



TRM Project

TRM-16DO

Ether**CAT**® 

Hardware Architecture

User Manual

Technical Documentation

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CONTENTS

This document is the User Manual for TRM-16DO device. TRM-16DO belongs to the TRM series of devices by TPA s.r.l. which are bus field devices to remote the CNC action on a tool machinery or, generally, in a controlled system; the devices are connected to a standard EtherCAT bus.

TRM-16DO is a digital multiple output module of TRM serie by TPA to drive 16 external digital signals (nominally 0-24V On/OFF logic) by the EtherCAT bus.

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This description is only intended for the use of trained specialists in control and automation engineering who are invited to always use the currently valid documentation.

It is recommended that the documentation (notes, explanations, diagrams, ecc.) are followed when installing and commissioning these components.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The Company reserves the right to revise and modify the current documentation at any time.

The Company doesn't respond of incorrect or improper use of the device.

Safeguard clause

If any information about this device will result not clear, please do not esitate to take contacts with TPA.srl Service.



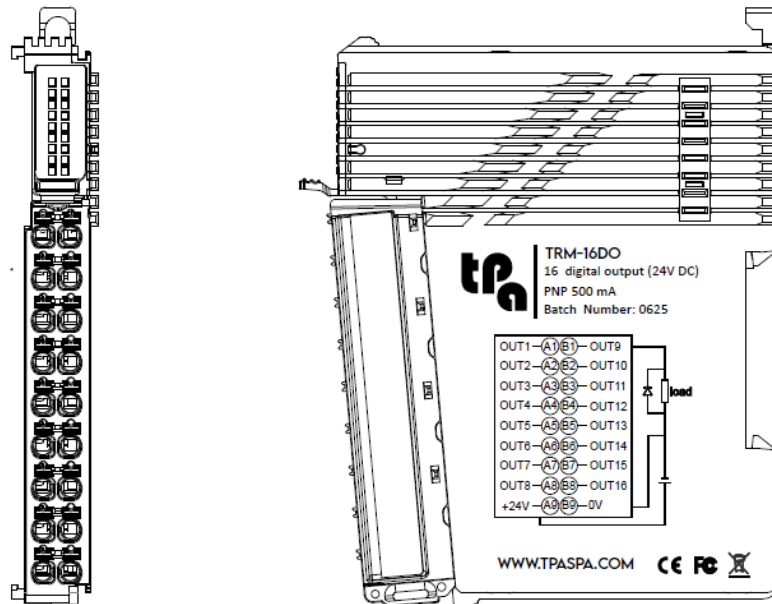
Albatros - Logo



TPA S.r.l - Logo

1 FUNCTIONAL SPECIFICATION

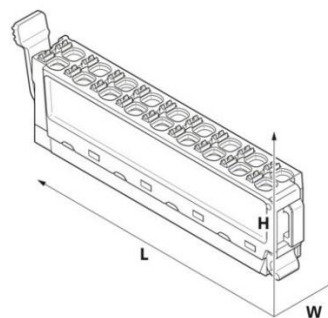
TRM-16DO is a module which provides 16 Digital Output 0-24V. It is directly joined to a bus coupler TRM-ECAT or in chain with other modules of the same serie. The connection between TRM-16DO and other TRM's serie moduls is made by the internal standard E-BUS, as described in IEC61158. It must be used to connect the TRM's serie terminal modules to TRM-ECAT bus coupler. No other application is allowed.



On the right side, a gray silkscreen is printed and it reports:

- the device Name and its main function
- the batch production number
- the consortium EtherCAT logo to specify the environment of use and compatibility
- the TPA reference - TPA's logo, QR code and site address
- CE certification logo
- a simplified schematic for input connections

TRM-16DO converts a digital word (16bit) into 16 independent single-ended and optoinsulated outputs with the rate of the RTC clock of the system. Data are sent by E-BUS and ECAT from the CNC unit. The 16 Digital Outputs can be connected by a 18 positions connector provided with the device; 16 outputs, 1 common reference positive power supply (+24V DC), 1 voltage reference 0V. The connector used is.



