They essentially contribute 2 functions:

- Extension of the architecture to surpass the “maximum network diameter”.
- Improvement of performance by a better allocation of bandwidth due to reduction in collisions and network load. In addition, switches in the ConneXium range support multicast filtering via the standard GARP/GMRP protocol, which optimizes performances of the Global Data service. With these products, multicast frames are transmitted only on switch ports where stations subscribing to the Global Data service are connected. ConneXium switches also support the Faulty Device Replacement (FDR) service, as well as the Transparent Ready private MIB for managing devices via the SNMP network management protocol.

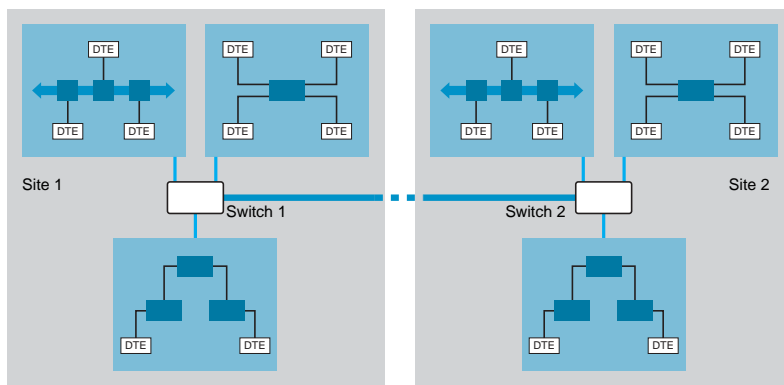
Rule 3: to be respected when switches are used

- Switches are DTE devices that can be connected to hubs or directly connected to devices. Rules 1 and 2, mentioned previously, thus apply.
 - When 2 switches are connected, the line can be in Full Duplex, which removes the risk of collisions and allows the effective data rate to be doubled. The rules related to the collision domain thus do not apply, and only those imposed by the physical limits should be observed.
- For example, 2 switches may be connected on their 100BASE-FX ports via a fiber optic cable 3,000 m in length.

Examples:



Switch used to isolate several collision domains (reduction of the network load in order to improve performance).



Switches used to extend the architecture to provide a link between 2 buildings, for example.

Maximum distances:

- 100BASE-TX: 100 m between 2 switches.
- 100BASE-FX: 2,000 m between 2 switches, 3,000 m with ConneXium switches and up to 40 km using monomode optical fiber (outside supply).

Routers

In general, routers are used at the Enterprise's network level, in order to link different units or sites. They are sometimes associated with security functions such as firewalls for filtering remote access.

A router must be configured to enable it to recognize where messages must be routed. Routing mechanisms are based on the IP address. Stations are grouped on the same subnet according to their IP addresses and their subnet mask.

Every message addressed to a remote network will be transmitted to the router, which ensures routing to the correct destination.

All of our Ethernet modules can be configured with a default gateway address and a subnet mask, complying with the IP standard.

On the factory floor level, a switch is less expensive than a router, performs better, and is easier to install ("plug and play").

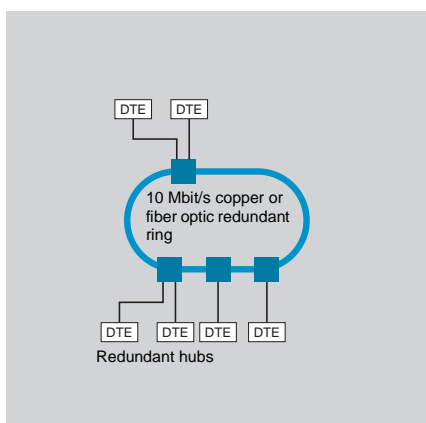
Redundancy

The architectures previously described can be created to have greater availability by using hubs or specific switches, linked to redundant copper or fiber optic rings. If the ring is broken, communication is seamlessly restored in less than 500 ms. These products are available with the possibility to create a redundant power supply.

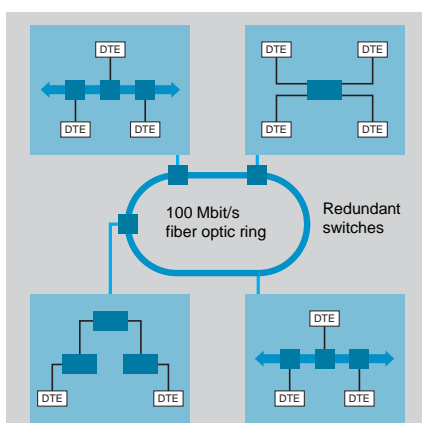
Associated with the Warm or Hot Standby offers, they guarantee maximum availability of the automation installations.

The various possible redundant topologies are:

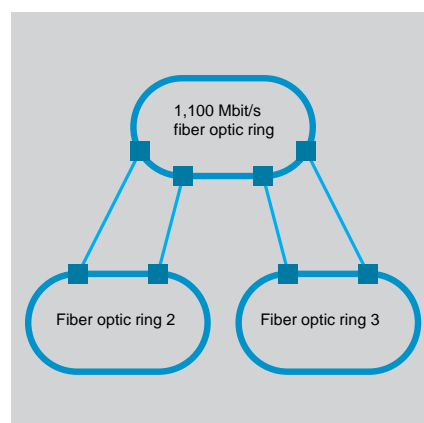
- 1 10 Mbit/s copper or fiber optic redundant ring topology, with redundant hubs.
- 2 100 Mbit/s fiber optic ring redundant topology with redundant switches: maximum commutation time from the "normal" line to the "emergency" line of 500 ms for a redundant ring with 50 switches.
- 3 100 Mbit/s redundant fiber optic multiple ring topology with redundant switches: maximum commutation time from the "normal" line to the "emergency" line of 500 ms.



1



2

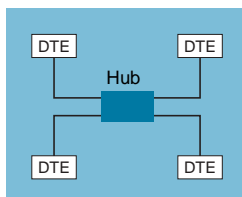


3

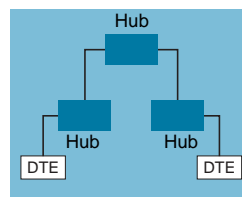
Presentation

Hubs (or concentrators) are used for transmitting signals between several media (ports). Hubs are "plug and play" devices that do not need any configuration. The use of hubs (or concentrators) makes it possible to create the following topologies:

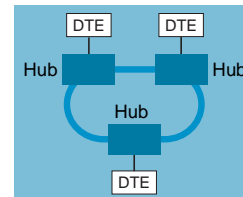
- Star topology using hubs.
 - Tree topology using hubs.
- See "Cabling system" page 5/35.



Star topology



Tree topology



Ring topology
(with 499 NOH 105 10)

Characteristics and references

Transparent
Ready.



Hubs					
Interfaces	Copper cable ports	Number and type	4 x 10BASE-T ports	4 x 100BASE-TX ports	3 x 10BASE-T ports
		Shielded connectors	RJ45		
		Medium	Shielded twisted pair		
		Line length	100 m		
	Optical fiber ports	Number and type	–		
		Connectors	–		
		Medium	–		
		Line length	–		
		Optical budget	–		
	Topology	Number of cascaded hubs	4 max.	2 max.	4 max.
Number of hubs in a ring		–			
Redundancy	P1 and P2 redundant power supplies			P1 and P2 redundant power supplies, redundant optical ring	
Power supply	Voltage	— 24 V (18...32 V), safety extra low voltage (SELV)			
	Power consumption	80 mA (130 max. at — 24 V)	210 mA (270 max. at — 24 V)	160 mA (350 max. at — 24 V)	
	Removable terminal	5-pin			
Operating temperature		0...+ 60 °C (32...140 °F)			
Relative humidity		10...95% non condensing			
Degree of protection		IP30	IP20		
Dimensions W x H x D		mm (in)	40 x 125 x 80 (1.57 x 4.92 x 3.14)	47 x 135 x 111 (3.15 x 5.51 x 3.35)	80 x 140 x 85 (1.85 x 5.31 x 4.37)
Weight		kg (lbs)	0.530 (1.17)	0.240 (0.53)	0.900 kg
Conformity to standards			cUL 60950, UL 508 and CSA 142, UL 1604 and CSA 213 Class 1 Division 2, C€, GL		
			FM 3810, FM 3611 Class 1 Division 2	–	FM 3810, FM 3611 Class 1 Division 2
LED indicators			Power, activity, link	Power, activity, link, error	Power, activity, link, collision
Alarm contact			Power supply failure, permanent fault in hub, faulty link status of TP port (volt-free contact 1 A max. under — 24 V)		
Reference			499 NEH 104 10	499 NEH 111 00	499 NOH 105 10

(1) Depends on the optical budget and fiber attenuation.

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready
ConneXium transceivers

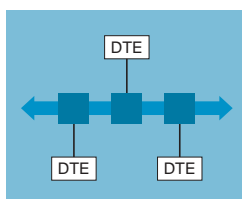
Presentation

The use of ConneXium transceivers makes it possible to perform the following:

- Creation of linear fiber optic bus topologies, for products with twisted pair cable Ethernet connection.
- Interfacing products with twisted pair cable Ethernet connection with fiber optic cable.

Transceivers are “plug and play” devices that do not need any configuration. See “Cabling system” page 5/35.

ConneXium transceivers provide fiber optic connections for transmission in areas subject to interference (high levels of electromagnetic interference) and for long distance communications.



Linear topology on optical fiber

Characteristics and references

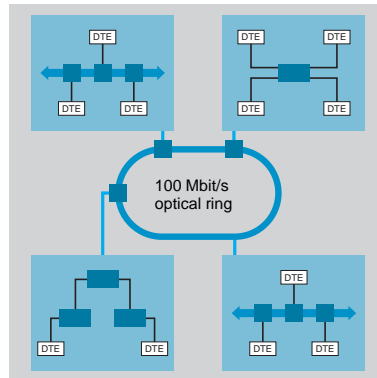
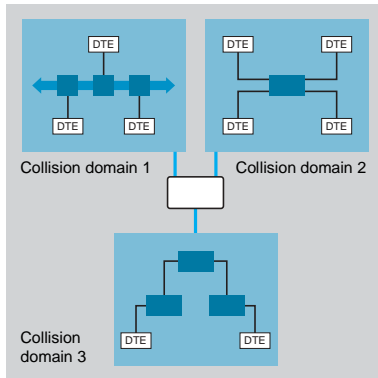
Transparent
Ready



Transceivers					
Interfaces	Copper cable port	Number and type	1 x 10BASE-T port		1 x 100BASE-TX port
		Shielded connectors	RJ45		
		Medium	Shielded twisted pair		
		Line length	100 m (328 ft)		
	Optical fiber ports	Number and type	1 x 10BASE-FL port		1 x 100BASE-FX port
		Connectors	ST (BFOC)		SC
		Medium	Multimode optical fiber		
		Line length	3100 m (10 170 ft) (1)		
	Signal attenuation	11.5 dB with 50/125 µm fiber 11.5 dB with 62.5/125 µm fiber		8 dB with 50/125 µm fiber 11 dB with 62.5/125 µm fiber	
Redundancy		P1 and P2 redundant power supplies			
Power supply	Voltage	--- 24 V (18...32), safety extra low voltage (SELV)			
	Power consumption	80 mA (100 max. at --- 24 V)		160 mA (190 max. at --- 24 V)	
	Removable terminal	5-pin			
Operating temperature		0...+ 60 °C (32...140 °F)			
Relative humidity		10...95% non condensing			
Degree of protection		IP30		IP20	
Dimensions W x H x D		mm (in)	40 x 134 x 80 (1.57 x 5.47 x 3.14)	47 x 135 x 111 (3.15 x 5.51 x 3.35)	
Weight		kg (lbs)	0.520 (1.15)	0.230 (0.50)	
Conformity to standards		cUL 60950, UL 508 and CSA 142, UL 1604 and CSA 213 Class 1 Division 2, C€, GL			
		FM 3810, FM 3611 Class 1 Division 2		–	
LED indicators		P1 and P2 power supplies, Ethernet link/port status			
Alarm contact		Power supply failure, permanent fault in hub, faulty link status of TP port (volt-free contact 1 A max. under --- 24 V)			
Reference		499 NTR 100 10		499 NTR 101 00	

(1) Depends on the optical budget and fiber attenuation.

Presentation



Switches (see “Cabling system” page 5/38) 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 pass band due to the reduction of collisions and the network load. Certain Connexium switches also enable redundant architectures to be created on twisted pair copper or fiber optic ring. Switches are “plug & play” devices that do not need any configuration. They can also be administered remotely via the SNMP or HTTP protocols for monitoring and diagnostics purposes.

Characteristics and references



Switches			Unmanaged basic	Shielded twisted pair and optical fiber, unmanaged				
Interfaces	Copper cable ports	Number and type	5 x 10BASE-T/ 100BASE-TX ports	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					
		Max. distances	100 m (328 ft)					
	Optical fiber 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 fiber			Monomode fiber	
		Fiber length	—	3100 m (10 170 ft) (1)			15 000 m (49 210 ft) (1)	
		Optical budget	—	8 dB with 50/125 µm fiber			16 dB with 10/125 µm fiber	
Topology	Number of switches	Cascaded	—					
		Redundant in a ring	—					
Power supply redundancy			—	P1 and P2 redundant power supplies				
Power supply	Voltage		— 24 V (19.2...30 V)	— 24 V (18...32 V), safety extra low voltage (SELV)				
	Power consumption		100 mA (120 max.)	5.4 W	5.9 W	5.4 W	5.9 W	
	Removable terminals		3-pin	5-pin				
Operating temperature			0...+ 60°C (32...140 °F)					
Relative humidity			10...95% non condensing	Max. 95% non condensing				
Degree of protection			IP20					
Dimensions W x H x D		mm (in)	75.2 x 143 x 43 (2.96 x 5.63 x 1.69)	47 x 135 x 111 (3.15 x 5.51 x 3.35)				
Weight		kg (lbs)	0.190 (0.42)	0.330 (0.72)	0.335 (0.74)	0.330 (0.72)	0.335 (0.74)	
Conformity to standards			UL508, CSA 1010, EN 61131-2	cUL 60950, UL 508 and CSA 142, UL 1604 and CSA 213 Class 1 Division 2, C€, GL				
LED indicators			Power supply, ETH link status, 10/100 Mbps	P1 and P2 power supplies, Ethernet link status, transmission activity				
Alarm contact			Power supply failure, permanent fault in hub, faulty link status of TP port (volt-free contact 1 A max. under — 24 V)					
Reference			499 NES 251 00	499 NMS 251 01	499 NMS 251 02	499 NSS 251 01	499 NSS 251 02	

▲ Available later

(1) Depends on the optical budget and fiber attenuation.

Characteristics and references (continued)

Transparent
Ready



Switches			Unmanaged, copper	Managed, copper	Managed, copper + fiber	
Interfaces	Copper cable ports	Number and type	8 x 10BASE-T/ 100BASE-TX ports	5 x 10BASE-T/ 100BASE-TX ports 2 x 100BASE-TX ports	5 x 10BASE-T/100BASE-TX ports	
		Shielded connectors	RJ45			
		Medium	Shielded twisted pair			
		Max. distances	100 m (328 ft)			
	Optical fiber ports	Number and type	–			2 x 100BASE-FX ports
		Connectors	–			SC
		Medium	–			Multi mode optical fiber
		Fiber length	–			3100 m (10 170 ft) ⁽¹⁾
		Optical budget	–			8 dB with 50/125 µm fiber ⁽²⁾ 11 dB with 62.5/125 µm fiber
	Ethernet services		–	FDR client, multicast filtering for optimization of the Global Data protocol ⁽³⁾		
	Topology	Number of switches	Cascaded	–	2 max.	
		Redundant in a ring	–	50 max.		
Redundancy			P1 and P2 redundant power supplies			
Power supply	Voltage		— 18...32 V, safety extra low voltage (SELV)			
	Power consumption		125 mA (290 max.)	7.5 W	9 W	
	Removable terminals		5-pin			
Operating temperature			0...+ 60°C	0...+ 55°C		
Relative humidity			10...95% non condensing			
Degree of protection			IP20			
Dimensions W x H x D		mm (in)	47 x 135 x 111 (3.15 x 5.51 x 3.35)	110 x 131 x 111 mm (4.33 x 5.16 x 4.37)		
Weight		kg (lbs)	0.230 (0.72)	0.460 (1.00)		
Conformity to standards			cUL 60950, UL 508 and CSA 14, UL 1604 and CSA 213 Class 1 Division 2, C€, GL			
LED indicators			P1 and P2 power supplies, Ethernet link status,	P1 and P2 power supplies, Ethernet link status, redundancy management		
Alarm contact			Power supply failure, permanent fault in hub, faulty link status of TP port (volt-free contact 1 A max. under — 24 V)			
Reference			499 NES 181 00	499 NES 171 00	499 NOS 171 00	

(1) Depends on the optical fiber budgt and fiber attenuation.

(2) Or 11 dB with 32.5/125 µm fiber.

(3) With for 499 NES 271 00 : VLAN, Portpriority, IGMP Snooping, SNTP, SNMP V2e and V3, RSTP (Rapid Spanning Tree Protocol).

Modicon Quantum automation platform

Ethernet TCP/IP network, Transparent Ready ConneXium gateways

Presentation

ConneXium communication gateways are used for interconnecting the following:

- Modbus/Ethernet TCP/IP
- Modbus Plus/Ethernet TCP/IP

by providing multiple ports to adapt to the different architectures.

Characteristics and references

Transparent
Ready



Gateways				
Functions	Communication gateway	Ethernet/Modbus serial link		Ethernet/Modbus Plus
	Interface for programming	Ethernet/Modbus		Ethernet
	Standard Ethernet TCP/IP communication services	Modbus TCP messaging SNMP Agent		Modbus TCP messaging SNMP Agent
	Modbus SL (RS 232/RS 485 serial link)	RTU/ASCII frame Data rate 0.3 K...115.2 Kbps		—
	Modbus Plus (RS 485 network)	—		Token bus, HDLC synchronous mode Data rate 1 Mbps
	Configuration	Local or remote by Telnet in hyper terminal mode		Local using DOS
Interfaces	Ethernet TCP/IP port	Type	1 x 10BASE-T/100BASE-TX	1 x 10BASE-T 1 x 10BASE2 1 x 10BASE5
		Shielded connectors	RJ45	RJ45, BNC and AUI
		Medium	Shielded twisted pair	RJ45
	Serial port	Max. distances	100 m (327 ft)	1 x 10BASE-T/100BASE-TX
		Type	1 x Modbus SL	1 x Modbus Plus
		Shielded connectors	RJ45	9-way SUB-D connector
Power supply	Voltage	9...30 V, 9...24 V		~ 110/220 V (~ 93.5 V...242 V), 47...63 Hz
	Power consumption	3 W		1 A
Operating temperature		0...+ 60°C		0...+ 50°C
Relative humidity		20...90% non condensing		10...95% non condensing
Degree of protection		IP20		
Dimensions W x H x D		mm (in)	35 x 95 x 60 (1.38 x 3.74 x 2.36)	122 x 229 x 248 (4.80 x 9.0 x 9.80)
Weight		kg (lbs)	0.500 (1.10)	4.260 (9.40)
Conformity to standards		UL, CSA, FM 3611 Class 1 Division 2		UL 508, CSA 142, C€
LED indicators		Activity, status, diagnostics		Power
Reference		174 CEV 300 20		174 CEV 200 30
				174 CEV 200 40 ▲

▲ Available later

(1) Local with additional keyboard and monitor, via a dedicated screen for basic diagnostic and configuration. Remote, via intuitive Web pages for full configuration and diagnostic.

Presentation

ConneXium shielded connection cables are available in two versions to meet current standards and approvals:

■ Standard EIA/TIA 568 shielded twisted pair cables:
These cables conform to the EIA/TIA-568 standard, category 5, IEC 11801/EN 50173 class D. Their fire behavior conforms to NFC 32070# class C2 and IEC 322/1, Low Smoke Zero Halogen (LSZH).

■ UL and CSA 22.1 approved shielded twisted pair cables:
These cables are UL and CSA 22.1 approved. Their fire resistance conforms to NFPA 70.

References

Standard EIA/TIA 568 shielded twisted pair cables

Description	Pre-equipped at both ends	Length m (ft)	Reference	Weight kg
Straight-through shielded twisted pair cables	2 RJ45 connectors For connection to terminal devices (DTE)	2 (6.56)	490 NTW 000 02	—
		5 (16.4)	490 NTW 000 05	—
		12 (39.4)	490 NTW 000 12	—
		40 (131.2)	490 NTW 000 40	—
		80 (262.5)	490 NTW 000 80	—

Description	Pre-equipped at both ends	Length m (ft)	Reference	Weight kg
Crossed cord shielded twisted pair cables	2 RJ45 connectors For connections between hubs, switches and transceivers	5 (16.4)	490 NTC 000 05	—
		15 (49.2)	490 NTC 000 05	—
		40 (131.2)	490 NTC 000 40	—
		80 (262.5)	490 NTC 000 80	—

UL and CSA 22.1 approved shielded twisted pair cables

Description	Pre-equipped at both ends	Length m (ft)	Reference	Weight kg
Straight-through shielded twisted pair cables	2 RJ45 connectors For connection to terminal devices (DTE)	2 (6.56)	490 NTW 000 02U	—
		5 (16.4)	490 NTW 000 05U	—
		12 (39.4)	490 NTW 000 12U	—
		40 (131.2)	490 NTW 000 40U	—
		80 (262.5)	490 NTW 000 80U	—

Description	Pre-equipped at both ends	Length m (ft)	Reference	Weight kg
Crossed cord shielded twisted pair cables	2 RJ45 connectors For connections between hubs, switches and transceivers	5 (16.4)	490 NTC 000 05U	—
		15 (49.2)	490 NTC 000 05U	—
		40 (131.2)	490 NTC 000 40U	—
		80 (262.5)	490 NTC 000 80U	—

Fiber optic cables

Description	Pre-equipped at both ends	Length m (ft)	Reference	Weight kg
Glass fiber optic cables for terminal devices (DTE) to hubs, switches and transceivers	1 SC connector and 1 MT-RJ connector	5 (16.4)	490 NOC 000 05	—
		5 (16.4)	490 NOT 000 05	—
	1 ST (BFOC) connector and 1 MT-RJ connector	5 (16.4)	490 NOT 000 05	—
		5 (16.4)	490 NOR 000 05	—



490 NT● 000 ●●



490 NOC 000 05



490 NOT 000 05



490 NOR 000 05

Presentation

The actuator sensor Interface (AS-Interface) is used in low-level automation systems as a digital replacement for conventional parallel wiring. This digital serial interface is comprised of a single, unshielded two-wire cable permitting communications to field-level devices (sensors and actuators) with internal intelligence. The technology is compatible with any fieldbus or device network including CAN, Profibus, Interbus, FIP, LON, RS 485 and RS 232.

The 140 EIA 921 00 Quantum AS-Interface module is a single-slot module with one AS-Interface channel per module. The Quantum I/O map interface makes the module useable in local, remote and distributed Quantum I/O drops. This module supports immediate I/O servicing from Quantum CPU for high speed applications such as grain handling, conveyors, press control, weld control, and PC board manufacture.

Network media and topology

AS-Interface uses an unshielded 2-wire cable for data and energy. The protocol is based on a master/slave hierarchy and allows up to 31 slave devices to be connected on a single network. This bus operates up to 100 meters, although additional distances can be achieved through the use of repeaters. AS-Interface is less complex than many of the other open digital communication protocols in the market, since it is tailored to the needs of the devices such as actuators and sensors where connection cost is of greater importance than complexity of the data to be handled.

The topology of the AS-Interface bus is totally flexible and can be adapted to users' requirements (point-to-point, line, and tree structure topology). In all cases, the total length of all the branches of the bus must not exceed 100 meters without using repeaters.

The AS-Interface cable is a two-wire link on which communication and power are transmitted to the connected devices. It is not necessary for the link to be twisted, and the wire cross-section can be 2 X 0.75 mm², 2 X 1.5 mm², or 2 X 2.5 mm², depending on the current consumption of the devices.

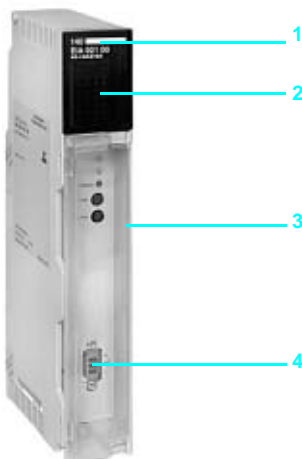
Benefits of the Quantum AS-Interface module

- Useable with all Quantum CPUs.
- Module parameter setup through Unity Pro, Concept 2.5 and ProWORX 2.1.
- Quantum I/O map interface allows 4 modules per local drop, 4 per remote drop, and 2 per distributed I/O drop.
- Enhanced LED Matrix of 32 LEDs displays slave addresses and state of slave input/output bits.
- Hot swap function available without damage for all Quantum I/O racks.
- Protected against reverse polarity of AS-Interface bus inputs.
- Less commissioning time and increased diagnostic capability reduces the overall cost of an automated system.
- Automated device reconfiguration (addresses and parameters).

Description

The 140 EIA 921 00 AS-Interface bus module is comprised of the following:

- 1 Model number and color code.
- 2 LED indicators.
- 3 Removable clear hinged door.
- 4 AS-Interface bus communication port.



Characteristics

Model		140 EIA 921 00
AS-Interface bus		
AS-Interface version supported		1.0
AS-Interface master profile		M2
Maximum bus cycle time	ms	5
Maximum bus length	m	100
Maximum no. of I/O points		124 inputs et 124 outputs
Maximum no. of slaves on the bus		31
Nominal supply bus voltage	≡ V	30
AS-Interface scan time for "n" slaves	μs	156 x (n+2) if n < 31 slaves 156 x (n+1) if n = 31 slaves
Transmission rate	K bits/s	167 approx.
Quantum AS-Interface Module		
Number of modules per		4
Local drop		4
Remote drop		4
Distribute drop		2
Bus current consumption at 30 V	mA	60 typical, 100 max.
Degree of protection		IP 20
Polarity reversal protection		Yes
Operating temperature	°C (°F)	0...+ 60 (+ 32...+ 140)
Agency approvals		UL, CSA, cE

References



140 EIA 921 00

Description	Protocol and profile	Reference	Weight kg (lb)
Quantum AS-Interface master module	AS-Interface M2	140 EIA 921 00	0.450 (0.990)
AS-Interface bus master – module user guide		840 USE 117 01	–

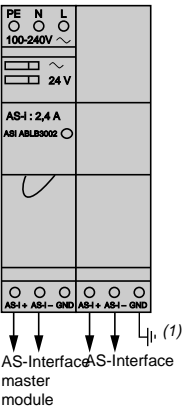


Modicon Quantum automation platform

Phaseo regulated switch mode power supplies for AS-Interface

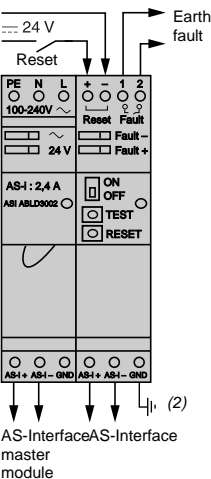
Power supplies for AS-Interface

Consistent with the standard Phaseo line, the range of ASI ABL power supplies is designed to deliver a d.c. voltage, as required by networks operating under the AS-Interface protocol. 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 ABLB300●

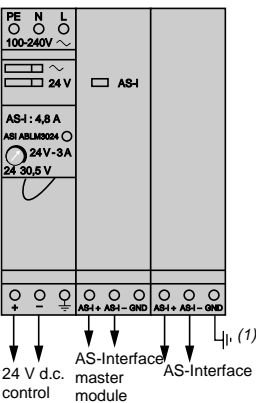
Operating on a 100 to 240 V a.c. supply, this power supply delivers a voltage of 30 V d.c. Available in 2.4 and 4.8 A ratings, the parallel output terminal blocks allow the bus to be connected separately to the slaves and the master. Input and output LEDs allow fast and continuous diagnostics.



■ ASI ABLD300●

Operating on a 100 to 240 V a.c. supply, this power supply delivers a voltage of 30 V d.c. Available in 2.4 and 4.8 A ratings, it allows diagnosis and management of earth faults on AS-Interface networks. In the event of an earth fault, the Phaseo power supply trips out, thus stopping dialogue on the bus. Restarting is only possible after deliberate acknowledgement of the fault. Two I/O are provided, which may be used to monitor status. The parallel output terminal blocks are used to connect the bus separately to the slaves and the AS-Interface master. Input, output and fault LED's allow fast and continuous diagnostics.

Warning: the earth (GND) (2) connection must be made. In the event of disconnection, the built-in detector becomes inoperative. To obtain earth connection diagnostics, it is recommended that an ASI ABLB300● power supply be used together with insulation relay RMO PAS 101.



■ ASI ABLM3024

Operating on a 100 to 240 V a.c. supply, this product delivers two d.c. outputs which are totally independent in the way they operate.

Two output voltages - 30 V d.c./2.4 A (AS-Interface supply) and 24 V d.c./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.

(1) Recommended connection.

(2) Compulsory connection.

Technical characteristics

Type of power supply		ASI ABLB3002	ASI ABLB3004	ASI ABLD3002	ASI ABLD3004	ASI ABLM3024	
Functions		Supply to the AS-Interface system					24 V --- supply
Product certifications		UL 508, CSA 22-2 n° 950					
Conforming to standards	Safety	EN 60950, TÜV					
	EMC	EN 50081-1, IEC 61000-6-2, EN 55022 class B					
	Low frequency harmonic currents	No					

Input circuit

LED indication		Orange LED					
Input voltage	Rated values	V	~ 100...240				
	Permissible values	V	~ 85...264				
	Permissible frequencies	Hz	47...63				
	Efficiency at nominal load	%	> 83				
	Current consumption		0.5	1	0.5	1	> 80
	Current at switch-on	A	< 30				
	Power factor		> 0.65				

Output circuit

LED indication		Green LED					
Nominal output voltage		V	--- 30 (AS-Interface)				
Nominal output current		A	2.4	4.8	2.4	4.8	2.4
Precision	Adjustable output voltage	V	---				
	Line and load regulation		3 %				
	Residual ripple - interference	mV	300 - 50				
Micro-breaks	Holding time for I max and Ve min	ms	10				
Protection	Short-circuit		Permanent/automatic restart after elimination of the fault				
	Overload		1.1 In				
	Overvoltage		Tripping if U > 1.2 Un				
	Undervoltage		Tripping if U < 0.95 Un				

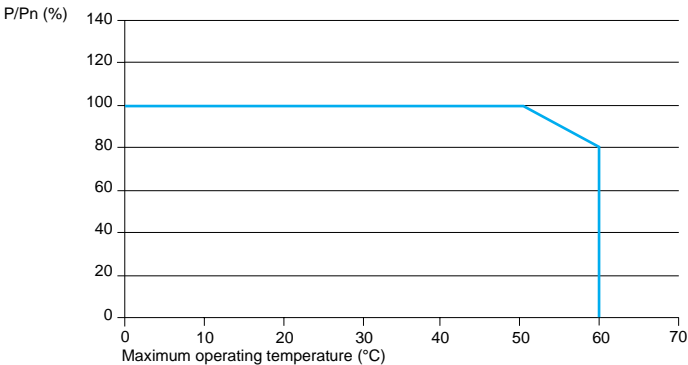
Operating characteristics

Connections	Input	mm ²	2 x 2.5 screw terminals + earth				
	Output	mm ²	2 x 2.5 screw terminals + earth, multiple output				
Environment	Storage temperature	°C	- 25 to + 70				
	Operating temperature	°C	0 to + 60 (derating from 50)				
	Maximum relative humidity		95 % (without condensation or dripping water)				
	Degree of protection		IP 20 (conforming to IEC 529)				
	Vibration		EN 61131-2				
Operating position			Vertical				
MTBF		h	> 100000 (conforming to Bell core, at 40 °C)				
Dielectric strength	Input/output		3000 V/50 Hz/1 mm				
	Input/earth		3000 V/50 Hz/1 mm				
	Output/earth (and input/output)		500 V/50 Hz/1 mm				
Input fuse incorporated			Yes (not interchangeable)				
Emissions	Conducted/radiated		Class B (conforming to EN 55022)				
Immunity	Electrostatic discharge		EN 61000-4-2 (4 kV contact/8 kV air)				
	Electromagnetic		EN 61000-4-3 level 3 (10 V/m)				
	Conducted interference		EN 61000-4-4 level 3 (2 kV), EN 61000-4-6 (10 V)				
	Mains interference		EN 61000-4-11				

Output 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 graph below shows the power (in relation to the nominal power) which the power supply can deliver continuously, according to the ambient temperature.



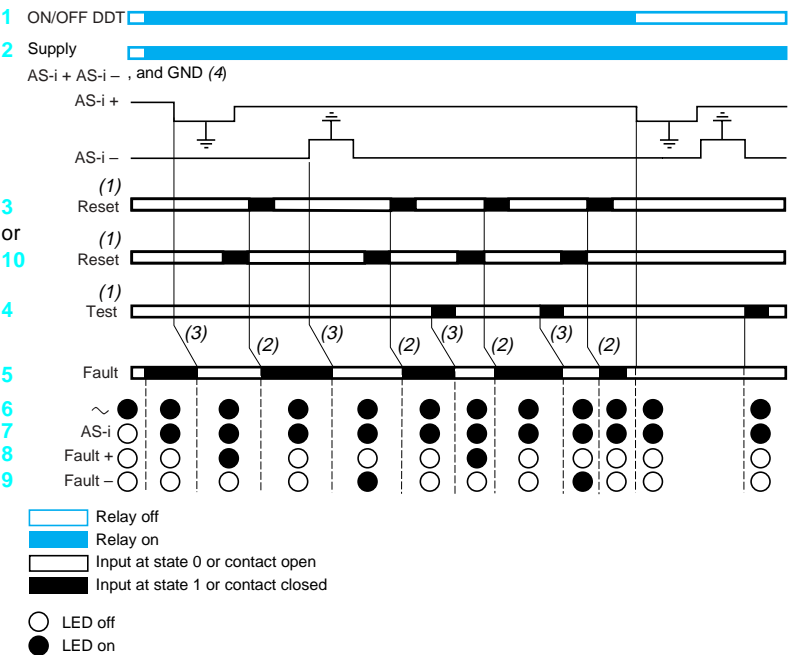
Selection

Upstream protection of power supplies for use on the AS-Interface system

Mains supply	~ 115 V single-phase		~ 230 V single-phase	
Type of protection	Thermal-magnetic circuit-breaker	Gg fuse	Thermal-magnetic circuit-breaker	Gg fuse
Single-pole	GB2 CB●●		GB2 DB●● C60N	
2-pole	GB2 DB●● C60N		GB2 DB●● C60N	
ASI ABLB3002	GB2 ●B07	MG24517 (1) 2 A	GB2 DB06	MG24516 (1) 2 A
ASI ABLB3004	GB2 ●B08	MG24518 (1) 4 A	GB2 DB07	MG17453 (1) 2 A
ASI ABLD3002	GB2 ●B07	MG24517 (1) 2 A	GB2 DB06	MG24516 (1) 2 A
ASI ABLD3004	GB2 ●B08	MG24518 (1) 4 A	GB2 DB07	MG17453 (1) 2 A
ASI ABLM3024	GB2 ●B07	MG24517 (1) 2 A	GB2 DB06	MG17453 (1) 2 A

(1) UL certified circuit-breaker.

Function diagram



(1) 30 ms min.

(2) 15 ms.

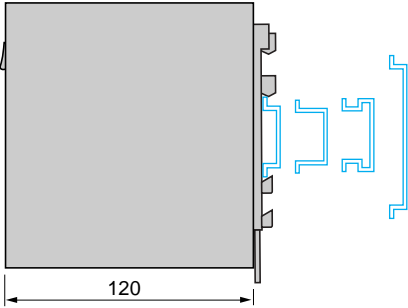
(3) 20 ms.

(4) Warning: the earth fault detector will only operate if the earth (GND) terminal is connected.

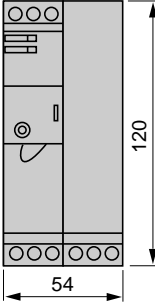
ASI ABL regulated switch mode power supplies								
Mains input voltage 47...63 Hz	Output voltage	Nominal power	Nominal current	Auto-protect reset	Earth fault detection	Reference	Weight	
V	== V	W	A				kg	
100...240 single-phase wide range	30	72	2.4	auto	no	ASI ABLB3002	0.800	
		145	4.8	auto	no	ASI ABLB3004	1.300	
		72	2.4	auto	yes	ASI ABLD3002	0.800	
		145	4.8	auto	yes	ASI ABLD3004	1.300	
	30 + 24		2 x 72	2.4 + 3	auto	no	ASI ABLM3024	1.300

Dimensions

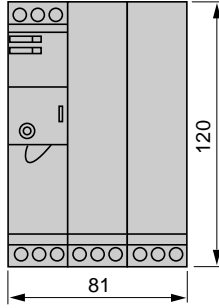
Common side view
Mounting on 35 and 75 mm rails



ASI ABLB3002
ASI ABLD3002

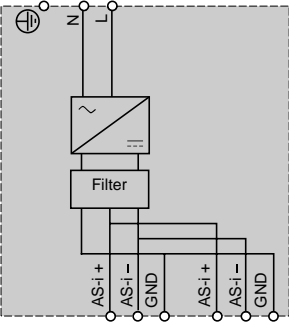


ASI ABLM3024
ASI ABL3004

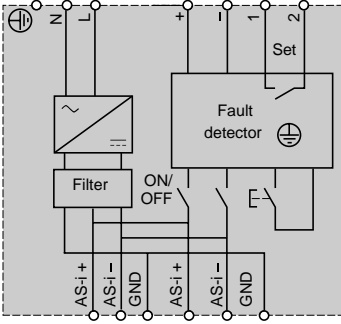


Schemes

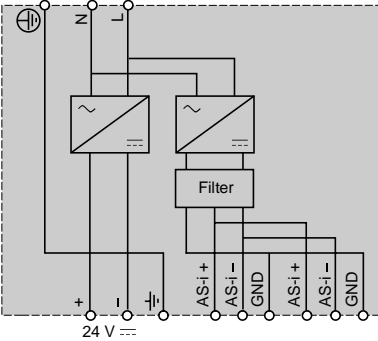
ASI ABLB300



ASI ABLD300



ASI ABLM3024



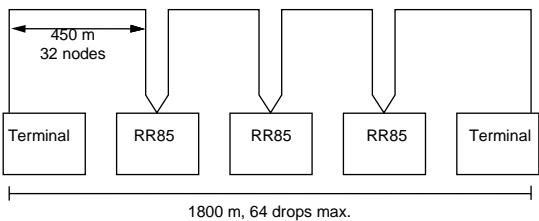
Presentation

All Quantum CPUs contain a Modbus Plus port. Modbus Plus combines high-speed peer-to-peer communication with easy implementation to simplify data sharing by nodes across a network. It is a local area network that facilitates communications between CPUs, host computers and other data sources via twisted-pair cable or optional fiber optic cable. Communications happen at up to 1 Mbaud.

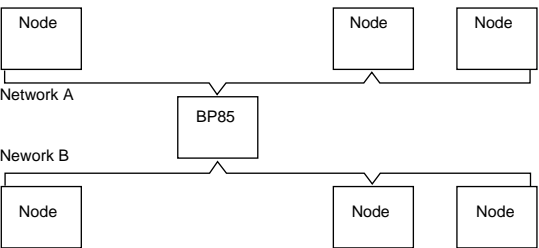
Typical applications include interlocking on control networks, data acquisition, uploading/downloading software, remote on-line programming, connecting to operator interfaces and host computer data collection. Modbus Plus is able to handle communications for real-time control devices like I/O and drives, and its performance is not degraded due to loading or traffic.

Topology

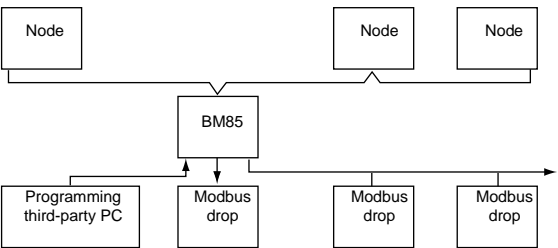
A standard Modbus Plus network based on twisted-pair cable supports up to 32 peer processors and can communicate over distances up to 450 m. If an applications requires more drops or longer distances, an RR85 Modbus Plus repeater between network links allows 64 addresses and a distances up to 900 m. As many as three repeaters can be used, supporting distances of up to 1800 m. The maximum number of network addresses support is 64.



If an application requires more than 64 drops, a BP85 Modbus Plus gateway can be used to connect two Modbus Plus networks. Bridge devices allow many small networks to be connected in order to achieve maximum performance.



If your application requires that a Modbus device, such as a programming panel, operator interface or third-party computer, needs access to data from a Modbus Plus network, you can accomplish this with a BM85 Modbus Plus bridge/MUX. The BM85 offers four Modbus-compatible serial RS232 ports, which allow Modbus master or Modbus slave devices to tie into a Modbus Plus network. The bridge/MUX connections enable data exchange between the Modbus devices as well as over the Modbus Plus network.



Presentation (continued)

Your application program can initiate event-driven communications and integrate network diagnostics using either the MSTR ladder logic instruction or an equivalent IEC 1131 function. A host computer can implement Modbus Plus with NetBioscompatible software libraries that are called from the host application program.

Appropriate libraries are provided for each host computer interface, which are offered for all major platforms and operating systems.

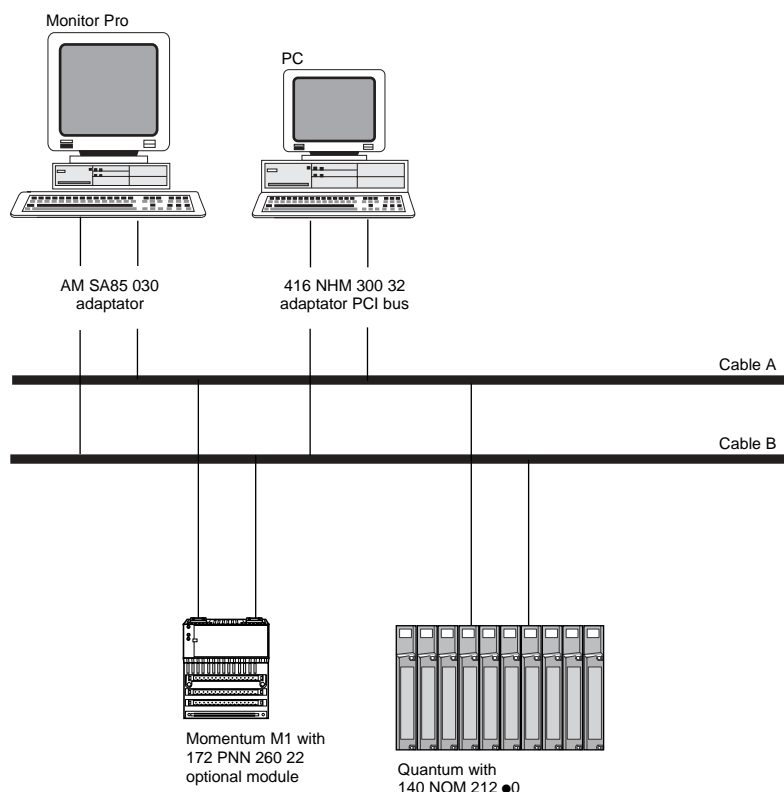
Installation

Modbus Plus is a self-establishing network that establishes communication over inexpensive twisted-pair cables. It is a genuinely plug-and-play network. Modbus Plus connectivity is available across many Modicon controller families, with additional connectivity provided through our ModConnect Partners program. Modbus Plus delivers up to 20 000 registers/second in a predictable, deterministic manner. Special features include global data and a peer-to-peer data table for easy setup and initialization.

Dagnostic programs and visual LED indicators help you troubleshoot the network.

Redundant cables

For high-availability applications, Schneider Automation offers a series of Modbus Plus network components and options for redundant operation. Redundant cabling enables Modbus Plus communication over two independent cable systems, with cable health being checked and validated on every message transfer. If one cable fails, the system automatically switches to the other cable. The defective cable is identified in the network statistics. If, for any reason, a cable stops functioning, the network continues operation on the second cable while the defective cable is being repaired.



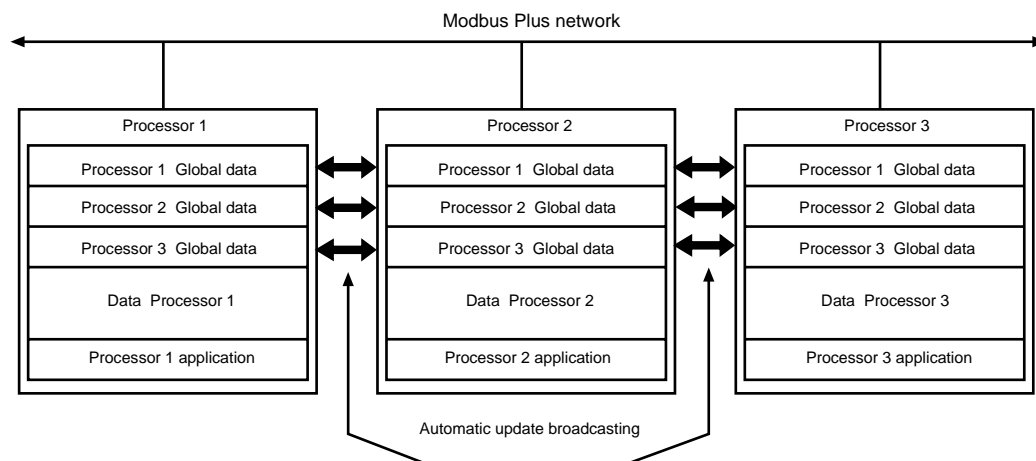
Global data

Global data allows you to share global variables across a Modbus Plus network of programmable logic controllers. It is an easy way for CPUs to keep track of process-sensitive information, and because the global database is broadcast, updating of global information happens extremely fast.

Each CPU has as many as 32 registers of global data; Modbus Plus nodes can support 2048 registers (32 registers x 64 CPUs) of global data. Each of up to 64 CPUs on the network is responsible for updating its own 32 registers of global data using an MSTR instruction. Each CPU also has the ability to read the 32 global registers from all the other CPUs on the network. When a CPU updates its global data, this information is broadcast automatically to all other CPUs on the network. Each receiving controller collects the new global data and stores it in its network interface memory. A CPU looking to read another peer's global data is actually pulling the information out of its own network interface.

Global data works only within a single layer of the Modbus Plus network. It cannot be transmitted through a NW BM85 C00● bridge MUX or NW BPBP85 002 bridge plus device.

Global data structure



Peer Cop

Peer cop is a software utility in Modsoft and Concept that enables you to define point-to-point data transactions between a CPU and other nodes across a Modbus Plus network. Peer cop uses defined data references (such as discretes or registers) as sources and destinations. A block of registers could constitute the data source for the transmitting node, and another block of registers could be the destination for the receiving device. A maximum of 32 words can be addressed in a CPU via peer cop, where a 16-point discrete module equals one word.

Peer cop offers two methods of data transaction—global and specific. Because all Modbus Plus nodes monitor the network, any one device can extract the data addressed specifically to it. Likewise, all nodes can extract global data. Peer cop enables the Modbus Plus device currently holding the token to direct specific data to individual nodes and broadcast global data to all nodes as part of its token frame. Each sending node can specify unique references as data sources, and each receiving node can specify the same or different references as data definitions. 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 happen quickly as part of the token rotation and can be directly mapped between data references in the sending and receiving nodes.

Network and data security are obtained with the CPU's write-protect feature. You can configure sections of references within the CPU as read-only so that those references cannot be corrupted over the network.

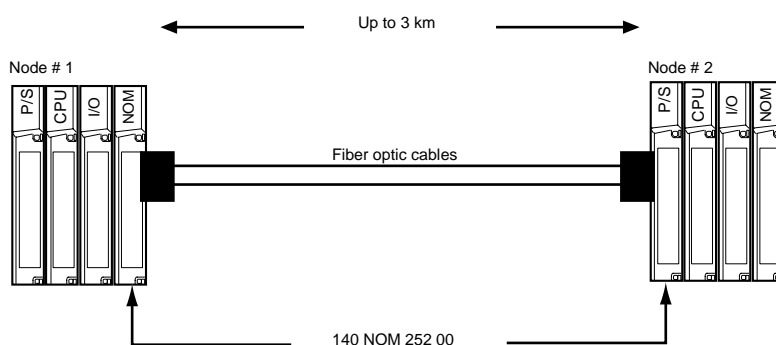
Peer cop, like global data, works only within a single layer of the Modbus Plus network.

Fiber optic network

Optional fiber optic cabling is available for a Modbus Plus network. With fiber optics, the total length of the network can be increased to as much as 3 km. The fiber optic medium provides intrinsically safe links, which may be required in certain hazardous environments. Fiber 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.

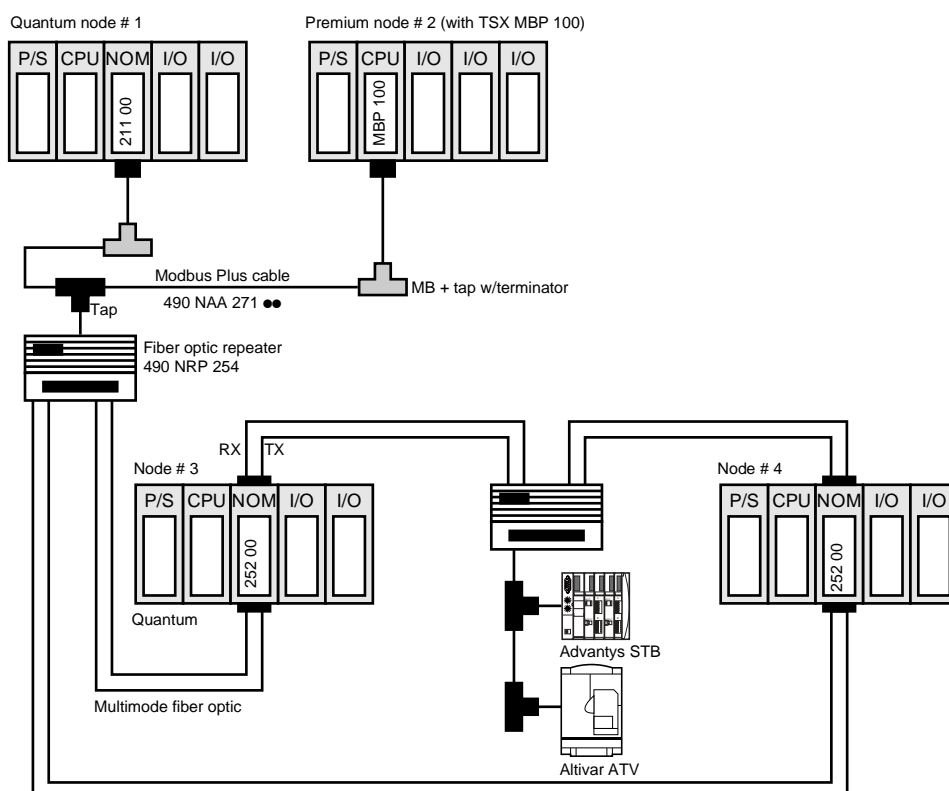
A point-to-point configuration

A point-to-point link between CPUs on a Modbus Plus network allows safe communications in a harsh environment over distances up to 3 km.



