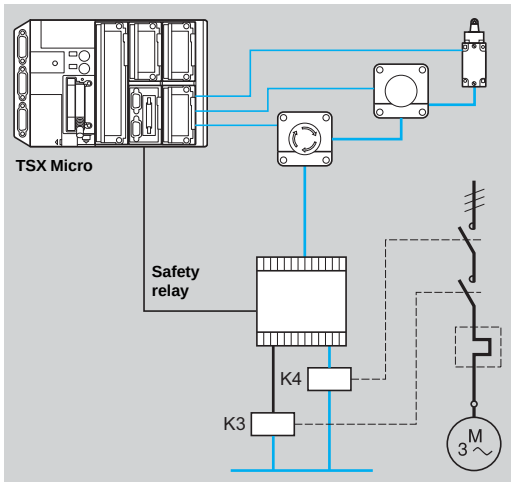
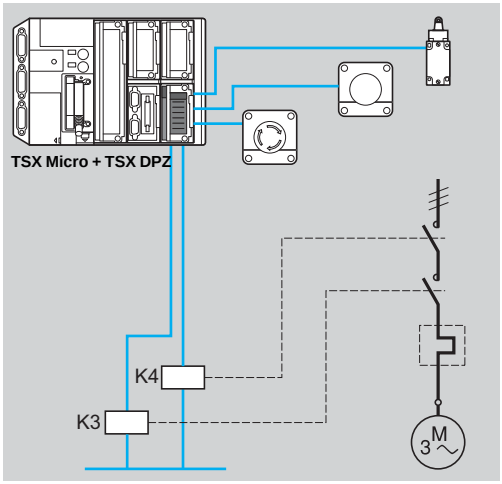
Safety automation system solutions
Modicon TSX Micro automation platform
Preventa safety module type TSX DPZ



Solution with safety relay and separate PLC



Simplification using the safety module integrated in the PLC

Presentation

The TSX DPZ 10D2A Emergency stop monitoring module integrated into the TSX Micro PLC combines:

- The ease of use of Preventa safety modules.
- PLC diagnostics performance.

It also maintains all the advantages of a standard PLC (extended choice of I/O, ease of installation, flexibility of hardware and software developments, etc).

The TSX DPZ 10D2A Emergency stop monitoring module combines a Preventa (XPS) hard-wired safety relay and a discrete acquisition function in a half-slot, for full diagnostics of input contacts and the state of safety circuit outputs.

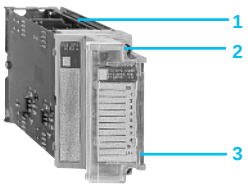
The TSX DPZ 10D2A safety module is used to interrupt one or more Emergency or safety stop control circuits in complete safety, in accordance with EN/IEC 60204-1.

The proven safety of hard-wired technology and the capacity of the TSX Micro PLC make module TSX DPZ 10D2A the optimum solution for making machines more reliable, safer, more compact and more cost-effective.

Application developments requiring safety systems and PLC diagnostics

LModule TSX DPZ 10D2A is suitable for Emergency stop and limit switch monitoring applications, requiring a level of safety up to category 3 *(1)* according to EN 954-1/ ISO 13849-1 (safety related parts of control systems).

(1) For more information on control system safety categories, please consult the chapter 6 of this catalogue.



Description

Emergency stop monitoring module TSX DPZ 10D2A comprises:

1 A metal casing with a locking system for fixing the module in its slot. This system is only accessible when the screw terminal block is removed.

2 A removable screw terminal block for connecting sensors and preactuators.

3 A cover giving access to the screw terminal block, which also holds the marker legend.

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Connections: page 43307-EN/5

