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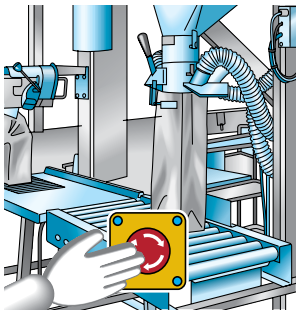
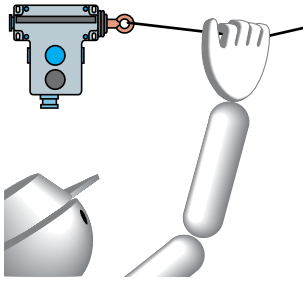
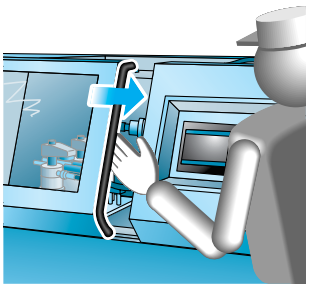
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Modicon Premium automation platform
Use of Preventa safety modules

Safety

Production workshops and technical building installations are subject to increasing requirements in terms of machine safety.

A good machine is a safe machine, combining:
- Safety of personnel (machine is not dangerous).
- Availability of the production tool (machine operational at any time).
- Safety is achieved by:
  - simultaneously optimising safety and availability,
  - using basic principles: redundancy, self-monitoring, etc,
  - considering reliability (failure determining the behavior of the machine in a specified position, positive safety features),
  - ease of maintenance.

The machinery directive and the work equipment directive

The machinery directive

A machine manufacturer is required to conform to the machinery directive

The machinery directive (89/392/EEC, 91/36/EEC, 93/44/EEC and 93/68/EEC) is designed to ensure the free circulation of machinery and safety components in European Union countries and to improve the level of safety for personnel.
Harmonised European standards establish technical specifications which comply with the minimum safety requirements defined in the corresponding directive.
Manufacturers must produce machinery which conforms to safety requirements.

The work equipment directive

The user is required to ensure that his range of machines conforms to the use of work equipment by workers at work directive

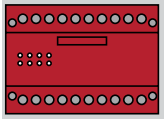
Directive 89/655/EEC lays down the minimum objectives for protection in the working environment and in particular concerns the use of products. The directive specifies the general framework of preventative measures which should be taken in the workplace.

Safety and automated systems

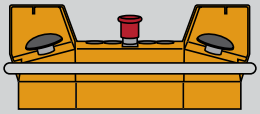
All dangerous areas must be identified and have restricted access, controlled in a secure manner, ie. any breakdown or careless operation must leave the automated system in a safe position.
It should be noted that the use of safety products does not necessarily mean that the machine conforms to the machinery directive.
It is the operation, wiring, compatibility and scheme used, which make the entire machine safe. It is more important to think in terms of safety solutions rather than safety products.

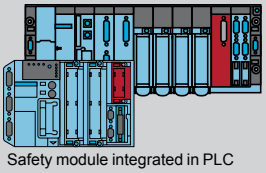
Groupe Schneider, safety specialists

Groupe Schneider, specialists in safety, has a range of several thousand products, all concerned directly or indirectly with safety. Some of these products are exclusively designed for safety.


Preventa safety module


"Mushroom head" emergency stop button


Two-handel control

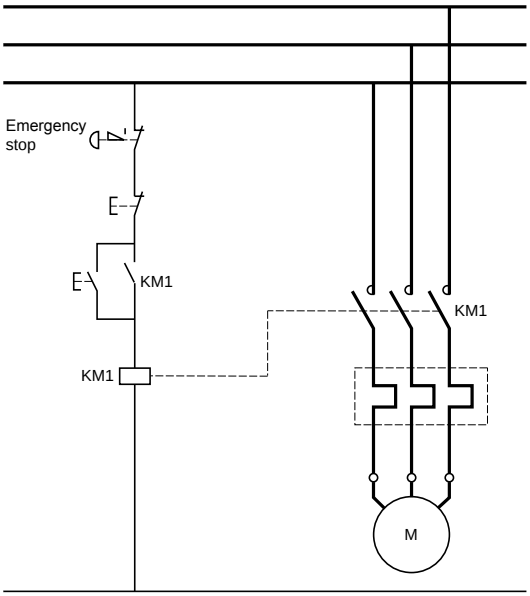

Safety module integrated in PLC

For further details on components for safety applications, please consult our catalogue:
"Safety solutions using Preventa".

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Modicon Premium automation platform
Use of Preventa safety modules

Non-controlled safety systems



The control signal from the protection device (emergency stop pushbutton illustrated to the left) acts directly on the power contactor of the machine.

In this type of scheme, the risks of simple faults are:
- Emergency stop button being shorted.
- KM1 contactor sticking.

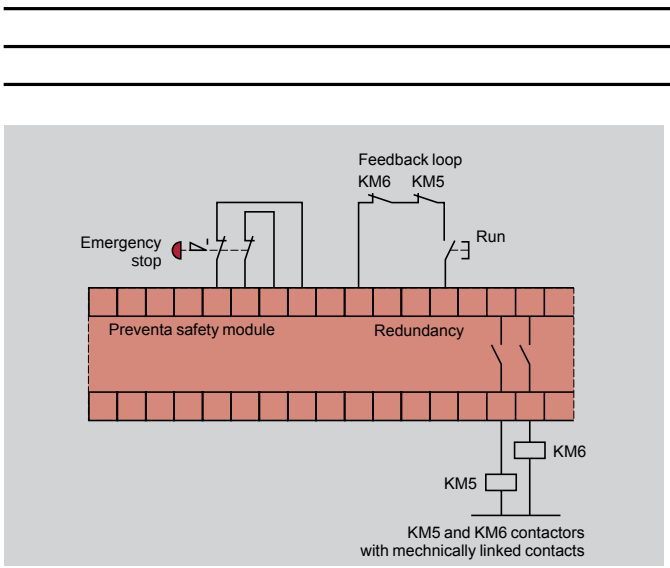
When the operator presses an emergency stop button, the instruction is not processed, and another sequence can begin following the emergency stop, despite the presence of the fault.

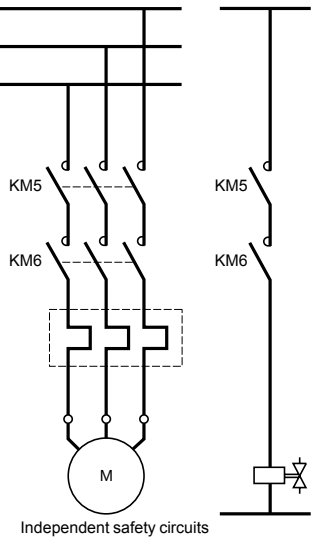
In the case of failure, the safety function *(1)* is compromised.
Therefore, a reliable intermediate relay system must be used.

(1) A safety function is a function whose non-execution or untimely execution results in the immediate placement of the equipment into a non-hazardous position.

4

Safety system controlled by a Preventa safety module





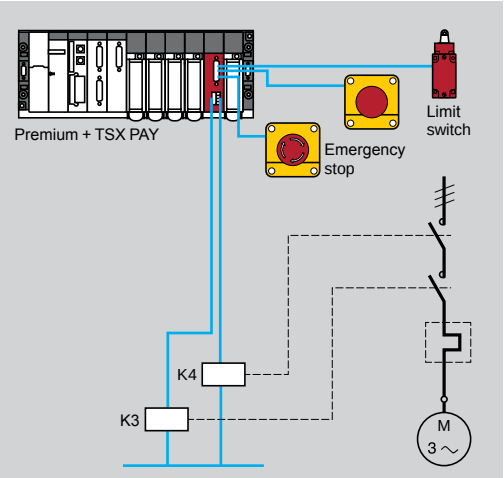
Preventa safety modules provide a **reliable** interposing relay function by eliminating the risks of:
- A control circuit fault (inputs).
- A power circuit fault (outputs).
- A fault on an internal safety module component.

The safety function remains operative whenever any one of these faults occur.

Note: For the use of mechanically linked contacts CA2-KN22/KN31, LC1-D09/D18/D25 with contacts which can be used in the feedback loop, please consult your Regional Sales Office

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Modicon Premium automation platform
Preventa safety modules type TSX PAY



Presentation

TSX PAY safety modules integrated in the Modicon Premium PLC combine :
□ the simplicity of use of Preventa safety modules
□ the high performance of PLC diagnostics
in addition to the advantages of a standard PLC (extended choice of I/O, simplicity of setup, flexibility for hardware and software developments, etc).

TSX PAY safety modules incorporate in a single module, a Preventa (XPS) hard-wired safety block and an electronic data acquisition unit for complete diagnostics of input contacts and the state of outputs in the safety system.

TSX PAY safety modules are used to safely interrupt one or more Emergency stop or safety stop control circuits according to the standards IEC/EN 60204-1 and EN/ISO 13850.

The proven safety of hard-wired technology and the performance of Premium PLCs make the TSX PAY modules the optimum solution for creating machines which are more available, safer, more compact and lower in cost.

Solution for applications requiring safety systems and high-performance diagnostics

The solution, integrated safety modules, enables complete diagnostics on the entire safety system. This diagnostics quickly locates the faulty contact, pushbutton cables, or limit switch, without additional contacts on the inputs and without any additional wiring.

TSX PAY safety modules have their own power supplies and operate independently of the PLC processor.

TSX PAY modules are suitable for Emergency stop and limit switch monitoring applications, demanding a level of safety up to category 4 according to standard EN 954-1/ISO 13849-1 (parts of control systems relating to safety).

Functions

TSX PAY modules offer the following functions:
■ Monitoring of 1 to 12 double or single pushbutton contacts, Emergency stop and limit switches for safety guards for an Emergency stop or immediate stop safety system (Emergency stop category 0 according to standard EN/ISO 13850).
■ Hard-wired safety block identical to Preventa XPS safety modules:
□ 2 or 4 N/O (normally open) safety outputs,
□ 12 double contact inputs.
■ Safety block independent of the Premium PLC processor: the PLC does not operate on the safety module.
■ 28 LEDs on the module display block: for complete diagnostics of the safety system.
■ Electronic data acquisition units for complete diagnostics of the safety system:
□ read the status of the 24 inputs (image of the status of the 12 pushbuttons or limit switches)
□ read the enable input,
□ read the feedback loop,
□ read the safety outputs control,
□ monitor the external power supply of the module.

This electronic data acquisition is designed so that the safety function is not compromised by any failure. If the safety system uses more sensors, it is possible to connect several TSX PAY modules.

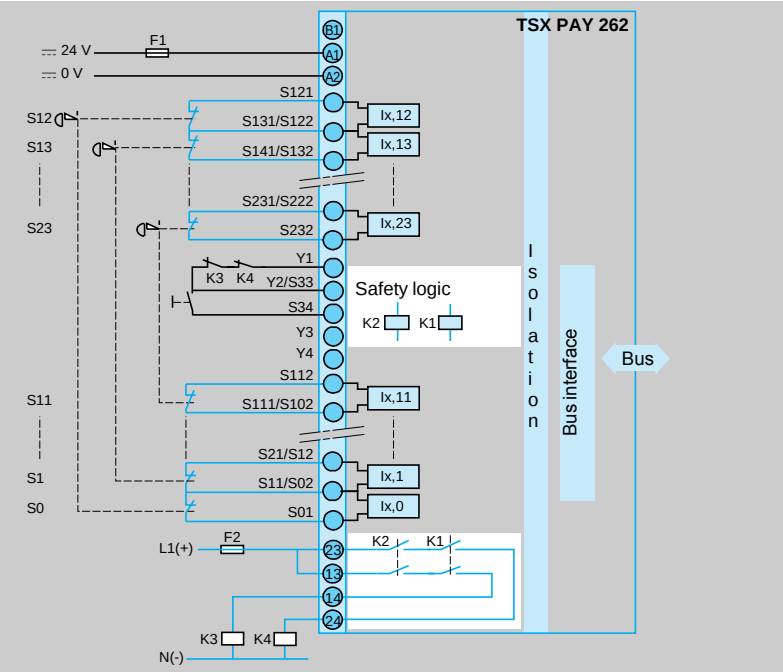
Description: page 4/6 | Characteristics: page 4/7 | References: page 4/8 | Connections: page 4/9

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Modicon Premium automation platform
Preventa safety modules type TSX PAY

TSX PAY 262 module schematic

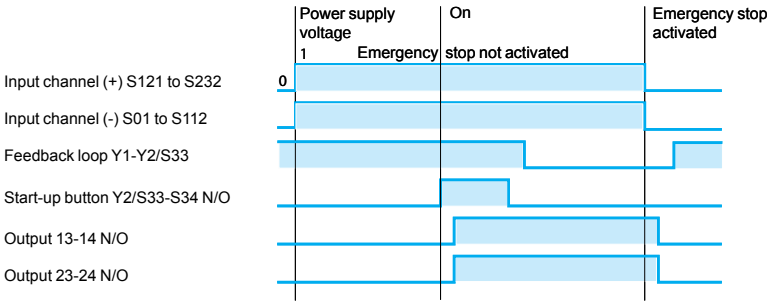
To ensure the safety function irrespective of the first failure, it is compulsory to use:
- For the inputs: Emergency stop pushbuttons or safety limit switches with double contacts
- For the outputs: if relaying is necessary, use a guided contact relay
- On the module power supply : an F1 protection fuse (see characteristics page 4/7)
- .



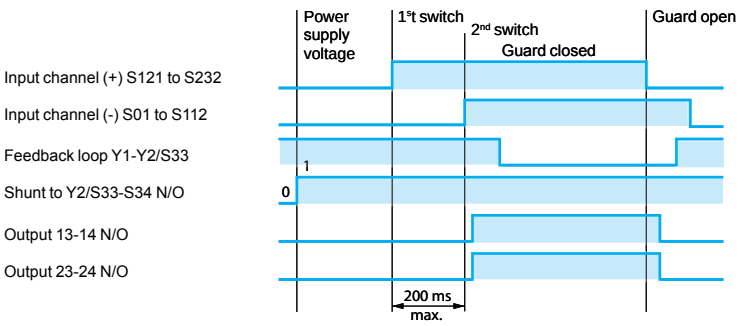
13-14 and 23-24 Safety outputs, volt-free
Y1-Y2/S33: Feedback loop
Y2/S33-S34: Run enable
Y3-Y4: Choice of reactivation mode, see page 4/9
S121 to S232: 12 contacts on (+) input channel
S01 to S112: 12 contacts on (+) input channel
A1-A2: ⎓ 24 V external power supply
B1: Selection of double or single contact wiring

Functional diagrams

Emergency stop function



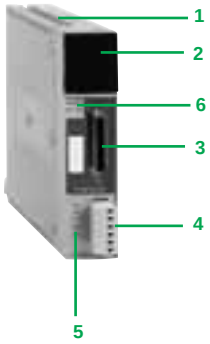
Protective function with automatic start-up



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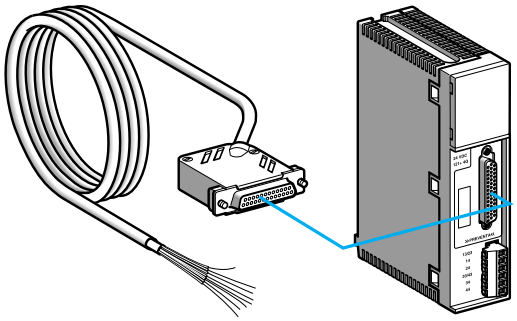
Preventa safety modules type TSX PAY



Description

TSX PAY safety modules comprise on the front panel :

1 A rigid IP 20 casing to hold and protect the electronic card.
2 A display block (32 LEDs) showing operating modes, faults and the status of the safety system.
3 A high density 44-way SUB-D connector for connecting the safety system.
4 A 6-way removable screw terminal block for connecting the safety outputs.
5 Marking for labelling the safety outputs.
6 Marking for the external power supply of the module.



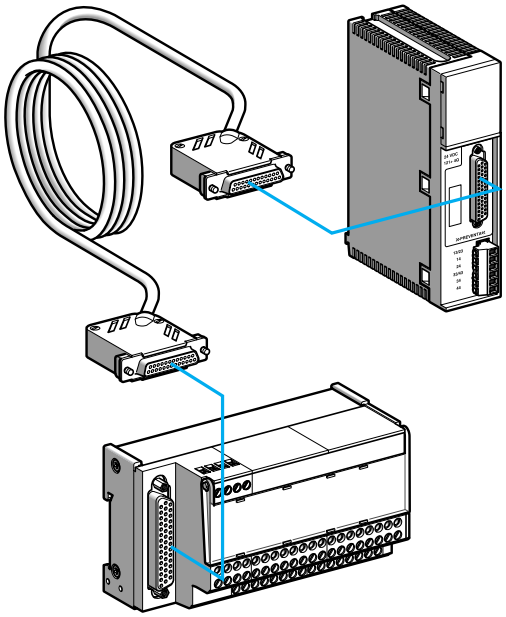
Connection principle

Two types of connection for TSX PAY safety modules are available:

Standard wiring

A **TSX CPP 301** 3 m cordset is fitted with a 44-way SUB-D moulded, elbow connector at one end, and flying leads differentiated by a colour code at the other end.

This wiring system conforms to the standard EN 954-1/ISO 13849-1.



Fast wiring

Using the Advantys Telefast ABE 7 pre-wired system facilitates the installation of TSX PAY safety modules by giving access to inputs on the safety system via screw terminals.

Connection is carried out using **TSX CPP ●02** cordsets fitted with 44-way SUB-D moulded, elbow connectors at both ends.

The Advantys Telefast **ABE 7CPA13** sub-base enables the connection of 12 double or single contact inputs, the power supply, reset inputs and the feedback loop.

This wiring system conforms to the standard EN 954-1/ISO 13849-1.

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Modicon Premium automation platform
Preventa safety modules type TSX PAY

Standards and certifications

Type of modules				TSX PAY 262	TSX PAY 282
Standards	Machine	Machine electrical equipment		IEC/EN 60204-1, EN/ISO 12100	
		Emergency stop equipment		EN/ISO 13850	
	Product	Machine safety-parts of control systems relating to safety		EN 954-/ISO 13849-11 category 4, EN 1088/ISO 14119	
	PLC	Specific requirements		IEC/EN 61131-2, CSA 22-2, UL 508	
Product certifications				BG, UL, CSA	

General characteristics

Power supply	Nominal voltage		**V**	⎓ 24
	Operating voltage limit		**V**	⎓ 19,2…30
	Fault indication		**V**	⎓ < 20
	Maximum consumption		**mA**	200
Protection by external F1 fuse	Conforming to IEC/EN 947-5-1		**A**	1 gG
Consumptions			**mA**	See page 9/6
Isolation			**kV**	4 (overvoltage category III, degree of pollution 2)

Characteristics of discrete inputs

Modularity	Discrete inputs			12 double or single contacts for Emergency stop or limit switch
	Reset PB input			1
	Feedback loop input			1
	Reset PB monitoring input			1
	Double or single contact selection input			1
Logic				Positive
IEC/EN 61131 conformity				Type 1
Courant d'appel	Maximum		**A**	0,5
Isolation between input and earth			**V rms**	500 - 50/60 Hz for 1 min
Power	Dissipated in the module		**W**	< 5

Characteristics of safety relay outputs

Modularity				2 volt-free outputs		4 volt-free outputs	
Operating voltage limit	a.c		**V**	∿ 19…250			
	d.c		**V**	⎓ 17…127			
Maximum thermal current (Ithe)			**A**	2,5			
Minimum current			**mA**	30			
a.c. load	Inductive AC-15 duty	Voltage	**V**	∿ 24	∿ 48	∿ 110	∿ 220
		Power	**VA**	60	120	280	550
d.c. load	Inductive DC-13 duty (L/R = 100 ms)	Voltage	**V**	⎓ 24			
		Power	**VA**	60			
Response timee			**ms**	< 10			
Type of contact				AgCdO gold plated			
External protection of outputs by F2 fuse			**A**	4 gG, conforming to IEC/EN 60947-5-1			
Cross-section of connecting cables	Without cable end		**mm²**	0.2…2.5			
	With cable end		**mm²**	1,5			
Isolation between input and earth	Insulation voltage		**V**	300, conforming to DIN VDE 0110 part 2			
	Test voltage		**V rms**	1500 - 50/60 Hz for 1 min			

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Modicon Premium automation platform
Preventa safety modules type TSX PAY


TSX PAY 262


TSX PAY 282

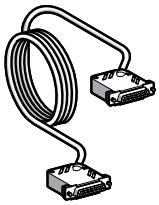
Safety modules

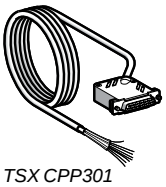
Type of input ⎓ 24 V	Safety outputs	Connections	Reference	Weight kg
12 Emergency stops or limit switches (double or single contacts), 1 reset button, 1 feedback loop, 1 reset monitor	2 N/O (volt-free) 2.5 A (Ithe)	Inputs: 44-way SUB-D connector Outputs: screw terminal (supplied)	**TSX PAY 262**	0.430
	4 N/O (volt-free) 2.5 A (Ithe)	Inputs: 44-way SUB-D connector Outputs: screw terminal (supplied)	**TSX PAY 282**	0.490


ABE-7CPA13

Connection accessory

Description	For connection on screw terminal	Type of connector on TSX PAY 2●2	Reference	Weight kg
Advantys Telefast ABE 7 sub-base for TSX PAY 2●2 modules	Safety system, reset, monitoring and loop inputs Power supply ⎓ 24 V	SUB-D, 44-way	**ABE 7CPA13**	0.290


TSX CPP ●02


TSX CPP301

Connecting cordsets

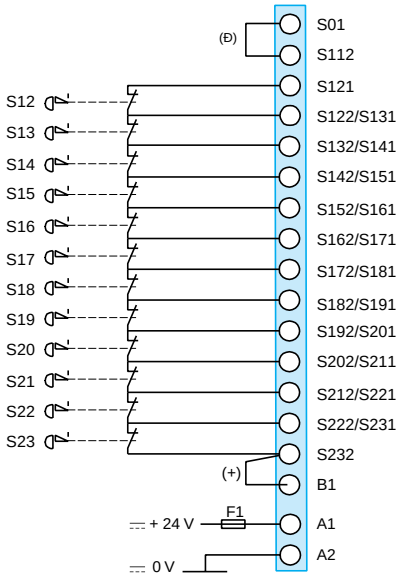
Use	From TSX PAY 2●2 module	To	Length	Reference	Weight kg
For fast wiring	44-way SUB-D connector	ABE-7CPA13 sub-base	1 m	**TSX CPP 102**	0.160
			2 m	**TSX CPP 202**	0.260
			3 m	**TSX CPP 302**	0.360
For standard wiring	44-way SUB-D connector	Flying leads with colour-coded wires	3 m	**TSX CPP 301**	0.330

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Preventa safety modules type TSX PAY

Input channel connection schemes

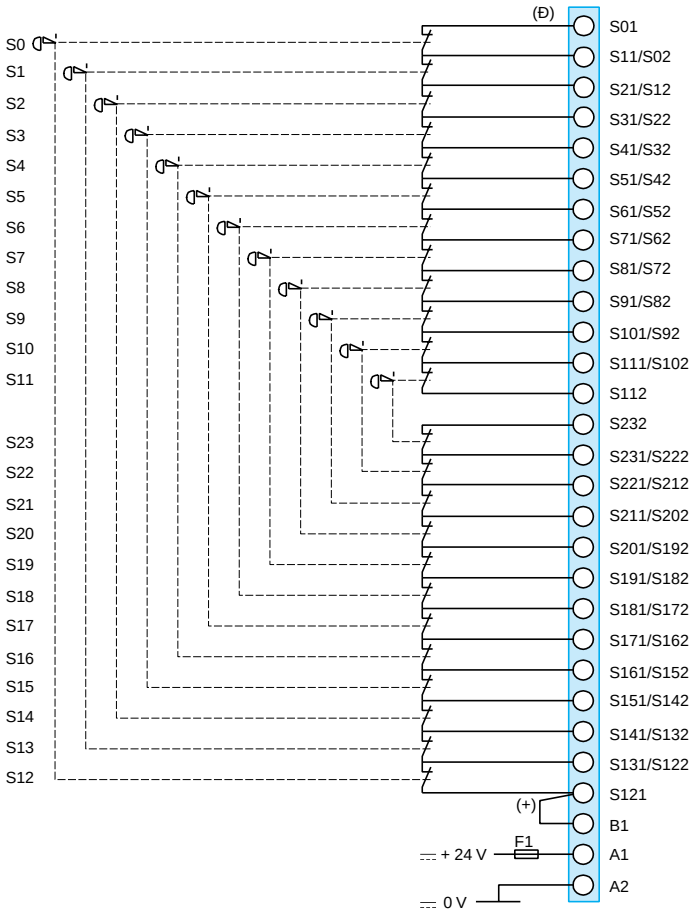
Wiring 1 input channel: single contact



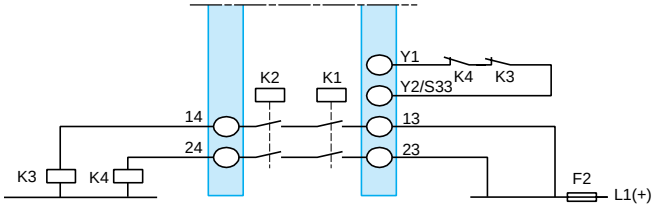
Single contact wiring is not suitable for applications which require a category 3 or 4 safety level. Not all faults are detected, a short-circuit on a contact is not detected.
When using less than 12 single contacts, connect the input terminals which are not being used.
For applications with more than 12 single contacts, it is possible to use several TSX PAY modules by wiring the outputs in series.

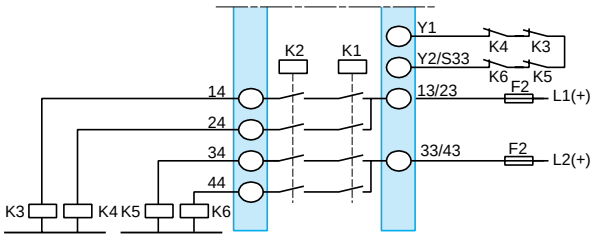
Double contact wiring of the inputs is necessary for creating applications which require a category 3 or 4 safety level.
When prompted, all the first faults are detected and located. A short-circuit between the 2 inputs is detected.
When using less than 12 double contacts, connect the input terminals which are not being used.
For applications with more than 12 double contacts, it is possible to use several TSX PAY modules by wiring the outputs in series.

Wiring 2 input channels: double contacts



Safety output connection schemes



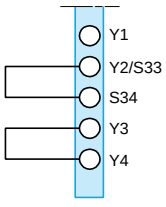


The design of a category 3 or 4 immediate stop system requires redundancy and checking, on request, of the power supply breaker devices.

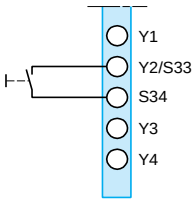
The wiring of N/C contacts (K3 and K4) enables this check on each request. Relays K3 and K4 must be mechanically linked contact relays.

When TSX PAY modules cut the power directly, it is necessary to connect the terminals Y1 and Y2/S33.

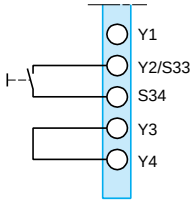
Reset function configurations



Automatic start-up



Manual reset without start button monitoring



Manual reset with start button monitoring

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Preventa configurable safety controllers type XPS MC



XPS MC16ZC



XPS MC32ZC

4

Presentation

Configurable safety controllers **XPS MC●●Z●** are designed to provide a solution for safety applications requiring conformity to category 4 of standard EN 954-1/ISO 13849-1 and SIL 3 requirements of standard IEC 61508.
The range of configurable safety controllers comprises 6 products, each with different technical characteristics.

Configurable controllers	Safety inputs	Safety outputs *(1)*	Connection via		
			CANopen bus	Profibus bus	Modbus link
XPS MC16Z	16	6 + 2 x 2	–	–	Yes, slave
XPS MC16ZC	16	6 + 2 x 2	Yes, slave	–	Yes, slave
XPS MC16ZP	16	6 + 2 x 2	–	Yes, slave	Yes, slave
XPS MC32Z	32	6 + 2 x 2	–	–	Yes, slave
XPS MC32ZC	32	6 + 2 x 2	Yes, slave	–	Yes, slave
XPS MC32ZP	32	6 + 2 x 2	–	Yes, slave	Yes, slave

Line control

The safety inputs are supplied by the various control outputs *(2)*, in such a manner so as to monitor for short-circuits between the inputs, short-circuits between each input and earth or the presence of residual voltages.
The controller, assisted by the control outputs, continuously tests all the connected inputs. As soon as an error is detected on an input, all the outputs associated with this input are disconnected. Safety outputs associated with other inputs remain active.

Configuration

Safety controllers **XPS MC●●Z●** are configurable and addressable using software **XPS MCWIN** running on a PC. Connection accessories required: see page 4/17.

Connections

For connection of safety inputs and outputs, safety controllers **XPS MC●●Z●** can be fitted with a choice of:
- screw connectors type **XPS MCTS●●**, or
- spring clip connectors type **XPS MCTC●●**.

These connectors are to be ordered separately, see page 4/16.

(1) 8 independent safety outputs = 6 solid-state safety outputs + 2 x 2 relay outputs (4 relay outputs with guided contacts).
(2) 8 control outputs are available but they are not safety outputs.

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Safety functions

Configuration of the safety functions is carried out using software XPSMCWIN which is available on the Safety Suite V2 CD-ROM.

30 certified safety functions are available with this software and they are easily assignable to the safety outputs. The safety functions have multiple combination possibilities and various starting conditions.

The safety functions are:
□ certified in accordance with EN 954-1/ISO 13849-1 and IEC 61508,
□ configurable in controller XPS MC using software **XPS MCWIN** which is available on the Safety Suite V2 software pack.

All 8 safety outputs are suitable for use in safety related parts of control systems conforming to category 4 of EN 954-1/ISO 13849-1 and each output can disconnect one of its safety circuits.

Main safety functions

- Emergency stop monitoring, with or without time delay, 1 or 2-channel wiring
- Two-hand control (type III-C conforming to EN 574/ISO 13851)
- Guard monitoring with 1 or 2 limit switches
- Guard monitoring for injection presses and blowing machines
- Magnetic switch monitoring
- Sensing mat monitoring
- Light curtain (type 4 conforming to IEC/EN 61496, relay or solid-state output) monitoring
- Zero speed detection
- Dynamic monitoring of hydraulic valves on linear presses
- Monitoring safety stop at top dead centre on eccentric press
- Safety time delays
- “Muting” function of light curtains
- Enabling switch monitoring, 2 or 3 contact
- Hydraulic press
- Eccentric press
- Foot switch monitoring
- Chain shaft breakage monitoring
- Position selector

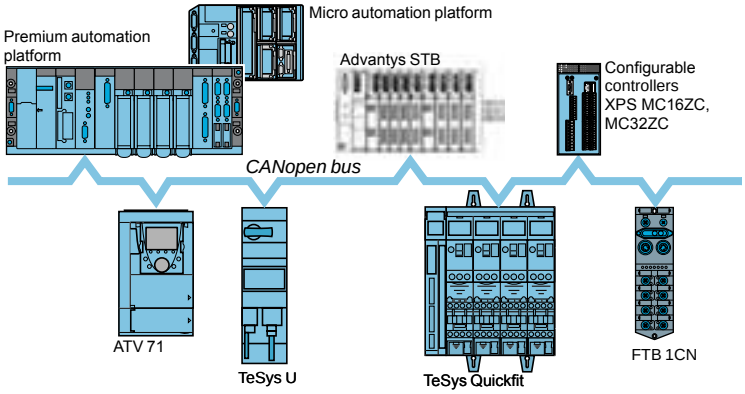
Application schemes and functional dihagrams

Consult our catalogue “Safety solutions using Preventa”

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Modicon Premium automation platform

Preventa configurable safety controllers type XPS MC

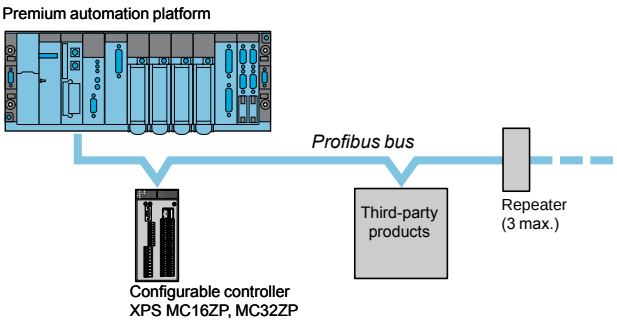


Communication

CANopen fieldbus

Configurable safety controllers **XPS MC●●ZC** incorporate a SUB-D 9-way male connector for direct connection on CANopen bus.