A self-healing ring

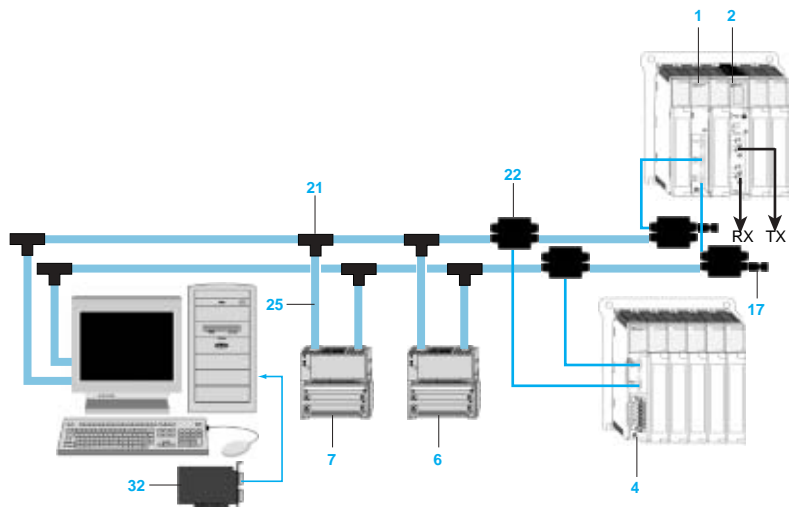
You can create a self-healing ring in a mixed fiber/twisted pair network by connecting the unused fiber optic ports of the first and last 140 NOM 252 00 modules, either directly or through the fiber optic repeater. This type of configuration maintains all the advantages previously described including built-in redundancy. A broken connection between any two Quantum modules in the ring will automatically reconfigure the network to the bus configuration and continue communicating.



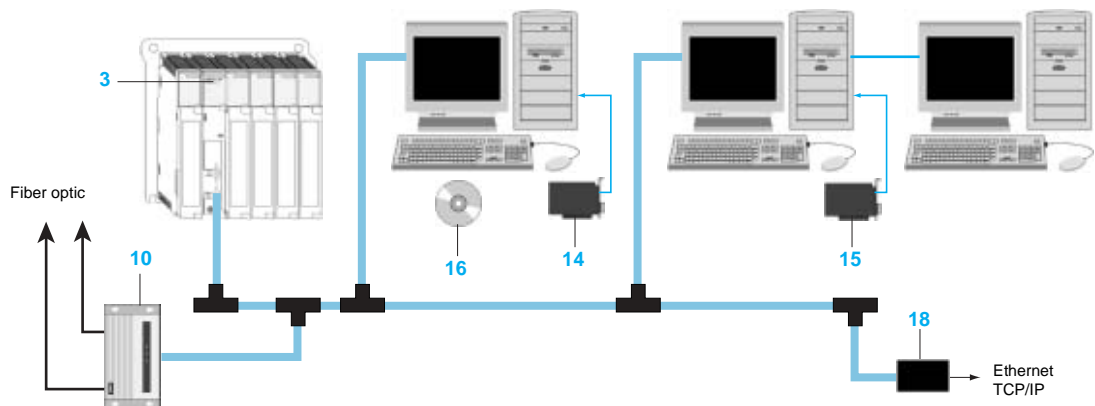
Modicon Quantum automation platform

Modbus Plus network

Quantum redundant Modbus Plus network



Network with PC cards for Modbus Plus

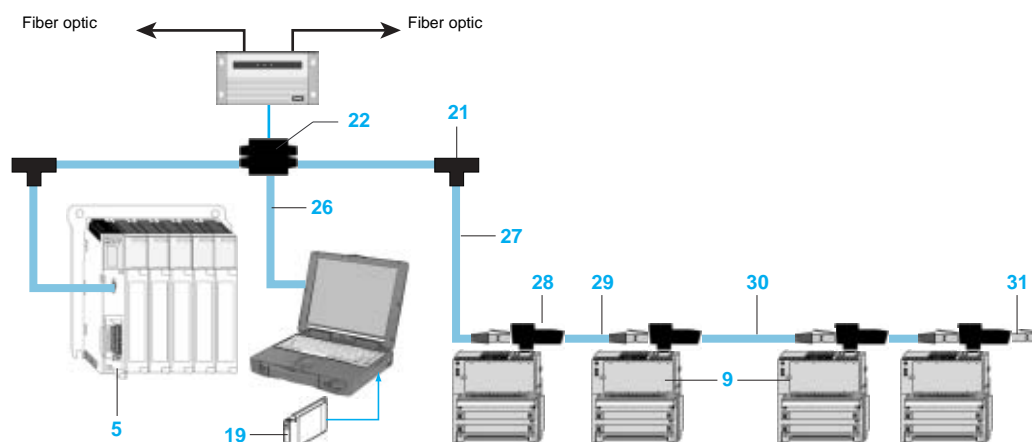


- 1 **140 NOM 212 00**: Quantum Modbus Plus Head-end Interface, redundant support, twisted pair cable.
- 2 **140 NOM 252 00**: Quantum Modbus Plus Head-end Interface, single-cable support, fiber optic cable (TX/RX).
- 3 **140 CPU**: Quantum Modbus Plus Head-end Interface, single-cable support, twisted pair cable.
- 4 **140 CRA 212 10**: Quantum Modbus Plus Drop Interface and power supply, redundant support, 115/230 VAC.
- 5 **140 CRA 211 10**: Quantum Modbus Plus Drop Interface and power supply, single-cable support, 115/230 VAC.
- 6 **170 PNT 160 20**: Momentum Modbus Plus Communication Adapter, redundant network, IEC support.
- 7 **170 NEF 160 21**: Momentum Modbus Plus Communication Adapter, redundant network, 984 support.
- 8 **170 NEF 110 21**: Momentum Modbus Plus Communication Adapter, non-redundant network, 984 support.
- 9 **170 PNT 110 20**: Momentum Modbus Plus Communication Adapter, non-redundant network, IEC support.
- 10 **490 NRP 254 00**: Modbus Plus Repeater, line/drop, fiber optic support.
- 11 **490 NRP 253 00**: Modbus Plus Repeater, point-to-point, fiber optic support.
- 12 **NW-BM85C-002**: Modbus Plus Bridge/Multiplexer, panel or shelf mount, 4 Modbus Plus ports.
- 13 **NW-RR85-001**: Modbus Plus Repeater, coaxial cable.
- 14 **AM-SA85-030**: Modbus Plus ISA PC Adapter Card, single port.
- 15 **416 NHM 300 30**: Modbus Plus PCI PC Adapter Card, single port.
- 16 **SW-MXDS-001**: Modbus Plus Driver Suite.

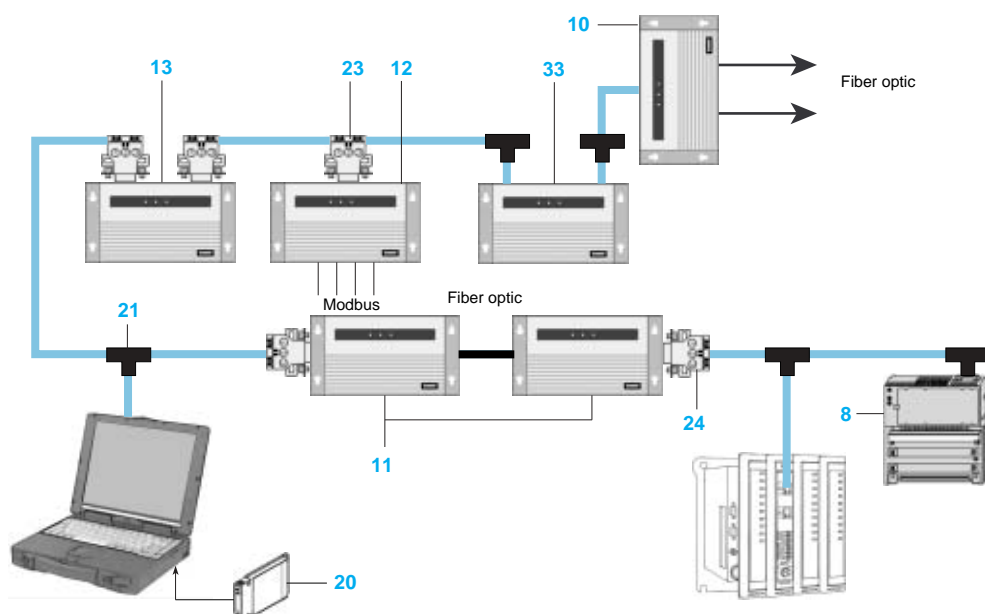
Modicon Quantum automation platform

Modbus Plus network

Modbus Plus network for Quantum and Momentum



Modbus Plus bridges, repeaters and taps



17 990 NAD 230 11: Modbus Plus Ruggedized Tap Terminators.

18 74 CEV 300 20: Modbus Plus-to-Ethernet Bridge.

19 16 NHM 212 33: Modbus Plus Type III PCMCIA Card, single port.

20 416 NHM 212 34: Modbus Plus Type III PCMCIA Card, single port with Plug-and-Play capability.

21 990 NAD 230 00: Modbus Plus Tap, IP20.

22 990 NAD 230 10: Modbus Plus Tap, IP65.

23 AS-MBKT-085: AS-MBKT-085 Modbus Plus Inline Connector.

24 AS-MBKT-185: AS-MBKT-185 Modbus Plus Terminating Connector.

25 990 NAD 211 10: Modbus Plus Drop Cable, 2.4 m (8 ft).

26 990 NAD 215 10: Plus Ruggedized Tap Programming Cable, 3.05 m (10 ft).

27 170 MCI 021 20: Modbus Plus RJ45 cable, 3.05 m (10 ft).

28 170 XTS 020 00: Modbus Plus "T" Connector (DB9 base).

29 170 MCI 020 10: Modbus Plus RS 485 cable, 25 cm (10 in).

30 170 MCI 020 80: Modbus Plus RJ45 cable, double-ended, 10 m (30 ft).

31 170 XTS 021 00: Modbus Plus RJ45 Terminator.

32 416 NHM 300 32: Modbus Plus PCI PC Adapter Card, dual ports.

33 NW-BP85-002: Modbus Plus Bridge Plus, 4 Modbus Plus ports.

Modicon Quantum automation platform

Modbus Plus network

References

Modbus Plus bridges and repeaters

Description	Supply	Support	No and type of ports	Rep.	Reference	Weight kg(lb)
Modbus Plus Bridge multiplexer	~ 115/220 V or --- 24 V	Panel or shelf	2 Modbus Plus 4 RS 232 Modbus	12	NW BM85C002	—
	~ 115/220 V	Rack-mount	1 Modbus Plus 4 RS 232 Modbus	—	NW BM85000	—
	--- 24 V or --- 115V	Rack-mount 19"	2 Modbus Plus 4 RS 232 Modbus	—	NW BM85D008	—
Modbus Plus programmable bridge/multiplexers	~ 115/220 V or --- 24 V	Panel or shelf	2 Modbus Plus 4 RS 232	—	NW BM85S232	—
			2 Modbus Plus 4 RS 485	—	NW BM85S485	—
Modbus Plus bridge Plus	~ 115/220 V or --- 24 V	Panel or shelf	4 Modbus Plus	33	NW BP85 002	—
Modbus Plus repeater		Coaxial cable		13	NW RR85 001	—
Point-to-point		Fiber optic/copper		11	490 NRP 253 00	—
Line/drop		Fiber optic/copper		10	490 NRP 254 00	—

Modbus Plus communication devices (1)

Description		Support	Type	Rep.	Reference	Weight kg(lb)
Quantum Modbus Plus	Drop interface and power supply	Single- cable	~ 115/230	5	140 CRA 211 10	—
			--- 24	—	140 CRA 211 20	—
		Redundant	~ 115/230	4	140 CRA 212 10	—
			--- 24	—	140 CRA 212 20	—
	Quantum CPU Head-end interface n#1	Single- cable	—	3	140 CPU (2)	—
	Head-end interface n#2 and n#3	Single- cable	Twisted pair cable	—	140 NOM 211 00	—
		Redundant	Twisted pair cable	1	140 NOM 212 00	—
		Single- cable	Fiber optic cable	2	140 NOM 252 00	—
Momentum Modbus Plus	Communica- tion adapter	Non redundant	IEC support	9	170 PNT 110 20	—
		Network	984 support	8	170 NEF 110 21	—
		Redundant	984 support	6	170 PNT 160 20	—
		Network	984 support	7	170 NEF 160 21	—

PC Interface Kits

Description	Sold by lot of	Rep.	Reference	Weight kg(lb)
Modbus Plus ISA PC Adapter Card	1	14	AM SA85 030	—
	2	—	AM SA85 032	—
Modbus Plus PCI PC Adapter Card	1	15	416 NHM 300 30	—
	2	32	416 NHM 300 32	—
Modbus Plus Type II PCMCIA Card	1	—	416 NHM 212 30	—
Modbus Plus Type III PCMCIA Card	1	19	416 NHM 212 33	—
Modbus Plus Type III PnP PCMCIA Card	1	20	416 NHM 212 34	—

(1) Other devices: TSX Micro/Premium, Advantys STB, ... see our catalogues.

(2) See pages 1/9 and 1/17.

Modicon Quantum automation platform

Modbus Plus network

References (continued)

Cables

Description	Lenght in m (ft)	Rep.	Reference	Weight kg (lb)
Standard Modbus Plus Cable	30.5 (100)	—	490 NAA 271 01	—
	152.5 (500)	—	490 NAA 271 02	—
	305 (1000)	—	490 NAA 271 03	—
	457 (1500)	—	490 NAA 271 04	—
	1525 (5000)	—	490 NAA 271 06	—
Modbus Plus Drop Cable	2.4 (8)	25	990 NAD 211 10	—
	6 (20)	—	990 NAD 211 30	—
Modbus Plus Ruggedized Tap Programming Cable	3.05 (10)	26	990 NAA 215 10	—
Modbus Plus RS 485 cable	25 cm (10 in)	29	170 MCI 020 10	—
	1 (3)	—	170 MCI 020 36	—
Modbus Plus RS 485 master Communication Cable (RJ45/RJ45)	0.3 (1)	—	170 MCI 041 10	—
Modbus Plus RJ45 cable	3 (10)	27	170 MCI 021 20	—
Modbus Plus RJ45 cable, double-ended	3 (10)	—	170 MCI 021 80	—
	10 (30)	30	170 MCI 020 80	—
Cable (RJ45/RJ45)	1 (3)	—	110 XCA 282 01	—
	3 (10)	—	110 XCA 282 02	—
	6 (20)	—	110 XCA 282 03	—

Wiring accessories

Description	Type	Rep.	Reference	Weight kg (lb)
Field Power Connector	IP 20 rated	—	140 XTS 005 00	—
Modbus Plus D-shell Adapter for AT serial port	RJ45 to 9-pin, adapter for AT serial port	—	110 XCA 203 00	—
Modbus Plus D-shell Adapter for XT serial port	RJ45 to 25-pin D shell adapter for XT serial port	—	110 XCA 204 00	—

Cable tools

Description	Rep.	Reference	Weight kg (lb)
Modbus Plus network cable installation tool	—	AS MBPL 001	—
RJ crimping tool	—	170 XTS 023 00	—
Ground Clamp	—	424 244 739	—

Connectors

Description	Sold by lot of	Rep.	Reference	Weight kg (lb)
Modbus Plus inline	1 per kit	23	AS MBKT 085	—
Modbus Plus "T" connector (DB9 base)	2 per kit	24	AS MBKT 185	—
RJ 45 terminator	1	28	170 XTS 020 00	—
RS 485 (DB9 base) cable connector "T" for RJ 45	2 per kit	31	170 XTS 021 00	—
RJ 45 shielded connectors	—	—	170 XTS 040 00	—
RS 485 (RJ485) cable connector "T" for RJ 45	20 per kit	—	170 XTS 022 00	—
RS 485 multi-master RJ 45 shunt plugs	1	—	170 XTS 041 00	—
Modbus Plus "T" connector (DB9 base)	2	—	170 XTS 042 00	—

Taps

Description	Sold by lot of	Rep.	Reference	Weight kg (lb)
Modbus Plus tap, IP 20	1	21	990 NAD 230 00	—
Modbus Plus ruggedized tap, IP 65	1	22	990 NAD 230 10	—
Modbus Plus ruggedized tap terminators	2 per kit	17	990 NAD 230 11	—
Modbus Plus ruggedized tap DIN rail mounting bracket assembly	1	—	990 NAD 230 12	—
Modbus Plus lightning arrester	1	—	490 NAC 721 00	—

Presentation

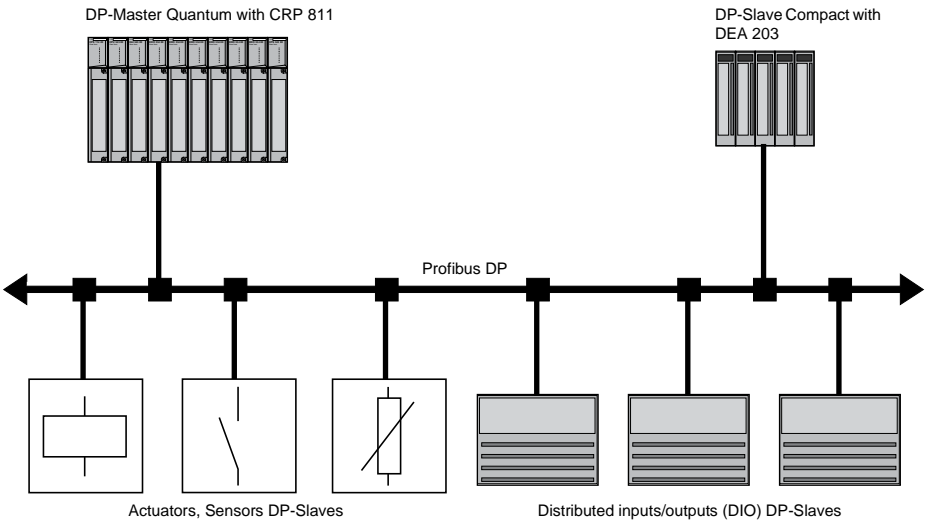
Profibus DP

Profibus DP (Distributed Process Periphery) is an enhanced, high-speed fieldbus which conforms to industrial communication requirements. Profibus DP combines two media access methods:

- The decentralized method, which uses the token-passing principle.
- The centralized method, which uses the master-slave principle.

Only master stations, called "active stations" have access rights to the bus. The slave, or "passive station", can only respond to prompts.

Profibus DP is an optimum alternative to cost-intensive parallel signal transfers at 24 V and measurement value transfers in 4 (0...20 mA) technology. It is designed for fast data exchange at sensor/actuator level. The physical connection is single-shielded twisted-pair cable, but fiber optic interfaces are available to create tree, star, or ring structures.



Description

The 140 CRP 811 00 Profibus DP module front panel comprises:

- 1 Model number and color code
- 2 LED array
- 3 RS 232C port
- 4 PCMCIA card with Profibus DP protocol (467 NHP 911)

The Profibus modules include a tap connection (490 NAE 911 00) off the main bus. This tap can be placed at distances of up to 20 cm on a DIN rail.



Characteristics			
Module type		140 CRP 811 00	
Profibus		DP VO	
LEDs		Active (green), Ready (green), Fault (red), Backplane (green), Profibus (green), DP S/R (green), FMS S/R (green) – not used, Load (yellow)	
Number of Quantum CRP modules		Dependent on CPU design and other communication modules (see CPU)	
Update time with 32 slaves (per 16 input bits, 16 output bits)		ms	12
Configuration software		Sycon SYS SPU LF● CD28M	
Data interface	Profibus	RS 485 for bus connection	
	RS 232C	Per DIN 66020, 19.2 Kbps non-isolated for configuration tool	
	RS 232C cable length	m	3 max. (shielded)
Power output		W	6.5
Compatibility	CPUs	All Quantum CPUs compatible with Concept/ProWORX	
	Software	Concept version ≥ 2.2, ProWORX Nxt version ≥ 2.0, ProWORX 32 version ≥ 1.0 SR1	
References			

Profibus DP module (1)

Description	Reference	Weight kg
Profibus DP VO communication module including Tap (490 NAE 911 00) and PCMCIA card (467 NHP 811 00)	140 CRP 811 00	–

Accessories

Description	Type of device	Reference	Weight kg
Sycon configuration software	Single (1 station)	SYS SPU LFU CD28M	–
	Group (3 stations)	SYS SPU LFG CD28M	–
	Team (10 stations)	SYS SPU LFT CD28M	–
	Site (>10 stations)	SYS SPU LFF CD28M	–

Description	Length (m)	Reference	Weight kg
Profibus cables	100	TSX PBS CA100	–
	400	TSX PBS CA400	–
	By the meter	KAB PROFIB	–

RS 232 programming cables	3.7	990 NAA 263 20	–
	15.5	990 NAA 263 50	–

Description	Type	Color	Reference	Weight kg
Profibus connectors	Line termination	Yellow	490 NAD 911 03	–
	In-line connector	Gray	490 NAD 911 04	–
	In-line connector and terminal port	Gray	490 NAD 911 05	–

Replacement parts

Description	Reference	Weight kg
Main bus tap	490 NAE 911 00	–
PCMCIA card	467 NHP 811 00	–

(1) Profibus DP V1 module, compatible with Unity Pro V2.0, Concept V2.6, ProWORX NT V ≥ 2.0 and ProWORX 32 ≥ 1.0 software: reference PTQ DPP MV1 from our partner Prosoft, www.prosoft-technology.com.

Presentation

INTERBUS is a fieldbus, designed for distributing sensor and actuator devices in a master/slave topology. The I/O slaves are serviced in a deterministic manner over a twisted-pair network. INTERBUS is best suited for talking to groups of I/O rather than individual I/O points. As such, INTERBUS slaves are typically available in 8, 16 or 32-channel blocks.

In the Quantum Automation Series, two INTERBUS master modules are available – 140 NOA 611 10 (generation 3) and 140 NOA 622 00 (generation 4). These Quantum INTERBUS masters can control Momentum slave devices (with INTERBUS communication module), as well as third-party products designed to operate on the fieldbus. Over 300 industrial vendors provide INTERBUS-compatible products, assuring open, cost-effective and wide-ranging connectivity.

The Quantum INTERBUS master modules interface with up to 4096 input and output points distributed over as many as 512 slave devices on the fieldbus. The INTERBUS data rate is 500 kbps, with data transferred to the Quantum CPU for logic processing on every scan. Up to three INTERBUS master modules can be supported in a local Quantum backplane.

INTERBUS products use the remote bus technique, which enables data transfers over 12.8 km (8 miles) across all 512 devices.

Electrical voltage levels on the Quantum remote bus are RS-485, with full-duplex mode communications. INTERBUS command words are pre-programmed in the INTERBUS master module. This is an INTERBUS standard that supports 16-function programmability. Four pre-programmed bits are defined:

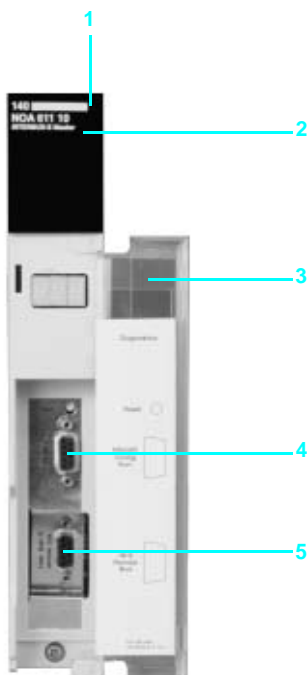
- Startup with configuration check
- Start network
- Stop network
- Clear display

An additional INTERBUS feature provided in the Quantum master is the peripheral communications protocol (PCP), which supports limited data communications to intelligent devices. PCP version 1.5 allows word communications to intelligent slaves, for advanced functions such as drive setup, parameterization or non-I/O data transfer. Many third-party slave devices available today do not support PCP capability, but it is supported in the Quantum master modules.

Description

The 140 NOA 611 10/622 00 INTERBUS module front panels comprise:

- 1 Model number and color code
- 2 LED array consisting of:
 - R (green) Ready. The firmware is running correctly and the module is ready for service.
 - Active (green). Communication with the Quantum CPU is active.
 - F (red). Fault on the module.
 - IB-S Run (green). The INTERBUS is functioning normally and carrying data.
 - BS Off (yellow). One or more bus segments are shut down.
 - Master (red). Processor fault. Fault on the INTERBUS processor, or the communication processor has failed.
 - RBUS (red). Remote bus fault. The remote bus has been diagnosed as defective.
 - LBUS (red). Peripheral bus fault. The peripheral bus has been diagnosed as defective.
 - Slave (red). An INTERBUS node has reported a (module) fault.
 - DEA202 (red). Initialization fault with the DEA 202.
 - Memory (red). Memory fault.
 - Start Up (red). The INTERBUS master is not operational.
- 3 Removable, hinged door and customer identification label.
- 4 RS 232C port.
- 5 INTERBUS port.



Loadable software

The 140 NOA 611 00 INTERBUS generation 3 module requires a loadable driver called ULEX, an intelligent module driver that provides 256 input data registers and 256 output data registers per logic scan. One ULEX instruction can support up to three 140 NOA 611 10 modules. ULEX is provided with the Quantum INTERBUS user manual (840 USE 419 00) (in English).

The Quantum INTERBUS master module can take advantage of various software packages for full-feature performance. PCP communications utilize two other 984 Ladder Logic loadable instructions – ICNT and ICOM. ICNT establishes a connection link to a slave device; ICOM communicates with the slave device.

The 140 NOA 622 00 generation 4 INTERBUS module is configured with SYCON software, reference SYC SPU LF●CD28M (sold separately).

Characteristics

Module type		140 NOA 611 10	140 NOA 622 00
INTERBUS compatibility		Generation 3	Generation 4
Type		INTERBUS master, PCP V1.5	INTERBUS master, PCP V2.0
Data interface	INTERBUS	RS 485, isolated (test voltage 500 V)	
	RS 232C	Per DIN 66.020, non-isolated for configuration tool	
	Cable length	m	20 maximum (shielded)
	Data transfer frequency	Kbps	500
Memory	RAM	bytes	256 K + 32 for data; 2 K dual-port RAM; 64 K multi-port RAM
	EPROM	bytes	128 K + 256 K firmware
	EEPROM	bytes	64 K INTERBUS command sequence
Bus current required		mA	800
Max. number of modules in INTERBUS local rack		3	2 with 140 CPU 113 03 6 with 140 CPU 434 12A and CPU 534 14A
Rack type		Local	
Power dissipation		W	4
Compatibility	CPUs	All CPUs, version 2.0 or higher, except the 140 CPU 113 02	140 CPU 113 03 140 CPU 434 12A or 140 CPU 534 14A
	Software	Concept version 2.1 or higher, ProWORX NxT version 2.0 or higher, ProWORX 32 version 1.0 SR1 or higher	Concept version 2.5 SR2 or higher
Approvals		C€, UL/CSA	C€, cUL

References

Description	Type	Reference	Weight kg
INTERBUS master module	Generation 3 (1)	140 NOA 611 10	0.900
	Generation 4 (2)	140 NOA 622 00	0.900
Connection accessories and documentation			
Description	Length	Reference	Weight kg
Preconnected cables	0.25 m	170 MCI 025 00	–
	1.00 m	170 MCI 100 01	–
Remote bus cables	100 m	TSX IBS CA 100	–
	400 m	TSX IBS CA 400	–
	By the meter	KAB 3225 LI	–
INTERBUS female/9-pin connector for remote bus cables	–	170 XTS 009 00	–
SYCON configuration software, single-user license for 140 NOA 622 00 module, compatible with Concept	–	SYS SPU LFU CD28M	–
RS 232 programming cables	3.7	990 NAA 263 20	–
	15.5	990 NAA 263 50	–
140 NOA 611 10 user manual	–	840 USE 419 00	–
140 NOA 622 00 user manual	–	840 USE 497 01	–

(1) Compatible with Concept/ProWORX programming software.

(2) Compatible with Concept programming software.

Presentation

The 140 ESI 062 10 asynchronous serial link module is a general-purpose ASCII interface 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 even devices communicating via a serial link, such as weigh scales, meters or other measurement 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 which will be sent down 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 internal data registers. Unlike transmission, the specifiers used on these reception message formats can be used to define the numerical base(s).

The Quantum controller application program communicates with the asynchronous serial link module via the mailbox registers. These registers submit commands to the module and translate the responses. The communication commands are processed by requesting transmission on one 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.

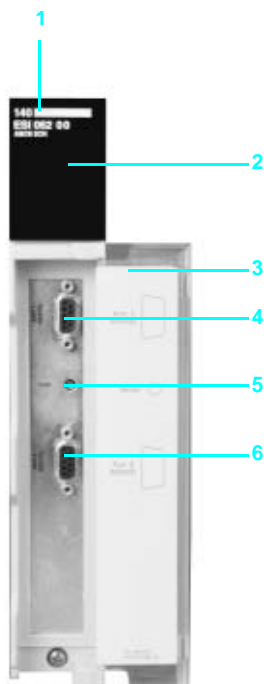
If the exchange mailboxes between the controller and the module are not large enough to carry all the application data required for a transaction, at the same time as the transmission and reception commands, additional commands (Get/Put) will be called on for exchanges between the controller database and the module internal registers.

Note: In LL984 programming mode, with Concept and ProWORX programming software, it is possible to call on an additional instruction (ESI), which is intended to simplify the management of data exchange sequences between the controller application and the asynchronous serial link module. This programming software also requires integration of special software (NSUP and ESI) during controller configuration (IEC Concept only uses ESI software). The ESI software is provided on floppy disk, supplied together with the asynchronous serial link module hardware reference guide.

Description

The 140 ESI 062 10 asynchronous serial link module front panel comprises:

- 1 Module number and color code
- 2 LED array
- 3 A removable, hinged door and customer identification label
- 4 A 9-pin SUB-D connector (RS 232C comm port 1)
- 5 A reset button
- 6 A 9-pin SUB-D connector (RS 232C comm port 2)



Characteristics			
Module type		140 ESI 062 10	
Data interface	Serial ports		2 RS 232C ports, per DIN 66020, non isolated, 9-pin SUB-D connector
	Burst speed	Kbps	19.2 each port
	Continuous speed		Application-dependent
	Cable	m	20 (shielded)
Firmware	Message nesting		8 levels
	Buffer size	bytes	255 I/255 Q
	Number of messages		255
	Message length	bytes	127 characters + 1 checksum max.
	Calendar clock		Hours/Minutes/Seconds Day of week/Month/Day of month/Year
Memory	RAM	Kb	32 (16 384 16-bit registers)
	Flash	Kb	128 (for firmware)
Backup in the event of power outage			Battery holder module 140 XCP 900 00
Power dissipation		W	2 max.
Bus current required		mA	300
Addressing requirement			12 input words and 12 output words
Compatibility	Software		Unity Pro version ≥ 2.0, ProWORX NxT version ≥ 2.0, ProWORX 32 or Concept ≥ 2.0
	Quantum CPU		Any type

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	
140 ESI 062 10 user manual (including loadable ESI for Concept and ProWORX software)	In English	840 USE 108 00	—	



6.1 - Unity software

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■ Unity Pro software

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- Software structure page 6/7
- IEC languages page 6/10
- Functions page 6/16
- References page 6/26

■ Unity EFB Toolkit software page 6/28

■ Unity SFC View software page 6/30

■ Unity Studio software suite

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■ Unity Application Generator (UAG)

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6.2 - Concept software

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■ Concept programming software

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■ Concept SFC View software page 6/56

■ Unity Application Generator (UAG)

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6.3 - ProWORX 32 software





■ ProWORX 32 programming software

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Unity Pro programming software



IEC 61131-3 languages	Instruction List (IL)	A - P	A - P - Q	A - P - Q
	Ladder (LD)	A - P	A - P - Q	A - P - Q
	Structured Text (ST)	A - P	A - P - Q	A - P - Q
	Function Block Diagram (FBD)	A - P	A - P - Q	A - P - Q
	Sequential Function Chart (SFC)/Grafcet	A - P	A - P - Q	A - P - Q
Programming services	Multitask programming (Master, fast and event-triggered)	A - P	A - P - Q	A - P - Q
	Multitask programming (Master, fast, auxiliary and event-triggered)			P (TSX P57 5●) - Q (140 CPU 651/671)
	Functional view and function modules	A - P	A - P - Q	A - P - Q
	DFB editor	A - P	A - P - Q	A - P - Q
	DDT compound data editor	A - P	A - P - Q	A - P - Q
	Data structure instances and tables	A - P	A - P - Q	A - P - Q
	Use of DFB instances	A - P	A - P - Q	A - P - Q
	EF function block libraries and EFB function blocks	A - P	A - P - Q	A - P - Q
	User-definable control loops	A (TSX PCI 2●) - P (TSX P57 2●)	A (TSX PCI 2●/3●) - P (TSX P57 2●/3●/4●)	P (TSX P57 2●/3●/4●/5●)
	Programmable control loops (with function block libraries)		P (TSX P57 4●) - Q	P (TSX P57 4●/5●) - Q
	Hot Standby PLC redundancy system			Q (140 CPU 67 160)
	System diagnostics	A - P	A - P - Q	A - P - Q
	Application diagnostics	A - P	A - P - Q	A - P - Q
	Diagnostics with location of error source	A - P	A - P - Q	A - P - Q
Debugging and display services	PLC simulator	A - P	A - P - Q	A - P - Q
	Hypertext link animations in graphic languages	A - P	A - P - Q	A - P - Q
	Step by step execution, breakpoint	A - P	A - P - Q	A - P - Q
	Watchpoint	A - P	A - P - Q	A - P - Q
	Runtime screens	A - P	A - P - Q	A - P - Q
	Diagnostic viewers	A - P	A - P - Q	A - P - Q
Other services	Creation of hyperlinks	A - P	A - P - Q	A - P - Q
	XML import/export	A - P	A - P - Q	A - P - Q
	Application converters (Concept, PL7)	A - P	A - P - Q	A - P - Q
	Utilities for updating PLC operating systems	A - P	A - P - Q	A - P - Q
	Communication drivers for Windows 2000/XP	A - P	A - P - Q	A - P - Q
Compatible Modicon platforms	Atrium slot-PLCs A	TSX PCI 204M	TSX PCI 204M	TSX PCI 204M
	Premium CPUs P	TSX P57 C● 0244/0244M TSX P57 104/1634/154M TSX P57 204/2634/254M	TSX PCI 354M TSX P57 C● 0244/0244M TSX P57 104/1634/154M TSX P57 204/2634/254M TSX P57 304/3634/354M TSX P57 4634/454M	TSX PCI 354M TSX P57 C● 0244/0244M TSX P57 104/1634/154M TSX P57 204/2634/254M TSX P57 304/3634/354M TSX P57 4634/454M TSX P57 5634/554M
	Quantum CPUs Q	—	140 CPU 311 10 140 CPU 434 12/534 14U	140 CPU 311 10 140 CPU 434 12/534 14U 140 CPU 651 50/60 140 CPU 671 60
Software name		Unity Pro Medium	Unity Pro Large	Unity Pro Extra Large
Unity Pro software type		UNY SPU MF● CD 20	UNY SPU LF● CD 20	UNY SPU EF● CD 20
Pages		6/27		

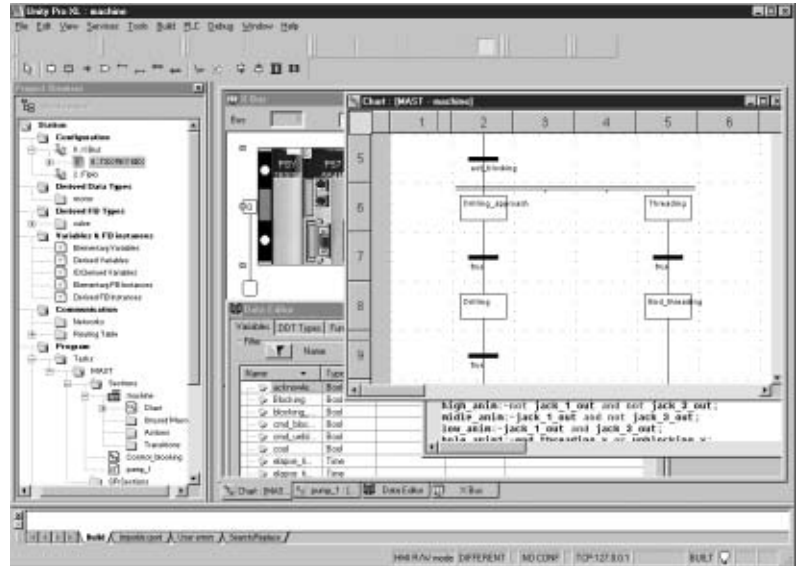
EF/EFB function development software in C language	"Collaborative Control" distributed project development software	Software for designing and generating batch/process applications	SFC View application diagnostic and monitoring software	Pack for developing specific solutions
				
<p>Enhancement of EF and EFB function block libraries:</p> <ul style="list-style-type: none"> □ Creation of families □ Development of functions in C language □ Access to all data and variable types □ Debugging functions (step by step, breakpoint) □ Use of functions created in all languages <p>Supplied with Microsoft Visual C++</p>	<p>Software suite for managing distributed and multi-application projects:</p> <ul style="list-style-type: none"> □ Used for developing and structuring control system applications in a "Collaborative Automation" environment □ Ensures consistency when synchronizing applications on Ethernet □ Based on the MS Visio 2003 graphic software, the software suite includes: <ul style="list-style-type: none"> □ Unity Studio Manager □ Unity Pro XL □ OFS (communication) □ PowerSuite (drives and motor starters) □ XBT-L1000 (user interface) □ VBA (<i>Visual Basic for Applications</i>) 	<p>UAG specialist software for designing and generating batch/process applications in a "Collaborative Automation" environment. It provides the unique project database:</p> <ul style="list-style-type: none"> □ process and control (PLCs) □ HMI user interface (Magellis) □ SCADA supervision (Monitor Pro V7.2) <p>Based around re-usable objects (PID, valves, etc) and complying with standard ISA S88, UAG generates the PLC code and the elements required for the HMI system. Complies with the GAMP standard (<i>Good Automation Manufacturing Practice</i>)</p>	<p>ActiveX control component for monitoring and diagnostics of chart status (SFC or Grafcet) in sequential applications:</p> <ul style="list-style-type: none"> □ Overview of charts and detailed views □ Can be integrated in human/machine interface (HMI) applications □ Access to PLC data via OFS (<i>OPC Factory Server</i>) <p>Includes EFB function block library for Unity Pro</p>	<p>Specialist software for developing made-to-order solutions (for example interfaces with an electrical CAD system, automatic application generator, etc):</p> <ul style="list-style-type: none"> □ Access to Unity Pro object servers □ Reserved for IT development engineers using Visual Basic or C++ <p>UDE software only supplied after signature of a specific contract with Schneider Electric</p>
<p>Compatible with:</p> <ul style="list-style-type: none"> □ Unity Pro Medium, Large and Extra Large □ All Atrium slot-PLCs □ All Premium Unity CPUs □ All Quantum Unity CPUs 	<p>Compatible with:</p> <ul style="list-style-type: none"> □ Unity Pro Medium, Large and Extra Large □ All Atrium slot-PLCs □ All Premium Unity CPUs □ All Quantum Unity CPUs 	<p>Compatible with:</p> <ul style="list-style-type: none"> □ Unity Pro Large and Extra Large □ TSX P57 4634/454M and TSX P57 5634/554M Premium Unity CPUs □ All Quantum Unity CPUs 	<p>Compatible with:</p> <ul style="list-style-type: none"> □ Unity Pro Medium, Large and Extra Large □ All Atrium slot-PLCs □ All Premium Unity CPUs □ All Quantum Unity CPUs 	<p>Compatible with:</p> <ul style="list-style-type: none"> □ Unity Pro Medium, Large and Extra Large □ All Atrium slot-PLCs □ All Premium Unity CPUs □ All Quantum Unity CPUs
Unity EFB Toolkit	Unity Studio	Unity Application Generator UAG Medium/Large	Unity SFC View	Unity Developer's Edition
UNY SPU ZFU CD20E	UNY SEW ●F	UNY SEW ●F● CD21	UNY SDU MF● CD20	Please consult your Regional Sales Office
6/27	6/27	6/47	6/33	6/26

Modicon Quantum automation platform

Unity Pro software

User interface

Unity Pro's welcome screen provides access to all available tools in a user-friendly format that has been redesigned on the basis of feedback received from users of Concept and PL7 Junior/Pro application design software.



This welcome screen consists of a general view made up of a number of windows and toolbars, which can be arranged as required on the screen:

- 1 Menu bar from which all functions can be accessed
- 2 Toolbar consisting of icons from which the most frequently used functions can be accessed
- 3 Application browser, which can be used to browse the application based on a conventional and/or a functional view
- 4 Editor windows area, which can be used to view a number of editors at the same time (configuration editor, Structured Text/Ladder etc. language editors, data editor)
- 5 Tabs for direct access to editor windows
- 6 Information window with tabs (User Errors, Import/Export, Search/Replace, etc.)
- 7 Status bar

Accessing functions

All functions can be accessed via drop-down menus from the menu bar. The toolbar, which consists of icons, provides more rapid access to the most frequently used functions. This toolbar, which is displayed by default, can be customized to meet the requirements associated with the various uses of Unity Pro software and is divided into three groups:

- Main toolbars, which are visible at all times
- Contextual toolbar, which is displayed when the corresponding editor is selected
- Toolbar with zoom functions (in and out), full-screen view for editor window

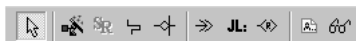
They are classified according to the category of functions available:

- File management (New Project, Open, Save, Print)
- Edit (Undo, Redo, Confirm, Go To)
- Application services (Analyze Project, Build Project, Browse, Find, Access Library)
- Automation platform operating mode (Upload/Download Project, Online/Offline, Run/Stop, Animate, PLC/Simulation Mode)
- Debug mode (Set/Remove Breakpoint, etc.)
- Window display (Cascade, Horizontal, Vertical)
- Online help (non-contextual or contextual)

Users can create their own toolbars and insert icons from the main and contextual toolbars into them.



"File/Edit" toolbar



FBD language editor contextual toolbar



"PLC" toolbar for debug mode



Toolbar with zoom (in and out)

Project browser

The project browser can be used:

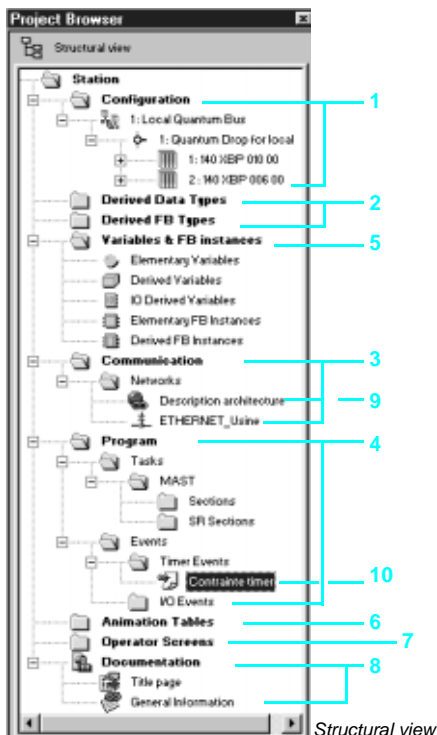
- To display the content of an Atrium, Premium or Quantum PLC project
- To move between the different components of the application (configuration, program, variables, communication, DFB user function blocks, DDT derived function blocks) created by the user

The project can be displayed using two types of view:

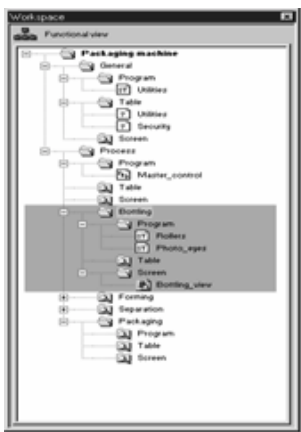
■ The **structural view**, which provides an overall view of the various components of the application. This representation provides a view of the order in which the program sections are processed in the PLC.

■ The **functional view**, which provides a view of the project based on specific function modules. This representation provides a breakdown according to consistent functions in relation to the process to be controlled.

These two types of view, which are available at any time, can be displayed separately or at the same time (horizontal or vertical windows) by clicking on the icons in the toolbar.



Structural view



Functional view

Structural view

This conventional view allows you to access all the different components of the application (configuration, programming, function blocks, debugging, etc.) via the application browser.

The browser gives an overall view of the program and offers fast access to all application components.

- 1 Configuration editor
- 2 DFB (user function block) and DDT (Derived Data Type) editors
- 3 Communication networks editor
- 4 Program editor
- 5 Variables editor
- 6 Animation tables editor
- 7 Runtime screens editor
- 8 Documentation editor

From any level in the tree structure, you can:

- 9 Create a hyperlink to a comment or description
 - 10 Create a directory for storing hyperlinks used to access a set of user folders
- From this level, it is also possible to zoom in and only view the detailed levels for a component on this level.

Functional view

Unity Pro software applications support the creation of an application structure for Atrium, Premium and Quantum platforms based on function modules comprising:

- Sections (program code)
- Animation tables
- Runtime screens

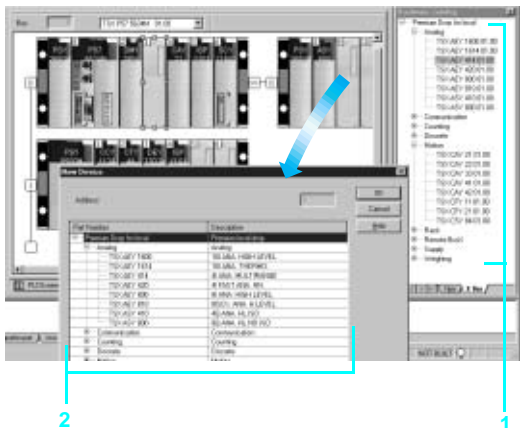
The designer can define a multi-level tree structure for the application, independently of the multitask structure of the PLC.

Program sections written in Ladder (LD), Structured Text (ST), Instruction List (IL), Function Block Diagram (FBD) or Sequential Function Chart (SFC) language can be associated with each level, along with animation tables and runtime screens.

Exporting/Importing function modules

All or part of the tree structure can be exported to function modules. In this case, all program sections on the various module levels are exported.

Utilities make it easy to reuse these modules in new applications by means of data and module name reassignment services.



Configuration editor

Hardware configuration

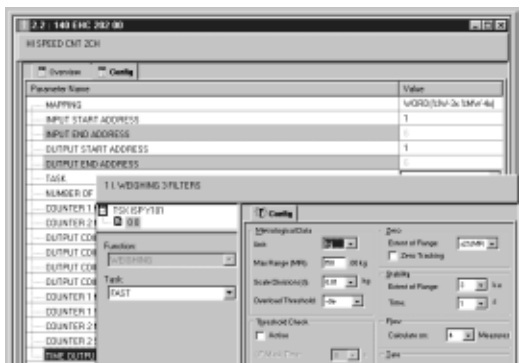
The first step when creating an automation project based on an Atrium, Premium or Quantum platform is to select the processor for which a rack and power supply are defined by default.

The configuration editor supports the intuitive and graphics-based modification and extension of this configuration with the following elements:

- Racks, power supply
- PCMCIA memory or communication cards (Atrium/Premium) on the processor
- Discrete I/O, analog I/O or application-specific modules
- Etc

The user has two options:

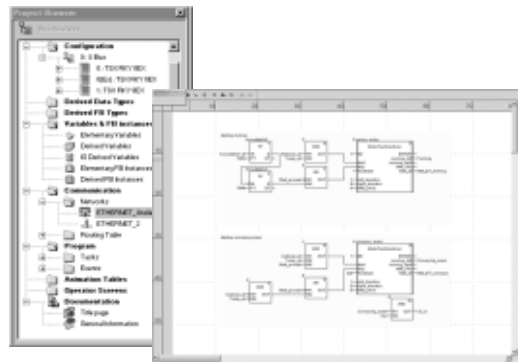
- 1 Select the reference for the module chosen from the catalog list and drag it to an available slot in the rack.
- 2 Insert a new module into a free slot from the contextual file.



Configuration and parameter settings for I/O and application-specific modules

From the configuration screen for Atrium, Premium or Quantum racks, the parameters screen displayed for the module concerned can be used to define the operating characteristics and parameters for the selected application, e.g.:

- Filter values for discrete I/O
- Voltage or current range for analog I/O
- Threshold counter values
- Trajectory of axes for position control
- Weigher calibration for weighing
- Transmission speed for communication
- Presymbolization for variables associated with modules
- Etc



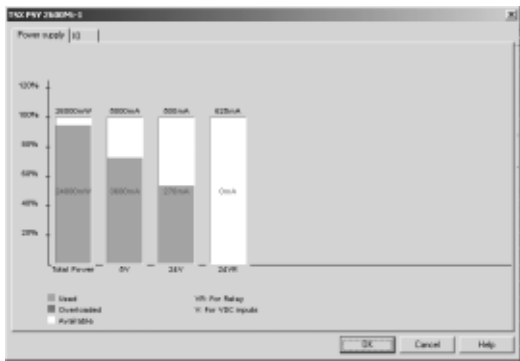
Configuration and parameter settings for communication networks

The "Communication" folder in the structural view can be used to define the list of networks connected to the PLC station. Then, the parameters for all elements required for networks to function correctly can be set by:

- Creating a logical network to which comments can be associated
 - Configuring a logical network defining the various associated network services.
- Once the network module has been created in the configuration, it must then be associated with one of the logical networks.

Ethernet TCP/IP, Modbus Plus and Fipway network modules are all configured in this way.

The Unity Studio software suite provides the same parameter-setting services for the global automation project, see page 6/36.



Configuration check

The following information can be accessed at any time during configuration:

- The power consumption statistics for the power supply in each of the racks in the PLC configuration, for all the different voltages provided by each of these power supplies
- The number of inputs/outputs configured (with Atrium or Premium platform)

Software structure

The Atrium, Premium and Quantum platforms set up by Unity Pro software support two types of application structure:

- **Single-task:** This is the more simple default structure, in which only the master task is executed.
- **Multitask:** This structure, which is more suitable for high-performance real-time events, consists of a master task, a fast task, periodic tasks, and high-priority event-triggered tasks.

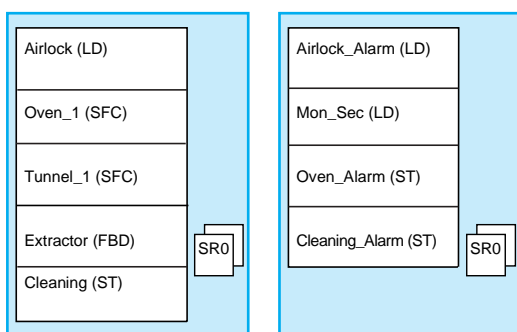
The master, fast and periodic tasks are made up of sections and subroutines. The sections and subroutines can be programmed in any of the following languages: Structured Text (ST), Instruction List (IL), Ladder (LD) or Function Block Diagram (FBD) (1). The event-triggered tasks use the same languages. Sequential Function Chart (SFC) or Grafset language is reserved for master task sections.

The table below lists the possible program tasks for Atrium, Premium and Quantum type processors respectively.

Platform	Premium			Atrium	Quantum	
	TSX P 57 1●4M	TSX P 57 2●(3)4M TSX P 57 3●(3)4M TSX P 57 4●(3)4M	TSX P 57 554M TSX P 57 564M	TSX PCI 57 204 M TSX PCI 57 454 M	140 CPU 31110 140 CPU 434 12A 140 CPU 534 14A	140 CPU 651 ●0 140 CPU 671 60
Cyclic or periodic master task	Yes	Yes	Yes	Yes	Yes	Yes
Periodic fast task	Yes	Yes	Yes	Yes	Yes	Yes
Periodic auxiliary tasks	–	–	4	–	–	4
Event-triggered tasks (from modules)	32	64	128	64	64	128
Event-triggered tasks (from timers)	–	–	32	–	16	32
Total number of event-triggered tasks	32	64	128	64	64	128

(1) Premium TSX P57 1●4M processors do not support Function Block Diagram (FBD) language.

