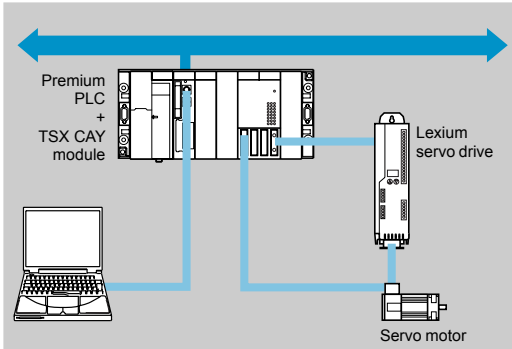


### Presentation



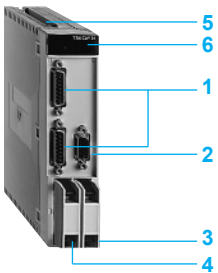
The servo-controlled **TSX CAY** positioning axis control offer is designed for machines requiring both high performance servo motion control in conjunction with PLC sequential control.

Depending on the model, the **TSX CAY** modules make it possible to:

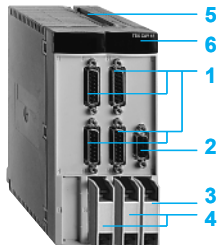
- Control 2 independent axes (TSX CAY 21/22)
  - Control up to 4 independent axes (TSX CAY 41/42)
  - Control 3 linearly interpolated axes (TSX CAY 33)
- They accept servo drives with  $\pm 10$  V analog inputs including Lexium 05, Lexium 15, Lexium 17D and Twin Line TLD 13 servo drives.

**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



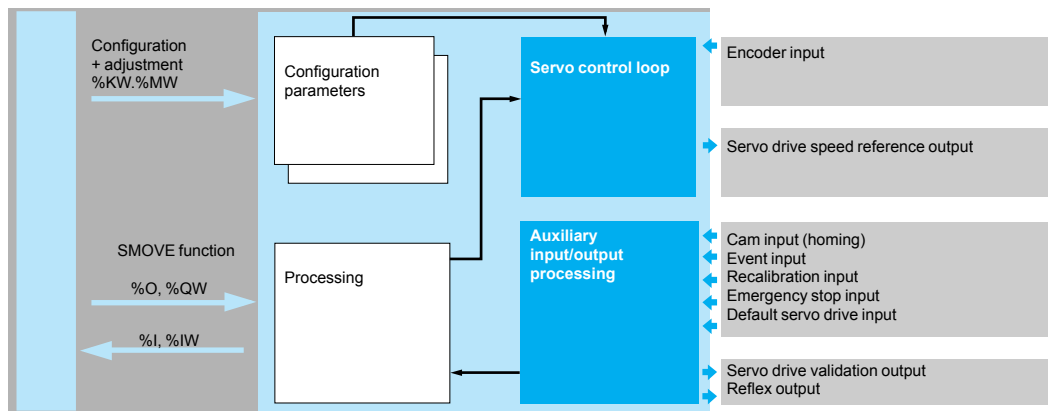
TSX CAY 41/42

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 TPCX57●●3M or TSX PCI 57●●4M slot PLCs are required for TSX CAY 22/42/33 modules.

# Modicon Premium automation platform

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	Period	ms	Proportional to overshoot compensation and gain switching		
			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 41: 32,000 points	TSX CAY 33: 256 points
			TSX CAY 22: 256 points	TSX CAY 42: 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 ≥ 4.1.