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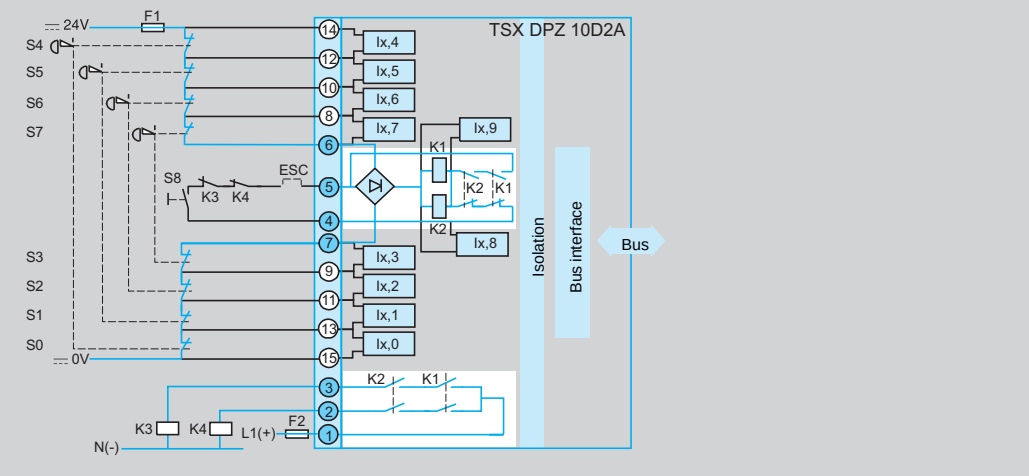
Safety module TSX DPZ 10D2A provides the following functions:
- Monitoring of 1 to 4 dual (or single), N/C (normally closed) contacts in pushbuttons, Emergency stops or limit switches on safety guards for an Emergency stop or immediate safety stop system (category 0 Emergency stop conforming to EN/ISO 13850).
- Hard-wired safety module identical to Preventa safety module XPS:
  - 2 N/O safety output circuits,
  - category 3.
- Safety module independent of the TSX Micro PLC processor: **the PLC does not affect the safety module.**
- 10 LEDs on the TSX Micro PLC display panel: power supply failure and full diagnostics of the safety system.
- Electronic data acquisition units for full diagnostics of the safety system:
  - reading the state of the 8 pushbutton or limit switch inputs,
  - reading the enable input and the feedback loop,
  - reading the control signal of the 2 safety outputs,
  - monitoring the external power supply for the module.

This electronic data acquisition is designed so that the first failure will not adversely affect the safety function.
If the safety system uses more sensors, it is possible to daisy-chain several TSX DPZ 10D2A modules.

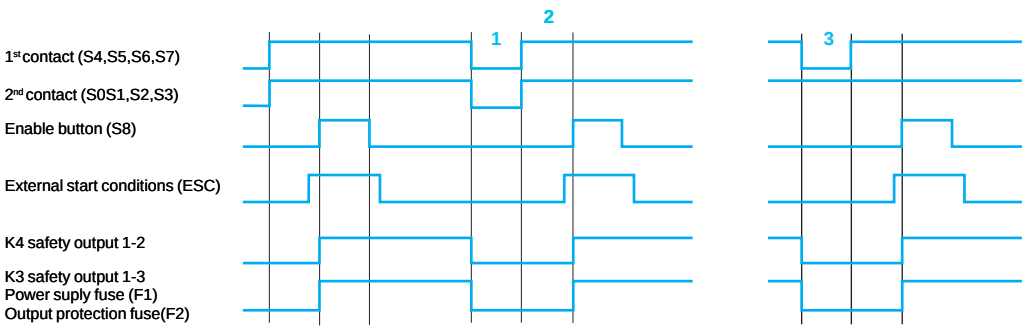
Schematic diagram

To ensure correct operation of the safety function whatever the first failure, the following must be used :
- At the inputs: Emergency stop pushbuttons or safety limit switches with dual contacts.
- At the outputs: if relaying is required, use relays with guided contacts.
- Module power supply: use an F1 protection fuse (see characteristics on page 43307-EN/4).



6-7	Control of the safety system.
1-2 et 1-3	Safety outputs, volt-free.
4-5	Feedback loop and run enable (ESC: additional enable conditions).
14-15	Monitoring of module ⎓ 24 V external power supply.
14-12, 12-10, 10-8, 8-6, 7-9, 9-11, 11-13, 13-15	8 read channels for the Emergency stop pushbutton or limit switch contacts

Functional diagram



1 Emergency stop or limit switch activated.
2 Emergency stop reset or limit switch closed.
3 Error on contact S0…S3.

Characteristics: page 43307-EN/4
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Connections: page 43307-EN/5

Standards and certifications

Standards	Whole machine	Electrical equipment of industrial machines		EN/IEC 60204-1, EN 12100
		Emergency stop device		EN/ISO 13850
	Product	Safety of machinery: safety related parts of control systems		EN 954-1 category 3/ISO 13849-1, pr EN 954-2, EN 1088/ISO 14119 IEC 61508 (SIL 2)
	PLC	Specific requirements		IEC 1131-2 or EN 61131-2, CSA 22-2, UL 508
Certifications				BG, INERIS, INRS, UL, CSA