**HSCP-SP 1,5-18-IO-7035 color gray
producer code 1569965 - Phoenix**

Each output can be driven in PNP logic, which means:

- PNP mode. Logical "0" condition is 0V (-3/+5V) weak pull-down, logical "1" by applying +24V voltage (+18/+30V), max 0,5A.

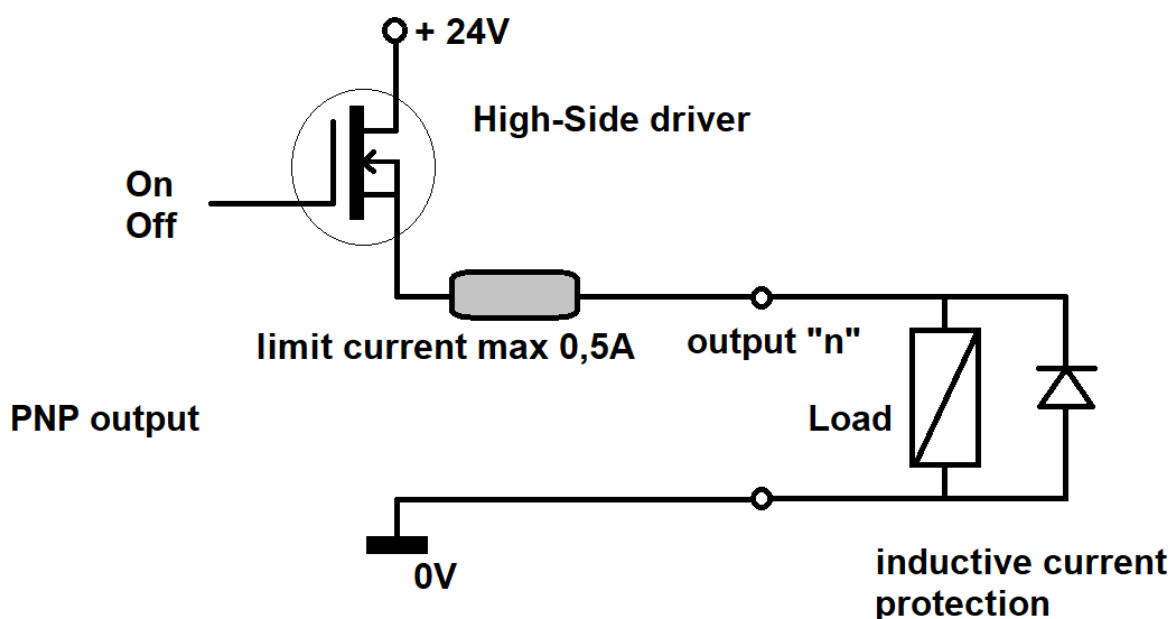
When not driven, a weak pull-down ties down the output.

Each output signal can be connected to a pin of the 18 positions connector; the last 2 pins are provided to connect +24V power supply and 0V voltage.

	TOP LEFT PIN	TOP RIGHT IN	
Output 01	A1	B1	Output 09
Output 02	A2	B2	Output 10
Output 03	A3	B3	Output 11
Output 04	A4	B4	Output 12
Output 05	A5	B5	Output 13
Output 06	A6	B6	Output 14
Output 07	A7	B7	Output 15
Output 08	A8	B8	Output 16
Power Supply +24V	A9	B9	Reference 0V
	BOTTOM LEFT PIN	BOTTOM RIGHT PIN	

Attention! On TRM-16DO every output is protected to prevent high voltage peaks due to inductive loads. However, it is mandatory to connect a clamp diode or other over-voltage protection so closer as possible to the inductive load's electric terminals. Typically, the same OEM of the load device specify which kind of protection must be selected.