# Modicon Premium automation platform

## TSX CAY motion control modules for servo motors

Electrical characteristics				TSX CAY 21	TSX CAY 22	TSX CAY 41	TSX CAY 42	TSX CAY 33	
<b>Module type</b>									
<b>Modularity</b>				2 axes		4 axes		3 axes	
<b>Maximum frequency on the counter inputs</b>	SSI absolute encoder			16 to 25 bits	12 to 25 bits	16 to 25 bits	12 to 25 bits		
	CLK frequency	transmission	<b>kHz</b>	200					
	Incremental encoder x 1			<b>kHz</b> 500					
				x 4					
				<b>kHz</b> 250 kHz in input or 1 MHz in counting					
<b>Consumption</b>	5 V $\pm$			<b>mA</b> 1100		1500			
	24 V $\pm$			<b>mA</b> 15		30			
<b>Current consumed by module on the 10/30 V encoder at 24V (24 V absolute encoder)</b>				Typical		<b>mA</b> 11 (20 max)		22 (40 max)	
<b>Power dissipated inside the module</b>				Typical		<b>W</b> 7.2 (11.5 max)		10 (17 max)	
<b>Control of sensor power supplies</b>				Yes					
Input characteristics				Counter inputs 5 V $\pm$ (IA/IB/IZ)	Servo drive control inputs (1 per axis)	Auxiliary inputs (homing, event, recalibration, emergency stop)			
<b>Type of input</b>				Positive					
<b>Logic</b>				Positive					
	<b>Nominal values</b>			Voltage		<b>V</b> 5		24	
			Current		<b>mA</b> 18		8		
<b>Value limits</b>	Voltage			<b>V</b> $\leq 5.5$		19...30 (possible up to 34 V, limited 1 hr per 24 hr)			
	At state 1			Voltage		<b>V</b> $\geq 2.4$		$\geq 11$ (OK state)	$\geq 11$
				Current		<b>mA</b> $> 3.7$ (for U = 2.4 V)		$> 3.5$ (for U = 11 V)	$> 6$ (for U = 11 V)
	At state 0			Voltage		<b>V</b> $\leq 1.2$		$\leq 5$ (default state)	$\leq 5$
				Current		<b>mA</b> $< 1$ (for U = 1.2 V)		$< 1.5$ (for U = 5 V)	$< 2$ (for U = 5 V)
	<b>Control of voltage/sensor feedback</b>				Presence check		-		
<b>Input impedance for nominal U</b>				$\Omega$ 270		3000			
<b>Type of input</b>				Resistive				Current sinks	
<b>Conforming to IEC 1131</b>				-		Type 1		Type 2	
<b>2-wire compatibility detector:</b>				-		-		Yes (all 24 V detectors)	
<b>3-wire compatibility detector</b>				-		-		Yes (all 24 V detectors)	
Output characteristics				Analog outputs (1 per axis)	Servo drive validation (1 relay output per axis)	Reflex outputs (1 per axis)			
<b>Type of output</b>									
<b>Range</b>				<b>V</b> $\pm 10, 24$		-			
<b>Resolution</b>				13 bits + sign					
<b>LSB value</b>				<b>mV</b> 1.25					
<b>Nominal voltage</b>				<b>V</b> -					
<b>Voltage limit</b>				<b>V</b> -		5...30		19...30 (possible up to 34 V, limited 1 hr per 24 hr)	
<b>Current</b>				<b>mA</b> -					
<b>Maximum current</b>				<b>mA</b> 1.5		200 (resistive charge under 30 V)		500 nominal	
<b>Minimum permitted load</b>				-		1 V/1mA		-	
<b>Max voltage drop ON</b>				<b>V</b> -		$< 1$			
<b>Leakage current</b>				<b>mA</b> -		$< 0.3$			
<b>Switching time</b>				-		$< 5$ ms		$< 500$ $\mu$ s	
<b>Compatibility with d.c. inputs</b>				-					
<b>Conforming to IEC 1131</b>				-		-		All positive logic inputs for which the input resistance is $< 15$ k $\Omega$	
<b>Short-circuit and overload protection</b>				-		-		Yes	
<b>Channel overvoltage protection</b>				-		-		By current limiter and thermal release	
<b>Channel overvoltage protection</b>				-		-		Zener diodes between the inputs and the + 24 V	
<b>Protection against reverse polarity</b>				-		-		By diode in the opposite direction to the power supply	