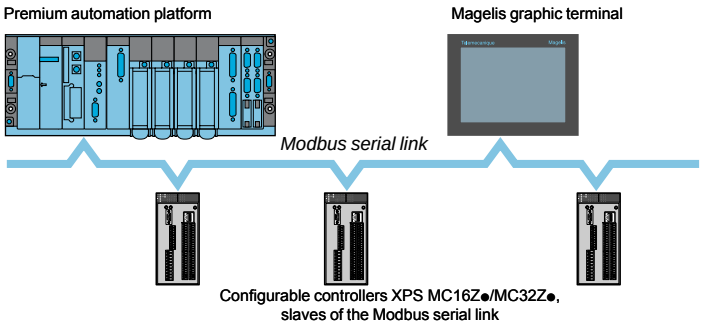
CANopen bus is an open bus that ensures deterministic and reliable access to the real-time data of automation equipment. The bus uses a shielded dual twisted pair on which a maximum of 127 devices can be connected by chaining. The data rate varies between 10 Kbps and 1Mbps depending on the length of the bus (5000 m to 20 m).



Profibus bus

Configurable safety controllers **XPS MC●●ZP** incorporate a SUB-D 9-way female connector for connection on Profibus bus.
Configurable safety controllers **XPS MC●●ZP** are slaves on the Profibus bus.

Profibus bus is a fieldbus that meets industrial communication requirements. The topology of the Profibus bus is of the linear type with a centralised master/slave type access procedure. The physical link is a single shielded twisted pair.



Modbus serial link

Configurable safety controllers **XPS MC●●Z● MC** incorporate a Modbus communication interface (RJ45 connector) for configuration and diagnostics.
This interface enables connection of the controllers to:
- a PC (configuration),
- a PLC (diagnostics), or
- an operator dialogue terminal (diagnostics).

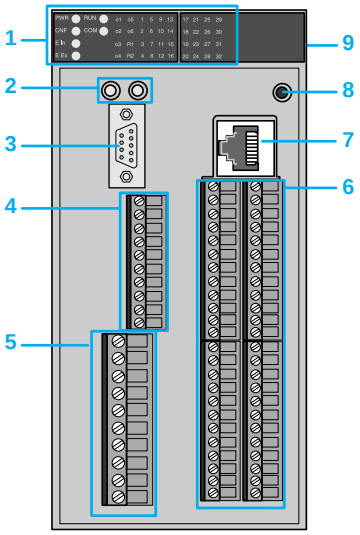
The Modbus serial link comprises a master station (Premium automation platform) and slave stations (configurable controllers **XPS MC16/32Z●**).
Two exchange mechanisms are possible:
- **Question/response:** the questions from the master are addressed to a given slave. The response is expected by return from the interrogated slave.
- **Distribution:** the master distributes a message to all the stations of the Modbus serial link. The latter execute the order without transmitting a reply.

Presentation: page 4/10 | Characteristics: page 4/14 | References: page 4/16 | Dimensions: page 4/17

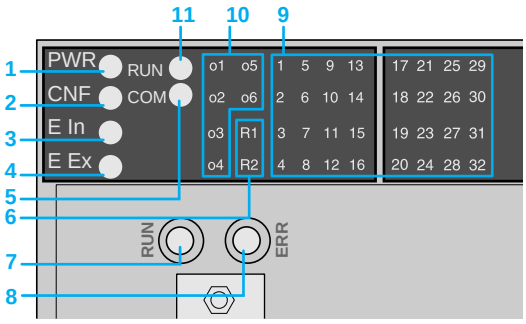
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Modicon Premium automation platform

Preventa configurable safety controllers type XPS MC



Configurable safety controller XPS MC●●Z●, with screw connectors



Illuminated display

Description

Configurable safety controllers XPS MC●●Z●

Front face of controllers:

1 LED display and system diagnostics.
2 Two LEDs for CANopen or Profibus *(1)* connection status.
3 SUB-D 9-way male connector for connection on CANopen bus with **XPS MC16ZC/MC32ZC**.
or SUB-D 9-way female connector for connection on Profibus bus with **XPS MC16ZP/MC32ZP**.
4 Solid-state safety output and "muting" indicator light terminals.
5 Power supply (⎓ 24 V) and relay safety output terminals.
6 Control output terminals for power supply to safety inputs and safety input terminals.
7 RJ45 connector for connection on Modbus serial link.
8 RESET button (resetting of controller).

Rear face of controllers:

9 Fixing plate for mounting on rail.

(1) Depending on controller model.

LED details

LED	Colour	Status	Meaning
1 PWR	Green	On	Supply voltage present.
2 CNF	Yellow	On	In configuration mode.
		Flashing	Not configured, initial power-up.
3 E In	Red	On	Internal error: all safety outputs deactivated.
4 E Ex	Red	On	External error: all safety outputs associated with the defective circuit are deactivated.
5 COM	Green	On	Controller communicating via the TER (RJ45) connection.
6 R1, R2	Green	On	Relay outputs 13/14, 23/24, 33/34 and 43/44 activated.
		Flashing	Fault on these outputs.
7 RUN	Green	Off	Hardware OK for the Profibus bus or the CANopen bus.
		On	Communicating on Profibus bus or on CANopen bus. Normal status.
8 ERR	Red	On	Communication impossible, configuration error, damaged cabling or absence. Bus deactivated
		Off	Communicating on CANopen or Profibus bus. Normal status.
		Flashing (x 1)	Warning limit reach.
		Flashing (x 2)	Control event error on CANopen bus.
		Flashing (x 3)	Synchronisation error on CANopen bus.
9 1…16 1…32	Green	On	Input circuit closed.
		Flashing	Error detected on input relating to LED.
10 o1…o6	Green	On	Solid-state output activated.
		Flashing	Short-circuit, fault on output.
11 RUN	Green	On	Run mode.
		Flashing	Changing from run mode to stop mode.

Modicon Premium automation platform

Preventa configurable safety controllers type XPS MC

Characteristics

Configurable safety controller type				XPS MC16Z and MC32Z, XPS MC16ZC and MC32ZC, XPS MC16ZP and MC32ZP
Conformity to standards				IEC/EN 60204-1, EN 1760-1/ISO 13856-1, IEC/EN 60947-5-1, IEC/EN 61496-1, EN 574/ISO 13851, EN 954-1/ISO 13849-1, IEC 61508
Product certifications				UL, CSA, TÜV
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1 and IEC 61508)				Category 4 max. (EN 954-1/ISO 13849-1), SIL 3 max. (IEC 61508)
Supply voltage			**V**	⎓ 24 ± 20%
Maximum consumption			**W**	12
Fuse protection			**A**	16 gL max.
Start button monitoring				Configurable
Control circuit voltage				28.8 V/13 mA (between input terminals C1-I1 to C8-I16, resp. I32)
Calculation of wiring resistance RL			Ω	100 max, maximum cable length: 2000 m (Between input terminals)
Synchronisation time between inputs			**s**	Depending on configuration selected
Outputs	**Relay**	Voltage reference		Volt-free
		Safety circuit		2 N/O per function (4 N/O total) (13-14, 23-24, 33-34, 43-44)
		Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180
		Breaking capacity in DC-13		24 V/1.5 A L/R = 50 ms
		Thermal current (Ithe) for each group of 2 outputs	**A**	6 for 1 output and 2 for the other, **or** 4 for both outputs.
		Current limit	**A**	Ith ≤ 16 (with several relay output circuits simultaneously loaded)
		Output fuse protection	**A**	4 gL or 6 quick blow
		Minimum current	**mA**	10 *(1)*
		Minimum voltage	**V**	17 *(1)*
	Solid-state	Breaking capacity		24 V/2 A
		Safety circuit		6 solid-state (O1, O2, O3, O4, O5, O6)
		Current limit	**A**	Ith ≤ 6.5 (with several solid-state output circuits simultaneously loaded)
Response time on input opening			**ms**	Response time = 20 or 30, configurable using software XPSMCWIN □ if 20 for controllers XPS MC●●Z●: 30 for a safety mat □ if 30 for controllers XPS MC●●Z●: 45 for a safety mat
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to IEC 60647-5-1, DIN VDE 0110 part 1)
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to IEC 60647-5-1, DIN VDE 0110 part 1)
LED display				30 (XPS MC16Z), 46 (XPS MC32Z) 32 (XPS MC16ZC/MC16ZP, 48 (XPS MC32ZC/MC32ZP)
Temperature	Operating		**°C**	- 10…+ 55
	Storage		**°C**	- 25…+ 85
Degree of protection				IP 20 conforming to IEC/EN 60529 (connector and enclosure)

(1) The controller is also capable of switching low power loads (17 V/10 mA minimum) provided that the contact has not been used for switching high power loads (possible contamination or wear of the gold layer on the contact tips).

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Communication

Modbus serial link

Compatibility			**XPS MC16Z, XPS MC32Z, XPS MC16ZC, XPS MC32ZC, XPS MC16ZP, XPS MC32ZP**
Serial link ports	Number and type		1 x RJ45
	Status		Slave
Data exchange			14 words
Addressing			1 …247
Data rate		**bit/s**	1200, 2400, 4800, 9600 or 19200
Parity			Even, odd, none
Fixed parameters			RTU (Remote Terminal Unit) mode 1 start bit / 8 data bits 1 stop bit stop with “even” or “odd” parity 2 stop bits without parity
Functions supported			01: 8-bit output data / 32-bit input data (0 = OFF, 1 = ON) 02: 32-bit input data / 8-bit output data (0 = OFF, 1 = ON) 03: information and errors

CANopen bus

Compatibility			**XPS MC16ZC, XPS MC32ZC**
Serial link ports	Number and type		1 x SUB-D 9-way male
	Status		Slave
Data exchange			14 words By included dual port memory: only data addresses, diagnostics, but no baud rates
Parameters (adjustable using software XPSMCWIN)	Data rate	**Kbit/s**	20, 50, 125, 250, 500, 800
		Mbit/s	1
	Address		1…127

Profibus bus

Compatibility			**XPS MC16ZP, XPS MC32ZP**
Serial link ports	Number and type		1 x SUB-D 9-way female
	Status		Slave
Data exchange			14 words By included dual port memory: only data addresses
Parameters	Data rate	**Mbit/s**	12
	Address		1…125

Connections

Type			**Separate plug-in screw connector XPS MCTS●● *(1)***	**Separate plug-in spring clip connector XPS MCTS●● *(1)***
Power supply and relay output terminals				
1 conductor	Without cable end		Solid or flexible cable: 0.2…2.5 mm², AWG 24-12	
	With cable end	**mm²**	Without bezel, flexible cable: 0.25…2.5	
		mm²	With bezel, flexible cable: 0.25…2.5	
2 conductors	Without cable end	**mm²**	Solid or flexible cable: 0.2…1.5	–
	With cable end	**mm²**	Without bezel, flexible cable: 0.25…1.5	–
		mm²	Double, with bezel, flexible cable: 0.5…1.5	Double, with bezel, flexible cable: 0.5…1
Tightening torque of screw terminals		**Nm**	0.5…0.6	–
Wire stripping length		**mm**	10	
Other terminals				
1 conductor	Without cable end		Solid or flexible cable: 0.14…1.5 mm², AWG 28-16	
	With cable end	**mm²**	Without bezel, flexible cable: 0.25…1.5	
		mm²	With bezel, flexible cable: 0.25…0.5	
2 conductors	Without cable end	**mm²**	Solid cable: 0.14…0.5 Flexible cable: 0.14…0.75	–
	With cable end	**mm²**	Without bezel, flexible cable: 0.25…0.34	–
		mm²	Double, with bezel, flexible cable: 0.5	–
Enclosure fixing (conforming to DIN EN 50022)			Metal adaptor for fixing on ⊔ 35 mm metal rail	

(1) To be ordered separately.

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Modicon Premium automation platform

Preventa configurable safety controllers type XPS MC


105569

XPS MC16Z


105570

XPS MC32Z


105739

XPS MC16ZC


105545

XPS MC32ZC


105540

XPS MC16ZP


105546

XPS MC32ZP

4

References

Configurable safety controllers (connector not included)

Number of inputs	Number of outputs: Relay	Number of outputs: Solid-state	Communication	Reference	Weight kg
16	**4 (2 x 2)**	**6**	Modbus	**XPS MC16Z**	0.820
			Modbus, CANopen	**XPS MC16ZC**	0.820
			Modbus, Profibus	**XPS MC16ZP**	0.820
32	**4 (2 x 2)**	**6**	Modbus	**XPS MC32Z**	0.840
			Modbus, CANopen	**XPS MC32ZC**	0.840
			Modbus, Profibus	**XPS MC32ZP**	0.840

Plug-in connectors for configurable safety controllers *(1)*

Description	For use with	Reference	Weight kg
Screw connectors	XPS MC16Z, MC16ZC, MC16ZP	**XPS MCTS16**	0.080
	XPS MC32Z, MC32ZC, MC32ZP	**XPS MCTS32**	0.110
Spring clip connectors	XPS MC16Z, MC16ZC, MC16ZP	**XPS MCTC16**	0.080
	XPS MC32Z, MC32ZC, MC32ZP	**XPS MCTC32**	0.110

Configuration software

■ Reference **XPS MCWIN** is the full version of configuration software XPSMCWIN version 2.10 and must be installed if no previous version of this software has been installed.

■ Reference **SSVXPSMCWINUP** is an update for software XPSMCWIN and can be used if SSVXPSMCWINUP has been installed using Safety Suite V1. An update from version 2.0 to version 2.10 for the software XPSMCWIN will then be performed.

Description	Operating system	Details *(2)*	Languages	Reference	Weight kg
Configuration software for controllers XPS MC●●Z● CD-ROM + user manual	Windows 2000, Windows XP	Software available on Safety Suite V2 software pack	EN, FR, DE, IT, ES, PT	**XPS MCWIN**	0.520
XSP MCWIN software update CD-ROM + user manual	Windows 2000, Windows XP	Software available on Safety Suite V2 software pack	EN, FR, DE, IT, ES, PT	**SSVXPSMCWINUP**	0.520

(1) To be ordered separately to the controllers.
(2) EDS and GSD files are available on the **XPS MCWIN** *configuration software CD-ROM.*

Presentation: page 4/10 | Characteristics: page 4/14 | References: page 4/16 | Dimensions: page 4/17

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XPS MCCPC


TSX PCX 1031


490 NT● 000 ●●

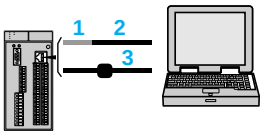

TSX CUSB485

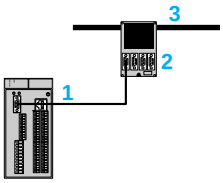

TSX CAN TDM4


ABL 8RPS24050

References

Connecting cables *(1)*

Function			Length	Reference	Weight kg
Diagnostics using Magelis operator dialogue terminal type XBT GT			3 m	**VW3 A8 306 R30**	1.130
Configuration software	1	Adaptor: RJ45 socket/PC connection cables	–	**XPS MCCPC**	0.011
	2	Cable to PC serial port (type SUB-D9)	2.5 m	**TSX PCX 1031**	0.170
	3	Straight shielded twisted pair cables, EIA/TIA 568 standard (RJ45 connector at each end)	2 m	**490 NTW 000 02**	–
			5 m	**490 NTW 000 05**	–
			12 m	**490 NTW 000 12**	–
		Straight shielded twisted pair cables, UL and CSA 22.1 approved (RJ45 connector at each end)	2 m	**490 NTW 000 02U**	–
			5 m	**490 NTW 000 05U**	–
			12 m	**490 NTW 000 12U**	–
	with	RJ45/PC USB port converter *(2)*	0,4 m	**TSX CUSB485**	–

Function	Medium		Length	Reference	Weight kg
Modbus serial link access	Premium automation platform TSX SCY 21601		–	**XPS MCSCY**	–
CANopen bus access	1	CANopen connection cables (fitted with: 1 SUB-D 9-way female connector at each end)	0.3 m	**TSX CANCADD03**	–
			1 m	**TSX CANCADD1**	–
			3 m	**TSX CANCADD3**	–
			5 m	**TSX CANCADD5**	–
	2	CANopen tap-off box	–	**TSC CANTDM4**	–
	3	Standard CANopen cables	50 m	**TSX CANCA50**	–
			100 m	**TSX CANCA100**	–
			300 m	**TSX CANCA300**	–
Profibus bus access			100 m	**TSX PBS CA100**	–
			400 m	**TSX PBS CA400**	–

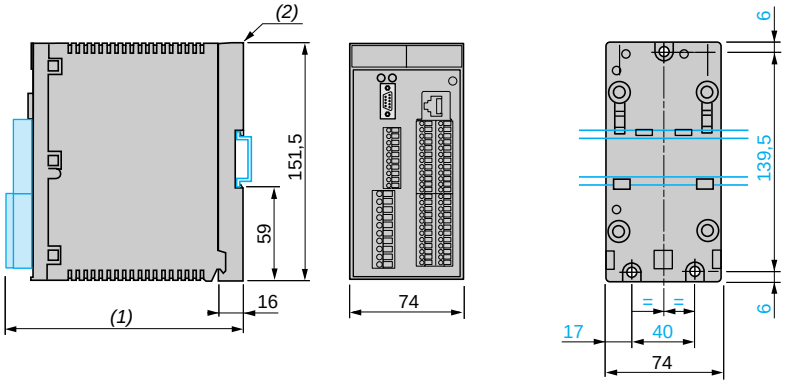
Accessories

Phaseo Universal range Regulated switch mode power supply, single-phase	Output voltage: ⎓ 24…28.8 V Nominal current: 3…20 A Nominal power: 72…480 W	See page 8/31	–

(1) To be ordered separately.
(2) The converter **TSX CUSB485** *is installed using* ***Driver Pack V2.3****. This "driver" is available on the Safety Suite V2 software pack or downloadable from our site:* **www.schneider-electric.com**

Dimensions, mounting

XPS MC●●Z●



(1) 153 mm with screw connector **XPS MCTS●●***. 151.4 mm with spring clip connector XPS MCTC●●.*
(2) Metal adaptor for fixing on metal ⊔ 35 mm rail.

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Modicon Premium automation platform
Counter and electronic cam modules

Applications		Counter modules	
			
Number of channels		2 channels	4 channels
Frequency per channel		40 kHz	40 kHz
Module cycle time		5 ms	10 ms
Counter/measurement input	Counting pulses ⎓ 24 V	Up to 40 kHz: Sensor type 2, Mechanical contacts	
	Incremental encoder	Up to 40 kHz : ⎓ 10…30 V, ⎓ 5 V RS 422 with zero marker	
	Absolute encoder	–	
Reflex inputs/outputs		Per channel: 3 inputs ⎓ 24 V: enable, preset and capture, 1 input ⎓ 24 V line check, incremental encoder power supply, 2 reflex outputs ⎓ 24 V	
Counting capacity		24 bits + sign (0 to + 16 777 215 points or ± 16 777 215 points)	
Functions		Downcounting with preset input, upcounting with reset to zero input Up/down counting with preset input, configurable upcounter input: - 1 upcounter input/1 downcounter input - 1 up/down counter input and 1 direction input - Incremental encoder with phase-shifted signals	
Processing		Inputs: counter enable, counter preset, read current value	
		Comparison: - Downcounting, to value 0 - Upcounting, 2 thresholds and 1 setpoint - Up/down counting, 2 thresholds and 2 setpoints	
		Reflex outputs: - Downcounting function, 1 passage through zero output - Upcounting function,1 passage through setpoint value output - Up/down counting function, 2 user-definable outputs	
Events		User-definable activation of the event-triggered task (threshold crossing, setpoint crossing, preset or reset, enable, capture)	
Connection		- 15-way SUB-D connectors (1 per counter channel, direct or TSX TAP S15 ●● accessory) - HE 10 connector for auxiliary I/O and power supply - Advantys Telefast ABE 7 system (ABE 7CPA01, ABE 7H08R10/16R20)	
Type of module		**TSX CTY 2A**	**TSX CTY 4A**
Pages		4/23	

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Fast counter and measurement module	Electronic cam module
	
2 channels	1 channel
500 kHz	
1 ms	
Up to 1 MHz : Sensors type 2, Mecanichal contacts	–
500 kHz in multiplication by 1, 250 kHz in multiplication by 4: - ⎓ 10…30 V - ⎓ 5 V RS 422 with zero marker	
Power supply ⎓ 5 V ou ⎓ 10…30 V: - SSI absolute encoder up to 25 bits - Parallel absolute encoder up to 24 bits (with AdvantysTelefast ABE 7CPA11 sub-base)	
Per channel : - 2 inputs ⎓ 24 V: preset and read - 1 enable input or ⎓ 24 V output, configurable - 2 reflex outputs ⎓ 24 V - 1 programmable frequency output 24 V - 1 encoder power supply input ⎓ 5 V/24 V	- 3 proximity sensor compatible inputs 24 V type I - 24 track outputs 24 V/0.5 A protected
24 bits + sign (0 to + 16 777 215, upcounting) or 24 bits + sign (- 16 777 215 to + 16 777 215, downcounting, up/down counting). Up to 25 bits for SSI absolute encoder	256 to 32 768 points per cycle and from 1 to 32 768 cycles, (absorbs play on reverse)
Up/down counting with preset input, configurable counter input: - 1 upcounter input/1 downcounter input - 1 up/down counter input and 1 direction input - Incremental encoder with phase-shifted signals Measurement 2 thresholds: - SSI absolute encoder - Parallel output absolute encoder with ABE 7CPA11 sub-base	Processing of 128 cams/32 tracks (of which 24 with direct output) Output update cycle: - 50 µs for 16 cams - 100 µs for 64 cams - 200 µs for 128 cams Two capture registers Control/recalibration of axis slip
Inputs: counter enable, counter preset, read current value	Cam profi les: 3 basic types (position, monostable, brake)
Comparison: 2 thresholds	Associated functions: - Elimination of axis backlash, position recalibration - Measurement capture - Switching feedforward - Parts counter
Sorties réflexes : 2 sorties paramétrables. Surveillance de vitesse Fonctions spéciales	
User-definable activation of the event-triggered task (crossing of thresholds or modulo value, preset, enable, capture)	User-definable activation of the event-triggered task (cams, track, adjustment, read, etc.)
- 15 way SUB-D connectors (1 per counter channel, direct or TSX TAP S15●● accessory) - HE 10 connector for reflex I/O and power supply - Advantys Telefast ABE 7 (ABE 7CPA01, ABE 7H16R20, ABE 7CPA11)	
TSX CTY 2C	**TSX CCY 1128**
4/27	4/30

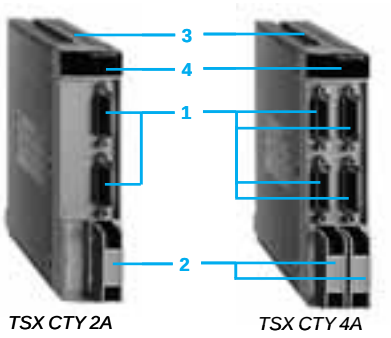
Modicon Premium automation platform
TSX CTY 2A/4A counter modules

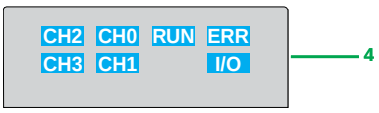
4

Presentation

Counting functions are required for counting parts or events, grouping objects, incoming or outgoing flow control, and measuring the length or the position of elements.

Premium PLCs perform these functions using **TSX CTY 2A/4A** counter modules which have a counting frequency of 40 kHz maximum. In a Premium PLC configuration, the number of TSX CTY counter modules is added to the number of other application-specific modules (communication, motion control and weighing). See pages 1/12, 1/21 and 1/31. They can be disconnected while powered up.
Counter modules are characterised by the number of channels :
■ 2 channels with downcounting, upcounting and up/down counting functions for the **TSX CTY 2A** module,
■ 4 channels with downcounting, upcounting and up/down counting functions for the **TSX CTY 4A** module.
The parameters of these functions are set by software configuration. The modules accept ⎓ 5 V or ⎓ 10 to 30 V solid state output sensors (incremental encoders, proximity sensors, photoelectric detectors) and mechanical contact output sensors (in this case the counting frequency is limited to 100 Hz).





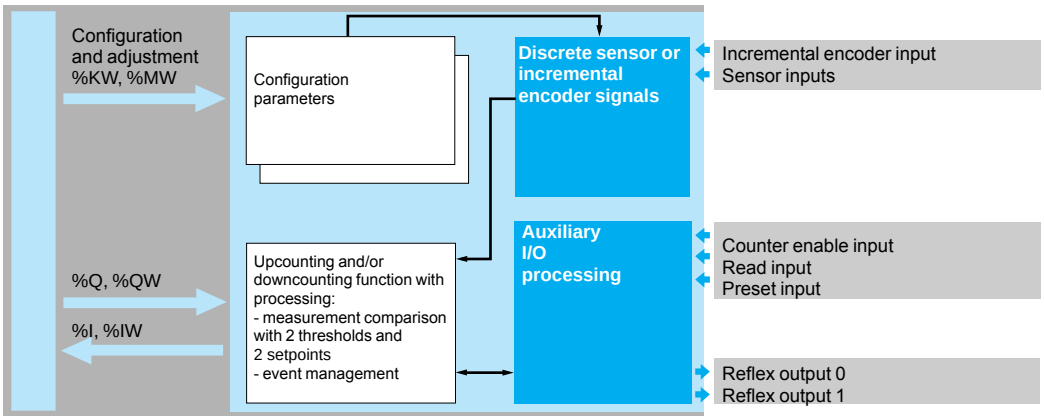
Description

The front panel of **TSX CTY 2A** (2-channel) and **TSX CTY 4A** (4-channel) counter modules comprises:
1 One 15-way SUB-D type connector per channel for connecting:
□ Counting sensors or incremental encoder.
□ Sensor power supply.
□ Encoder supply feedback for checking it is correctly supplied.
2 One 20-way HE10 type connector for 2 channels for connecting on each channel:
□ Auxiliary inputs: preset, enable.
□ Reflex outputs.
□ Power supplies for auxiliary I/O and incremental encoders.
3 Rigid casing which:
□ Holds the electronic card.
□ Locates and locks the module in its slot...
4 Module diagnostic LEDs:
□ Module diagnostics:
- Green RUN LED: module operating,
- Red ERR LED: internal fault, module failure,
- Red I/O LED: external fault.

□ Channel diagnostics:
- Green CH● LED: channel diagnostics available.

Operation block diagram

Block diagram of a channel



Counter modules are set up using PL7 Junior/Pro software

Characteristics: page 4/23
Connections: page 4/22
References: page 4/23

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Modicon Premium automation platform
TSX CTY 2A/4A counter modules

Electrical characteristics

Type of modules		TSX CTY 2A	TSX CTY 4A
Modularity		2 channels	4 channels
Frequency on counter inputs	**kHz**	40 maxi	40 maxi
Consumption	**mA**	see page 9/6	see page 9/6
Dissipated power	**W**	4.5 typical (6 maxi)	8 typical (11.5 maxi)
Sensor power supply check		yes	yes
Module cycle time	**ms**	5	10
Event processing response time	**ms**	Acceptance of event-triggered input (enable/read/preset) and positioning of: - reflex output on TSX CTY 2A/4A: 1 ms - discrete module output; TSX DSY 8T22: 2.1 ms; TSX DSY 32T2K: 3.2 ms	

Input characteristics

Type of input				Counter inputs (IA/IB/IZ)		Auxiliary inputs (preset, enable, read)
Nominal values	Voltage		**V**	5	24	24
	Current		**mA**	18	18	7
Limit values	Voltage		**V**	≤ 5.5	19...30 (up to 34 V possible, limit 1 hr per 24 hr period)	19...30 (up to 34 V possible, limit 1 hr per 24 hr period)
	At state 1	Voltage	**V**	≥ 2.4	≥ 11	≥ 11
		Current	**mA**	> 3.7 (for U = 2.4 V)	> 6 (for U = 11 V)	> 6 (for U = 11 V)
	At state 0	Voltage	**V**	≤ 1.2	≤ 5	≤ 5
		Current	**mA**	< 1 (for U = 1.2 V)	< 2 (for U = 5 V)	< 2 (for U = 5 V)
Logic				Positive	Positive	Positive
Sensor voltage check response time						
	At loss of 24 V		**ms**	–	–	< 2.5
	At return of 24 V		**ms**	ms	–	–
Input impedance	For nominal U		**W**	400	1400	3400
	For U = 2.4 V (RS 422 compatibility)		**W**	> 270	–	–
Response time				Max. permissible frequency 40 kHz with incremental encoder Immunity 1.6 ms with mechanical contact		< 250 µs
Type of input				Resistive	Resistive	Current sink
IEC/EN 61131 conformity				–	Type 2	Type 2
Proximity sensor compatibility				–	2-wire/3-wire	2-wire/3-wire

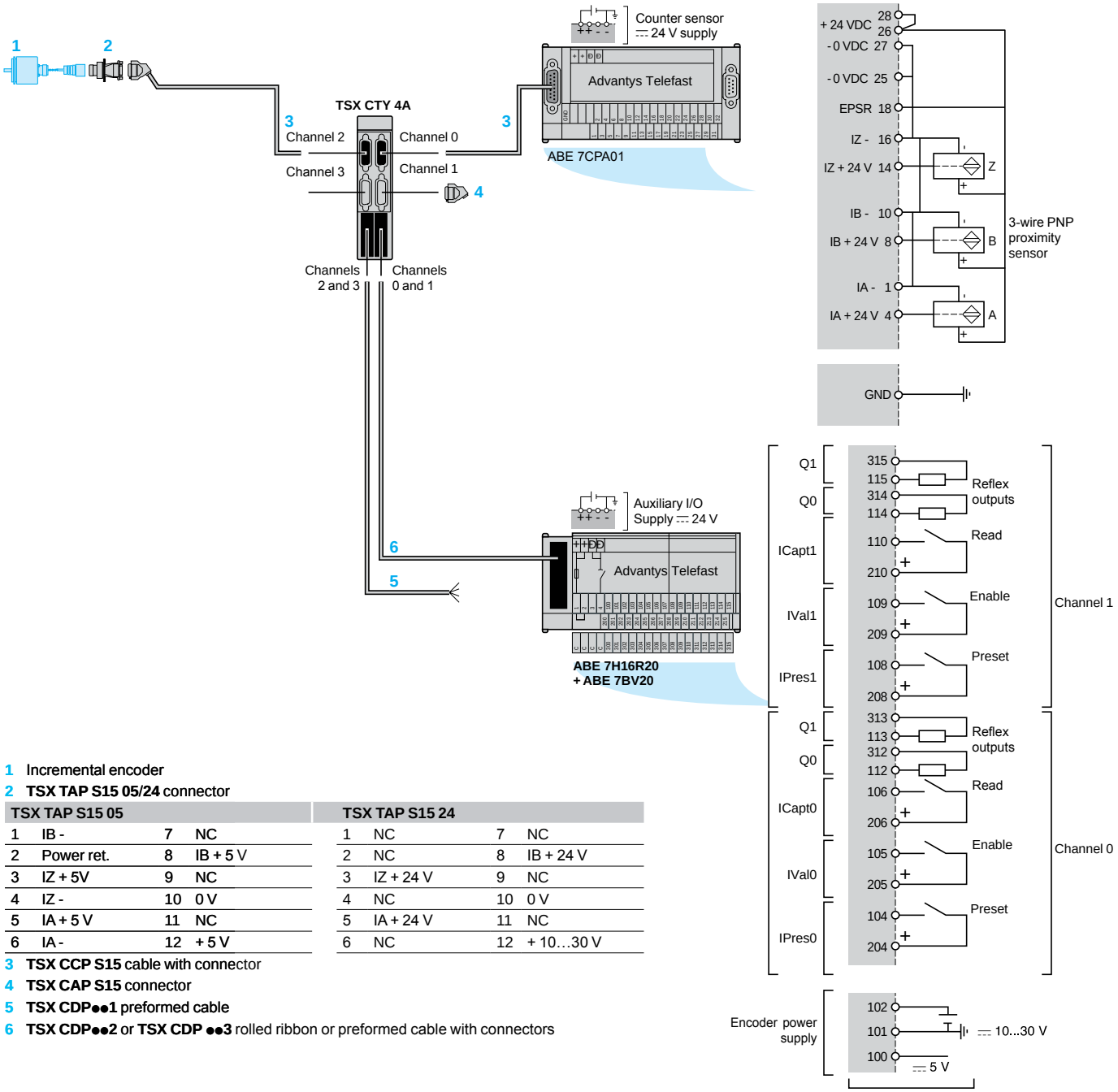
Output characteristics

Type of output			**Auxiliary outputs** (2 par channel)
Nominal	**Voltage**	**V**	⎓ 24
	Current	**mA**	500
Voltage limits		**V**	19...30 (up to 34 V possible, limit 1 hr per 24 hr period)
Maximum voltage drop when ON		**V**	< 0.5
Leakage current		**mA**	< 0.1
Switching time		**µs**	< 250
Electrostatic discharge time		**s**	L/R
Switching frequency on inductive load		**Hz**	F < 0.6 / (LI²)
Compatibility	With Premium d.c. inputs		All positive logic inputs with input resistance < 15 kΩ
	IEC/EN 61131		yes
Protections against	Overloads and short-circuits		Current limiter and thermal tripping (reactivated via program or automatically)
	Channel overvoltages		Zener diode between outputs and + 24 V
	Polarity inversions		Diode reverse-mounted on supply

Description: page 4/20 | Connections: page 4/22 | References: page 4/23

Connections

Examples of connecting counter inputs



1 Incremental encoder
2 **TSX TAP S15 05/24** connector

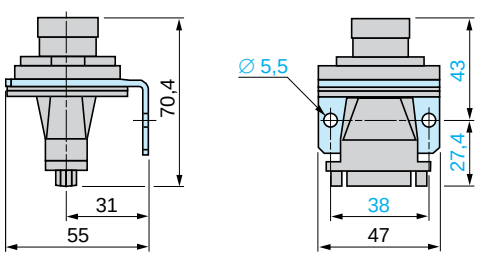
TSX TAP S15 05				TSX TAP S15 24			
1	IB -	7	NC	1	NC	7	NC
2	Power ret.	8	IB + 5 V	2	NC	8	IB + 24 V
3	IZ + 5V	9	NC	3	IZ + 24 V	9	NC
4	IZ -	10	0 V	4	NC	10	0 V
5	IA + 5 V	11	NC	5	IA + 24 V	11	NC
6	IA -	12	+ 5 V	6	NC	12	+ 10…30 V

3 **TSX CCP S15** cable with connector
4 **TSX CAP S15** connector
5 **TSX CDP●●1** preformed cable
6 **TSX CDP●●2** or **TSX CDP ●●3** rolled ribbon or preformed cable with connectors

Dimensions

Connection interface for incremental encoder

TSX TAP S15 05/24



Mounting through enclosure (dust and damp proof)
- cut-out Ø 37,
- maximum panel thickness 5 mm.