General characteristics

Power supply	Nominal voltage	**V**	⎓ 24
	Limit operating voltage	**V**	⎓ 21.6…30
	Error signalling	**V**	⎓ < 16
	Maximum consumption	**mA**	< 200
Protection via external F1 fuse	Conforming IEC 947-5-1	**A**	1 (gl)
Consumption on internal 5 V		**mA**	< 20
Isolation		**kV**	4 (overvoltage category III, degree of pollution 2)

Characteristics of discrete inputs

Nominal voltage			**V**	⎓ 24
Modularity	Emergency stop or limit switch discrete inputs			8
	Feedback loop discrete input			1
Logic				Positive
Inrush current			**A**	10/100 µs
Isolation between input and earth			**V rms**	1500 - 50/60 Hz for 1 minute
Power	Dissipated in the module		**W**	< 4.5

Characteristics of safety relay outputs

Modularity				2 volt-free outputs			
Limit operating voltage	a.c.		**V**	∿ 19…264			
	d.c.		**V**	⎓ 17…250			
Max. thermal current (I the)			**A**	1.25			
Minimum current			**mA**	10			
a.c. load	Inductive AC-15 duty	Voltage	**V**	**∿ 24**	**∿ 48**	**∿ 110**	**∿ 220**
		Power	**VA**	30	60	140	165
d.c. load	Inductive DC-13 duty (L/R = 100 ms)	Voltage	**V**	**⎓ 24**			
		Power	**VA**	30			
Response time			**ms**	< 100			
Type of contacts				AgNi gold flashed			
External output protection via F2 fuse	Conforming IEC 947-5-1		**A**	4 (gl)			
Isolation between input and earth	Insulation voltage conforming DIN VDE 0110 part 2		**V**	300			
	Test voltage		**V rms**	2000-50/60 Hz for 1 minute			

Environment

Temperatures	Operation	**°C**	- 10 °C…+ 60 °C
	Stockage	**°C**	- 25 °C…+ 60 °C
Degree of protection			IP 20 conforming IEC 529
Connecting cable c.s.a.	Without cable end	**mm²**	1 x 0.8 minimum
	With cable end	**mm²**	2 x 1 maximum

Reference

Inputs number	Voltage	Safety outputs	Connection Format	Reference	Weight kg
4 Emergency stops or limit switches (dual or single contacts) **1 Start button**	⎓ 24 V	2 “N/O” (volt-free) 1.25 A (I the)	Via screw terminal block (suplied) Half-format	**TSX DPZ 10D2A**	0.280

TSX DPZ 10D2A

Connections:
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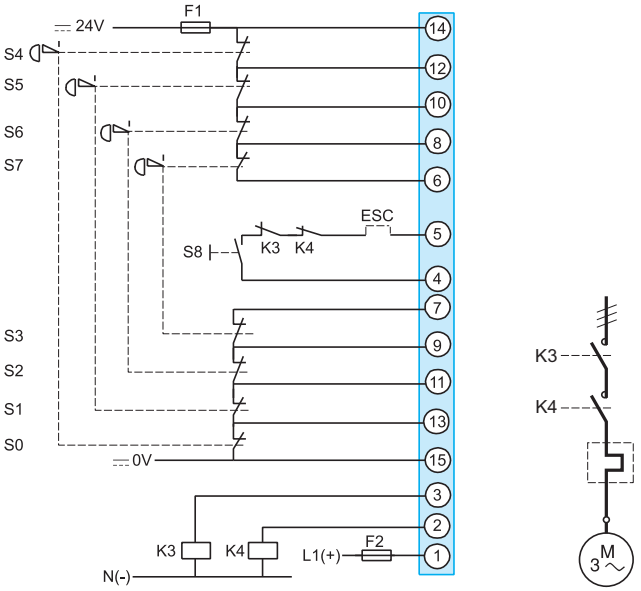
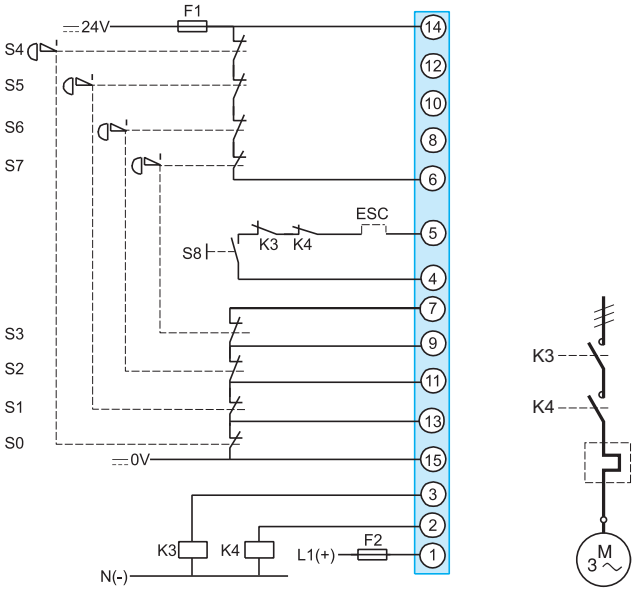
Category 3 wiring diagrams (redundant inputs and outputs): recommended applications