# Modicon Premium automation platform

## TSX CAY motion control modules for servo motors



TSX CAY 2●



TSX CAY 33



TSX CAY 4●



TSX TAP S15 05



TSX TAP MAS



ABE 7CPA01



ABE 7H16R20

### Motion control modules for servo motors (1)

Type of input	Characteristics	Function	No. of axes (2)	Reference (3)	Weight kg
<b>Incremental encoders</b> 5 V $\overline{\text{---}}$ RS 422, 10...30 V $\overline{\text{---}}$ Totem pole (4)	500 kHz counter with incremental encoder	Servo control on independent linear axis	2	<b>TSX CAY 21</b>	0.480
<b>Absolute encoders</b> RS 485 serial or parallel (5)	200 kHz acquisition with absolute serial encoder		4	<b>TSX CAY 41</b>	0.610
		Servo control on independent linear or independent infinite axis Following axes	2	<b>TSX CAY 22</b>	0.480
		Servo drive realtime offset correction Cut on the fly (6)	4	<b>TSX CAY 42</b>	0.610
		Servo control on linear or infinite axis Linear interpolation on 2 or 3 axes Servo drive realtime offset correction	3	<b>TSX CAY 33</b>	0.610

### Connection elements

#### Connection accessories

Description	Connection	Type of connector on module TSX CAY ●●	Item no. (7)	Reference	Weight kg
<b>SUB-D connectors</b> (sold in lots of 2)	SSI absolute/ incremental encoder	15-way SUB-D (1 per axis)	4	<b>TSX CAP S15</b>	0.050
	Speed references	9-way SUB-D (1 per TSX CAY module)	7	<b>TSX CAP S9</b>	0.050
<b>Connection interface for incremental encoder</b>	Incremental encoder 5 V $\overline{\text{---}}$ RS 422/RS 485	15-way SUB-D (1 per axis)	6	<b>TSX TAP S15 05</b>	0.260
<b>Splitter unit</b>	Speed references towards servo drives	9-way SUB-D (1 per TSX CAY module)	—	<b>TSX TAP MAS</b>	0.590
<b>Advantys Telefast ABE 7 connection bases</b>	Speed references	9-way SUB-D (1 per TSX CAY module)	—	<b>ABE 7CPA01</b>	0.300
	Auxiliary inputs, reflex outputs, I/O power supply 24 V $\overline{\text{---}}$ , encoder power supplies 5/24 V $\overline{\text{---}}$	10, 20-way HE (1 for 2 axes)	—	<b>ABE 7H16R20</b>	0.300
	Servo drive control signals, I/O power supply 24 V $\overline{\text{---}}$	10, 20-way HE (1 per TSX CAY module)	—	<b>ABE 7H16R20</b>	0.300
<b>Adaptor base</b>	Absolute encoders with parallel outputs (16 to 24 bit) 5 V $\overline{\text{---}}$ , 10...30 V $\overline{\text{---}}$	15-way SUB-D	—	<b>ABE 7CPA11</b>	0.300

(1) To order other accessories please consult our "Automation platform Modicon Premium and Unity - PL7 software" specialist catalogue.

(2) Double format **TSX CAY 41/42/33** modules.

(3) Supplied with a multilingual quick reference guide: in English and French.

(4) Totem pole encoder with supplementary Push/Pull outputs.

(5) Parallel output absolute encoders with **ABE 7CPA11** adaptor interface.

(6) Cut on the fly function available with **TSX CAY 22** module. Requires Unity Pro software version  $\geq 2.2$  or PL7 Junior/Pro software version  $\geq 4.1$

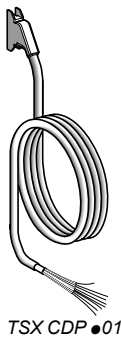
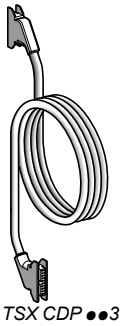
(7) Item no. see pages 43550/7 and 43550/8.