Description: page 4/20
Characteristics: page 4/21
References: page 4/23

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Modicon Premium automation platform
TSX CTY 2A/4A counter modules

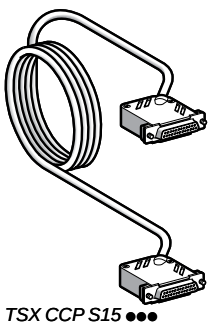

TSX CTY 2A

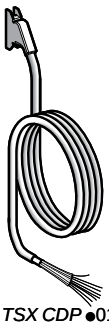

TSX CTY 4A

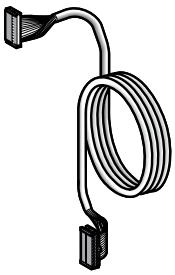

ABE 7CPA01

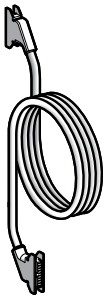

ABE 7H16R20


TSX TAP S15 ●●


TSX CCP S15 ●●●


TSX CDP ●01


TSX CDP ●02


TSX CDP ●03

Counter modules

Type of input	Characteristics	No. of channels	Reference	Weight kg
2/3-wire prox.sensors PNP/NPN, ⎓ 24 V, Incremental encoder ⎓ 5 V RS 422 or ⎓ 10…30 V Totem Pole	Counting 40 kHz Cycle time 5 ms	2	**TSX CTY 2A**	0.320
	Counting 40 kHz Cycle time 10 ms	4	**TSX CTY 4A**	0.430

Connection accessories

Description	For connecting	Connector type on TSX CTY ●●	Rep.	Unit Reference	Weight kg
SUB-D connectors Sold in lots of 2	Counter sensors or incremental encoder	SUB-D, 15-way	4	**TSX CAP S15**	0.050
Advantys Telefast ABE 7 connection sub-bases	Counter sensors and ⎓ 24 V power supply	SUB-D, 15-way	–	**ABE 7CPA01**	0.300
	Auxiliary inputs, ⎓ 24 V power supply and ⎓ 5 V/10…30 V encoder power supply	HE 10, 20-way (for 2 channels)	–	**ABE 7H16R20**	0.300
Additional terminal block Order in mulitiples of 5	20 shunted terminals for ABE 7H16R20 sub-base		–	**ABE 7BV20**	0.030
Connection interfaces for incremental encoder	Encoder ⎓ 5 V RS 422	SUB-D, 15-way	2	**TSX TAP S15 05**	0.260
	Encoder ⎓ 10...30 V Totem Pole	SUB-D, 15-way	2	**TSX TAP S15 24**	0.260

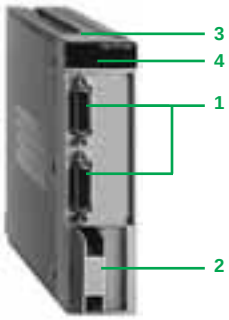
Connecting cables

Description	From TSX CTY ●● module	To	Rep.	Length	Reference	Weight kg
Cordsets AWG 12 (0.205 mm²)	15-way SUB-D connector	ABE 7CPA01/CPA11 sub-bases or TSX TAP S15●● (15-way SUB-D connector)	3	0.5 m	**TSX CCP S15 050**	0.110
				1 m	**TSX CCP S15 100**	0.160
				2.5 m	**TSX CCP S15**	0.300
20-wire preformed cables AWG 22 (0,324 mm²) 500 mA max.	Auxiliary inputs, ⎓ 24 V power supply and ⎓ 5 V/10…30 V encoder power supply (HE 10, 20-way moulded connector)	Free end with colour-coded wires	5	3 m	**TSX CDP 301**	0.400
				5 m	**TSX CDP 501**	0.660
				10 m	**TSX CDP 1001**	1.210
Rolled ribbon cable AWG 28 (0,08 mm²) 100 mA max.	Auxiliary inputs, ⎓ 24 V power supply and ⎓ 5 V/10…30 V encoder power supply (HE 10, 20-way connector)	ABE 7H16R20 sub-base (HE 10, 20-way connector)	6	1 m	**TSX CDP 102**	0.090
				2 m	**TSX CDP 202**	0.170
				3 m	**TSX CDP 302**	0.250
Conecting cables AWG 22 (0,324 mm²) 500 mA max.	Auxiliary inputs, ⎓ 24 V power supply and ⎓ 5 V/10…30 V encoder power supply (HE 10, 20-way connector)	ABE 7H16R20 sub-base (HE 10, 20-way connector)	6	0.5 m	**TSX CDP 053**	0.085
				1 m	**TSX CDP 103**	0.150
				2 m	**TSX CDP 203**	0.280
				3 m	**TSX CDP 303**	0.410
				5 m	**TSX CDP 503**	0.670
				10 m	**TSX CDP 1003**	1.180

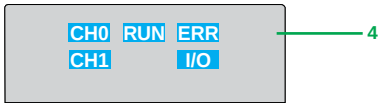
Description: page 4/20 | Characteristics: page 4/21 | Connections: page 4/22

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Modicon Premium automation platform
TSX CTY 2C measurement and counter module



TSX CTY 2C



Presentation

The **TSX CTY 2C** measurement and counter module is used with fast machines requiring precise measurements with short cycle times and high input frequencies (timber machines, packing machines, etc).

The **TSX CTY 2C** measurement and counter module provides the standard functions (speed monitoring, reflex outputs, etc) enabling a simple position control function to be performed by the application program.
The **TSX CTY 2C** measurement and counter module also enables special functions to be managed.

Description

The front panel of a **TSX CTY 2C** measurement and counter module comprises:
1 One 15-way SUB-D connector per channel for connecting:
- Counting sensors or incremental encoder,
- SSI absolute encoder or parallel output encoder with **ABE 7CPA11** sub-base,
- Sensor power supply,
- Encoder power supply feedback for checking it is correctly supplied.

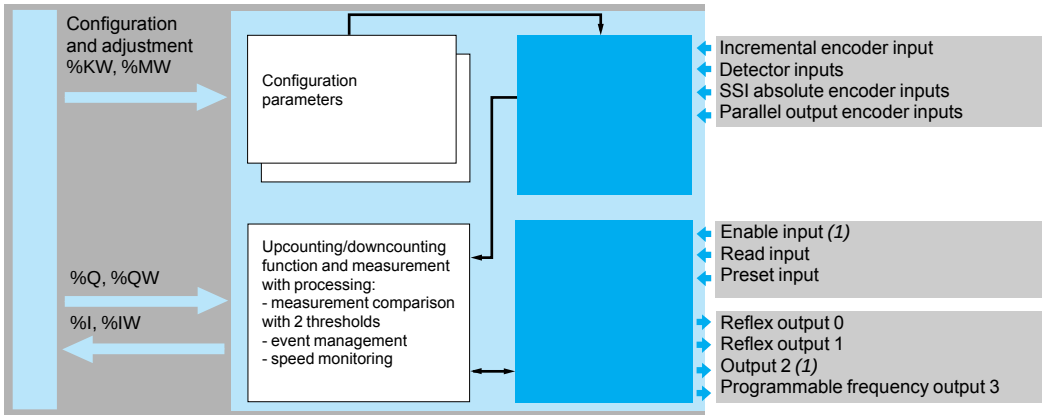
2 One 20-way HE10 connector for connecting on each channel :
- Auxiliary inputs: preset, enable and read,
- Reflex outputs,
- Programmable frequency output,
- Power supplies for auxiliary I/O and encoders.

3 Rigid casing which:
- Holds the electronic card,
- Locates and locks the module in its slot...

4 Module diagnostic lamps:
- Module diagnostic:
  - Green RUN: module operating.
  - Red ERR lamp: internal fault, module failure.
  - Red I/O lamp: external fault.
- Channel diagnostic:
  - Green CH● lamp: channel diagnostics available.

Operation block diagram

Block diagram of a channel



Counter modules are set up using Unity Pro or PL7 Junior/Pro software

(1) The enable input and output 2 cannot be used simultaneously.

Characteristics: page 4/25
Connections: page 4/26
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Modicon Premium automation platform
TSX CTY 2C measurement and counter module

Electrical characteristics

Type of module		TSX CTY 2C
Modularity		2 channels
Frequency on counter inputs		Counting: 1 MHz. With phase-shifted signal encoder: multiplication by 1: 500 kHz, multiplication by 4: 250 kHz
Consumption	**mA**	see page 9/6
Dissipated power	**W**	7 typical (10 max.)
Sensor power supply check		Yes
Module cycle time	**ms**	1 (for 2 channels)
Event processing response time	**ms**	Acceptance of event-triggered input (enable/read/preset) and positioning of - a reflex output: 1 ms - discrete output modules **TSX DSY 8T22**: 2.1 ms ; **TSX DSY 32T2K:** 3.2 ms.

Input characteristics

Type of input				Counter inputs **IA/IB/IZ or SSI absolute encoder**	Counter inputs **IA/IB/IZ**	**Auxiliary inputs** (preset, enable, read)
Nominal values		Voltage	**V**	5	24	24
		Current	**mA**	18	16	8
Limit values		Voltage	**V**	≤ 5.5	19...30 (up to 34 V possible, limited to 1 hr per 24 hr period)	19...30 (up to 34 V possible, limited to 1 hr per 24 hr period)
	At state 1	Voltage	**V**	≥ 2.4	≥ 11	≥ 11
		Current	**mA**	> 3.6 (for U = 2.4 V)	> 6 (for U = 11 V)	> 6 (for U = 11 V)
	At state 0	Voltage	**V**	≤ 1.2	≤ 5	≤ 5
		Current	**mA**	< 1 (for U = 1.2 V)	< 2 (for U = 5 V)	< 2 (for U = 5 V)
Logic				Positive	Positive	Positive
Sensor voltage check response time		At loss of 24 V	**ms**	–	–	< 2.5
		At return of 24 V	**ms**	–	–	< 10
Input impedance		For nominal U	**W**	400	1500	3400
Input impedance for U = 2.4 V (RS 422 compatibility)			**W**	> 270	–	–
Response time			**ms**	–	–	< 50
Type of input				Resistive	Resistive	Current sink
IEC/EN 61131 conformity				–	Type 2	Type 2
Proximity sensor compatibility				–	2-wire/3-wire	2-wire/3-wire

Output characteristics

Type of output		**Auxiliary outputs (2 per channel)**
Nominal values	Voltage	**V** ⎓ 24
	Current	**mA** 500
Voltage limits		**V** 19...30 (up to 34 V possible, limited to 1 hr per 24 hr period)
Maximum voltage drop at state 1		**V** < 0.5
Leakage current		**mA** < 0.1
Switching time		**ms** < 250
Electrostatic discharge time		**s** L/R
Switching frequency on inductive load		**Hz** F < 0.6 / (LI²)
Compatibility	With Premium d.c. inputs	All positive logic inputs with input resistance < 15 kW
	IEC/EN 61131-2	Yes
Protection against	Overloads and short-circuits	Current limiter and thermal tripping (reactivation via program or automatically)
	Channel overvoltages	Zener diode between outputs and + 24 V
	Polarity inversions	Diode reverse-mounted on supply

Description: page 4/24 Connections: page 4/26 References: page 4/27

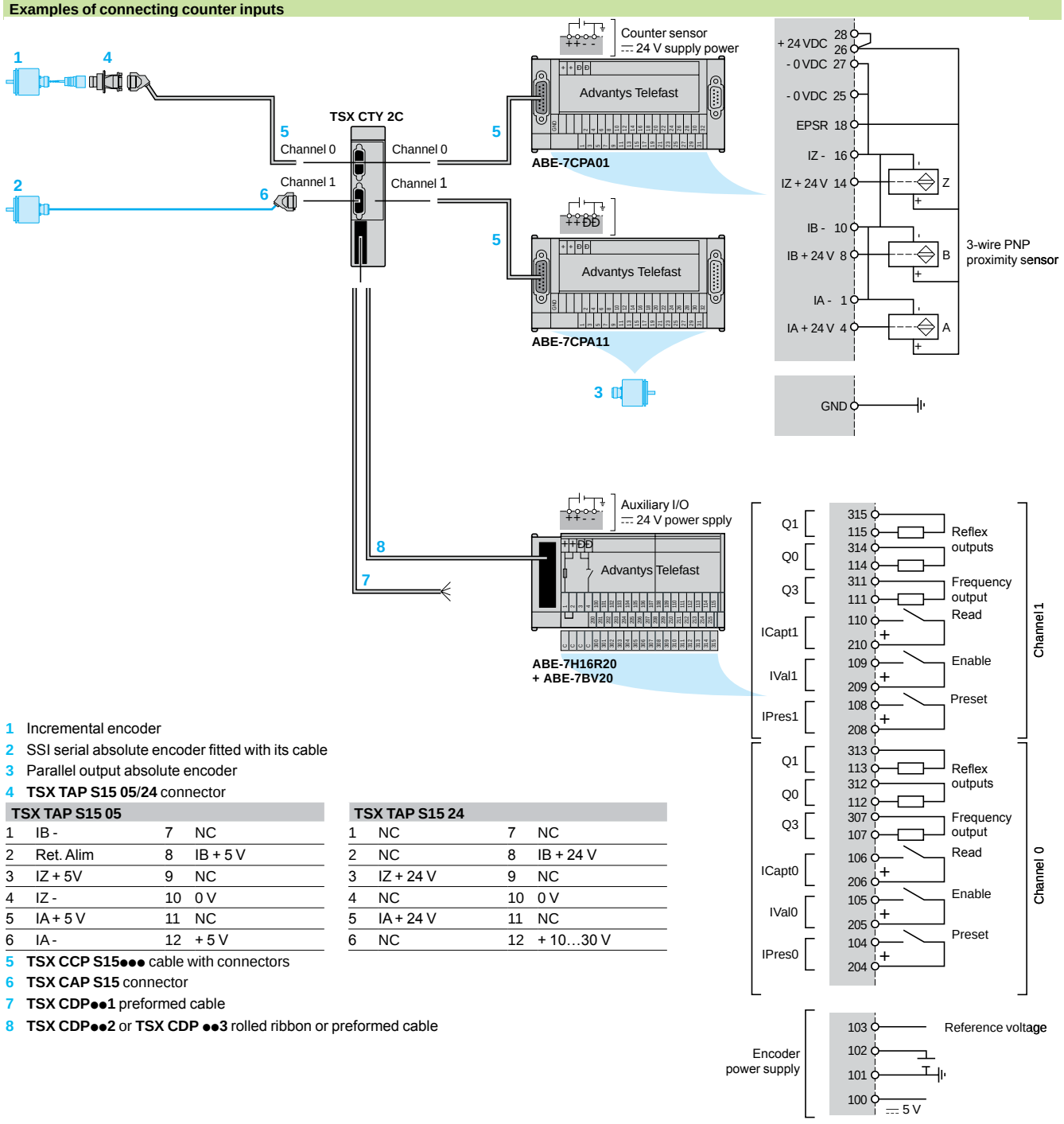
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Modicon Premium automation platform

TSX CTY 2C measurement and counter module

Connections

Examples of connecting counter inputs



1 Incremental encoder
2 SSI serial absolute encoder fitted with its cable
3 Parallel output absolute encoder
4 **TSX TAP S15 05/24** connector

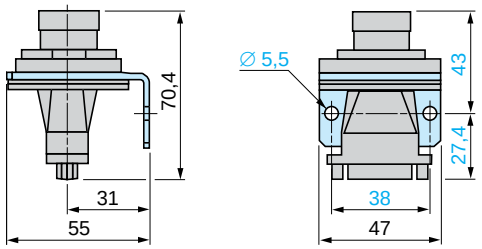
TSX TAP S15 05			
1	IB -	7	NC
2	Ret. Alim	8	IB + 5 V
3	IZ + 5V	9	NC
4	IZ -	10	0 V
5	IA + 5 V	11	NC
6	IA -	12	+ 5 V

TSX TAP S15 24			
1	NC	7	NC
2	NC	8	IB + 24 V
3	IZ + 24 V	9	NC
4	NC	10	0 V
5	IA + 24 V	11	NC
6	NC	12	+ 10…30 V

5 **TSX CCP S15●●●** cable with connectors
6 **TSX CAP S15** connector
7 **TSX CDP●●1** preformed cable
8 **TSX CDP●●2** or **TSX CDP ●●3** rolled ribbon or preformed cable

Dimensions

TSX TAP S15 05/24



Mounting through enclosure (dust and damp proof):
- cut-out Ø 37
- maximum panel thickness 5 mm

Description:
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Characteristics:
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References:
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Modicon Premium automation platform
TSX CTY 2C measurement and counter module


TSX CTY 2C

Measurement and counter module

Type of input	Characteristics	Nb of channels	Reference	Weight kg
2/3-wire prox.sensors PNP/NPN ⎓ 24 V **Incremental encoder** ⎓ 5 V RS 422 or ⎓ 10…30 V Totem Pole	Counting Cycle time 1 ms	2	**TSX CTY 2C**	0.340
SSI serial or parallel output absolute encoders with ABE 7CPA11 sub-base	Cycle time 1 ms			


ABE 7CPA01


ABE 7H16R20

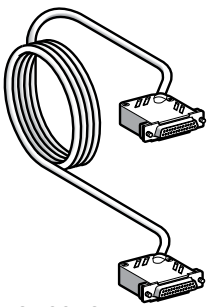

TSX TAP S15 ●●

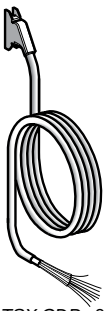
Connection accessories

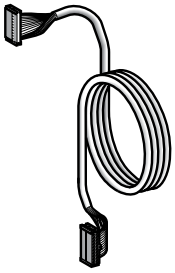
Description	For connecting	Connector type on TSX CTY 2C	Rep.	Unit reference	Weight kg
SUB-D connector Sold in lots of 2	Counter sensors or incremental encoder	SUB-D, 15-way	6	**TSX CAP S15**	0.050
Advantys Telefast ABE 7 connection sub-bases	Counter sensors and ⎓ 24 V power supply	SUB-D, 15-way	–	**ABE 7CPA01**	0.300
	Auxiliary inputs, supply ⎓ 24 V and encoder supply ⎓ 5 V/10…30 V	HE 10, 20-way (for 2 channels)	–	**ABE 7H16R20**	0.300
Additional terminal block Order in multiples of 5	20 shunted terminals for ABE 7H16R20 sub-base	–	–	**ABE 7BV20**	0.060
Adaptor sub-base for TSX CTY 2C module *(1)*	Parallel output absolute encoders ⎓ 5 V, ⎓ 10…30 V	SUB-D, 15-way	–	**ABE 7CPA11**	0.300
Connection interfaces for incremental encoder	Encoder ⎓ 5 V RS 422	SUB-D, 15-way	4	**TSX TAP S15 05**	0.260
	Encoder ⎓ 10...30 V Totem Pole	SUB-D, 15-way	4	**TSX TAP S15 24**	0.260

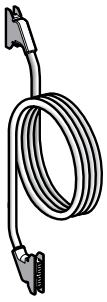
Connecting cables

Description	From TSX CTY 2C module	To	Rep.	Length	Reference	Weight kg
Cordsets AWG 12 (0.205 mm²)	15-way, SUB-D connector	ABE 7CPA01/CPA11 sub-base or TSX TAP S15●● accessory (15-way, SUB-D connector)	5	0.5 m	**TSX CCP S15 050**	0.110
				1 m	**TSX CCP S15 100**	0.160
				2.5 m	**TSX CCP S15**	0.300
20-wire preformed cables AWG 22 (0,324 mm²) 500 mA max.	Auxiliary inputs supply ⎓ 24 V and encoder supply ⎓ 5 V/10…30 V (20-way, HE 10 moulded connector)	Free end with flying leads	7	3 m	**TSX CDP 301**	0.400
				5 m	**TSX CDP 501**	0.660
				10 m	**TSX CDP 1001**	1.210
Rolled ribbon cables AWG 22 (0,08 mm²) 100 mA max.	Auxiliary inputs supply ⎓ 24 V and encoder supply ⎓ 5 V/10…30 V (20-way, HE 10 connector)	ABE 7H16R20 Telefast 2 sub-base (20-way, HE 10 connector)	8	1 m	**TSX CDP 102**	0.090
				2 m	**TSX CDP 202**	0.170
				3 m	**TSX CDP 302**	0.250
Connecting cables AWG 22 (0,324 mm²) 500 mA max.	Auxiliary inputs supply ⎓ 24 V and encoder supply ⎓ 5 V/10…30 V (20-way, HE 10 moulded connector)	ABE 7H16R20 Telefast 2 sub-base (20-way, HE 10 connector)	8	0.5 m	**TSX CDP 053**	0.085
				1 m	**TSX CDP 103**	0.150
				2 m	**TSX CDP 203**	0.280
				3 m	**TSX CDP 303**	0.410
				5 m	**TSX CDP 503**	0.670
				10 m	**TSX CDP 1003**	1.180


TSX CCP S15 ●●●


TSX CDP ●01


TSX CDP ●02

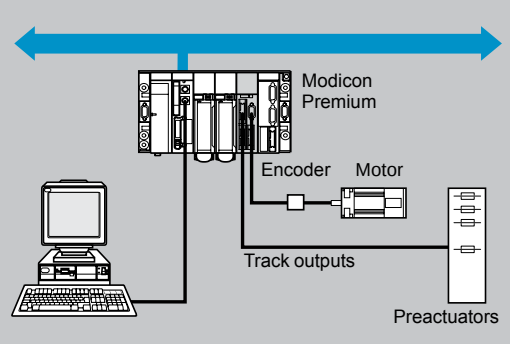

TSX CDP ●03

(1) Enables multiplexing of 2 absolute encoders on the same channel (up to 4 absolute encoders when using 2 **ABE 7CPA11** *adaptor sub-bases).*

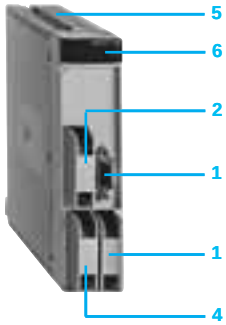
Description: page 4/24 | Characteristics: page 4/25 | Connections: page 4/26

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Modicon Premium automation platform
TSX CCY 1128 electronic cam module



The **TSX CCY 1128** module performs the “electronic cam” function for an animated axis of a rotary movement in a single direction, alternating, cyclical (with periodic arrival of parts for processing) or endless (with random arrival of parts for processing). The axis is managed by an incremental or absolute encoder.
The **TSX CCY 1128** electronic cam module manages, independently, up to 128 cams which may be spread over a maximum of 32 tracks to which 24 discrete physical outputs and 8 logic outputs may be assigned.
Processing is structured in 4 groups of 8 tracks each, with groups 0 and 1 associated with the module connector 0 and groups 2 and 3 with connector 1.
The **TSX CCY 1128** module can be used for the following functions: elimination of axis backlash, position recalibration, capturing measurements (part length, number of points per revolution, angle of arrival of parts, slip, etc), anticipation of switching, parts counter, generating events.
Like all application-specific modules, the **TSX CCY 1128** module can be installed in any slot of a Premium PLC, except those dedicated to the power supply and the processor.



TSX CCY 1128



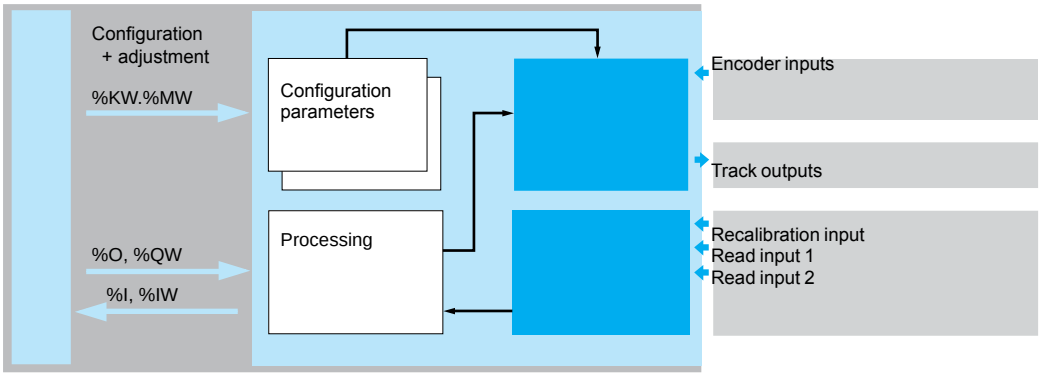
Description

The front panel of the **TSX CCY 1128** electronic cam module comprises:
1 One 15-way SUB-D connector for connecting the incremental or absolute encoder.
2 One 20-way HE 10 connector for connecting the track outputs on groups 0 and 1 (connector 0).
3 One 20-way HE 10 connector for connecting the track outputs on groups 2 and 3 (connector 1).
4 One 20-way HE 10 connector for connecting the auxiliary inputs and the encoder power supply.
5 Rigid casing for the following functions:
- Holding the electronic cards,
- Attaching and locking the module in its slot.

6 Module diagnostic indicator lights:
- Module diagnostics:
  - green RUN indicator lamp: module on,
  - red ERR indicator lamp, internal fault, module defective,
  - red I/O indicator lamp, external or application fault.
- Channel diagnostics:
  - green CH0 indicator lamps, channel diagnostics operative.

Operation

Block diagram of channel



The electronic cam module is set up using Unity Pro or PL7 Junior/Pro.

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Modicon Premium automation platform
TSX CCY 1128 electronic cam module

Operating characteristics

Number of cams		128 position, monostable, brake type
Number of tracks		32 (24 directly associated with the 24 physical outputs, 8 logic)
Position encoder inputs		Incremental with RS 422/485 line emitter or Totem Pole output Absolute with SSI serial link Absolute with parallel outputs (via ABE 7CPA11 adaptor sub-base)
Controlled outputs		24 discrete outputs 24 V, 0.5 A
Associated functions		Elimination of axis backlash, position recalibration, measurement capture, switching feedforward, parts counter, generation of events

Electrical characteristics

Modularity			1 axis
Max.frequency on encoder input			
SSI absolute encoder 8 to 25 bits	CLK transmission frequency	**kHz**	200
Incremental encoder	x 1	**kHz**	500
	x 4	**kHz**	250
Cosumption	On ⎓ 5 V and ⎓ 24 V	**mA**	See page 9/6
	On 10…30 V	**mA**	11 (use of an SSI encoder and single 24 V power supply)
Power dissipated in the module (typical)		**W**	7
Monitoring of sensor/preactuator power supplies			Yes
Output refresh cycle		µs	50 (up to 16 cams), 100 (up to 32 cams), 200 (up to 128 cams)

Input characteristics

Type of input				**Encoder inputs (IA/IB/IZ) with RS 422**	**with 10…30 V**	**Auxiliary inputs** (recalibration, capture 0, capture 1)
Logic				Differential inputs	Positive or negative	Positive
Nominal values	Voltage		**V**	–	24	24
	Current		**mA**	10	15.5	8
	Sensor power supply		**V**	≤ 5.5	19…30 (possible up to 34 V limited to 1 hr in 24 hrs)	
Limit values	At state 1	Voltage		> 3	≥ 11	≥ 11
		Current	**mA**	> 5.8	> 5	> 3
	At state 0	Voltage	**V**	≤ - 3	< 5	< 5
		Current	**mA**	≤ - 5.8	< 2	< 1.5
Input impedance for nominal U			Ω	–	1500	3000
Type of input				Resistive	Resistive	Resistive
Response time			µs	–	–	< 100
Conformity with IEC/EN 61131				–	–	Type 1
Compatibility sensors	2-wire		**V**	–	–	Yes (with 24 V)
	3-wire		**mA**	–	–	Yes (with 24 V)

Output characteristics

Type of output				**Track outputs**
Nominal values		Voltage	**V**	24
		Current	**mA**	500
Limit voltage			**V**	19…30 (possible up to 34 V limited to 1 hr in 24 hrs)
Max.current	Per output for U ⎓ 30 or 34 V		**mA**	600
	Per connectorr		**A**	≤ 6
	Per module		**A**	≤ 12
Maximum power for tungsten filament lamp			**W**	10
Switching frequency on an inductive load			**Hz**	< 0.6/LI²
Electro. discharge time			**s**	< L/R
Preactuator voltage monitoring threshold		OK	**V**	> 18
		Fault	**V**	< 14
Compatibility with d.c. inputs				All positive logic inputs whose input resistance is < 15 kΩ
Protection against	Overloads and short-circuits			By current limiter and thermal circuit-breaker
	Overvoltages on outputs			By Zener diode between the outputs and the + 24 V
	Polarity inversions			By reverse diode on the power supply
Conformity with IEC/EN 61131-2				Yes

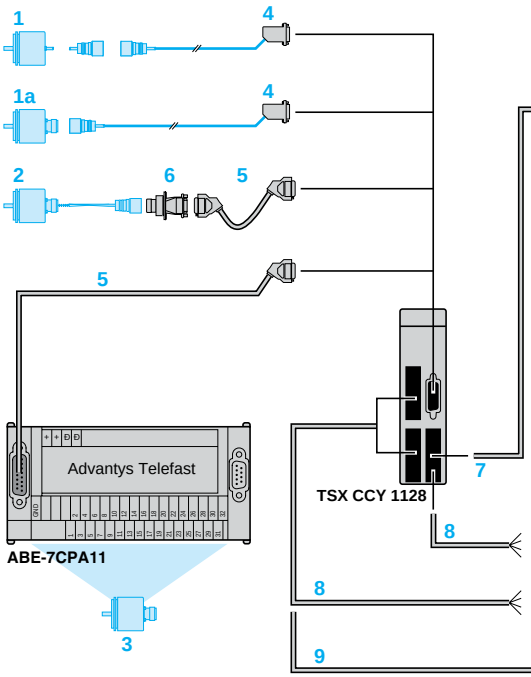
Description: page 4/28 | Connections: page 4/30 | References: page 4/31

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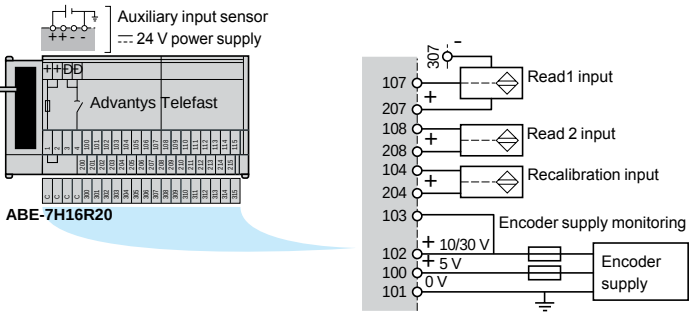
Modicon Premium automation platform
TSX CCY 1128 electronic cam module

Connections

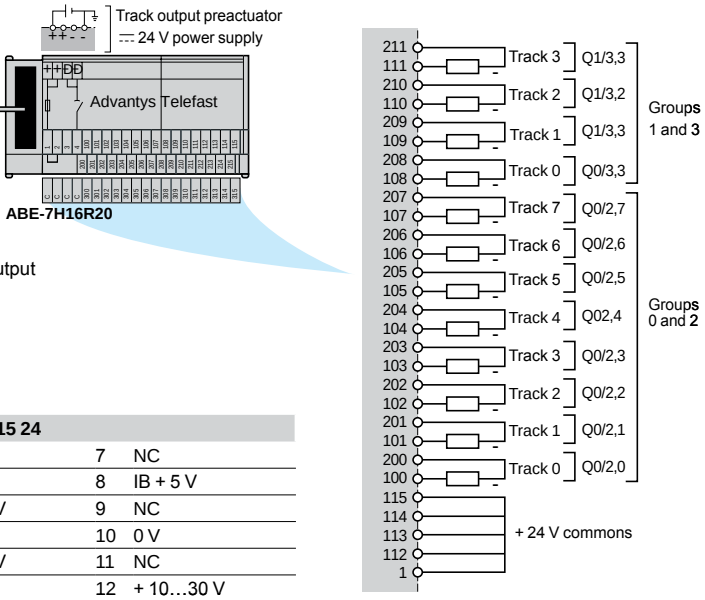
Examples of encoder connections



Examples of auxiliary input connections



Example of track output preactuator connection



1 Incremental or absolute encoder
1 Incremental or absolute encoder with 12-way DIN connector output
2 5 V RS 422/485 Totem Pole incremental encoder
3 Absolute encoder with parallel outputs
4 **TSX CAP S15** connector
5 **TSX CCP S15●●●** cable with connectors
6 **TSX TAP S15 05/24** connector

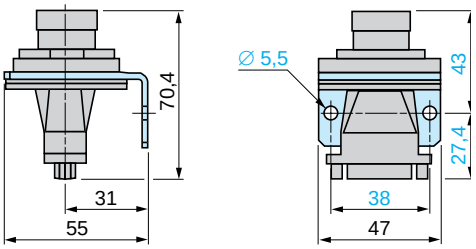
TSX TAP S15 05			
1	IB-	7	NC
2	Sup.Ret.	8	IB + 5 V
3	IZ + 5 V	9	NC
4	IZ -	10	0 V
5	IA + 5 V	11	NC
6	IA -	12	+ 5 V

TSX TAP S15 24			
1	NC	7	NC
2	NC	8	IB + 5 V
3	IZ + 24 V	9	NC
4	NC	10	0 V
5	IA + 24 V	11	NC
6	NC	12	+ 10…30 V

7 **TSX CDP●●3** cable with connectors
8 **TSX CDP●01** preformed cable with flying leads
9 **TSX CDP●03** cable with connectors

Dimensions

Connection interface for TSX TAP S15 05/24 incremental encoder



Enclosure feedthrough mounting (dust and damp proof)
- cut-out Ø 37,
- maximum panel thickness 5 mm.