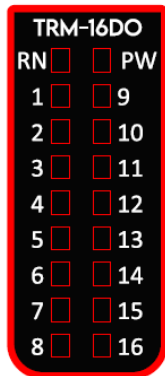
Attention! When the load is a lamp, limit inrush current on the first switch-on, due to cold lamp (for ex. set a few Ohm resistor in serie to the lamp, 10 Ohm 3W).



Pay attention!

Each output needs protection against inductive current and for clamping undervoltage events. Please, take adequate countermeasures (normally specified by the nature of the electric load) to avoid any damage to the output circuits (typically a fast diode or a voltage transient suppressor). Output current is limited by a resettable fuse (PTC).

For loads which require more current, it is possible to connect 2 or more outputs (in parallel) and to drive them together in the meantime by the CNC PLC code, having always the attention to consider 80% of the of the nominal max current limit for each output.



LED		LED	
RN	ECAT link status	PW	Logical Power Supply
1	output 01	9	output 9
2	output 02	10	output 10
3	output 03	11	output 11
4	output 04	12	output 12
5	output 05	13	output 13
6	output 06	14	output 14
7	output 07	15	output 15
8	output 08	16	output 16
	(24V=on, 0V=off)		(24V=on, 0V=off)

On the top of the frontal image of TRM-16DO a list of LED indicators is set.

LED behaviour	EtherCAT State condition
Extinguished	INIT State
Blinking (regular)	PreOP State
Single flash	SafeOP State
Bright	Operational

Regarding the RN EtherCAT status led

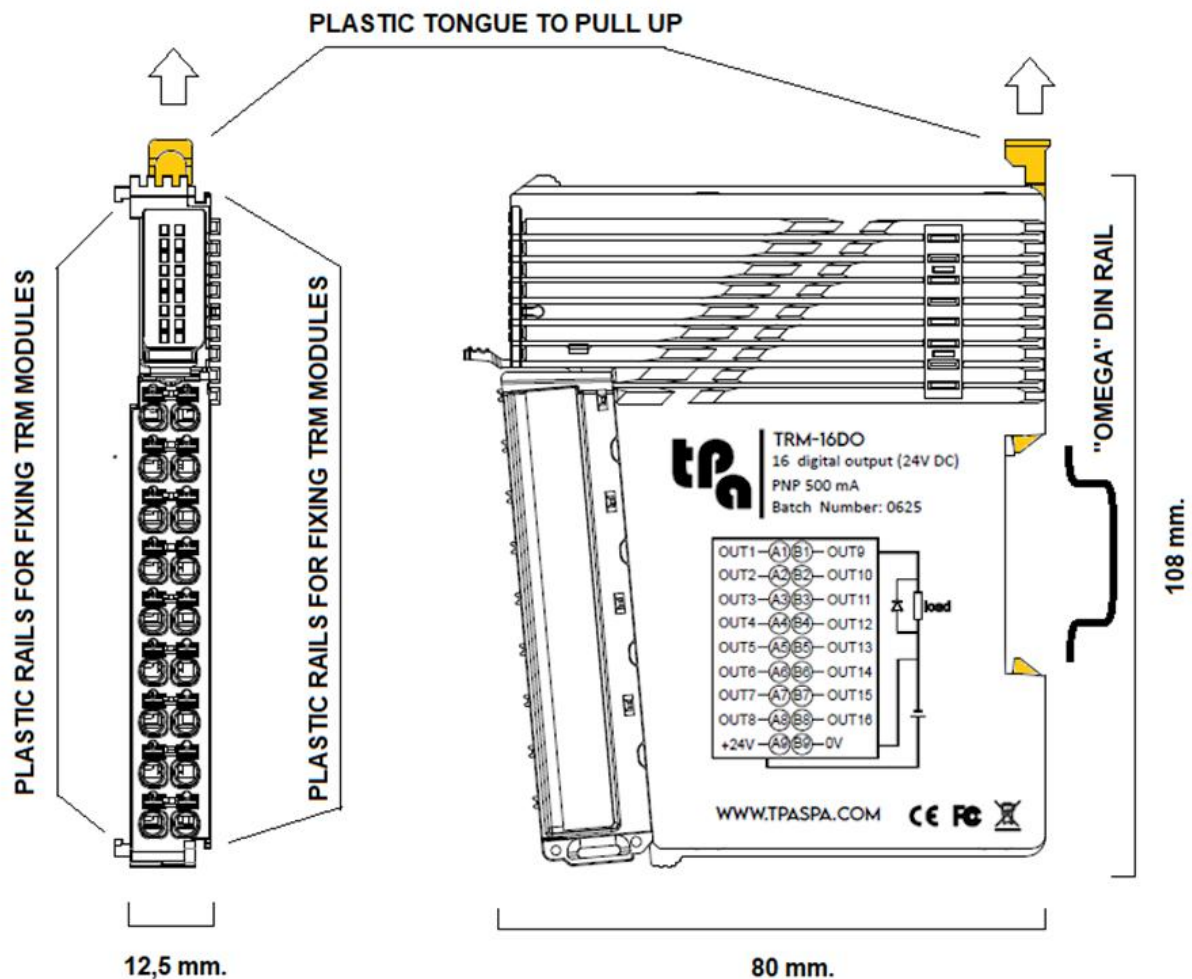
Attention! PW led shows logical power supply is on. There is no feedback signal for external field power supply (+24V DC).

