

TPI
Tap Position Indicator
User manual



Device:
TPI

Document: User manual
Code: TPIMUBCD

Date:
15.04.2024

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1 PREFACE

Liability statement

We have checked the contents of this manual to ensure that the descriptions of both hardware and software are as accurate as possible. However, deviations may occur so that no liability can be accepted for any errors or omissions contained in the information given.

The contents of this manual will be checked in periodical intervals, corrections will be made in the following editions.

We reserve the right to make technical improvements without notice.

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Copyright

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Explanation of the symbols



Read the instructions!



Device was tested with 2,5 kV AC voltage to check the device insulation.



Waste Electrical and Electronic Equipment (WEEE) Directive 2015/863/EU; the affixed product label indicates that you must not discard this electrical/electronic product in domestic household waste.

Warnings

In this paper the following terms are used:

Danger

indicates that death, severe personal injury or substantial property damage will result if proper precautions are not taken.

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Warning

indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

Caution

indicates that minor personal injury or property damage can result if proper precautions are not taken. This particularly applies to damage on or in the device itself.

General information

These paper contain the information that is necessary for the proper and safe operation of the described devices. This paper is intended for technically qualified personnel.

**Warning!**

Hazardous voltage is present inside the device during operation. Disregarding of safety rules can result in severe personal injury or property damage.

Only qualified personnel may work with described devices after being familiar with warnings and safety notices in this paper and other safety regulations.

**Warning!**

Device must operate completely assembled! Device must be used as described. No modifications of the device should be made.

**Warning!**

Do not open device while it is energized! Hazardous voltage is present inside the device. Disconnect all connectors before opening!

**Warning!**

If device is damaged disconnect it from power supply! Send it to the manufacturer for inspection.

**Warning!**

Connect to earth before attaching power supply!