Description: page 4/28
Characteristics: page 4/29
References: page 4/30

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Modicon Premium automation platform
TSX CCY 1128 electronic cam module



TSX CCY 1128



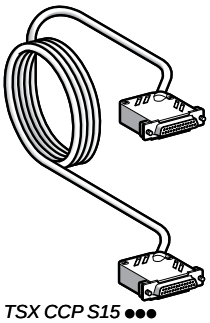
ABE 7CPA11



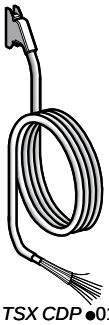
ABE 7H16R20



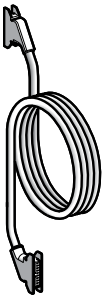
TSX TAP S15●●



TSX CCP S15 ●●●



TSX CDP ●01



TSX CDP ●03

Electronic cam module

Type of output	Characteristics	Nb of axes	Reference	Weight kg
Incremental encoder Supplied with 5 V or 10…30 V, with RS 422/485, or 5 V Totem Pôle outputs *(1)*	500 kHz counting with incremental encoder	1	**TSX CCY 1128**	0.480
Absolute encoder RS 485 serial or parallel *(2)*	Acquisition 200 kHz with serial absolute encoder			

Connection accessories

Description	For connection of	Type of connectors on TSX CCY 1128	Ref. *(3)*	Unit reference	Weight kg
SUB-D connector Sold in lots of 2	SSI absolute/incremental encoder	15-way SUB-D	4	**TSX CAP S15**	0.050
Advantys Telefast ABE 7 adaptor sub-base	Absolute encoder with parallel outputs (16 to 24 bits) ⎓ 5 V, 10…30 V	15-way SUB-D	–	**ABE 7CPA11**	0.300
Advantys Telefast ABE 7 connection sub-base	Auxiliary inputs, ⎓ 5…24 V encoder power supply	20-way HE 10 (1 per module)	–	**ABE 7H16R20**	0.300
	Track outputs	20-way HE 10 (1 per 2 groups)			
Additional terminal block Order in multiples of 5	20 shunted terminals for ABE 7H16R20 sub-base	–	–	**ABE 7BV20**	0,060
Connection interfaces for incremental encoder	⎓ 5 V RS 422/RS 485 encoder	15-way SUB-D	6	**TSX TAP S15 05**	0.260
	⎓ 10…30 V Totem Pôle	15-way SUB-D	6	**TSX TAP S15 24**	0.260

Connection cables

Description	From	To	Ref. *(3)*	Length	Reference	Weight kg
Cordsets AWG 12 (0.205 mm²)	TSX CCY 1128 module 15-way SUB-D connector	ABE 7CPA11 adaptor sub-base or TSX TAP S15 ●● interface (15-way SUB-D connector)	5	0.5 m	**TSX CCP S15 050**	0.110
				1 m	**TSX CCP S15 100**	0.160
				2.5 m	**TSX CCP S15**	0.220
Preformed cables with flying leads AWG 22 (0.324 mm²) 500 mA max.	TSX CCY 1128 module 20-way insulated HE 10 connector	Auxiliary inputs, power supply signals (free end)	8	3	**TSX CDP 301**	0.400
				5	**TSX CDP 501**	0.660
				10	**TSX CDP 1001**	1.210
Connection cables AWG 22 (0.324 mm²) 500 mA max.	TSX CCY 1128 module 20-way insulated HE 10 connector	ABE 7H16R20 sub-base (20-way HE 10 connector)	7, 9	0.5	**TSX CDP 053**	0.085
				1	**TSX CDP 103**	0.150
				2	**TSX CDP 203**	0.280
				3	**TSX CDP 303**	0.410
				5	**TSX CDP 503**	0.670
				10	**TSX CDP 1003**	1.180

(1) Totem Pole encoder with complementary Push/Pull outputs.
(2) Absolute encoders with parallel outputs with **ABE 7CPA11** *adaptor interface.*
(3) Diagram references (see page 4/30).

Description: page 4/28 | Characteristics: page 4/29 | Connections: page 4/31

Modicon Premium automation platform
Motion control modules

Applications	Motion control modules for stepper motor		Motion control modules for servo motors Compatible with: - Lexium 15 servo drives with analog setpoint - Altivar ATV 61/71 variable speed drives	
				
Number of axes	1 axis	2 axes	2 axes	4 axes
Frequency per axis	187 kHz		Counter: 500 kHz with incremental encoder Acquisition: 200 kHz with SSI serial absolute encoder or parallel output	
Counter input	Per axis: Translator inputs ⎓ 5 V, negative logic (translator loss of step checks)		Per axis: - Incremental encoder ⎓ 5 V, RS 422/ RS 485 or Totem pole - SSI serial absolute encoder 16 to 25 bits ⎓ 10…30 V - Parallel output absolute encoder 16 to 24 bits ⎓ 5/10/30 V with Advantys Telefast ABE 7 conversion sub-base (ABE 7CPA11)	
Control outputs	Per axis: RS 422 translator outputs, TTL 5 V compatible (+/- pulses, boost, enable, reset loss of step check)		Per axis: 1 analog output ± 10 V, 13 bits + sign, servodrive setpoint	
Auxiliairy input/output	Per axis: 6 discrete inputs ⎓ 24 V 1 output ⎓ 24 V (brake control)		Per axis: 4 discrete I/O ⎓ 24 V (homing cam, event, recalibration,emergency stop) 1 input/1 output for servodrive control 1 reflex output ⎓ 24 V	
Counter capacity	24 bits + sign (± 16 777 215 points)			
Functions			Servo Control on individual linear axis	
Processing	Open loop control of the position of a moving part on a limited linear axis according to motion control functions supplied by the PLC processor		Positioning of a moving part on an axis according to motion control functions supplied by the Premium PLC processor	
	Axis parameter setting, adjustment and debugging using PL7 Junior/Pro and Unity Pro software		Axis parameter setting, adjustement and debugging using PL7 Junior/Pro and Unity Pro software	
Events	User-definable activation of the event-triggered task			
Connection	- 15-way SUB-D connector for translator - 20-way HE 10 connector for auxiliary I/O - Advantys Telefast ABE 7 system (ABE 7H16R20)		- 9 and 15-way SUB-D connectors for encoder input (direct or via TSX TAP S15●●), speed reference - HE 10 connector for auxiliary inputs - Advantys Telefast ABE 7 system (ABE 7CPA01 / 7H16R20, ABE 7CPA11), - Specific accessories (TSX TAP MAS)	
Type of modules	**TSX CFY 11**	**TSX CFY 21**	**TSX CAY 21**	**TSX CAY 41**
Page	4/37		4/42	

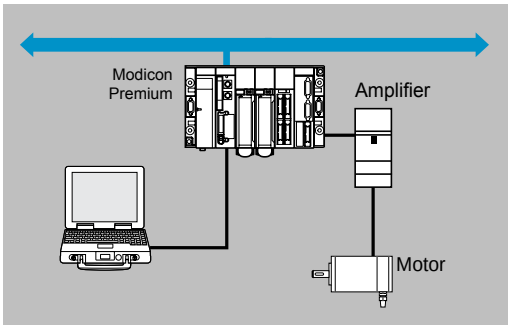
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Motion control modules for servo motors Compatible with: - Lexium 15 servo drives with analog setpoint - Altivar ATV 61/71 variable speed drives			Motion control modules for servo motors Compatible with Lexium 15 servo drives equipped with optional card SERCOS	
				
2 axes	4 axes	3 axes	8 axes	16 axes
Counter: 500 kHz with incremental encoder Acquisition: 200 kHz with SSI serial absolute encoder or parallel output			SERCOS ring: 4 M bauds	
Per axis: - Incremental encoder ⎓ 5 V, RS 422/RS 485 or Totem pole, - SSI serial absolute encoder 12 to 25 bits Parallel output absolute encoder 12 to 24 bits ⎓ 5/10/30 V with Advantys Telefast ABE 7 conversion sub-base (ABE 7CPA11)			Per SERCOS digital link	
Per axis: 1 analog output ± 10 V, 13 bits + sign, servodrive setpoint			Per SERCOS digital link	
Per axis: 4 discrete I/O ⎓ 24 V (homing cam, event, recalibration,emergency stop) 1 input/1 output for servodrive control 1 reflex output ⎓ 24 V			Per SERCOS digital link	
Servo control on individual infinite axis Follower axes (dynamic ratio) Realtime correction of servodrive offset		Servo control on individual linear or infinite axis Linear interpolation on 2 or 3 axes Realtime correction of servodrive offset	Individual linear or infinite axis Linear interpolation on 2 to 8 axes Follower axes (6 slaves) by gearing or camming Manual mode (JOG and INC) *(1)* Special functions, see page 4/50	
Flying shear on position or event *(1)*	–			
Positioning of a moving part on an axis according to motion control functions supplied by the Premium PLC processor				
Axis parameter setting, adjustement and debugging using PL7 Junior/Pro and Unity Pro software			Axis parameter setting, adjustment and debugging using PL7 Junior/Pro software and Unity Pro software *(2)*	
User-definable activation of the event-triggered task				
- 9 and 15-way SUB-D connectors for encoder input (direct or via TSX TAP S15●●), speed reference - HE 10 connector for auxiliary inputs - Advantys Telefast ABE 7 system (ABE 7CPA01, ABE 7H16R20, ABE 7CPA11), - Specific accessories (TSX TAP MAS) -			2 SMA type connectors for plastic (or glass) fiber optic cable	
TSX CAY 22	**TSX CAY 42**	**TSX CAY 33**	**TSX CSY 84** **TSX CSY 85** *(3)*	**TSX CSY 164**
4/42			4/53	

(1) Function not available with Premium platform under Unity Pro software.
(2) The Unity Pro software version ⩽ V 2.0 is not compatible with the **TSX CSY 164** *module.*
(3) **TSX CSY 85** *with path functions : 2 groups of 3 axes or 3 groups of 2 axes. With linear and circular interpolation with links via polynomial interpolation.*

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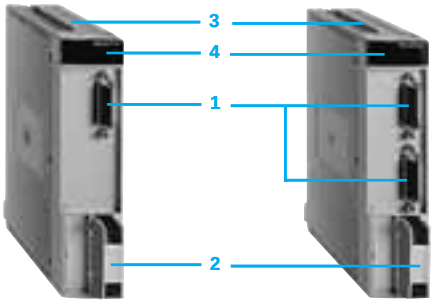
Modicon Premium automation platform
TSX CFY 11/21 modules for stepper motors



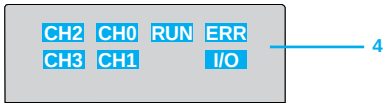
Presentation

The **TSX CFY 11/21** stepper motor axis control range is intended for machines which simultaneously require motion control by stepper motor associated with sequential control by programmable controller.
The **TSX CFY 1**1 module controls, via an amplifier for stepper motor, 1 axis (channel 0). The **TSX CFY 21** module controls 2 axes (channels 0 and 1). They accept amplifiers with:
- RS 422 or TTL 5 V inputs (negative logic).
- RS 422 or ⎓ 5 V NPN open collector outputs.

In a Premium PLC configuration, the number of TSX CFY motion control modules should be added to the other application-specific modules (communication, counting, axis control and weighing).



TSX CFY 11 *TSX CFY 21*



Description

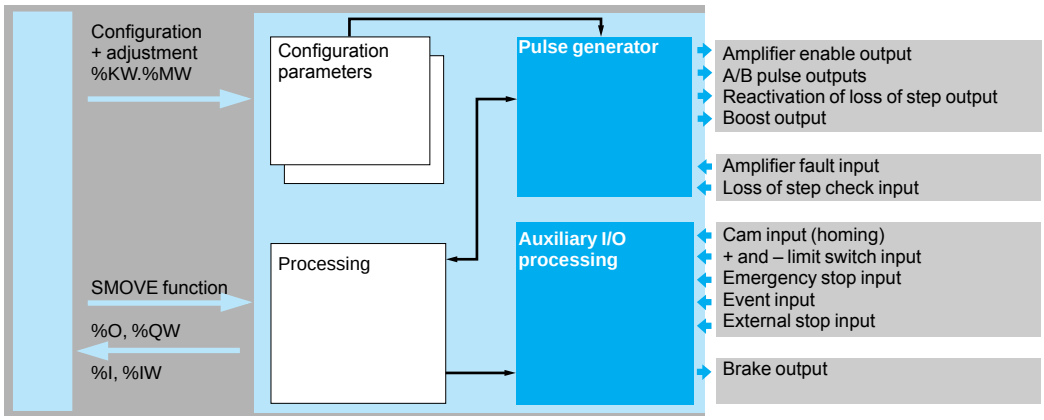
The front panel of **TSX CFY 11/21** stepper control modules comprises:
1 One 15-way SUB-D connector per channel for connecting:
- Amplifier inputs.
- Amplifier outputs.
- Amplifier input power supply.

2 One 20-way HE 10 connector for connecting:
- Auxiliary inputs: per axis, homing cam, emergency stop, limit switches (+ and -), event, external stop.
- Brake outputs (1 per axis).
- External power supplies for sensors and preactuators.

3 Rigid casing which:
- Holds the electronic card.
- Locates and locks the module in its slot.

4 Module diagnostics lamps:
- Module diagnostics:
  - green RUN lamp: module operating,
  - red ERR lamp: internal fault, module failure,
  - red I/O lamp: external fault.
- Axis diagnostics:
  - 2 green CH● lamps: axis diagnostics available.

Operation block diagram



Operating characteristics are described on page 4/36

Stepper control modules are set up using Unity Pro or PL7 Junior/Pro software.

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Modicon Premium automation platform
TSX CFY 11/21 modules for stepper motors

Electrical characteristics

Type of module				TSX CFY 11	TSX CFY 21
Modularity				1 axis	2 axes
Maximum pulse frequency			**kHz**	187.316	187.316
Consumption			**mA**	See page 9/6	
Power dissipated in the module			**W**	3.8 typical	5.6 typical
Sensor power supply check				Yes	Yes

Input characteristics

Inputs				Amplifier inputs	Auxiliary inputs
Logic				Negative	Positive
Nominal values	Voltage		**V**	5	24
	Current		**mA**	4.5	7
Limit values	Voltage		**V**	–	19...30 (up to 34 V possible, limited to 1 hour per 24 hours period)
	At state 1	Voltage	**V**	< 2	≥ 11
		Current	**mA**	–	> 6 (for U = 11 V)
	At state 0	Voltage	**V**	> 3.6	< 5
		Current	**mA**	–	< 2 (for U = 5 V)
Input impedance for nominal U			**kΩ**	–	3.4
Input immunity			**µs**	Loss of step input: 15 to 30:	–
			µs	–	Homing cam and event inputs: < 250
			ms	Amplifier fault input: 3 to 16	Limit switch, emergency stop and external stop inputs: 3 to 10
Monitoring of external power supply for sensors and preactuators	Voltage for OK state		**V**	–	> 18
	Voltage for fault state		**V**	–	< 14
	Immunity OK ➡ fault		**ms**	–	> 1
	Immunity fault ➡ OK		**ms**	–	< 30
Type of input				Resistive	Current sink
IEC/EN 61131 conformity				–	Type 2
Sensor compatibility				–	2-wire/3-wire

Output characteristics

Outputs				Amplifier outputs	Brake outputs (1 per axis)
Type of output				RS 422, TTL 5 V open collector NPN compatible	Open collector, PNP
Output differential voltage			**V**	± 2 (load resistance ≤ 100 Ω)	–
Short-circuit current			**mA**	< 150	–
Permissible common mode voltage			**V**	≤ 7	–
Permissible differential voltage			**V**	≤ 12	–
Voltages	Nominal		**V**	–	⎓ 24
	Limit		**V**	–	19...30 (up to 34 V possible, limited to 1 hour per 24 hours period)
Currents	Nominal		**mA**	–	500
	Leakage		**mA**	–	< 0.3
	Maxi		**mA**	–	625 (for U = 30 or 34 V)
Maximum voltage drop when ON			**V**	–	⎓ < 1
Switching time			**µs**	–	< 250
Compatibility with DC inputs				–	All positive logic inputs with input resistance < 15 kΩ
IEC/EN 61131-2 compliance				–	Yes
Short-circuit check on each channel				–	One signalling bit per channel
Protection against	**Overloads and short-circuits**			–	Via current limiter and thermal tripping (reactivated via program or automatically)
	Channel overvoltage			–	Zener diode between outputs and ⎓ + 24 V
	Polarity inversions			–	By diode reverse-mounted on supply

4

Description: page 4/34 Connection: page 4/36 References: page 4/37

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TSX CFY 11/21 modules for stepper motors

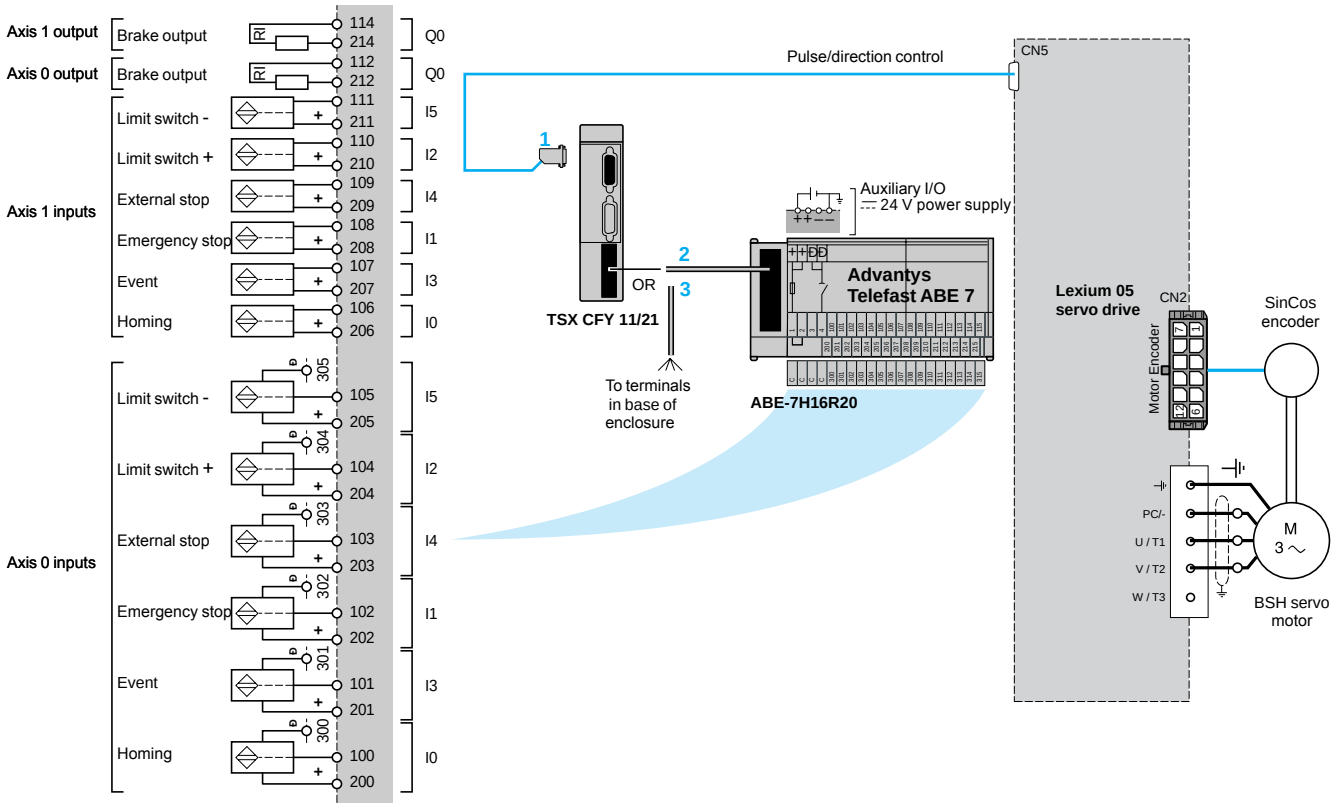
Operating characteristics

Control		Pulse, frequency from 0 to 187 kHz
		+ and - outputs or +/- outputs and direction
Paths		Trapezoidal speed profile with minimum movement frequency
Operating modes	OFF	Module inactive
	DIR DRIVE	Module operating as pulse generator
	MAN	Motion controlled by operator: - visual control of movement - incremental movement
	AUTO	Movement sequence controlled by PLC program. Movements are described using a syntax similar to that of ISO language. Movements may be expressed in absolute or relative terms (in relation to either the current position or a home point). Operation is possible in "step-by-step" mode.
Checks	Environment	Amplifier, limits switches, Emergency stop
	Motion	Check correct execution by software position limits, loss of step
	Control	Check consistency of commands
	Parameters	Check validity of parameters
Optional commands		Boost, brake

4

Connections

TSX CFY 11/21 stepper control module connections



1 Cable with connectors **VW3 M8 204 R●●** (pulse/direction)

2 Cable with connectors **TSX CDP053/103/203/303/503/1003** (L = 0.5, 1, 2, 3, 5 or 10 m)

3 Cable with connector at one end and flying leads at the other **TSX CDP 301/501/1001** (L = 3, 5 or 10 m)

Characteristics: pages 4/35

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TSX CFY 11/21 modules for stepper motors

Motion control modules for stepper motors


TSX CFY 11


TSX CFY 21

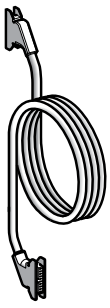
Description	To control	Connections to connectors		No. of axes	Reference	Weight kg
		SUB-D, 15-way	HE 10, 20-way			
Motion control modules for stepper motors	Amplifier with RS 422 I/O, Inputs ⎓ 5 V TTL and ouputs ⎓ 5 V with open collector	Amplifier I/O	Auxiliary I/O, ⎓ 24 V power supply	1	**TSX CFY 11**	0.440
				2	**TSX CFY 21**	0.480

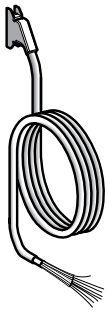
Connection accessories


ABE 7H16R20

Description	TSX CFY ●1 connector	Type of connector on TSX CFY ●1 module	Unit reference	Weight kg
SUB-D connectors Sold in lots of 2	Amplifier	SUB-D, 15-way (1 per axis)	**TSX CAP S15**	0.050
Advantys Telefast ABE 7 connection sub-base	Auxiliary I/O for axes 0/1, ⎓ 24 V power supply	HE 10, 20-way (1 for 2 axes)	**ABE 7H16R20**	0.300
Additional terminal block Order in multiples of 5	20 shunted terminals for ABE 7H16R20 sub-bases	–	**ABE 7BV20**	0.030

Connecting cables


TSX CDP ●03


TSX CDP ●01

Description	From module TSX CFY ●1	To	Rep. (1)	Length	Reference	Weight kg
Connection cables AWG 22 (0.324 mm²) 500 mA max.	20-way HE 10 connector	ABE 7H16R20 sub-base (20-way HE 10 molded connector)	2	0.5 m	**TSX CDP 053**	0.085
				1 m	**TSX CDP 103**	0.150
				2 m	**TSX CDP 203**	0.280
				3 m	**TSX CDP 303**	0.410
				5 m	**TSX CDP 503**	0.670
				10 m	**TSX CDP 1003**	1.180
Preformed cables with flying leads AWG 22 (0.324 mm²) 500 mA max.	20-way HE 10 connector	Auxiliary I/O for axes 0/1, 24 V ⎓ power supply (flying leads at I/O end)	3	3 m	**TSX CDP 301**	0.400
				5 m	**TSX CDP 501**	0.660
				10 m	**TSX CDP 1001**	1.310
Cables for servo drives	15-way SUB-D connector	Lexium 05 servo-drive (10-way Molex connector for CN5)	1	0.5 m	**VW3 M8 204 R05**	0,020
				1.5 m	**VW3 M8 204 R15**	0,030
				3 m	**VW3 M8 204 R30**	0,040
				5 m	**VW3 M8 204 R50**	0,050

(1) For key, see page 4/36

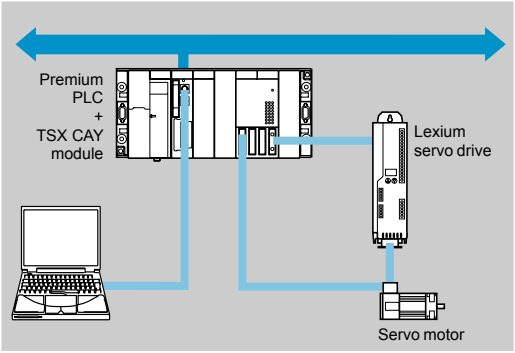
Characteristics: pages 4/35
Connection: page 4/36

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TSX CAY motion control modules for servo motors

Presentation



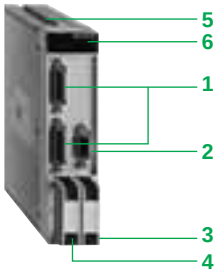
The servo-controlled TSX CAY●● positioning axis control offer is designed for machines requiring both high performance servo motion control in conjunction with PLC sequential control.

Depending on the model, the **TSX CAY ●●** modules make it possible to:
- Control 2 independent axes, **TSX CAY 21/22**
- Control up to 4 independent axes, **TSX CAY 41/42**
- Control 3 linearly interpolated axes, **TSX CAY 33**

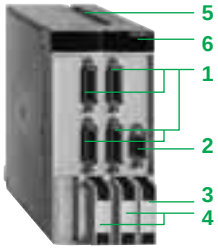
They accept servo drives with ±10 V analog inputs including Lexium 05, Lexium 15 and Lexium 17D servo drives.

TSX CAY ●● modules can be inserted, like all application-specific modules, in all Premium PLC or Slot PLC Atrium slots.

Description



TSX CAY 21/22



TSX CAY 41/42

On the front panel of the **TSX CAY ●●** axis control modules there is:

1 A 15-way SUB-D connector per axis for connection of an incremental or absolute encoder

2 A 9-way SUB-D connector for all axes for connection of an analog output “speed reference” for each axis

3 An HE 10 to 20-way connector for all axes for connection:
- ◻ of auxiliary servo drive control inputs
- ◻ of external power supply of servo drive inputs/outputs

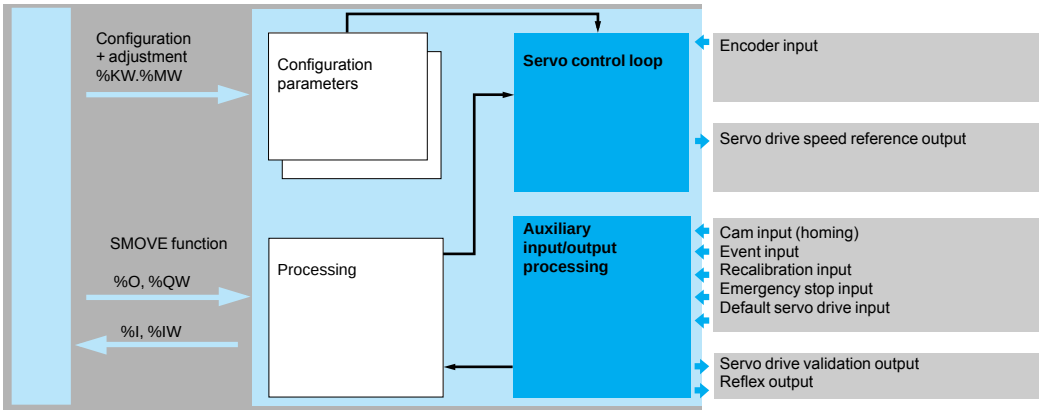
4 An HE 10 to 20-way connector for two axes (0/1 or 2/3) for connection:
- ◻ of auxiliary inputs: homing cam, emergency stop, event, recalibration,
- ◻ of reflex outputs
- ◻ external sensor and preactuator power supplies

5 rigid casing that performs the functions of:
- ◻ supporting electronic cards
- ◻ attaching and locking the module in its slot

6 LEDs for module diagnostics:
- ◻ diagnostics at module level:
  - Green RUN LED: module in operation
  - Red ERR LED: internal fault, module out of service
  - red I/O LED: external fault
- ◻ diagnostics at axis level:
  - Green CH● LED: axis diagnostics present

Operation

Diagram of an axis



Axis control modules are set up using Unity Pro or PL7 Junior/Pro software.

Premium **TSX P57 ●●3M/4M** and Atrium **TSX PCI 57●●4M** slot PLCs are required for **TSX CAY 22/42/33** modules.