Structure, modular and portable programming



Master task

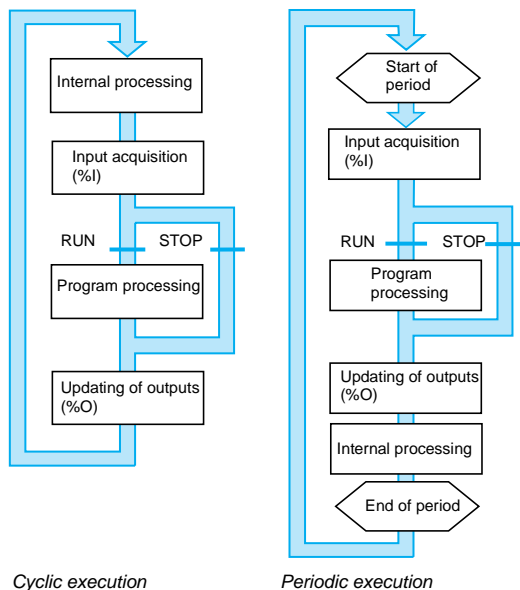
Fast task

The tasks of a Unity Pro program for Atrium, Premium or Quantum platforms are composed of several parts known as sections and subroutines. Each of these sections can be programmed in the most appropriate language for the process to be executed.

Such division into sections enables a structured program to be created and program modules to be generated or added with ease.

Subroutines can be called from any section of the task to which they belong or from other subroutines in the same task.

Compatibility of languages compliant with IEC standard 61131-3: Unity Pro software can be configured (*Tools/Project Settings/Language Extensions menu*) to ensure that applications generated are compliant with IEC standard 61131-3. Furthermore, as long as you use only the standard instruction libraries, you will be able to reuse programs created in this way on any Atrium, Premium or Quantum platform.



Single-task memory structure

Two types of cyclic execution are supported:

- Normal cyclic execution. This is the default option.
- Periodic execution. This type of execution, as well as the period, are selected by the user during programming when the task parameters are set (master task).

Normal execution (cyclic)

At the end of each scan, the PLC system launches a new scan. The execution time of each scan is monitored by a software watchdog whose value is defined by the user (max. 1500 ms).

In the event of overrun, a fault occurs causing:

- The scan to stop immediately (STOP)
- A fault state to be displayed on the front panel of the processor
- The alarm relay for the main rack power supply to be set to 0

Periodic execution

A new scan is executed at the end of each period. The execution time of the scan must be less than the time of the period defined (max. 255 ms). In the event of overrun, the latter is stored in a system bit (%S19), which can be reset to 0 by the user (via the program or terminal).

A software watchdog, which can be configured by the user (max. 1500 ms), monitors the scan time. In the event of overrun, an execution fault is indicated (see normal execution). The scan execution times (the last scan, the longest scan and the shortest scan) are stored in system words %SW 30/31/32.

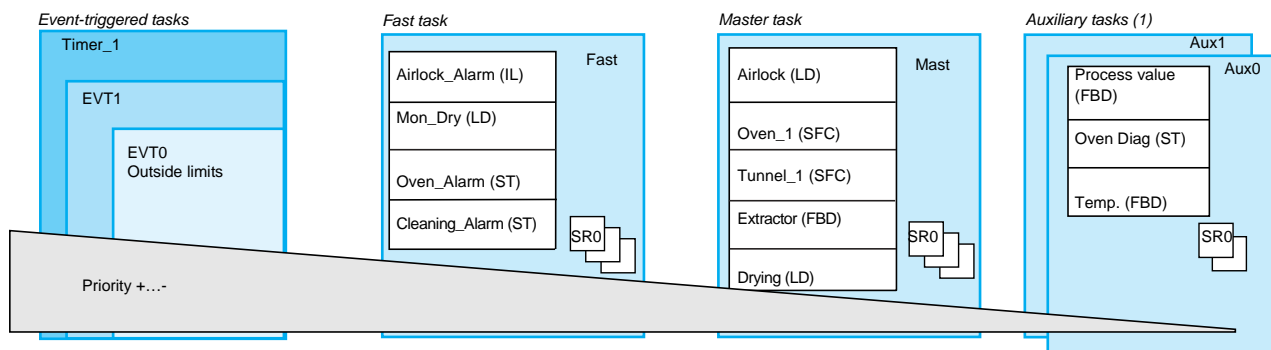
Multitask software structure

Atrium, Premium and Quantum platforms support a multitask structure comprising:

- 1 master task (divided into several sections programmed in ST, IL, LD, FBD, and SFC languages)
- 1 fast task (divided into sections)
- 0 to 4 auxiliary tasks (divided into sections) (1)
- 1 or more event-triggered tasks (only one section per task)

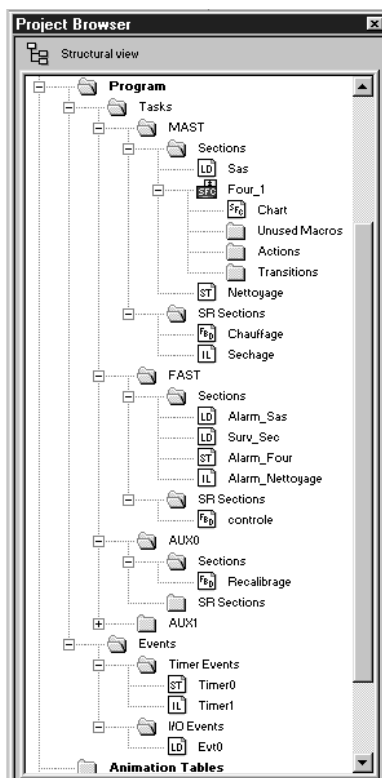
These tasks are independent and are executed in parallel, with the PLC processor managing their execution priority. When an event occurs, or at the start of the fast task scan:

- If any lower-priority tasks are currently being executed, they are suspended.
- The event-triggered task or fast task is executed.
- The interrupted task resumes once execution of the priority task has been completed.



This structure optimizes the way in which processing power is employed and can be used to structure the application and simplify design and debugging, as each task can be written and debugged independently of the others.

(1) Tasks reserved for top-of-the-range Premium TSX P57 5●4M and Quantum 140 CPU 651 ●0/67160 processors.



Multitask memory structure (continued)

Master task

This task, which can be periodic or cyclic, executes the main program. It is activated systematically.

Each of its component sections and subroutines can be programmed in Ladder (LD), Function Block Diagram (FBD), Structured Text (ST) or Instruction List (IL) language. Several sections of the master task can be programmed in Sequential Function Chart (SFC) or Grafcet language.

Fast task

This task, which has a higher priority than the master task, is periodic in order to allow time for tasks with lower priorities to be executed. It should be used when fast periodic changes in discrete inputs need to be monitored and acknowledged.

The execution of the master task (lower priority) is suspended while the fast task is being executed. Processing operations in this task must be as short as possible in order to avoid adversely affecting master task processing operations.

Each of the component sections and subroutines of the fast task can be programmed in Instruction List, Structured Text, Ladder or Function Block Diagram language (ST, IL, LD or FBD).

Auxiliary tasks

These tasks, which are available on top-of-the-range Premium TSX P57 5●4M and Quantum 140 CPU 651 ●0/67160 processors, are designed for use with slower types of processing operation such as measurement, process control, HMI, application diagnostics, etc.

Periodic type auxiliary tasks have the lowest level of priority and are executed once the higher-priority periodic tasks (master and fast) have completed their scan.

Each of the component sections and subroutines of the fast task can be programmed in Instruction List, Structured Text, Ladder or Function Block Diagram language (ST, IL, LD or FBD).

Event-triggered tasks

Unlike the tasks described above, these tasks are not linked to one period. The execution of these tasks is triggered asynchronously by:

An event from certain application-specific modules (e.g.: overrun of a counter threshold, change of state of a discrete input)

An event from the event timers

These tasks are processed before all other tasks and are thus suitable for processing requiring very short reaction times in comparison to the arrival of the event.

Atrium, Premium or Quantum platforms have 3 levels of priority (these are, in descending order, module event EVT0, module events EVTi and timer events Timeri).

These tasks, each comprised of a single section, can be programmed in Instruction List, Structured Text, Ladder or Function Block Diagram language (ST, IL, LD or FBD).

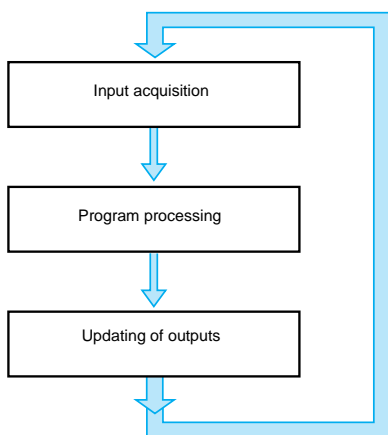
Assignment of I/O channels to tasks

Each of the master, fast or event-triggered tasks reads (at the start of the scan) and writes (at the end of the scan) the inputs assigned to it. By default, they are assigned to the master task.

For the Quantum platform, the remote inputs/outputs (RIO) are only assigned to the master task (these assignments can be made per station or for each of the component sections of the task), while the distributed inputs/outputs (DIO) are all assigned to the master task (without assignment to its component sections).

For event-triggered tasks, it is possible to assign input/output channels (1) other than those relating to the event. Exchanges are then performed implicitly at the start of processing for inputs and at the end of processing for outputs.

(1) These channel assignments are made per I/O module for Quantum and per channel for Atrium/Premium inputs/outputs.



The five IEC languages

The five graphical or textual languages available in Unity Pro are used for programming Atrium, Premium and Quantum automation platforms.

The 3 graphical languages are:

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

The 2 textual languages are:

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

For these 5 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 Atrium/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.

Functionalities common to all five language editors

The editors for each of the 5 languages provide a number of common tools used for writing, reading and analyzing programs in a user-friendly manner:

- The text editors for Instruction List (IL) and Structured Text (ST) support:
 - Text entry in insert or overwrite mode
 - The use of dialog boxes for the assisted entry of variables, functions, function blocks or assignment instructions
 - Checks on data entry to detect syntax or semantics errors. The user is informed of the result of this check by red "wavy" underlining or by a change in the color of the text concerned.
 - Access to a set of colors, which can be used to facilitate reading by distinguishing text (black) from operators (red), language key words (blue), and program comments (green)
- The graphics editors for Ladder (LD) language, Function Block Diagram (FBD) language and Sequential Function Chart (SFC) language feature:
 - A set of graphic elements for direct access to the various graphic symbols in the language via the mouse or keyboard
 - A pop-up menu, which can be accessed by right-clicking with the mouse
- Unlimited number and length of comments. These comments can be positioned as text objects in any cell (graphical languages) or at any point in expressions (textual languages).
- Assisted data entry functions for:
 - Accessing DFB function libraries, the variables editor or the text object for entering comments
 - Initializing a variable reference
 - Initializing the animation table on selected variables
 - Displaying and modifying the properties of the selected variable
 - Creating variables in real time without having to use the data editor
- "Cut", "Copy", "Paste", "Delete", "Move", etc.
- Setting bookmarks on lines of text or in the margin so that you can:
 - Easily locate lines in important program sections
 - Browse in an editor by bookmark, label or line and column number

Ladder (LD) language

Each section or subroutine using Ladder language consists of a series of rungs, which are executed sequentially by the PLC. Each rung consists of graphic objects (placed in cells arranged in columns and lines) corresponding to contacts, links, coils, operation blocks, EF/EFB/DFB function blocks, jumps, SR calls, etc.

Name	Type	Address	Value	Comment	Save	Used
Stop	BOOL			Stop process		3
Table	ARRAY[0...					4
Temp_fault_1	EB00L			Fault for temperature to low		3
Temp_fault_2	EB00L			Fault for temperature to h...		3
Temp_ok	BOOL			Temperature ok		20
ten	SFCSTEP...			step for packaging ten pi...		3
t	TIME					
x	BOOL					
trainErr	BOOL					
trainErr	BOOL					
ten_pices	BOOL			Packaging 10 pices		6
test	BOOL		1			3
Valve_1	EB00L		1			4
Valve_2	EB00L		1			3
Valve_3	EB00L		1			2
Valve_4	EB00L		1			3
Valve_A_closed	EB00L			Material valve A closed		5
Valve_A_open	EB00L	%Q0.3.1		Material valve A open		9
Valve_B_closed	EB00L			Material valve B closed		7
Valve_B_open	EB00L	%Q0.3.2		Material valve B open		10
Var_1	INT					0
var_overflow	INT					5
Weighing_A_done	BOOL			Internal bit for weighing ...		10
Weighing_B_done	BOOL			Internal bit for weighing ...		10
Weighing_Mater...	INT			Weighing material A in pt...		13
Weighing_Mater...	INT			Weighing material B in pt...		9
Weight_empty	EB00L			Weight empty		4

Program structure (section or subroutine)

Each Ladder language section may contain:

- Between 11 and 64 columns (number set by user)
- Up to 2000 lines (for all rungs in the section)

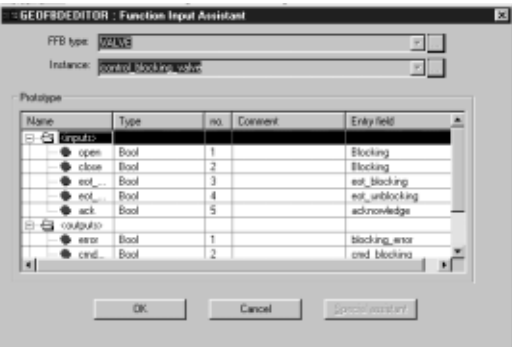
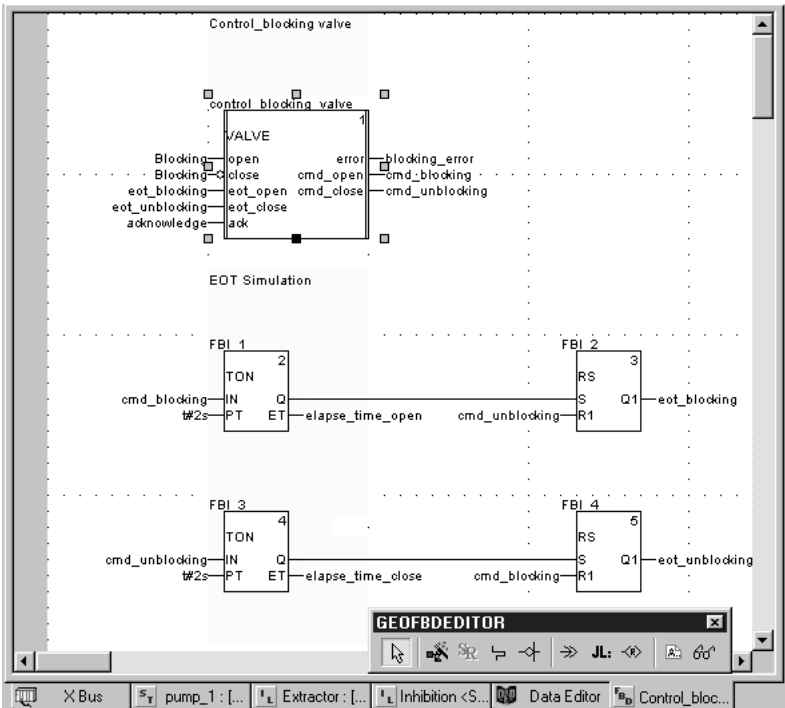


Graphics palette in the Ladder language editor

“Mixed Display” mode supports the unrestricted display of comments, addresses and symbols for the variables used for rungs.

Function Block Diagram (FBD) language, with Unity Pro Large and X Large version

Function Block Diagram language is a graphical language based on function blocks associated with variables or parameters, which are linked together. This language is particularly suitable for process control applications.



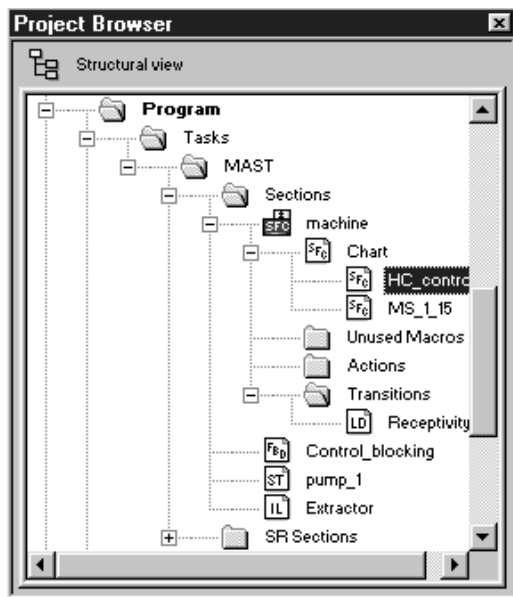
Program structure (section or subroutine)

The graphical language FBD supports three types of function block:

- Elementary blocks (EFs)
- Elementary Function Blocks (EFBs), sorted into different libraries depending on their type of use
- Derived Function Blocks (DFBs), which have a structure identical to that of EFBs but are created by the user with the ST, IL, LD or FBD programming languages

Within the same section, subroutines can be called using a specific block. Program jumps to a block instance can also be programmed.

A section programmed in FBD language contains the equivalent of a grid with 30 columns and 23 rows. The blocks are positioned on this grid in minimum steps of 1/10 of a column and 1/10 of a line (called halftone dot).



Sequential Function Chart (SFC) and Grafcet language

Sequential Function Chart (and Grafcet) language can be used to describe the sequential part of an automation system in simple graphical format using steps and transitions.

SFC language does not process charts in the same way as Grafcet language:

- SFC only authorizes one token in one chart.
- Grafcet language authorizes several tokens in one chart.

Unity Pro software has one editor for these two languages with the option of defining behavior in the application settings (*Tools/Project Settings/Language Extensions menu*).

Program structure (master task section)

SFC language is only used in sections belonging to the master task. Each SFC section consists of a main chart sub-section CHART and sub-sections for each of the macro-steps. The component parts of the charts are:

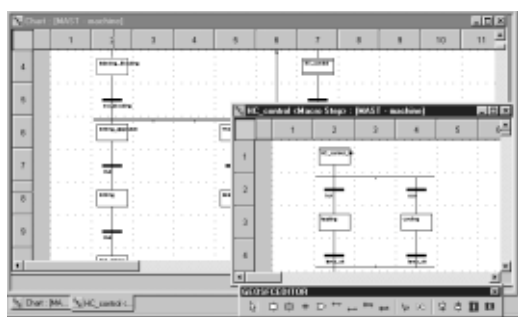
- Macro-steps, which are the sole representation of a set of steps and transitions (used to set up a hierarchical chart structure)

- Steps
- Transitions and directed links between steps and transitions

Associated with steps and transitions respectively, the actions and transition conditions can be:

- Integrated into the CHART or macro-step charts, in which case the actions or transition conditions are defined by a single variable
- Processed in specific sections, in which case dedicated processing (to be programmed in Ladder, Function Block Diagram, Structured Text or Instruction List language) is necessary

In order to check that machine scans have been completed successfully, activity times (minimum, maximum) can be associated with each step. These times are set by the user.



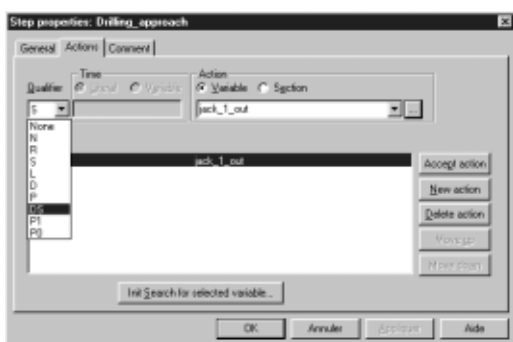
Program structure (section in master task)

For each SFC section, the graphics editor provides a maximum of:

- One grid containing 32 columns and 200 rows, or 6400 cells. Steps, transitions or jumps all need one cell respectively.
- 1024 steps (macro-steps and steps in macro-steps)
- 20 actions assigned to the same step
- 100 steps activated at the same time
- 100 actions activated at the same time

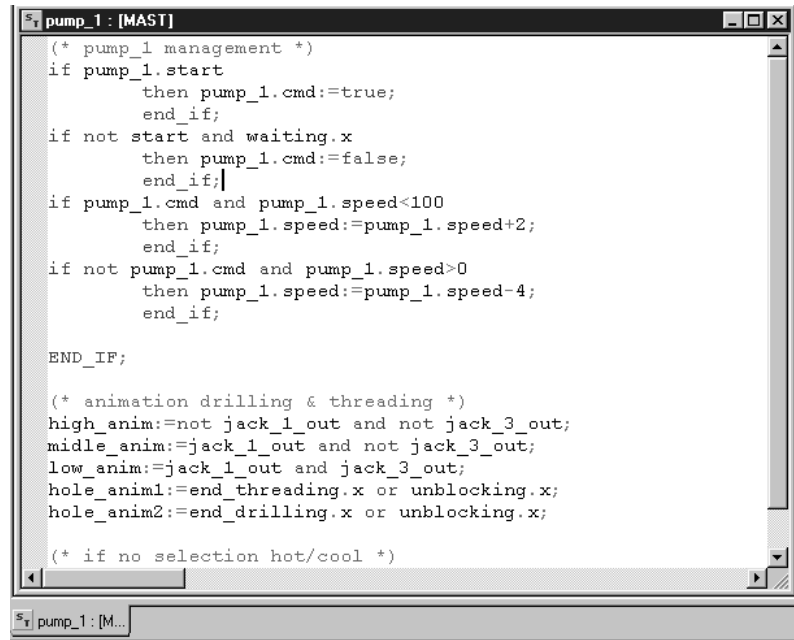
To help you to create basic charts, graphic screens can be used to create “n” steps in series and “m” steps in parallel in a single operation.

Dialog boxes can be used to assign associated properties to steps (activity time, actions), transitions (variable linked to transition condition), etc.



Structured Text (ST) language

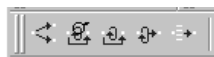
Structured Text language is a sophisticated algorithmic type language, which is particularly suitable for programming complex arithmetic functions, table operations, message handling, etc.



Program structure (section or subroutine)

Structured Text language, which can be used to directly transcribe an analysis based on an organization chart, is structured into expressions composed of a series of instructions organized in lines.

There is no limit to the number of characters an instruction line may contain (the only limit is the program memory available for the Premium and Quantum platforms, except on TSX P57 10...40 processors, where the limit is 64 Kb). The length of the section is only limited by the size of the application memory.



Four preformatted expression structures can be called up directly from the toolbar:

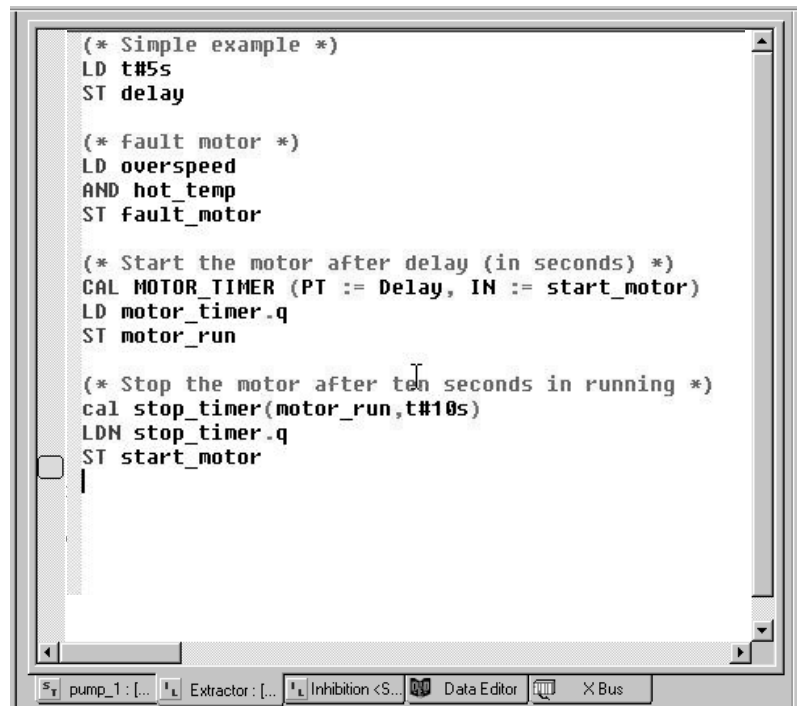
- **Conditional action** : IF...THEN...ELSIF...THEN...ELSE...END-IF;
- **Iterative conditional action**: WHILE...DO...END_WHILE;
REPEAT...UNTIL...END_REPEAT;
- **Repetitive action**: FOR...TO...BY...DO...END_FOR;
- **Selective action**: CASE...OF...ELSE...END_CASE;

The operands used in the expressions are bit variables, word variables or variables linked to function blocks.

To make the expressions easier to read, different colors are used to identify objects, language key words and program comments.

Instruction List (IL) language

Instruction List language is a language representing the equivalent of a Ladder diagram in text form. It can be used to write Boolean and arithmetic equations using all the functions available in the Unity Pro language (calling of functions and function blocks, assignment of variables, creation of program jumps, branching to subroutines within a program section, etc.).

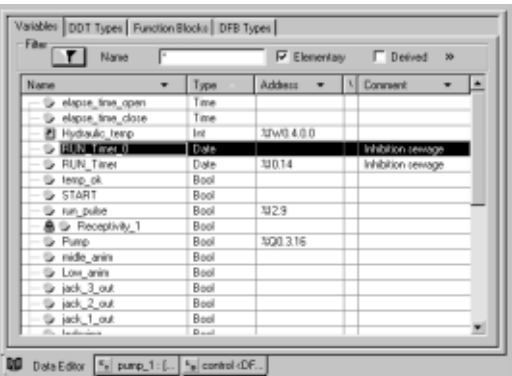


Program structure (section or subroutine)

A program in Instruction List language comprises a sequence of instructions classified into the following different families:

- Bit instructions, e.g. read input: *LD overspeed*
- Function block instructions, e.g. call timer: *CAL MOTOR_TIMER*
- Numerical instructions using single, double and floating point integers, e.g.: *LD Result ADD Surplus ST Archive*
- Word table or character string instructions, e.g. make assignment: *LD Result:10:=Setpoint:10*
- Program instructions, e.g. SR call: *CALL SR10*

The operands used in the expressions are bit variables, word variables or variables linked to function blocks.



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, instants 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 under 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” tabs for the declaration of EFB and DFB function blocks
- “DFB Types” for the creation of DFB user function block data types



Each data instance has several attributes, of which:

- The name and type of the variable are mandatory
- The comment, physical address in the memory or 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.

DFB user function blocks

The user can create his own function blocks for specific application requirements on Atrium, Premium and Quantum platforms using Unity Pro software.

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

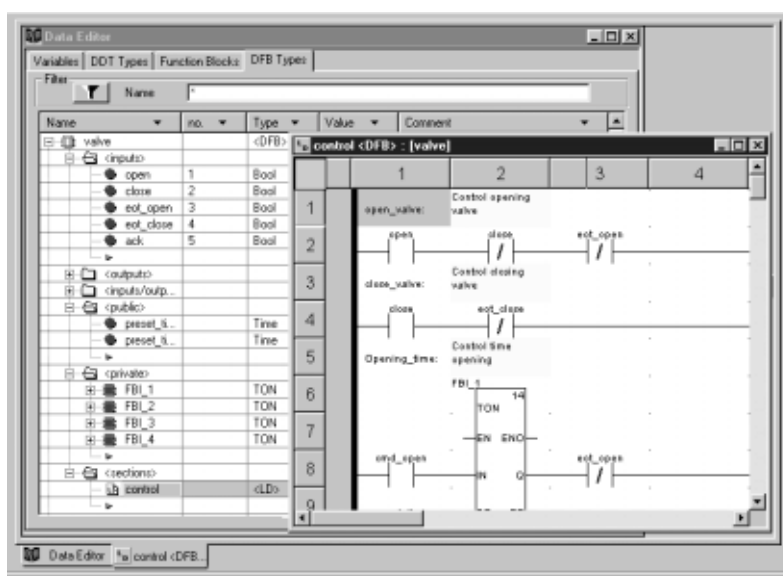
These user function blocks can be used to structure an application. They are used when a program sequence is repeated several times in the application or for fixing a standard programming routine. They can be read-only protected or read/write-protected. They can be exported to all other Unity Pro applications.

Using a DFB function block in one or more applications:

- Simplifies program design and entry
- Improves program readability and understanding
- Facilitates program debugging (all variables handled by the DFB block function are identified in the data editor)
- Enables the use of private variables specific to the DFBs, which are independent of the application

A DFB function block is set up in several phases:

- 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 (Elementary Function Block). (The instance can be created from within the program.)

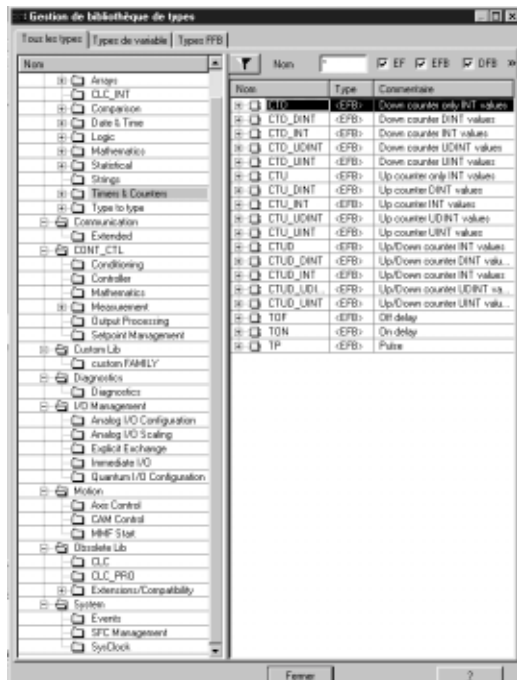


Main characteristics

Inputs	32 max. (1)
Outputs	32 max. (2)
Inputs/outputs	32 max. (1) (2)
Public internal variables	Unlimited (can be accessed via the application program)
Private internal variables	Unlimited (cannot be accessed via the application program)
Comment	1024 characters max.
Program sections	Unlimited, each section can be programmed independently in one of the 4 languages (IL, ST, LD, and FBD).

(1) The maximum cumulative total of inputs and inputs/outputs is 32.

(2) The maximum cumulative total of outputs and inputs/outputs is 32.



Function block libraries

The function and function block libraries manager contains all the elements provided with Unity Pro software. The functions and function blocks are organized into libraries, which themselves consist of families. Depending on the type of PLC selected and the model of processor, the user will have a sub-set of these libraries available to write his/her applications. However, the "Base Lib" library contains a set of functions and function blocks, the majority of which are compatible with all platforms. In particular, it contains the blocks compliant with IEC 61131-3.

The "Base Lib" library is structured into families:

- Timers and counters
- Internal process control
- Array management
- Comparison
- Date and time management
- Logic processing
- Mathematical processing
- Statistical processing
- Character string processing
- Type-to-type data conversion

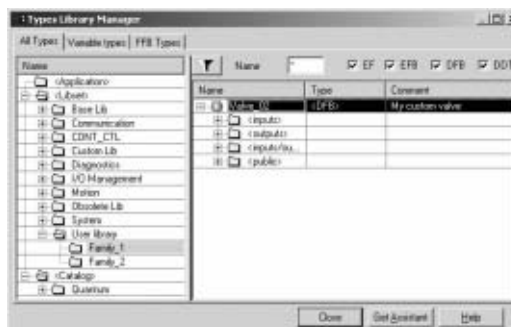
This library, which covers standard automation functions, is supplemented by other, more application-specific libraries, which are platform-specific:

- **Management library** for motion control and fast counting
- **Process control library.** The CONT_CTL library can be used to set up process-specific control loops. In particular, it offers controller, derivative and integral control 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 share data or to deliver data to be displayed on an HMI.
- **Extended library,** providing additional algorithms, e.g.: EFBs for calculating mean values, selecting a maximum value, performing movements with first-order interpolation, detecting edges or assigning a hysteresis to process variables, 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.
- **"System" library,** which provides EFBs for the execution of system functions: evaluation of scan time, availability of several different system clocks, SFC section monitoring, display of system state, etc.
- Finally, a **library named "obsolete"** containing all function blocks used by legacy programming software needed to perform application conversions

Management of user standards

Users may create libraries and families in order to store their own DFB function blocks and DDT data structures. 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



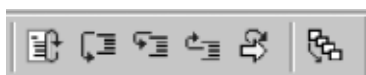
Debugging tools

Unity Pro software offers a complete set of tools for debugging Atrium, Premium or Quantum applications. A tool palette provides direct access to the main functions:

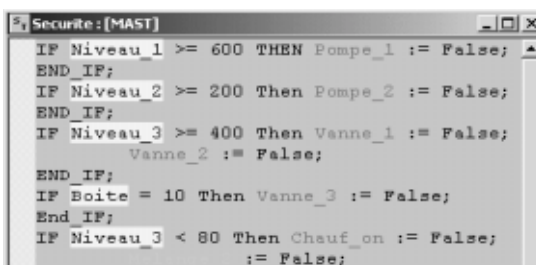
- Dynamic program animation
- Setting of watchdogs or breakpoints (not authorized in event-triggered tasks)
- Step-by-step program execution. A function in this mode enables section-by-section execution. Instruction-by-instruction execution can be launched from the previous breakpoint. Three execution commands are therefore possible when the element to be processed is a subroutine (SR) or DFB user block:
 - Detailed step-by-step or "Step Into". This command is used to move to the first element of the SR or DFB.
 - Overall step-by-step or "Step Over". This command is used to process the entire SR or DFB.
 - Outgoing step-by-step or "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.



Insertion/removal of watchpoint



Execution command



Animation of ST program

Animation of program elements

Dynamic animation is managed section by section. A button in 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

Several windows can be displayed and animated simultaneously. The "Tool tip" function, which uses help balloons, can be used to view a variable and its content simultaneously when the object is selected with the mouse (or other pointing device).

Two types of animation are supported:

- Standard: The variables of the active section are refreshed at the end of the master task (MAST).
- Synchronized: The watchpoint can be used to synchronize the display of animated variables with a program element in order to determine their value at this precise point in the program.

Name	Value	Type	Comment
Initial	0	Bool	
Niveau_1	420	Int	
Niveau_2	0	Int	
Niveau_3	333	Int	
Boite	0	Int	
Quantite_a_pr...	0	Int	
Quantite_pos...	0	Int	
Pompe_1	1	Bool	
Melange_2	0	Bool	

Animation table

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. In addition to data animation it is possible to:

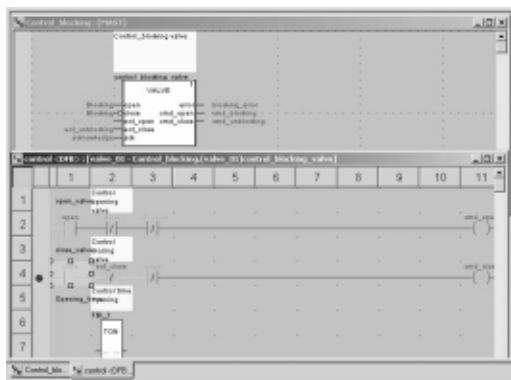
- Modify bit variables or force them to 0 or 1
- Change the display format
- Copy or move variables
- Search by cross-reference
- Display the list of forced bits

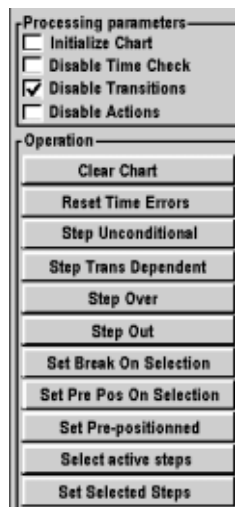
These tables can be stored in the application and retrieved from there at a later date.

Debugging of 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.





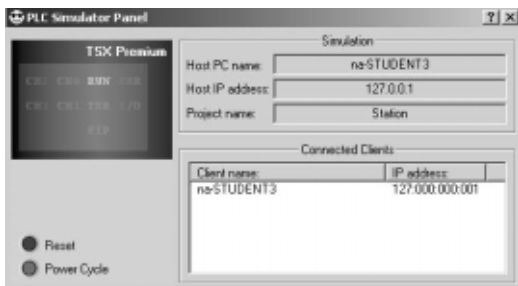
SFC control panel

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.

Numerous commands are available in this debugging mode via the control panel:

- Deactivate active step(s)
- Activate initial step(s)
- Disable step execution times
- Freeze chart regardless of transition conditions
- Stop processing of steps
- Move to the next step taking account of the transition conditions
- Enable transition and move to next step(s) (detailed step-by-step command, "Step Into")
- Enable transition in order to execute the end of the macro-step (outgoing step-by-step command, "Step Out")
- Preposition chart on steps for which markers have been set, etc.



Simulator control panel

PLC simulator

The simulator integrated in Unity Pro can be used to test the application program for Atrium, 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.

Documentation editor

The documentation editor is built around 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.

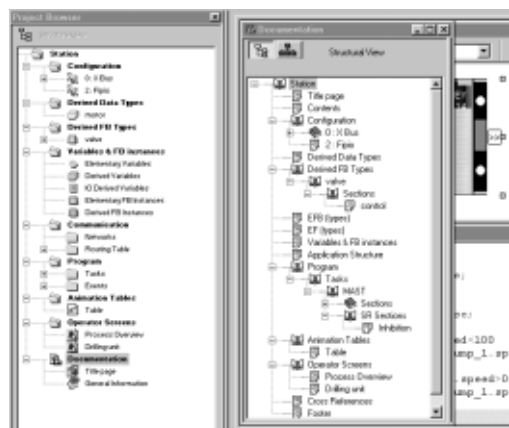
The documentation editor supports the creation of user-specific documentation files using the following headings:

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

The documentation editor can generate the documentation file based on two different structures:

- Structural view: All the objects in the project are associated with their corresponding headings.
- Functional view: The objects in the project are associated with the function modules to which they belong.

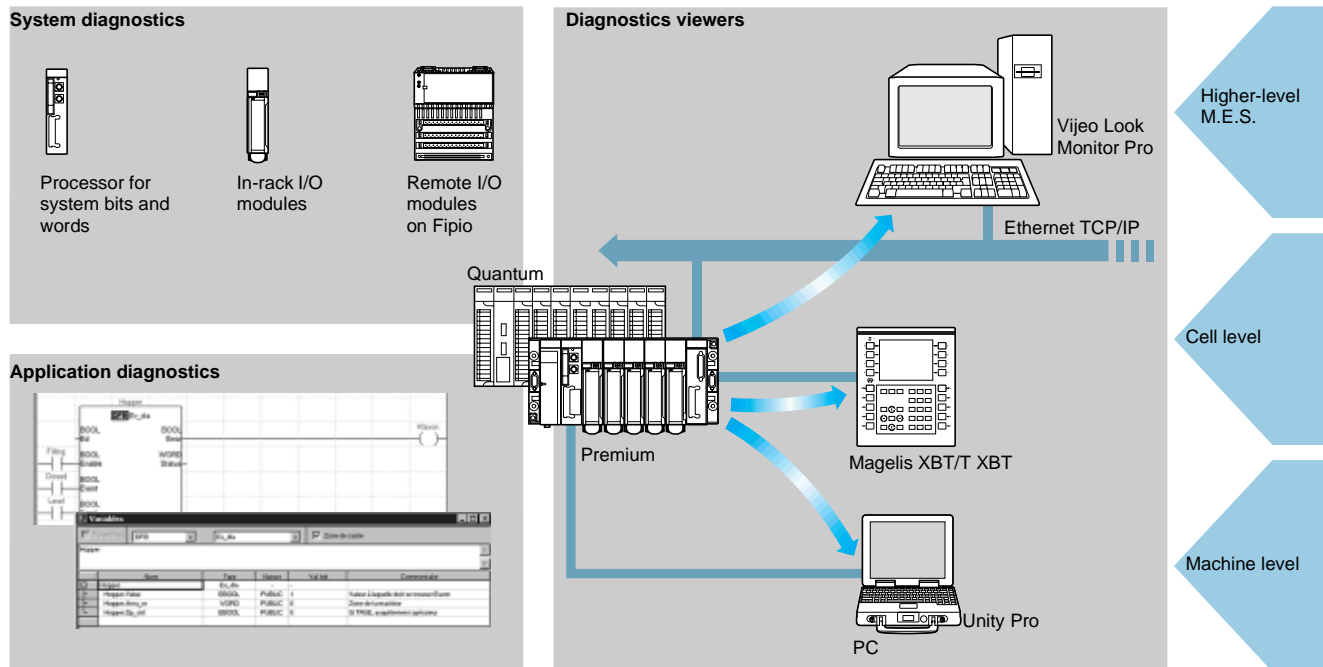
The documentation file can be created and saved as the project progresses, from one Unity Pro session to another.



Access to documentation editor

Presentation

Diagnostics integrated into Atrium, Premium and Quantum automation platforms



The diagnostics offer for Atrium, Premium and Quantum platforms is based on three components:

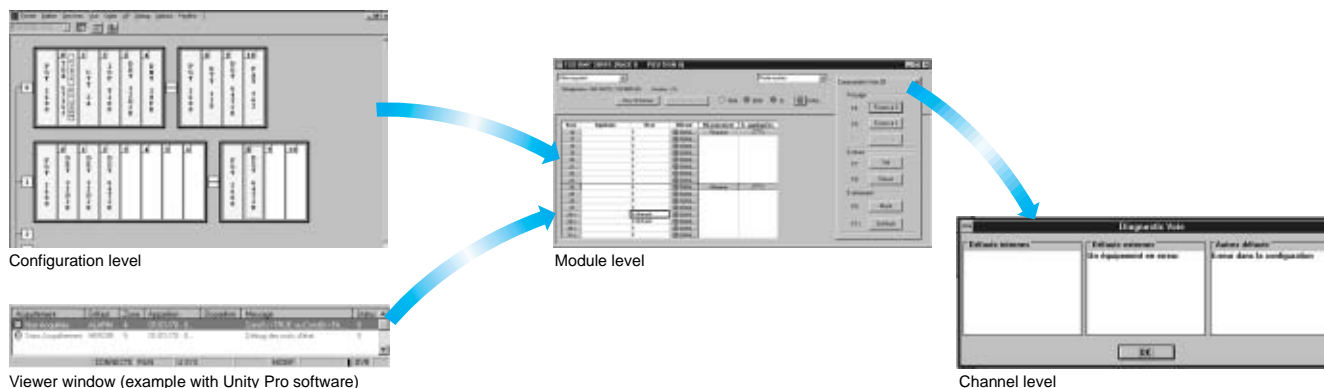
- System diagnostics
- DFB and EFB diagnostic function blocks (for system and application diagnostics)
- Error message display system or viewers supplied as standard with Magelis XBT/T XBT terminals, Vijeo Look/ Monitor Pro supervisory software and Unity Pro setup software.

Functions

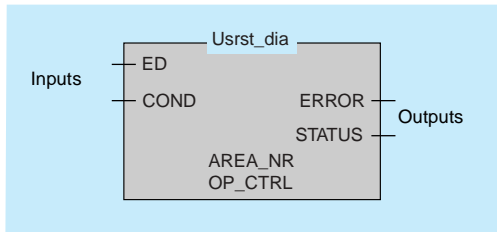
System diagnostics

The system diagnostics for the Atrium, Premium and Quantum platforms supports the monitoring of system bits/words, I/O modules and activity times (minimum/maximum) of SFC steps. By simply choosing the relevant option in the application configuration, any event will result in time-stamped messages being generated automatically without the need for any additional programming thanks to these diagnostics viewers (1).

With the assistance of Unity Pro's integrated diagnostics, this function can be used to perform 1st level diagnostics of the elements in the configuration, up to and including each I/O module channel.



(1) Diagnostics viewers are tools used to display and acknowledge error messages relating to diagnostics. They are supplied as standard with Unity Pro, Vijeo Look and Monitor Pro software and with Magelis terminals.



Application diagnostics

Unity Pro software also has a library of function blocks for monitoring, called diagnostic DFBs and EFBs. The library of diagnostic function blocks contains:

- **Manufacturer blocks for system diagnostics**
 - IO_DIA input/output fault, which is used to monitor the state of inputs/outputs.
 - ASI_DIA, which monitors whether an error has occurred on the AS-i bus (module or bus fault, no slave, slave not configured or faulty).
- **Manufacturer blocks for application diagnostics**, for example:
 - EV_DIA, which monitors whether an event (bit status) has the correct value at a given time (no notion of timing).
 - MV_DIA, D_GRP, D_REA, which monitor whether an event (change in the status of a bit) occurs in accordance with the specified time conditions.
 - ALRM_DIA, which monitors the combination of the status of 2 bits.
 - NEPO_DIA and TEPO_DIA, which can be used to check, control and perform diagnostics for elements in the working part of the system made up of the combination of 2 actuators and 2 sensors.

■ **Open diagnostics blocks**
These enable users to create their own diagnostic function blocks to meet the specific requirements of their applications and therefore to supplement the manufacturer DFBs and EFBs described above. They can be created from 2 model blocks, which must be written in Ladder (LD), Structured Text (ST), Function Block Diagram (FBD) or Instruction List (IL) language.

Diagnostics with fault finding

Furthermore, when a fault occurs, Unity Pro analyzes the program sections concerned and opens a second window displaying the causes and probable sources of the fault.

The user or process operator is guided through the fault-finding process, enabling machine downtimes to be reduced.

The configuration module or instruction, which is the source of the fault, can also be accessed via the diagnostics viewer integrated into Unity Pro, directly from the alarm in the viewer output window (see page 6/23).



Viewer

Diagnostics viewers

All the diagnostic events processed by Atrium, Premium and Quantum platforms via diagnostic DFBs/EFBs are stored in a buffer (specific data memory area on the PLC). The information contained in this buffer is sent (transparently for the user) to viewers for automatic display and for management of faults and alarms. The viewer function is supplied as standard with:

- Vijeo Look and Monitor Pro V7 supervisory software
- Unity Pro programming software
- Magelis XBT F and Magelis iPC HMI terminals (function only available with Premium PLCs)

The integrated viewer in Unity Pro can also be used to access the instruction or module, which is the source of the fault. See “Diagnostics with fault finding”, page 6/22.

Atrium, Premium and Quantum platforms have multiviewer capability (can be used with a maximum of 15 viewers). A PC-compatible station with the viewer function can be multi-PLC (can be used with a maximum of 15 Atrium/Premium/Quantum platforms).

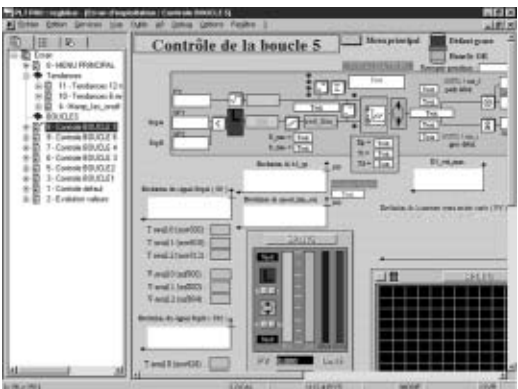
The buffer/viewer structure supports:

- A single point for fault management in each application
- Time-stamping of the occurrence of faults at source
- Storage of intermittent faults in memory
- Independence with regard to the viewer functions. The frame sent from the PLC buffer is identical for all viewers.
- Automatic archiving of all error messages

Output window

The diagnostics viewer takes the form of an output window divided into 2 sections:

- A message list indicating, for each alarm: state, DFB type, geographical zone, dates and times of appearance/disappearance, associated message and status
- An area for additional information about the selected message: type, comment, date of appearance, specific data, variables in error state, etc.



Runtime screens

The runtime screen tool is integrated into Unity Pro. The runtime screens are designed to facilitate the operation of automated processes during debugging, startup and maintenance. The runtime screens provide a set of information (explanatory texts, display of dynamic values, push buttons, and synoptics), enabling users to act quickly and easily to modify and dynamically monitor PLC variables.

The runtime screens editor provides all the HMI (*Human/Machine Interface*) elements needed for the animated design and viewing of processes. It enables these screens to be designed using specific tools:

- Screen: Creation of runtime screens, which can be classified according to family.
- Message: Creation of messages to be displayed.
- Objects: Creation of a graphic objects library using:
 - Geometrical elements (line, rectangle, ellipse, incorporation of images, controller front panels, etc.)
 - Control elements (buttons, data entry fields, screen browsing controls, etc.)
 - Animation elements (colors, flashing elements, bar graphs, etc.)

When the station on which Unity Pro has been installed is connected to the PLC, the user can obtain a dynamic display of the screens according to the state of the process. Screen sequencing is possible, depending on the priority attributed, either via the keyboard or a PLC request.

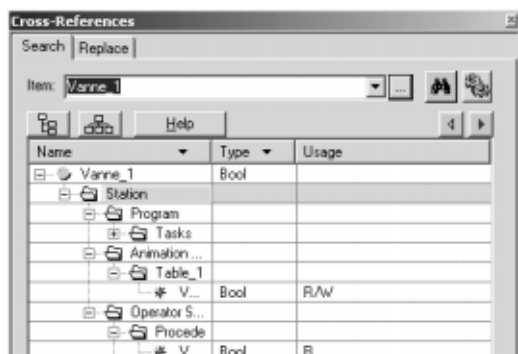
When online, the Unity Pro application program can be accessed directly from the runtime screens by clicking on the selected object in a synoptic screen view. It is also possible to activate the animation table or cross-reference functions by selecting one or more variables on the screen. To make the display easier to read, the synoptic views can be displayed in full-screen view.

Modifying the program with the PLC in RUN

Unity Pro enables changes to be made to the program when the PLC connected to the programming terminal is in RUN. These modifications are made by performing the following operations:

- Where necessary, transferring the application in the PLC to the PC terminal running Unity Pro.
- Preparing the program changes offline. These program modifications can be of any type and in any language (IL, ST, LD, FBD, and SFC), for example adding/deleting SFC steps or actions. Furthermore, modifications can be made to the code of a DFB user function block (although its interface cannot be modified).
- Updating the program in the PLC (in RUN) to reflect these program changes.

This function allows program code and data in different parts of the application to be added or modified in a single modification session (thus making modification unified and consistent with regard to the controlled process). This increased flexibility comes at a cost in terms of the program memory volume required.



Cross-References functions

The Unity Pro Cross-References function, which is available in standalone mode (offline) and when connected to the PLC (online), allows users to view all the elements of a PLC application by searching for variables of any type. This view indicates where the declared variable is used as well as the mode in which it is used (write, read, etc.).

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

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

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

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

- .xvm format compatible with OFS data server software
- Source format, in a .scy file compatible with PL7 design software
- Text format with separator (TAB), in a .txt file for compatibility with any other system

On import, data can be assigned to new instances of the following elements via an assistant:

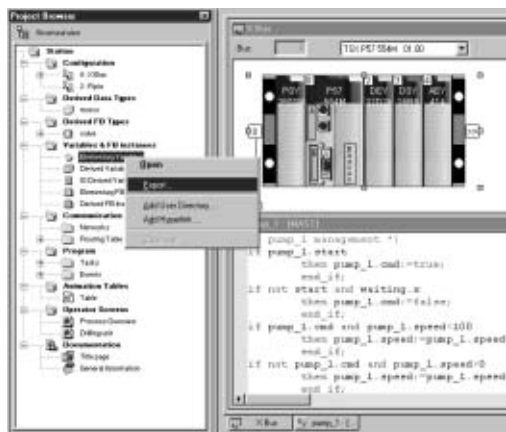
- DFB function blocks
- DDT data structures
- Simple data

Furthermore, when importing a function module, the data associated with animation tables and runtime screens is also reassigned.

The XML import function also supports the transfer of an Atrium, 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 means that the user does not have to repeat the PLC configuration process when this has already been completed in the SIS Pro tool.