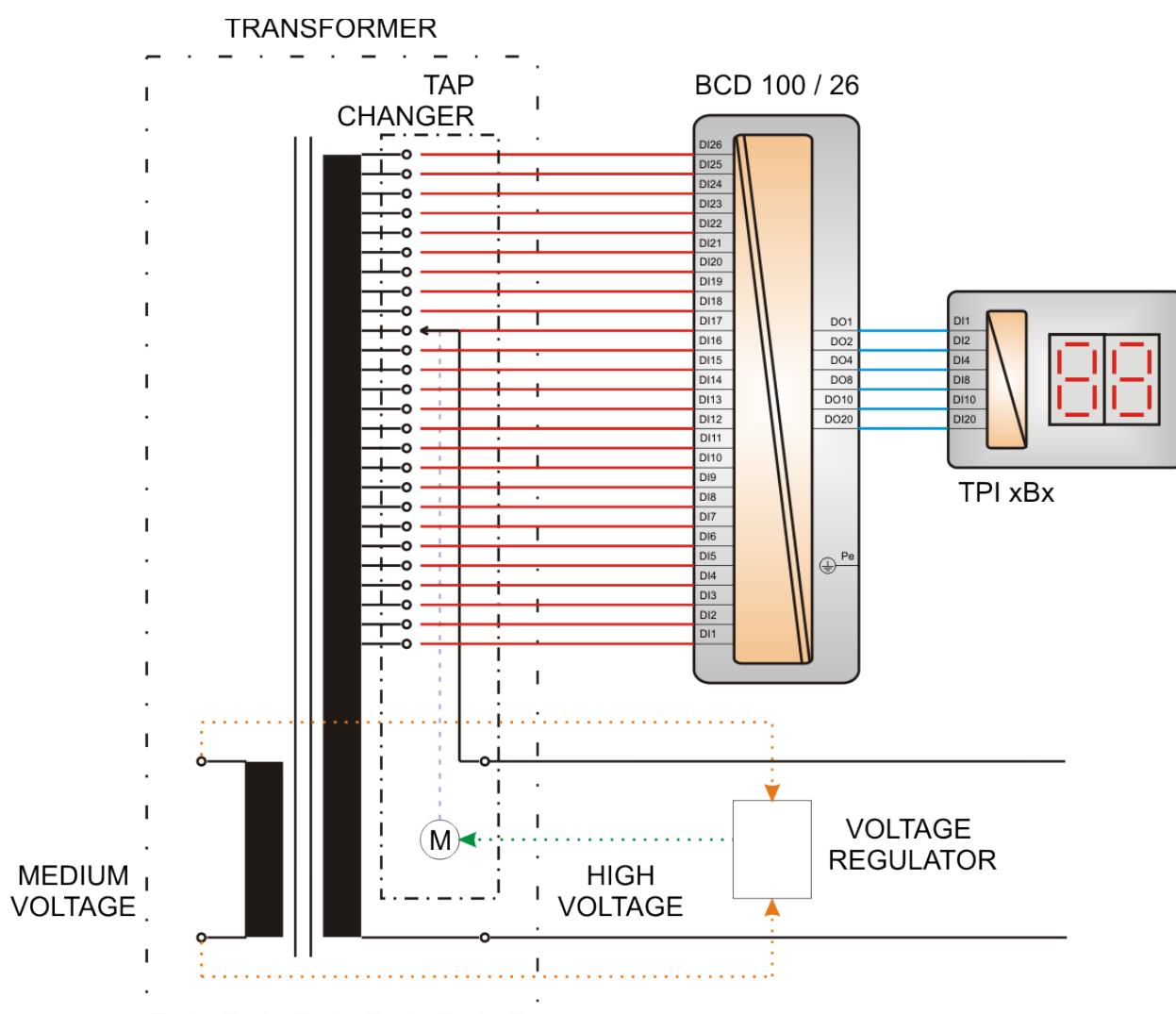
2 GENERAL DESCRIPTION

TPI is tap changer position indicator. It displays position on two 1" high displays up to 39 positions. Device can obtain information via 6x digital inputs (BCD coding), 20 mA analog input (in development) or resistance measurement (in development).

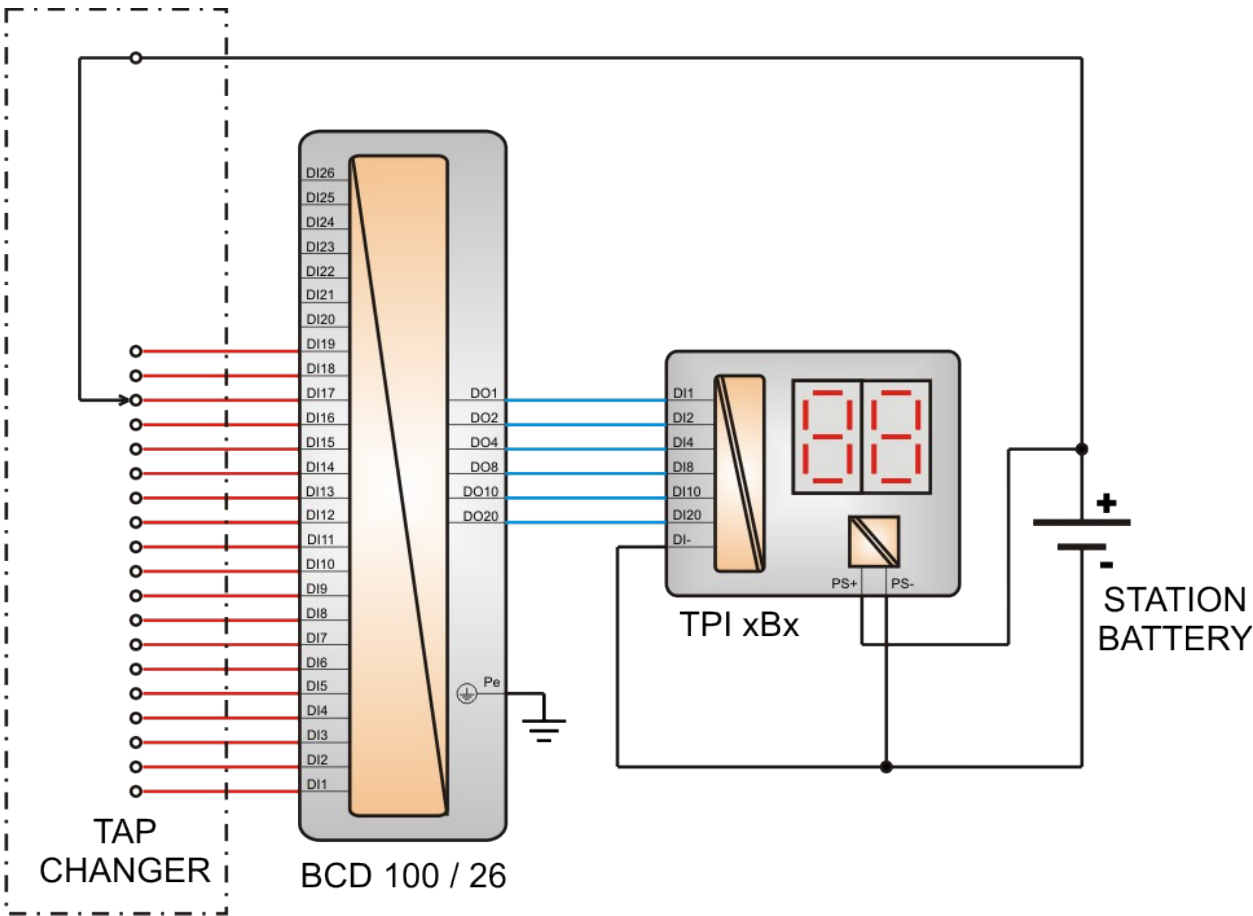
Power supply and digital inputs are made for standard substation voltages; 24 V DC, 48 V-60 V DC, 110 V-125 V DC, 220 V DC and 230 V AC.