# Modicon Premium automation platform

## TSX CAY motion control modules for servo motors

Connection elements (continued)						
Cables						
Description	Use		Item no.	Length m	Reference	Weight kg
	From	To				
Cables fitted with SUB-D connectors	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	TSX CCP S15 050	0.110
				1	TSX CCP S15 100	0.160
				2.5	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	TSX CXP 213	0.270
				6	TSX CXP 613	0.580
Sectors equipped with a SUB-D connector and a free end (servo drive side)	TSX CAY ●● module, or TSX TAP MAS unit	Lexium 05/15/17D servo drive speed reference, Twin Line TLD 13 or other drives (section 0.205 mm <sup>2</sup> )	9	6	TSX CDP 611	0.790
Connection cables fitted with HE 10 connectors	TSX CAY ●● module, (cast mould 20-way HE 10 connector)	ABE 7H16R20 sub-base (10, 20-way HE connector)	10	0.5	TSX CDP 053	0.085
		500 mA max cable		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
Sectors equipped with an HE 10 connector and a free end (servo drive side)	TSX CAY ●● module, (cast mould 20-way HE 10 connector)	Auxiliary inputs, reflex output, control signals, power supplies (free end)	11	3	TSX CDP 301	0.400
		20 wire 500 mA max sectors		5	TSX CDP 501	0.660
Cables 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	TSX CXP 235	0.210
				6	TSX CXP 635	0.470
		Simulated absolute encoder feedback (9-way SUB-D connector)	13	2	TSX CXP 245	0.210
				6	TSX CXP 645	0.470