(1) XML language: Open text-based language providing structural and semantic information.



Application converters

Unity Pro's integrated conversion tools can be used to convert PLC applications created with Concept and PL7 programming and setup software in Unity Pro applications.

Concept/Unity Pro converter (Quantum PLC)

The conversion can be performed from a Concept V2.5 application (possible in V2.11 or later but only once it has been updated to version V2.5). In order to perform the conversion, the application must be exported to an ASCII file in Concept. The export file is converted into Unity Pro source files automatically. This source 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 from which the part of the program to be modified can be accessed directly. The Concept application converter converts the application into Unity Pro but does not guarantee that it will operate correctly in real time. It is therefore essential to test or debug any converted application.

PL7/Unity Pro converter (Premium and Atrium slot PLC)

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

Operating system update utilities

OS-Loader software is designed for updating operating systems on Atrium, Premium and Quantum platforms and is supplied with Unity Pro software.

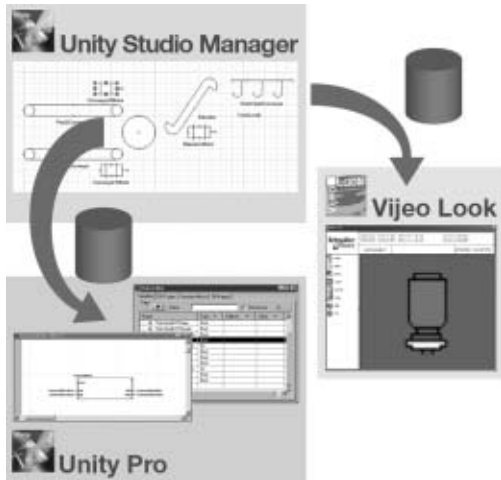
It can be used to update the following for compatibility with Unity Pro:

- Premium TSX P57 2●3M/2623M and TSX P57 3●3M/3623M processors
 - Quantum 140 CPU 434 12A and 140 CPU 534 14A processors (requires PV 04 or later)
 - Ethernet TCP/IP TSX ETY and 140 NOE 771 communication modules
- These operating system updates are performed as follows for the various types of processor:
- 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 Ethernet Premium and Quantum processors

Communication drivers

The drivers used most frequently on the Atrium, Premium and Quantum platforms are installed at the same time as the Unity Pro software. Furthermore, Unity Pro also includes the following communication drivers, which can be installed as required:

Driver type	Windows XP Windows 2000	Windows NT	Windows 98 Millennium	Windows 95	OSS/2	DOS
Uni-Telway	V1.6 IE17	V1.9 IE17	V1.6 IE17	V7.8 IE18	–	V7.4 IE14
TSX FPC10	V1.3 IE05	V1.3 IE08	V1.3 IE05	V2.4 IE14	V2.4 IE13	V2.2 IE11
TSX FPC20	V1.2 IE03	V1.3 IE08	V1.2 IE04	V1.2 IE04	V1.5 IE05	–
TSX SCP 114	V1.1 IE04	V1.1 IE04	V1.1 IE04	V1.1 IE04	–	–
Ethway	V1.1 IE02	V1.1 IE03	V2.6 IE06	V2.6 IE06	V2.6 IE22	–
ISAway	V1.2 IE04	V1.5 IE06	V1.2 IE04	V1.2 IE09	–	–
PCIway	V1.0 IE06	–	–	–	–	–
XIP	V1.7 IE13	V1.7 IE13	V1.7 IE13	V1.7 IE13	–	–
Modbus	V1.1 IE06	V1.1 IE06	V1.1 IE06	V1.1 IE06	–	–
USB for mini-DIN terminal port	Included with PL7	–	–	–	–	–
USB for USB terminal port	V1.0 IE14	–	–	–	–	–



Example of a made-to-order solution, which can be set up with UDE

Advanced openness for experienced IT engineers

Advanced openness, which is reserved for experienced IT engineers, supports the development of interfaces between Unity and expert tools as well as specific user-defined functions.

This type of development requires expert IT knowledge in the following areas:

- C++ or Visual Basic languages
- Client/server architectures
- XML and COM/DCOM technologies
- Issues relating to data synchronization

As a supplement to the Unity Studio software suite, the UDE (Unity Developer's Edition) development tool can be used to set up made-to-order solutions. In addition to a development kit, it includes the Unity servers, training, documentation, and technical support.

This UDE development tool can only be supplied once a specific contract has been signed with Schneider Electric. Please consult your Regional Sales Office.

References

Unity Pro Medium, Large and Extra Large software packages

The software is available in 3 versions:

- Unity Pro Medium for programming and setting up Unity automation platforms:
 - Atrium TSX PCI 57 20
 - Premium TSX 57 0●, 57 10 and 57 20
- Unity Pro Large for programming and setting up automation platforms:
 - Atrium TSX PCI 57 20 and 57 30
 - Premium TSX 57 0●, 57 10, 57 20, 57 30 and 57 40
 - Quantum with 140 CPU 311 10, 434 12U and 534 14U processors
- Unity Pro Extra Large for programming and setting up all Unity automation platforms:
 - Atrium TSX PCI 57 20 and 57 30
 - Premium TSX 57 0●, 57 10, 57 20, 57 30, 57 40 and 57 50
 - Quantum with 140 CPU 311 10, 434 12U, 534 14U, 651 50, 651 60 and Hot Standby 140 CPU 671 60 processors

Furthermore, Unity Pro can be used to design and run programmable process control loops on Premium TSX 57 40 and 57 50 platforms and Quantum platforms with 140 CPU 651 50, 651 60 and 671 60 processors (access to CONT_CTL process control function block library).

Upgrade kits for Concept, PL7 Pro and ProWORX software

Users who have already purchased these installed base software programs **and have a current subscription** may purchase Unity Pro version V2.0 software at vastly reduced prices. These upgrades are only possible for licenses of the same type (from Concept XL group license to Unity Pro Extra Large group license).

OS Windows composition and compatibility

Unity Pro multilingual software is compatible with Windows 2000 Professional and Windows XP operating systems.

It comprises:

- Documentation in electronic format in 4 languages (English, French, German, and Spanish)

This documentation can be ordered separately in paper format.

- 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.

Modicon Quantum automation platform

Unity Pro software



References (continued)

Unity Pro Medium version 2.0 software packages

For PLCs	Description	Type of license	Reference	Weight kg
TSX 57 0●...57 20 TSX PCI 57 20	Unity Pro Medium software packages	Single-station	UNY SPU MFU CD 20	—
		Group (3 stations)	UNY SPU MFG CD 20	—
	Software upgrades from: - Concept M - PL7 Junior	Single-station	UNY SPU MZU CD 20	—
		Group (3 stations)	UNY SPU MZG CD 20	—

Unity Pro Large version 2.0 software packages

For PLCs	Description	Type of license	Reference	Weight kg
TSX 57 0●...57 40 TSX PCI 57 20/30 140 CPU 311 10 140 CPU 434 12U 140 CPU 534 14U	Unity Pro Large software packages	Single-station	UNY SPU LFU CD 20	—
		Group (3 stations)	UNY SPU LFG CD 20	—
		Team (10 stations)	UNY SPU LFT CD 20	—
		Site (> 10 stations)	UNY SPU LFF CD 20	—
	Software upgrades from: - Concept M - PL7 Junior	Single-station	UNY SPU LZU CD 20	—
		Group (3 stations)	UNY SPU LZG CD 20	—
		Team (10 stations)	UNY SPU LZT CD 20	—
		Site (> 10 stations)	UNY SPU LZF CD 20	—

Unity Pro Extra Large version 2.0 software packages

For PLCs	Description	Type of license	Reference	Weight kg
TSX 57 0●...57 50 TSX PCI 57 20/30 140 CPU 311 10 140 CPU 434 12U 140 CPU 534 14U 140 CPU 651 50/60 140 CPU 671 60	Unity Pro Extra Large software packages	Single-station	UNY SPU EFU CD 20	—
		Group (3 stations)	UNY SPU EFG CD 20	—
		Team (10 stations)	UNY SPU EFT CD 20	—
		Site (> 10 stations)	UNY SPU EFF CD 20	—
	Software upgrades from: - Concept M - PL7 Junior - ProWORX NxT - ProWORX 32	Single-station	UNY SPU EZU CD 20	—
		Group (3 stations)	UNY SPU EZG CD 20	—
		Team (10 stations)	UNY SPU EZT CD 20	—
		Site (> 10 stations)	UNY SPU EZF CD 20	—

Documentation for Unity Pro version 2.0

For PLCs	Description	Type of license	Reference	Weight kg
Getting Started manuals (on CD-ROM)	Assisted creation of a first Unity Pro application	English	UNY USE 100 10E	—
		French	UNY USE 100 10E	—
Hardware and software manuals (on CD-ROM)	Platform setup for: - Atrium/Premium - Quantum - Momentum - Electromagnetic compatibility of networks and fieldbuses Software setup for: - Unity Pro - EF/EFB/DFB function blocks library	Multilingual: English, French, German, and Spanish	UNY USE 909 CD M	—

Separate parts

Description	Use from processor	To PC port	Length	Reference	Weight kg
PC terminal connection cables	Mini-DIN port for Premium TSX 57 1●/2●/3●/4● Atrium TSX PCI 57	RS 232D (15-way SUB-D connector)	2.5 m	TSX PCX 1031	0.170
		USB port	2.5 m	TSX PCX 3030	0.150
	Modbus port 15-way SUB-D Quantum 140 CPU 311 10 140 CPU 434 12A 140 CPU 534 14A	RS 232D (15-way SUB-D connector)	3.7 m	990 NAA 263 20	0.300
			15 m	990 NAA 263 50	0.180
			1 m	110 XCA 282 01	—
			3 m	110 XCA 282 02	—
			6 m	110 XCA 282 03	—
	RJ45 connector for Modbus port Quantum 140 CPU 6●1	RJ45 connector	3.3 m	UNY XCA USB 033	—
	USB port Premium TSX 57 5● Quantum 140 CPU 6●1	USB port	3.3 m	UNY XCA USB 033	—



TSX PCX 1031

Presentation

Unity EFB Toolkit is the software for developing EF functions and EFB function blocks in C language and is optional software for Unity Pro. It can be used to develop new functions (whose internal code is written in C language) to extend and complete the set of functions proposed as standard in Unity Pro. This software comes with Microsoft Visual C++ @.Net which can be used to debug the functions used on the Unity Pro PLC simulator. Unity EFB Toolkit also includes a service for creating and managing families of functions, with a view to their integration in the Unity Pro function libraries.

Setup

C language development software is a proper tool for managing the whole function while it is being performed:

- A user-friendly creation interface, integrated in Unity Pro, 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 development stations

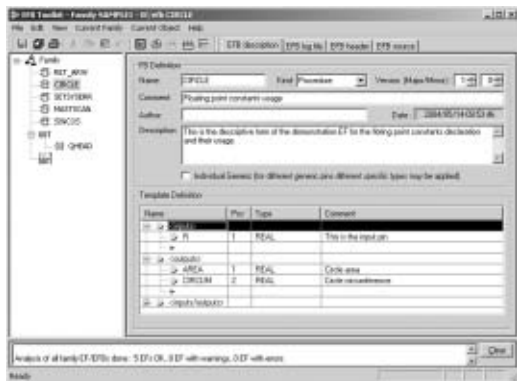
Managing function families

The software can be used to define different function families. These functions, also known as EFs/EFBs, are stored in families, making it possible to create an organized library of functions written in C language.

Once created, these families can be distributed and integrated in the Unity Pro libraries.

They are:

- Arranged in families/functions
- Used in all languages with the same flexibility as standard functions (data entry wizard)
- Managed by the Unity Pro library tool (version management)



Editing functions

The various tabs in the EFB Toolkit software editor allow the user to create the function by:

- Declaring the interface, all data types are possible (elementary, structures, tables)
- Supporting public and private variables

Writing the source code file in C language

A function written in C language can access numerous internal PLC services such as the real-time clock, PLC variables, system words, math functions. In particular, it is possible to perform numerical processing in floating point format.

Setup (continued)
Debugging functions

The function created can be tested after insertion in an application and loading into the Unity Pro PLC simulator.
The Microsoft Visual C++ tool is used to debug the function.
It is used to:

- Insert breakpoints
- Perform step by step execution
- Display the code with the breakpoints visible
- Display manipulated data



Enhancing the function library

As the function has been debugged, it can be generated and distributed, and the updating tool supplied with Unity Pro can be used to enhance the libraries on a user station.
Version management means that at any time the user knows the level of functions installed on a station and can update the application with the latest existing versions.

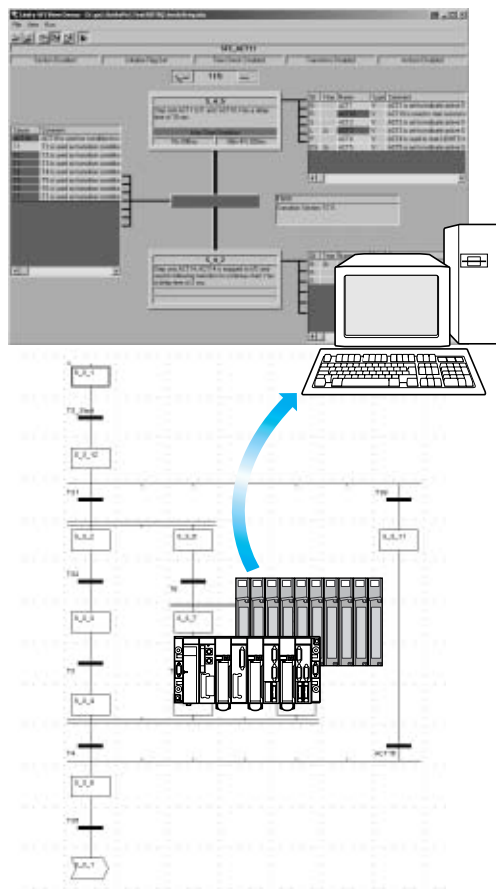
References

The “companion” software for Unity Pro, Unity EFB Toolkit can be used to create EF elementary blocks and EFB elementary function blocks. These are developed in Visual C++ language and are integrated in Unity Pro function block libraries.
The Unity EFB Toolkit software and its documentation are supplied in electronic form on CD-ROM in English.

Description	Type of license	Language	Reference	Weight kg
Unity EFB Toolkit, kit for developing EF and EFB blocks	Single (1 station)	English (software and electronic documentation)	UNY SPU ZFU CD 20E	–
Unity EFB Toolkit subscription renewal			UNY CSP SPU ZBU	–

Modicon Quantum automation platform

Unity SFC View software



Presentation

Unity SFC View is integrated in human/machine interface (HMI) applications for monitoring Unity Pro sequential applications written in sequential function chart language (SFC or Grafset) executed by a PLC.

Set up in the same way as an ActiveX control component, Unity SFC View is used to display status information relating to SFC charts executed by a Premium or Quantum PLC. Installed on an HMI station, Unity SFC View monitors and controls the status of SFC charts in real time, supplying detailed diagnostic data.

Unity SFC View reads the necessary data from the Unity project database in offline mode. The PLC data is accessed online via the OFS (*OPC Factory Server*).

Without needing to recreate SFC charts in the HMI environment, Unity SFC View reads the structure of the SFC charts directly from the Unity project database. Modifications made to the SFC application are detected and updated at any time. In online mode, Unity SFC View accesses the PLC diagnostic data, thus enabling awareness and tracking of the occurrence of the first fault and subsequent faults. System downtime is much reduced since Unity SFC View enables maintenance staff to locate the source of the problem much more quickly.

Unity SFC View is designed for end users and system designers who wish to integrate this control into their HMI system. Unity SFC View is compatible with most HMI platforms handling ActiveX Control components such as Vijeo Look control software or Monitor Pro supervisory software or in a programming environment such as Visual Basic.

Modicon Quantum automation platform

Unity SFC View software

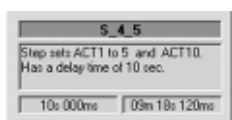
The 3 Unity SFC View views

Unity SFC View offers 3 views:

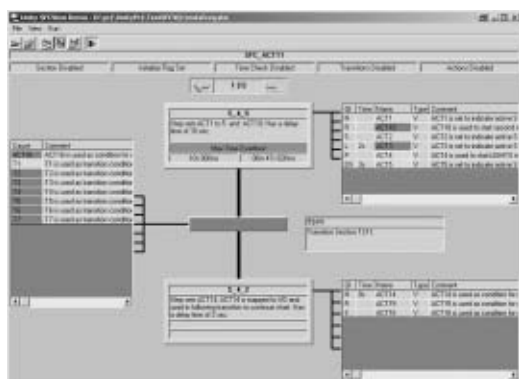
- An overview for managing selection of SFC charts
- Two detailed views presenting the status and diagnostic data of the selected SFC chart



Overview



Simple detailed view



Detailed view

The overview provides a general view of all the SFC charts in a Unity project. It contains real-time data such as current step, simultaneous steps, chart error with indication of the SFC chart status. The overview makes it easy to browse through SFC charts and switch quickly to the detailed view of the desired SFC chart in the Unity Pro application.

The simple detailed view shows the elementary data on the active step (or selected step) of the SFC chart in real time. The data displayed may include the name, comment, chart and step status, as well as the activity times (min, max, actual). You can also enable the chart navigation option.

Because of the compact size of the simple detailed view, it is possible to place several instances of it on a single HMI screen relating to a certain part of the process. From this simple detailed mode, you can navigate between HMI screens with SFC View controls and display the detailed view of SFC charts.

The detailed view illustrates the details of an SFC chart in real time. The display indicates the current step, the transition awaiting activation and the next step. The actions associated with the steps are displayed along with sequence selections or parallel branches. The detailed diagnostic data includes analysis of the causes of the fault at transition level. Depending on the diagnostic mode, the error grid contains the causes of errors or all the variables assigned to the transition logic. The current state of the various variables and selected errors are identified by different colors.

Diagnostic mode

Transition logic diagnostics is a key function of Unity SFC View. It minimizes system downtimes in the event of a fault.

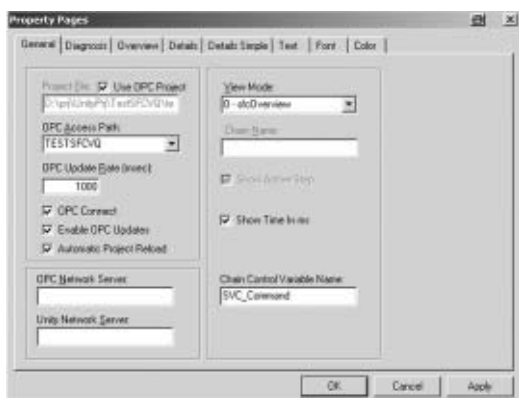
Two different diagnostic modes are available:

- Unity SFC View reads the data in the Unity PLC diagnostic buffer. It provides information about faulty or missing events that are preventing the transition from being enabled. This mode does not require any configuration or additional programming in the PLC program.
- Unity SFC View monitors the internal logic of the transition conditions "back to front". This mode provides diagnostic data concerning all the inputs connected to the transition (not limited to faulty inputs). In this mode, Unity SFC View uses specific EFB function blocks linked to the transition conditions. The library for these blocks is supplied with the Unity SFC View software.

Customization

Unity SFC View offers a programming interface which can be used to integrate the ActiveX Control component in an HMI application and customize its functions and its operator interface.

The ActiveX Control component in Unity SFC View can be customized. It accepts properties, methods and events (all the properties have a default value). The properties pages simplify configuration. Unity SFC View accepts scripts with methods such as browsing through charts, status control of charts, and also events such as error notification or chart selection. This data can be used to launch programs or operator screens.



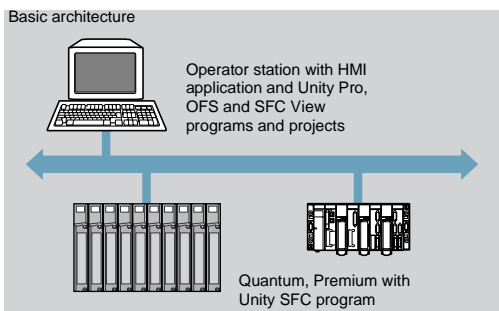
SFC View properties page

Modicon Quantum automation platform

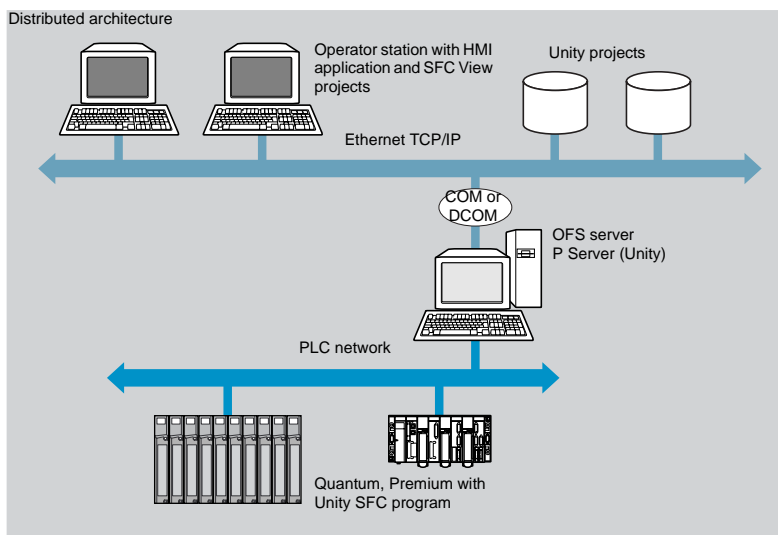
Unity SFC View software

Possible architectures

Unity SFC View is used in a configuration where the OFS and Unity Pro software reside on the same PC platform as the HMI application.



In a distributed configuration, the OFS and Unity Pro software can be installed on different servers.



Modicon Quantum automation platform

Unity SFC View software



References

When integrated in an HMI application, Unity SFC View can be used to monitor and control charts in applications developed in Sequential Function Chart (SFC) language running on Premium/Quantum Unity PLCs.

The HMI station, compatible with Windows 2000 or Windows XP Professional operating systems, must support ActiveX Control components. Unity SFC View V2.0 requires:

- Unity Pro V2.0 (M, L or XL), to be ordered separately
- OFS V3.1 data server software, to be ordered separately

Unity SFC View multilingual software, supplied on a CD-ROM, includes:

- The SFC View ActiveX Control component
- The EFB function block library for Unity Pro V2.0
- An example of how to integrate SFC View in Unity Pro projects
- The electronic documentation (English, French, German and Spanish)

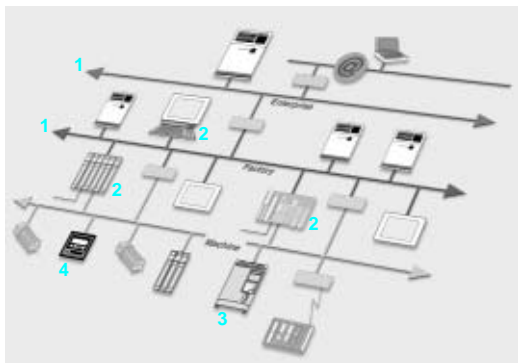
The Unity SFC View integration example illustrates the main possibilities offered by Unity SFC View. This is an executable program which does not need HMI software in order to run. It helps the user understand how to configure and use the Unity SFC View ActiveX Control component.

Description	Type of license	Reference	Weight kg
Unity SFC View software packages (version V2.0)	Single (1 station)	UNY SDU MFU CD20	–
	Team (10 stations)	UNY SDU MFT CD20	–
	Site (100 stations)	UNY SDU MFF CD20	–



Modicon Quantum automation platform

Unity Studio software suite General presentation



Unity Studio for the development of a distributed project

The Unity Studio software suite is the key component on design office workstations used for designing and structuring automation applications in a collaborative environment. This type of project consists of creating an automation application comprising various devices:

- 1 Communication networks
- 2 Automation platforms and distributed I/O
- 3 Variable speed drives, motion control
- 4 Human machine interfaces (HMIs)

Based on a horizontal approach, the software suite supports:

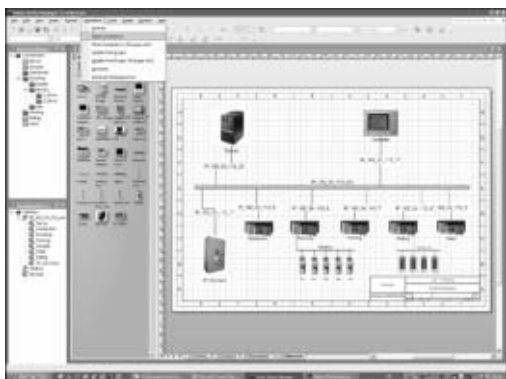
- Project management for distributed applications
- Application and device management
- The consistency and synchronization of Ethernet TCP/IP communication between devices

The Unity Studio software suite offers designers of industrial automation distributed control projects the possibility of using all these tools in conjunction. From the design phase on, everyone involved has easy, user-friendly access to a single, shared representation of the project.

The objective of the Unity Studio software suite is to:

- Provide a unique structural representation of the project shared by experts in all application-specific domains
- Increase the productivity of each expert

“All-in-one” software suite



Unity Studio V2.0 is an “all-in-one” software suite based on Microsoft's Visio 2003 Professional graphic design tool. It is supplied with the following software as standard:

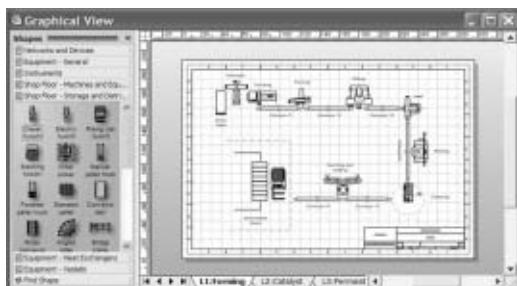
- Unity Studio Manager V2.0 for managing distributed control applications
- Unity Pro XL V2.0 for programming Atrium, Premium and Quantum platforms
- OFS V3.1 (OPC Factory Server) for accessing and exchanging data in the architecture
- PowerSuite V1.5 for setting up drives and motor starters
- XBT-L1000 V4.30 for creating Magelis HMI applications
- Microsoft VBA (Visual Basic for Applications) for developing customized functions
- MS Visio 2003 Professional, depending on the type of software license

Unity Studio V2.0 is the ideal tool for integrating and configuring Transparent Ready products.

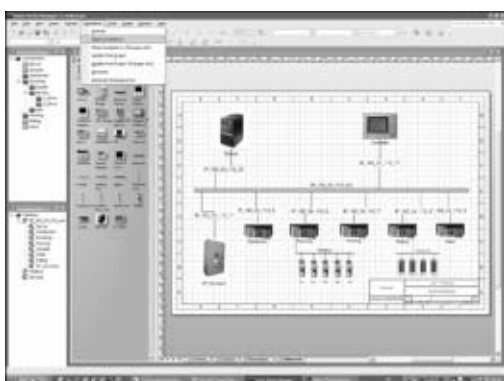
Unity Studio Manager tools allow you to create direct links with other Schneider Electric applications or with third-party software applications.

In addition, the Unity Developer's Edition (UDE) software package provides an advanced open development solution for the programming of user functions and the development of interactive interfaces with other software applications (programming in C++, VBA, VBA macros, etc.), see page 6/26.

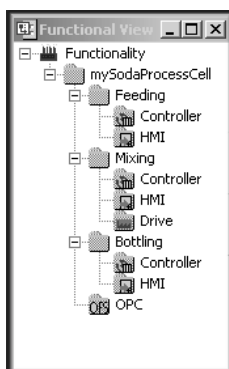
The Unity Studio software suite is the ideal software engineering platform for distributed control applications.



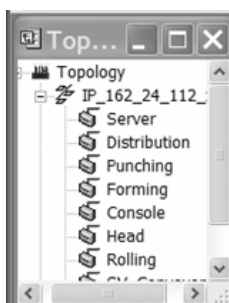
Graphical process or machine view



Graphical view of the distributed automation architecture



Functional view



Topological view

Project views

Graphical project views

In conjunction with the Visio 2003 graphics editor, the Unity Studio software suite can be used to create project views in specific pages:

- **Process or machine view:** A unique representation shared by all specialist experts/consultants working on the project (mechanical, hydraulic, electrical engineering, etc.).
- **View of the distributed automation architecture:** A graphical representation of the project's automation devices and communication networks.

These views are composed using application-specific object libraries (construction, mechanical, hydraulic, electrical engineering, etc.). The Schneider component library extends the scope of the Visio libraries. Graphical views are created by dragging and dropping objects from the libraries to the tabbed pages.

Objects, their links and related properties composing the project views are entered once into the graphical views and shared with:

- Other views
- Other Unity Studio suite software and external software applications

Based on the Visio 2003 editor, the graphical views are easy to use thanks to the standard user interface (Microsoft office tools). Graphic elements can be integrated from other market-standard CAD software (AutoCAD, Micro Station, etc.).

Functional view

The functional view is a structured tree diagram of the entire set of machine or process functions. It is taken from the graphical view of the process or machine.

This hierarchical structure comprises functional entities in the form of folders that can be nested at different levels.

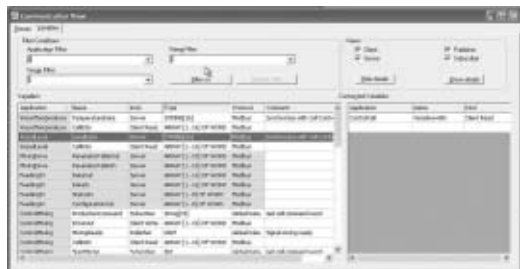
The project designer associates functional entities with stations making up the project.

After "generation" (see page 6/39), the corresponding functional entities are made available in the structural view (configuration entity) of Unity Pro applications for Atrium/Premium/Quantum platforms.

Topological view

The topological view is composed using the control architecture graphical view. This topological view displays the communication networks and connected devices in a folder structure.

In a similar fashion, after "generation" (see page 6/39), elements of the topological view are made available in the structural view (communication element) of each Unity Pro application for the Modicon Atrium/Premium/Quantum platforms in the distributed automation architecture. Network names and the names and types of stations defined in the graphical view of Unity Studio are sent to Unity Pro applications.



Communication view

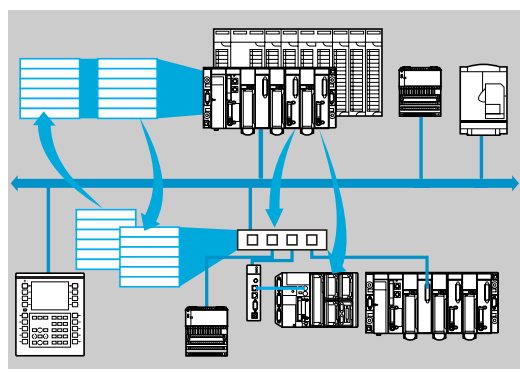
Communication view

The communication view enables PLCs to be synchronized and data to be exchanged with the following types of distributed product:

- Altivar drives
- Advantys STB, Momentum distributed I/O
- Or any other product connected to the Ethernet architecture, including those connected via Ethernet/Modbus Plus or Ethernet/Modbus gateways.

Set using the symbolic variables editor in Unity Studio, parameters for communication services between the various devices or products (Global Data and I/O Scanning services) are loaded automatically in the files for each station during generation (see page 6/39), thereby ensuring that all stations benefit from:

- Ensured communication consistency between the distributed applications concerned
- Maximum productivity based on station configuration
- Reduction in the risk of errors



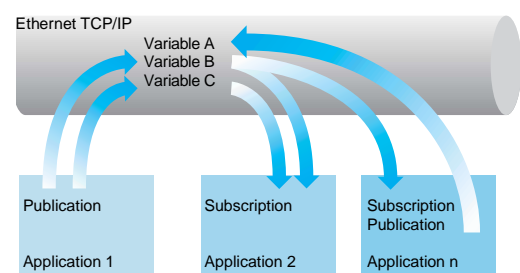
I/O Scanning

The I/O Scanning service can be used to manage the exchange of remote I/O states on the Ethernet TCP/IP network following simple configuration, with no need for specific programming.

I/O scanning is transparent and is carried out via read/write requests sent by the Atrium, Premium and Quantum automation platforms in accordance with the Modbus TCP client/server protocol. This technique of scanning via a standard protocol enables communication with any product that supports a Modbus server on TCP/IP.

Unity Studio can define a number of communication frames for each station. Each communication frame, reserved for reading inputs and writing outputs, is limited to 100 consecutive words.

See page 5/22 for more information about the I/O Scanning service.



Global Data

The Global Data service on Ethernet TCP/IP communication networks can be used to exchange data between connected stations in real time.

This service enables a common database to be synchronized and shared between 64 stations. Each of the 64 stations in a distribution group can:

- Publish a 1024-byte variable on the network
- Subscribe to between 1 and 64 published variables

The Global Data view in Unity Studio can be used to define Global Data distribution groups and set parameters for variables published and subscribed to by the stations.

See page 5/24 for more information about the Global Data service.



Process library



Schneider Electric automation product library

Object libraries

The Unity Studio software suite supplies open libraries of objects that can be re-used in graphical views:

- Visio 2003 libraries
- Schneider Electric automation product library

Objects found in these libraries are of 2 types:

- **Process objects** for the creation of a graphical view of a process or machine (motors, valves, actuators, pumps, etc.)
- **Automation objects** for the creation of a control architecture view (PLCs, networks, drives, HMI terminals, Ethernet hubs, etc.)

Each object can be given its own parameters (type of valve, etc.) using predefined properties or enhanced by applying customized properties.

Adding new objects

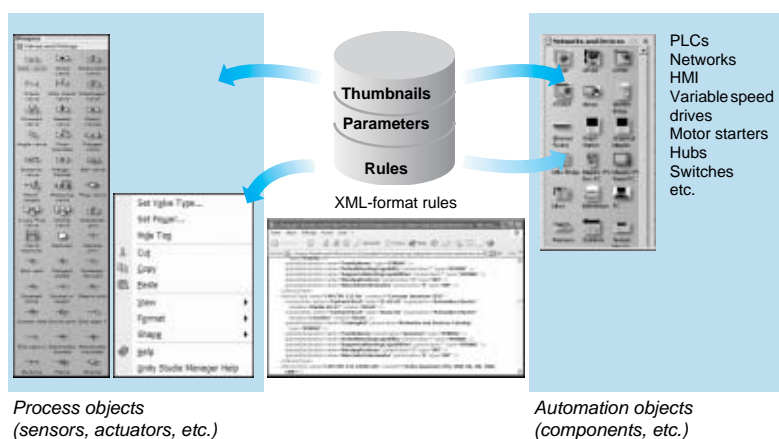
The numerous libraries supplied can be expanded as needed by:

- Downloading Visio objects available online, covering all industrial fields (Microsoft Visio site, product reseller sites or sites specializing in Visio objects)
- Creation of objects by the user

A customized object can be created by:

- Integrating a graphical thumbnail of your choice (.bmp format) into the library
- Defining customized object properties
- Creating XML-format rules for complex objects

Complex objects (for automation devices) can be created by writing usage rules (for instance, the possibility of connecting a type of automation device to a type of communication network) in standard eXtensible Markup Language (XML) format.

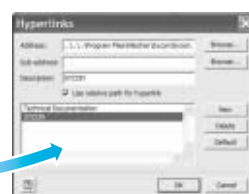
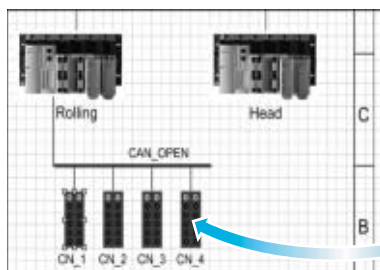


Hyperlinks can be defined from the objects in order to launch a software application or to open a document related to the object (see next page).

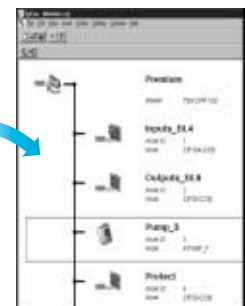
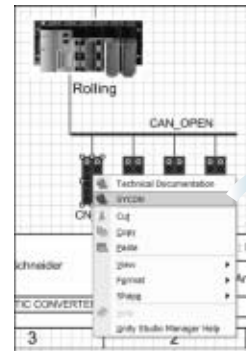
Direct-access hyperlinks

From the Unity Studio project views, it is possible to create hyperlinks at any time to:

- All document types in .xls, .doc, .pdf, etc. formats
- Web pages via a URL address
- Software tools, for example for configuration, network diagnostics, production management, etc.



Creation of a link from an object

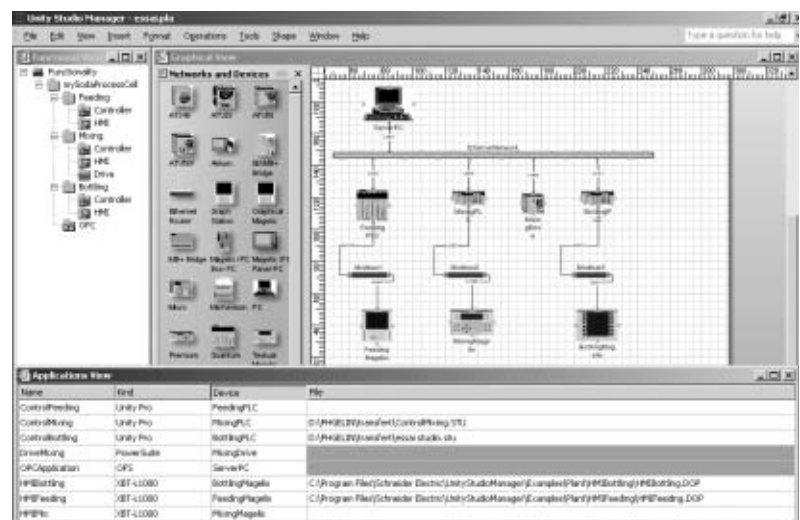


Direct access to the configuration software tool relative to the object

Managing distributed control applications

The project is described in Unity Studio by different views, which:

- Provide specific types of characteristic information
- Provide access to associated information



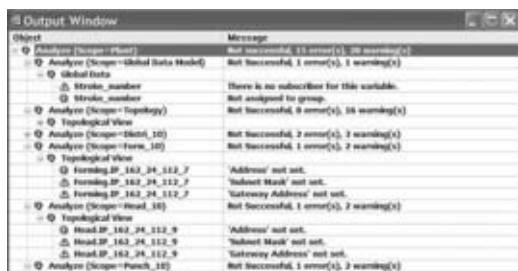
4

2

1

3

- 1 Assignment of an automation application to each station in the architecture
- 2 Launch of the application from the topological or functional view
- 3 Creation and location of files for each station
- 4 Assignment of functional process or machine entities to station applications



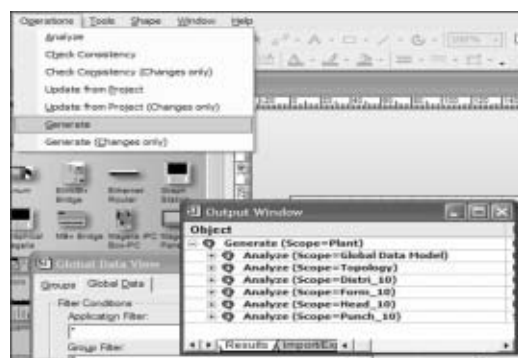
Project analysis operations

In order to detect any errors as early as possible, the Unity Studio software suite analyzes application coherence and consistency. A report indicates any possible errors in the form of alarms. Checks are performed on:

- Station addressing
- The types of station defined
- Data exchanged in real time on the Ethernet network between PLC stations via the I/O Scanning and Global Data services (reserved word zones, group, published and subscribed variables)
- The hierarchical structure of functional entities



Generation in Unity Pro



Creation of Unity Pro program structures

Generation for each individual station

Following the analysis (and after any corrections have been made to render the application compliant), generation using the Unity Pro software suite enables you to create specific parameter settings for each station in each corresponding station file. The parameter settings generated - consistent with the global project - are listed in the table below for each type of station.

For PLC stations (Atrium, Premium and Quantum), this generation includes the creation of the functional view, the program structure and the parameter settings for the Global Data and I/O Scanning services.

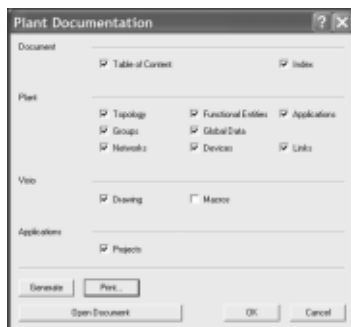
Type of data generated		Unity Pro	XBT L1000	Power Suite	Concept	PL7	OFS
Application	Name						
	Project file						
Device	Name						
	Format						
Network	Routing path						
Link	Name						
	Format						
	Address						
Functional entity	Name						
	Structure						
Group	Name						
	Multicast address						
	Variable name						
Global Data	Variable type						
	Producer/consumer						
	Variable name						
I/O Scanning	Variable type						
	I/O Scanner setting						

	Data generated using Unity Studio with consistency check and updates
	Data created in Unity Studio
	XML data generated using Unity Pro

Consistency check and update operations

The check verifies the consistency of the project parameter settings with the files for each station.

The update updates the parameter settings in the station files to correspond to those in Unity Studio (see table above). Any modifications made on the stations are checked and replicated at all other project levels. The existing parameter settings for a station added to the project are updated in Unity Studio (in the event of the re-use of an existing station).



Global project documentation

The Unity Studio software suite is a single publishing resource for creating global project documentation including information about the following different levels:

- **Project** (topology, networks, global data, functional modules, Visio graphical views, VBA macros)
- **Stations** (station applications), see “Unity Pro documentation editor”, page 6/19

This documentation can be viewed on screen or printed.

Openness of the Unity Studio software suite

Better customer solutions with Unity Studio

The inherent openness of Unity Studio means that project object models can be accessed for the purpose of using and extending their services. This adaptation of generic functions to meet user-specific requirements is achieved by:

- Importing/exporting components in standard XML format
- Launching VBA macros (*Microsoft Visual Basic*)
- The option to include hyperlinks to third-party documents and software (MES, ERP, web, configurators, maintenance guide, etc.)
- The use of COM/DCOM technology
- The use of the UDE (*Unity Developer's Edition*) development tool, see page 6/27

The Unity Studio software suite is supplied with productivity examples based on VBA technology for creating language objects designed to enhance the Unity Pro design software.

Unrestricted design approach

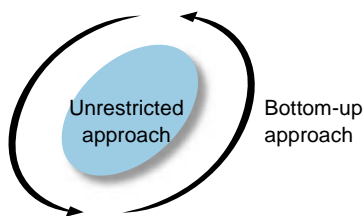
Unity software applications combine the assurance of overall project consistency with the freedom to select project design and debugging methods. A number of approaches are possible:

- **The top-down approach:** In the Unity Studio software suite, this approach corresponds to the creation of graphical representations, the declaration of applications, the configuration of communications, the generation of station files (particularly in the Unity Pro setup software) and the publishing of global documentation.
- **The bottom-up approach:** Based on applications created at each station level, this approach enables all parameter settings to be updated to match those at Unity Studio project level.
- **The unrestricted approach:** In the Unity Studio software suite, this approach allows users to freely select the design method for a distributed automation project. Information entered at one level is automatically replicated and distributed at other levels of the project.

This design freedom facilitates, for example:

- The integration of existing applications into the project with upgrading to Unity Pro software and Unity Studio global project level
- The incorporation of modifications made to each application following testing and start-up or maintenance operations

Top-down approach



Bottom-up approach

Modicon Quantum automation platform

Unity Studio software suite



References

The multilingual Unity Studio software suite, compatible with the Windows 2000 Professional and Windows XP Professional operating systems, can be used to design and structure distributed automation projects.

The Unity Studio software suite includes the following software applications:

- Depending on the software offer, Microsoft Visio 2003 Professional for graphic design
- Unity Studio Manager V2.0 for the management of distributed applications
- Unity Pro Extra Large V2.0 for the programming and debugging of Atrium, Premium and Quantum automation platforms
- OFS V3.1 (OPC Factory Server) for accessing and exchanging data in the architecture
- PowerSuite V1.50 for setting up drives and motor starters
- XBT-L1000 V4.30 for creating Magelis applications
- Microsoft VBA (Visual Basic for Applications) for developing customized functions
- Communication drivers (see detailed information on page 6/26).

Documentation is supplied in electronic format.

Processor/PC programming terminal connection cables must be ordered separately (see page 6/27).

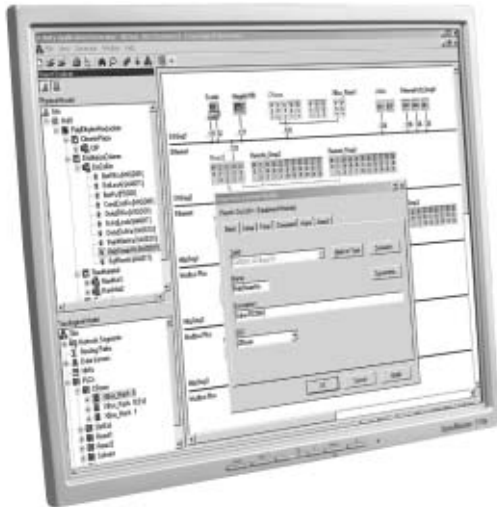
Description	MS Visio 2003	Type of license	Language (1)	Reference	Weight kg
Unity Studio development software suite	Included	Single-station	French	UNY SEW XFU CD20F ▲	–
			English	UNY SEW XFU CD20E ▲	–
			German	UNY SEW XFU CD20D ▲	–
			Spanish	UNY SEW XFU CD20S ▲	–
			Italian	UNY SEW XFU CD20T ▲	–
	Not included	Single-station	Multilingual	UNY SEW LFU CD20 ▲	–
		Group (3 stations)	Multilingual	UNY SEW LFG CD20 ▲	–
		Team (10 stations)	Multilingual	UNY SEW LFT CD20 ▲	–
		Site (unlimited)	Multilingual	UNY SEW LFF CD20 ▲	–
	Not included	Single-station	Multilingual	UNY SEW LYU CD20 ▲	–
Upgrade from Unity Pro to Unity Studio	Not included	Single-station	Multilingual	UNY SEW LYU CD20 ▲	–

(1) Defines the language for Visio 2003 Professional and the electronic documentation.

▲ Launch planned for 4th quarter of 2004

Modicon Quantum automation platform

Unity Application Generator

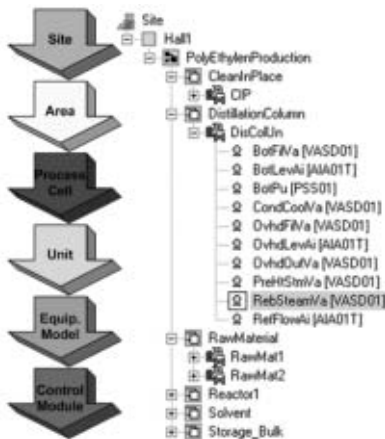


Unity Application Generator for designing and generating process applications

Unity Application Generator (UAG) is a specialized software productivity tool for modeling and generating process applications in a collaborative environment.

For process type applications, UAG provides a single database containing all the project information (process model, control configuration and SCADA integration). Using an approach based on reusable control devices (PID, motor, valve, etc.), UAG which complies with the standard ISA S88 and generates the PLC code (Unity Pro & Concept), plus all the elements required by the HMI monitoring system (Magelis) or SCADA (Monitor Pro V7.2 (1) or third-party supervision system).

Single entry and central information management ensure data consistency and the integration of the control (PLC) and monitoring (HMI/SCADA) systems.



Process models

Physical model (process view)

Process components and logical structuration of the process are based on the ISA S88 standard.

Adopting the ISA S88 standard provides the following benefits:

- Considerable process flexibility.
- Significant reduction in development and delivery timescales.
- A standardized, uniform solution.
- Reuse of sub-elements.

UAG offers the 6 structural levels from the ISA S88 standard (site, area, process cell, unit, equipment module and control module):

These levels can be found again within the applications structure (supervision and PLC) generated by UAG. Process parameters for control devices, such as motors, control loops and valves, are set at control module level.

Topological model (automation view)

In a Collaborative Control environment, UAG can be applied to the entire process' control, monitoring and supervision topology. The topological view includes all devices with I/O points, as well as the communication channels between these devices.

UAG supports:

- Architectures comprising automation platforms.
 - Modicon Quantum, Premium and Atrium with Unity Pro.
 - Modicon Quantum and Momentum with Concept.
- SCADA systems (Monitor Pro, iFix or generic), Magelis panels.
- Ethernet TCP/IP and Modbus Plus communication networks.
- Third-party devices.

The process for configuration of networks, PLC applications with their I/O and other devices of the topological model, takes place directly in UAG.

Compleat model (project view)

The physical and topological models are independent and can be created in parallel by independent process and automation experts.

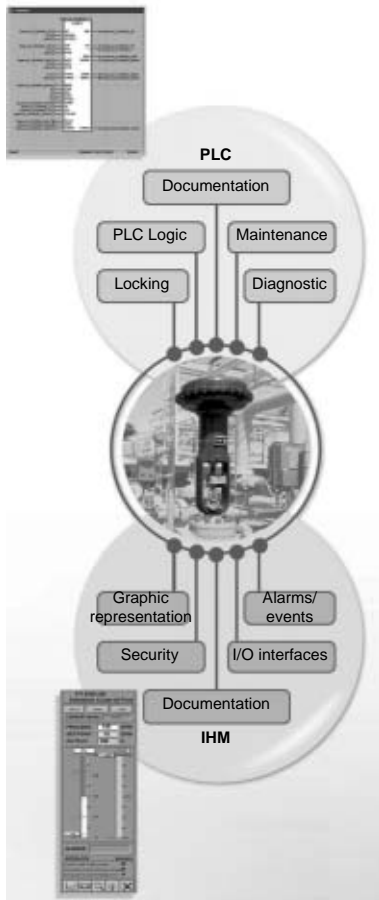
The models are integrated via simple drag & drop operations between the two views..

This integration simply involves assigning PLC I/O points to control devices (valves, motors, etc.).

Modicon Quantum automation platform

Unity Application Generator

Flow loop control



Integrating your expertise in UAG

Smart Control Devices (SCoDs)

UAG software is an object-oriented tool based on these Smart Control Devices. These elements describe a part of the process, including all the aspects of the process control system:

- Links to the PLC logic.
- Links to the graphic representation in the supervisory system.
- Description of I/O interfaces.
- Description of interfaces intended for HMI/SCADA supervisory.
- Information related for handling alarms and events.
- Documentation.

In UAG these multi-faceted elements are called SCoDs (Smart Control Devices). They are created using UAG's specific SCoD editor.

A SCoD is defined for each control devices, and is created with the help of the SCoD editor by:

- Using the DFB or EFB interface of the PLC logic (Unity Pro/Concept) by importing FBD Language.
- Assigning a supervisory graphic reference (Monitor Pro (1) or others).
- Defining the Smart control Device parameters and their behavior in the process control system:
 - control device parameters and attributes from the process side (operating modes, threshold limits, alarm texts, etc.).
 - I/O parameters and attributes for PLC logic,
 - parameters and attributes for HMI/SCADA supervisory.
- Defining configuration screens for the UAG user interface.
- Defining default or initial parameters.

This means that **you can integrate your process expertise and know-how** in your own SCoD libraries and reuse them again and again in all your UAG applications.