Connection of 4 sensors with dual contacts



The states of all the contacts in the input circuit are read by the PLC. The consistency test carried out by the PLC program on the input contacts enables it to signal and locate precisely the faulty contact(s).
When using less than 4 dual contacts, the input terminals not in use must be linked. For example, if contacts S0 and S4 are not in use, a bridge is required between terminals 14 and 12 and terminals 13 and 15.

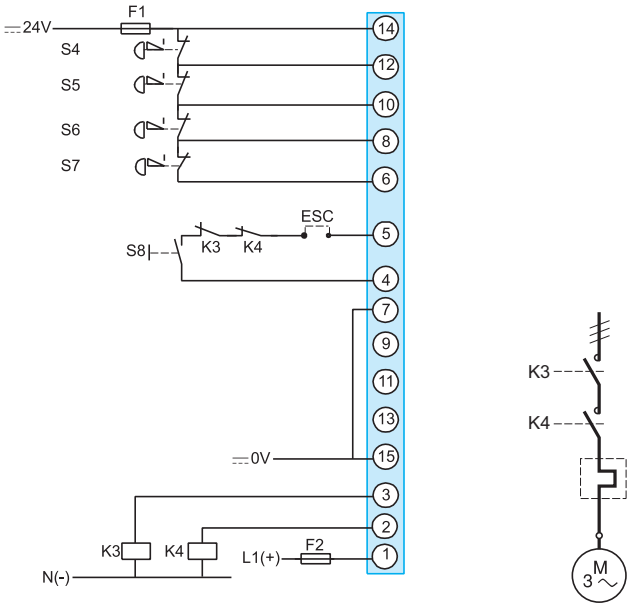
Connection of 4 sensors with dual contacts for existing installations



Suitable for use with existing wiring; with one contact on the safety module and one contact for diagnostics, this wiring enables global reading of the state of contacts S4 to S7 and individual reading of contacts S0 to S3.
The consistency test carried out by the PLC program on the inputs enables it to signal any inconsistency with partial location of the fault.

Wiring diagram with single contacts

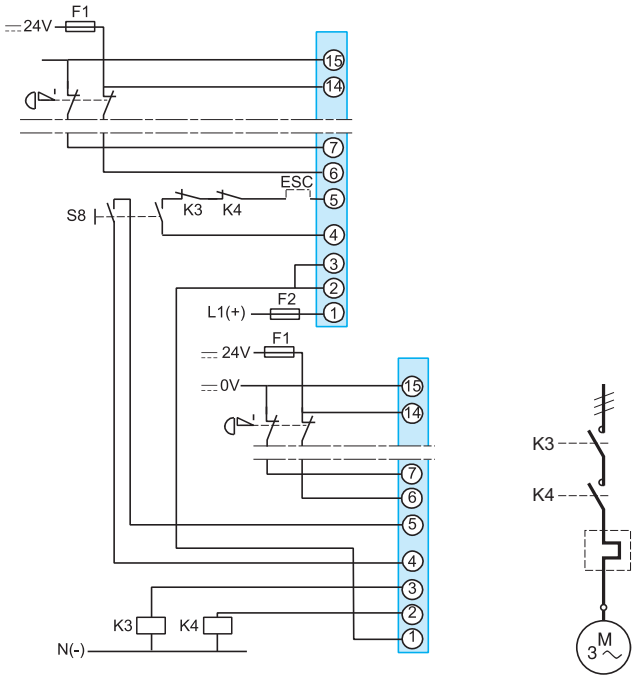
Connection of 4 sensors with dual contacts



Not all faults are detected. A short-circuit on a pushbutton or limit switch is not detected.
When using less than 4 single contacts, the input terminals not in use must be linked.
For example, if contact S5 is not in use, a bridge is required between terminals 10 and 12.

Connecting TSX DPZ 10D2A modules in series

Connection of 4 sensors with dual contacts for existing installations



The connection of safety relay outputs in series enables diagnostics for up to 32 single or dual contact pushbuttons or limit switches. The number of modules connected in series is limited by the number of slots available on the TSX Micro PLC.

Characteristics: page 43307-EN/4
References: page 43307-EN/4