Characteristics: pages 4/39 | References: pages 4/42 | Connections: page 4/44 | Dimensions: page 4/41

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TSX CAY motion control modules for servo motors

Functional characteristics

Module type			TSX CAY 21/22	TSX CAY 41/42	TSX CAY 33
Servo control loop			Proportional to overshoot compensation and gain switching		
	Period	**ms**	2	4	
Paths	Speed profile		Trapezoid or parabolic		
Resolution	Minimum		0.5 position units per point		
	Maximum		1000 position units per point		
Length of axis	Minimum		**TSX CAY 21**: 32,000 points **TSX CAY 22**: 256 points	**TSX CAY 41**: 32,000 points **TSX CAY 42**: 256 points	**TSX CAY 33**: 256 points
	Maximum		32,000,000 points		
Speed	Minimum		54,000 points/min		
	Maximum		270,000 points/min		
Acceleration (Change from 0 to VMAX)	Minimum	**s**	10		
	Maximum	**ms**	8	16	
Operating modes	OFF		Measuring mode, disabling of the servo control loop The module operates by acquiring the position and current speed		
	DIR DRIVE		Servo control is switched off, disabling of the servo control loop The module operates only in analog output		
	MAN		Motion control by an operator: - movement by viewing - incremental movement		
	AUTO		Sequence of movements controlled by a PLC program. The movements are described by a syntax similar to ISO language. The movements can be expressed absolutely or relatively (in relation to the current position or the captured position). Possibility of “step by step” execution, suspension/resumption of movement, changes in speed		
	FOLLOWER		Axis n of the module is servo controlled: - either at the 0 axis of the same module - or at a control profile transmitted by application program		–
	Environment		Encoder coupling, servo drive present, emergency stop		
	Movements		Control of the proper execution of movements (following difference, operational window, software stops)		
	Control		Control consistency check		
	Parameters		Parameter validity check		

Functionalities

Module type		TSX CAY 21	TSX CAY 22	TSX CAY 41	TSX CAY 42	TSX CAY 33
2/3 axes linear interpolation		–				Yes
Limited axes		Yes				
Infinite axes		–	Yes	–	Yes	
Following axes	Static ratio	Yes	–	Yes	–	
	Dynamic ratio	–	Yes	–	Yes	–
Servo drive offset correction		–	Yes	–	Yes	
Cut on the fly	On position or on event with infinite master axis and linearly-limited slave axis	–	Yes *(1)*	–		

(1) The **TSX CAY 22** *module’s cut on the fly function requires Unity Pro software version ≥ 2.2 or PL7 Junior/Pro software version u 4.1.*

Description: page 4/38 | References: pages 4/42 | Connections: page 4/44 | Dimensions: page 4/41

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TSX CAY motion control modules for servo motors

Electrical characteristics

Module type				TSX CAY 21	TSX CAY 22	TSX CAY 41	TSX CAY 42	TSX CAY 33
Modularity				2 axes		4 axes		3 axes
Maximum frequency on the counter inputs	SSI absolute encoder			16 to 25 bits	12 to 25 bits	16 to 25 bits	12 to 25 bits	
	CLK frequency	transmission	**kHz**	200				
	Incremental encoder	x 1	**kHz**	500				
		x 4	**kHz**	250 kHz in input or 1 MHz in counting				
Consumption		5 V⎓	**mA**	1100		1500		
		24 V⎓	**mA**	15		30		
Current consumed by module on the 10/30 V encoder at 24V (24 V absolute encoder)			**mA**	11 typical, 20 max.		22 typical, 40 max.		
Power dissipated inside the module			**W**	7.2 typical, 11.5 max.		10 typical, 17 max.		
Control of sensor power supplies				Yes				

Input characteristics

Type of input				**Counter inputs 5 V⎓** (IA/IB/IZ)	**Servo drive control inputs** (1 per axis)	**Auxiliary inputs** (homing, event, recalibration, emergency stop)
Logic				Positive		
Nominal values	Voltage		**V**	5	24	
	Current		**mA**	18	8	
Value limits	Voltage		**V**	≤ 5.5	19...30 (possible up to 34 V, limited 1 hour per 24 hours)	
	At state 1	Voltage	**V**	≥ 2.4	≥ 11 (OK state)	≥ 11
		Current	**mA**	> 3.7 (for U = 2.4 V)	> 3.5 (for U = 11 V)	> 6 (for U = 11 V)
	At state 0	Voltage	**V**	≤ 1.2	≤ 5 (default state)	≤ 5
		Current	**mA**	< 1 (for U = 1.2 V)	< 1.5 (for U = 5 V)	< 2 (for U = 5 V)
Control of voltage/sensor feedback				Presence check	–	
Input impedance for nominal U			Ω	270	3000	
Type of input				Resistive		Current sinks
Conforming to IEC/EN 61131				–	Type 1	Type 2
Compatibility detectors		2-wire		–		Yes (all 24 V detectors)
		3-wire		–		Yes (all 24 V detectors)

Output characteristics

Type of output			**Analog outputs** (1 per axis)	**Servo drive validation** (1 relay output per axis)	**Reflex outputs** (1 per axis)
Range		**V**	± 10, 24	–	
Resolution			13 bits + sign	–	
LSB value		**mV**	1.25	–	
Nominal voltage		**V**	–	⎓ 24	
Voltage limit		**V**	–	5…30	19...30 (possible up to 34 V, limited 1 hour per 24 hours)
Current		**mA**	–		500 nominal
Maximum current		**mA**	1.5	200 (resistive charge under 30 V)	625 (for U = 30 or 34 V)
Minimum permitted load			–	1 V/1mA	–
Max voltage drop ON		**V**	–		< 1
Leakage current		**mA**	–		< 0.3
Switching time			–	< 5 ms	< 500 µs
Compatibility with d.c. inputs			–		All positive logic inputs for which the input resistance is < 15 kΩ
Conforming to IEC/EN 61131			–		Yes
Protections	Short-circuit and overload		–		By current limiter and thermal release
	Channel overvoltage		–		Zener diodes between the inputs and the + 24 V
	Against reverse polarity		–		By diode in the opposite direction to the power supply

Description: page 4/38 | References: pages 4/42 | Connections: page 4/44 | Dimensions: page 4/41

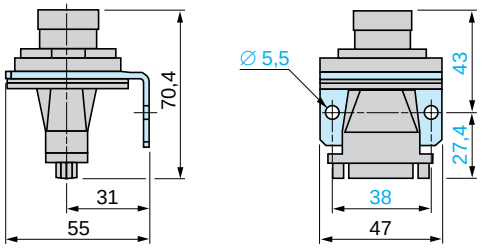
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TSX CAY motion control modules for servo motors

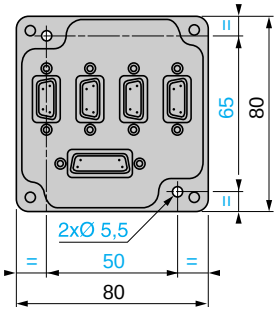
Dimensions

TSX TAP S15 05 connection interface for incremental encoder



Mounting in enclosure feedthrough (dust and damp proof)
- Ø 37 cut-out,
- Panel thickness 5 mm maximum

TSX TAP MAS speed reference splitter block for speed drives



Mounting on DIN rail with LA9-DC9976 accessory.

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TSX CAY motion control modules for servo motors



TSX CAY 2●



TSX CAY 4●

Motion control modules for servo motors

Type of input	Characteristics	Function	No. of axes *(1)*	Reference	Weight kg
Incremental encoders ⎓ 5 V RS 422, ⎓ 10…30 V Totem pole *(2)* **Absolute encoders** RS 485 serial or parallel *(3)*	500 kHz counter with incremental encoder 200 kHz acquisition with absolute serial encoder	Servo control on independent linear axis	2	**TSX CAY 21**	0.480
			4	**TSX CAY 41**	0.610
		Servo control on independent linear or independent infinite axis Following axes Servo drive realtime offset correction Cut on the fly *(4)*	2	**TSX CAY 22**	0.480
			4	**TSX CAY 42**	0.610
		Servo control on linear or infinite axis Linear interpolation on 2 or 3 axes Servo drive realtime offset correction	3	**TSX CAY 33**	0.610



TSX CAY 33

Connection elements

Connection accessories

Description	Connection	Type of connector on module TSX CAY ●●	Rep. *(5)*	Unit reference	Weight kg
SUB-D connectors Sold in lots of 2	SSI absolute/ incremental encoder	15-way SUB-D (1 per axis)	4	**TSX CAP S15**	0.050
	Speed references	9-way SUB-D (1 per TSX CAY module)	7	**TSX CAP S9**	0.050
Connection interface for incremental encoder	Incremental encoder ⎓ 5 V RS 422/RS 485	15-way SUB-D (1 per axis)	6	**TSX TAP S15 05**	0.260
Splitter unit	Speed references towards servo drives	9-way SUB-D (1 per TSX CAY module)	–	**TSX TAP MAS**	0.590
Advantys Telefast ABE 7 connection bases	Speed references	9-way SUB-D (1 per TSX CAY module)	–	**ABE 7CPA01**	0.300
	Auxiliary inputs, reflex outputs, I/O power supply ⎓ 24 V, encoder power supplies ⎓ 5/24 V	10, 20-way HE (1 for 2 axes)	–	**ABE 7H16R20**	0.300
	Servo drive control signals, I/O power supply ⎓ 24 V	10, 20-way HE (1 per TSX CAY module)			
Additional terminal block Order in multiples of 5	20 shunted terminals for ABE 7H16R20 sub-base	–	–	**ABE 7BV20**	0,060
Adaptor base	Absolute encoders with parallel outputs (16 to 24 bit) ⎓ 5 V, ⎓ 10…30 V	15-way SUB-D	–	**ABE 7CPA11**	0.300



TSX TAP S15 05



TSX TAP MAS



ABE 7CPA01



ABE 7H16R20

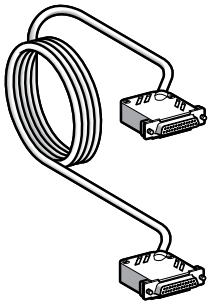
(1) Double format **TSX CAY 41/42/33** *modules.*
(2) Totem pole encoder with supplementary Push/Pull outputs.
(3) Parallel output absolute encoders with **ABE 7CPA11** *adaptor interface.*
(4) Cut on the fly function available with **TSX CAY 22** *module. Requires Unity Pro software version ≥ 2.2 or PL7 Junior/Pro software version ≥ 4.1*
(5) Diagram references, see page 4/43.

Description: page 4/38 | Characteristics: page 4/39 | Connections: page 4/44 | Dimensions: page 4/41

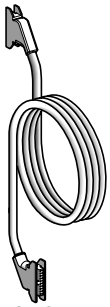
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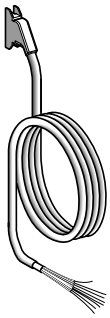
TSX CAY motion control modules for servo motors



TSX CCP S15 ●●●



TSX CDP ●●3



TSX CDP ●01

Connection elements (continued)

Cables

Description	Use		Rep.	Length	Reference	Weight
	From	To	(1)			kg
Cordsets AWG 12 (0.205 mm²)	TSX CAY●● module, 15-way SUB-D connector	TSX TAP S15 05 interface or ABE 7CPA11 adaptor base (15-way SUB-D connector)	5	0.5 m	**TSX CCP S15 050**	0.110
				1 m	**TSX CCP S15 100**	0.160
				2.5 m	**TSX CCP S15**	0.220
	TSX CAY●● module, 9-way SUB-D connector (speed reference)	ABE 7CPA01 sub-base or TSX TAP MAS splitter unit (15-way SUB-D connector)	8	2.5 m	**TSX CXP 213**	0.270
				6 m	**TSX CXP 613**	0.580
Preformed cable AWG 14 (0.205 mm²)	TSX CAY ●● module, or TSX TAP MAS unit (9-way SUB-D connector)	Lexium 05/15/17D servo drive speed reference or other drives (free end)	9	6 m	**TSX CDP 611**	0.790
Connecting cables AWG 22 (0.324 mm²) 500 mA max.	TSX CAY ●● module, (20-way HE 10 connector)	ABE 7H16R20 sub-base (20-way HE 10 connector)	10	0.5 m	**TSX CDP 053**	0.085
				1 m	**TSX CDP 103**	0.150
				2 m	**TSX CDP 203**	0.280
				3 m	**TSX CDP 303**	0.410
				5 m	**TSX CDP 503**	0.670
				10 m	**TSX CDP 1003**	1.180
20-wire pre-formed cables AWG 22 (0.324 mm²) 500 mA max.	TSX CAY ●● module, (20-way HE 10, moulted connector)	Auxiliary inputs, reflex output, control signals, power supplies (free end with colour-coted wires)	11	3 m	**TSX CDP 301**	0.400
				5 m	**TSX CDP 501**	0.660
				10 m	**TSX CDP 1001**	1.210
Codsets equipped for Lexium 15 servo drives	TSX CAY ●● module, 15-way SUB-D connector (encoder input)	Simulated incremental encoder feedback (9-way SUB-D connector)	12	2 m	**TSX CXP 235**	0.210
				6 m	**TSX CXP 635**	0.470
		Simulated absolute encoder feedback (9-way SUB-D connector)	13	2 m	**TSX CXP 245**	0.210
				6 m	**TSX CXP 645**	0.470

(1) Diagram references, see page 4/44 and 4/45.

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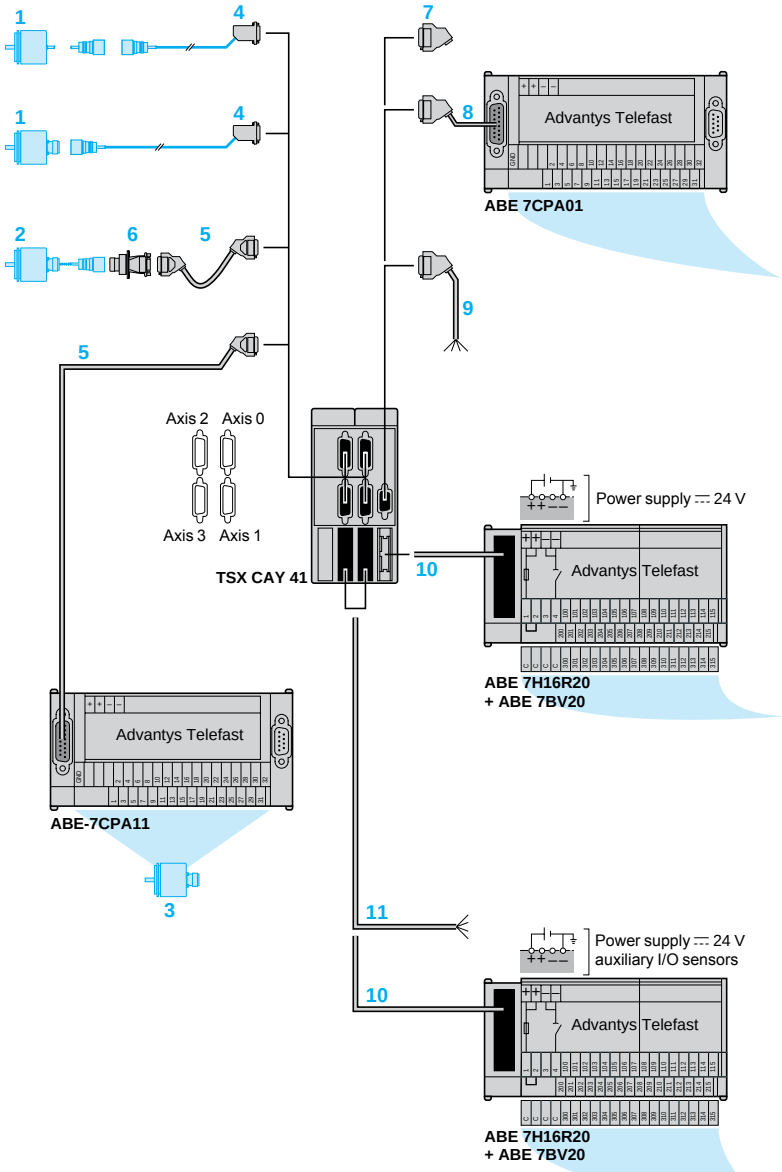
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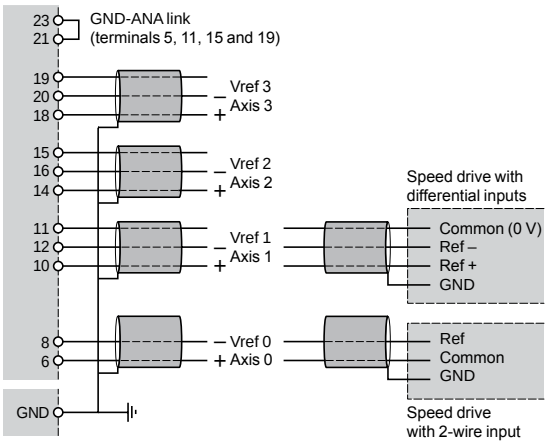
Connections for TSX CAY modules

General connections

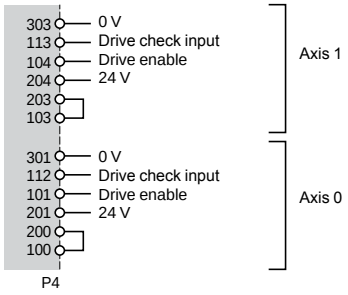
Examples of encoder connections



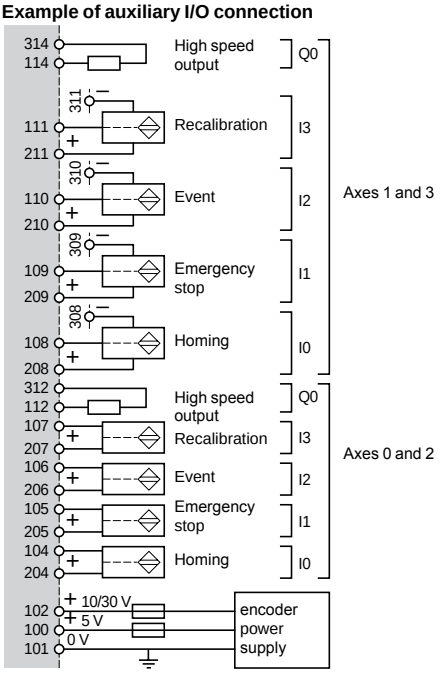
Examples of speed reference signal connections



Example of speed drive connection (auxiliary I/O)



Example of auxiliary I/O connection



1 Incremental or absolute encoder
2 5 V RS 422 incremental encoder
3 Parallel output absolute encoder
4 **TSX CAP S15** connector
5 **TSX CCP S15●●●** cable with connectors
6 **TSX TAP S15 05** connector

TSX TAP S15 05			
1	IB-	7	NC
2	Sup. Ret.	8	IB + 5 V
3	IZ + 5 V	9	NC
4	IZ -	10	0 V
5	IA + 5 V	11	NC
6	IA -	12	+5 V

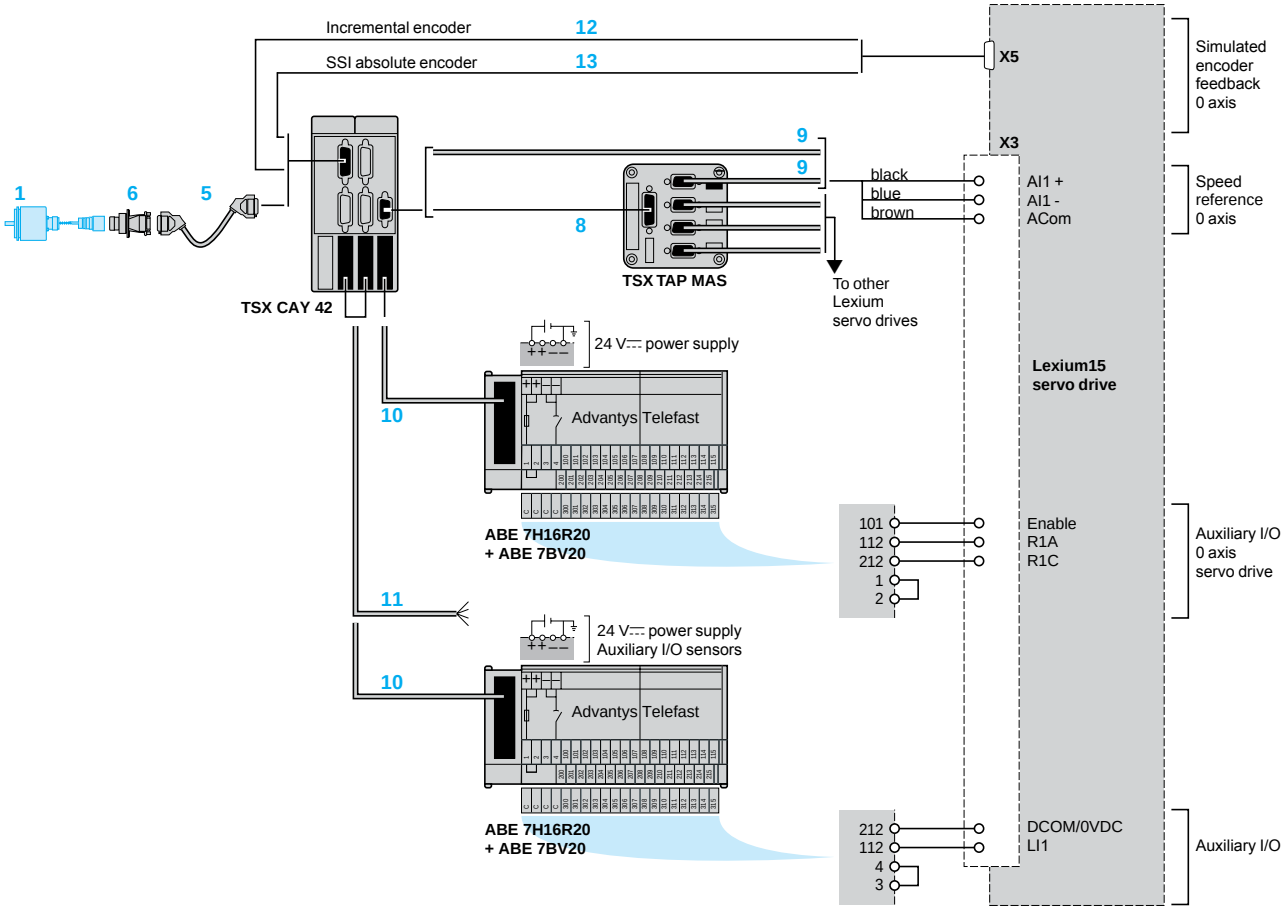
7 **TSX CAP S9** connector
8 **TSX CXP 213/613** cable with connector
9 **TSX CDP 611** preformed cable with connector
10 **TSX CDP●●3** cable with connector
11 **TSX CDP●01** preformed cable with connector

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Modicon Premium automation platform

TSX CAY motion control modules for servo motors

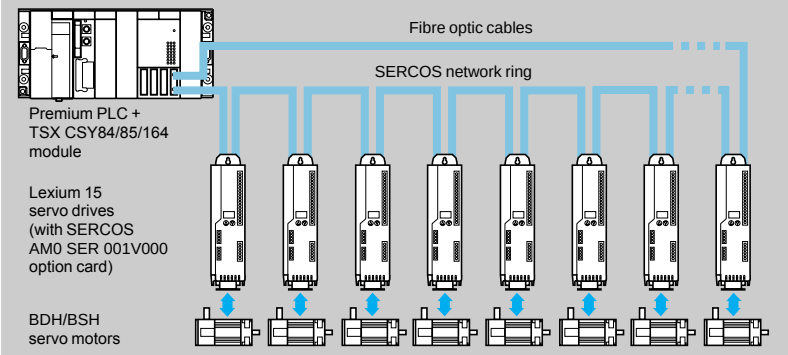
Example of Lexium 15 servo drive connection for BDH/BSH servo motor



1 Absolute/incremental encoder
5 **TSX CCP S15●●●** fitted cordset (encoder feedback)
6 **TSX TAP S15 05** connector
8 **TSX CXP 213/613** fitted cordset
9 **TSX CDP 611** fitted cable
10 **TSX CDP●●3** fitted connecting cable
11 **TSX CDP●01** fitted pre-formed cable
12 **TSX CXP 235/635** fitted cordset (simulated incremental encoder feedback)
13 **TSX CXP 245/645** fitted cordset (simulated SSI absolute encoder feedback)

Modicon Premium automation platform
SERCOS TSX CSY 84/85/164 motion control modules

Presentation



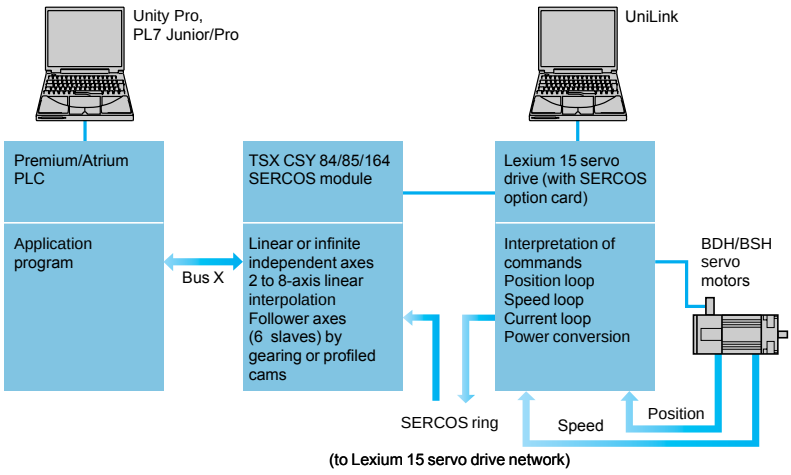
SERCOS (SERial COmmunication System) is a communication standard which defines the digital link (exchange protocol and medium) between a motion control module and servo drives. This is defined in European standard IEC 61491.
The use of SERCOS distributed architecture allows application I/O (position encoder, emergency stop, etc.) to be connected directly to the servo drives, thus reducing connection costs. The fibre optic digital link permits high speed exchanges (2 or 4 Mbps) while ensuring a high level of immunity in disturbed industrial environments.

The SERCOS range in the Premium automation platform consists of:
■ **TSX CSY 84/85/164** axis control modules *(1)* which can each control up to 8 servo drives (TSX CSY 84/85) and 16 servo drives (TSX CSY 164) via a SERCOS ring. The module calculates the path and the interpolation for several axes (position mode). Access to the other modes (speed and torque) is possible with the assistance of Schneider Electric application services.
■ 1.5 A to 70 A permanent Lexium 15 servo drives (fitted with SERCOS option card). The servo drives manage the position loop, speed loop and torque loop, and ensure power conversion to control the servo motor. The sensor feedback information is sent to the servo drive (current position, current speed).
■ BDH and BSH servo motors. The motors feature permanent magnets delivering a high power-to-weight ratio, resulting in excellent dynamic speed response in a compact unit.
The Lexium 15 range offers all the accessories required (line chokes, braking resistors, etc.) as well as a full set of connectors.

(1) The **TSX CSY 85** *module also supports path functions using the TjE path editor software.*

System overview

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



Characteristics: page 4/48 | Functions: page 4/50 | References: page 4/53 | Connections: page 4/53

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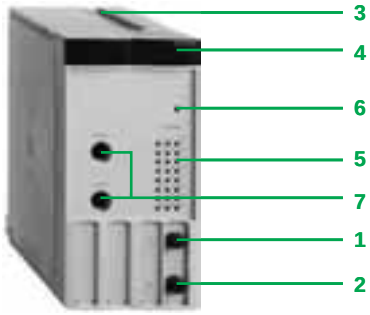
Modicon Premium automation platform
SERCOS TSX CSY 84/85/164 motion control modules

System overview (continued)

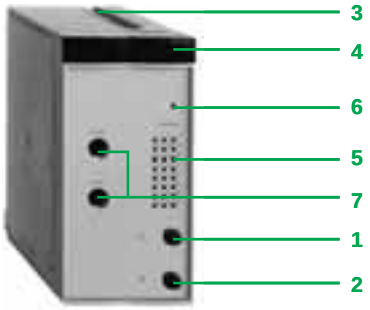
PL7 Junior/Pro or Unity Pro software via the Premium platform terminal port can be used to:
- Declare SERCOS **TSX CSY 84/85/164** modules in the PLC configuration.
- Configure the functions and define the parameters for the axes used.
- Program the movements in the PLC application.
- Adjust the parameters via the operating codes (parameters, TSX CSY module and Lexium 15 servo drive with SERCOS option card).
- Test and debug the application.

Unilink software, via the Lexium 15 servo drive's RS 232 terminal port (with SERCOS option card) can be used to:
- Define types of Lexium 15 servo drive (with SERCOS option card) and BDH/BSH servo motor.
- Adjust the parameters for Lexium 15 servo drives (with SERCOS option card), back them up in the servo drive EEprom memory and save them on a compatible PC.

Description



TSX CSY 84/164



TSX CSY 85

The SERCOS **TSX CSY 84/85/164** axis control modules comprise:
1 An SMA-type connector, marked TX, for connecting the servo drives using the SERCOS ring fibre optic transmission cable.
2 An SMA-type connector, marked RX, for connecting the servo drives using the SERCOS ring fibre optic reception cable.
3 Double format rigid casing, in order to:
- Support electronic cards.
- Attach and lock the module in its slot.

4 Module diagnostics LEDs:
- RUN LED (green): LED ON indicates module operating correctly.
- SER LED (yellow): flashing LED indicates data transmission and reception on the SERCOS network.
- ERR LED (red):
  - -LED ON indicates internal module fault.
  - -flashing LED on module start up indicates communication fault, incompatible configuration or application missing.
- I/O LED (red): LED ON indicates external fault or application fault.
- INI LED (yellow): flashing LED indicates module reinitializing.

5 Channel diagnostic LEDs (green): LED ON indicates axis operating normally; OFF: configuration fault; flashing: serious error on axis:
- 1 to 8: display of 8 real axes *(1)*.
- 9 to 12: display of 4 imaginary axes *(1)*.
- 13 to 16: display of 4 remote axes *(1)*.
- 17 to 20: display of 4 coordinated sets.
- 21 to 24: display of 4 follower sets.

6 A pencil point button to reinitialize the module.
7 Two mini DIN type 8-way connectors for Schneider Electric use.

(1) 1 to 16: display of 16 axes (real, imaginary or remote) with module **TSX CSY 164**.

4

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Modicon Premium automation platform
SERCOS TSX CSY 84/85/164 motion control modules

Electrical characteristics

Module type			TSX CSY 84	TSX CSY 85	TSX CSY 164
SERCOS network:	Type		Industrial support complying with standard EN 61491		
	Topology		Ring		
	Medium		Fibre optic cable		
	Rate		4 Mbps by default		
	Cycle time *(1)* (independent axes)	ms	**2 axes**: 2 / **4 axes**: 2 / **8 axes**: 4		**2/4/8 axes**: 2 / **12 axes**: 3 / **16 axes**: 4
	Max. number of segments		9		17
	Length of segment	**m**	38 max. with plastic fibre optic cable, 150 max. with glass fibre optic cable		
Bus X	Distance	**m**	100 max. *(2)* between TSX CSY 84/85/164 axis control module and Premium processor		
SERCOS certification			TSX CSY 84/164 modules comply with SERCOS IEC/EN 61491 certification and with the tests defined by IGS (SERCOS Interest Group). Certification no. Z00030		
Power consumption for 5 V⎓ voltage		**A**	1.8		
Power dissipated in the module		**W**	9 (typical)		

Operating characteristics

Module type			TSX CSY 84	TSX CSY 85	TSX CSY 164
Number of channels			32 configurable channels (0 to 31), channel 0 used for SERCOS ring configuration		
Type of axes	Real axes (connected to a servo drive)		8 (channels 1 to 8)		16 (channels 1 to 16) may be dynamically configured as real axes, imaginary axes or external encoders
	Imaginary axes		4 (channels 9 to 12)		
	Remote axes *(3)*		4 (channels 13 to 16)		
Set of axes			4 coordinated (channels 17 to 20) Each set allows simple linear interpolation of 2 to 8 axes		
			4 followers (channels 21 to 24) Each set can have up to 7 axes: 1 master/6 slaves in gearing or camming mode		
Cam profile			7 (channels 25 to 31). Used to create the electronic cams with linear or cubic interpolation between profile points		
Path functions			Simple linear paths, following of auxiliary axes	Linear paths: - with 3° or 5° polynomial links. - with circular link on 2 axes. Circular path TjE path editor software for sets of 2 or 3 axes	Simple linear paths, following of auxiliary axes

(1) 4 ms default value. Values may be programmed according to the number of axes.
(2) Without use of the **TSX REY 200** *bus X remote module.*
(3) Determine external position using an encoder connected to the servo drive position input.