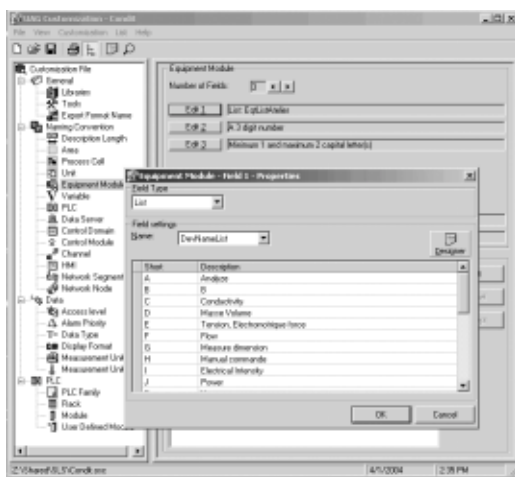
Customization

UAG can be used to define your own standards and apply them. It provides a uniform solution based on your standards, and prepares for validation operations. During the design phase, the risk of error is kept to a minimum, thereby reducing debugging and maintenance costs too.

UAG can be used to customize:

- The selection of SCoD libraries.
- The symbols nomenclature used in UAG.
- The selection of PLC platforms and modules.
- The definition of access levels, display formats, units of measurement, etc. used for HMI/SCADA supervisory.
- The user documentation.
- Security.

This means that **you can integrate your process expertise and standards** in all your UAG applications.



Integrating your expertise in UAG (continued)

Modeling process applications

Once you have created the customization based on your standards and chosen your SCoD libraries, UAG offers you a simple, user-friendly, application-specific method of working.

The process is defined using the physical model (process view), exploiting the expertise provided at customization and SCoD library creation stages. This means that the process behavior and the process configuration screens match exactly your requirements.

The process control is defined using the topological model (automation view), again, in accordance with your customization.

■ Process design using UAG is made easy through functional analyses. It allows the user to reliably track the exact project status. In order to be able to detect any error or oversight as soon as possible, UAG analyzes the project and flags any bugs at the various levels of the project, for instance:

■ At physical model level:

- SCoD instance attributes that are missing or over limit,
- invalid or missing interlock parameters.

■ At topological model level:

- Communication channels between devices that are not defined,
- invalid or missing communication parameters.

■ At project level:

- SCoD data is being transmitted from another PLC, but communication with this device has not been configured,
- the SCoD data is not assigned to any PLC I/O variable,
- behavior on response time for I/O variables that is not defined.

This means that **your process expertise and know-how** is made available to be used in UAG, ensuring consistent process application modeling.

Generating process applications

UAG provides at a single point all the process information intended for the project's multiple applications (PLCs, HMI/SCADA), along with the communication parameters.

When applications are generated this information is used to create the configuration and part of the control logic in using IEC 61131-3 FBD functional language. The following items are generated:

■ At PLC level:

- Hardware configuration,
- localized and non-localized data with its initial value and symbol,
- initialization,
- inter-PLC communication and distributed I/O (I/O Scanning on Ethernet or Peer Coop on Modbus Plus),
- DFB/EFB block data (information from SCoDs),
- interlocks.

■ At HMI/SCADA level:

- Data for graphic animations,
- localized data with its corresponding symbol (display, alarm, archiving information, etc.),
- user access rights.

■ At communication level:

- Communication driver configuration (Monitor Pro (1) and iFIX),
- configuration data for third-party devices (via an XML interface).

The generation process in UAG is incremental, which makes it possible to supplement the various applications with their dedicated tools outside UAG without any risk.

Incremental generation in UAG only impacts changed elements within the applications, which ensures that any additions made using the dedicated tools are stored permanently.

This means that **your process expertise and know-how** is quickly operational in your process without any errors or oversights.

Modicon Quantum automation platform

Unity Application Generator

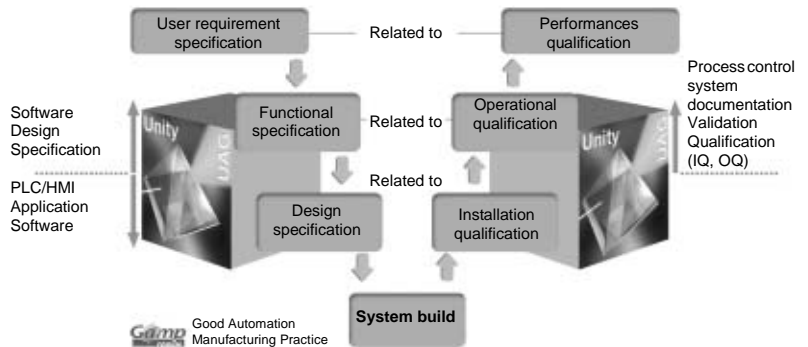
Validation

Validation

UAG is a specialized functional tool for process experts and has been developed to comply with the following process standards:

- ISA S88.
- GAMP (*Good Automation Manufacturing Practice*).

Implementing validation procedures



UAG uses ISA S88 standard terminology for batch control and adopts the GAMP methodology for creating an automated system.

The inclusion of these two standards provides major support in the task of approving and validating processes. Validation according to FDA 21CFR Part 11 regulations is simplified by UAG, as it provides:

- All process information at a single point, based on functional analysis.
- Automatic generation of process applications by UAG.
- Archiving in compliance with FDA regulations.
- A log of all interactions by UAG.
- Electronic documentation.

UAG tracks and documents every modification made. The version control system, in compliance with regulation FDA 21 CFR Part 11, ensures simple, straightforward validation.

Active collaboration

Compatible with third-party tools

UAG arranges existing information according to your operating objectives and constraints. Open import/export interfaces are available at every level, facilitating the connection of third-party tools at any time. This means that you can share your expertise by reusing, for example, data from your CAD tools.

Total user accessibility

With its multi-user environment and common language, UAG facilitates sharing among process and PLC developers, as well as maintenance engineers and operating staff.

UAG ensures optimum productivity throughout your application's entire life cycle.



References

This specialized software program UAG (Unity Application Generator) is multilingual (available in English, French and German) and is compatible with the Windows 2000 Professional and Windows XP operating systems.

UAG can be used to model and generate process applications in a collaborative environment. It generates the PLC code (Unity Pro & Concept) and the elements required by the HMI monitoring system (Magelis), SCADA (Monitor Pro V7.2 or third-party supervision systems).

There are two types of software license available for UAG: Medium (M) and Large (L). They are determined by the functional level of the HMI integration:

- The Medium version generates HMI information using customizable XML files (XSL style sheets).
- The Large version also provides customizable XML files, direct integration for Monitor Pro and iFix supervision systems featuring the generation of SCADA applications with variables and attributes, mimics (graphic objects), alarm tables and communication driver configuration.

Documentation is supplied in electronic format.

UAG software suites				
Description	Type	License type	Reference	Weight
Code generated				kg
UAG software suites (Unity Application Generator)	Medium	Single (1 machine)	UAG SEW MFUCD 21 ▲	–
		Site	UAG SEW MFFCD 21 ▲	–
	Large	Single (1 machine)	UAG SEW LFUCD 21 ▲	–
		Site	UAG SEW LFFCD 21 ▲	–

▲ Available later



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	MI - C	MI - C - Q
LL984 Ladder Logic language		ML	ML - C	ML - C - Q
Programming services	Multitask programming (Master, fast and event-triggered)	MI - ML	MI - ML - C	MI - ML - C - Q
	DFB 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
	DDT compound data editor	MI - ML	MI - ML - C	MI - ML - C - Q
	EF function block libraries and EFB function blocks	MI - ML	MI - ML - C	MI - ML - C - Q
	Programmable control loops (with function block libraries)	MI - ML	MI - ML - C	MI - ML - C - Q
	Hot Standby PLC redundancy system			Q (140 CPU 43 412/534 14)
				Q
	System diagnostics	MI - ML	MI - ML - C	MI - ML - C - Q
Debugging and display services	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
	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
Other services	Dagnostic viewers	MI - ML	MI - ML - C	MI - ML - C - Q
	Modsoft application converter	MI - ML	MI - ML - C	MI - ML - C - Q
Compatibles Modicon platforms	Quantum processors Q	140 CPU 113 02 140 CPU 113 03 140 CPU 434 12A 140 CPU 534 14A		
	Momentum M1 et M1E processors 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 processors C	PC E984 258 PC E984 265 PC E984 275 PC E984 285		
Software name		Concept S	Concept M	Concept XL
Concept software type		372 SPU 471 01 V26	372 SPU 472 01 V26	372 SPU 474 ●1 V26
Pages		6/55		

EF/EFB function development software in C language	Logiciel Concept version exploitation/maintenance	Software for designing and generating batch/process applications	SFC View application diagnostic and monitoring software
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<p>Enhancement of EF and EFB function block libraries:</p> <ul style="list-style-type: none"> □ Creation of families □ Development of functions in C language □ Access to all data and variable types □ Use of functions created in all languages <p>Supplied with Borland C++ software</p>	<p>Logiciel destiné aux techniciens de maintenance pour les applications en exploitation pour :</p> <ul style="list-style-type: none"> □ Téléchargement de programme □ Surveillance et diagnostic des applications <p>Ne donne pas accès à la modification de programme</p>	<p>UAG specialist software for designing and generating batch/process applications in a "Collaborative Automation" environment. It provides the unique project database:</p> <ul style="list-style-type: none"> □ process and control (PLCs) □ HMI user interface (Magelis) □ SCADA supervision (Monitor Pro V7.2) <p>Based around re-usable objects (PID, valves, etc) and complying with standard ISA S88, UAG generates the PLC code and the elements required for the HMI system. Complies with the GAMP standard (<i>Good Automation Manufacturing Practice</i>)</p>	<p>ActiveX control component for monitoring and diagnostics of chart status (SFC or Grafset) in sequential applications:</p> <ul style="list-style-type: none"> □ Overview of charts and detailed views □ Can be integrated in human/machine interface (HMI) applications □ Access to PLC data via OFS (<i>OPC Factory Server</i>) <p>Includes EFB function block library for Concept</p>
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<p>Compatible with:</p> <ul style="list-style-type: none"> □ Concept S, M and XL □ All processors for Concept 	<p>Compatible with all processors for Concept</p>	<p>Version V2.0 compatible with:</p> <ul style="list-style-type: none"> □ Concept S, M and XL (V2.6) □ All Quantum processors for Concept <p>Version V2.1, available 4^e trimestre 2004</p>	<p>Compatible with:</p> <ul style="list-style-type: none"> □ Concept S, M and XL □ All processors for Concept
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Concept EFB Toolkit	Concept Application Loader	Unity Application Generator UAG Medium/Large	Concept SFC View
372 SPU 470 01 V26	372 SPU 477 01 V26	UNY SEW ●F● CD20/21	372 SFV 160●0 V20
6/55	6/55	6/65	6/59

Modicon Quantum automation platform

Concept programming software

Presentation

Concept is a software configuration and application programming tool for the automation platform. It is a Windows-based software that can be run on a standard personal computer. The configuration task can be carried out online (with the PC connected to the CPU) or offline (PC only). Concept supports the configuration by recommending only permissible combinations, thereby preventing misconfiguration. During online operation, the configured hardware is checked immediately for validity, and illegal statements are rejected.

When the connection between programming unit (PC) and CPU is established, the configured values (e.g., from the variables editor) 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).
- Ladder diagram (LD).
- Sequential function chart (SFC).
- Instruction list (IL).
- Structured text (ST).

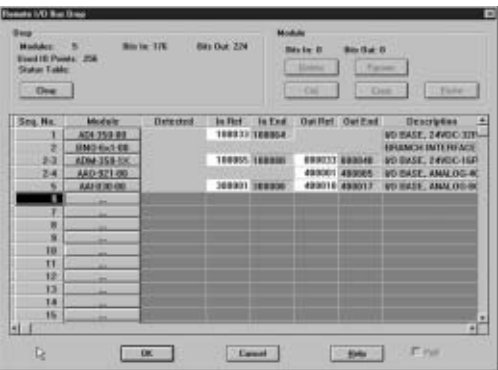
as well as Modsoft-compatible ladder logic (LL984). IEC 61131-3 compliant data types are also available. With the data type editor, custom data types can be converted to and from the IEC data types.

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; additionally, LD provides contact and coil elements. The 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 is used within a given segment. You build the control program, which the automation device uses 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.

PLC hardware configuration

Variables for linking basic objects within one section are not required by the graphic programming languages (FBD, LD, SFC and LL984) since these links are created by connections. These connections are managed by the system, which eliminates any configuration effort. Other variables, such as variables for data transfers between different sections, are configured with the variables editor. With the data type editor, custom data types can be derived from existing data types.



Modicon Quantum automation platform

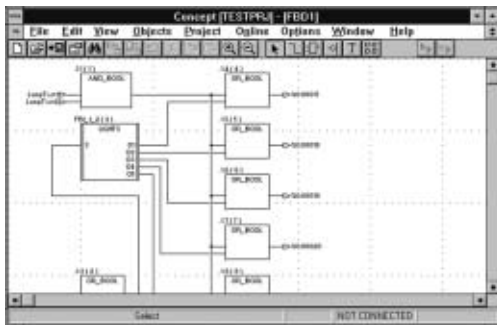
Concept programming software

Functions

Concept provides an editor for each programming language. These editors contain custom menus and tool bars. You can select the editor to be used as you create each program segment.

In addition to the language editors, Concept provides a data type editor, a variables editor and a reference data editor.

Function block diagram (FBD)



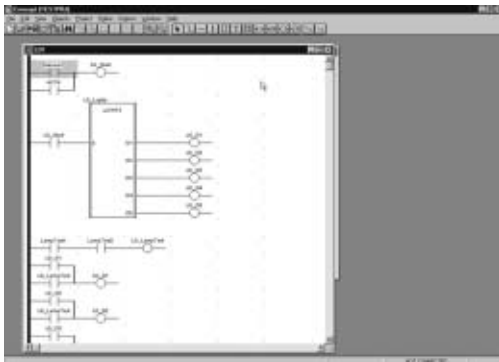
With the IEC 61131-3 function block diagram language, you can combine elementary functions, elementary function blocks (EFBs) and derived function blocks (all three of which are known as FFBs) with variables in an FBD. FFBs and variables can be commented. Text can be freely placed within the graphic. Many FFBs offer an option for input extensions.

Concept provides various block libraries with predefined EFBs for programming an FBD. EFBs are grouped in the libraries according to application types to facilitate the search.

In the FBD editor, you can display, modify and load initial values; current values can be displayed. The CLC and CLC_PRO libraries allow you to display animated diagrams of the FFBs and a graph of the current values.

For custom function blocks (DFBs), the Concept-DFB editor is used. In this editor, you can create your own function blocks from EFBs or existing DFBs. DFBs created in the FBD editor can be recalled in the LD, IL and ST editors, and DFBs created in the LD, IL and ST editors can be used in the FBD editor.

Ladder diagram (LD)



With the IEC 61131-3 ladder diagram language, you can build an LD program with elementary functions, function blocks and derived function blocks (all of which are known as FFBs), along with contacts, coils and variables. FFBs, contacts, coils and variables can be commented. Text can be placed freely within the graphics. Many FFBs offer an option for input extensions.

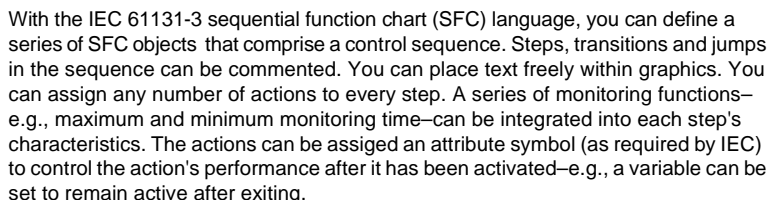
The structure of an LD segment corresponds to that of a current path for relay circuits. On its left side is a left bus bar, which corresponds to the phase (L conductor) of a current path. As with a current path, only the LD objects (contacts, coils) connected to a power supply (i.e., connected to the left bus bar) are processed in LD programming. The right bus bar, which corresponds to the neutral conductor, is not visible. However, all coils and FFB outputs are internally connected to it in order to create a current flow.

The same EFB block libraries available for the FBD editor can be used in the LD editor to program a ladder diagram.

In the LD editor, initial values can be displayed, modified and loaded; current values can be displayed. For the EFBs in libraries CLC and CLC_PRO, animated diagrams of the FFBs and a graph of the current values can be displayed.

For custom function blocks (DFBs), the Concept-DFB editor is used. With this editor, you can create your own function blocks from EFBs or existing DFBs. DFBs created in the LD editor can be recalled in the FBD, IL and ST editors, and DFBs created in the FBD, IL and ST editors can be used in the LD editor.

Sequential function chart (SFC)



With the IEC 61131-3 IL language, you can call entire functions and function blocks conditionally or unconditionally, execute assignments and make conditional and unconditional jumps within a program segment.

IL is a text-based language, and standard Windows word processing tools can be used to generate code. The IL editor also provides several word processing commands. Keywords, separators and comments are spell-checked automatically as they are entered. Errors are highlighted in color.

For custom function blocks (DFBs), the Concept-DFB editor is used. In this editor, you can create your own function blocks from EFBs or existing DFBs. DFBs created in the IL editor can be recalled in the ST, LD and FBD editors, and DFBs created in the ST, LD and FBD editors can be used in the IL editor.

With the IEC 61131-3 ST language, you can call function blocks, execute functions and assignments and conditionally execute and repeat instructions. The ST programming environment is similar to Pascal. It is a text-based language, and Windows word processing functions can be used to enter code. The ST editor itself also provides several word processing commands. Keywords, separators, and comments are spell-checked automatically as they are entered. Errors are highlighted in color.

Custom function blocks (DFBs) created with the ST editor can be called in the IL, LD and FBD editors; DFBs created in the IL, LD and FBD editors can be used in the ST editor.

Functions (continued)

Data type editor

The data type editor defines new derived data types. Any elementary data types and derived data types already existing in a project can be used for defining new data types. With derived data types, various block parameters can be transferred as one set. Within the program, this set is divided again into single parameters, processed, then output as either a parameter set or individual parameters. Derived data types are defined in text format, and standard Windows word processing tools can be used. The data type editor also provides several word processing commands.

Variables editor

The variables editor contains input options for:

- The variable type (located variable, unlocated variable, constant).
- The symbolic name.
- The data type.
- Direct address (explicit, if desired).
- Comments.
- Identification as human-machine interface (HMI) variable for data exchange.

Reference data editor

In online mode, the reference data editor displays, forces and controls variables. The editor contains the following options:

- Default values for the variable.
- Status display for the variable.
- Various format definitions.
- The ability to isolate the variable from the process.



Functions (continued)

Libraries

EC Library

The IEC library contains the EFBs defined in IEC 61131-3 (calculations, counters, timers, etc).

Extended Library

The extended library contains useful supplements to various libraries. It provides EFBs for mean value creation, maximum value selection, negation, triggering, converting, building a traverse with interpolation of the first order, edge detection and determination of the neutral range for process variables.

System Library

The system library contains EFBs in support of system functions. It provides EFBs for cycle time detection, utilization of various system clocks, control of SFC sections and system status display.

CLC and CLC_PRO Library

The CLC library is used for defining process-specific control loops. It contains control, differentiation, integration and polygon graph EFBs. The CLC_PRO library contains the same EFBs as the CLC library along with data structures.

Communication Library

The communication libraries of built-in function blocks provide easy integration of programs which allow communication between PLCs or HMI devices from within the PLC's application program. Like other function blocks, these EFBs can be used in all languages to share data, or provide data to the HMI device for display to the operator.

Diagnostics Library

The diagnostics library is used for troubleshooting the control program. It contains EFBs for action, reaction, interlocking, and process prerequisite diagnostics, along with signal monitoring.

LIB984 Library

The LIB984 library provides common function blocks used in both the 984 ladder logic editor and the IEC languages. This allows for easy transition of portions of application code from the 984LL environment to the IEC environment.

Fuzzy Logic Library

The fuzzy library contains EFBs for fuzzy logic.

Analog I/O Library

The ANA_IO library is used to process analog values.



Modicon Quantum automation platform

Concept programming software

References

Concept packages

Description	License type	Reference	Weight kg
Concept S Version 2.6	Single-user license	372 SPU 471 01 V26	–
Concept M Version 2.6	Single-user license	372 SPU 472 01 V26	–
Concept XL Version 2.6	Single-user license	372 SPU 474 01 V26	–
	Three-user license	372 SPU 474 11 V26	–
	10-user license	372 SPU 474 21 V26	–
	Network license	372 SPU 474 31 V26	–
Concept EFB Toolkit Version 2.6	–	332 SPU 470 01 V26	–

Concept upgrades

Description	License type	Reference	Weight kg
Concept XL V x.x to Concept XL V 2.6	Single-user license	372 ESS 474 01	–
	Three-user license	372 ESS 474 03	–
	10-user license	372 ESS 474 10	–
	Network license	372 ESS 474 00	–
Concept S V x.x to Concept S V 2.6	Single-user license	372 ESS 471 01	–
Concept M V x.x to Concept M V 2.6	Single-user license	372 ESS 472 01	–
Modsoft V x.x to Concept XL V 2.6	Depends on number of users	372 ESS 485 01	–
Concept EFB Toolkit V x.x to V 2.6	–	372 ESS 471 01	–

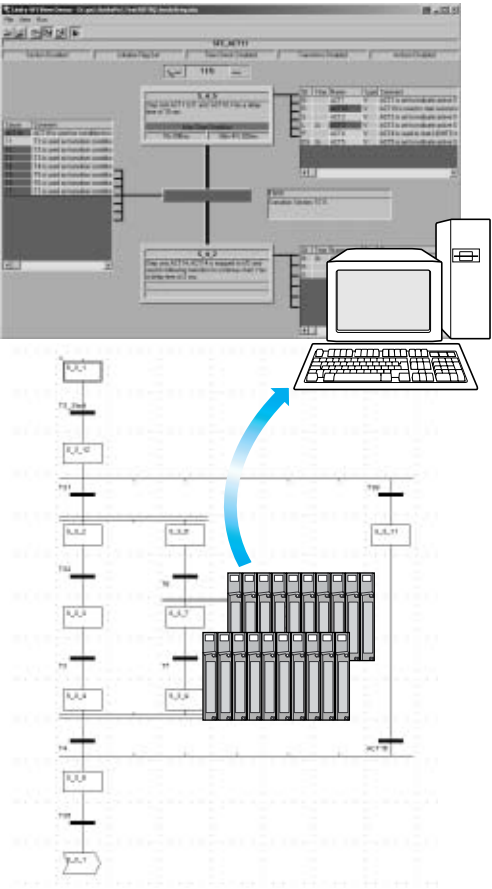
Documentation

Description	Number of volumes	Reference (1)	Weight kg
Concept Installation Instructions	1	840 USE 492 0●	–
Concept User Manual	3	840 USE 493 0●	–
Concept IEC Block Library	13	840 USE 494 0●	–
Concept 984 LL Block Library	2	840 USE 496 0●	–
Concept EFB Tool User Manual	1	840 USE 495 01	–

(1) ● = 0 in this position indicates english language, 1 indicates french language, 2 indicates german language and 3 indicates spanish language.

Modicon Quantum automation platform

Concept SFC View software



Presentation

Concept SFC View is integrated in human/machine interface (HMI) applications for monitoring Concept sequential applications written in sequential function chart language (SFC or Grafcet) executed by a PLC.

Set up in the same way as an ActiveX control component, Concept SFC View is used to display status information relating to SFC charts executed by a Premium or Quantum PLC. Installed on an HMI station, Concept SFC View monitors and controls the status of SFC charts in real time, supplying detailed diagnostic data.

Concept SFC View reads the necessary data from the Concept project database in offline mode. The PLC data is accessed online via the OFS (*OPC Factory Server*).

Without needing to recreate SFC charts in the HMI environment, Concept SFC View reads the structure of the SFC charts directly from the Concept project database. Modifications made to the SFC application are detected and updated at any time. In online mode, Concept SFC View accesses the PLC diagnostic data, thus enabling awareness and tracking of the occurrence of the first fault and subsequent faults. System downtime is much reduced since Concept SFC View enables maintenance staff to locate the source of the problem much more quickly.

Concept SFC View is designed for end users and system designers who wish to integrate this control into their HMI system. Concept SFC View is compatible with most HMI platforms handling ActiveX Control components such as Vijeo Look control software or Monitor Pro supervisory software or in a programming environment such as Visual Basic.

6

3.2



Modicon Quantum automation platform

Concept SFC View software

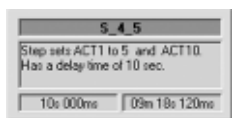
The 3 Concept SFC View views

Concept SFC View offers 3 views:

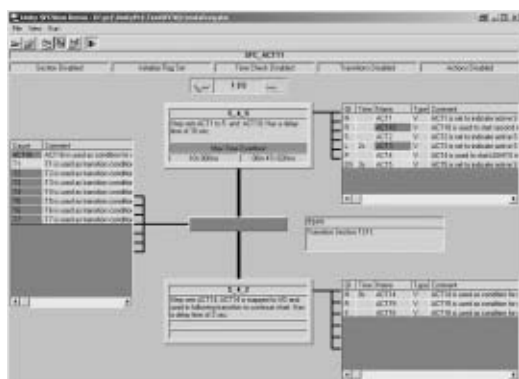
- An overview for managing selection of SFC charts
- Two detailed views presenting the status and diagnostic data of the selected SFC chart



Overview



Simple detailed view



Detailed view

The overview provides a general view of all the SFC charts in a Concept project. It contains real-time data such as current step, simultaneous steps, chart error with indication of the SFC chart status. The overview makes it easy to browse through SFC charts and switch quickly to the detailed view of the desired SFC chart in the Concept application.

The simple detailed view shows the elementary data on the active step (or selected step) of the SFC chart in real time. The data displayed may include the name, comment, chart and step status, as well as the activity times (min, max, actual). You can also enable the chart navigation option.

Because of the compact size of the simple detailed view, it is possible to place several instances of it on a single HMI screen relating to a certain part of the process. From this simple detailed mode, you can navigate between HMI screens with SFC View controls and display the detailed view of SFC charts.

The detailed view illustrates the details of an SFC chart in real time. The display indicates the current step, the transition awaiting activation and the next step. The actions associated with the steps are displayed along with sequence selections or parallel branches. The detailed diagnostic data includes analysis of the causes of the fault at transition level. Depending on the diagnostic mode, the error grid contains the causes of errors or all the variables assigned to the transition logic. The current state of the various variables and selected errors are identified by different colors.

Diagnostic mode

Transition logic diagnostics is a key function of Concept SFC View. It minimizes system downtimes in the event of a fault.

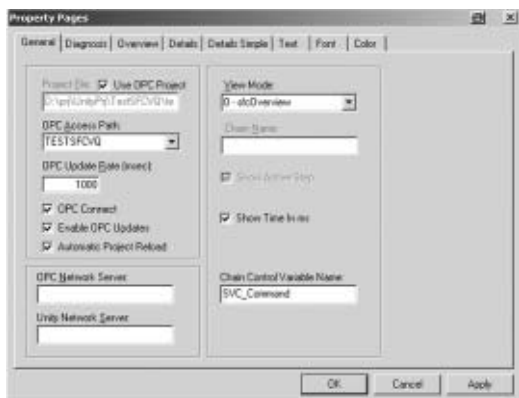
Two different diagnostic modes are available:

- Concept SFC View reads the data in the Concept PLC diagnostic buffer. It provides information about faulty or missing events that are preventing the transition from being enabled. This mode does not require any configuration or additional programming in the PLC program.
- Concept SFC View monitors the internal logic of the transition conditions "back to front". This mode provides diagnostic data concerning all the inputs connected to the transition (not limited to faulty inputs). In this mode, Concept SFC View uses specific EFB function blocks linked to the transition conditions. The library for these blocks is supplied with the Concept SFC View software.

Customization

Concept SFC View offers a programming interface which can be used to integrate the ActiveX Control component in an HMI application and customize its functions and its operator interface.

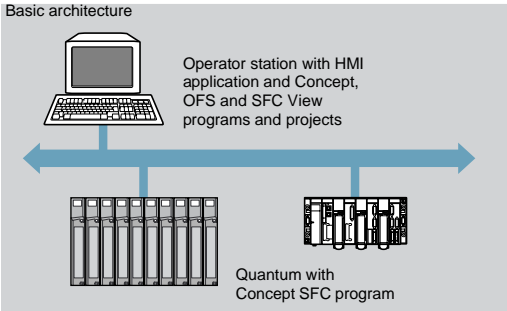
The ActiveX Control component in Concept SFC View can be customized. It accepts properties, methods and events (all the properties have a default value). The properties pages simplify configuration. Concept SFC View accepts scripts with methods such as browsing through charts, status control of charts, and also events such as error notification or chart selection. This data can be used to launch programs or operator screens.



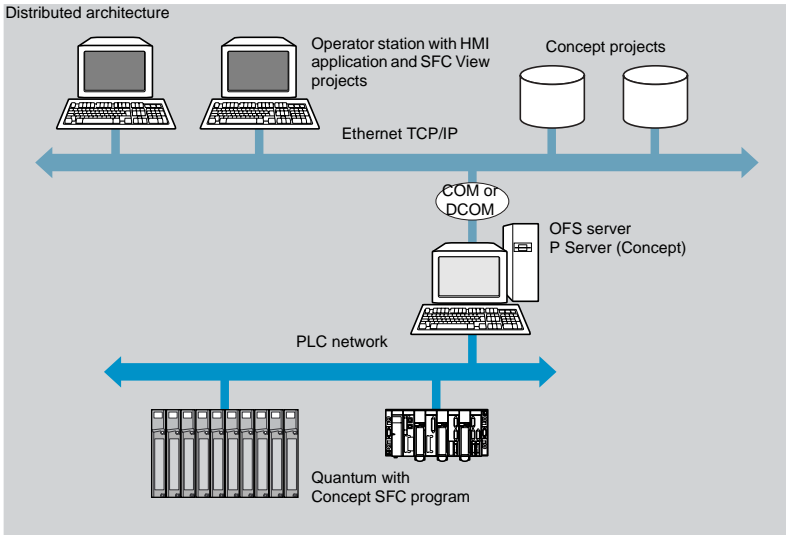
SFC View properties page

Possible architectures

Concept SFC View is used in a configuration where the OFS and Concept software reside on the same PC platform as the HMI application.



In a distributed configuration, the OFS and Concept software can be installed on different servers.



6

3.2





References

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 Concept PLCs.

The HMI station, compatible with Windows 2000 or Windows XP Professional operating systems, must support ActiveX Control components.

Concept SFC View V3.0 requires:

- Concept V2.2 SR2, V2.5 SR2 or V2.6 SR1, to be ordered separately
- OFS V > 2.2 data server software, to be ordered separately

Concept SFC View multilingual software, supplied on a CD-ROM, includes:

- The SFC View ActiveX Control component
- The EFB function block library for Concept
- An example of how to integrate SFC View in Concept projects
- The electronic documentation (English, French, German and Spanish)

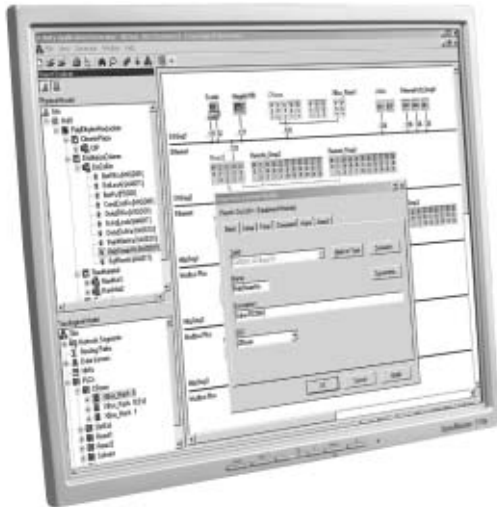
The Concept SFC View integration example illustrates the main possibilities offered by Concept SFC View. This is an executable program which does not need HMI software in order to run. It helps the user understand how to configure and use the Concept SFC View ActiveX Control component.

Description	Type of license	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

Unity Application Generator

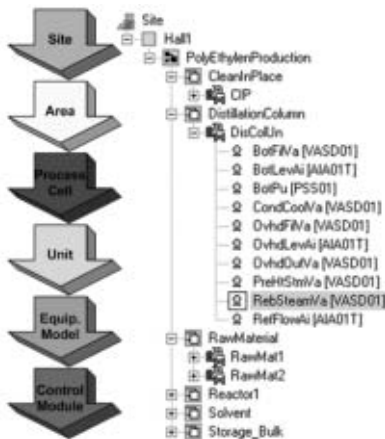


Unity Application Generator for designing and generating process applications

Unity Application Generator (UAG) is a specialized software productivity tool for modeling and generating process applications in a collaborative environment.

For process type applications, UAG provides a single database containing all the project information (process model, control configuration and SCADA integration). Using an approach based on reusable control devices (PID, motor, valve, etc.), UAG which complies with the standard ISA S88 and generates the PLC code (Unity Pro (1) & Concept), plus all the elements required by the HMI monitoring system (Magelis) or SCADA (Monitor Pro V7.2 (1) or third-party supervision system).

Single entry and central information management ensure data consistency and the integration of the control (PLC) and monitoring (HMI/SCADA) systems.



Process models

Physical model (process view)

Process components and logical structuration of the process are based on the ISA S88 standard.

Adopting the ISA S88 standard provides the following benefits:

- Considerable process flexibility.
- Significant reduction in development and delivery timescales.
- A standardized, uniform solution.
- Reuse of sub-elements.

UAG offers the 6 structural levels from the ISA S88 standard (site, area, process cell, unit, equipment module and control module):

These levels can be found again within the applications structure (supervision and PLC) generated by UAG. Process parameters for control devices, such as motors, control loops and valves, are set at control module level.

Topological model (automation view)

In a Collaborative Control environment, UAG can be applied to the entire process' control, monitoring and supervision topology. The topological view includes all devices with I/O points, as well as the communication channels between these devices.

UAG supports:

- Architectures comprising automation platforms.
 - Modicon Quantum, Premium and Atrium with Unity Pro (1).
 - Modicon Quantum and Momentum with Concept.
- SCADA systems (Monitor Pro, iFix or generic), Magelis panels.
- Ethernet TCP/IP and Modbus Plus communication networks.
- Third-party devices.

The process for configuration of networks, PLC applications with their I/O and other devices of the topological model, takes place directly in UAG.

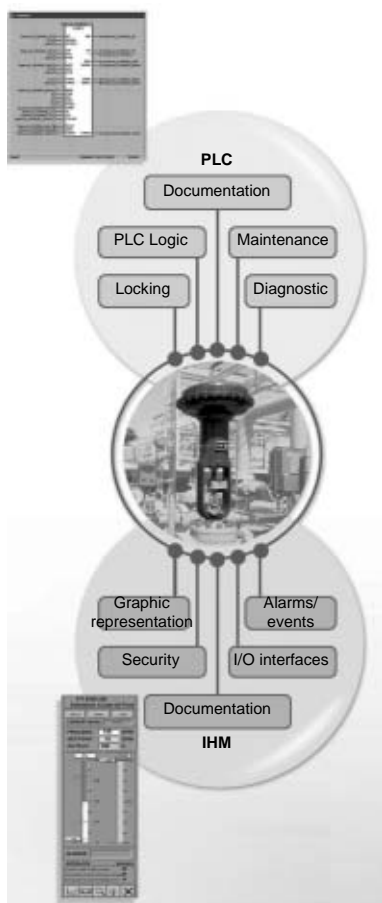
Compleat model (project view)

The physical and topological models are independent and can be created in parallel by independent process and automation experts.

The models are integrated via simple drag & drop operations between the two views.. This integration simply involves assigning PLC I/O points to control devices (valves, motors, etc.).

(1) Available with UAG version V2.1.

Flow loop control



Integrating your expertise in UAG

Smart Control Devices (SCoDs)

UAG software is an object-oriented tool based on these Smart Control Devices. These elements describe a part of the process, including all the aspects of the process control system:

- Links to the PLC logic.
- Links to the graphic representation in the supervisory system.
- Description of I/O interfaces.
- Description of interfaces intended for HMI/SCADA supervisory.
- Information related for handling alarms and events.
- Documentation.

In UAG these multi-faceted elements are called SCoDs (Smart Control Devices). They are created using UAG's specific SCoD editor.

A SCoD is defined for each control devices, and is created with the help of the SCoD editor by:

- Using the DFB or EFB interface of the PLC logic (Unity Pro/Concept) by importing FBD Language.
- Assigning a supervisory graphic reference (Monitor Pro (1) or others).
- Defining the Smart control Device parameters and their behavior in the process control system:
 - control device parameters and attributes from the process side (operating modes, threshold limits, alarm texts, etc.).
 - I/O parameters and attributes for PLC logic,
 - parameters and attributes for HMI/SCADA supervisory.
- Defining configuration screens for the UAG user interface.
- Defining default or initial parameters.

This means that **you can integrate your process expertise and know-how** in your own SCoD libraries and reuse them again and again in all your UAG applications.

(1) Available with UAG version V2.1.

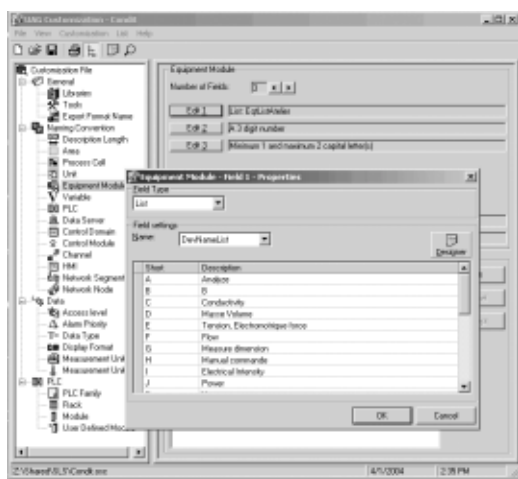
Customization

UAG can be used to define your own standards and apply them. It provides a uniform solution based on your standards, and prepares for validation operations. During the design phase, the risk of error is kept to a minimum, thereby reducing debugging and maintenance costs too.

UAG can be used to customize:

- The selection of SCoD libraries.
- The symbols nomenclature used in UAG.
- The selection of PLC platforms and modules.
- The definition of access levels, display formats, units of measurement, etc. used for HMI/SCADA supervisory.
- The user documentation.
- Security.

This means that **you can integrate your process expertise and standards** in all your UAG applications.



Integrating your expertise in UAG (continued)**Modeling process applications**

Once you have created the customization based on your standards and chosen your SCoD libraries, UAG offers you a simple, user-friendly, application-specific method of working.

The process is defined using the physical model (process view), exploiting the expertise provided at customization and SCoD library creation stages. This means that the process behavior and the process configuration screens match exactly your requirements.

The process control is defined using the topological model (automation view), again, in accordance with your customization.

■ Process design using UAG is made easy through functional analyses. It allows the user to reliably track the exact project status. In order to be able to detect any error or oversight as soon as possible, UAG analyzes the project and flags any bugs at the various levels of the project, for instance:

■ At physical model level:

- SCoD instance attributes that are missing or over limit,
- invalid or missing interlock parameters.

■ At topological model level:

- Communication channels between devices that are not defined,
- invalid or missing communication parameters.

■ At project level:

- SCoD data is being transmitted from another PLC, but communication with this device has not been configured,
- the SCoD data is not assigned to any PLC I/O variable,
- behavior on response time for I/O variables that is not defined.

This means that **your process expertise and know-how** is made available to be used in UAG, ensuring consistent process application modeling.

Generating process applications

UAG provides at a single point all the process information intended for the project's multiple applications (PLCs, HMI/SCADA), along with the communication parameters.

When applications are generated this information is used to create the configuration and part of the control logic in using IEC 61131-3 FBD functional language. The following items are generated:

■ At PLC level:

- Hardware configuration,
- localized and non-localized data with its initial value and symbol,
- initialization,
- inter-PLC communication and distributed I/O (I/O Scanning on Ethernet or Peer Coop on Modbus Plus),
- DFB/EFB block data (information from SCoDs),
- interlocks.

■ At HMI/SCADA level:

- Data for graphic animations,
- localized data with its corresponding symbol (display, alarm, archiving information, etc.),
- user access rights.

■ At communication level:

- Communication driver configuration (Monitor Pro ⁽¹⁾ and iFIX),
- configuration data for third-party devices (via an XML interface).

The generation process in UAG is incremental, which makes it possible to supplement the various applications with their dedicated tools outside UAG without any risk.

Incremental generation in UAG only impacts changed elements within the applications, which ensures that any additions made using the dedicated tools are stored permanently.

This means that **your process expertise and know-how** is quickly operational in your process without any errors or oversights.

(1) Available with UAG version V2.1.



Modicon Quantum automation platform

Unity Application Generator

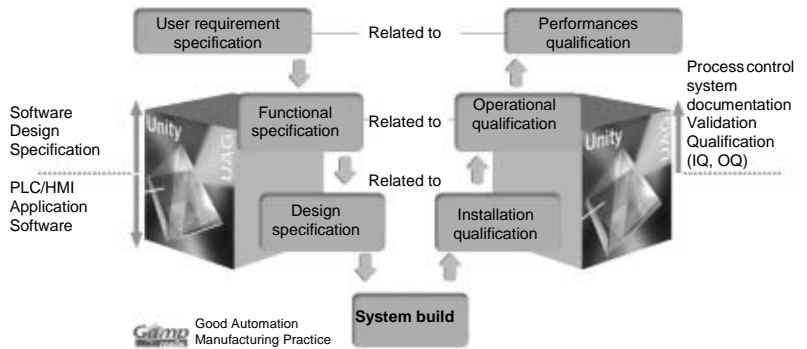
Validation

Validation

UAG is a specialized functional tool for process experts and has been developed to comply with the following process standards:

- ISA S88.
- GAMP (*Good Automation Manufacturing Practice*).

Implementing validation procedures



UAG uses ISA S88 standard terminology for batch control and adopts the GAMP methodology for creating an automated system.

The inclusion of these two standards provides major support in the task of approving and validating processes. Validation according to FDA 21CFR Part 11 regulations is simplified by UAG, as it provides:

- All process information at a single point, based on functional analysis.
- Automatic generation of process applications by UAG.
- Archiving in compliance with FDA regulations.
- A log of all interactions by UAG.
- Electronic documentation.

UAG tracks and documents every modification made. The version control system, in compliance with regulation FDA 21 CFR Part 11, ensures simple, straightforward validation.

Active collaboration

Compatible with third-party tools

UAG arranges existing information according to your operating objectives and constraints. Open import/export interfaces are available at every level, facilitating the connection of third-party tools at any time. This means that you can share your expertise by reusing, for example, data from your CAD tools.

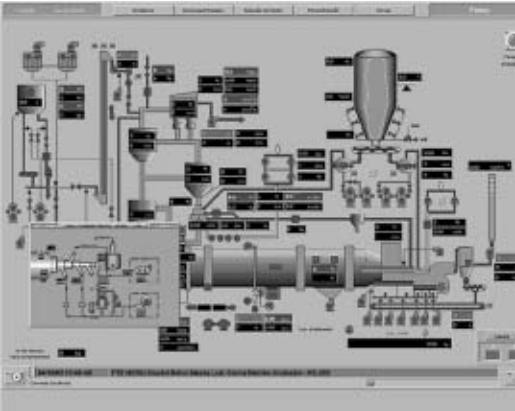
Total user accessibility

With its multi-user environment and common language, UAG facilitates sharing among process and PLC developers, as well as maintenance engineers and operating staff.

UAG ensures optimum productivity throughout your application's entire life cycle.

Interfacing with SCADA applications

UAG can openly interface with many of the SCADA systems currently available on the market.



Direct integration

- Direct integration by UAG automatically generates the Monitor Pro V7.2 supervisory application elements, which are:
- Variables with symbol and attributes.
 - Alarm server configuration.
 - Trend server configuration (real time and historical).
 - Mimics (graphic objects) of the devices.
 - Configuration of the Modbus TCP/IP communication driver.

In addition, for each modification by UAG, the Monitor Pro V7.2 application is automatically updated without any conflicts or risk of disruption of added or changed elements.
UAG therefore ensures data consistency between the automation control and the supervisory level.

This type of direct integration is also available with the iFix supervisory and control system (GE Fanuc).

Open integration

Open integration is based on all the UAG application information made available via XML file format. This XML file is generated by UAG and can be imported into many third-party SCADA systems, once it has been customized using the XLS style sheets specific to the third-party system.

Regardless of whether direct or open integration is involved, UAG provides you with total consistency within your control, monitoring and supervision system throughout the application's entire life.

6

3.2





References

This specialized software program UAG (Unity Application Generator) is multilingual (available in English, French and German) and is compatible with the Windows 2000 Professional and Windows XP operating systems.

UAG can be used to model and generate process applications in a collaborative environment. It generates the PLC code (Unity Pro & Concept) and the elements required by the HMI monitoring system (Magelis), SCADA (Monitor Pro V7.2 (1) or third-party supervision systems).

There are two types of software license available for UAG: Medium (M) and Large (L). They are determined by the functional level of the HMI integration:

- The Medium version generates HMI information using customizable XML files (XSL style sheets).
- The Large version also provides customizable XML files, direct integration for Monitor Pro and iFix supervision systems featuring the generation of SCADA applications with variables and attributes, mimics (graphic objects), alarm tables and communication driver configuration.

Documentation is supplied in electronic format.

UAG software suites				
Description	Type	License type	Reference	Weight
Code generated				
UAG software suites (Unity Application Generator)	Medium	Single (1 machine)	UAG SEW MFUCD 2● ▲ (2)	–
		Site	UAG SEW MFFCD 2● ▲ (2)	–
	Large	Single (1 machine)	UAG SEW LFUCD 2● ▲ (2)	–
		Site	UAG SEW LFFCD 2● ▲ (2)	–

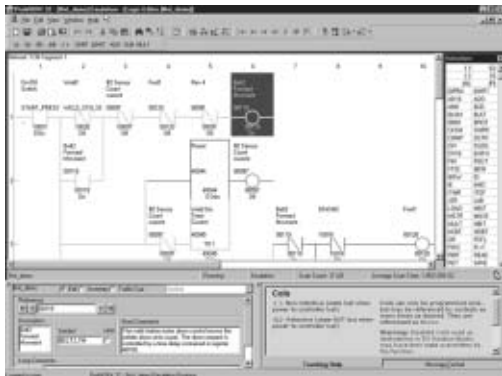
▲ Available later

(1) Monitor Pro V7.2 integration with UAG version 2.1.
(2) To order before 4th quarter 2004: replace ● at the end of reference by 0 (UAG version V2.0), to order from 4th quarter 2004: replace ● by 1 (UAG version V2.1).



Modicon Quantum automation platform

ProWORX 32 programming software



Presentation

ProWORX 32 programming software is a full-featured, Modicon PLC programming software that is 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 realtime.

Some of the new ProWORX 32 features:

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 complete 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 powerful 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 for the basis of 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 devices. The profiles can even be sent electronically to Schneider Electric for inclusion in future product 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 from 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 realtime, or logs it to disk for in-depth historical analysis later on. 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 discretes and analogs.

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 cards defined in the Traffic Cop. Generate necessary drawings all at once or just one card at a time – simply select an address the I/O card 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 or prints it.

Modicon Quantum automation platform

ProWORX 32 programming software

Presentation (continued)

Network editor

With the Network Editor, ProWORX 32 reduces development time by using the same commands and instructions for every controller. 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 the "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.

Realtime 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.

Powerful diagnostics

To effectively control your operation, you need to see your operation in action. The built-in HMI allows you to build a simple representation of your application to visualize the entire operation. With the "Data Watch Window", you can see values in realtime and perform "Data Logging" for later data analysis. The "Trending" tool is a simple built-in chart recorder to help you visualize performance factors without having to crunch hard data. And "Diagnostic Trace" helps to easily solve complicated issues such as network element interdependencies.

Advanced I/O management

Ensure that the I/O card you are configuring in the software matches the one on your plant floor with ProWORX 32's graphical Traffic Cop. It displays I/O cards on your screen the same way they look in real life, eliminating all confusion. To place a card, just select it from the convenient drop down menu and then drag it into the controller slot you want. To save even more time, the Traffic Cop automatically associates the card's I/O points with a block of free addresses in your controller. 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 is healthy.

Modicon Quantum automation platform

ProWORX 32 programming software

Presentation (continued)

Client/Server Tools

ProWORX 32 allows projects to be developed in a collaborative environment without sacrificing control and security by utilizing the ProWORX 32 server as the central repository for projects, the center for security, and the hub for communications. The system administrator has total control over user accounts, user groups, passwords, rights, and auditing policies and can grant access when and where needed.

The client/server relationship allows projects to be skillfully managed and controlled. The server can be used to keep "Master" versions of PLC projects for editing (subject to rights), while editing is achieved using 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 server has the capability to schedule software backups of the controller, 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 the design and testing of your system. It provides the ability to test projects prior to running them in the PLC run-time environment to ensure your system will run at peak efficiency immediately upon commissioning. Two emulators are provided that test interdependent projects with one another, giving you complete confidence and peace of mind before going live.

Material List Generation

Want a shopping list for your PLC equipment? 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 insuring that all required components are fully documented and identified.