Electrical parameters	Values
Signals	PNP
Nominal voltage output	+24Vdc (-15% / +20%)
Max. output current	0,5A (short circuit proof) per channel – PTC limited
Peak output current	< 1A for 1 ms
Electrical isolation	500V (ECAT line to +24V field Power Supply)
Operating Temperature	-20°C – 60°C
Storage Temperature	-40°C – 60°C
Relative humidity	5 – 95% (not condensating)
Dimensions	108x12,5x80mm.
Net weight	60g.
EMC	CE/FCC
Protection level	IP20

2 MECHANICAL DATA

TRM-16DO module can be installed onto a metallic rail DIN 60715, with "OMEGA" profile, model 7,5mm. or 15mm.

To add a TRM-16DO device to a TRM-ECAT or to another TRM module in a blackchain, let's introduce it along the right side of the TRM-16DO module. There are two plastic rails on the TRM-16DO that help to get the correct position of the TRM I/O device. Then, throw up the orange tongue to fix it to the DIN rail.



Dimension	Value	Notes
Height	108 mm.	Let's consider the extension of the tongue and the possibility to have a min. extended space to handle it
Dept	80 mm.	Let's consider the extension of the connectors and the curves of the cables
Thickness	12,5 mm.	

3 ETHERCAT COMMUNICATION

The TRM-16DO module is compliant with standard EtherCAT normed by ETG in IEC61158.

TRM-16DO is just a simple multi digital output On/Off actuator and it is addressed as a station into the EtherCAT network; it can run only in an ECAT network.

Other TRM's serie devices can be mechanically and electrically joined to TRM-16DO, to constitute a I/O remote block, connected in blockchain, as shown.



Data communication into the blockchain is supported by E-BUS, a local bus derived from ECAT. The communication is full-duplex, real time clocked and based on 100Base-Tx exchange on internal E-BUS. This bus is coupled toward ECAT by a TRM-ECAT modul. TRM-16DO cannot be used not joined to TRM-ECAT.

The max exchange rate (the real Time Clock of the network) can be accorded in this range: 250µs, 500µs, 1ms, 2ms, 4ms or more. It is a Master station dependent parameter.

Output signals are updated in accordance with ECAT frame and played in FREE-RUN (1ms cycle time).