Presentation: page 4/46 | Functions: page 4/50 | References: page 4/53 | Connections: page 4/53

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Main functions of TSX CSY 84/85/164 modules

Programming	Movements	Homing, absolute, relative or continuous Immediate movement, or queued, to a given position Speed override possible Acceleration and deceleration parameters may be set for each axis motion control Synchronization on start or desynchronization on stop for a slave axis on a master axis in a given position Rollover counter
	Special functions	Position capture and distance measurement between two edges on one or two logic inputs on the servo drive. This can be applied to the real or remote axis (position measurement via external sensor) Count probe: counts the edges on a logic input on the servo drive over a period of time Fast index: starts a movement on an event Registration move: position capture on an edge of the logic input on the servo drive Rotary knife: cuts using a rotary knife. Synchronizes a circular axis on a linear axis and controls a logic output on the servo drive
	Other special functions	It is possible to develop all other special functions with the assistance of our application services. Please consult our Regional Sales Offices.
	Stop/start functions	Fast stop, stop on configured deceleration profile Temporary stop Restart of stopped movement Choice of stop method: ■ on faulty slave: master is not stopped. Master stops normally according to pre-determined deceleration ramp or servo-driven master emergency stop ■ on faulty master: slave stops normally according to pre-determined deceleration ramp or servo-driven slave emergency stop On Emergency Stop: calculation of slave axis deceleration ramp alignment with master axis to obtain synchronized stopping of all axes in the set On Emergency Stop: axes may be allowed to “freewheel” or may be stopped according to a pre-determined ramp
Configuration and adjustment	SERCOS ring	Bus cycle time, traffic on the bus, optical power on the fibre, SERCOS loop diagnostics
	Acceleration/deceleration	Ramp values, ramp type (rectangular, triangular and trapezoid), choice of units, maximum acceleration adjustment
	Speed	Speed units, default speed, maximum speed, speed override
	Other settings	Target window, rollover, software limits
	Set of follower axes	Following of master axis by gearing or camming (cam profile), threshold position of master triggers the following, bias value when synchronizing an axis, monitoring of master/slave positions, master offset for follower axis
	Set of coordinated axes	Type of interpolation: linear
	Cam profile	Values of an existing point of a cam profile, number of points (5000 max.), type of interpolation, table addresses
	State of a movement or axis	Moving, accelerating, decelerating, homing, in position, faulty, etc.
	Diagnostics	Servo drive fault, axis currently reading data, following error, overvoltage, undervoltage, overcurrent, power supply fault Availability of follower axis fault information for a given axis set Multi-axis motion path control according to a common tolerance for all axes in the motion, with alarm feature. Only available with the TSX CSY 164 module

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Modicon Premium automation platform
SERCOS TSX CSY 84/85/164 motion control modules

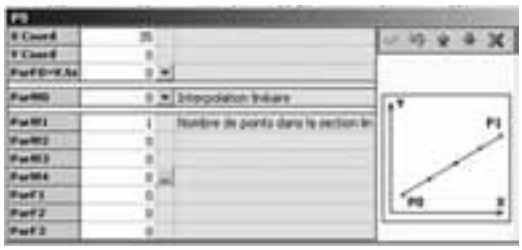
Functions specific to the TSX CSY 85 module

Path creation using TjE editor



All paths, whether simple or complex, are divided into linear or circular segments linked by interpolation laws of 6 possible types. Each segment is characterized by:
- The X and Y coordinates of the point to be reached (in the example on the left, P6) or "tangented" (P1, P2,....P5)
- The movement speed, maximum or limited according to setpoint (parameter "ParF0", see screens below):
  - The type of interpolation (parameter "ParW0", see screens below)
  - The number of points in the linear segment (min. 1 point)
  - The number of points in the cubic interpolation part of the segment
  - Various other parameters depending on the type of interpolation

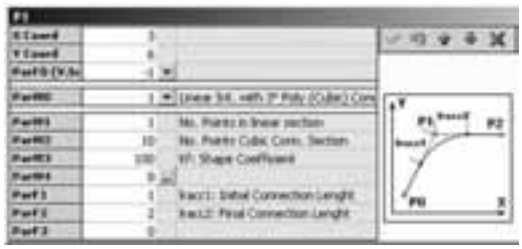
Linear interpolation



This type of interpolation is used to create a rectilinear path between the preceding point P_{i-1} and point P_i defining the segment. The various parameters below are used as follows:
- "ParW1" indicates the number of points in the linear segment. The number of points represents the number of intermediate points that the **TSX CSY 85** motion control module must calculate to define the path on the segment (minimum 1).
- "ParW4" is used to indicate that the movement of a third axis will follow the path (here, a linear segment) using the tangential mode: positioning according to a constant angle with the path *(1)*.

(1) Available in the future version of the TjE software.

Linear interpolation with 3° polynomial interpolation connection



This type of interpolation is used to create a curve between two linear segments in accordance with a 3° interpolation in order to smooth the transitions. The path no longer passes through the defined point P_i (in the example on the left, P1) but follows a curve defined by the following parameters:
- "ParW2" indicates the number of points in the cubic interpolation part (curve)
- "ParW3" defines the shape coefficient of the cubic interpolation enabling the curve to move closer to or further from the defined point P_i
- "Iracc1" and "Iracc2" correspond to the initial and final connection lengths. If these lengths are too great, maximum lengths are calculated by the **TSX CSY 85** motion control module as a function of the previous section for Iracc1 and of the following section for Iracc2.

Linear interpolation with 5° polynomial interpolation connection



This type of 5° polynomial interpolation is used to define a path in the same way as that using 3° polynomial interpolation.

Nonetheless, compared to a 3° interpolation, 5° interpolation ensures more flexible movement.
If the acceleration limit in the segment in question is reached, however, the speed on the segment can be reduced for this type of connection.

Linear interpolation with circular interpolation connection



This type of interpolation is used to link segments via a circular path (circle arcs or full circles). The specific parameters defining this type of path are:
- "ParW2" indicates the number of points in the circular interpolation part
- "ParW4" defines whether the arc is greater or less than 180° (defining the arc direction)
- "ParF1" corresponds to the length of the circular interpolation segment

Circular interpolation is only possible for a movement in a plane involving only 2 axes.

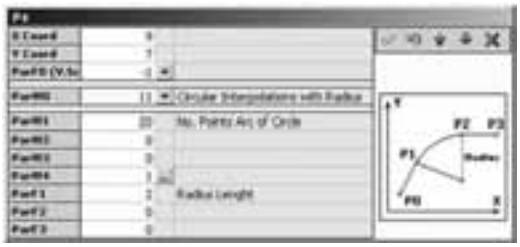
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Modicon Premium automation platform
SERCOS TSX CSY 84/85/164 motion control modules

Functions specific to the TSX CSY 85 module (continued)

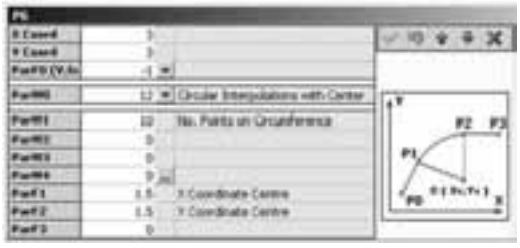
Circular interpolation according to radius



This type of interpolation is used to connect segments via a circular path (circle arcs) by specifying the start and end points, the circle radius and the path direction (clockwise or counter-clockwise). The specific parameters defining this type of path are:
- "ParW1" indicates the number of points in the circle arc
- "ParW4" defines the path direction (clockwise or counter-clockwise)
- "ParF1" corresponds to the radius of the circle arc

Circular interpolation according to radius:
- Is only possible for a movement in a single plane (2 axes only)
- Cannot be used to create paths in a full circle (to do this, use linear interpolation with connection according to circular interpolation)

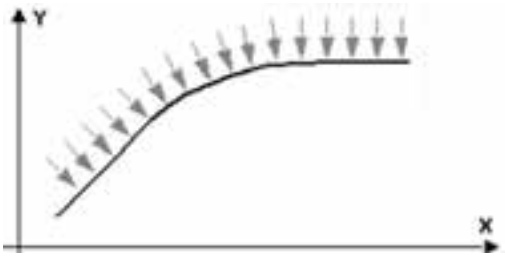
Circular interpolation according to centre



This type of interpolation is also used to connect segments by a circular path (circle arcs or full circles) by specifying the start and end points, the circle centre coordinates and the path direction (clockwise or counter-clockwise). The specific parameters defining this type of path are:
- "ParW1" indicates the number of points in the circle arc
- "ParW4" defines the path direction (clockwise or counter-clockwise)
- "ParF1" indicates the abscissa of the centre of the circle (X)
- "ParF2" indicates the ordinate of the centre of the circle (Y)

Full circular movement is defined as the end point being the same as the start point.
Circular interpolation is only possible for a movement in a single plane (2 axes only).

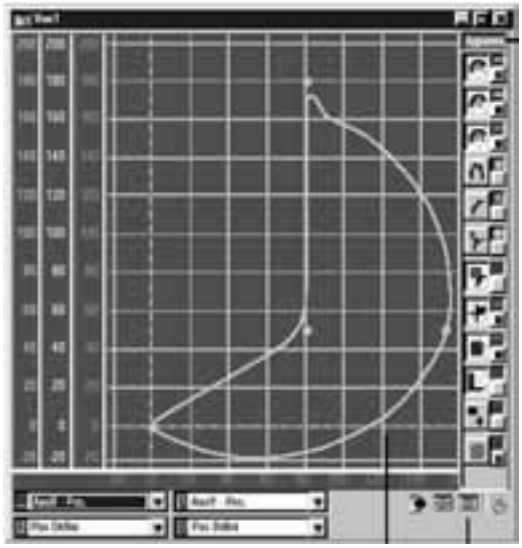
Tangential axis interpolation



Tangential axis interpolation applied to a third angular axis is used to enable it to follow the path defined by the first two axes according to a constant and controlled angle.
Tangential mode will be fully available in a future version.

This version V1.0 of the **TSX CSY 85** module, however, offers functions for creating tangential mode using the PL7 application.

TjE path editor software



The TjE path editor software supplied with the SERCOS **TSX CSY 85** motion control module is used in offline mode to:
- Create master/slave axes and axis sets for use in the paths with a maximum of 3 sets of 2 real axes or 2 sets of 3 axes.
- Each slave axis requires a cam profile selected from the 7 profiles available in the **TSX CSY 85** module (with a limit of 10,000 cam points for all the profiles).
- Define paths by setting the parameters for each segment which are linked to the various possible interpolations described in pages 4/50 and 4/51.

The TjE software validates all the parameters and calculates the paths for each set of axes.

Path display

The TjE software integrates different graphic tools for displaying the previously created paths and the relevant data linked to the axes (making up the paths) with their positions, speeds and accelerations. The paths can be displayed with:
- A choice of curves, colours and scaling
- A choice of scales and offsets
- Display of segment reference points
- Display of points of the master, and calculated points of cam profiles

This display enables the user to validate the paths before transferring all the data thus generated to the PL7 Junior/Pro application managing the SERCOS **TSX CSY 85** motion control module(s).

(1) Maximum 8 real axes per **TSX CSY 85** *module.*

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Modicon Premium automation platform
SERCOS TSX CSY 84/85/164 motion control modules

Software setup of TSX CSY 84/85/164 modules



Module configuration



Declaring the axes of the TSX CSY 164 module



Setting the axis parameters



Debugging in PL7 Pro software

When setting up application-specific functions, screens specific to SERCOS motion control functions can be accessed via Unity Pro or PL7 Junior/Pro software, for configuration, adjustment, debugging and documentation of applications. These services are performed by editors which can be directly accessed from the basic screen using icons in the toolbars. Windows relating to the editors can be simultaneously displayed on one screen (example: it is possible to program using the program editor and to simultaneously define the symbols in the variables editor).

Declaring the SERCOS motion control modules

Parameter entry for application-specific functions is accessed via the configuration screen, by clicking on the slot occupied by the module.

Configuring the module

The configuration editor provides assistance with entering and modifying the values of the various axis configuration parameters. These parameters enable the operation of the axis control module to be adapted to the machine which is to be controlled.
The axes configuration parameters are:
- Units of measurement
- Resolution
- Maximum and minimum limit positions
- Maximum speed
- Accelerating/decelerating

This data relates to the machine and cannot be modified by the program.

The configuration screen as shown here can be used to declare the 16 axes as real, imaginary or remote measurement axes in the **TSX CSY 164** module.

Adjusting the modules

These parameters are associated with operation of the axes. They generally require the operations on and movements of the moving part to be known. These parameters are adjusted in online mode (they are initialized during configuration, in offline mode). They include:
- Maximum speed
- Resolution
- Servo control parameters
- Accelerating/decelerating

Debugging the modules

In online mode, the debugging tool provides the user with a control panel screen, giving a quick display which can be used to control and observe the behaviour of the axis.

The **TSX CSY 84/85/164** modules associated with the Unity Pro or PL7 Junior/Pro software provides manual mode for running continual (JOG) or incremental (INC) motion commands without prior programming.

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Modicon Premium automation platform
SERCOS TSX CSY 84/85/164 motion control modules

References



TSX CSY 84/164



TSX CSY 85

TSX CSY 84/85/164 multi-axis control modules have 32 application-specific channels which are only counted they are configured in the Premium PLC application (using PL7 Junior/Pro or Unity Pro software). The maximum number of application-specific channels allowed depends on the type of processor:

Type of processor or slot PLC	TSX 57 0● TSX 57 1●	TSX 57 2● PCX 57 20 PCI 57 20	TSX 57 3● PCX 57 35 PCI 57 35	TSX 57 4●	TSX 57 5● TSX 57 6●
Max. number of application-specific channels	4 (P57 0●) 8 (P57 1●)	24	32	64	64

Motion control modules

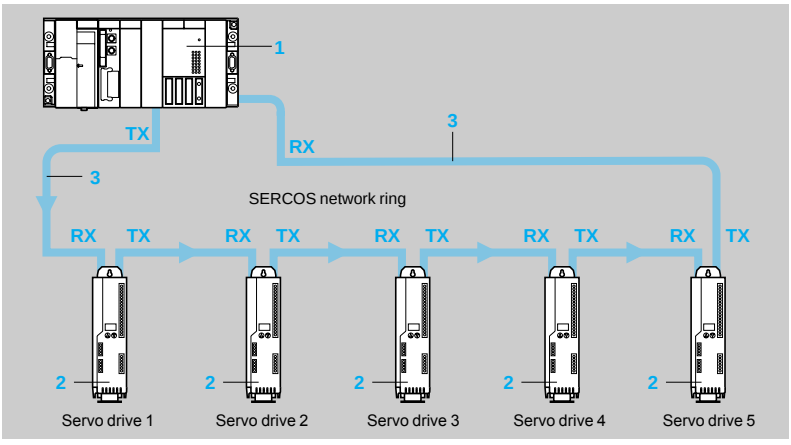
Description	Functions	Number of axes	Reference	Weight kg
Multi-axis control modules	SERCOS digital servo drives control	8 real axes 4 imaginary axes 4 remote axes	**TSX CSY 84**	0.520
		8 real axes 4 imaginary axes 4 remote axes TjE path creation function	**TSX CSY 85**	0.520
		16 axes (real, imaginary or remote)	**TSX CSY 164**	0.520

Fibre optic connection cables

Description	Connection	Length	Reference	Weight kg
Plastic fibre optic cables fitted with SMA-type connectors (curvature radius: 25 mm min.)	Lexium 15 servo drive (with SERCOS option card)	0.3 m	**990 MCO 000 01**	0.050
		0.9 m	**990 MCO 000 03**	0.180
		1.5 m	**990 MCO 000 05**	0.260
		4.5 m	**990 MCO 000 15**	0.770
		16.5 m	**990 MCO 000 55**	2.830
		22.5 m	**990 MCO 000 75**	4.070
		37.5 m	**990 MCO 001 25**	5.940

Connections

SERCOS ring with five Lexium 15 servo drives (example)

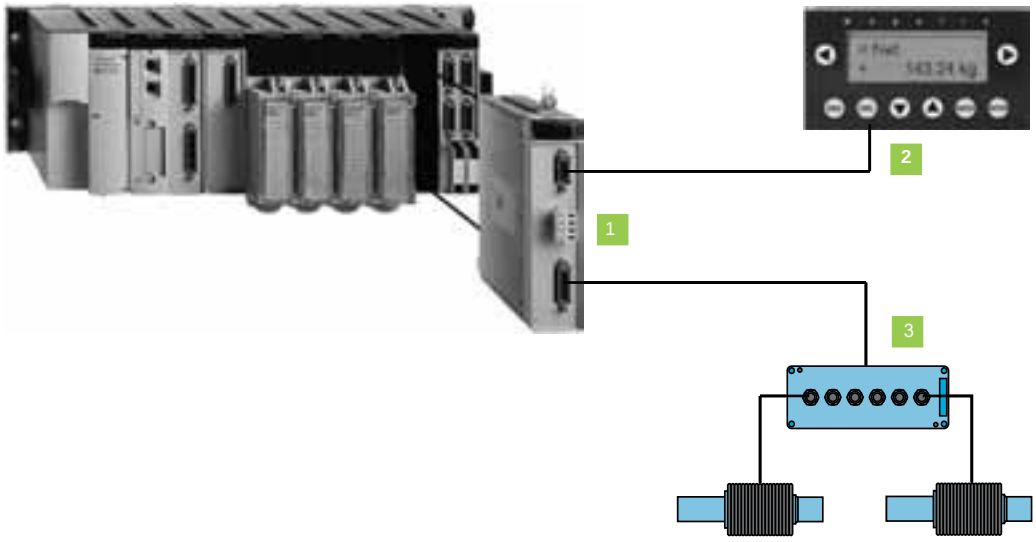


1 **TSX CSY 84/85/164**: multi-axis motion control module for Premium PLC.
2 **LXM 15●●●M3/N4/N4X**: Lexium 15 servo drives fitted with the SERCOS **AM0 SER 001V000** option card.
3 **990 MCO 000 ●●**: plastic fibre optic cables fitted with SMA-type connectors.
TX Transmission
RX Reception

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Modicon Premium automation platform
ISP *Plus* integrated weighing system

The ISP *Plus* weighing range, when used with the Premium PLC, enables the automation of machines combined with weighers or installations



1 Weighing module

The **TSX ISP Y101** standard format weighing module is the central part of the weighing system.
It has:
- A measurement input which will take up to 8 sensors.
- A sealable link for the display unit.
- Two discrete reflex outputs for weigher doser applications.

2 Weight indicator

The **TSX XBT N410** remote display unit displays the measured weight with no prior configuration. When the link to the weighing module is sealed, this display unit then becomes the main display unit for commercial transactions.
The **TSX ISP Y121** module/display unit assembly conforms to OIML recommendations and is CE approved for class III weighers (6000 scale divisions) and for class IIII weighers (1000 scales divisions).

3 Accesories

Junction boxes, cables and test circuit.

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Modicon Premium automation platform
ISP *Plus* integrated weighing system

When a **TSX ISP Y101** weighing module is plugged into a Premium programmable controller, it is possible to go beyond the scope of a simple weighing application. The PLC manages not only the entire weighing environment, but also the whole of the machine or industrial process associated with the weighing system.

In a Premium configuration, the number of **TSX ISP Y101** weighing modules must be added to the other dedicated modules (TSX SCY 21601 communication, TSX CTY counting, TSX CAY/CSY axis control and TSX CFY movement control). The maximum of **TSX ISP Y101** weighing module (2 application-specific channels per module) permissible is :
- 2 dedicated modules with TSX P57 0● processor.
- 4 dedicated modules with TSX P57 1● processor.
- 12 dedicated modules with TSX P57 2● processor.
- 16 dedicated modules with TSX P57 3● processor.
- 32 dedicated modules with TSX P57 4●/5●/6● processor.





Description

Weighing module

The **TSX ISP Y101** weighing module has the following on the front face:
1 A SUB-D 9-way female connector for the dedicated RS 485 serial link to the weight indicator.
2 A screw terminal block for connecting the 2 discrete reflex outputs (outputs used with threshold detection).
3 A SUB-D 15-way female connector for the indicator input channel (50 samples per second, from 1 to 8 load cells).
4 Module sealing device, if required.

Weighing indicator

Weight values are displayed on a **TSX XBT N410** weight indicator (supplied with the TSX ISP Y121 unit). The weight indicator is pre-configured.

It has the following on the front face:
1 An LCD, back-lit display screen with 4 lines of 20 characters (height 4,34 mm).
2 Two control or contextual link keys, non configurable
3 Six service keys

The back is equipped with:
□ A plug-in screw terminal block for ⎓ 24 V external power supply.
□ A 25-way SUB-D type female connector for connection to the **TSX ISP Y101** weighing module (30 m maximum).

Strain gauge type load cells and connection accessories

Consult your Regional Sales Office.

4

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Modicon Premium automation platform
ISP *Plus* integrated weighing system

Functions

The weighing module with its associated display unit constitutes a weighing indicator. The module incorporates numerous functions specific to weighing:
- Continuous weighing (in g, kg, t, lb, oz…) and flow calculation (weight variation).
- Filtering of measurements by several methods (19 filtering options).
- Tare (automatic/manual) and preset tare.
- Automatic reset.
- Weighing stability control.
- Threshold detection with extrapolation of the cut-off point: positioning of local "discrete" outputs to the nearest millisecond.
- Assisted calibration: the module calculates the zero point and the gradient.
- Calibration parameters saved in the module (EEPROM) and in the Premium processor.
- Forced calibration: fast replacement of a failed module and restarting using the previous calibration parameters.
- Locking of the configuration, sealing of the module and its connections to the load cells and weight indicator.
- Continuous formatting and transmission of measurements to the PLC.
- Transmission of measurement validity data (validity, stability, nett/gross…).
- Transmission of diagnostic data from the module and its connections.
- Configuration, calibration and debugging via Unity Pro or PL7 Junior/Pro screens.
- Most of the operating parameters can be modified and most of the functions can be run by PLC program.

Setting up the weighing module

Unity Pro or PL7 Junior/Pro software allows complete setting up of the weighing system (configuration, calibration and debugging).



Configuration

Configuration

This covers:
- The measuring data of the weigher.
- Filtering of measurements.
- The flow calculation method.
- The tare.
- Data format.
- Stability criteria and zero point management method.
- Threshold monitoring for positioning of discrete outputs.



Weigher calibration

Weigher calibration

The module itself calculates the gain and the offset to be applied to the electronic weighing system. Calibration is carried out in two phases:
- Measurement of the dead load.
- Measurement of a standard weight.

Forced calibration allows immediate restarting of the system in the event of a module failure; the new module is configured automatically.



Debbuging

Debugging

The dedicated weighing screen provides the following dynamic display:
- The measurement in progress.
- The operating state of the module.

It also allows fast modification of setting parameters (filtering, flow, threshold values…).
Instructions and parameters that can be modified by the program in real time with the module.
These parameters and instructions can be monitored from an operator dialogue type device and/or a supervisory device connected to the Premium.

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Modicon Premium automation platform
ISP *Plus* integrated weighing system

Electrical characteristics of weighing module TSX ISP Y101

Measurement input	1 weigher per module		1 measurement input
	Resolution		1 048 576 points (20 bits)
	Measuring rate		50 measurementss per second
	Input impedance	**MΩ**	> 1
Input load cells	Number that may be connected		Maximum of 8 x 350 Ω load cells, connected in parallel
	Supply voltage	**V**	⎓ 10
	Supply type		d.c.
	Cabling distance	**m**	300 (without loss of accuracy with 4 load cells)
Discrete reflex outputs	Number		2 positive logic transistor outputs, for sack weighing, filling and sort/check weighing.
	Nominal voltage	**V**	⎓ 24
	Nominal current	**mA**	500
	Response time		1 ms discrimination. The point at which the thresholds are crossed between 2 measurements is calculated by polling to the nearest millisecond.
Weight indicator output	Physical interface		RS 485 non isolated
	Binary flow	**K bit/s**	9.6
	Remote connection distance	**m**	30 (maximum)
Consumption		**mA**	See page 9/6
Environment	Weights and measures		The weighing module associated with its weight indicator conforms to OIML recommendations. It is CE approved for class III (up to 6000 divisions) and class IIII (up to 1000 divisions) weighers in accordance with European circular 90 384 of 20th June 1990.
	Minimum voltage division	**µV**	1
	CE certification		SDM n° 97.06 - Revision of 15 june 1999 LCIE 03 ATX 6399X of 21 january 2004

Characteristics of weight indicator Magelis TSX XBT N410

Display	Type of screen			Green back-lit LCD
	Number of lines			1 line of 5 characters (17.36 x 11.8 mm) to 4 lines of 20 characters (4.34 x 2,95 mm) For weighing applications, used 2 lines of 10 characters (8.38 x 5.9 mm)
Keys				8 keys
Alimentation	Nominal voltage		**V**	⎓ 24 non isolated
	Limit voltages		**V**	⎓ 18…30
	Ripple			5 % max.
	Consumption		**W**	5 max.
Signalling				–
Environment	Conforming to standards			IEC/EN 61131-2, IEC/EN 60068-2, UL 508, CSA 22.2 No. 14
	Product certifications			CE, UL, CSA Class 1, Div. 2 (UL and CSA), ATEX zone 2/22
	Temperatures	Operation	**° C**	0…55
		Storage	**° C**	- 20…+ 60
	Degree of protection	Front pannel		IP 65, conforming to IEC/EN 60529, Nema 4X (outdoor use).
		Rear panel		IP 20, conforming to IEC/EN 60529

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Modicon Premium automation platform
ISP *Plus* integrated weighing system



TSX ISP Y111







TSX ISP Y121



SM1 PS371



SM1 PY52



SF2 PY3504



TSX XBT N410

ISP *Plus* weighing modules

Description	Composition	Reference	Weight kg
ISP *Plus* weighing modules (1 weigher per module) *(1)* Supplied non calibrated	Standard format module (sealable) - Load cell input 50 meas./s (for 1 to 8 load cells), - 2 reflex discrete outputs (for threshold detection), - RS 485 output (for display)	**TSX ISP Y101**	0.420
	- Module TSX ISP Y101. - Indicator TSX XBT N410 (LCD back-lit, preconfigured display). - Module/weight indicator connecting cable (length 3 m)	**TSX ISP Y121**	1.020

Accessories for maintenance test (supplied with a 4 m cable)

Function	For use with	Mounting	Reference	Weight kg
Load cell simulation	ISP *Plus*	Separated	**SM1 PS371**	0.520
Test circuit (voltage)	ISP *Plus*	Separated	**SM1 PS381**	0.100

Junction boxes for load cells

Material	Number of load cells	Reference	Weight kg
Metal *(2)*	4	**SF2 PY3504**	0.800

Intrinsically safe junction box *(3)*

This box is installed in the weighing system between the weighing indicator and the junction box in which the load cells are grouped. Its function is to limit any peak voltages and to limit the current to 100 mA in the event of a short circuit.
The load cells and junction box are the only devices located in the explosive environment; the weighing indicator is located in a safe environment.

Description	For use with	Marking	Reference	Weight kg
Zener barrier box	All types of load cells and weighing indicators	EEx ib II B EEx ib II C	**SM1 PY52**	2.800

Remote weight indicator

Description	Length	Reference	Weight kg
Weight indicator for connection to the ISP *Plus* weighing module ⎓ 24 V external supply	–	**TSX XBT N410**	0.380
Module/weight indicator connecting cables	5 m	**SF3 CPY005**	0.500
	10 m	**SF3 CPY010**	1.100
	15 m	**SF3 CPY015**	1.700
	20 m	**SF3 CPY020**	2.200
	25 m	**SF3 CPY025**	2.800
	30 m	**SF3 CPY030**	3.400

(1) The setup of weighing modules requires of Unity Pro ≥ V2.0 or PL7 Junior/Pro ≥ V4.1. software.
(2) When a weighing system is located in an explosive environment, a metal junction box must be used.
(3) Equipment approved by the Laboratoire Central des Industries Electriques (LCIE) (Central Laboratory for the Electric Industries).

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References (continued)

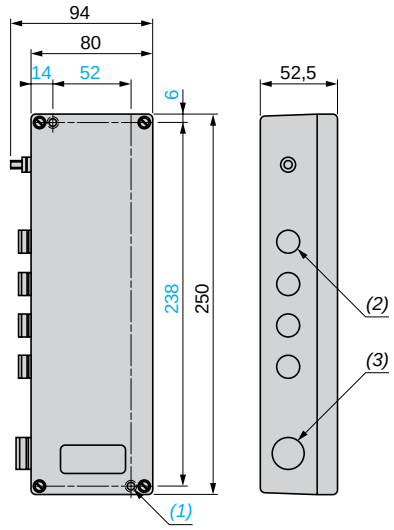


SF3 PY32●●●

Descritpion	For connection to	Length m	Reference	Weight kg
Indicator cable: 6-core with 1 SUB-D type 15-way connector for ISP *Plus*	Junction box SF2 PY3504	3 m	**SF3 PY32003**	0,300
		10 m	**SF3 PY32010**	1,100
		20 m	**SF3 PY32020**	2,200
		30 m	**SF3 PY32030**	3,400
		40 m	**SF3 PY32040**	4,500
		50 m	**SF3 PY32050**	5,600
		60 m	**SF3 PY32060**	6,900
		80 m	**SF3 PY32080**	9,000
		120 m	**SF3 PY32120**	13,500
		200 m	**SF3 PY32200**	22,500
		300 m	**SF3 PY32300**	33,500

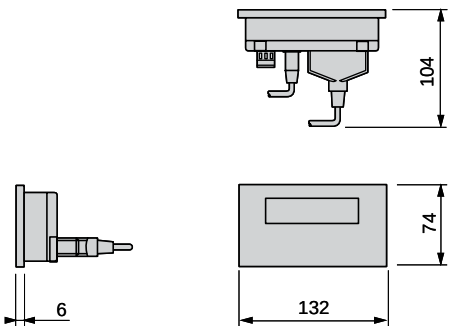
Dimensions, mouting

Junction boxes SF2 PY3504

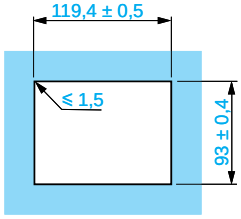


(1) 2 fixing holes for Ø 4 mm screws and lead sealing.
(2) 4 cable glands, capacity 5 mm max..
(3) 1 cable gland, capacity 8 mm max..

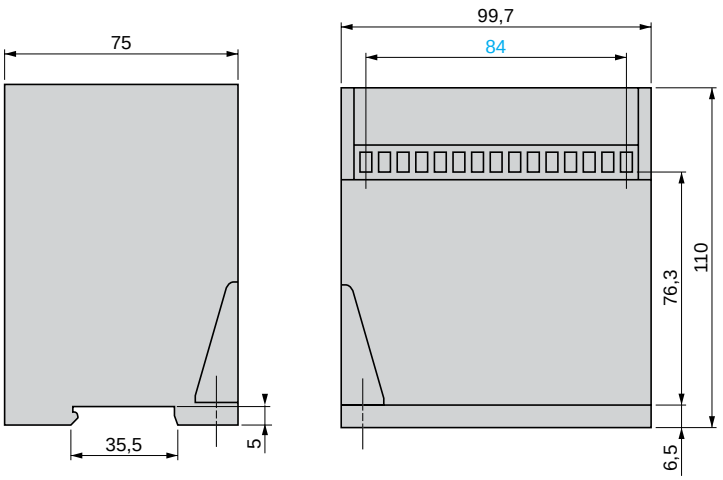
Weight indicator TSX XBT N410



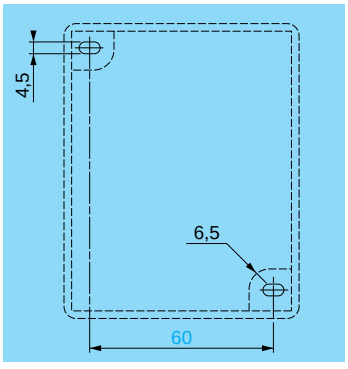
Cut-out for flush mouting
Fixing by 2 spring clips (including) on 1.5…6 mm thick panel



Zener barrier box SM1 PY52



Mouting zener barrier box SM1 PY52

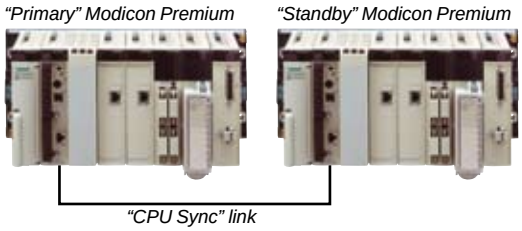


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Modicon Premium automation platform

Hot Standby system

Unity Pro software



Presentation

The Premium Hot Standby redundancy offer, which is compatible with Unity Pro software, ensures continuity of operation for an automation system based on a Modicon Premium platform in the event of failure of:
- Central processing and communication functions
- All or part of the I/O system

It is based on the "Primary/Standby" redundancy principle, with complete redundancy of the main processing and communication functions, the use of shared I/O on the Ethernet Modbus/TCP network, a Modbus link and/or redundancy of in-rack I/O (single-rack configuration only).