Modicon Quantum automation platform

ProWORX 32 programming software

ProWORX Client/Server software

ProWORX packages

Description	User	Reference	Weight kg
ProWORX 32	Server	372 SPU 780 01 PSEV	–
	Client/Server Suite	372 SPU 780 01 PSSV	–
	Offline/Online Client	372 SPU 780 01 PDEV	–
	3 Multi-user Client License	372 SPU 780 01 PSTH	–
	10 Multi-user Client License	372 SPU 780 01 PSTE	–
	Site License	372 SPU 780 01 SITE	–
	Online Client	372 SPU 781 01 PONL	–
ProWORX 32 Lite	Offline/Online Client	372 SPU 710 01 PLDV	–
	3 Multi-user Client License	372 SPU 710 01 PLTH	–
	10 Multi-user Client License	372 SPU 710 01 PLTE	–
Legacy Product Upgrade to ProWORX 32	Client	372 SPU 784 01 LPUP	–
	3 Multi-user Client License	372 SPU 784 01 LPTH	–
	10 Multi-user Client License	372 SPU 784 01 LPTE	–
	Multiuser Incremental Addition	372 SPU 784 01 SEAT	–

Documentation

Description	Language	Reference	Weight kg
ProWORX 32 User Manual	English	372 SPU 780 01 EMAN	–
	French	372 SPU 780 01 FMAN	–
	German	372 SPU 780 01 DMAN	–
	Spanish	372 SPU 780 01 SMAN	–

7 - Human/Machine Interfaces

Selection guide Magelis display units and terminals page 7/2

Selection guide Magelis graphic terminals page 7/4

Selection guide Magelis iPC industrial PCs page 7/6

Software and Web servers page 7/8

■ OFS data server software page 7/10


■ Tego Dial for Human-Machine interfaces


 □ Presentation, description page 7/14


 □ Tego Dial/Tego Power installation system. page 7/16

Operator dialogue terminals

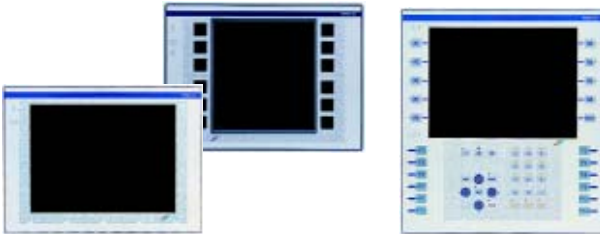
Magelis display units and terminals

Applications		Display of text messages		Display of text messages and/or semi-graphics
Type of unit		Compact display units	Display units	
				
Display	Type	Back-lit green LCD, height 5.5 mm or Back-lit green, orange or red LCD, height 4.34...17.36 mm	Fluorescent green matrix (5 x 7 pixels), height 5 mm or Back-lit LCD (5 x 7 pixels), height 9 mm	Back-lit monochrome matrix LCD (240 x 64 pixels), height 5.3 or 10.6 mm
	Capacity	2 lines of 20 characters or 1 to 4 lines of 5 to 20 characters	2 lines of 20 characters	4 to 8 lines of 20 to 40 characters
Data entry		Via keypad with 8 keys (4 with changeable legends)	Display only or via keypad with 4 function keys + 1 service key or 5 service keys	
Memory capacity	Application	512 Kb Flash	128 Kb/256 Kb Flash	384 Kb Flash EPROM
	Extension via type II PCMCIA	—		
Functions	Maximum number of pages	128/200 application pages 256 alarm pages	100/200 application pages 128/256 alarm pages 256 print-out form pages (1)	600 application pages 256 alarm pages 256 print-out form pages (1)
	Variables per page	40...50		
	Representation of variables	Alphanumeric		
	Recipes	—		
	Curves	—		
	Alarm logs	—		
	Real-time clock	Access to the PLC real-time clock		
	Alarm relay	—		
Communication	Asynchronous serial link	RS 232 C/RS 485	RS 232 C/RS 485/RS 422	
	Downloadable protocols	Uni-Telway, Modbus	Uni-Telway, Modbus, AEG and for PLC brands: Allen Bradley, GE Fanuc, Omron, Siemens	
	Bus and networks	—	AS-Interface using 22.5 pitch module	
	Printer link	—	RS 232 C asynchronous serial link (1)	
Development software		XBT L1001 and XBT L1003 (under Windows 98, 2000 and XP)		
Operating systems		Magelis		
Type of terminal		XBT N	XBT H	XBT HM
Pages		Consult our catalog "Automation and Control-Human/Machine Interfaces" (1) Depending on model		

Display of text messages Control and parametering of data		Display of text messages and/or semi-graphics Control and parametering of data
Terminals		
		
Fluorescent green matrix (5 x 7 pixels), height 5 mm or Back-lit LCD (5 x 7 pixels), height 9 mm	Fluorescent green matrix (5 x 7 pixels), height 5 mm or Back-lit LCD (5 x 7 pixels), height 5 mm	Back-lit monochrome matrix LCD (240 x 64 pixels), height 5.3 or 10.6 mm
2 lines of 20 characters	2 or 4 lines of 40 characters	4 to 8 lines of 20 to 40 characters
Via keypad with 8 function keys + 9 service keys or keypad with 12 function keys + 10 service keys + 12 numeric keys	Via keypad with 24 function keys + 10 service keys + 12 alphanumeric keys	Via keypad with 12 function keys 10 service keys 12 numeric keys 4 soft function keys
256 Kb Flash EPROM	384 Kb Flash EPROM	512 Kb Flash EPROM
—		
400 application pages 256 alarm pages 256 print-out form pages (1)	800 application pages 256 alarm pages 256 print-out form pages (1)	800 application pages 256 alarm pages 256 print-out form pages (1)
50		
Alphanumeric		Alphanumeric, bargraph, gauge
—		
—		
Depending on model		
Access to the PLC real-time clock	Built-in	Access to the PLC real-time clock
No	Yes	No
RS 232 C/RS 485/RS 422		
Uni-Telway, Modbus, AEG and for PLC brands: Allen Bradley, GE Fanuc, Omron, Siemens		
AS-Interface using 22.5 pitch module	—	AS-Interface using 22.5 pitch module
RS 232 C asynchronous serial link (1)		
XBT L1001 and XBT L1003 (under Windows 98, 2000 and XP)		
Magelis		
XBT P	XBT E	XBT PM
Consult our catalog "Automation and Control-Human/Machine Interfaces"		

Applications		Display of text messages and graphic objects Control and parametering of data
Type of unit		Graphic terminals
		
Display	Type	Back-lit monochrome LCD (320 x 240 pixels) or Colour LCD STN with touch-sensitive screen (320 x 240 pixels) with optimum viewing angle (1)
	Capacity	5.7"
Data entry		<div>Via touch-sensitive screen 4 tactile feedback keys (XBT-FC)</div> <div>Via keypad with 10 static function keys 8 soft function keys 12 service keys 12 alphanumeric keys</div>
Memory capacity	Application	8 Mb Flash EPROM (via PCMCIA type II card)
	Extension	By PCMCIA type II card, 8 or 16 Mb
Functions	Maximum number of pages	50 to 720 application, alarm, help and print-out form pages depending on the memory card used (512 alarms maximum)
	Variables per page	64
	Representation of variables	Alphanumeric, bitmap, bargraph, gauge, potentiometer, selector
	Recipes	125 records maximum with 5000 values maximum
	Curves	16
	Alarm logs	Yes
	Real-time clock	Access to the PLC real-time clock
	Alarm relay	Yes
Communication	Asynchronous serial link	RS 232 C/RS 485/RS 422
	Downloadable protocols	Uni-Telway, Modbus, AEG and for PLC brands: Allen Bradley, GE Fanuc, Omron, Siemens
	Bus and networks	Modbus Plus, Fipio/Fipway with add-on PCMCIA type III card, Ethernet 10/100 TCP/IP (1) (2)
	Printer link	RS 232 C asynchronous serial link (depending on model)
Development software		XBT L1003 (under Windows 98, 2000 and XP)
Operating systems		Magelis
Type of terminal		XBT F01/F03/FC
Pages		Consult our catalog "Automation and Control-Human/Machine Interfaces" (1) Depending on model. (2) TCP/IP with Modbus protocol for XBT F. (3) Uni-Telway version V2 for Nano/Micro/Premium PLCs.

New Technology touch-sensitive graphic terminals

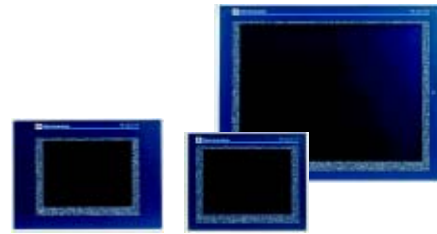


Back-lit monochrome LCD (640 x 480 pixels)
or Back-lit colour LCD TFT (640 x 480 pixels) with optimum viewing angle (1)

9.5" (monochrome)
10.4" (colour)

Via touch-sensitive screen
8, 12 or 16 tactile feedback keys (XBT-FC) (1)

Via keypad with
12 static function keys
10 soft function keys
12 service keys
12 alphanumeric keys



Back-lit monochrome (blue or black and white mode) or colour
LCD STN or LCD TFT (320 x 240 pixels)
or Back-lit colour LCD TFT (640 x 480 pixels or
800 x 600 pixels)
or Back-lit colour LCD STN (640 x 480 pixels)

5.7" (monochrome or colour)
7.4", 10.4" and 12.1" (colour)

Via touch-sensitive screen (1)

4...8 Mb (1)

By "Compact Flash" card, 16 or 32 Mb

30 to 480 application, alarm, help and print-out form pages depending on the memory card used
(512 alarms maximum)

Limited by the internal Flash memory capacity or "Compact Flash"
card memory capacity

Unrestricted

Alphanumeric, bitmap, bargraph, gauge, button, light, clock,
flashing light, keypad

—

Yes, with log

Built-in

—

RS 232 C/RS 485

Uni-Telway (3), Modbus, Modbus TCP/IP

Ethernet (1), IEEE 802.3 10BaseT, RJ 45

For future use

VJD SPUL FUCDV10M (under Windows 2000 and XP)

Magelis (CPU 100 MHz RISC)

XBT F02/F03/FC

XBT G

Consult our catalog "Automation and Control-Human/Machine Interfaces"

Applications

"All in One" compact products



Screen 12"
SVGA (800 x 600),
Data entry

By keyboard
By keyboard and touch screen
By touch screen

Screen 15"
XGA (1024 x 768)
Data entry

By keyboard
By keyboard and touch screen
By touch screen

Page

–

Control box

For modular products, to use with 1 front panel screen or in stand-alone (1)

Type

Processor

VIA 667 MHz

Intel Pentium 4 Mobile
1.7 GHz

Internal hard disk

–

≥ 20 Gb

RAM memory

256 Mb extendable to 512 Mb

256 Mb extendable to 512 Mb

CD-Rom drive

–

Yes

Floppy disk drive

–

Yes

Extension slots

2 PCMCIA slots

1 PCI bus slot,
2 PCMCIA slots and 1 Compact Flash slot

Ethernet TCP/IP network

1 x 10BASE-T/100BASE-TX (RJ45)

Input/output ports

2 x USB, 1 x COM1,
1 x COM2, 1 x parallel
1 x PS/2 keyboard

2 x USB, 1 x COM1, 1 x COM2, 1 x COM3, 1 x parallel

1 x USB on front panel, 1 x PS/2 keyboard, 1 x PS/2 pointing device

Operating system

Windows XPe integrated operating system

Windows 2000 pre-installed operating system

Pre-installed software or software package

Transparent Ready Web browser

Vijeo Look

Vijeo Look

Supply voltage

24 V

~ 115...230 V

Type of PC or Control box

MPC ST5 2NDJ 00T

MPC KT5 2NAA 00●

MPC KT5 5NAA 00●

Pages

Consult our catalog "Automation and Control-Human/Machine Interfaces"

Modular products

Control box to use with 1 front panel screen or in stand-alone (1)



MPC NA2 0NNN 00N		
	MPC NA2 0NNN 00N	
		MPC NA2 0NNN 00N
MPC NA5 0NNN 00N		
	MPC NA5 0NNN 00N	
		MPC NA5 0NNN 00N
-		



Modular iPC Small	Modular iPC Medium	Modular iPC Large
Intel Celeron 566 MHz	Intel Pentium III 850 MHz	Intel Celeron 566 MHz
		Intel Pentium III 850 MHz
≥ 20 Gb, removable		
Optional		
Yes, removable		
Yes, removable		
-	1 ISA bus slot, 1 PCI bus slot and 1 ISA/PCI bus slot	2 ISA bus slots, 3 PCI bus slots and 1 ISA/PCI bus slot

2 x USB, 1 x COM1, 1 x COM4 and 1 x parallel

1 x external VGA video screen, 1 x PS/2 keyboard (2), 1 x PS/2 pointing device (2)





Windows pre-installed operating system (Windows 2000 or Windows XPe)

Pack A	-	Pack A, B, C or D (~ 115...230 V)	-	Pack E (~ 115...230 V model)
~ 115...230 V	24 V	~ 115...230 V ou 24 V depending on model		
MPC AN0 2NA 00N	MPC AN0 2ND 00N	MPC BN0 2NA 00N	MPC BN0 5NA 00N	MPC CN0 2NA 00N
				MPC CN0 5NA 00N


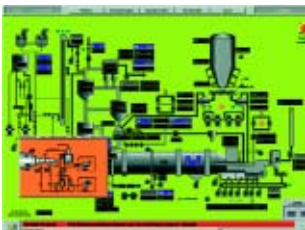


Consult our catalog "Automation and Control-Human/Machine Interfaces"

(1) To use the Control box without a front panel, you will require the **MPC NP0 0NNN 00N** mounting panel.


(2) Port not operational when the Control box is used with the front panel screen.

Applications		Traditional architecture, HMI executed on dedicated terminal or PC platform	
		Configuration software for user interface applications	
			
Target products	Type	Magelis XBT N/H/P/E Magelis XBT HM/PM Magelis XBT F/FC (1)	Magelis XBT G (1)
	Operating system on terminals	Proprietary Magelis operating system	
Functions	Reading/writing of PLC variables	Yes	
	Display of variables	Yes	
	Data processing	–	Yes, with Java programming
	Sharing of variables between HMI applications	–	
	Saving of variables to external database	–	
Development of graphics applications	Native library of graphic objects	Yes	
	Container	Active X	–
		Java Beans	–
	Curves and alarms	Yes, with XBT F/FC terminal	Yes
	Scripts	VBA	Yes, with log
		Java	–
Online modification of applications		–	
Communication between PLCs and HMI application		Via I/O drivers	
Uploading of applications		Yes	No
Simulation of HMI applications		Yes	
Redundancy		–	
Recipe management		Yes	No
Report printing		Form, historical data and alarm pages	–
Access security		Linked to user profiles	
Software compatible with OS		Windows 98, 2000 or XP	Windows 2000 or XP
Type of software		XBT L1000	Vijeo Designer
			
Pages		Consult our catalog "Automation and Control-Human/Machine Interfaces"	

(1) Magelis XBT terminals behave transparently on restoration of power.

SCADA supervisory software		Web architecture, embedded HMI in PLC	
		Ethernet TCP/IP modules with embedded Web server	
			
Magelis Compact iPC industrial PCs Magelis Modular iPC industrial PCs PC micro-computers	Magelis Modular iPC industrial PCs PC micro-computers	TSX Micro TSX ETZ Premium TSX ETY Quantum 140 NOE 771	Premium TSX WMY 100 Quantum 140 NWM 100 00
Microsoft Windows			

Yes		Yes Application tasks	–	Yes
		Yes Client/server architecture	–	
Yes MSDE 2000 interface supplied (2)		Yes SQL server 2000 interface supplied	–	Yes + e-mail transmission triggered by event
Yes		–		
		–		Yes
				Alarms via diagnostics buffer (3)
Yes		Yes + compiled math and logic	–	
		–		
Yes		–		Yes
Via OFS data server		Via OFS data server or I/O drivers	Via internal bus on Premium/Quantum platforms	
Yes				
		–		Yes
		–		
Yes		–		
Alarms and setpoints		All information in the real-time database	–	

		Windows 98, 2000, NT or XP	Windows 2000 or XP
Vijeo Look	Monitor Pro	FactoryCast	FactoryCast HMI
			

Consult our catalog "Automation and Control-Human/Machine Interfaces"

(2) Compatible with SQL server 2000 interface.

(3) Specific memory area with Modicon Premium (with PL7 or Unity Pro software) and Quantum (with Unity Pro software) PLC platforms.

Presentation

OPC Factory Server (OFS) version 3.0 software uses the OLE for Process Control (OPC) standard, allowing "Client" software applications (supervisors, databases, spreadsheet programs) to access the following data:

- Internal variables (words, bits) and inputs/outputs of Modicon Premium/Quantum PLCs.
- Internal variables (words, bits) of Modicon TSX Micro PLCs, Modicon Momentum/Quantum PLCs (1), TSX Series 7 and April PLCs.

OFS software is a multi-PLC data Server that enables several communication protocols to be used by providing Client application programs with a set of services for accessing the control system variables.

This software is aimed at two types of user in particular:

- "End" users who seek to develop applications on a PC and require access to PLC data. In this context, it is possible, for example, to create Client applications (supervisory control screens, Excel tables, etc.) with access to a number of PLCs connected to the PC supporting these applications.
- "Suppliers" of control system or industrial data processing products (supervision, Human/Machine Interfaces, etc.) seeking to develop, within their standard products, an OPC Client application capable of accessing data stored in PLCs via the OPC Server.

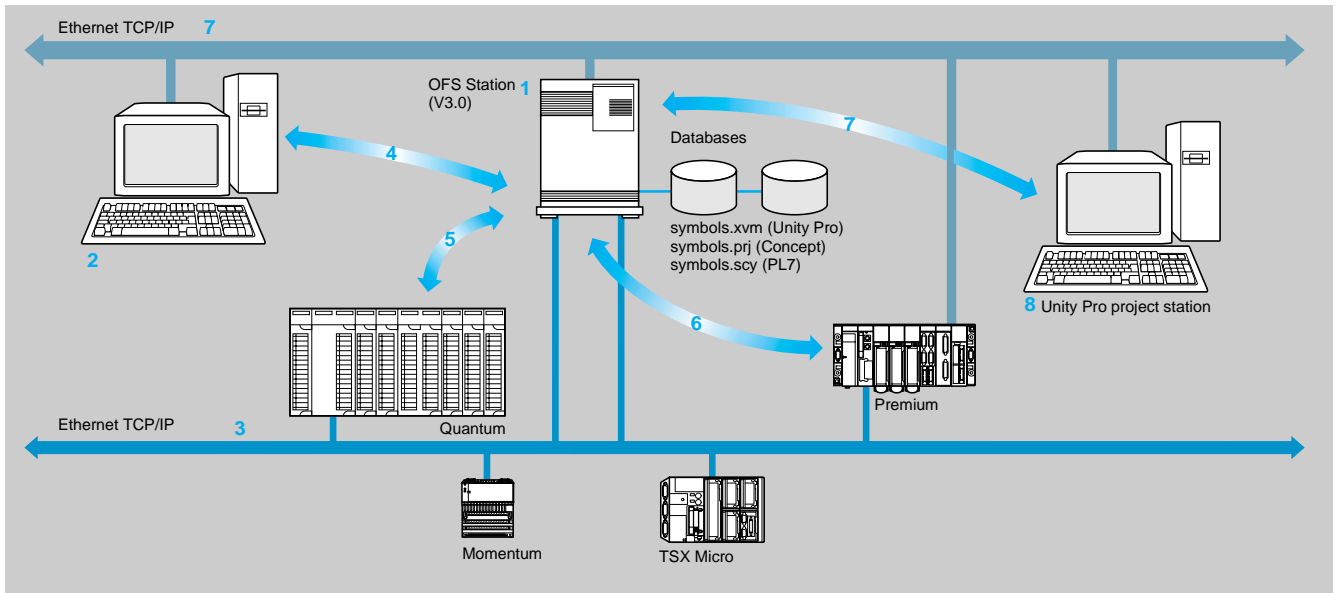


The OFS offer comprises:

- A tool for configuring the OPC Server.
- An OPC Server software application that receives requests from an OPC Client and retransmits them to the PLCs.
- Low-level drivers for communication with Modicon PLCs.
- An OPC Client enabling verification of Client/Server communication between the various connected elements.
- A simulator enabling verification of operation of one or more Clients, without a connected PLC.
- The electronic setup documentation.

(1) With Concept/ProWORX software.

Setup



OFS software can be integrated into control system architectures such as the one shown above:

- 1 PC running OFS software including the OPC Server.
- 2 PC running the Client application, which accesses the PLC data via OFS.
- 3 Communication networks linking the PC, running OFS software, with the PLCs.
- 4 OPC communication protocol.
- 5 Modbus on TCP/IP communication protocol.
- 6 Uni-TE on TCP/IP communication protocol.
- 7 OFS software program accesses Unity Pro project variables directly. Additionally, it conducts a check to verify that these variables are consistent with those of the Premium or Quantum PLC.

Depending on the usage, the Client application and OFS software can be located on the same PC or on two different PCs 1 and 2, linked by a TCP/IP Ethernet network 7.

Nota : Depending on the software used for Modicon PLCs:

- PL7 software generates PLC variable symbol export files. These export files (symbols.scy) should be integrated in the OPC Server.
- Concept: the variables can be accessed directly in the project (file.prj) of the Concept application. This direct link requires Concept (version > V2.0) to be installed on the OFS station 1.
- Unity Pro programming software generates export files from PLC variable symbols. These export files (.xvm symbols) should be integrated into the OPC Server when the Unity Pro project development station 8 is not accessible via the OFS station. If the Unity Pro project station is permanently accessible via the OFS station, the former exchanges directly with the variables of the Unity Pro project (via P. server).

Functions

Development of Client applications

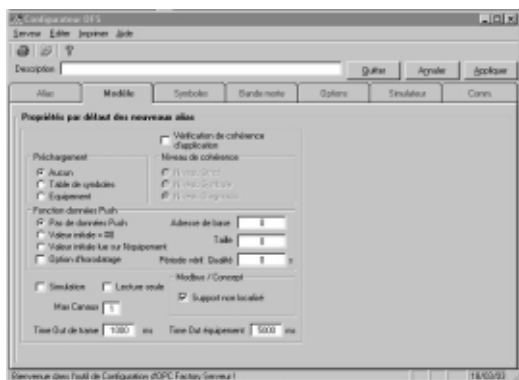
OFS software has two interfaces:

- **OPC Automation interface.**

Particularly suitable for "end" users, it enables the development of OPC Client applications in Visual Basic, in Visual Basic for Excel, but also in C++.

- **OPC Custom interface.**

Used primarily by "suppliers" of automated control system or industrial IT products. It enables the development of applications in C++ in order to access the OFS software OPC Server. This interface 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 but it requires extensive knowledge of C++ programming.



OFS software services

The various OFS software services enable:

- **Access to the Server in local or remote mode.** Symbols are accessed either:
 - via an .xvm/.prj/.scy-format export file (depending on the software used),
 - or via direct access to the Unity Pro project in the case where it is accessible via the OFS station.
- **With Unity Pro software, when accessing the Unity Pro project directly, the OFS software program transparently manages the consistency of the Unity Pro project symbol database with that of the Premium or Quantum PLC.** In the event of inconsistency, three types of operation are possible:
 - "strict" mode, which stops exchanges,
 - "symbolic" mode, which signals an alert to the user,
 - "debug" mode, which does not hold up debugging of the architecture.
- **Access to variables in the form of addresses or symbols.**
- **Reading and writing of variables to one or more PLCs present on the communication network connected to the PC running the OFS software.** These variables can be:
 - the sum of all variables belonging to the Unity Pro projects (bits, words, spreadsheets, DDT/IODDT-type compound data),
 - system variables (OPC System Group: PLC status, diagnostics, etc.),
 - internal variables representing the PLC words or registers (OPC User Group).
- **Use of a notification mechanism that transmits change of status values to the Client.** Communication between the OPC Server and the PLC uses polling or can be initiated by the PLC in order to decrease the volume of exchanges ("push data").
- **Definition of dead bands for measurement noise filtering (floating variables).**

Communication with PLCs

The various variables contained in the PLCs are accessed via standard Telemecanique communication protocols using the following:

- **Uni-Telway bus and Ethernet/Fipway networks, Uni-TE protocol on TCP/IP, as well as the PCIway communication driver when TSX PCI 57 Atrium coprocessors (with Unity Pro) are used.**
- **Modbus serial link, Ethernet/Modbus Plus networks and Modbus protocol on TCP/IP.**

The various corresponding communication drivers are supplied in the OFS software (except Modbus Plus driver, which is supplied with the PC Modbus Plus card).

References

OFS software for PC compatible stations (minimum configuration: Pentium 266 MHz processor, 64 Mb of RAM) running Windows 2000 Professional or Windows XP.

The OFS offer comprises:

- OPC Server software, compatible with the OPC Data Access 2.0 standard.
- OPC Server simulator (for debugging the application when no PLCs are present).
- A tool for configuring the Server on the PC.
- A example of OPC Client for setting up applications.
- The setup documentation on CD-Rom.

Supplied on CD-Rom, this software operates independently on a PC. Nevertheless, export files for variables generated by PL7 or ProWORX development software are required. The direct link with Concept applications requires Concept software (version > 2.0) to be installed on the same station.

Description	Function	Type of license	Reference	Weight kg
OFS data server software (version V3.0)	Enables the development of Client applications, accessing data of Premium and Quantum (with Unity Pro) via the OFS Server. Also compatible with: - TSX Micro/Premium (with PL7), - Momentum/Quantum (with Concept/ProWORX), - TSX Series 7 and April PLCs	Single station	TLX CD OFS 30M	—
		10 stations	TLX CD 10OFS 30M	—
		200 stations	TLX CD UNOFS 30M	—
OFS software update	Enables you to update a previous version of OFS data server software	—	Consult your Regional Sales Office.	

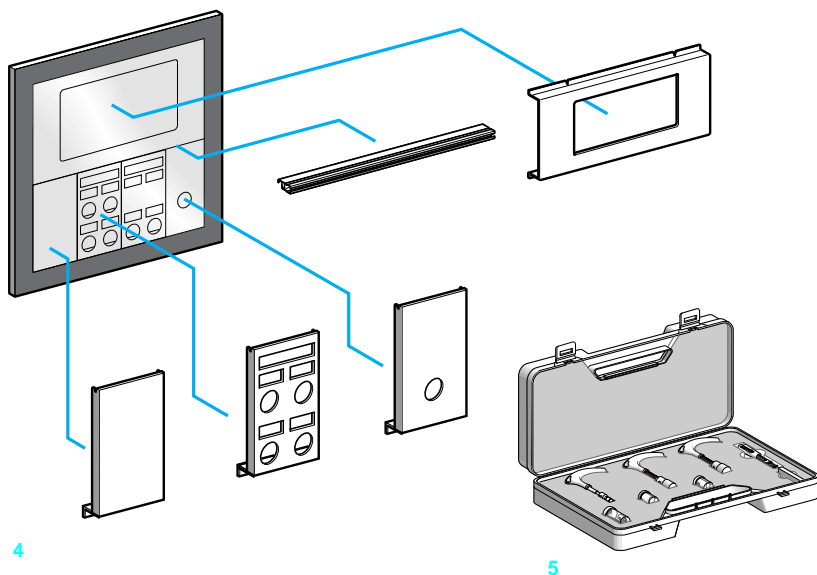
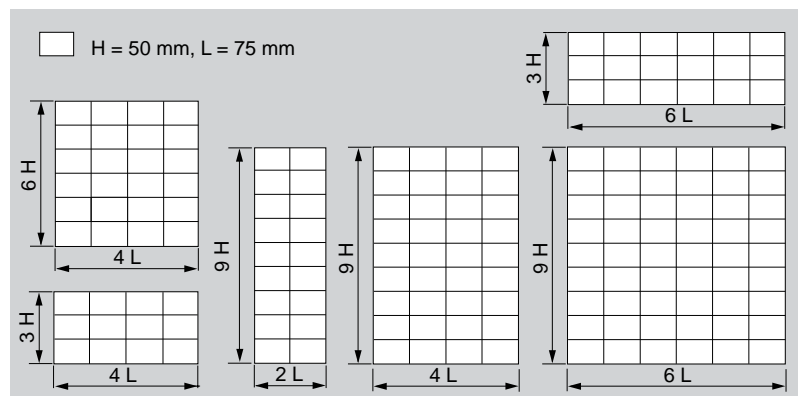
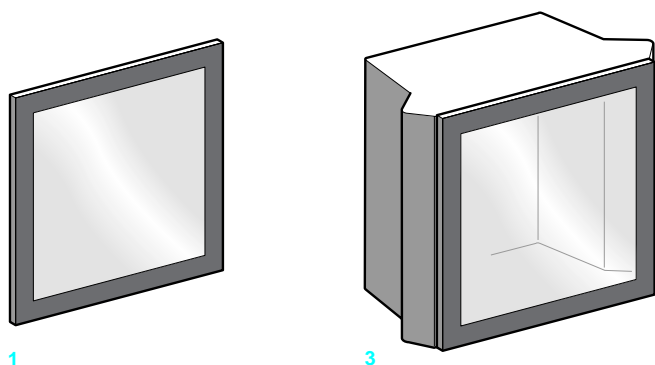
Presentation

The modular Tego Dial system is used to define human-machine interfaces. It facilitates the installation of Ø 22, Ø 16 and Ø 30 mm control and signalling units, DIN format display units, Magelis terminals and display units, XBL keypads and other products.

Tego Dial simplifies an HMI application by :

- definition of the application by Tego Dial Design software,
- quick assembly of dialogue and display units, through the use of modular elements,
- standard connections from the dialogue units to PLCs, bus and other products,
- facilitates the integration of the dialogue application into the machine, control panel, enclosure, machine housing or intermediate suspension arm.

Description



● Tego Dial Design definition software

This software on CD-ROM facilitates graphical definition of the dialogue application in relation to the control units, pilot lights and display units necessary for the device.

It selects the correct Tego Dial components that are required for the application and also features a legend design and printing function, both for the front panel and the connections.

● Dialboard front panels 1

The front panels basically comprise a grey, RAL 7016, painted aluminium frame which is covered by a polycarbonate film. Six sizes are available based on a modular pattern of height H = 50 mm and width W = 75 mm 2. The sizes are 3H x 4W, 3H x 6W, 6H x 4W, 9H x 2W, 9H x 4W and 9H x 6W.

● Dialpack control console enclosures 3

Four control consoles are available in the following modular sizes: 3H x 4W, 6H x 4W, 9H x 4W and 9H x 6W.

The Dialpack console is an assembly comprising a Dialboard type front panel and a sheet steel folded and welded enclosure, painted with textured grey RAL 7016.

The front panel is hinged and can be opened to 120°. Closing is by a 1/4-turn device, with stop, and locking by Ronis key no. 455. Double bar or CNOMO triangular key locks are also available. A customising component in 2 versions - yellow or unpainted - enhances the Dialpack unit and makes it more ergonomic. A Dialpack S version in stainless steel type 304 is available for corrosive environments. This version conforms to enclosure standard EN 50298.

● Plates and cross-pieces 4

A range of modular dimensioned plates facilitates the installation of all combinations of control and signalling units, operator dialogue terminals and other devices. These plates are attached directly to the framework of the front panel.

The plates, made from sheet steel and painted grey RAL 7016, are designed for the following product ranges :

- Ø 22, Ø 16 and Ø 30 control and signalling units,
- DIN format display units,
- Electronic operator terminals and displays (Magelis and others),
- keypads,
- other units: joystick controllers, cam switches, etc.

Cross-pieces aid vertical mounting of several rows of plates.

Cut-outs in the plates are dimensioned to suit the dialogue or display units that are to be installed. Some plate versions for Ø 22 units are available with knock-outs, which need to be removed before mounting the unit. Other versions incorporate cut-outs for the transparent polycarbonate legend holders (included with the plate).

Alternatively, solid plates are also available for mounting any special equipment required.

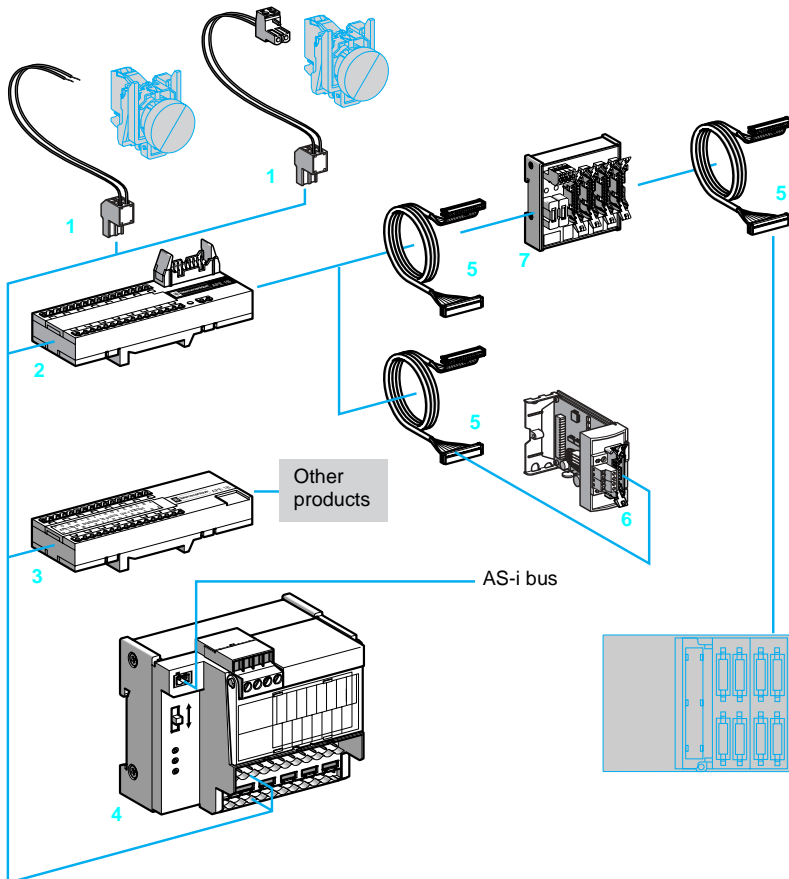
● Toolkit 5

The installation of dialogue and display units requires cut-outs to be made through the polycarbonate film. To simplify this operation, the plate is marked with cut-out guides and a toolkit is available, comprising : a mallet, cutting tools and replacement blades.

● Pre-assembled kits

Dialboard and Dialpack with pre-assembled plates and cross-pieces are available.

Standard connections



Tego Dial offers a range of interface components and cabling accessories that simplify connections between control and signalling units and PLCs, buses and other products.

The main components which make up this range are :

- prefabricated connection cables and insulation displacement connectors **1**, 5 mm pitch, for connecting control and signalling units to Dialbase interfaces,
- Dialbase 8I/8O or 16I interfaces **2** with integrated commons, for connecting control and signalling units to PLCs via prefabricated Telefast connection cables **5**,
- an active splitter block **7** for connecting a Dialbase 8I/8O interface to PLCs with a connection modularity greater than 8I/8O,
- a Dialbase 230 V interface **3** for connecting control and signalling units to any product up to 230V,
- a Dialbase AS-i 4I/4O interface **4** with integrated commons, for connecting control and signalling units to the AS-i bus.

The selection guide on page 7/16 indicates the type and quantity of components (Dialbase interfaces, active splitter block, Telefast connection cables) required to connect the control and signalling units to the various types of PLC. The most efficient connection is achieved using the Dialbase 8I/8O interface and the Telemecanique TSX Micro PLC TSX DMZ16DTK card **6**.

Dialfix and Dialmove suspension arms



Dialpack control consoles can be fitted directly using 4 adjustable lugs, ref. AE3-FX122. However, for improved ergonomics, they are usually mounted on a suspension arm. This can either be fixed (Dialfix) or moving (Dialmove).

Dialfix fixed arms

Two versions are available :

- a straight fixed arm kit, comprising a straight Ø 70 mm tube, 500 or 1000 mm in length, and a pair of clamps (one for each end). Depending on the positioning of the clamps, an inclination of $\pm 15^\circ$ from the natural position can be achieved,
- an elbowed (90°) fixed arm kit, 500 mm in length. This kit also includes the pair of clamps described above.

Arms for corrosive environments

The arms are in 304 type stainless steel and provide 350° rotation on the Dialpack fixing side. Two models are available:

- straight arm kit, length 1000 mm,
- 90° elbowed arm kit, length 500 mm.

Dialmove moving arm

This arm enables an extensive choice of mounting configurations. The cabling runs through the elements, which have removable side covers for easy access.

Numerous configuration possibilities can be achieved by combining the following components:

- straight tubes (100 to 1000 mm long),
- fixed 90° joint,
- wall fixing bracket (straight or elbowed, fixed or mobile),
- straight fixing plates (one fixed, other rotating) for Dialpack,
- 15° tilted joints,
- pivoting joint (-90° to +90° in the same plane).

Modicon Quantum automation platform

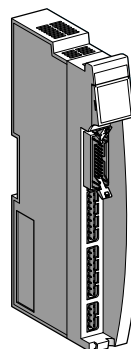
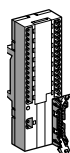
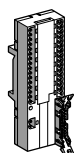
Tego Dial/Tego Power installation system

Tego Dial for Human-Machine interfaces and Tego Power for motor power-starter components

Automation platforms

Tego Dial components

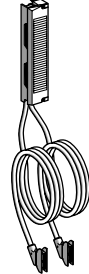
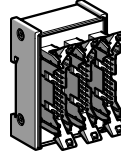
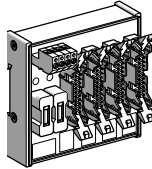
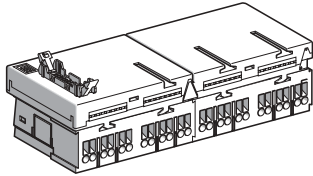
Tego Power components



Type	Modularity of connection to the PLC	Compatible I/O modules	Tego Dialbase 8 I/8 O	Tego Dialbase 16 I	Communication module or control splitter box with 8 I/8 O
			APE-1B24M	APE-1B24E	APP-1CH, APP-2R4H1/H3
Micro platform					
Tego Dial	8 inputs + 8 outputs	TSX DMZ 16DTK	1		
	16 inputs + 16 outputs	TSX DMZ 64DTK	1 (1)		
	16 inputs	TSX DMZ 64DTK/28DTK		1	
Tego Power	8 inputs + 8 outputs	TSX DMZ 16DTK			1
	16 inputs + 16 outputs	TSX DMZ 64DTK			1
Premium platform					
Tego Dial	16 inputs + 16 outputs	TSX DEY 16FK/32D2K/64D2K TSX DSY 32T2K/64T2K	1 (1)		
	16 inputs	TSX DEY 16FK/32D2K/64D2K			
Tego Power	16 inputs + 16 outputs	TSX DEY 32D2K/64D2K/16FK TSX DSY 32T2K/64T2K			1
Quantum platform					
Tego Dial	32 inputs + 32 outputs	140 DDI 353 00/10, 140 DDI 853 00, 140 DD0 353 00/10	1 (1)		
	32 inputs	140 DDI 353 00/10, 140 DDI 853 00		1	
Tego Power	32 inputs + 32 outputs	140 DDI 353 00/10, 140 DDI 853 00, 140 DD0 353 00/10			1

(1) For the connection of a second Dialbase APE-1B24M, use 2 x TSX DP 003 connecting cables.

Connecting components



Control splitter box 16 I/8 O	Splitter box 16 I + 16 O to 2 x (8 I+8 O)	Splitter box 16 to 2 x 8	Telefast connecting cables	
APP-2RH2/H4	APE-1R1628	ABE-7ACC02	TSX CDP ●●3	ABF-M32H●●0
			1	
	1		2	
	1			
			1	
	1 (2)		3	
1		1 (3)	3	
	1		2	
			2	
	1 (2)		3	
1		1 (3)	3	
	1		1	2
				1
	1 (2)		1	2
1		1 (3)	1	2

(2) 8 I + 8 O remain available. To connect a second APP-1CH module or APP-2●●● 8 E + 8 S control splitter box, use a additional TSX CDP ●●4 cable.
 (3) 8 O remain available on ABE-7ACC02. To connect them a second AAP-2●●● 16 I/8 O control splitter box, use a additional TSX CDP ●●3 cable.

8 - Connection interfaces and power supplies

8.1 - Telefast 2 pre-wired system

Selection guide Telefast 2 pre-wired system page 8/2

- Presentation page 8/8
- References
 - Passive connection sub-bases for discrete signals page 8/10
 - Sub-bases with soldered solid state page 8/12
 - Sub bases equipped with plug-in relays page 8/13
 - Sub-bases for analogue channels page 8/16
- Dimensions page 8/18




8.2 - Power supplies for d.c. control circuits

Selection guide Phaseo regulated switch mode power supplies page 8/20

- Presentation page 8/22
- Selection page 8/24
- Characteristics page 8/26
- References page 8/31
- Dimensions and schemes page 8/32

Connection interfaces

Telefast® 2 pre-wired system
Discrete input and/or output sub-bases

Applications	Discrete input or output				
	<div><div><div>817436</div></div><div><div>817437</div></div><div><div>817438</div></div></div>				
Relay amplification	—				
Equipped with relay	—				
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 — 24 V or 0 V)	Signal	Signal, Common (configurable — 24 V or 0 V)	
Connectors	20-way HE10 connector				
Terminal block	Removable		No		
	Type of terminals		Screw or spring		
Additional or optional* function	Low cost version fitted with cable	Miniature sub-bases	Compact size *	Type 2 input * (1)	Isolator *
Device type	ABE-7H20E●●● 7H32E●●●	ABE-7H16C●●	ABE-7H●●R1● 7H●●R50	ABE-7H●●R2●	ABE-7H●●S21
Pages	8/10		8/11		

(1) For TSX Micro and Premium PLCs.

Discrete input and output



817432



521500

—		Removable electromechanical or solid state	
—		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 API Micro PLC		Miniature sub-base - Common per 4 channels Synergy with Tego Power and API Micro PLC	
ABE-7H16CM11	ABE-7H16CM21	ABE-7P16M111	ABE-7R16M111
8/10		8/14	8/13

Applications

Discrete output



Relay amplification	Electromechanical, fixed			Electromechanical or solid state	
Equipped with relay	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.)
Output current per channel	2 A (th)	3 A (th)	5 A (th)	2 A (solid state), 6 A (electromechanical)	Depends on relay mounted 0.5 to 10 A
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
	Type of terminals	Screw or spring			Screw
Additional or optional* function	Miniature sub-base Bistable relay	Volt-free or common per 8 channels		Miniature sub-bases Common per 4 channels	Isolator and fuse
Device type	ABE- 7R08S216●	ABE- 7R●●S1●●	ABE- 7R●●S2●●	ABE- 7R16T111	ABE- 7P16T111
					ABE- 7P16T2●●● 7P08T3●●●
Pages	8/12			8/13	8/14

(1) For TSX Micro and Premium PLCs.

Discrete input



Electromechanical, removable	Solid state, fixed	–	–	Solid state, fixed	Solid state, removable
------------------------------	--------------------	---	---	--------------------	------------------------

Yes	Yes	–	–	Yes	No
-----	-----	---	---	-----	----

From --- 24 V to \sim 230 V	From 5 V TTL to \sim 230 V
--	------------------------------

--- 5 V... 150 V \sim 230 V	--- 24 V
---	-------------------

5A (th)	8 A (th)	from 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	Signal --- 24 V and 0 V	Signal can be isolated, Protected common	Signal	Signal and common
---	--	----------------	-------------------------------------	--	--------	-------------------

No	Yes	No	No	Yes	No
----	-----	----	----	-----	----

Screw	Screw or spring	Screw	Screw or spring
-------	-----------------	-------	-----------------

Volt-free or common per:	Fault signal	Isolator and fuse (indicator)	3-wire proximity sensor	Isolator and fuse (indicator)	–
8 channels	4 channels				

ABE-7R16T2●●	ABE-7R16T3●●	ABE-7S●●S2B●	ABE-7H16F43	ABE-7H16R3●	ABE-7H16S43	ABE-7S16E2●●	ABE-7P16F31●
--------------	--------------	--------------	-------------	-------------	-------------	--------------	--------------

8/13	8/12	8/11	8/12	8/15
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Applications

Analogue signals and special functions



Compatibility

TSX Micro

Premium

Standard

Type of signal

Counter inputs
and analogue I/OCounter inputs
Axis control
Position controlAnalogue inputs
Current
Voltage
Pt 100Analogue outputs
Current
Voltage

Functions

Passive connection, point-to-point with shield continuity

Modularity

1 counter channel or 8 analogue inputs + 2 analogue outputs

8 channels

4 channels

Control voltage

— 24 V

Output voltage

— 24 V

Output current
per channel

25 mA

Number of terminals
per channel

2

2 or 4

2 or 4

Type of connector

15-way SUB-D + 9-way SUB-D

25-way SUB-D

Terminal block

Removable

No

No

Type of terminals

Screw

Screw

Device type

ABE-7CPA01

ABE-7CPA02

ABE-7CPA21

Pages

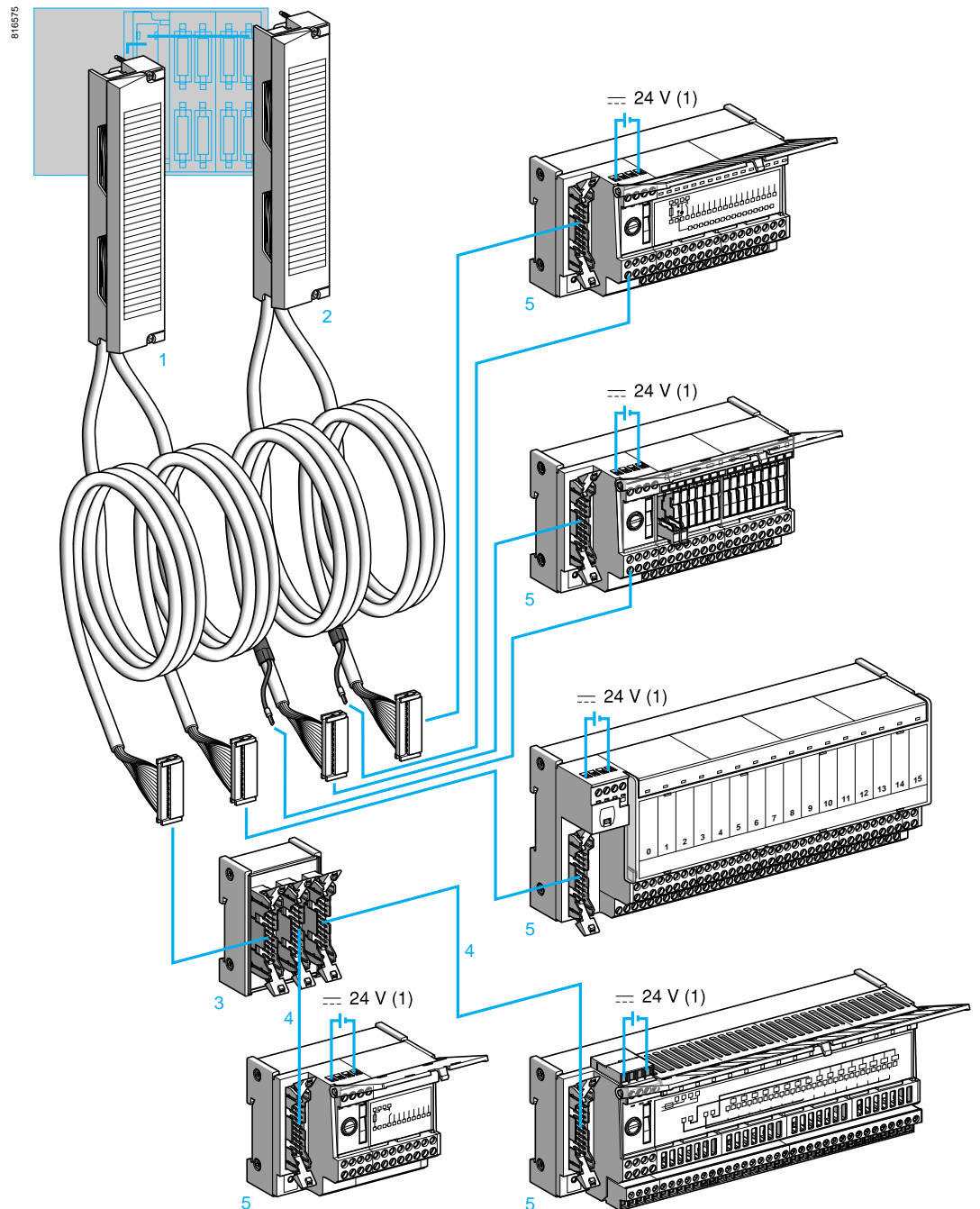
8/16



	Premium TSX AEY810	Premium TSX CAY●1 TSX CTY2C	Premium TSX AEY1614	Premium TSX PAY2●2
Analogue inputs Current Voltage Pt 100	Isolated analogue inputs	Inputs Counter	Inputs for thermocouples	I/O
Distribution of sensor power supplies per limiter (25 mA)	Distribution of isolated sensor power supplies per 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
				—
		—	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

Connection interfaces

Telefast® 2 pre-wired system
Connector cables for Modicon PLCs



Connection interfaces

Telefast® 2 pre-wired system
Modicon PLC and NUM numerical control I/O modules with interface sub-bases

I/O modules		Modicon PLCs														NUM numerical controllers						
		984-A120-Compact					Quantum										NUM 1050/1060		NUM 1020			
		Inputs		Outputs			TOR In-put		Outputs		TOR In-put		Out-put		Analogue Inputs		Outputs		Inputs/Outputs		Inputs/Outputs	
		16 E		16 S			32 E	32 S	96 E	96 S	8 E	16E	4 S		8 S	64 E + 48 S		32 E + 24 S				
		DEP 220 DEO 216 DEP 216	DEP 217	DAO 216 DAP 216	DAO 216 DAP 216	DAP 217	DDI 353 DDI 853	DDO 353	DDI 364	DDO 364	140 AVI 03000 140 ACI 03000	140 ACI 04000	140 AVO 02000	140 ACO 02000	140 ACO 13000	64 I	48 O	32 I	24 O			
Connection terminal blocks		Included														NUM cables not supplied						
Cabled connectors		ABF-	M16 H●●0			M16 H●●1	M32 H●●0	M32 H●●1	—		M08 S201	M16 S201	M04 S200	M04 S201	M08 S202	—	—	—	—			
Splitter sub-bases		ABE-7	—			—	—	—	CDP●●●3		—		—		—		ACC04	ACC05	ACC04	ACC05		

Connection sub-bases

8 channels	ABE-7H08R●●	(5)	(1) (5)		(1)	(2)			(2)							(2)		(2)	
	ABE-7H08S21	(5)							(2)							(2)		(2)	
12 channels	ABE-7H12R●●																		
	ABE-7H12S21																		
16 channels	ABE-7H16R●●/H16C●●		(1)																
	ABE-7H16S21																		
	ABE-7H16R23					(4)													
	ABE-7H16F43																		
	ABE-7H16S43					(3)													

Input adaptor sub-bases

16 channels	ABE-7S16E2●●/7P16F3●●																		
	ABE-7P08T330					(2)													

Output adaptor sub-bases

8 channels	ABE-7S08S2●●									(2)									
	ABE-7R08S●●●/7P08T330					(2)			(2)										
16 channels	ABE-7R16S●●●																		
	ABE-7R16T●●●/7P16T●●●																		
	ABE-7S16S●●●																		

Sub-bases for analogue/counter I/O

ABE-7CPA01																			
ABE-7CPA02										(6)									
ABE-7CPA03										(6)									
ABE-7CPA21																			
ABE-7CPA31											(6)								

(1) With Telefast 2 sub-bases with no channel LED.


(2) With the splitter sub-base ABE-7ACC02.

(3) Only with module DDI 853.

(4) Only with module DDI 353.

(5) With the splitter sub-base ABE-7ACC02 or with a cabled connector ABF-M16H●●1 directly.

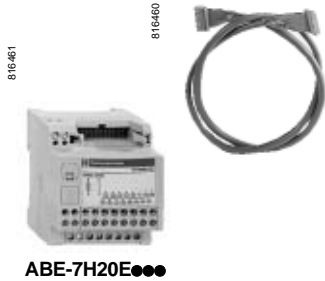
(6) 2 sub-bases are required.

 Pre-wired cabled connectors

Connection interfaces

Telefast® 2 pre-wired system
Passive connection sub-bases

Passive connection sub-bases for discrete signals



ABE-7H20E●●●

"Low cost" sub-bases

Function	No. of channels	No. of terminals per channel	For PLCs	Length of PLC connection cable m	Type of connection	Reference	Weight kg
Input or Output	16	1	Modicon TSX Micro/Premium	1	Screw	ABE-7H20E100	0.330
			Siemens S7	2	Screw	ABE-7H20E200	0.410
				3	Screw	ABE-7H20E300	0.480
				1.5	Screw	ABE-7H32E150	0.360
				3	Screw	ABE-7H32E300	0.460

"Miniature" sub-bases

Function	No. of channels	No. of terminals per channel	LED per channel	Polarity distribution	Type of connection	Reference	Weight kg
Input or Output	16	1	No	No	Screw	ABE-7H16C10	0.160
	2	2	Yes	0 or 24 V	Screw	ABE-7H16C11	0.160
	3	3	Yes	0 and 24 V	Screw	ABE-7H16C21	0.205
					Screw	ABE-7H16C31	0.260
Input and Output (1)	16	1	Yes	No	Screw	ABE-7H16CM11	0.160
	2	2	Yes	0 or 24 V	Screw	ABE-7H16CM21	0.200

(1) 8 I + 8 Q: these products have 2 commons connections which enable inputs and outputs to be connected to the same sub-base at the same time.

Connection interfaces

Telefast® 2 pre-wired system
Passive connection sub-bases

810464



ABE-7H16R50

816465



ABE-7H16R31

816466



ABE-7H16S43

Passive connection sub-bases for discrete signals (continued)

Function	No. of channels	No. of terminals per channel	No. 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	
								Spring	ABE-7H16R11E	0.274
2			No	No	—	Screw	ABE-7H16R50	0.196		
						Spring	ABE-7H16R50E	0.196		
2		2		No	0 or 24 V	—	Screw	ABE-7H16R20	0.300	
				Yes	0 or 24 V	—	Screw	ABE-7H16R21	0.300	
						Spring	ABE-7H16R21E	0.300		
								I	Screw	ABE-7H16S21
				Spring	ABE-7H16S21E	0.375				
3	3	No	0 and 24 V	—	Screw	ABE-7H16R30	0.346			
		Yes	0 and 24 V	—	Screw	ABE-7H16R31	0.346			
	Type 2 input (1)	16	2	2	Yes	0 and 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 Modicon TSX Micro, Premium and Numerical Controller NUM 1020/1060.

