

HARDWARE GUIDES

28 input/5 output transcoder unit for transformer tap changer



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PROTECTION, AUTOMATION AND
CONTROL FOR POWER INDUSTRY



VERSION INFORMATION

VERSION	DATE	MODIFICATION	COMPILED BY
1.0	2021-06-02	First edition	Erdős

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1 Introduction

The TRCS is a special device, which encodes the 28 stage-state of the transformer voltage regulator into 5-bit binary code.



Figure 1-1 Front view and rear view with fastening for mounting rail

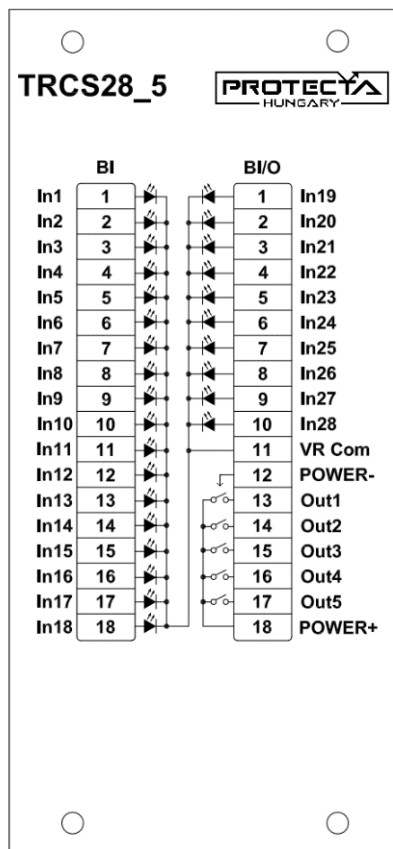


Figure 1-2 Connector arrangement

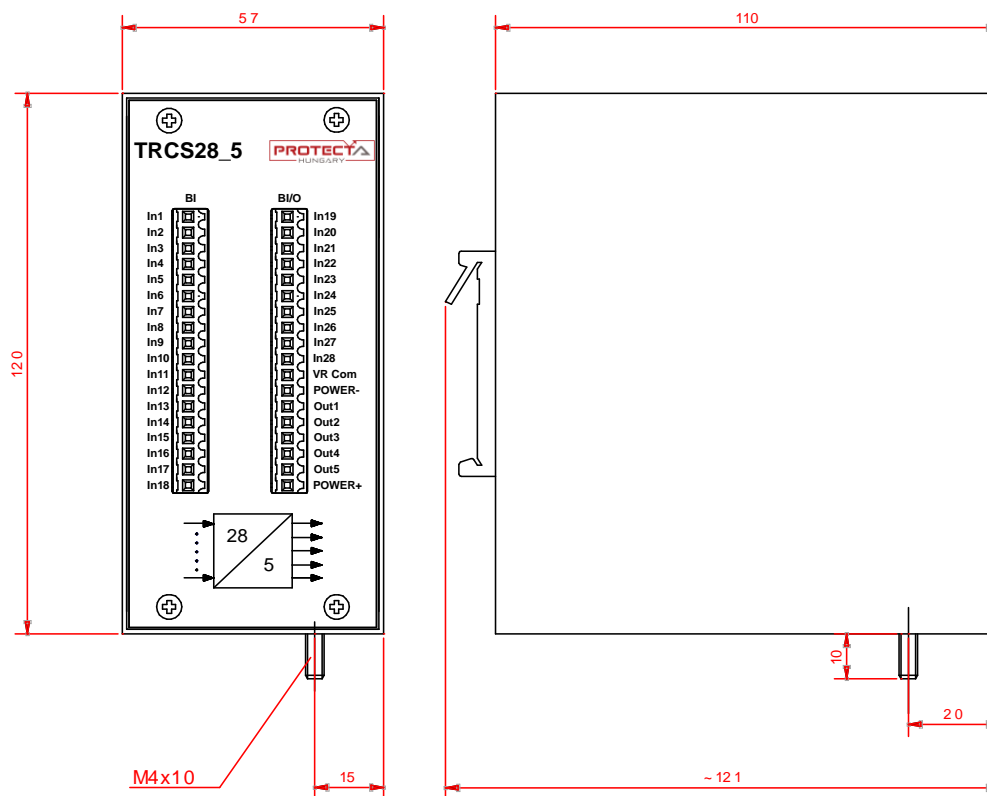


Figure 1-3 TRCS module dimensions

Table 1-1 TRCS technical information

DEVICE TYPE	TRCS
NUMBER OF INPUTS	28
NOMINAL VOLTAGE OF THE INPUTS	48V DC/110V DC/220V DC (Ordering option)
NUMBER OF OUTPUTS	5
NOMINAL VOLTAGE OF THE OUTPUTS	250V AC/DC
OUTPUT CONTINUES CARRY	6 A
CONNECTOR TYPE	Weidmüller BL 3.5/18/180

Output main features:

- Breaking capacity, (L/R = 40 ms) at 110 V DC: 0.2 A, at 220 V DC: 0.1 A

2 Application

2.1 Internal logic, operation of the outputs

According to the current state of the tap changer/voltage regulator, one of the inputs of the TRCS is energized. The outputs are controlled by a static internal logic that realizes the number of the energized input in binary form.

As an example, if the input In11 is active, then the outputs will form the number 11 in binary (with five bits it becomes **01011**), where the lowest position belongs to Out1, so the active outputs will be Out1, Out2 and Out4.