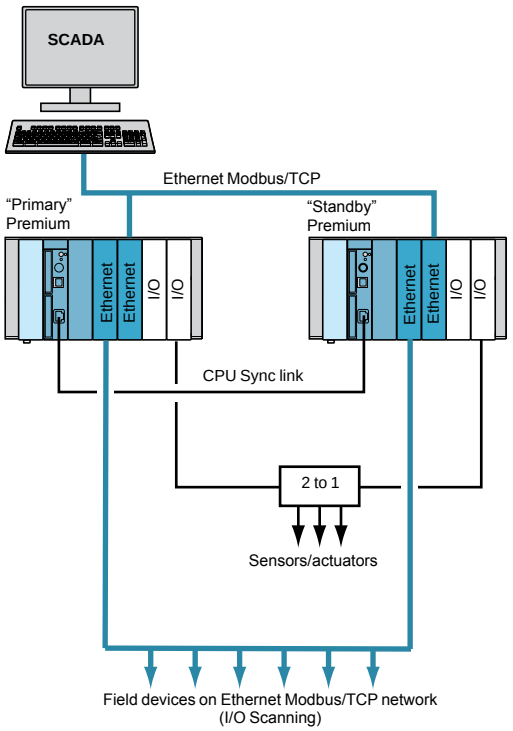
Premium Hot Standby redundant architectures offer an ideal solution for availability requirements when changeover time is not critical. They are designed for processes which can tolerate a lack of control on the part of the Premium PLC lasting up to one second (average changeover time from the "Primary" unit to the "Standby" unit and for updating shared I/O on Ethernet).

They can meet all availability requirements when the purpose of the PLC is to monitor and control an installation in continuous operation, signal incidents to a control station, and transmit command instructions from the supervision manager to various locations on an extensive site.

Example areas of application:
- Centralized technical management of a public facility (tunnel, airport, signals, etc.)
- Control/monitoring of a water treatment or distribution station
- Electrical technical management
- Hydroelectric power production
- etc.

Principle

At the centre of the system, there are two Modicon Premium single-rack configurations called the "Primary" PLC and the "Standby" PLC. Their hardware and software configurations are identical (i.e. identical modules in each rack). The offer comprises two processor models (**TSX H57 24M** and **TSX H57 44M**) designed specifically for Hot Standby architectures with Unity Pro software (version ≥ 3.1). This dual processor configuration combines the functions of the CPU and redundant coprocessor in the same unit.



The "Primary" PLC:
- Executes the application program and manages the I/O, which can take the form of:
  - Field devices on an Ethernet network managed by the I/O Scanning service (see page 5/30)
  - Field devices on a Modbus master link
  - Sensors and actuators connected to Premium I/O modules on bus X with single-rack configuration
- Safeguards the transfer of all data via the "CPU Sync" link to the "Standby" PLC at the start of every cycle

In the event of a failure affecting the "Primary" PLC, the standby system changes over automatically, whereby execution of the application program and control of the I/O is changed over to the "Standby" PLC within 1.5 cycles, with an up-to-date data context.

An automatic mechanism for the assignment of "IP" and "IP + 1" addresses changes the addresses of the Ethernet network modules with the 2 Premium configurations which manage the field devices. The same mechanism is used for "n" and "n + 1" slave address assignments for Modbus link modules.
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.

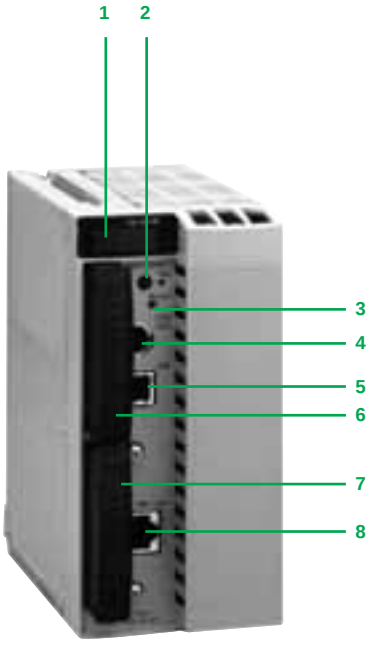
Description: page 4/61 | Architectures: pages 4/62 | Functions: pages 4/66 | Characteristics: page 4/68 | References: page 4/69

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Modicon Premium automation platform

Hot Standby system

Unity Pro software



TSX H57 24M/44M

Hot Standby processors TSX H57 24M/44M

The double-format Premium Hot Standby processors **TSX H57 24M** and **TSX H57 44M** comprise, on the front panel:

1 A display unit consisting of six LEDs:
■ RUN LED (green):
□ LED permanently on: Processor in “Primary” mode during operation (program running)
□ Flashing 2.5 s (on)/0.5 s (off): Processor in “Standby” mode during operation (execution of first program section)
□ Flashing 0.5 s (on)/2.5 s (off): Processor not in standby mode
□ Flashing 0.5 s (on)/0.5 s (off): PLC in Stop mode
■ ERR LED (red):
□ LED permanently on: Fault on the processor or its on-board devices (PCMCIA memory card)
□ Flashing 0.5 s (on)/0.5 s (off): Application fault
■ TER LED (yellow): Activity on the TER/AUX terminal port
■ I/O (red), permanently on: Fault on another module on the PLC station, or configuration fault
■ STS LED (yellow):
□ Flashing 0.5 s (on)/0.5 s (off): Redundant mode between the “Primary” and “Standby” processors is fault-free
□ LED permanently on: Standby mode not active or being initialized
□ Off: Processor self-test failure
■ ACT LED (yellow): Activity on the “CPU Sync” link between the “Primary” and “Standby” processors is fault-free
Diagnostics at redundancy mode level is supported by the 3 LEDs (RUN, ERR and STS) on the **TSX ETY 4103/5103** communication modules managing the shared I/O on Ethernet.

2 One Memory Extract button: Not operational on Hot Standby processors
3 One RESET button which initiates a cold restart of the PLC when activated
4 An 8-way female mini-DIN connector marked TER/AUX for connecting a programming, adjustment or user interface terminal
5 A USB connector marked TER for connecting a programming terminal (requires **UNY XCA USB 033** 3.3 m connection cable for connection to a compatible PC; to be ordered separately)
6 A PCMCIA slot (no. 0) for a memory extension card
7 A PCMCIA slot (no. 1) for a memory extension card to store additional data *(1)*
8 An RJ45 connector marked HSBY Link, designed for Hot Standby communication between the “Primary” and “Standby” processors

“CPU Sync” link

The “CPU Sync” link **8** (marked HSBY Link) on the front panel of Hot Standby processors is an Ethernet 10BASE-T/100BASE-TX port dedicated to data exchange between the “Primary” and “Standby” PLCs on the standby system.
This link is used by the active “Primary” PLC (from the point of view of the system I/O) to replicate its context (status of its data) with the “Standby” PLC on every application cycle in such a way that, in the event of a changeover triggered by a failure of the “Primary” PLC, the “Standby” PLC can take control of the automation system within 1.5 processor cycles.
The “CPU Sync” link is a copper link with a maximum length of 100 m.

⚠ The use of active components (transceivers, switches, …) on “CPU Sync” link is strictly forbidden.

USB port

The USB port **5** with a useful data rate of 12 Mbit/s is compatible with Unity Pro programming software and the OPS data server (OPC Factory Server).
TSX H57 24M/44M processors can be connected to a USB bus with several peripheral devices. However:
■ Only one processor can be connected to the USB bus.
■ None of the equipment on the USB bus (such as the modem or printer) can be controlled by the PLC.

(1) PCMCIA communication cards, reference **TSX SCP 11●** *(Modbus, Uni-Telway, serial link),* **TSX CPP 110** *(CANopen),* **TSX FPP 20** *(Fipway) and* **TSX MBP 100** *(Modbus Plus), are not authorized for use in slot 1 on Hot Standby processors.*

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Modicon Premium automation platform

Hot Standby system

Unity Pro software

Elements for redundancy

1 6, 8 or 12-position non-extendable rack **TSX RKY ●**
2 Power supply module **TSX PSY ●●●M**
3 Premium Hot Standby processor **TSX H57 24M/44M**
4 Ethernet network module **TSX ETY 4103/5103** (version ≥ sv 4.0)

Ethernet ring shared elements

15 Modicon M340 automation platform featuring processor with built-in Ethernet port **BMXP34 2020/2030**
16 Advantys STB modular distributed I/O with network interface module **STB NIP 2212**
17 Altivar 61/71 variable speed drive with communication card **VW3 A3 310**
18 Advantys OTB Optimum distributed I/O with interface module **OTB 1E0 DM9LP**
19 Magelis XBT GT graphic terminal with on-board Ethernet port **XBT GT ●●30/40**

Other possible shared elements:

- Advantys FTM, IP 67 modular I/O
- Momentum distributed I/O
- **TSX ETG 100/1000** gateway for connecting Modbus devices
- W@de remote management modules (RTU), designed for water applications **TSX HEW 315/320/330**
- Inductel/Ositrack identification system **XGK S1715503** and **XGK Z33ETH**
- Lexium servo drives with communication card **AMO ETH 001V000**
- Preventa **XPS MF** compact and modular safety PLCs

Ethernet wiring elements:

10 ConneXium managed switch with 2, 4 or 8 10/100BASE-TX ports **TCS ESM 0●3**
11 CPU Sync link, copper crossover cable **490 NTC 000 ●●●**
12 Copper straight-through cable **490 NTW 000 ●●●**
13 Copper crossover cable **490 NTC 000 ●●●** *(1)*

(1) For Ethernet ring lengths > 100 m, the copper link is replaced by a multimode optical fiber link (max. 3 km) or a single-mode optical fiber link (max. 20 km) by using ConneXium switches **TCS ESM 043F2CS0** *with a copper straight-through cable* **490 NTW 000 ●●●** *(optical fiber is not included in Schneider Electric's scope of supply).*

***Note**: In cases where other "Primary" and "Standby" PLC Ethernet modules are required to be "monitored", in order to extend the redundancy field (for the Ethernet SCADA network, for example), an application program must be written in each PLC.*

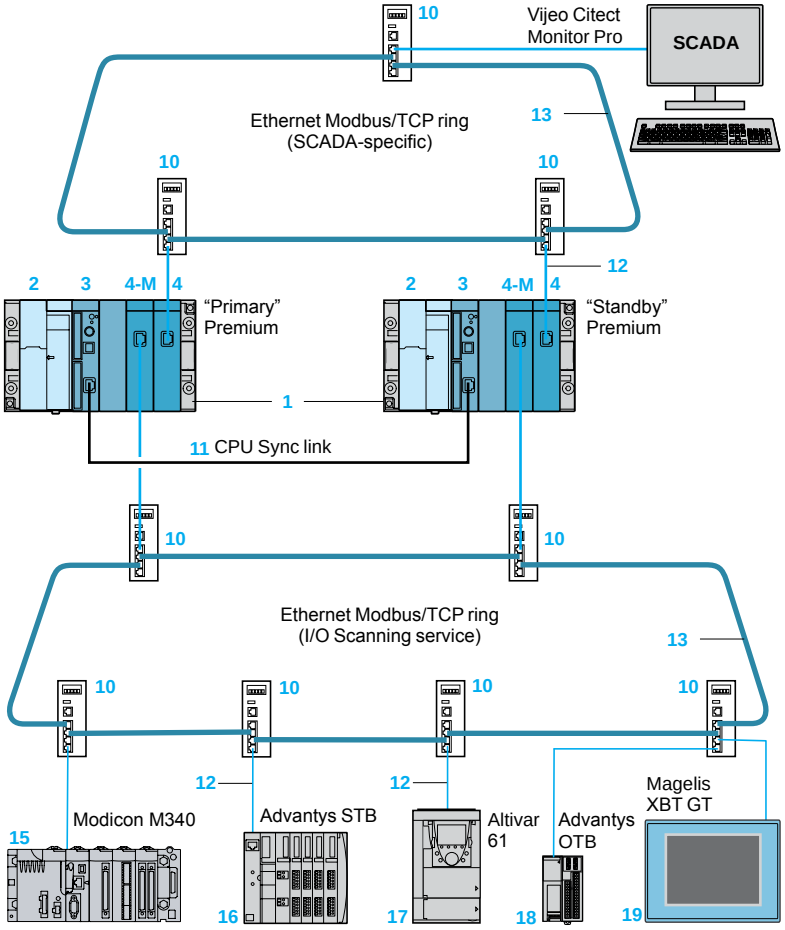
Architectures

Typical architecture

In this type of architecture, the I/O system in Premium PLCs equipped with a dedicated Hot Standby **TSX H57 24M/44M** processor is defined by the distribution of field devices or equipment on the Ethernet Modbus/TCP network.
From an operational point of view, the following devices or equipment are connected on the same Ethernet network:
■ Client: Twido controller, Modicon PLC, Magelis HMI, W@de remote management module, etc.
■ Modbus/TCP server: Advantys OTB/Momentum distributed I/O, Advantys STB I/O islands, Altivar variable speed drives, Lexium servo drives, Inductel/Ositrack identification systems, etc.

The Ethernet I/O Scanning service enables client-server exchanges between a PLC and Ethernet equipment communicating by means of the Modbus/TCP protocol. This service can be used to define up to 64 periodic read or write exchanges in the form of a configuration, based on tables of (word type) variables for target devices or equipment. The I/O Scanning service is a function that is available as standard with **TSX ETY 4103/5103** Ethernet network modules.

The Ethernet network topology for connecting Ethernet Modbus/TCP modules on PLCs to distributed devices/equipment can be a bus or ring type topology with a copper or fiber optic cable.



"Monitored" Ethernet network modules

When configuring the Hot Standby system using Unity Pro software, an Ethernet module (4-M) located on both the "Primary" and the "Standby" PLCs, must be defined as having the status "monitored" and use the Ethernet I/O Scanning service. This status assigns the module with the task of monitoring that it is functioning correctly, as well as monitoring its electrical link to its Ethernet switch. A failure (affecting the "monitored" module or its Ethernet link) will trigger a Hot Standby changeover from the "Primary" PLC to the "Standby" PLC.

Presentation: page 4/60 | Description: page 4/61 | Functions: pages 4/66 | Characteristics: page 4/68 | References: page 4/69

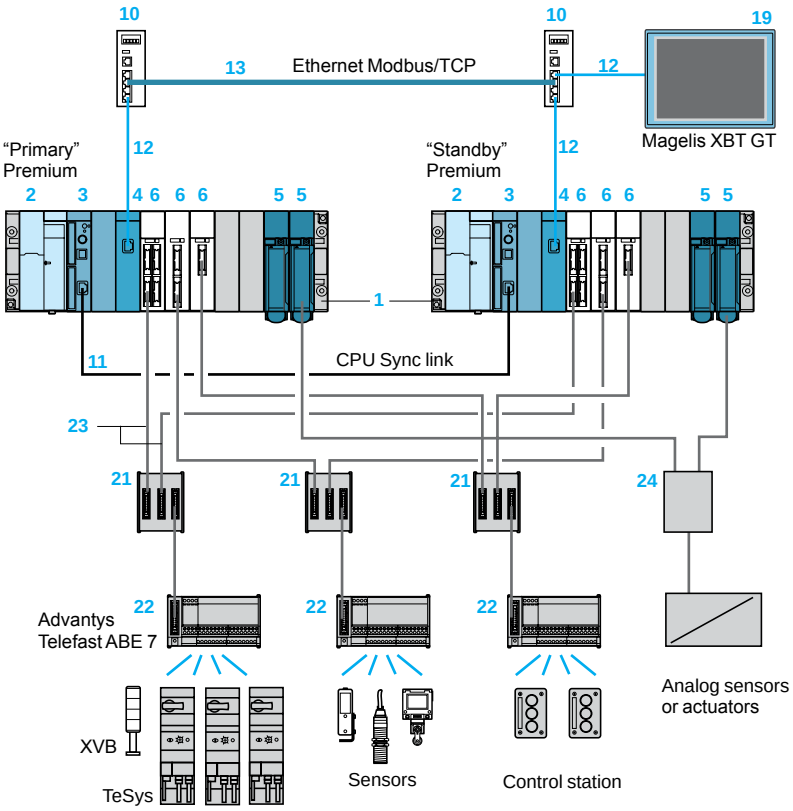
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Modicon Premium automation platform
Hot Standby system
Unity Pro software

Architectures (continued)

Architecture with redundant I/O on bus X

In this type of architecture, the discrete and analog I/O on bus X are the redundant elements. The discrete and analog I/O modules that control them are positioned within each “Primary” and “Standby” single-rack configuration.



Management of redundant I/O

Each “Primary” and “Standby” Premium PLC has a group of identical I/O modules on its **TSX RKY ●** rack.
The discrete sensors/actuators are connected to 16-channel Advantys Telefast passive or adaptor sub-bases **ABE 7H16/S16/R16**.
The analog sensors/actuators are connected via a JM Concept converter. Visit www.jmconcept.com

For redundant inputs, the sensor information is transmitted simultaneously to the “Primary” and “Standby” PLCs via the 2 identical input modules placed in the Premium racks. Two Advantys Telefast ABE 7 16-channel sub-bases, **ABE 7ACC11** with redundant inputs and **ABE 7ACC10** with redundant outputs, can be used to achieve this double wiring easily using cables equipped with HE 10 connectors.
The output values are generated solely by the application processing of the “Primary” PLC, which sends its commands to the corresponding output modules. During each cycle, the “Standby” PLC receives the “Primary” PLC's output values via the CPU Sync link and applies them to its own outputs. This update enables “Normal/Standby” changeover to take place smoothly during the changeover time.

Note: *Output fallback values: Within a Hot Standby system, the redundant output modules must be configured with fallback to 0, while the outputs of the shared elements (on Ethernet I/O Scanning or Modbus) must be configured to maintain their state.*

Note: *When using* **TSX PAY 262/282** *Preventa safety modules: Within a Hot Standby system, the modules are authorized in the Premium racks subject to compliance with the wiring recommendations. Please consult your Regional Sales Office.*

Elements for redundancy:
1 6, 8 or 12-position non-extendable rack **TSX RKY ●**
2 Power supply module **TSX PSY ●●●M**
3 Hot Standby processor **TSX H57 24M/44M**
4 Ethernet network module **TSX ETY 4103/5103** (version ≥ sv 4.0)
5 Analog I/O modules **TSX AEY/ASY ●●●**
6 16, 28, 32 or 64-channel discrete I/O modules (1 HE 10 connector per 16 channels) **TSX DEY/DSY/DMY 16/28/32/64●●K**

Advantys Telefast ABE 7 and JM Concept wiring elements:
21 Redundancy sub-bases:
- □ 16 in 2 x 16 input channels **ABE 7ACC 11**
- □ 16 in 2 x 16 output channels **ABE 7ACC 10**

22 16-channel passive sub-bases **ABE 7H16●●●** or adaptor sub-bases for 16-channel inputs or outputs **ABE 7S16/7R16/7P16●●●**
23 Cables equipped with 2 HE 10 connectors **TSX CDP ●●3** (length: 0.5, 1, 2, 3, 5 or 10 m)
24 Multiplexer for analog inputs **JK 3000 N2** or outputs **GK 3000 D1** (supplied by JM Concept)

Ethernet wiring elements:
10 ConneXium switch with 4, 8 or 16 10/100BASE-TX ports **499 NES ●●1 00** (unmanaged) or **TCS ESM ●●3** (managed)
11 CPU Sync link, copper crossover cable **490 NTC 000 ●●●**
12 Copper straight-through cable **490 NTW 000 ●●●**
13 Copper crossover cable **490 NTC 000 ●●●** *(1)*

Human Machine Interface:
19 Magelis XBT GT graphic terminal with on-board Ethernet port **XBT GT ●●30/40**

(1) See Note (1) on page 4/62

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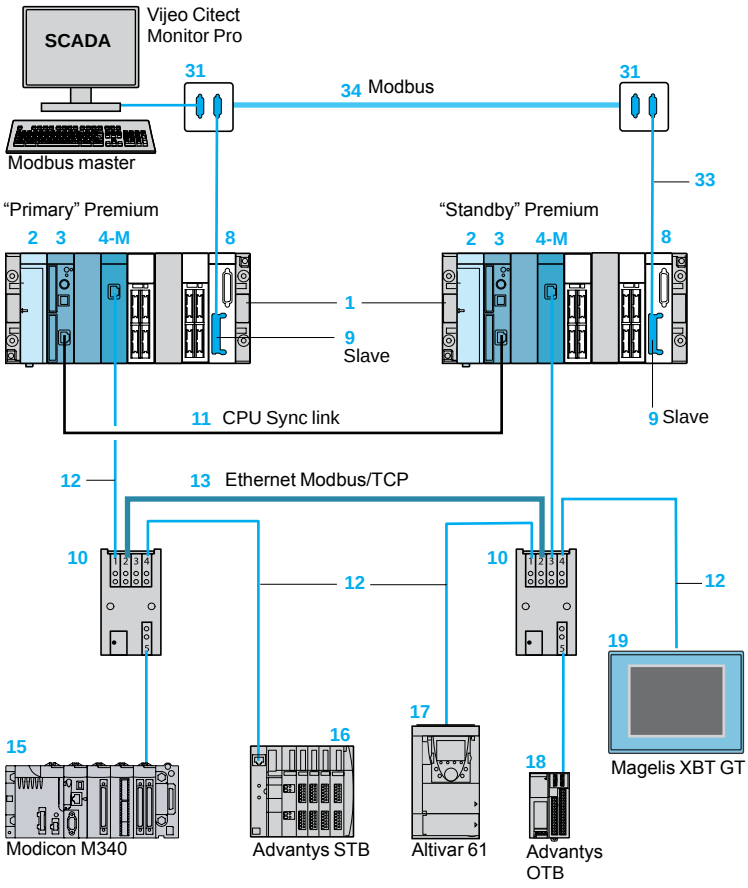
Modicon Premium automation platform
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Architectures (continued)

SCADA architecture on Modbus and shared I/O on Ethernet Modbus/TCP

As in the typical architecture shown on page 4/62, the I/O in the Premium Hot Standby system are shared on an Ethernet network (with a bus topology as shown in the example below). However, the SCADA interface is connected to the standby system via a Modbus serial link.

The Ethernet Modbus/TCP network modules are configured to be “monitored” so that they can trigger a Hot Standby changeover in the event of a failure (of the Ethernet module or electrical link and its switch). See page 4/62, 4 - M



SCADA supervision system

In this type of architecture, the redundancy of the SCADA station, which is based on Vijeo Citect or Monitor Pro supervision software, is assured by a Modbus serial link on which the SCADA station is the master. Via their **TSX SCY 21601** communication module, equipped with a **TSX SCP 114** PCMCIA RS 485 card, the “Primary” and “Standby” PLCs have the slave addresses “n” and “n + 1” respectively.

A failure triggers a changeover from the “Standby” to the “Primary” PLC and brings about an automatic change in the Modbus addresses: The address of the new “Primary” PLC becomes “n” and the address of the old one becomes “n+1”.

Elements for redundancy:

1 6, 8 or 12-position non-extendable rack **TSX RKY ●**
2 Power supply module **TSX PSY ●●●M**
3 Hot Standby processor **TSX H57 24M/44M**
4 Ethernet network module **TSX ETY 4103/5103** (version ≥ sv 4.0)
8 Communication module **TSX SCY 21601** whose integrated channel cannot be used in this type of architecture
9 PCMCIA RS 485 isolated card **TSX SCP 114** used with the Modbus slave protocol

Shared elements on the Ethernet network:

15 Modicon M340 automation platform featuring processor with built-in Ethernet port **BMXP34 2020/2030**
16 Advantys STB modular distributed I/O with network interface module **STB NIP 2212**
17 Altivar 61/71 variable speed drive with communication card **VW3 A3 310**
18 Advantys OTB Optimum distributed I/O with interface module **OTB 1E0 DM9LP**
19 Magelis XBT GT graphic terminal with on-board Ethernet port **XBT GT ●●30/40**

Other possible shared elements: See page 4/62

Ethernet wiring elements:

10 ConneXium unmanaged switch with 5 10BASE-T/100BASE-TX ports **499 NES 251 00**
11 CPU Sync link, copper crossover cable **490 NTC 000 ●●●**
12 Copper straight-through cable **490 NTW 000 ●●●**
13 Copper crossover cable **490 NTC 000 ●●●**

Modbus wiring elements:

31 Passive junction box, connection via screw terminals with line termination **TSX SCA 50**
33 Tap cable for PCMCIA card with flying leads at one end **TSX SCP CM 4030** (length 3 m)
34 RS 485 double shielded twisted pair trunk cable **TSX CSA 100/200/500** (length 100, 200 or 500 m)

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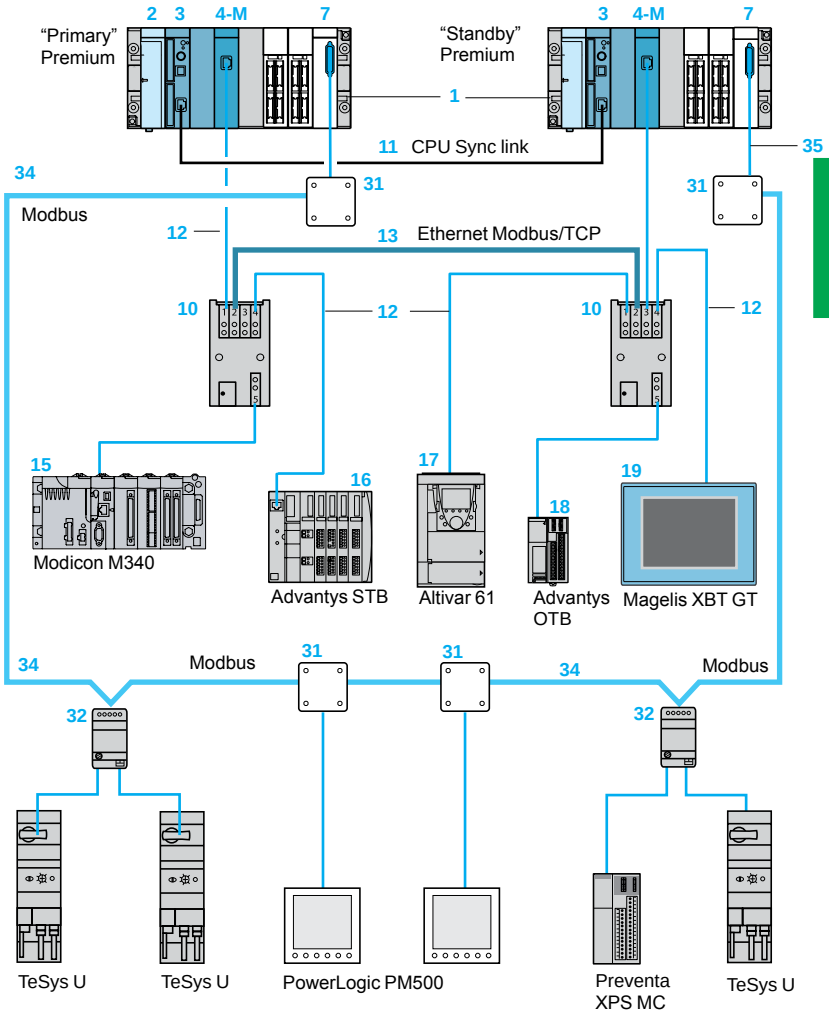
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Hot Standby system
Unity Pro software

Architectures (continued)

Architecture with shared devices, on Modbus **and shared I/O**, on Ethernet Modbus/TCP

In this type of architecture, the devices, peripheral devices or equipment in the Premium Hot Standby redundant system are:
- Shared on an Ethernet network (with a bus topology as shown in the example below)
- Shared on a Modbus link, and can thus support a large number of diverse peripheral devices or items of equipment (Schneider Electric or third-party) equipped with a Modbus slave interface

As with the previous types of architecture, this type can support a SCADA supervision system on Ethernet or Modbus.



Elements for redundancy
1 6, 8 or 12-position non-extendable rack **TSX RKY ●**
2 Power supply module **TSX PSY ●●●M**
3 Hot Standby processor **TSX H57 24M/44M**
4 Ethernet network module **TSX ETY 4103/5103** (version ⩾ sv 4.0)
7 Communication module **TSX SCY 11601/21601** whose integrated channel is used in the Modbus master

Shared elements on Modbus: Examples
- TeSys U starter-controllers
- PowerLogic PM500 LV/MV power meters
- Preventa XPS MC safety controllers

Shared elements on the Ethernet network
15 Modicon M340 automation platform featuring processor with integrated Ethernet port **BMX P34 2020/2030**
16 Advantys STB modular distributed I/O with network interface module **STB NIP2212**
17 Altivar 61/71 variable speed drive with communication card **VW3 A3 310**
18 Advantys OTB Optimum distributed I/O with interface module **OTB 1E0 DM9LP**
19 Magelis XBT GT graphic terminal with on-board Ethernet port **XBT GT ●●30/40**

Ethernet wiring elements
10 ConneXium unmanaged switch with 5 10BASE-T/100BASE-TX ports **499 NES 251 00**
11 CPU Sync link, copper crossover cable **490 NTC 000 ●●●**
12 Copper straight-through cable **490 NTW 000 ●●●**
13 Copper crossover cable **490 NTC 000 ●●●**

Modbus wiring elements
31 Passive junction box **TSX SCA 50**, connection via screw terminals with line termination
32 Junction box with line isolation **TWD XCA ISO**, connection of trunk cable via screw terminal and of 2 tap-offs via RJ45 connector
34 RS 485 double shielded twisted pair trunk cable **TSX SCA 100/200/500** (length 100, 200 or 500 m)
35 Tap cable for integrated channel **TSX SCY CM 6030** (length 3 m), 25-pin SUB-D connector with flying leads at one end

Redundant I/O on Modbus

In this type of architecture, the peripheral devices or equipment are shared by the Modbus link on which the two PLCs ("Primary" and "Standby") are masters. The other peripheral devices or equipment connected to the Modbus link are slaves. Each Premium PLC has a **TSX SCY 11601** or **TSX SCY 21601** communication module 7 with an integrated isolated RS 485 link (25-pin SUB-D connector).

The **TSX SCA 50** splitter box 31 positioned at the level of each Premium PLC ("Primary" and "Standby") includes the line termination. In addition, the **TSX SCY 11601/21601** communication modules polarize the Modbus line. Disconnecting a slave during operation will not impair Modbus communication in any way.

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Functions

Functions of “Primary” and “Standby” PLCs

“Primary” and “Standby” PLCs are physically and functionally identical; the difference in their roles lies in their status (“Primary” or “Standby”).

“Primary” Premium PLC

- Executes the entire application program
- Updates the inputs and outputs according to the in-rack architecture selected on bus X, Modbus and/or Ethernet network
- Facilitates communication with peripheral devices
- Sends its data to the “Standby” PLC via the dedicated “CPU Sync” link and retrieves diagnostic information from the “Standby” PLC.
- Generates its own diagnostic information as well as that of the Hot Standby architecture

“Standby” Premium PLC

- Reads the state of the in-rack inputs on bus X of the “Standby” PLC
- Reads the image of the “Primary” PLC inputs (in-rack inputs on bus X, Modbus and/or Ethernet)
- Executes the application in part (only the first section of the program)
- Updates the image of its outputs according to the execution of the first section of the program
- Facilitates communication with peripheral devices
- Retrieves diagnostic information from the “Primary” PLC
- Generates its own diagnostic information as well as that of the Hot Standby architecture

Management of “Primary/Standby” states

The failure of one of the following elements:

- Main rack power supply
- PLC processor
- **TSX ETY 4103/5103** “monitored” Ethernet Modbus/TCP network module

automatically triggers a “Primary/Standby” changeover. For all other elements, “Primary/Standby” changeover can be customized via the application program (manual changeover).

Services provided by TSX ETY 4103/5103 Ethernet Modbus/TCP modules within the Hot Standby architecture
Standard Web: “Rack Viewer” and “Data Editor”
FactoryCast configurable Web (TSX ETY 5103 only)
User Web pages (8 MB with TSX ETY 5103)
Modbus/TCP messaging
HTTP, FTP, XIP, Telnet
I/O Scanning
NTP time synchronization (with TSX ETY 5103)
SMTP e-mail notification (via Unity Pro function blocks)
Network manager, SNMP agent

Management of shared I/O on Ethernet network

The “Primary” PLC can easily be configured to manage the exchange of shared I/O states on the Ethernet network (bus or ring type). Thanks to the advanced I/O Scanning service, there is no need for specific programming.
Only the “Primary” PLC reads the physical inputs on the network and controls the/physical outputs on it.
During each cycle, the “Standby” PLC receives the images of the I/O on the Ethernet network from the “Primary” PLC via the dedicated “CPU Sync” link. This updating of the memory facilitates smooth “Primary/Standby” changeover during the changeover time (devices or equipment maintaining their state on fallback).

Management of redundant I/O

For redundant inputs, sensor information is transmitted simultaneously to the “Primary” and “Standby” PLCs via the input module placed in the racks of each PLC (see page 4/63).
The output values are generated solely by the application processing of the “Primary” PLC, which sends its commands to the corresponding output modules.
During each cycle, the “Standby” PLC receives the “Primary” PLC output values via the dedicated “CPU Sync” link and applies them to its own outputs.
This update method facilitates smooth “Primary/Standby” changeover during the changeover time (outputs with fallback to 0).