(2) With LED to indicate blown fuse.

Connection interfaces

Telefast® 2 pre-wired system

Connection sub-bases with soldered relays and plug-in terminal blocks

816467



ABE-7S16E2●●

Sub-bases with soldered solid state inputs, plug-in terminal blocks

Number of channels	No. of terminals per channel	Isolation PLC/application	Voltage V	Type of connection	Reference	Weight kg
16	2	Yes	--- 24	Screw	ABE-7S16E2B1	0.370
				Spring	ABE-7S16E2B1E	0.370
			--- 48	Screw	ABE-7S16E2E1	0.370
				Spring	ABE-7S16E2E1E	0.370
			~ 48	Screw	ABE-7S16E2E0	0.386
				Spring	ABE-7S16E2E0E	0.386
			~ 110	Screw	ABE-7S16E2F0	0.397
				Spring	ABE-7S16E2F0E	0.397
			~ 230	Screw	ABE-7S16E2M0	0.407
				Spring	ABE-7S16E2M0E	0.407

Sub-bases with soldered solid state outputs, plug-in terminal blocks

No. of channels	Isolation PLC/application	Output voltage V	Output current A	Fault detection signal (1)	Type of connection	Reference	Weight kg
8	No	--- 24	0.5	Yes (2)	Screw	ABE-7S08S2B0	0.252
					Spring	ABE-7S08S2B0E	0.252
			2	Yes (2)	Screw	ABE-7S08S2B1	0.448
					Spring	ABE-7S08S2B1E	0.448
16	No	--- 24	0.5	Yes (2)	Screw	ABE-7S16S2B0	0.405
					Spring	ABE-7S16S2B0E	0.405
				No	Screw	ABE-7S16S1B2	0.400
					Spring	ABE-7S16S1B2E	0.400

Sub-bases with soldered electromechanical relays, plug-in terminal blocks

No. of channels	Relay width mm	No. of contacts	Output current A	Polarity distribution/application	Type of connection	Reference	Weight kg
8	5	1 "N/O"	2	Contact common per group of 4 channels	Screw	ABE-7R08S111	0.244
					Spring	ABE-7R08S111E	0.244
		Bistable	2	Volt-free	Screw	ABE-7R08S216	0.250
					Spring	ABE-7R08S216E	0.250
	10	1 "N/O"	5	Volt-free	Screw	ABE-7R08S210	0.352
					Spring	ABE-7R08S210E	0.352
16	5	1 "N/O"	2	Contact common per group of 8 channels	Screw	ABE-7R16S111	0.352
					Spring	ABE-7R16S111E	0.352
		1 "N/O"	5	Volt-free	Screw	ABE-7R16S210	0.547
					Spring	ABE-7R16S210E	0.547
	10	1 "N/O"	5	Common per group of 8 chan. on both poles	Screw	ABE-7R16S212	0.547
					Spring	ABE-7R16S212E	0.547

(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

Telefast® 2 pre-wired system
Plug-in relay sub-bases

8 0449

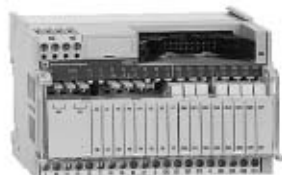


ABE-7R16T210

Sub-bases for plug-in solid state input relays (1)

No. of channels	Terminals/ channel	For relay type	Isolation PLC/ application	Input connection	Type of connection	Reference	Weight kg
16	2	ABS-7E ABR-7 ABS-7S33E	Yes	Volt-free	Screw	ABE-7P16F310	0.850
					Spring	ABE-7P16F310E	0.850
				Polarity distribution	Screw	ABE-7P16F312	0.850

8 0471



ABE-7R16M111

Output sub-bases, equipped with plug-in electromechanical relays (2)

No. of channels	Relay width mm	Type of relay	No. and type of contacts	Polarity distribution/ application	Reference	Weight kg
16	5	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 input common terminals	ABE-7R16M111 (3)	0.600	
	10	ABR-7S21	1 N/O	Volt-free	ABE-7R16T210	0.735
			Common on both poles (4)	ABE-7R16T212	0.730	
10	ABR-7S23	1 C/O	Contact common (4)	ABE-7R16T231	0.730	
			Volt-free	ABE-7R16T230	0.775	
12	ABR-7S33	1 C/O	Volt-free	ABE-7R16T330	1.300	
			Common on both poles (5)	ABE-7R16T332	1.200	
12	ABR-7S37	2 C/O	Volt-free	ABE-7R16T370	1.300	

(1) Not equipped with relays.

(2) Both technologies (electromechanical and solid state) may be combined on the same sub-base.

(3) 2 connection methods are available, enabling inputs and outputs to be connected to the same sub-base at the same time.

(4) Per group of 8 channels.

(5) Per group of 4 channels.

Connection interfaces

Telefast® 2 pre-wired system
Plug-in relay sub-bases

Sub-bases for solid state and/or electromechanical output relays, plug-in (1)

No. of Relay chan- nels	Relay width mm	For relay type	Isolator per channel	Fuse per channel	Polarity distribution/ application	Type of connection	Reference	Weight kg
16	5	ABR-7S11 ABS-7SC1B	No	No	Contact common per group of 4 channels		ABE-7P16T111	0.550
						Contact common per group of 4 output channels and 2 common input terminals	ABE-7P16M111 (2)	0.550
	10	ABR-7S2● ABS-7SA2● ABS-7SC2● ABE-7ACC20	No	No	Volt-free	Screw	ABE-7P16T210 (3)	0.615
							ABE-7P16T230 (3)	0.655
						Spring	ABE-7P16T230E (3)	0.655
				Yes	Volt-free	Screw	ABE-7P16T214	0.675
				No	Common on both poles (4)	Screw	ABE-7P16T212	0.615
				Yes	Common on both poles (4)	Screw	ABE-7P16T215	0.670
8	12	ABR-7S33 ABS-7SA3● ABS-7SC3●● ABE-7ACC21	No	No	Volt-free	Screw	ABE-7P08T330	0.450
						Spring	ABE-7P08T330E	0.450
16	12	ABR-7S33 ABS-7SA3● ABS-7SC3●● ABE-7ACC21	No	No	Volt-free	Screw	ABE-7P16T330	0.900
						Spring	ABE-7P16T330E	0.900
					Common on both poles (5)	Screw	ABE-7P16T332	0.900
		ABR-7S33 ABS-7SA3M ABS-7SC3E ABE-7ACC21	No	Yes	Volt-free	Screw	ABE-7P16T334	0.900
			Yes	Yes	Common on both poles (5)	Screw	ABE-7P16T318	1.000
						Spring	ABE-7P16T318E	1.000



ABE-7P16T2●●

(1) Not equipped with relays

(2) 2 connection methods are available, enabling inputs and outputs to be connected to the same sub-base at the same time.

(3) With relay ABR-7S21 for sub-base ABE-7P16T210, with relay ABR-7S23 for sub-base ABE-7P16T230●.

(4) Per group of 8 channels.

(5) Per group of 4 channels.

Plug-in solid state relays (Order in multiples of 4)

Relay width mm	Functions	Input circuit Current	Nominal voltage V	Output circuit Current (1) A	Nominal voltage V	Unit reference	Weight kg
5	Output	---	24	2	--- 24	ABS-7SC1B	0.010
10	Output	---	24	0.5	--- 5...48	ABS-7SC2E	0.016
					~ 24...240	ABS-7SA2M	0.016
12	Input	---	5 TTL		--- 24	ABS-7EC3AL	0.014
			24 Type 2	—	--- 24	ABS-7EC3B2	0.014
			48 Type 2	—	--- 24	ABS-7EC3E2	0.014
		~ 50 Hz	48	—	--- 24	ABS-7EA3E5	0.014
		~ 60 Hz	110...130	—	--- 24	ABS-7EA3F5	0.014
		~ 50 Hz	230...240	—	--- 24	ABS-7EA3M5	0.014
	Output	---	24	2 Self-protected	--- 24	ABS-7SC3BA	0.016
				1.5	--- 5...48	ABS-7SC3E	0.016
				1.5	~ 24...240	ABS-7SA3MA	0.016

Plug-in electromechanical relays

Relay width mm	Control voltage V	Output current (1) A (lth)	No. of contacts	Order in multiples of	Unit reference	Weight kg
5	--- 24	5	1 N/O	4	ABR-7S11	0.005
10	--- 24	5	1 N/O	4	ABR-7S21	0.008
			1 C/O	4	ABR-7S23	0.008
12	--- 24	10	1 C/O	4	ABR-7S33	0.017
		8	2 C/O	4	ABR-7S37	0.017
	--- 48	8	1 C/O	4	ABR-7S33E	0.017

Accessory

Description	Reference	Weight kg
Extractor for 5 mm miniature relays	ABE-7ACC12	0.010

(1) See characteristics table for specifications of relays in the sub-bases

816475



ABS-7SC1B

816476



ABR-7S2●

816474



ABR-7S3●

Connection interfaces

Telefast® 2 pre-wired system
Connection sub-bases for counter and analogue channels

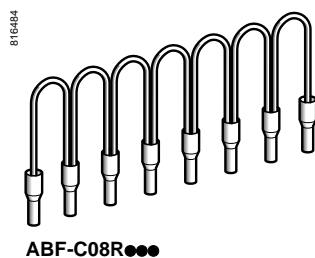
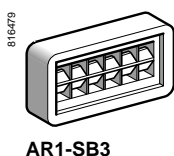
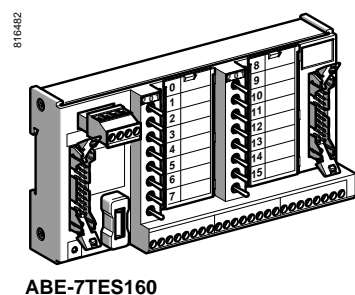
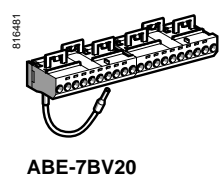
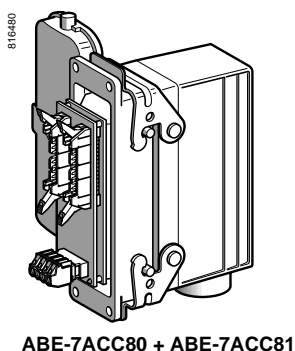
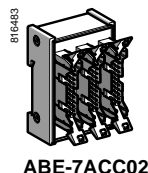


ABE-7CPA01



ABE-7CPA02

Connection sub-bases for counter and analogue channels						
Functions	For Modicon PLCs	Compatible modules	Type of connection Telefast 2 side	Type of connection	Reference	Weight kg
Counting and analogue	TSX Micro	Integrated analogue and counter TSX 37.22 TSX CTZ●A	15-way SUB-D	Screw	ABE-7CPA01	0.300
Counting Axis control Position control	Premium	TSX CTY●A TSX CAY●1	15-way SUB-D	Screw	ABE-7CPA01	0.300
Parallel output absolute encoder connection	Premium	TSX CTY●A TSX CAY●1	15-way SUB-D	Screw	ABE-7CPA11	0.330
Distribution of 16 thermocouples	Premium	TSX AEY1614	25-way SUB-D	Screw	ABE-7CPA12	0.300
Passive distribution of 8 channels on screw terminal block with shielding continuity	Premium	TSX ASY810 TSX AEY1600 TSX A●Y800	25-way SUB-D	Screw	ABE-7CPA02	0.290
	Quantum	140 AVI 03000				
		140 ACI 03000				
		140 ACI 04000 140 ACO 13000				
Distribution of 4 analogue output channels	Premium	TSX ASY410 TSX AEY420	25-way SUB-D	Screw	ABE-7CPA21	0.210
	Quantum	140 AVO 02000				
		140 ACO 02000				
Distribution and supply of 8 analogue channels with limitation of each current loop	Premium	TSX AEM8●1 TSX AEM16●● TSX AEY800 TSX AEY1600	25-way SUB-D	Screw	ABE-7CPA03	0.330
	Quantum	140 AVI 03000				
		140 ACI 03000				
		140 ACI 04000				
Distribution and supply of 8 analogue input channels isolated from each other with 25 mA/ channel limiter	Premium	TSX AEY810	25-way SUB-D	Screw	ABE-7CPA31	0.410
	Quantum	140 AVI 03000				
		140 ACI 03000				
		140 ACI 04000		Spring	ABE-7CPA31E	0.410
Safety	Premium	TSX PAY2●2	25-way SUB-D	Screw	ABE-7CPA13	0.290



Software

Description	Operating system	Reference	Weight kg
Software for client label marking	Under Windows version 3.1 or 95	ABE-7LOGV10	0.350
Pack of 25 pre-cut label sheets (160 labels)	—	ABE-7LOGF25	0.200

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
Removable continuity blocks	—	10 mm wide	4	ABE-7ACC20	0.007
	—	12 mm wide	4	ABE-7ACC21	0.010
Locating device for removable terminal block	—	—	100	ABE-7ACC30	0.100
Enclosure feedthrough with industrial connector	32	40-way	1	ABE-7ACC80	0.300
Plug-in 40-way male connector	32	For mounting on ABE-7ACC80	1	ABE-7ACC81	0.370
Enclosure feedthrough with CNOMO M23 connector (1 x 20-way HE 10 connector, PLC end)	16	19-way	1	ABE-7ACC82	0.150
	8 and 12	19-way	1	ABE-7ACC83	0.150
Impedance adaptor for Type 2 compatibility	—	Used with ABE-7ACC82 and ABE-7ACC83	1	ABE-7ACC85	0.012
IP 65 cable gland	—	For 3 cables	1	ABE-7ACC84	0.300
Additional snap-on terminal blocks (shunted terminals)	8	10 screw terminals	5	ABE-7BV10	0.030
		10 spring terminals	5	ABE-7BV10E	0.030
	16	20 screw terminals	5	ABE-7BV20	0.060
		20 spring terminals	5	ABE-7BV20E	0.060
I/O simulator sub-base	16	Display, forcing inhibition, continuity	1	ABE-7TES160	0.350
Adhesive label holder	—	For 6 characters	50	AR1-SB3	0.001
Fast 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

“Flexible commoning links” accessories

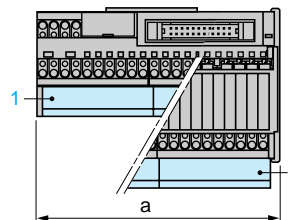
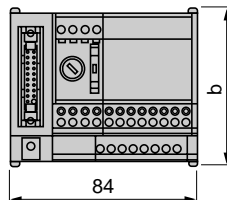
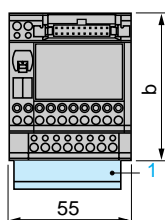
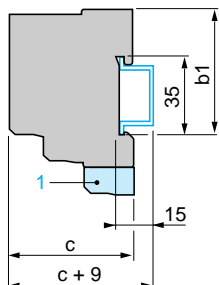
Description	For common	Colour	Distance between cable ends cm	Reference	Weight kg
Flexible commoning links	Coil	White	12	ABF-C08R12W	0.020
			2	ABF-C08R02W	0.010
	~	Red	12	ABF-C08R12R	0.020
			2	ABF-C08R02R	0.010
	Modularity				
	8 x 1 mm ²	Blue	12	ABF-C08R12B	0.020
			2	ABF-C08R02B	0.010

Common side view

ABE-7H20E●●●
ABE-7H32E●●●

ABE-7H16R50, ABE-7H12R50,
ABE-7H08R1●, ABE-7H08R21,
ABE-7R08S111/S111E,
ABE-7H08S21, ABE-7CPA21

ABE-7H16C●●/ABE-7H16CM●●,
ABE-7●16M111/ABE-7●16T111



ABE-	7H20E/7H32E●●●	7H●●●●●/CPA21	7R08S111●
b	67	70	77
b1	56	58	58
c	59	58	58

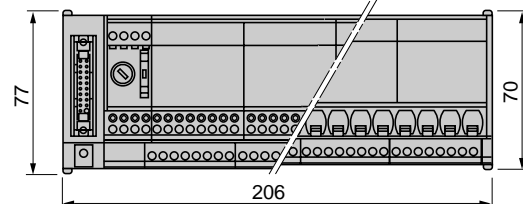
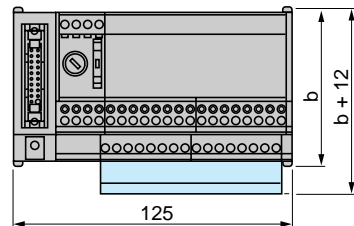
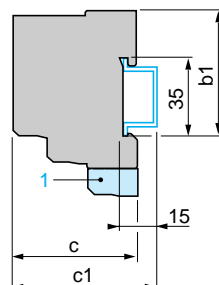
1 Additional shunt terminal block ABE-7BV10/7BV20

Common side view

ABE-7H16R2●, ABE-7H12R2●, ABE-7H16R3●,
ABE-7H16R1●, ABE-7H12R1●, ABE-7H12S21,
ABE-7H16S2●, ABE-7R16S11●, ABE-7R08S210,
ABE-7S08S2B0, ABE-7CPA02, ABE-7CPA03
ABE-7S16S1B2, ABE-7R08S216

ABE-7R16S21●, ABE-7S16S2B0/S2B02E,
ABE-7S16E2●●/S16E2●●E,
ABE-7S08S2B1/S08S2B1E
ABE-7CPA31

ABE-7H16●43

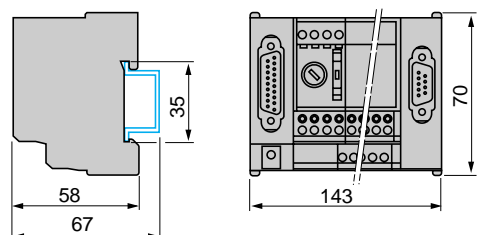
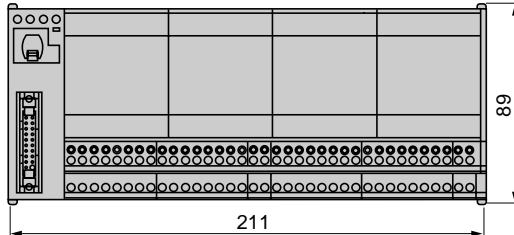
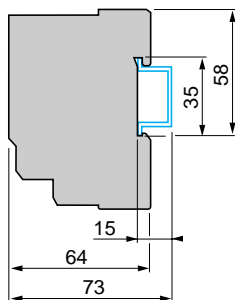


ABE-	7●●●●●	7●R08S210●, 7S16S1B2●, 7R08S216
b	70	77
b1	58	58
c	58	58

1 Additional shunt terminal block ABE-7BV10/7BV20

ABE-7R16T2●●, ABE-7P16T2●●

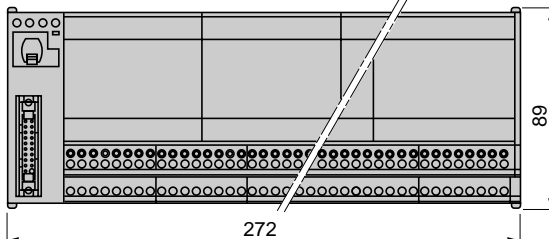
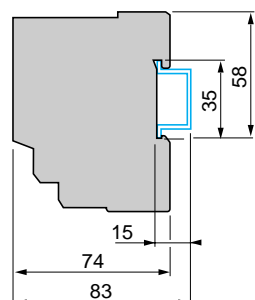
ABE-7CPA01, ABE-7CPA11/CPA12/CPA13



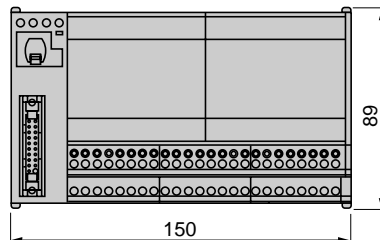
Note:
details of the front view are the same as for the ABE-7CPA01.

ABE-7R16T3●●, ABE-7P16T3●●, ABE-7P16F31●

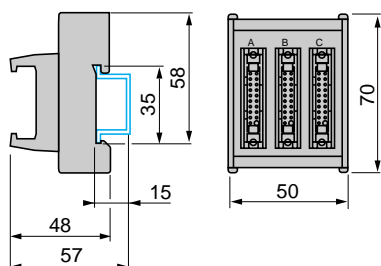
Common side view



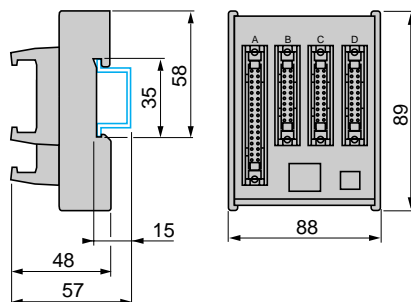
ABE-7P08T330



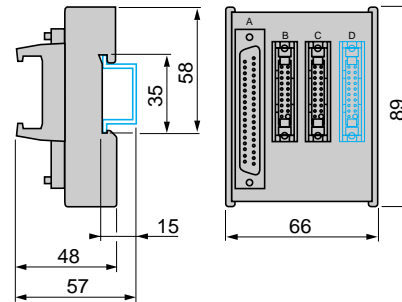
ABE-7ACC02



ABE-7ACC03

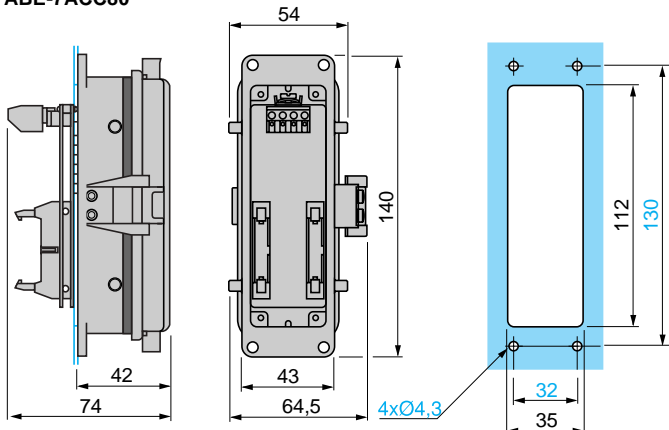


ABE-7ACC04, ABE-7ACC05
ABE-7ACC10, ABE-7ACC11

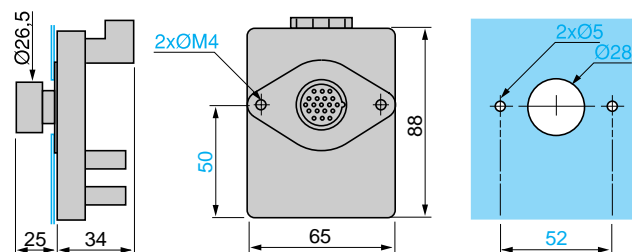


Note: Drawing representing ABE-7ACC04 and ABE-7ACC05

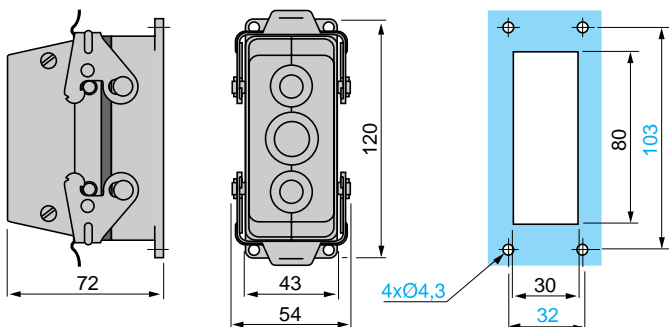
ABE-7ACC80



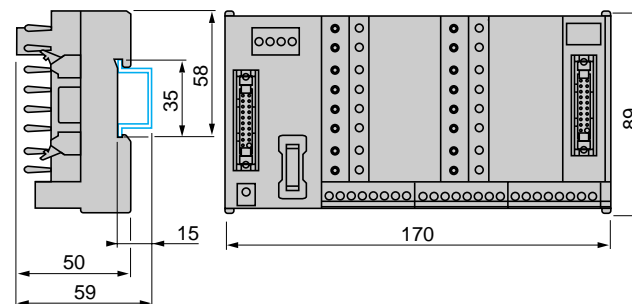
ABE-7ACC82, ABE-7ACC83



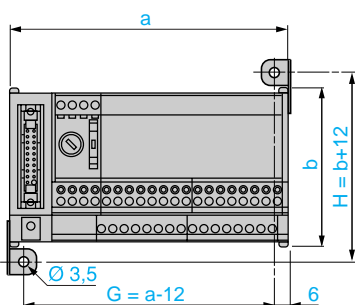
ABE-7ACC84



ABE-7TES160








Fixing centres for sub-bases using mounting kit ABE-7ACC01



ABE-7	G	H
ACC02	38	82
ACC03	53	101
ACC04	53	101
ACC05	53	101
ACC10/11	53	101
H08R●●	72	82
H08S21	72	82
H12R50	72	82
H16R50	72	82
R08S111	72	82
CPA01	131	82
CPA02	113	82
CPA1●	131	82
CPA03	113	82

ABE-7	G	H
H12R1●	113	82
H12R2●	113	82
H16R1●	113	82
H16R2●	113	82
H16R3●	113	82
H12S21	113	82
H16S21	113	82
R08S210	113	82
R16S111	113	82
R16S21●	194	82
S08S2B0	113	82
S08S2B1	194	82

ABE-7	G	H
H16F43	194	82
H16S43	194	82
S16E2●●	194	82
S16S1B2	113	82
S16S2●●	194	82
R16T2●●	199	101
P16T2●●	199	101
R16T3●●	260	101
P08T330	150	101
P16T3●●	260	101
P16F3●●	260	101

Functions	Supplies for d.c. control circuits				
Type of product	Single-phase, modular switch mode power supplies		Single-phase, regulated switch mode power supplies		
					
Applications	Industrial, commercial or residential applications. Modular format allowing integration into panels.		Simple, low power equipment.	Industrial applications, low and medium power. Machine equipment applications.	Industrial or commercial applications on sites sensitive to mains interference. Protection against accidental restarting.
Nominal power	22 W	30 W	7 W...30 W	48...240 W	60...240 W
Input voltage	~ 100...240 V single-phase		~ 100...240 V single-phase --- 110...220 V compatible (1)	~ 100...240 V single-phase	~ 100...240 V single-phase, --- 110...220 V compatible (1)
Output voltage	--- 12 V adjustable	--- 24 V adjustable	--- 24 V adjustable	--- 24 V adjustable	--- 12, 24 V or 48 V adjustable
Technology	Primary switch mode electronic power supplies.				
Secondary protection	Integrated, against overloads and short-circuits, with automatic reset.			Integrated, against overloads and short-circuits, with manual and automatic reset.	
Signalling	Output indicator lamp.			Output and input indicator lamp.	
Other characteristics	—		Connection by lug-clamps possible	—	Anti-harmonic distortion filter
Mounting	Direct on  rail		Direct, on  rail and on panel	Direct on  rail	
Disturbance (conforming to EN55011/22) Conducted and radiated	cl.B		cl.A (7/15 W) cl.B (30 W)	cl.B	
Conforming to standards	EN 50081-1, IEC 61000-6-2 (EN 50082-2), IEC 950, EN61131-2/A11		EN 50081-2, IEC 61000-6-2, EN 60950	EN 50081-1, IEC 61000-6-2, (EN 50082-2), IEC 950	EN 50081-1, IEC 61000-6-2, (EN 50082-2), IEC 950, 61000-3-2
Approvals	UL, CSA, TÜV		cULus, TÜV	UL, CSA, TÜV, CTick	
Device type	ABL-7RM		ABL-7CEM	ABL-7RE	ABL-7RP
Pages	Please consult our catalog: "Automation & Control, Interfaces, I/O splitter boxes and power supplies"		8/22		

(1) Compatible input voltage, not indicated on the product.

2-phase regulated switch mode power supplies



Industrial applications.

120 and 240 W

~ 2 x 380...415 V 2-phase

~ 24 V
adjustable

3-phase regulated switch mode power supplies



Industrial applications.
In-line continuous process equipment, machine tools, injection presses, etc.

240 and 480 W

120 W

240...960 W

~ 3 x
380...415 V
3-phase

~ 3 x
400...520 V
3-phase

~ 3 x
400...520 V
3-phase

Regulated switch mode power supplies for AS-Interface



Industrial applications.
Supply of d.c. voltage necessary for AS-Interface systems.

72 W

145 W

2 x 72 W

~ 100...240 V single-phase

~ 30 V

~ 24 V
adjustable

Primary switch mode electronic power supplies.

Integrated, against overloads and short-circuits, with manual and automatic reset.

Integrated, against overloads and short-circuits, overvoltage and undervoltage.

Output indicator lamp.

–

–

Anti-harmonic
distortion filter

Output and input indicator lamps.

–

Direct on ~ rail

Direct on ~ rail
(except ABL-7UPS 24200 and ABL-7UPS24400)

Direct on ~ rail

cl.B

cl.B

cl.B

EN 50081-1, EN 50082-2, EN 60950

EN 50081-1, EN 50082-2,
EN 60950

EN 50081-1,
EN 50082-2,
EN 60950,
IEC 61000-3-2

EN 50081-1, IEC 61000-6-2, EN 55022 class B

–

–

cULus, cULus

UL, CSA, TÜV

ABL-7REQ

ABL-7UEQ

ABL-7UES

ABL-7UPS

ASI-ABL

8/22

8/22

Please consult our catalog
"AS-Interface cabling system"

ABL-7 power supplies

The ABL-7 range of power supplies is designed to provide the d.c. voltage necessary for the control circuits of automation system equipment. Split into three families, this range meets all the needs encountered in industrial, commercial and residential applications. Single-phase or 3-phase, of the electronic switch mode type, they provide a quality of output which is suitable for the loads supplied and compatible with the mains supply available in the equipment. Clear guidelines are given for selecting protection devices which are often used with them and thus a comprehensive solution is provided, which can be used in total safety.

Phaseo switch mode power supplies

These switch mode power supplies are totally electronic and regulated. The use of electronics makes it possible to significantly improve the performance of these power supplies, which offer:

- very compact size,
- integrated overload, short-circuit, overvoltage and undervoltage protection,
- a very wide range of permissible input voltages, without any adjustment,
- a high degree of output voltage stability,
- good performance,
- LED indicators on the front panel.

Phaseo power supplies are available in single-phase and 3-phase versions. They deliver a voltage which is precise to 3%, whatever the load and whatever the type of mains supply, within a range of 85 to 264 V for single-phase, or 360 to 550 V for 3-phase. Conforming to IEC standards and UL and CSA 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-7 RE and ABL-7 RP supplies are also equipped with an output undervoltage control which causes the product to trip if the output voltage drops below 19 V, in order to ensure that the voltage delivered is always usable by the actuators being supplied. All the products are fitted with an output voltage adjustment potentiometer in order to be able to compensate for any line voltage drops in installations with long cable runs. Most of our power supplies are designed for direct mounting on 35 and 75 mm U_L rails.

These power supplies are available in single-phase and 3-phase versions and are split into three families:

Compact single-phase supply ABL-7CEM:

- power less than or equal to 30 W (1.2 A),
- compact size,
- for all low power equipment,
- suitable for use in automation system environments based on the Nano and Twido platforms, or in any automation system configuration requiring a U_{N} 24 V supply.

Universal single-phase supplies ABL-7RE and ABL-7RP:**■ ABL-7RE**

- power between 48 W (2 A) and 240 W (10 A),
- compact size,
- for all machine equipment,
- suitable for use in automation system environments based on the Micro and Premium platforms, or in any automation system configuration requiring a U_{N} 24 V supply.

■ ABL-7RP

- power between 60 W (2.5 A) and 240 W (10 A),
- output voltage available: U_{N} 12, 24 and 48 V,
- input filter (PFC) for commercial and residential environments (conforming to standard EN 61000-3-2),
- two operating modes possible for handling of overload and short-circuit faults:
 - "AUTO" mode which provides automatic restarting of the power supply on elimination of the fault,
 - "MANU" mode which requires manual resetting of the power supply to restart. Resetting is achieved by switching off the mains power.



ABL 7CEM



ABL 7RP



ABL-7UPS

ABL-7REQ

Phaseo switch mode power supplies (continued)

3-phase and single-phase process supplies ABL-7U and ABL-7REQ:

■ ABL-7UE

- power between 120 W (5 A) and 480 W (20 A),
- compact size,
- voltages between 3 x 380 V and 3 x 500 V,
- for use in industrial applications, for all in-line or continuous process equipment, machine tools and injection presses, etc.
- suitable for use in automation system environments based on the Premium and Quantum platforms, or in any automation system configuration requiring a $\text{---} 24 \text{ V}$ supply.

■ ABL-7UPS

- power between 120 W (10 A) and 960 W (40 A).
- Identical to the **ABL-7UE** range, this power supply differs in that it includes a filter (PFC) which means that it can be connected directly to the public mains supply, in compliance with standard EN 61000-3-2. This product, for world-wide use, is UL certified.

■ ABL-7 REQ

- power between 120 W (5 A) and 240 W (10 A),
- compact size,
- can be connected to **2-phase** input voltages between 380 V and 415 V, to replace older power supplies connected by only two wires. Economical, more competitive, yet with a smaller input voltage range it can, in certain cases, be used in place of the 3-phase versions.

Using $\text{---} 24 \text{ V}$

■ Using $\text{---} 24 \text{ V}$ enables so-called protection installations (PELV) to be built. Using PELV is a measure designed to protect people from direct and indirect contact. Measures relating to these installations are defined in publication NF C 12-201 and in standard IEC 364-4-41.

■ The application of these measures to the electrical equipment in machines is defined in standard NF EN 60204-1 and requires:

- that the voltage used is below 60 V d.c. in dry environments and below 30 V in damp environments,
- the connection of one side of the PELV circuit, or one point of the source, to the equipotential protection circuit associated with higher voltages,
- the use of switchgear and control gear on which measures have been taken to ensure "safety separation" between power circuits and control circuits.

■ A safety separation is necessary between power circuits and control circuits in PELV circuits. Its aim is to prevent the appearance of dangerous voltages in $\text{---} 24 \text{ V}$ safety circuits.

■ The reference standards involved are:

- IEC 61558-2-6 and EN 61558-2-6 (safety transformers),
- IEC 664 (coordination of isolation).

Telemecanique power supplies meet these requirements.

■ Moreover, to ensure that these products will operate correctly in relation to the demands of their reinforced isolation, it is recommended that they be mounted and wired as indicated below:

- they should be placed on an earthed mounting plate or rail,
- they should be connected using flexible cables, with a maximum of two wires per connection, and tightened to the nominal torque,
- conductors of the correct insulation class must be used.

■ If the d.c. circuit is not connected to an equipotential protection conductor, an earth leakage detector will indicate any accidental earth faults (please consult your Regional Sales Office).

Operating voltage

■ The permissible tolerances for the operating voltage are listed in publications IEC 1131-2 and DIN 19240.

■ For nominal voltage $U_n = \text{---} 24 \text{ V}$, the extreme operating values are from - 15 % to + 20 % of U_n , whatever the supply fluctuations in the range -10 % to + 6 % (defined by standard IEC 38) and load variations in the range 0-100 % of I_n . All Telemecanique $\text{---} 24 \text{ V}$ power supplies are designed to provide a voltage within this range.

■ It may be necessary to use a voltage measurement relay to detect when the normal voltage limits are being surpassed and to deal with the consequences of this (please consult your Regional Sales Office).

Selection of power supplies

The characteristics to be taken into account when selecting a power supply are:

- the required output voltage and current,
- the mains voltage available in the installation.

An initial selection can be made using the table opposite.

This may however result in several products being selected as suitable.

Other selection criteria must therefore be taken into account.

■ The quality of the mains power supply

The Phaseo range is the solution because it guarantees precision to 3% of the output voltage, whatever the load current and the input voltage. In addition, the wide input voltage range of Phaseo power supplies allows them to be connected to all mains supplies within the nominal range, without any adjustment.

The Phaseo RP family can also be connected to \approx 110 and 220 V emergency supplies.

■ Harmonic pollution (power factor)

The current drawn by a power supply is not sinusoidal. This leads to the existence of harmonic currents which pollute the mains supply. European standard EN 61000-3-2 limits the harmonic currents produced by power supplies. This standard covers all devices between 75 W and 1000 W, drawing up to 16 A per phase, and connected directly to the public mains power supply. Devices connected downstream of a private, low voltage general transformer are therefore excluded.

Regulated switch mode supplies always produce harmonic currents; a filter circuit (Power Factor Correction or PFC) must therefore be added to comply with standard EN 61000-3-2.

Phaseo ABL-7RP and ABL-7UPS power supplies conform to standard EN 61000-3-2 and can therefore be connected directly to public mains power supplies.

■ Electromagnetic compatibility

Levels of conducted and radiated emissions are defined in standards EN 55011 and EN 55022.

The majority of products in the Phaseo range have class B certification and can be used without any restrictions due to their low emissions.

ABL-7CEM24003 and ABL-7CEM24006 power supplies have class A certification. It is recommended that they should not be used in the following equipment: trains, aircraft, nuclear applications and in any environment where malfunctioning could cause serious injuries or lead to death. These products are designed for use in industrial equipment and are not suitable for use in residential environments.

■ Behaviour in the event of short-circuits

Phaseo power supplies are equipped with an electronic protection device. This protection device resets itself automatically on elimination of the fault (around 1 second for ABL-7 RE/RP, around 3 seconds for ABL-7 UE/UP/REQ) which avoids having to take any action or change a fuse. In addition, the Phaseo ABL-7RP/U/REQ ranges allow the user to select the reset mode in the event of a fault:

- in the "AUTO" position, resetting is automatic,
- in the "MANU" position, resetting occurs after elimination of the fault and after switching the mains power off and back on.

This feature allows Phaseo ABL-7RP/U/REQ power supplies to be used in installations where the risks associated with untimely restarting are significant.

■ Behaviour in the event of phase failure

In the event of failure of one phase, all Phaseo 3-phase power supplies switch to relaxation mode for as long as the input voltage is < 450 V.

For operation on higher voltages (e.g. 480 V), use of an upstream GV2 type residual current protection device is recommended.

■ Selection of reset mode

- on the ABL-7RP family of products:

By microswitch on the front panel of the product.

- on the ABL-7U/REQ family of products:

By jumper on the front panel. **Warning: selection of the function is only possible after the mains power supply has been switched off for at least 5 minutes.** The jumper is moved using a pair of insulated, flat-nose pliers.

Selection according to application characteristics

Type of mains supply		Single-phase				2-phase	3-phase		
Rated mains supply voltage		\sim 100...240 V 50/60 Hz \equiv 110... 220 V (1) Wide range				100...240 V 50/60 Hz Wide range	2 x 380...415 V 50/60 Hz	3 x 380...415 V 50/60 Hz	3 x 400...520 V 50/60 Hz Wide range
Permissible variation		85...264 V, 47...63 Hz \equiv 100...250 V (1), \equiv 105...370 V (2)				85...264 V 47...63 Hz	340...460 V 47...63 Hz	340...460 V 47...63 Hz	360...550 V 47...63 Hz
Output voltage		12 V	48 V	24 V	24 V	24 V	24 V	24 V	24 V
Output current	0.3 A			ABL-7CEM24003					
	0.6 A			ABL-7CEM24006					
	1.2 A			ABL-7CEM24012					
	2 A				ABL-7RE2402				
	2.5 A		ABL-7RP4803						
	3 A			ABL-7RP2403	ABL-7RE2403				
	5 A	ABL-7RP1205		ABL-7RP2405	ABL-7RE2405	ABL-7REQ24050		ABL-7UES24050	
	10 A			ABL-7RP2410	ABL-7RE2410	ABL-7REQ24100	ABL-7UEQ24100		ABL-7UPS24100
	20 A						ABL-7UEQ24200		ABL-7UPS24200
	40 A								ABL-7UPS24400
Conforming to EN 61000-3-2		Yes (not applicable for ABL-7CEM)				No	No	No	No
Integrated automatic protection		Yes Automatic or manual restart on ABL-7RP Automatic restart only on ABL-7CEM				Yes Automatic restart	Yes Automatic or manual restart		

(1) Values for ABL-7RP power supplies, not indicated on the product.

(2) Values for ABL-7CEM power supplies, not indicated on the product.

Technical characteristics

Type of power supply	ABL-7CEM	ABL-7RE	ABL-7RP
Product certifications	cULus, TÜV	UL, CSA, TÜV, CTick	
Conforming to standards	UL 508	UL 508, CSA 22.2 n° 950	
Safety	IEC/EN 60950, FELV		IEC/EN 61496-1-2, FELV
EMC	EN 50081-2, EN 50082-2	EN 50081-1, IEC 61000-6-2 (EN 50082-2)	
Low frequency harmonic currents	–	–	EN 61000-3-2

Input circuit

LED indication		–	Orange LED	Orange LED
Input voltages	Rated values	V	~ 100...240, --- 110...220 compatible (1)	~ 100...240 --- 110...220 compatible (1)
	Permissible values	V	~ 85...264, --- 105...370 compatible (1)	~ 85...264, --- 100...250 compatible (1)
	Permissible frequencies	Hz	47...63	
	Efficiency at nominal load		> 70 %	> 85 %
	Current consumption	A	0.1 (7 W)/0.2 (15 W)/0.45 (30 W)	0.6 (48 W)/0.83 (72 W) 1.2 (120 W)/2.5 (240 W)
	Ue = 240 V			0.4 (72 W)/0.6 (120 W) 1.3 (240 W)
	Ue = 100 V	A	0.17 (7 W)/0.3 (15 W)/0.68 (30 W)	1.2 (48 W)/1.46 (72 W) 1.9 (120 W)/3.6 (240 W)
	Current at switch-on	A	< 50	< 30
	Power factor		0.45 approx.	0.65 approx.
				0.98 approx.

Output circuit

LED indication		Green LED	Green LED	Green LED
Nominal output voltage (U out)	V	--- 24		12, 24 and 48
Nominal output current	A	0.3/0.6/1.2	2/3/5/10	2.5/5/10
Precision	Output voltage	Adjustable from 90 to 110 %	Adjustable from 100 to 120 %	
	Line and load regulation	2 % max	± 3 %	
	Residual ripple - interference	mV	< 200 (peak-peak)	
Micro-breaks	Holding time at I max and Ve min	ms	> 20	> 10
Temporary overloads	Permissible inrush current (U out > 19V)		See curves page 8/29	
Protection	Short-circuit		Permanent/automatic restart	Permanent/automatic restart or restart after switching off mains power
	Overload		1.05 In	1.1 In
	Overvoltage		U > 1.2	Tripping if U > 1.5 Un
	Undervoltage		–	Tripping if U < 0.8 Un

Operating and environmental characteristics

Connections	Input	mm ²	2 x 2.5 + earth	
	Output	mm ²	2 x 2.5	2 x 2.5 + earth, multiple output, depending on model
Ambient conditions	Storage temperature	°C	- 25... + 70	
	Operating temperature	°C	- 10... + 60 (derating as from 50° C, mounted vertically)	0... + 60 (derating as from 50° C, mounted vertically)
	Max. relative humidity		20...90 %	95 % without condensation or dripping water
	Degree of protection		IP 20 conforming to IEC 529	
	Vibrations		Conforming to IEC 61131-2	
Operating position			Vertical and horizontal (see derating curve, page 8/28)	Vertical
MTBF at 40°			> 100 000 h	
Connections	Series		Possible (see page 8/29)	
	Parallel		No	Possible (max. temperature 50° C)
Dielectric strength	Input/output		3000 V/50 and 60 Hz 1 min	3000 V/50 and 60 Hz 1 min
	Input/earth		2000 V/50 and 60 Hz 1 min	3000 V/50 and 60 Hz 1 min
	Output/earth (and output/output)		500 V/50 and 60 Hz 1 min	500 V/50 and 60 Hz 1 min
Input fuse incorporated			Yes (not interchangeable)	
Disturbance	Conducted		EN 50081-2 (generic)	EN 50081-1
			EN 55011/EN 55022 class A (7 and 15 W) EN 55011/EN 55022 class B (30W)	EN 55011/EN 55022 class B
	Radiated		EN 55011/EN 55022 class B	
Immunity			IEC 61000-6-2 (generic)	
	Electrostatic discharge		EN 61000-4-2 (4 kV contact/8 kV air)	
	Electromagnetic		EN 61000-4-3 level 3 (10 V/m)	
	Conducted interference		EN 61000-4-4 level 3 (2 kV) , EN 61000-4-5, EN 61000-4-6 level 3, EN 61000-4-8 level 4	
	Mains interference		EN 1000-4-11 (voltage drops and cuts)	

(1) Compatible input voltage, not indicated on the product.

Technical characteristics

Type of power supply	ABL-7REQ24●	ABL-7UEQ24●	ABL-7UES24●	ABL-7UPS24●
Product certifications	-			cULus, cULus
Conforming to standards				
Safety	EN 60950, FELV			
EMC	EN 50081-1, EN 50082-2			
Low frequency harmonic currents	-			EN 61000-3-2

Input circuit

LED indication		—			
Input voltages					
Rated values	V	~ 2 x 380...415	~ 3 x 380...415	~ 3 x 400...520	~ 3 x 400...520
Permissible values	V	~ 2 x 340...460	~ 3 x 340...460	~ 3 x 360...550	~ 3 x 360...550
Permissible frequencies	Hz	50...60			
Efficiency at nominal load		> 85 %	> 90 %		
Current consumption					
Ue = 400 V	A	0.65 (120 W)/1.2 (240 W)	0.75 (240 W)/1.5 (480 W)	0.7 (240 W)/1.2 (480 W)/1.7 (960 W)	
Current at switch-on	A	< 35			
Power factor		0.6	0.55	0.7	0.7/0.9 (960 W)
2-phase operating mode	V	—			
		Relaxation if input voltage < ~ 450			

Output circuit

LED indication			Green LED			
Nominal output voltage (U out)		V	--- 24			
Nominal output current		A	5/10	10/20	5	10/20/40
Precision						
	Output voltage		Adjustable from 100 to 116%			
	Line and load regulation		1 % max			
	Residual ripple - interference	mV	< 200 (peak-peak)			
Micro-breaks						
	Holding time for I max and Ve min	ms	15	10		Between 8 and 13
Temporary overloads						
	Permissible inrush current (U out >19V)		See curves, page 8/29			
Protection						
	Short-circuit		Permanent/automatic or normal restart			
	Overload		1.20 In < 50 ms			
	Overvoltage	V	28.5 typical			
	Undervoltage	V	19 typical			

Operating and environmental characteristics

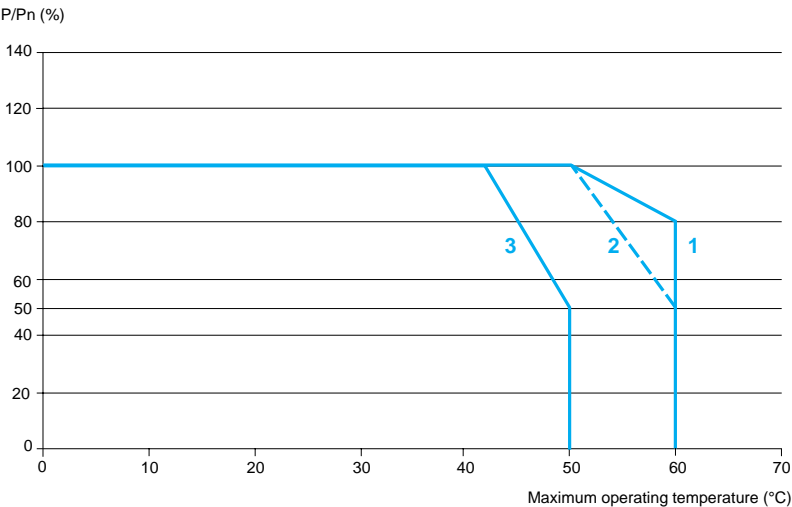
Connections	Input	mm ²	2 x 1.5...2.5 mm ² + earth			
	Output	mm ²	4 x 1.5...2.5 mm ²	4 x 4...6 mm ²	4 x 1.5...2.5 mm ²	4 x 1.5...2.5 mm ² + earth (240 W) 4 x 4...6 mm ² + earth (480 W) 4 x 4...10 mm ² + earth (960 W)
Ambient conditions	Storage temperature	°C	- 25...+ 70			
	Operating temperature	°C	0° C...+ 60° C			
	Maximum relative humidity		30...90 %			
	Degree of protection		IP 20 or IP XXB			
	Vibrations		Conforming to IEC 61131-2			
Operating position			Vertical			
MTBF			> 100 000 h			
Connections	Series		Possible			
	Parallel		See page 8/29			
Dielectric strength	Input/output		3750 V/50 and 60 Hz 1 min			
	Input/earth		3500 V/50 and 60 Hz 1 min			
	Output/earth (and output/output)		500 V/50 and 60 Hz 1 min			
Input fuse incorporated			No			
Disturbance	Conducted/radiated		EN 55011/EN 5022 - class B			
Immunity	Electrostatic discharge		EN 61000-4-2 (4 kV contact/8 kV air)			
	Electromagnetic		EN 61000-4-3 level 3 (10 V/m)			
	Conducted interference		EN 61000-4-4 level 3 (2 kV), EN 61000-4-5, EN 61000-4-6 level3, EN 61000-4-8 level 4 (for ABL-7RE/RP)			
	Mains interference		EN 61000-4-11 (voltage drops and cuts)			

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. Conversely, a power supply can deliver more than its nominal power if the ambient temperature remains largely below the rated operating temperature.

The rated ambient temperature for Phaseo power supplies is 50 °C. Above this, derating is necessary up to a maximum temperature of 60 °C.

The graph below shows the power (in relation to the nominal power) which the power supply can deliver continuously, according to the ambient temperature.



- 1 ABL-7RE, ABL-7RP, ABL-7U mounted vertically
- 2 ABL-7CEM mounted vertically
- 3 ABL-7CEM mounted horizontally

Derating should be considered in extreme operating conditions:

- intensive operation (output current permanently close to the nominal current, combined with a high ambient temperature),
- output voltage set above 24 V (to compensate for line voltage drops, for example),
- parallel connection to increase the total power.

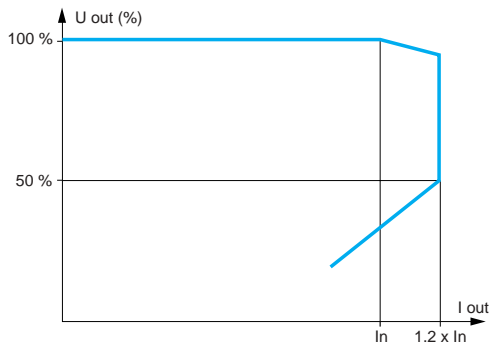
General rules to be complied with

Intensive operation	See derating on above graph. Example for ABL-7RE: - without derating, from 0 °C to 50 °C, - derating of nominal current by 2%, per additional °C, up to 60 °C.
Rise in output voltage	The nominal power is fixed. Increasing the output voltage means that the current delivered must be reduced
Parallel connection to increase the power (except ABL-7CEM)	The total power is equal to the sum of the power supplies used, but the maximum ambient temperature for operation is 50 °C. To improve heat dissipation, the power supplies must not be in contact with each other

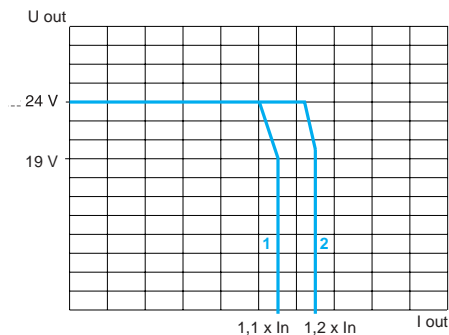
In all cases, there must be adequate convection round the products to ensure easier cooling. There must be a clear space of 50 mm above and below Phaseo power supplies and of 15 mm at the sides.