The table below shows the combinations of the outputs according to the active input.

Table 2-1 Truth table of the TRCS logic

INPUT	OUT1	OUT2	OUT3	OUT4	OUT5
1	1	0	0	0	0
2	0	1	0	0	0
3	1	1	0	0	0
4	0	0	1	0	0
5	1	0	1	0	0
6	0	1	1	0	0
7	1	1	1	0	0
8	0	0	0	1	0
9	1	0	0	1	0
10	0	1	0	1	0
11	1	1	0	1	0
12	0	0	1	1	0
13	1	0	1	1	0
14	0	1	1	1	0
15	1	1	1	1	0
16	0	0	0	0	1
17	1	0	0	0	1
18	0	1	0	0	1
19	1	1	0	0	1
20	0	0	1	0	1
21	1	0	1	0	1
22	0	1	1	0	1
23	1	1	1	0	1
24	0	0	0	1	1
25	1	0	0	1	1
26	0	1	0	1	1
27	1	1	0	1	1
28	0	0	1	1	1

2.2 Connection and setup

The TRCS works together with the Automatic Tap Changer Controller (ATCC – Voltage Control) function block. Figure 2-1 shows the necessary connections to apply the device properly:

- The **In1..28** inputs are connected to the tap changer.
- The **VR Com** and **POWER-** inputs are connected to the common point of the tap changer's voltage. The latter is necessary for controlling the outputs.
- The **Out1..5** outputs provide the encoded state signals of the tap changer; the 5 outputs are connected to 5 binary inputs on the corresponding EuroProt+ device
- The voltage that is to be switched on the outputs is connected to the **POWER+** input. This voltage is defined by the nominal voltage of the binary input module of the EuroProt+ device which the Out1..5 outputs are wired to.
- The *logical connection* between the binary input module and the ATCC function block is made in the device software configuration, edited in Logic Editor of the EuroCAP software.
- The *parameter of the ATCC function* is set either on the local (LCD) or the remote (web interface) HMI of the device.