Management of supervision transparency (SCADA)

Another pair of **TSX ETY 4103/5103** Ethernet Modbus/TCP modules ensure transparent communication with level 2 (supervisor, third-party device, etc) during changeover of the PLC in “Primary” mode to the PLC in “Standby” mode.
Communication with a redundant architecture is, therefore, similar to that with a standard architecture. This transparency is the result of the automatic mechanism for the assignment of “IP” and “IP + 1” addresses.
It can also be achieved on Modbus by using the **TSX SCP 114** PCMCIA card (Modbus slave protocol in RS 485) installed in the **TSX SCY 21601** communication module (automatic mechanism for the assignment of “n” and “n + 1” slave addresses).

Presentation: page 4/60 | Description: page 4/61 | Architectures: pages 4/62 | Characteristics: page 4/68 | References: page 4/69

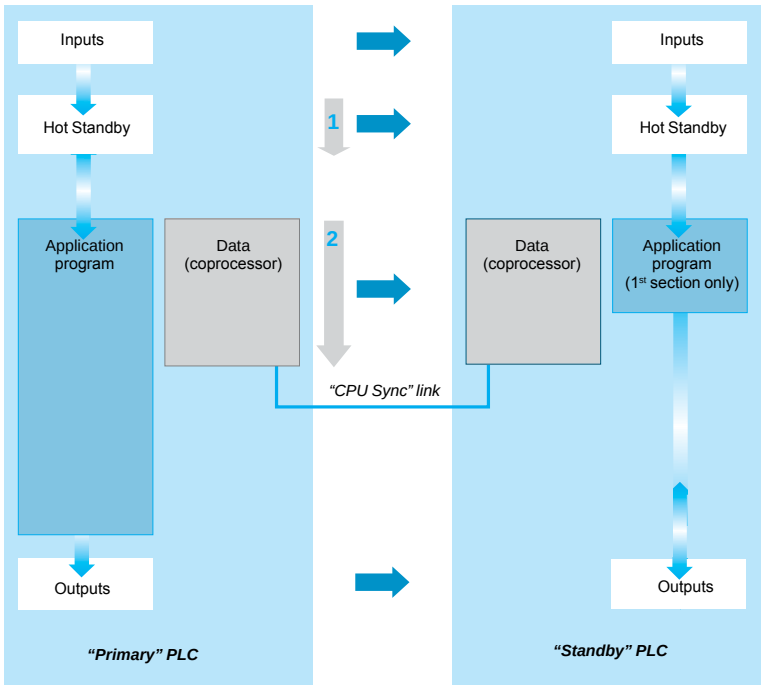
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Functions (continued)

Memory space

All the memory space reserved for the application program and the data is managed by the Hot Standby system with Unity Pro software. With an on-board RAM memory of 192 or 440 Kb (depending on the model), the RAM memory on **TSX H57 24M** and **TSX H57 44M** processors dedicated to Hot Standby applications can be increased for the application program to 768 or 2048 Kb (depending on the model) by adding a PCMCIA memory card.



Configuration

Installation of the application program does not differ fundamentally from installing a simple PLC program. It essentially uses the information requested by dedicated dialogue boxes, which must be entered at configuration stage in the Unity Pro software.

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 dedicated "CPU Sync" link, at the same time as the content of the tables containing the images of the input/output states are transferred to it. The Hot Standby system is thus able to transfer a data zone (I/O image, located *(1)* and unlocated internal data) from the "Primary" PLC to the "Standby" PLC comprising:

- 192 Kb max. with the **TSX H57 24M** processor
- 440 Kb max. with the **TSX H57 44M** processor

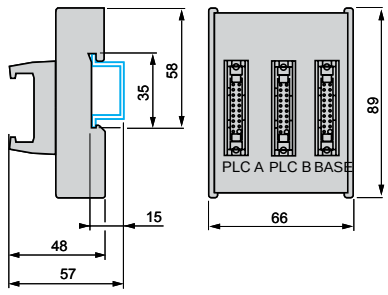
The exchange principle is illustrated in the diagram opposite, along with the exchange times according to data volume, where:

1 Hot Standby system: 10 ms for 100 Kb
2 Data transfer via the coprocessor: 30 ms for 100 Kb. This data transfer takes place in parallel with the execution of the "Primary" PLC application program.

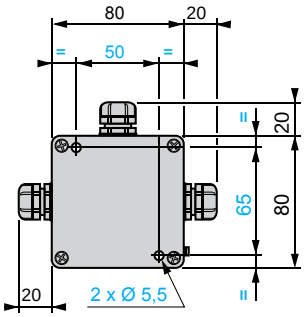
(1) The first 100 %MW words in each located data zone are not exchanged. Therefore, they can be assigned to data for a specific process on the "Primary" or "Standby" PLC.

Dimensions

ABE 7ACC10/11 redundancy sub-bases



TSX SCA50 passive splitter box



Note: For all other dimensions, refer to the dimensions pages in this catalogue.

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Modicon Premium automation platform
Hot Standby system
Unity Pro software

Characteristics and performance

Type of processor				TSX H57 24M	TSX H57 44M
Maximum configuration	No. of racks	6/8/12 slots		1	
	Maximum no. of module slots			12	
Functions	Maximum no. *(1)*	Discrete I/O		1024, limited to 512 (max. 8 slots)	2048, limited to 512 (max. 8 slots)
		Analog I/O		80	256, limited to 128 (max. 8 slots)
		Control channels		10 (up to 30 parameterizable simple loops)	20 (up to 60 parameterizable simple loops)
				Programmable loops via EFB control blocks (with Unity Pro Large and Extra Large)	
		Application-specific channels		24, limited to 16 (max. 8 slots) TSX SCY 11/21 601 serial link modules only	64, limited to 16 (max. 8 slots) TSX SCY 11/21 601 serial link modules only
	Integrated connections	Ethernet		1 CPU Sync link dedicated to exchanges between “Primary” and “Standby” processors 10BASE-T/100BASE-TX (RJ45 connector), max. length 100 m ⚠ The use of active components (transceivers, switches, …) on CPU Sync link is strictly forbidden.	
		Serial link		1 x RS 485 serial link, 19.2 kbit/s, marked TER/AUX (8-pin mini-DIN connector)	
				1 USB link, 12 Mbit/s, marked TER (USB type A connector)	
	Max. no. of connections	Ethernet		2 (TSX ETY 4103/5103 modules, version ⩾ sv 4.0)	4 (TSX ETY 4103/5103 modules, version ⩾ sv 4.0)
		Other		Any of AS-Interface, CANopen, Fipway, Modbus Plus, Profibus DP, InterBus, etc. type	
Memories	Maximum capacity	Without PCMCIA card	**Kb**	192, program + data	440, program + data
		With PCMCIA card	**Kb**	768, program 192, data	2048, program 440, data
		Data storage	**Kb**	16,384 (limited to 8192 with current PCMCIA cards)	
	Maximum size of object areas	Located internal bits	**Bits**	8056 %Mi	32,634 %Mi
		Located internal data	**Words**	32,464 for internal %M●i 32,760 for constant %M●i	
		Unlocated internal data		Elementary EDT and derived DDT data: Unlimited *(2)*	
				DFB and EFB function data: Unlimited size per instance, unlimited no. of instances *(2)*	
		Max. size of data exchanged via CPU Sync link		To safeguard data exchange during each cycle via the CPU Sync link, the maximum size of the data set (bits, located and unlocated internal data) is limited to:	
			Kb	192 max.	440 max.
Application structure	Tasks	Master		1	
		Fast		Use is prohibited in a Hot Standby architecture	
		Auxiliary		–	
		Event-triggered		Use not recommended as tasks are not synchronous with exchange cycles from the “Primary” PLC to the “Standby” PLC	
Execution time for one instruction (limited values)	Without PCMCIA card	Boolean	**µs**	0.039 to 0.057, depending on type of instruction	
		On word or fixed point arithmetic	**µs**	0.054 to 0.073, depending on type of instruction	
		On floating points	**µs**	0.550 to 0.630, depending on type of instruction	
	With PCMCIA card	Boolean	**µs**	0.048 to 0.057, depending on type of instruction	
		On word or fixed point arithmetic	**µs**	0.054 to 0.073, depending on type of instruction	
		On floating points	**µs**	0.550 to 0.630, depending on type of instruction	
Typical program code execution time for 1 Kinstruction	Without PCMCIA card	100% Boolean	**Kinst /ms**	15.75	
		65% Boolean and 35% fixed arithmetic	**Kinst /ms**	11.40	
	With PCMCIA card	100% Boolean	**Kinst /ms**	15.75	
		65% Boolean and 35% fixed arithmetic	**Kinst /ms**	11.40	
Times specific to the standby system	Transfer between processor and coprocessor TSX H57 ●4M		**ms**	10 per 100 Kb of data exchanged via CPU Sync link	
	“Primary” to “Standby” changeover			1.5 cycle times to resume in-rack I/O exchanges on bus X 1 s to resume exchanges on Ethernet I/O Scanning	
	Transfer of data from “Primary” to “Standby”		**ms**	30 per 100 Kb of data exchanged via CPU Sync As this data transfer is managed by the coprocessor, the transfer time TTd progresses in parallel with the application cycle time TC, which means that the application cycle time TC is not affected unless TTd > TC.	
System overhead	Task	Master	**ms**	1.00	

(1) The I/O on the Modbus link or on the Ethernet Modbus/TCP network should not be taken into account for these values.

(2) Within the limits of the processor's data memory capacity

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Hot Standby system
Unity Pro software


TSX H57 24M/44M


TSX ETY 4103/5103


TSX SCY 21 601


TSX SCY 11 601


TSX SCP 114


490 NT● 000 ●●


ABE 7ACC10/11

References

Hot Standby processors with Unity Pro

Type Rep..	I/O capacity	Memory capacity Memory	 Control channel	No. of Ethernet network modules	Integrated ports	Reference	Weight kg
TSX 57 2● 3	1024 discrete I/O 80 analog I/O channels 0 application-specific channels *(1)*	192 Kb integrated 768 Kb max. on PCMCIA card	10	2	- 1 x RS 485 - 1 x 12 Mbit/s USB - 1 x 100 Mbit/s Ethernet port dedicated to "CPU Sync" link	**TSX H57 24M**	0.560
TSX 57 4● 3	2048 discrete I/O 256 analog I/O channels 0 application-specific channels *(1)*	440 Kb integrated 2048 Kb max. on PCMCIA card	20	4	- 1 x RS 485 - 1 x 12 Mbit/s USB - 1 x 100 Mbit/s Ethernet port dedicated to "CPU Sync" link	**TSX H57 44M**	0.560

Modules to be installed in "Primary" and "Standby" rack (depending on architecture)

Designation Rep..	Description	Transparent Ready services	Reference	Weight kg
Ethernet Modbus/TCP modules version ≥ sv 4.0 4	Speed: 10/100 Mbit/s, 10BASE-T/100BASE-TX	Class B30 Standard Web server, I/O Scanning, SMTP, SNMP	**TSX ETY 4103**	0.340
		Class C30 Configurable Web server, I/O Scanning, NTP, SMTP, SNMP	**TSX ETY 5103**	0.340
Serial link communication modules 7-8	7-8 One integrated isolated RS 485 channel, Modbus protocol, character mode and Uni-Telway One serial link PCMCIA card slot		**TSX SCY 21601**	0.360
	7 One integrated isolated RS 485 channel, Modbus protocol		**TSX SCY 11601**	0.340
PCMCIA card 9	RS 485, 1.2 to 19.2 Kbit/s, Modbus protocol, character mode and Uni-Telway For TSX SCY 21601 communication module		**TSX SCP 114**	0.105
I/O modules	6 Discrete		See pages 3/10 to 3/12	
	5 Analog		See pages 3/26 and 3/27	
	Preventa safety, type TSX PAY		See pages 4/63 and 4/8	

Separate connection parts *(3)*

Designation Rep..	Use/composition *(4)*		Length	Reference *(4)*	Weight kg
Crossover cables for "CPU Sync" link 11 **Inter-switch link** 13	Shielded twisted pairs to standard EIA/TIA 658 Equipped with 1 RJ45 connector at each end		5 m	**490 NTC 000 05**	–
			15 m	**490 NTC 000 15**	–
			40 m	**490 NTC 000 40**	–
			80 m	**490 NTC 000 80**	–
Straight-through cables for Ethernet TSX ETY ●103 module link and switch 12	Shielded twisted pairs to standard EIA/TIA 658 Equipped with 1 RJ45 connector at each end		2 m	**490 NTW 000 02**	–
			5 m	**490 NTW 000 05**	–
			12 m	**490 NTW 000 12**	–
			40 m	**490 NTW 000 40**	–
			80 m	**490 NTW 000 80**	–
Advantys Telefast ABE 7 redundancy sub-bases 21 (connection on 3 HE 10 connectors)	For redundant discrete in-rack I/O *(5)* 16 channels in 2 x 16-channels	Input channels	–	**ABE 7ACC11**	0.075
		Output channels	–	**ABE 7ACC10**	0.075

Rep.: *Refer to the architectures shown on pages 4/62 to 4/65.*

1) The Premium Hot Standby system does not support application-specific channels (counter, motion control and weighing). Only application-specific communication channels (serial links) are authorized.

(2) Require specific setup instructions in the Hot Standby configuration. Please consult your Regional Sales Office.

(3) Other separate parts: ConneXium managed and unmanaged switches: See pages 5/54 to 5/60; Advantys Telefast ABE 7: See pages 8/8 to 8/17.

(4) For crossover and straight-through cables with shielded twisted pairs that are UL and CSA22.1 approved, add **U** *at the end of the reference. For example:* **490 NTC/NTW 000 05U**.

(5) For in-rack analog I/O, multiplexers 24 *supplied by* **JM Concept**, *please visit* www.jmconcept.com.

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Modicon Premium automation platform
Warm Standby system
PL7 Pro software

Presentation

Only compatible only with **PL7 Pro** software, the Premium Warm Standby redundancy offer ensures continuity of operation for a control system based on a Premium platform in the event of failure of:
- Central processing and communication functions.
- All or part of the I/O system.

It is based on the “Normal/Backup” redundancy principle with complete redundancy of the main processing and communication functions, the use of simple I/O shared on a Fipio bus and/or redundancy of in-rack I/O.
It covers all availability requirements when the purpose of the PLC is to monitor an installation in continuous operation, signal incidents to a control station, and transmit command instructions from the supervision manager to various locations on an extensive site. It is aimed at processes which can tolerate a lack of control on the part of the PLC lasting 1 to 2 s (average time for changeover from the “Normal” to the “Backup” unit).

Areas of application:
- In the commercial sector:
  - centralised technical management of a public facility (tunnel, airport, etc),
  - control/monitoring of a water treatment or distribution station,
  - electrical technical management.
- In the industrial sector:
  - food and beverage processing,
  - slow chemical processes,
  - level/temperature monitoring, etc.

Operational safety and availability

The Warm Standby architecture ensures that the control system functions are available, irrespective of the failure of any system component.

Operational safety in control systems:

Capacity to provide a specific service during the cycle

- **Safety:** capacity of an entity to present no danger to people, goods and the environment
- **Availability:** capacity of an entity to be operational, at any given moment or for a given period of time
  - **Reliability**: capacity of an entity to perform a service within a given time
  - **Ease of maintenance:** capacity of en entity to be maintained or returned to operational state within a given time
  - **Maintenance logistics** : capacity of an organisation to provide the necessary maintenance resources



Principle: page 4/71
Functions: page 4/72
References: page 4/74
Connections: page 4/75

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Modicon Premium automation platform

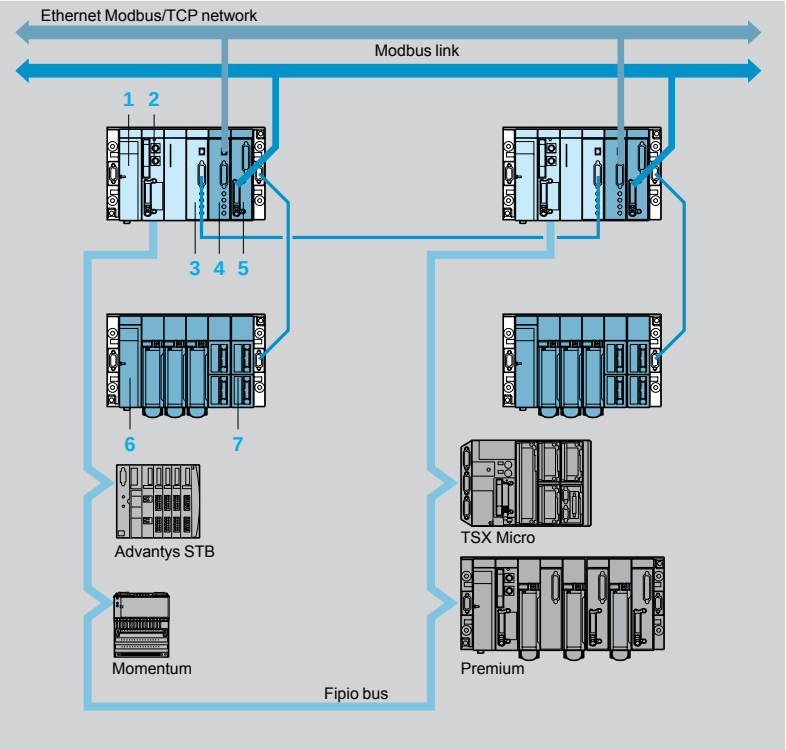
Warm Standby system

PL7 Pro software

Principle

The Premium Warm Standby architecture combines physical redundancy of the PLC with “Normal/Backup” type operation.
Only the “Normal” PLC processes the application and generates the outputs. The “Backup” PLC applies the outputs generated by the “Normal” PLC, performs self-diagnostics and permanently diagnoses the “Normal” PLC.
In event of a malfunction on the “Normal” PLC, the “Backup” PLC takes control and then becomes the “Normal” PLC (the faulty PLC, previously “Normal”, becomes the “Backup”).

Optimum availability of the application is ensured by:
- Automatic or manual “Normal/Backup” changeover.
- Smooth changeover on the actuators.
- Updating of the “Backup” PLC on each cycle.
- Signalling of the faulty component.
- Online repair.
- Transparent supervision (SCADA).



Essential elements for redundancy
1 **TSX PSY●●●0M** power supply
2 **TSX P57 353AM/453AM** processor
3 **TSX ETY 110WS** Ethernet communication module

Optional elements for redundancy
4 **TSX ETY 210** Ethernet communication module
5 **TSX SCY 21601** communication module with **TSX SCP 114** Modbus protocol PCMCIA card
6 **TSX PSY●●●0M** power supply
7 **TSX D●Y** discrete I/O modules

Shared elements on the Fipio bus

Elements which can be redundant are:
- The main rack.
- The main rack power supply.
- The processor.

Possibly accompanied by:
- Discrete input modules.
- Discrete output modules.
- One or more extendable racks with their power supply.
- One or more Ethernet network or Modbus bus communication modules.

Elements of the Fipio bus **shared** between the “Normal” and “Backup” PLCs are:
- Discrete or analog input modules (Advantys STB or Momentum) *(1)*.
- Discrete or analog output modules (Advantys STB or Momentum) *(1)*.
- One or more TSX Micro/Premium agent PLCs (these can support the entire range of I/O: discrete, analog or application-specific).

(1) TBX distributed I/O legacy modules are also possible as shared elements .

Presentation: page 4/70 | Functions: page 4/72 | References: page 4/74 | Connections: page 4/75

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Modicon Premium automation platform
Warm Standby system
PL7 Pro software

Functions

"Normal" and "Backup" PLC functions

The "Normal" and "Backup" PLCs are physically and functionally identical, but their role is differentiated according to their status: "Normal" or "Backup".

The "Normal" Premium PLC:

- Executes the application.
- Updates the outputs and inputs (in-rack and on the Fipio bus).
- Provides communication functions with peripheral devices.
- Sends its database to the "Backup" PLC.
- Recovers diagnostic information from the "Backup" PLC.
- Generates its own diagnostic information as well as that of the Premium Warm Standby architecture.

The "Backup" Premium PLC:

- Executes part of the application.
- Reads the state of the in-rack inputs.
- Updates its in-rack and Fipio outputs according to the state of those of the "Normal" PLC.
- Provides communication functions with peripheral devices.
- Recovers diagnostic information from the "Normal" PLC.
- Generates its own diagnostic information as well as that of the Premium Warm Standby architecture.

Management of shared I/O on Fipio bus

The Fipio bus manages I/O exchanges on Fipio devices. The "Normal" PLC is an arbitrator for the active Fipio bus while the "Backup" PLC is an arbitrator for the passive Fipio network.

Due to the characteristics of the Fipio bus, only the "Normal" PLC reads the physical inputs on the Fipio bus and controls the physical outputs on the Fipio bus. The "Backup" PLC does not access the Fipio bus.

During each cycle, the "Backup" PLC receives the values of the I/O on the Fipio bus from the "Normal" PLC via the inter-PLC Ethway link (**TSX ETY 110WS** module) and applies them to its own outputs. **This updating of the memory enables smooth "Normal/Backup" changeover** by maintaining the state of the I/O during changeover.

Management of "Normal/Backup" states

Malfunction of one of the following elements automatically causes a "Normal/Backup" changeover:

- Main rack power supply.
- PLC processor.
- **TSX ETY 210** communication module.
- Fipio bus connected to the integrated processor port.

For all other elements, "Normal/Backup" changeover can be customised (manual changeover).

Management of optional redundant I/O

For redundant inputs, the sensor information is transmitted simultaneously to the "Normal" and "Backup" PLCs via the 2 input modules placed in each PLC. Two Advantys Telefast 16-channel sub-bases, **ABE 7ACC10** with redundant inputs and **ABE 7ACC11** with redundant outputs, can be used to perform this double wiring easily using preformed HE 10 connector connection cables, (see page 4/75, refs. 14, 15, 20 and 21).

The output values are only generated by the application processing of the "Normal" PLC. This sends its commands to the corresponding output modules.

During each cycle, the "Backup" PLC receives the "Normal" PLC output values via the inter-PLC Ethway link (**TSX ETY 110WS** module) and applies them to its own outputs. **This updating enables smooth "Normal/Backup" changeover** by maintaining the state of the outputs during changeover.

Management of supervision transparency (SCADA)

Transparent communication with level 2 (supervisor, third-party device, etc) during changeover of the PLC in "Normal" mode to the PLC in "Backup" mode is provided by the **TSX ETY 210** Ethernet modules, using a unique IP address.

Communication with a redundant architecture is therefore similar to that for a simple architecture.This transparency is identical in Modbus with the use of the **TSX SCP 114** PCMCIA card (Modbus protocol in RS 485) installed in the **TSX SCY 21601** communication module.

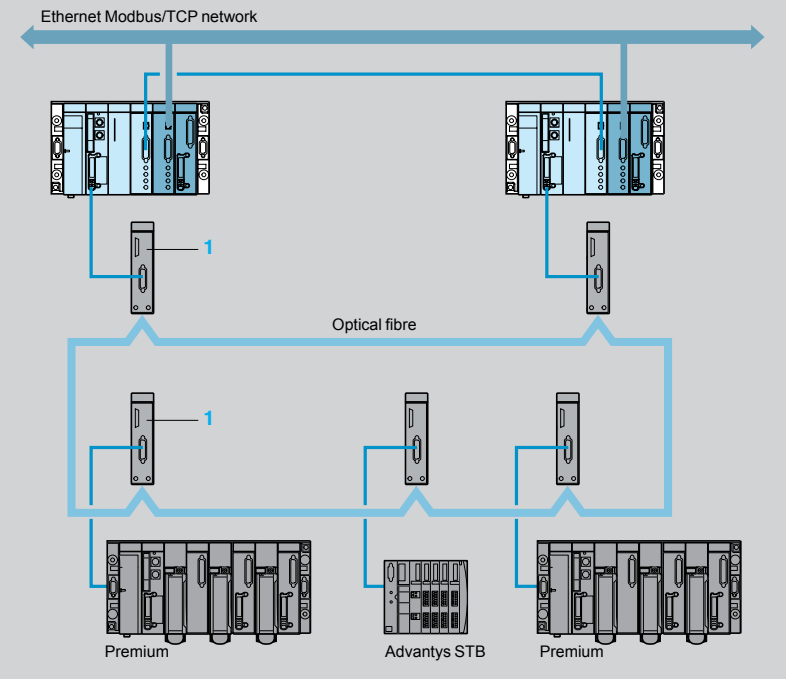
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Functions

Ring topology for shared equipment on the Fipio bus

To improve the availability of shared equipment on the Fipio bus, it is possible to create a Fipio redundant ring using fibre optics. The fibre optic ring can then be used to:
- Maintain normal operation in the event of a break at some point on the fibre optic medium.
- Increase the immunity of the Fipio bus in environments with high levels of electromagnetic interference.



1 **OZD FIP G3** fibre optic transmitter (see page 5/85).

Software setup

Premium Warm Standby redundant architecture is set up using **PL7 Pro** software *(1)*, in exactly the same way as a standard non-redundant process is set up. It is, however, necessary to apply the rule that the application program of both the “Normal” and “Backup” PLCs must be completely identical.

Redundancy entails certain special features which, if taken into account at the start of the development task, are very simple to set up using the additional Premium Warm Standby application design software **TLX CD WSBY P40E**.

This software can be perform the following functions:
- Taking account of Normal/Backup states during program execution.
- Sharing the database between the 2 PLCs via DFB user function blocks and EF elementary function blocks.
- Management of redundant in-rack I/O.
- Management of shared I/O on the Fipio bus.

(1) Warm Standby non compatible with Unity Pro software.

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References



TSX ETY 210

Description	Type	Reference	Weight kg
Software package for setting up a Warm Standby redundant architecture on Premium	Equipment with 1 station (equiped with PL7 Pro software)	**TLX CD WSBY P40E**	–
Ethernet Modbus/TCP communication module for Premium Warm Standby redundant architecture	Identical to those of the TSX ETY 110WS module (see page 5/45). For the Warm Standby architecture, this module also provides: - transparent addressing during changeover - diagnostics of the architecture (self-tests, state of the Ethernet link and of the TSX ETY 210 dual module), - la maintenance with access to the “backup” PLC	**TSX ETY 210**	0.270

Additional compatible elements

The Warm Standby architecture presented on page 4/71 shows, among other things, the essential elements for redundancy. Compatible standard modules can be added to this minimum configuration according to the requirements of the process being automated.

Elements for redundancy (sold in lots of 2) *(1)*

■ Bus X remote system:
□ **TSX REY 200** Bus X remote module, for increasing the length of Bus X to 2 x 350 m.
■ Communication:
□ **TSX ETY 210** Ethernet communication module, for communication with level 3,
□ **TSX SCP 114** Modbus communication PCMCIA card, for Modbus Slave communication with transparent addressing for third-party devices. This card should be inserted in the slot in the **TSX SCY 21601** communication module.
■ Discrete and analog I/O:
□ **TSX DEY ●●K** discrete input modules with HE 10 connectors with **ABE 7ACC11** Advantys Telefast redundant sub-bases,
□ **TSX DSY ●●K** discrete output modules with HE 10 connectors with **ABE 7ACC10** Advantys Telefast redundant sub-bases,
□ T**SX DMY ●●K** discrete mixed I/O modules with HE 10 connectors with A**BE 7ACC11/10** Advantys Telefast redundant sub-bases.



ABE 7ACC10/11

Shared elements on the Fipio bus

■ Advantys STB distributed I/O modules:
□ **STB NFP 2212** Fipio interface module,
□ **STB DDI/DAI/DDO/DAO/DR●** discrete I/O modules,
□ **STB AVI/ACI/ART/AVO/ACO** analog I/O modules,
■ **TSX EEF/ESF/EMF** dust and damp proof discrete I/O base units.
■ Momentum I/O modules:
□ **170 FTN 110 01** Fipio communication module,
□ **170 ADI/ADO/ADM** discrete I/O base units,
□ **170 AAI/AAO/AMM** analog I/O base units.
■ Fipio agent PLCs:
□ Premium PLC, can take all I/O and application-specific modules,
□ TSX Micro PLC, can take all I/O and application-specific modules .
■ Other shared elements:
□ **OZF FIP G3** fibre optic transmitter, can be used to create a Fipio bus fibre optic ring,
□ **TSX FP ACC 6** Fipio electrical repeater, increases the length of the bus by the creation of segments, each 1000 m maximum.

(1) The TSX AEY/ASY I/O analog modules, the TSX CTY/CCY/CAY/CSY/CFY/ISP Y application-specific modules are no redundancy elements. They can be used as shared elements with Fipio agent Premium PLCs

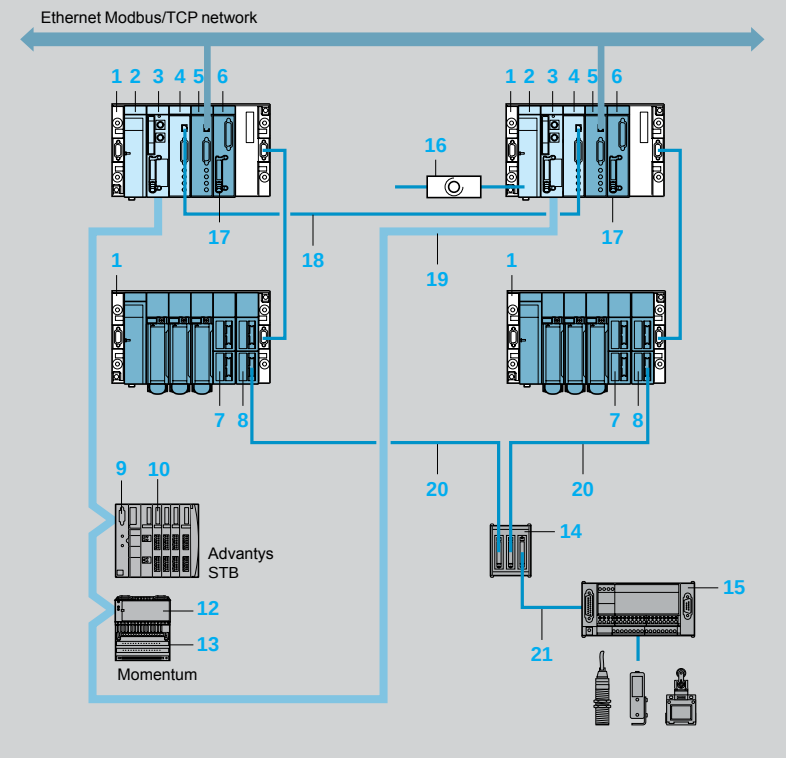
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Warm Standby system

PL7 Pro software

Example of architecture with redundant I/O and shared I/O on Fipio bus



1 **TSX RKY ●EX**: Premium extendable rack.
2 **TSX PSY●●●0M**: power supply module.
3 **TSX P57 353AM/453AM**: Premium processor with integrated Fipio link.
4 **TSX ETY 110WS**: Ethernet Modbus/TCP network module.
5 **TSX ETY 210**: Ethway/Ethernet Modbus/TCP network module.
6 **TSX SCY 21601**: communication module for type III PCMCIA card.
7 **TSX DSY●●K**: discrete output modules, for redundancy.
8 **TSX DEY●●K**: discrete input modules, for redundancy.
9 **STB NFP 2212**: Fipio interface module for Advantys STB distributed I/O with **TSX FP ACC2/12** connector (polycarbonate/zamak)
10 **STB D●I/D●O/DR●/A●I/A●O**: Advantys STB distributed discrete input/output modules.
12 **170 FNT 110 00**: Fipio communication module for Momentum base unit with **TSX FP ACC2/12** connector (polycarbonate/zamak).
13 **170 ADI/AAI/ADM●●●**: discrete or analog I/O Momentum base unit.
14 **ABE 7ACC11/10**: Advantys Telefast ABE 7 redundant I/O sub-bases.
15 **ABE 7●16●●●**: Advantys Telefast ABE 7 connection sub-bases.
16 **LA4 DT2U:** time-delay relay designed to desynchronise starting of the “Normal” PLC and the “Backup” PLC during simultaneous power-up.
17 **TSX SCP 114**: type III PCMCIA card for Modbus Slave communication.
18 **490 NTC 000●●**: crossed cord shielded twiwted pair cordsets with RJ 45 connector, for interconnecting **TSX ETY 110WS** module (shielded twisted pair).
19 **TSX FP CA●00**: Fipio bus trunk cable, shielded twisted pair.
20 **TSX CDP●53:** preformed connection cable with HE 10 connector (length = 0.5, 1, 2, 3, or 5 m).
21 **ABF H20H008**: preformed connection cable with HE 10 connector (length = 0.08 m).

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