Load limit

ABL-7CEM24●●●



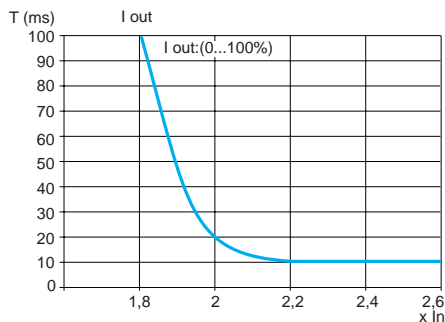
ABL-7RE24●●/ABL-7RP●●●●
ABL-7U●●24●●/ABL-7REQ●●●●



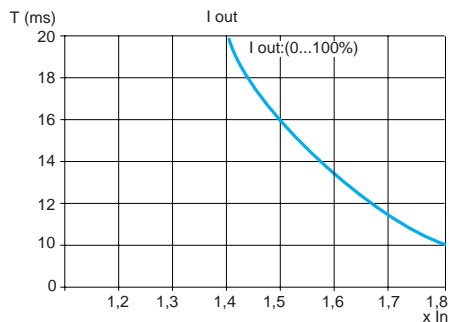
1 ABL-7RE24●●/ABL-7RP●●●●
2 ABL-7U●●24●●/ABL-7REQ●●●●

Temporary overloads

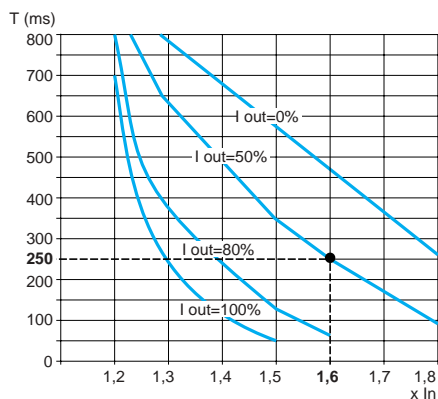
ABL-7CEM



ABL-7RE/ABL-7RP



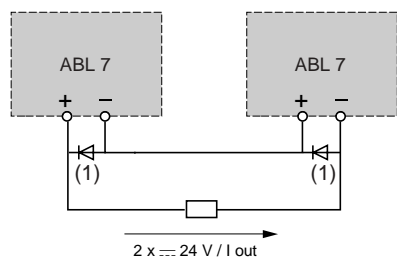
ABL-7U



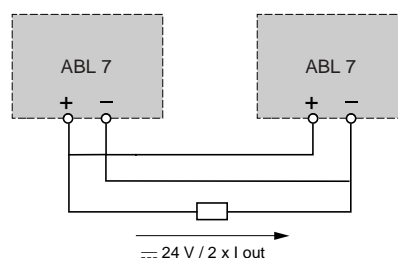
Example: For an ABL-7UPS24●●● power supply with 50 % loading. ($I_{out} = 50\%$), this power supply can absorb a current peak of $1.6 \times I_n$ for 250 ms with an output voltage ≥ 19 V.

Series or parallel connection

Series connection



Parallel connection



Family	Series	Parallel
ABL-7CEM	2 products max (1)	No
ABL-7RE/RP	2 products max	2 products max
ABL-7U/REQ	2 products max	2 products max

(1) 2 Shottky diodes 2 A/100 V on ABL-7CEM only.

ABL-7CEM, ABL-7RE and ABL-7RP power supplies: protection of the power supply line

Type of mains supply	~ 115 V single-phase			~ 230 V single-phase		
Type of protection	Thermal-magnetic circuit-breaker		gG fuse	Thermal-magnetic circuit-breaker		gG fuse
	GB2	C60N		GB2	C60N	
ABL-7CEM24003	GB2-CD06	24183 MG24516 (1)	2A	GB2-CD07	24184 MG24517 (1)	2 A
ABL-7CEM24006	GB2-CD07	24184 MG24517 (1)	2A	GB2-CD08	24185 MG24518 (1)	2 A
ABL-7CEM24012	GB2-CD07	24184 MG24517 (1)	2A	GB2-CD08	24185 MG24518 (1)	2 A
ABL-7RE2402	GB2-●B07	MG24517 (1)	2A	GB2-DB06	MG24516 (1)	2 A
ABL-7RE2403	GB2-●B07	MG24517 (1)	2 A	GB2-DB06	MG24516 (1)	2 A
ABL-7RE2405	GB2-●B08	MG24518 (1)	4 A	GB2-DB07	MG17453 (1)	2 A
ABL-7RE2410	GB2-●B12	MG17454 (1)	6 A	GB2-DB08	MG24518 (1)	4 A
ABL-7RP2403	GB2-●B07	MG24517 (1)	2 A	GB2-DB07	MG24516 (1)	2 A
ABL-7RP2405	GB2-●B07	MG24517 (1)	2 A	GB2-DB07	MG24516 (1)	2 A
ABL-7RP2410	GB2-●B09	MG24519 (1)	4 A	GB2-DB07	MG24516 (1)	2 A
ABL-7RP4803	GB2-●B07	MG24517 (1)	2 A	GB2-DB07	MG24516 (1)	2 A

ABL-7REQ power supplies: protection of the power supply line

Type of mains supply	~ 400 V 2-phase		
Type of protection	Thermal-magnetic circuit-breaker		gG fuse
2-pole	GB2-DB●●	C60N	
ABL-7REQ24050	DB07	24100	10 A
ABL-7REQ24100	DB08	24100	10 A

ABL-7UEQ, ABL-7UES and ABL-7UPS power supplies: protection of the power supply line

Type of mains supply	~ 400...480 V 3-phase		
Type of protection	Thermal-magnetic circuit-breaker		gG fuse
2-pole	GV2-ME●●	C60N	
ABL-7UEQ24100	GV2-ME08 (1)	24212	4 A
ABL-7UEQ24200	GV2-ME08 (1)	24213	6 A
ABL-7UES24050	GV2-ME08 (1)	24210	2 A
ABL-7UPS24100	GV2-ME08 (1)	24210	2 A
ABL-7UPS24200	GV2-ME08 (1)	24211	3 A
ABL-7UPS24400	GV2-ME08 (1)	24212	4 A

(1) UL certified circuit-breaker.



ABL-7CEM

ABL 7CEM single-phase regulated switch mode power supplies

Mains input voltage 47...63 Hz	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conforming to standard EN 61000-3-2	Reference	Weight
V	== V	W	A				kg
~ 100...240 single-phase wide range == 110...220 (1)	24	7	0.3	auto	no	ABL-7CEM24003	0.150
		15	0.6	auto	no	ABL-7CEM24006	0.180
		30	1.2	auto	no	ABL-7CEM24012	0.220

ABL-7RE single-phase regulated switch mode power supplies

Mains input voltage 47...63 Hz	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conforming to standard EN 61000-3-2	Reference	Weight
V	== V	W	A				kg
~ 100...240 single-phase wide range	24	48	2	auto	no	ABL-7RE2402	0.520
		72	3	auto	no	ABL-7RE2403	0.520
		120	5	auto	no	ABL-7RE2405	1.000
		240	10	auto	no	ABL-7RE2410	2.200

ABL-7RP single-phase regulated switch mode power supplies

Mains input voltage 47...63 Hz	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conforming to standard EN 61000-3-2	Reference	Weight
V	== V	W	A				kg
~ 100...240 single-phase wide range == 110...220 (1)	12	60	5	auto/man	yes	ABL-7RP1205	1.000
	24	72	3	auto/man	yes	ABL-7RP2403	0.520
		120	5	auto/man	yes	ABL-7RP2405	1.000
		240	10	auto/man	yes	ABL-7RP2410	2.200
	48	144	2.5	auto/man	yes	ABL-7RP4803	1.000

ABL-7REQ 2-phase regulated switch mode power supplies

Mains input voltage 47...63 Hz	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conforming to standard EN 61000-3-2	Reference	Weight
V	== V	W	A				kg
~ 380...415	24	120	5	auto/man	no	ABL-7REQ24050	0.850
		240	10	auto/man	no	ABL-7REQ24100	1.200

ABL-7U 3-phase regulated switch mode power supplies

Mains input voltage 47...63 Hz	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conforming to standard EN 61000-3-2	Reference	Weight
V	== V	W	A				kg
~ 3x380...415	24	240	10	auto/man	no	ABL-7UEQ24100	1.200
		480	20	auto/man	no	ABL-7UEQ24200	2.100
~ 3x400...520	24	120	5	auto/man	no	ABL-7UES24050	1.300
		240	10	auto/man	yes	ABL-7UPS24100	1.300
		480	20	auto/man	yes	ABL-7UPS24200	2.300
		960	40	auto/man	yes	ABL-7UPS24400	4.500

(1) Compatible input voltage, not indicated on the product.

ABL-7RE2405
ABL-7RP2405
ABL-7RP4803

ABL-7REQ

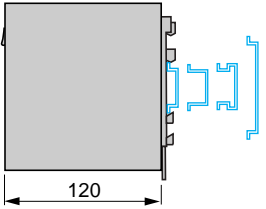


ABL-7UPS

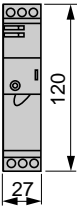
Power supplies and transformers

Power supplies for d.c. control circuits
Phaseo regulated switch mode power supplies

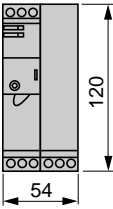
ABL-7RE24●●/ABL-7RP●●●●
Common side view
Mounting on 35 and 75 mm rails



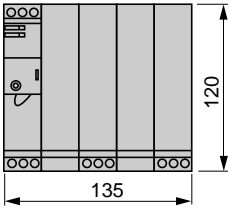
ABL-7RE2402/2403
ABL-7RP2403



ABL-7RE2405
ABL-7RP1205/2405/4803



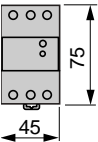
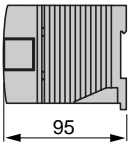
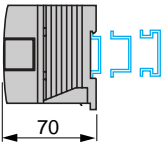
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ABL-7RP2410



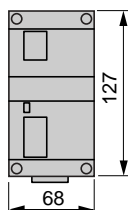
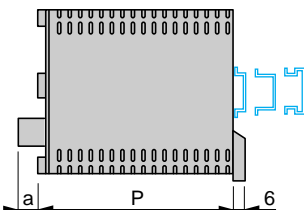
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ABL-7CEM24003

ABL-7CEM24006/
ABL-7CEM24012

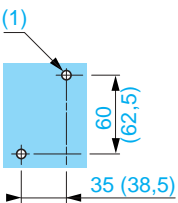
Common front view



ABL-7REQ24●●●/ABL-7UEQ24100/ABL-7UES24050/
ABL-7UPS24100



Panel mounting

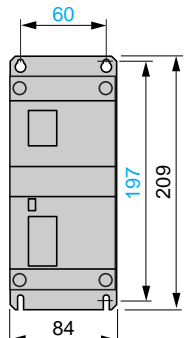
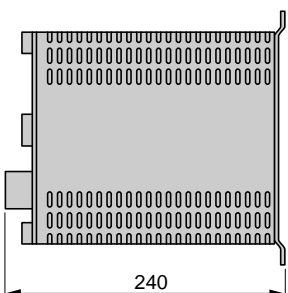
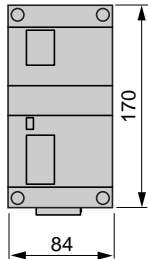
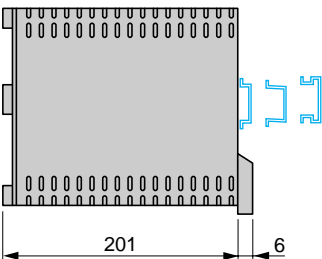


(1) 2 x M4 or 2 x Ø4.5

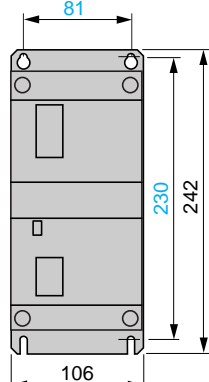
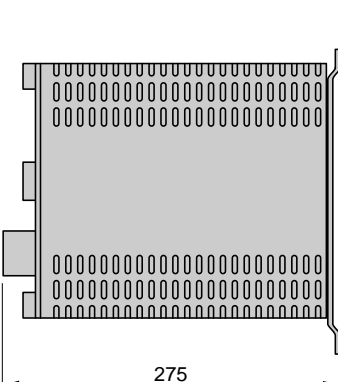
ABL-7UEQ24200

ABL-	P mm	a mm
7REQ24050	130	–
7REQ24100	154	–
7UEQ24100	154	–
7UES24050	171	15
7UPS24100	171	15

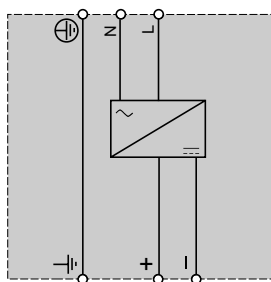
ABL-7UPS24200



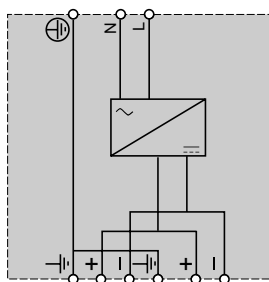
ABL-7UPS24400



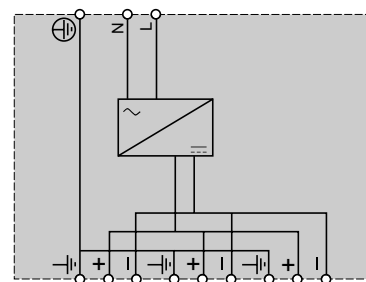
ABL-7RE2402/2403



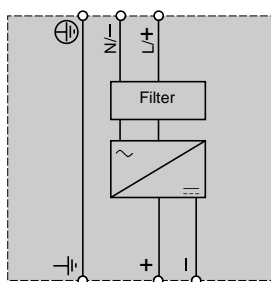
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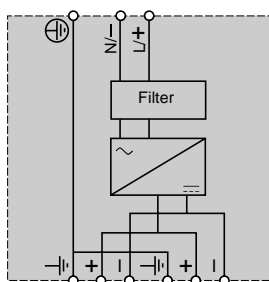
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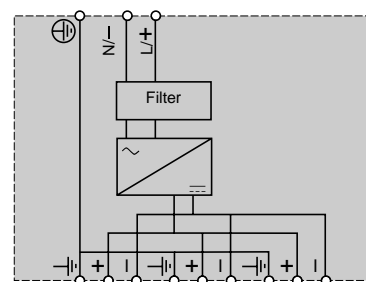
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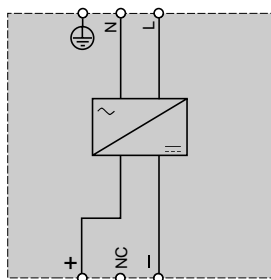
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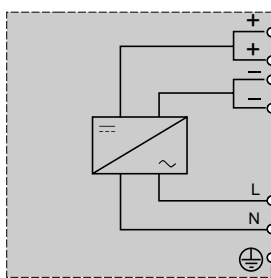
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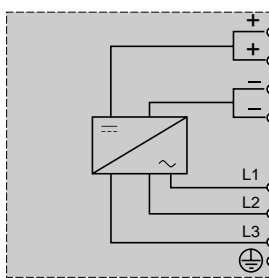
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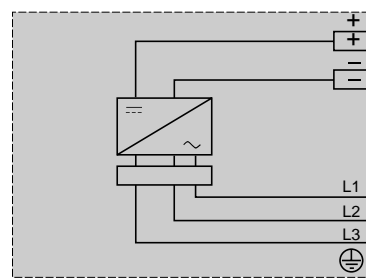
ABL-7REQ24●●●



ABL-7UE●●●●●



ABL-7UP●●●●●



Technical information

- Modicon Quantum automation platform main characteristics *page 9/2*
- Optional conformal coating *page 9/3*
- Documentation *page 9/4*
- Automation product certifications *page 9/6*
- Community regulations *page 9/7*

Schneider Electric worldwide

- Adresses *page 9/8*

Index

- Product reference index *page 9/14*

Mechanical specifications			
Weight/module	kg	1.0 max.	
	lb	2 max.	
Dimensions (H x D x W)	mm	250 x 103.85 x 40.34	
	inch	9.84 x 4.09 x 1.59	
Wire size	mm	0.5...2.0 one wire, 0.5...1.3 two wires	
	AWG	14 one wire, 16 two wires, 20 max	
Material (chassis and cover)		Flame-retardant polycarbonate	
Space in the backplane	slots	1/ module typical, 2 / some CPUs and MMS modules	
Electrical specifications			
Electrostatic discharge (IEC 801-2)	Air	kV	8
	Contact	kV	4
RFI immunity (IEC 801-3)	MHz	80...1000, 10 V/m	
Ground surge (IEC 801-5)	kV	2, shield-to-ground	
Environmental specifications			
Temperature	Operating	°C	0...+60 (32...140 °F)
	Storage	°C	-40...+85 (- 40...+ 185 °F)
Relative humidity	%	0...95 non-condensing @ 60 °C (140 °F)	
Altitude	m	up to 5000 (16,4000 ft), full operation. When the altitude exceeds 2000 m (6562 ft), the specified operating ambient temperature of 60 °C (140 °F) should be reduced by 6°C (14 °F) per 1000 m (3281 ft) of additional elevation.	
Shock	G	±15 peak for 11 ms, half-sine wave	
Flammability	V-O	94, connector and module	
Free fall	m	1	
	ft	3	
Agency approvals		UL 508, c UL, CSA 22.2-142, CSA Class 1 Div 2, Factory Mutual, Class 1, Div 2, Maritime approvals, c€	

If your control system needs to operate in a corrosive environment, Quantum modules can be ordered with a conformal coating applied to components of the product. Conformal coating will extend its life and enhance its environmental performance capabilities.

Mixed flowing gas (power on)

Standard	Pollutant	Parts/billion	Quantum's performance
EIA 364-65 level III	Cl ₂	20 (±5)	Meets the standard
	NO ₂	200 (±50)	Exceeds standard (1250 parts/billion)
	H ₂ S	100 (±20)	Meets standard
ISA-S71.04 GX severe	Cl ₂	10	Exceeds standard (20 parts/billion)
	NO ₂	1250	Meets standard
	H ₂ S	50	Exceeds standard (100 parts/billion)
	SO ₂	300	Meets standard

Humidity (operating)

Standard	Concentration (%)	Quantum's performance
IEC-68-2-3	93 @ 60 °C (140 °F)	Meets standard

Salt mist (non-operating)

Standard	Concentration (%)	Quantum's performance
IEC 68-2-11	5 (±1)	Exceeds standard (5.7%)

Fungus resistance

Standard	Quantum's performance
MIL-I-46058C	Designed to meet standard

Temperature cycling (operating)

Standard	Cycles	Quantum's performance
IEC 68-2-14	100 @ 0...60 °C (32...140 °F)	Meets standard

Dust (non-operating)

Standard	Pollutant	Weight (%)	Quantum's performance
EIA 364-TP91 (pending)	Silica	36	Meets standard
	Calcite	29	Meets standard
	Iron oxide	12	Meets standard
	Alumina	8	Meets standard
	Gypsum	5	Meets standard
	Paper fiber	3	Meets standard
	Cotton fiber	3	Meets standard
	Polyester fiber	2	Meets standard
	Carbon black	1	Meets standard
	Human hair	0.5	Meets standard
	Cigarette ash	0.5	Meets standard

Availability

All Quantum backplanes, power supplies, I/O modules, special-purpose modules and CPUs are available in conformal coated modules. Almost all the Quantum communication adapters are available in conformal coated modules, the only exceptions are the 140 CRP 811 ●● Profibus-DP and the 140 EIA 921 00 AS-Interface modules.

How to order conformal coated modules

To order a Quantum module or backplane with conformal coating applied, simply append a **C** to the standard catalog number. For example, if you want to order a 140 CPS 114 20 power supply with conformal coating, the new catalog number is **140 CPS 114 20C**.

For more information contact your Regional Sales Office.

Modicon Quantum automation platform

Documentation

An electronic documentation (hardware and software) in 4 languages (English, French, German and Spanish) is included in the software package (1). Each software includes online contextual help in 4 languages.

These electronic documentation are added to following paper documentation:

■ B7 format multilingual data sheet (93 x 127 mm), supplied with each application-specific module and communication module.

■ Kit of manuals (178 x 216 mm) for hardware installation of:

- Quantum processors,
- discrete I/O modules,
- analog I/O modules,
- communication overview,
- grounding and cabling system installation.

■ Unity Pro quick start manual.

(1) Only with Unity Pro software.

Unity documentation manuals

Description	Use	Reference	Weight kg
Quantum reference manual : bases, discrete/analog modules, I/O architecture, grounding and cabling system installation	To be ordered separately	UNY USE 10010 V20E	–
Unity Pro quick start manual	To be ordered separately	UNY USE 40010 V20E	–

Concept documentation manuals

Description	Use	Reference	Weight kg
Quantum reference manual : bases, discrete/analog modules, I/O architecture	To be ordered separately	840 USE 100 00	–
Concept V2.6 manual installation instructions	To be ordered separately	840 USE 502 00	–
Concept V2.6 software user guide	To be ordered separately	840 USE 503 00	–
Concept V2.6 software IEC library user guide	To be ordered separately	840 USE 504 00	–
Concept V2.6 software EFB Toolkit user guide	To be ordered separately	840 USE 505 00	–
Manuel Concept V2.6 software 984 Ladder Logic block library user guide	To be ordered separately	840 USE 506 00	–

ProWORX 32 documentation manuals

Description	Use	Reference (1)	Weight kg
Manuel ProWORX 32 user manual	To be ordered separately	372 SPU 780 01 EMAN	–
Langage Ladder Logic library Ver4.0	To be ordered separately	840 USE 101 00	–

Documentation on CD-Rom

Désignation	Utilisation	Référence	Masse kg
Full documentation , hardware (Atrium, Premium and Quantum) and Unity software	4 languages (English, French, German and Spanish) To be ordered separately	UNY USE 909 CDM	–

Modules and solutions documentation manuals (178 x 216 mm)

Description	Use	Reference	Weight kg
Hot Standby solution for Unity Pro user guide	To be ordered separately	UNY USE 10710 V20E	—
Hot Standby solution for Concept/LL984 user guide	To be ordered separately	840 USE 106 00	—
Remote I/O cable system planning and installation guide	To be ordered separately	890 USE 101 00	—
Distributed I/O cable system planning and installation guide	To be ordered separately	840 USE 104 00	—
Grounding and cabling system installation guide	To be ordered separately	UNY USE 10010 V11E	—
Embedded Web server user guide	To be ordered separately	840 USE 115 00	—
Ethernet TCP/IP modules 140 NOE 771 ●● user guide	To be ordered separately	840 USE 116 00	—
Modbus Plus network planning and installation guide	To be ordered separately	890 USE 100 00	—
AS-Interface module 140 EIA 921 00 user guide	To be ordered separately	840 USE 117 00	—
Profibus DP V0 module 140 CRP 811 00 user guide (non compatible with Unity V2.0)	To be ordered separately	840 USE 468 00	—
INTERBUS module 140 NOA 611 10 user guide, generation 3 (non compatible with Unity V2.0)	To be ordered separately	840 USE 418 00	—
INTERBUS module 140 NOA 622 00 user guide, generation 4 (non compatible with Unity V2.0)	To be ordered separately	840 USE 497 00	—
LonWorks module 140 NOL 911 10 user guide (non compatible with Unity V2.0)	To be ordered separately	840 USE 109 00	—
Latch/interrupt module 140 HLI 340 00 user guide	To be ordered separately	840 USE 112 00	—
Clock synchronisation module 140 DCF 077 00 user guide	To be ordered separately	840 USE 470 00	—

Technical information

Automation products certifications






In some countries, certification of certain electrical components is enforced by law. A standard conformity certificate is then issued by the official organization. Each certified product must carry approval symbols when enforced. Use on board merchant navy vessels generally requires prior approval (= certification) of an electrical device by certain marine classification authorities.

Key	Certification body	Country
CSA	Canadian Standards Association	Canada
C-Tick	Australian Communication Authority	Australia
UL	Underwriters Laboratories	USA
Key	Classification authority	Country
ABS	American Bureau of Shipping	USA
BV	Bureau Veritas	France
DNV	Det Norske Veritas	Norway
GL	Germanischer Lloyd	Germany
GOST	Institut de recherche Scientifique Gost Standardt	C.I.S., Russia
LR	Lloyd's Register	United-Kingdom
RINA	Registro Italiano Navale	Italy
RMRS	Register of Shipping	C.I.S.

The table below shows the situation as of the 01.07.2004 for certifications obtained or pending from organizations for base PLCs. An overview of certificates for Telemecanique products is available on our Internet web site :

www.telemecanique.com

Product certifications

		Certifications					
							Hazardous locations Class 1 Div 2 (1)
		UL	CSA	ACA	SIMTARS	GOST	
		USA	Canada	Australia	Australia	CEI, Russia	US
Advantys STB							
ConneXium							(2)
Lexium MHD/BPH							
Magelis IPC							
Magelis XBT-F/FC							
Magelis XBT-G/H/P/E/HM/PM							
Momentum							
Premium	PL7						
	Unity						CSA
Quantum	Concept						
	Unity						FM
TBX							
Telefast 2							
TSX Micro							
TSX/PMX 47 à 107							
Twido		(2)					
Twin Line							

(1) **Hazardous locations:** CSA 22.2 no. 213, certified products are suitable for use in Class I, division 2, groups A, B, C and D or non-hazardous locations only.

(2) Depending on product, see pages 5/40 to 5/45.

(3) cULus north-american certification (Canada and US).

Local certifications








BG	Germany	TSX DPZ 10D2A safety module (TSX Micro) TSX PAY 262/282 safety modules (Premium)
AS-Interface	Europe	TSX SAZ 10 master module (TSX Micro) TSX SAY 100/1000 master modules (Premium) TBX SAP 10 Fipio bus/AS-Interface bus gateway

Technical information

Automation products certifications

Community regulations

Marine classification

		Marine classification des autorités						
								
		ABS	BV	DNV	GL	LR	RINA	RMRS
		USA	France	Norway	Germany	Unit.-Kingdom	Italy	C.I.S.
Advantys STB								
ConneXium					(1)			
Lexium MHD/BPH								
Magelis iPC								
Magelis XBT-F/FC								
Magelis XBT-H/P/E/HM/PM								
Momentum								
Premium	PL7							
	Unity	(2)						
Quantum	Concept							
	Unity	(2)						
TBX								
Telefast 2								
TSX Micro								
TSX/PMX 47 à 107								
Twido								
Twin Line								

(1) Depending on product, see pages 5/40 to 5/45.

(2) Request for Marine certifications forecast 4th quarter 2004.

Community regulations

European directives

The opening of European markets implies a harmonization of regulations in the various European Union member states.

European Directives are documents used to remove obstacles to the free movement of goods and their application is compulsory in all states of the European Union. Member states are obliged to transcribe each Directive into their national legislation and, at the same time, to withdraw any conflicting regulations.

The Directives, particularly those of a technical nature with which we are concerned, only set objectives, called "general requirements".

The manufacturer must take all necessary measures to ensure that his products conform to the requirements of each Directive relating to his equipment.

As a general rule, the manufacturer affirms that his product conforms to the necessary requirements of the Directive(s) by applying the **CE** label to his product.

CE marking is applied to Telemecanique products where relevant.

The significance of CE marking

■ **CE** marking on a product means that the manufacturer certifies that his product conforms to the relevant European Directives ; it is necessary in order that a product which is subject to a Directive(s) can be marketed and freely moved within the European Union.

■ **CE** marking is intended solely for the national authorities responsible for market regulation.

For electrical equipment, only conformity of the product to standards indicates that it is suitable for use, and only a guarantee by a recognised manufacturer can ensure a high level of quality.

One or more Directives, as appropriate, may apply to our products, in particular :

■ The Low Voltage Directive 72/23/EEC amended by Directive 93/68/EEC : **CE** marking under the terms of this Directive is compulsory as of 1 January 1997.

■ The Electromagnetic Compatibility Directive 89/336/EEC, amended by Directives 92/31/EEC and 93/68/EEC : **CE** marking on the products covered by this Directive has been compulsory since 1 January 1996.



The system designer must use devices external to the SCADA to protect against active faults, which are not indicated and are judged to be dangerous to the application.

This may require solutions from various different technologies such as mechanical, electromechanical, pneumatic or hydraulic devices (for example, directly wiring a limit switch and emergency stop switches to the coil of a movement control contactor).



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Afghanistan	Contacts are assured by	Schneider Electric India		
Albania	Contacts are assured by	Schneider Electric Austria		
Algeria	■ Schneider Electric	voie A Lot C22 Zone industrielle Rouiba - Alger	Tel. : +213 21 92 97 02 à 09 Fax : +213 21 92 97 00 à 01	
Andorra	Contacts are assured by	Schneider Electric France		
Angola	Contacts are assured by	Schneider Electric South Africa		
Anguilla	Contacts are assured by	Schneider Electric Dominican Rep.		
Antartica	Contacts are assured by	Schneider Electric Brazil		
Antigua & Barbuda	Contacts are assured by	Schneider Electric Dominican Rep.		
Argentina	■ Schneider Argentina	Viamonte 2850 - 1678 Caseros (provincia Buenos Aires)	Tel.: +54 1 716 88 88 Fax: +54 1 716 88 33	www.schneider-electric.com.ar
Armenia	Contacts are assured by	Schneider Electric Russian Fed.		
Aruba	Contacts are assured by	Schneider Electric Dominican Rep.		
Australia	■ Schneider Electric (Australia) Pty. Limited	2 Solent Circuit Norwest Business Park Baulkham Hill _ NSW 2153	Tel.: +61 298 51 28 00 Fax: +61 296 29 83 40	www.schneider.com.au
Austria	■ Schneider Austria Ges.m.b.H.	Birostrasse 11 1239 Wien	Tel.: +431 610 540 Fax: +431 610 54 54	www.schneider-electric.at
Azerbaijan	Contacts are assured by	Schneider Electric Russian Fed.		
Bahamas	■ Schneider Electric	Union Village PO Box 3901 - Nassau	Tel. : +1 242 327 42 91 Fax : +1 242 327 42 91	www.squared.com
Bahrain	■ Schneider Electric	Floor 1 - Juma Building Abu Horaira Avenue PO Box 355 - 304 Manama	Tel.: +97 322 7897 Fax: +97 321 8313	
Bangladesh	Contacts are assured by	Schneider Electric India		
Barbados	Contacts are assured by	Schneider Electric Dominican Rep.		
Belarus	■ Schneider Electric Industries SA	Prospect Macherova 5, of. 202 220004 Minsk	Tel. : +375 172 23 75 50 Fax : +375 172 23 97 61	
Belgium	■ Schneider Electric nv/sa	Dieweg 3 B - 1180 Brussels	Tel.: +3223737711 Fax: +3223753858	www.schneider-electric.be
Belize	Contacts are assured by	Schneider Electric USA		
Benin	Contacts are assured by	Schneider Electric Ivory Coast		
Bermuda	Contacts are assured by	Schneider Electric Dominican Rep.		
Bhutan	Contacts are assured by	Schneider Electric India		
Bolivia	Contacts are assured by	Schneider Electric Chile		
Bosnia and Herzegovina	Contacts are assured by	Schneider Electric Croatia		
Botswana	Contacts are assured by	Schneider Electric South Africa		
Bouvet island	Contacts are assured by	Schneider Electric Dominican Rep.		
Brazil	■ Schneider Electric Brazil Ltda.	Avenida Das Nações Unidas 23223 Jurubatuba - CEP 04795-907 São Paulo-SP	Tel.: +55 55 24 52 33 Fax: +55 55 22 51 34	www.schneider-electric.com.br
Brunei (Darussalam)	Contacts are assured by	Schneider Electric Singapore		
Bulgaria	■ Schneider Electric	Expo 2000, Boulevard Vaptzarov 1407 Sofiav	Tel.: +3592 919 42 Fax: +3592 962 44 39	www.schneiderelectric.bg
Burkina Faso	Contacts are assured by	Schneider Electric Ivory Coast		
Burundi	Contacts are assured by	Schneider Electric Kenya		
Cambodia	Contacts are assured by	Schneider Electric Viet Nam		
Cameroon	■ Schneider Electric Cameroon	166, rue de l'Hôtel de Ville BP12087 - Douala	Tel.: +237 343 38 84 Fax: +237 343 11 94	
Canada	■ Schneider Canada	19, Waterman Avenue M4 B1Y2 Toronto - Ontario	Tel.: +1 416 752 8020 Fax: +1 416 752 4203	www.schneider-electric.ca
Cape Verde	Contacts are assured by	Schneider Electric Senegal		
Caribee	Contacts are assured by	Schneider Electric Dominican Rep.		
Cayman islands	Contacts are assured by	Schneider Electric Dominican Rep.		
Central African Republic	Contacts are assured by	Schneider Electric Cameroon		
Chad	Contacts are assured by	Schneider Electric Cameroon		
Chile	■ Schneider Electric Chile S.A.	Avda. Pdte Ed. Frei Montalva, 6001-31 Conchali - Santiago	Tel.: +56 2 444 3000 Fax: +56 2 423 9335	www.schneider-electric.co.cl
China	■ Schneider Beijing	Landmark bldg-Room 1801 8 North Dong Sanhuan Rd Chaoyang District 100004 Beijing	Tel.: +86 10 65 90 69 07 Fax: +86 10 65 90 00 13	www.schneider-electric.com.cn



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Cocos (Keeling) islands	Contacts are assured by	Schneider Electric Australia		
Colombia	■ Schneider Electric de Colombia S.A.	Calle 45A #102-48 Bogota DC	Tel.: +57 1 426 97 00 Fax: +57 1 426 97 40	
Comoros	Contacts are assured by	Schneider Electric la Reunion		
Congo	Contacts are assured by	Schneider Electric Cameroon		
Cook islands	Contacts are assured by	Schneider Electric Australia		
Costa Rica	■ Schneider Centroamérica Ltda.	1.5 kms oeste de la Embajada Americana, Pavas, San José, Costa Rica C.A. Apartado: 4123-1000 San Jose	Tel.: +506 232-60-55 Fax: +506 232-04-26	www.schneider-ca.com
Croatia	■ Schneider Electric SA	Fallerovo Setaliste 22 HR - 10000 Zagreb	Tel.: +385 1 367 100 Fax: +385 1 367 111	
Cuba	■ Schneider Electric	Bureau de Liaison de La Havane Calle 36- N°306-Apto1 Entre 3ra y 5ta Avenida Miramar Playa Habana	Tel.: +53 724 15 59 Fax: +53 724 12 17	
Cyprus	■ Schneider Electric Cyprus	28 General Timayia Avenue Kyriakos Building, Block #A301 Larnaca 6046	Tel.: +00357 248 12646 Fax: +00357 246 37382	
Czech Republic	■ Schneider Electric CZ, s.r.o.	Thámová 13 Praha 8 - 186 00	Tel.: +420 2 810 88 111 Fax: +420 2 24 81 08 49	www.schneider-electric.cz
Democratic Rep. of Congo	Contacts are assured by	Schneider Electric Cameroon		
Denmark	■ Schneider Electric A/S	Baltorpbakken 14 DK-2750 Ballerup	Tel.: +45 44 73 78 88 Fax: +45 44 68 5255	www.schneider-electric.dk
Djibouti	Contacts are assured by	Schneider Electric Egypt		
Dominican Republic	■ Schneider Electric	Calle Jacinto Manon Esq. Federico Geraldino Edificio D' Roca Plaza Suite 402, Ens. Paraiso - Santo Domingo	Tel.: +1 809 334 66 63 Fax: +1 809 334 66 68	
Ecuador	■ Schneider Electric Ecuador SA	Av. Republica del Salvador 1082 y Nac Edificio Mansion Blanca-Quito	Tel.: +593 2 224 42 42 Fax: +593 2 224 42 94	
Egypt	■ Schneider Electric Egypt sae	68, El Tayaran Street Nasr City, 11371 - Cairo	Tel.: +20 24 01 01 19 Fax: +20 24 01 66 87	www.schneider.com.eg
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Estonia	■ Lexel Electric	Ehitajate tee 110 EE 12618 Tallinn	Tel.: +372 650 97 00 Fax: +372 650 97 22	
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Falkland islands	Contacts are assured by	Schneider Electric Brazil		
Faroe islands	Contacts are assured by	Schneider Electric Australia		
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Finland	■ Schneider Electric Oy	Sinimäentie 14 02630 Espoo	Tel.: +358 9 527 000 Fax: +358 9 5270 0376	www.schneider-electric.fi
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French West Indies	Contacts are assured by	Schneider Electric Dominican Rep.		
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Gambia	Contacts are assured by	Schneider Electric Senegal		
Georgia	Contacts are assured by	Schneider Electric Russian Fed.		
Germany	■ Schneider Electric GmbH	Gothaer Straße 29 D-40880 Ratingen	Tel.: +49210 240 40 Fax: +492 10 240 49 256	www.schneiderelectric.de
Ghana	■ Schneider Electric Ghana	PMB Kia 3rd Floor Opeibea House Airport Commercial Center Liberation road - Accra	Tel.: +233 21 70 11 687 Fax: +233 21 77 96 22	
Gibraltar	Contacts are assured by	Schneider Electric Spain		
Greece	■ Schneider Electric AE	14th km - RN Athens-Lamia GR - 14564 Kifissia	Tel.: +302 106 29 52 00 Fax: +302 106 29 52 10	www.schneider-electric.com.gr
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Guadeloupe	Contacts are assured by	Schneider Electric Martinique		
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Haiti	Contacts are assured by	Schneider Electric Dominican Rep.		
Heard & Mac Donald isl.	Contacts are assured by	Schneider Electric Australia		
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Hong Kong	■ Schneider Electric (Hong Kong) Ltd	Room 3108-28, 31th Floor, Sun Hung Kai Centre, 30 Harbour Road, Wanchai	Tel.: +852 25 65 06 21 Fax: +852 28 11 10 29	
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Iceland	Contacts are assured by	Schneider Electric Denmark		
India	■ Schneider Electric India	Max House, 1 Dr Jha Marg, Okhla 110 020 New Dehli	Tel.: +91 11 631 85 84 Tel.: +91 11 631 71 61	www.schneider-electric-in.com
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Iran (Islamic Republic of)	■ Telemecanique Iran	1047 Avenue VALI ASSR P.O. Box 15875-3547 15116 Teheran	Tel.: +98 218 71 01 42 Fax: +98 218 71 81 87	
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Ireland	■ Schneider Electric Ireland	Maynooth Road Cellbridge - Co. Kildare	Tel.: +353+0 1 6012200 Fax: +353+0 1 6012201	www.schneider-electric.ie
Italy	■ Schneider Electric S.p.A.	Centro Direzionale Colleoni Palazzo Sirio - Viale Colleoni, 7 20041 Agrate Brianza (Mi)	Tel.: +39 39 655 8111 Fax: +39 39 605 6237	www.schneider-electric.it
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Jamaica	■ Schneider Electric	Shop#5, Plaza Dunrobin 30 Dunrobin Avenue - Kingstown	Tel.: +1876 755 41 27 Tel.: +931 87 74	
Japan	■ Schneider Electric Japan Ltd	Torigoe F. Bldg 1-8-2, Torigoe Taito-Ku - 111-0054 Tokyo	Tel.: +81 358 35 35 81 Fax: +81 358 35 35 85	www.schneider-electric.co.jp
Jordan	■ Schneider Electric Industr. Jordan	Jordan University Street Abu Al Haj Commercial Complex 2nd Floor - Office # 202 - Amman	Tel.: 962 65 16 78 87 Fax: 962 65 16 79 1	
Kazakstan	■ Schneider Electric Kazakhstan Liaison Office	Prospekt Abaia 157 off 9 480009 Almaty	Tel.: +7 327 250 93 88 Tel.: +7 327 250 63 70	
Kenya	■ Schneider East Africa	Power Technics Complex Monbasa Road - PO Box 46345 Nairobi	Tel.: +254 2.824.156 Fax: +254 2.824.157	
Kiribati	Contacts are assured by	Schneider Electric Australia		
Korea	■ Schneider Electric Korea Ltd	3Floor, Cheil Bldg., 94-46, 7-Ka Youngdeungpodong, Youngdeungpo-ku 150-037 Seoul	Tel.: +82 2 2630 9700 Fax: +82 2 2630 9800	www.csinfo.co.kr/schneider/
Kuwait	■ Schneider Electric Kuwait	Al Gaas Tower - Sharq 2nd Floor PO Box 20092 - 13 061 Safat	Tel.: +965 240 75 46 Fax: +965 240 75 06	
Kyrgyz Republic	Contacts are assured by	Schneider Electric Russian Fed.		
Laos	Contacts are assured by	Schneider Electric Thailand		
Latvia	■ Lexel Electric	60A A.Deglava str. LV1035 Riga	Tel.: +371 780 23 74/75 Fax: +371 754 62 80	
Lebanon	■ Schneider Electric Liban	Tabaris, Avenue Charles Malek Immeuble Ashada, 8 P.O. Box 166223 - Beyrouth	Tel.: +961 1 20 46 20 Tel.: +961 1 20 31 19	
Lesotho	Contacts are assured by	Schneider Electric South Africa		
Liberia	Contacts are assured by	Schneider Electric Ghana		
Libya	Contacts are assured by	Schneider Electric Tunisia		
Liechtenstein	Contacts are assured by	Schneider Electric Switzerland		
Lithuania	■ Lexel Electric	44, Verkiu str. LT-2012 Vilnius	Tel.: +370 278 59 59/61 Fax: +370 278 59 60	
Loro Sae	Contacts are assured by	Schneider Electric Australia		
Luxembourg	■ Schneider Electric Industrie SAS	Agence de Metz 1, Rue Graham Bell - BP n° 35190 57075 Metz cedex 3 - France	Tel.: 33 03 87 39 06 03 Fax: 33 03 87 74 25 96	www.schneider-electric.fr
Macau	Contacts are assured by	Schneider Electric China		



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Madagascar	Contacts are assured by	Schneider Electric la Reunion		
Malawi	Contacts are assured by	Schneider Electric South Africa		
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Maldives	Contacts are assured by	Schneider Electric Reunion		
Mali	Contacts are assured by	Schneider Electric Senegal		
Malta	Contacts are assured by	Schneider Electric Tunisia		
Marshall islands	Contacts are assured by	Schneider Electric Australia		
Martinique	■ Schneider Electric	Schneider Electric Immeuble Cottrell - ZI de la Lézarde 97232 Le Lamentin	Tel.: +05 96 51 06 00 Fax: +05 96 51 11 26	
Mauritania	Contacts are assured by	Schneider Electric Senegal		
Mauritius	■ Schneider Electric	Route côtière Calodyne - Mauritius	Tel.: 230 282 18 83 Fax: 230 282 18 84	
Mayotte	Contacts are assured by	Schneider Electric Reunion		
Mexico	■ Groupe Schneider Mexico	Calz. Rojo Gomez N° 1121-A Col. Guadalupe del Moral México, D.F. - C.P. 09300	Tel.: +525 686 30 00 Fax: +525 686 24 09	www.schneider-electric.com.mx
Micronesia	Contacts are assured by	Schneider Electric Australia		
Moldova	Contacts are assured by	Schneider Electric Romania		
Monaco	Contacts are assured by	Schneider Electric France		
Mongolia	Contacts are assured by	Schneider Electric Russian Fed.		
Montserrat	Contacts are assured by	Schneider Electric Dominican Rep.		
Morocco	■ Schneider Electric Morocco	26, rue Ibnou Khalikane Quartier Palmiers 20100 Casablanca	Tel.: +212 299 08 48 to 57 Fax: +212 299 08 67 and 69	www.schneider.co.ma
Mozambique	Contacts are assured by	Schneider Electric South Africa		
Myanmar	Contacts are assured by	Schneider Electric Singapore		
Namibia	Contacts are assured by	Schneider Electric South Africa		
Nauru	Contacts are assured by	Schneider Electric Australia		
Nepal	Contacts are assured by	Schneider Electric India		
Netherlands	■ Schneider Electric BV	Waarderweg 40 - Postbus 836 2003 RV Haarlem	Tel.: +31 23 512 4124 Fax: +31 23 512 4100	www.schneider-electric.nl
Netherlands Antilles	Contacts are assured by	Schneider Electric Dominican Rep.		
New Caledonia	Contacts are assured by	Schneider Electric Australia		
New Zealand	■ Schneider Electric (NZ) Ltd	14 Charann Place Avondale P.O. Box 15355 - New Lynn Auckland	Tel. : +64 9 829 04 90 Fax : +64 9 829 04 91	www.schneider-electric.co.nz
Nicaragua	Contacts are assured by	Schneider Electric United States		
Niger	Contacts are assured by	Schneider Electric Ivory Coast		
Nigeria	■ Schneider Electric Nigeria Limited	Biro plaza - 8th Floor - Plot 634 Abeyemo Alakija Street Victoria Islan - Lagos	Tel. : +234 1 2702973 Fax : +234 1 2702976	
Niue	Contacts are assured by	Schneider Electric Australia		
Norfolk island	Contacts are assured by	Schneider Electric Australia		
North Korea	Contacts are assured by	Schneider Electric China		
Northern Mariana islands	Contacts are assured by	Schneider Electric Australia		
Norway	■ Schneider Electric Norge A/S	Solgaard Skog 2 Postboks 128 - 1501 Moss	Tel.: +47 6924 9700 Fax: +47 6925 7871	www.schneider-electric.no
Oman	■ Schneider Electric CA	c/o Arab Development Co PO Box 439 - 113 Muscat	Tel.: +968 77 163 64 Fax: +968 77 104 49	
Pakistan	■ Schneider Electric Pakistan	43-L, 2nd floor, M.M. Alam Road, Gulberg II - Lahore	Tel.: +92 42 5754471 à 73 Fax: +92 42 5754474	
Palau	Contacts are assured by	Schneider Electric Australia		
Panama	Contacts are assured by	Schneider Electric United States		
Papua New Guinea	Contacts are assured by	Schneider Electric Australia		
Paraguay	Contacts are assured by	Schneider Electric Uruguay		
Peru	■ Schneider Electric Peru S.A.	Los Telares n°231 Urb. Vulcano, Ate Lima 03	Tel.: +511 348 44 11 Fax: +511 348 05 23	www.schneider-electric.com.pe



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Pitcairn	Contacts are assured by	Schneider Electric Australia		
Poland	■ Schneider Electric Polska Sp. z o.o.	ul. Lubinowa 4a 03-878 - Warszawa	Tel.: +48 22 511 8 200 Fax: +48 22 511 8 210	www.schneider-electric.pl
Portugal	■ Schneider Electric Portugal	Av.do Forte, 3 Edifício Suécia II, Piso 3-A CP 2028 Carnaxide 2795 Linda-A-Velha	Tel.: +351 21 416 5800 Fax: +351 21 416 5857	www.schneiderelectric.pt
Puerto Rico	Contacts are assured by	Schneider Electric United States		
Qatar	■ Schneider Electric Qatar Branch	c/o Khalifa BinFahred Al Thani Trad.and Co - P.O. Box 4484 Doha	Tel.: +97 4424358 Fax: +97 4424358	
Reunion	■ Schneider Electric	Immeuble Futura, 190, rue des 2 canons BP 646 - 97497 Sainte Clothilde	Tel.: +262 28 14 28 Fax: +262 28 39 37	
Romania	■ Schneider Electric	Bd Ficusului n°42 Apimondia, Corp.A, et.1, Sector 1 Bucuresti	Tel.: +401 203 06 50 Fax: +401 232 15 98	www.schneider-electric.ro
Russian Federation	■ Schneider Electric ZAO	Enisseyskaya 37 129 281 Moscow	Tel.: +7095 797 40 00 Fax: +7095 797 40 03	www.schneider-electric.ru
Rwanda	Contacts are assured by	Schneider Electric Kenya		
Samoa	Contacts are assured by	Schneider Electric Australia		
San Marino	Contacts are assured by	Schneider Electric Italy		
Sandwich & Georgia island	Contacts are assured by	Schneider Electric Australia		
Sao Tome & Principe	Contacts are assured by	Schneider Electric Senegal		
Saudi Arabia	■ Schneider Electric	Second Industrial City P.O. Box 89249 - 11682 Riyadh	Tel.: +966 1 265 1515 Fax: +966 1 265 1860	
Senegal	■ Schneider Electric Sénégal	BP 15952 - Dakar-Fann Rond point N'Gor - Dakar	Tel.: +221 820 68 05 Fax: +221 820 58 50	
Seychelles	Contacts are assured by	Schneider Electric Reunion		
Sierra Leone	Contacts are assured by	Schneider Electric Ghana		
Singapore	■ Schneider Electric Singapore Pte Ltd	10 Ang Mo Kio Street 65 #02-17/20 TechPoint Singapore 569059	Tel.: +65 484 78 77 Fax: +65 484 78 00	www.schneider-electric.com.sg
Slovak Republic	■ Schneider Electric Slovakia spol s.r.o.	Borekova 10 SK-821 06 Bratislava	Tel. : +02 45 52 40 10 and 40 30 Fax : +02 45 52 40 00	www.schneider-electric.sk
Slovenia	■ Schneider Electric, d.o.o.	Dunasjka 47 1000 Ljubljana	Tel. : +386 1 23 63 555 Fax : +386 1 23 63 559	www.schneider-electric.si
Solomon islands	Contacts are assured by	Schneider Electric Australia		
Somalia	Contacts are assured by	Schneider Electric Egypt		
South Africa	■ Schneider Electric South Africa (PTY) Ltd	Private Bag X139 Halfway House 1685 - Midrand.	Tel.: +27 11 254 6400 Fax: +27 11 315 8830	www.schneider-electric.co.za
Spain	■ Schneider Electric España, S.A.	Pl. Dr. Letamendi, 5-7 08007 Barcelona	Tel.: +34 93 484 3100 Fax: +34 93 484 3308	www.schneiderelectric.es
Sri Lanka	■ Schneider Electric Industries SA	Liaison office SRI Lanka Level 3B Valiant towers 46/7 Nawam Mawatha-Colombo 2	Tel. : +94 77 48 54 89	www.schneiderelectric-in.com
St Helena	Contacts are assured by	Schneider Electric Italy		
St Kitts & Nevis	Contacts are assured by	Schneider Electric Dominican Rep.		
St Lucia	Contacts are assured by	Schneider Electric Dominican Rep.		
St Pierre et Miquelon	Contacts are assured by	Schneider Electric Dominican Rep.		
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ABE 7H16S21	8/11	ABF C08R02W	8/17	AS MBKT 185	5/59	MRP C001M	1/11		
ABE 7H16S21E	8/11	ABF C08R12B	8/17	AS MBPL 001	5/59	MRP C002M	1/11		
ABE 7H16S43	8/11	ABF C08R12R	8/17	ASI ABLB3002	5/51	MRP C003M	1/11		
ABE 7H20E100	8/10	ABF C08R12W	8/17	ASI ABLB3004	5/51	MRP C007M	1/11		
ABE 7H20E200	8/10	ABL 7CEM24003	8/31	ASI ABLD3002	5/51	MRP C01M7	1/11		
ABE 7H20E300	8/10	ABL 7CEM24006	8/31	ASI ABLD3004	5/51	MRP C768K	1/11		
ABE 7H32E150	8/10	ABL 7CEM24012	8/31	ASI ABLM3024	5/51	MRP F004M	1/11		
		ABL 7CEM24012	8/31			MRP F008M	1/11		
		ABL 7RE2402	8/31	D		P CAP	1/11		
		ABL 7RE2403	8/31	DCF 77E	4/29	PBS CA100	5/61		
		ABL 7RE2405	8/31			PBS CA400	5/61		
						PCX 1031	6/27		
						PCX 3030	6/27		

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Owing to changes in standards and equipment, the characteristics given in the text and images in this document are not binding us until they have been confirmed with us.

Production: Schneider Electric Industries
Photos: Schneider Electric Industries
Printed by: Pozzo Gros Monti - Italy