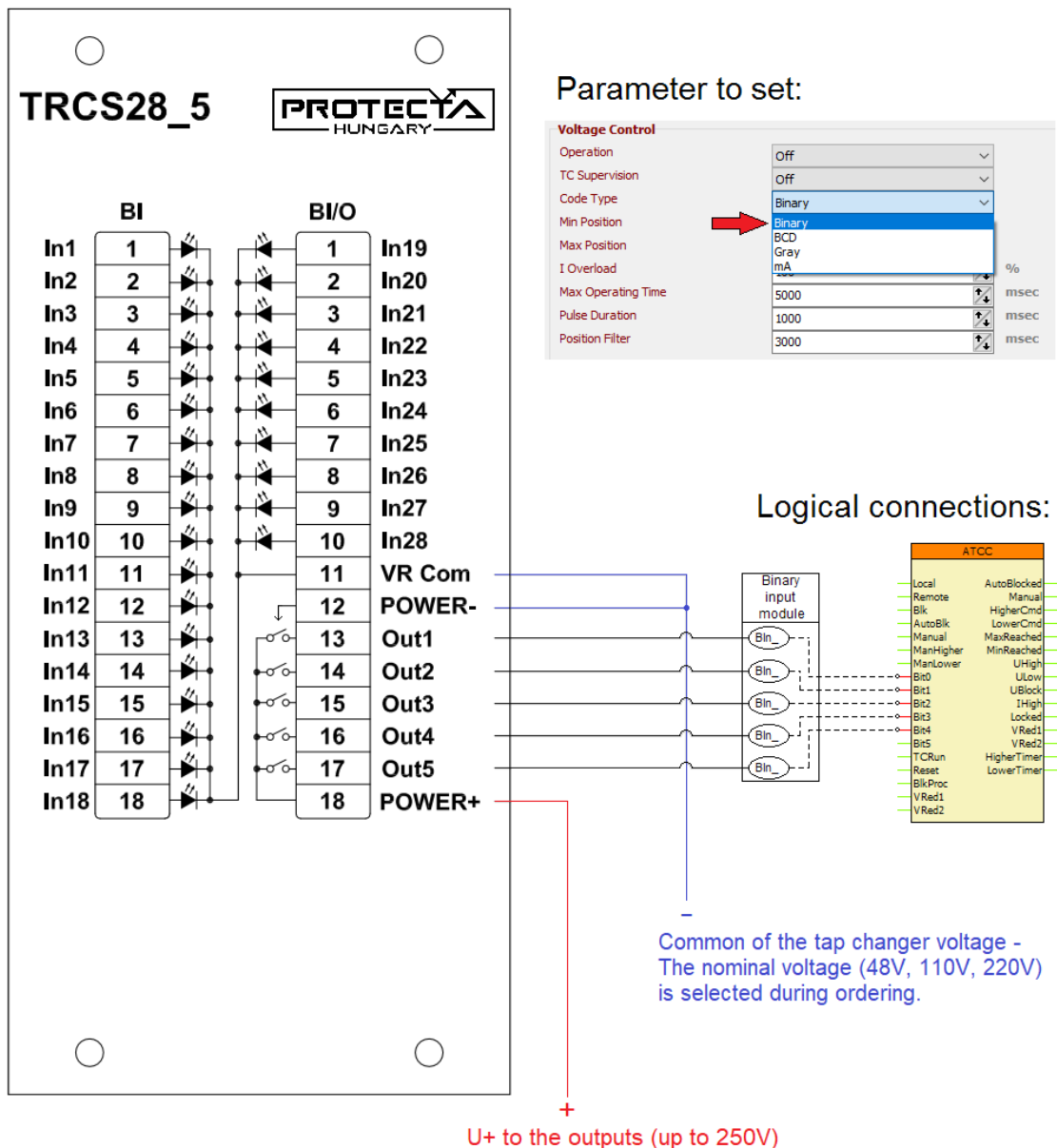


Figure 2-1 Wiring diagram and function setting

3 General data

- Storage temperature: - 40 °C ... + 70 °C
- Operation temperature: - 20 °C ... + 55 °C
- Humidity: 10 % ... 93 %
- Altitude: up to 2000 m
- Atmospheric pressure: 86 ... 106 kPa