(1) Item no. see page 43550/7 and 43550/8



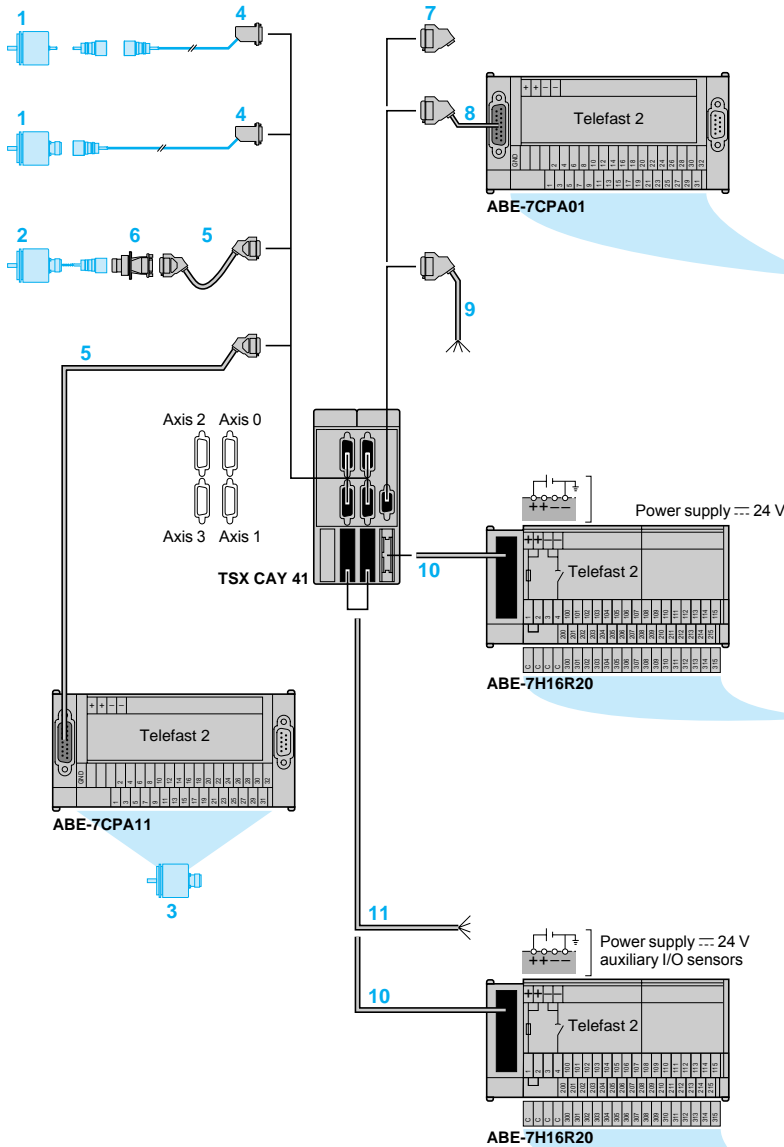
TSX CDP ●●3

TSX CDP ●01

### Connections for TSX CAY modules

#### General connections

##### Examples of encoder connections

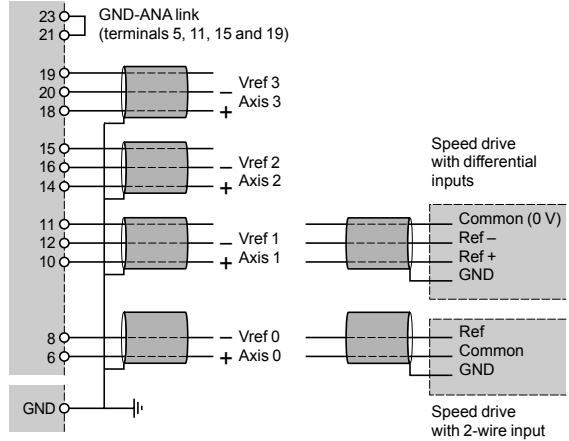


- 1 Incremental or absolute encoder
- 2 5 V RS 422 incremental encoder
- 3 Parallel output absolute encoder
- 4 TSX CAP S15 connector
- 5 TSX CCP S15 cable with connectors
- 6 TSX TAP S15 05 connector

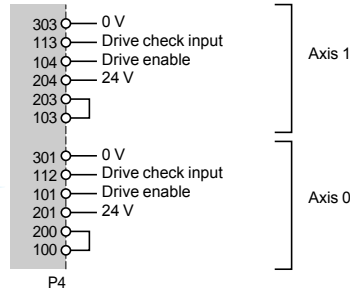
1	IB-	7	NC
2	Sup. Ret.	8	IB + 5 V
3	IZ + 5 V	9	NC
4	IZ -	10	0 V
5	IA + 5 V	11	NC
6	IA -	12	+5 V

- 7 TSX CAP S9 connector
- 8 TSX CXP 213/613 cable with connector
- 9 TSX CDP 611 preformed cable with connector
- 10 TSX CDP cable with connector
- 11 TSX CDP preformed cable with connector

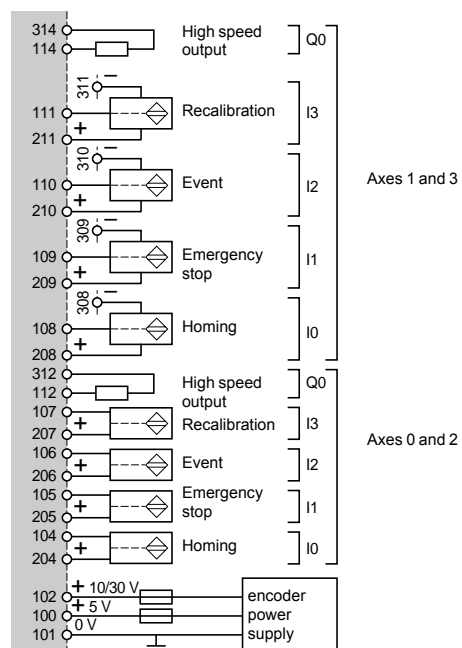
##### Examples of speed reference signal connections