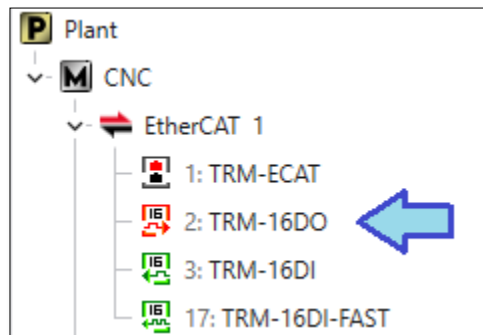
Methods to access and to run it are provided by a description ESI file (TRM-16DO.xml is provided for setting up the device into the control system).

TRM-16DO doesn't present any COE Object or protocol. It is only a simple ECAT bus station.

Thus, the ECAT control unit sees it as a node, a Hardware Station point, with no configurable objects or PDOs.

Output signals can be accessed by writing 16 RxPDOs (0x1600-0x160F). The entries of these RxPDOs are preset to Objects 0x7000 – 0x700F; each RxPDO has 1 BOOLEAN to output the corresponding one driver of the module. The objects are effectively linked to the bits of register 0xF00 - 0xF01 to the ESC (ET1200 by Beckhoff). For the list of the main registers, consult ET1200 specification - registers.

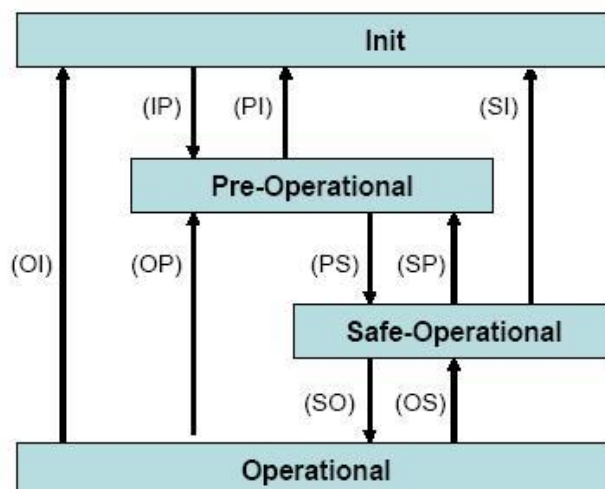
In Albatros SW by TPA, you need to introduce a TRM-ECAT node to convert EtherCAT signals into EBUS format. In the hardware configuration window, under the EtherCAT bus symbol, it is possible to select the TRM-16DO device.



TRM-16DO shows its data with 16 RxPDOs, each one has only one entry of 1 BOOLEAN value which sets the value of the corresponding output (1=active, 0=no active).

2: TRM-16DO							
	Index	In/Out	Sm	Tags	Size	Name	
☒	0x1600	Out	0	M F	0.1	Channel 1	
☒	0x1601	Out	0	M F	0.1	Channel 2	
☒	0x1602	Out	0	M F	0.1	Channel 3	
☒	0x1603	Out	0	M F	0.1	Channel 4	
☒	0x1604	Out	0	M F	0.1	Channel 5	
☒	0x1605	Out	0	M F	0.1	Channel 6	
☒	0x1606	Out	0	M F	0.1	Channel 7	
☒	0x1607	Out	0	M F	0.1	Channel 8	
☒	0x1608	Out	1	M F	0.1	Channel 9	
☒	0x1609	Out	1	M F	0.1	Channel 10	
☒	0x160A	Out	1	M F	0.1	Channel 11	
☒	0x160B	Out	1	M F	0.1	Channel 12	
☒	0x160C	Out	1	M F	0.1	Channel 13	
☒	0x160D	Out	1	M F	0.1	Channel 14	
☒	0x160E	Out	1	M F	0.1	Channel 15	
☒	0x160F	Out	1	M F	0.1	Channel 16	

Here is the Process Data window in Albatros SW, clicking on TRM-16DO icon. The EtherCAT State Machine shown in figure is applicable to TRM-16DO. Outputs are operative exclusively in OPERATIONAL state.



4 TRM-16DO VIEW



TRM-16DO
Front view



TRM-16DO
Right side view