3.1 Standard conformance

- Electrostatic discharge immunity (ESD), IEC-EN 60255-26:2013, Level 4
 - Test voltages: 15 kV air discharge, 8 kV contact discharge
- Radiated, radio-frequency, electromagnetic field immunity, IEC-EN 60255-26:2013 Level 3
 - Test field strength: 10 V/m
- Electrical fast transient/burst immunity (EFT/B), IEC-EN 60255-26:2013, Level 4
 - Test voltage: 4 kV
- Surge immunity test, IEC-EN 60255-26:2013
 - Test voltages: 2 kV line-to-earth, 1 kV line-to-line
- Immunity to conducted disturbances, induced by radio-frequency fields, IEC-EN 60255-26:2013, Level 3
 - Test voltage: 10 V
- Damped oscillatory wave immunity test, IEC-EN 60255-26:2013
 - Test frequency: 1 MHz
 - Test voltage: 2.5 kV in common mode, 1 kV in differential mode
- Voltage dips, short interruptions and voltage variations immunity, IEC-EN 60255-26:2013
 - Voltage dips: 40 % (200 ms), 70 % (500 ms), 80 % (5000 ms)
- Ripple on d.c. input power port immunity, IEC-EN 60255-26:2013
 - Level 4, 15 % of rated d.c. value
- Power frequency magnetic field immunity test, IEC-EN 60255-26:2013, Level 5
 - Test field strength: 100 A/m continuous, 1000 A/m for 3 s
- Power frequency immunity test on the binary inputs, IEC-EN 60255-26:2013, Class A
 - Test voltages: 300 V in common mode, 150 V in differential mode
- Insulation tests, IEC-EN 60255-27:2013
 - Impulse voltage test
 - Test levels: 5 kV (1 kV for transducer and temperature measuring inputs)
 - Dielectric test
 - Test levels: 2 kV AC 50 Hz (0.705 kV DC for transducer inputs)
 - Insulation resistance
 - Insulation resistance > 15 GΩ
- Radiated emission, IEC-EN 60255-26:2013

Limits:

 - 30 MHz to 230 MHz: 50 dB(μV/m) quasi peak, 3 m
 - 230 MHz to 1 000 MHz: 57 dB(μV/m) quasi peak, 3 m
 - 1 GHz to 3 GHz: 76 dB(μV/m) peak, 3 m
 - 3 GHz to 6 GHz: 80 dB(μV/m) peak, 3 m
- Conducted emission, IEC-EN 60255-26:2013

Limits:

 - 0,15 MHz to 0,50 MHz: 79 dB(μV) quasi peak, 66 dB(μV) average
 - 0,5 MHz - 30 MHz: 73 dB(μV) quasi peak, 60 dB(μV) average
- Vibration, shock, bump and seismic tests on measuring relays and protection equipment
 - Vibration tests (sinusoidal), Class I, IEC 60255-21-1:1988
 - Shock and bump tests, Class I, IEC 60255-21-2:1988
 - Seismic tests, Class I, IEC 60255-21-3:1993

4 Mechanical data

4.1 General mechanical data

- Construction
 - Painted steel surface
- IP protection:
 - IP2x
- Size:
 - See Figure 1-3 for the device dimensions
- Weight:
 - 0.7 kg

4.2 Connectors

Table 4-1 Connectors on the TRCS

CONNECTOR NAME	CONNECTOR TYPE	STRIP LENGTH [MM]	CONDUCTOR AREA [MM ²]	CONDUCTOR DIAMETER [MM]	TIGHTENING TORQUE [NM]	MINIMUM BEND RADIUS*
BL 3.5 (-)	Weidmüller BL 3.5/18/180	6	0.2 – 1.5	0.5 – 1.4	0.2 – 0.25	3 × OD**
PE FASTON TERMINAL	TE Connectivity 6.3x0.8	7	min. 4	min. 2.3	-	3 × OD**

* Bend radius is measured along the inside curve of the wire or wire bundles.

** OD is the outer diameter of the wire or cable, including insulation.

The tightening torque of the screw for protective earth connection and the wall mounting must be approx. 5 Nm.

During the installation, make sure that the shortest possible length for PE (Protective Earth) cable.

The minimum distance between the device and its wire channel must be at least 3 cm.