##### Example of speed drive connection (auxiliary I/O)



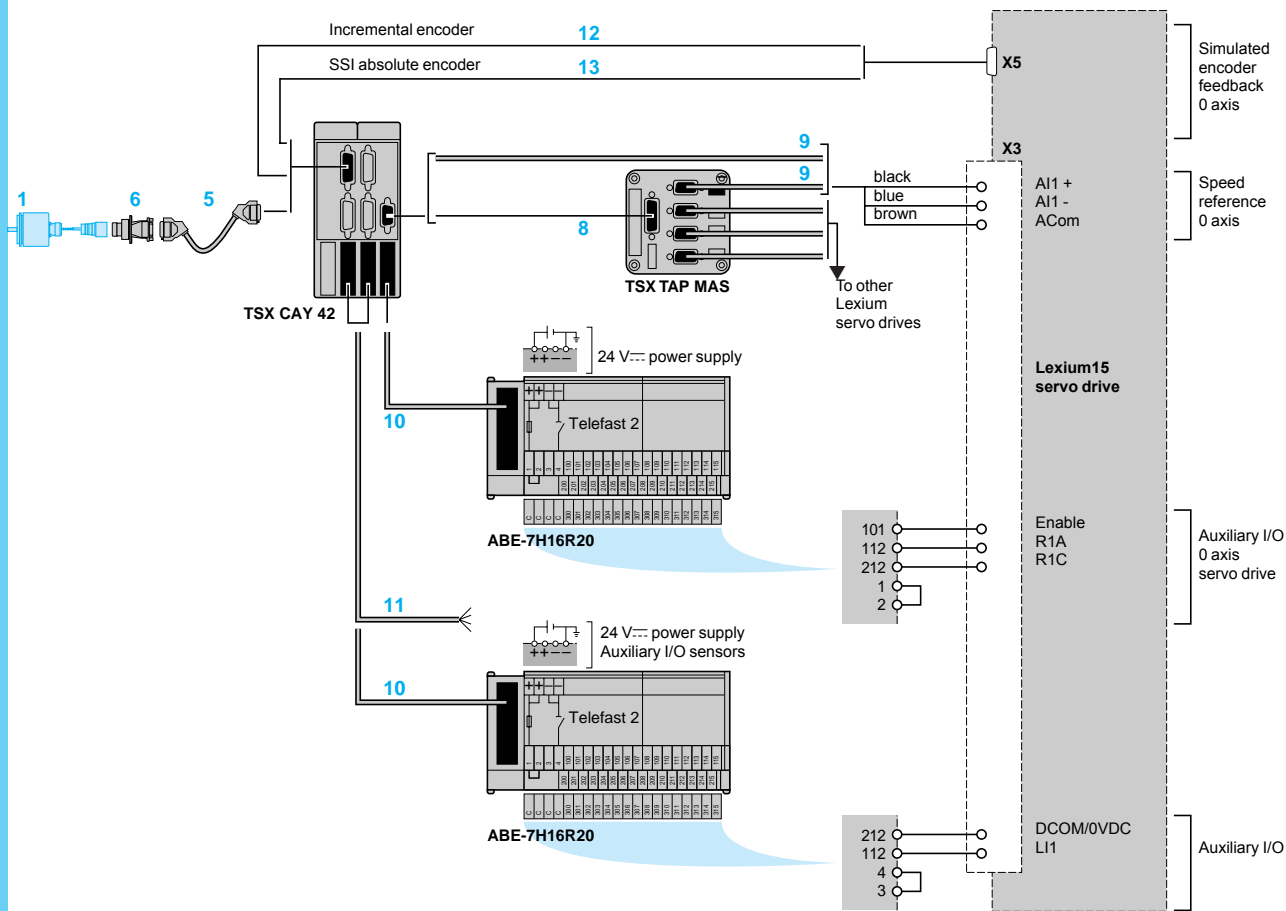
##### Example of auxiliary I/O connection



# Modicon Premium automation platform

## TSX CAY motion control modules for servo motors

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



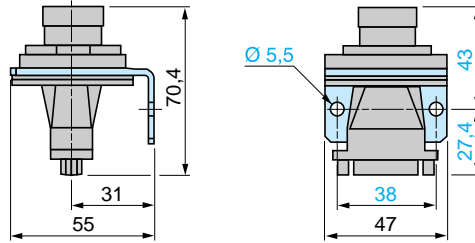
- |  |  |   |
|--|--|---|
| 1 Absolute/incremental encoder                         | 8 TSX CXP 213/613 cable with connector       | 12 TSX CXP 235/635 cable with connector (simulated incremental encoder feedback)  |
| 5 TSX CCP S15 cable with connectors (encoder feedback) | 9 TSX CDP 611 preformed cable with connector | 13 TSX CXP 245/645 cable with connector (simulated SSI absolute encoder feedback) |
| 6 TSX TAP S15 05 connector                             | 10 TSX CDP cable with connector              |   |
|  | 11 TSX CDP preformed cable with connector    |   |

# Modicon Premium automation platform

TSX CAY motion control modules for servo motors

## Dimensions

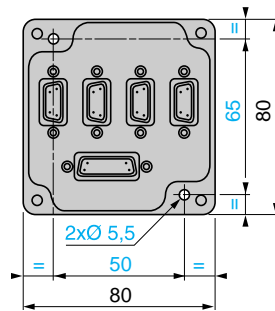
### TSX TAP S15 05 connection interface for incremental encoder



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.