TPI is intended for mounting into panel

TPI can be equipped with RS485 communication with Modbus or IEC 60870-5-103 protocol.



Picture 1: TPI xBx application



Picture 2: TPI xBx and BCD 100 connection

3 OPERATION

3.1 BCD CODE

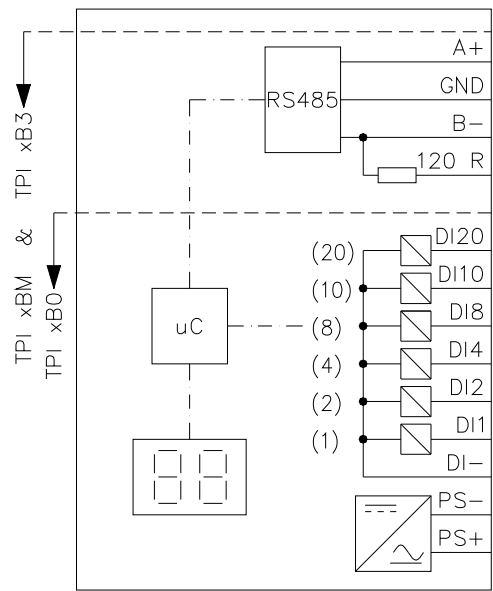
DIGITAL INPUTS						DISPLAY	
1	2	4	8	10	20		
any illegal state						-	-
X							1
	X						2
X	X						3
		X					4
X		X					5
	X	X					6
X	X	X					7
			X				8
X			X				9
				X		1	0
X				X		1	1
	X			X		1	2
X	X			X		1	3
		X		X		1	4
X		X		X		1	5
	X	X		X		1	6
X	X	X		X		1	7
			X	X		1	8
X			X	X		1	9

DIGITAL INPUTS						DISPLAY	
1	2	4	8	10	20		
					X	2	0
X					X	2	1
	X				X	2	2
X	X				X	2	3
		X			X	2	4
X		X			X	2	5
	X	X			X	2	6
X	X	X			X	2	7
			X		X	2	8
X			X		X	2	9
				X	X	3	0
X				X	X	3	1
	X			X	X	3	2
X	X			X	X	3	3
		X		X	X	3	4
X		X		X	X	3	5
	X	X		X	X	3	6
X	X	X		X	X	3	7
			X	X	X	3	8
X			X	X	X	3	9

X - means that DI is active

4 SCHEMATIC

4.1 TPI xBx SCHEMATIC



Picture 3: TPI xBx schematic

- TPI 1xx (24 V DC)*
- TPI 2xx (48 V-60 V DC)*
- TPI 3xx (110 V-125 V DC)
- TPI 4xx (220 V DC)
- TPI 5xx (230 V AC)

TPI xBx (6x BCD coded digital inputs)

- TPI xx0 (no communication)
- TPI xxM (RS485 communication with Modbus protocol)*
- TPI xx3 (RS485 communication with IEC 60870-5-103 protocol)*

* in development

5 INSTALLATION



Warning!

Hazardous voltage is present inside the device during operation. Disregarding of safety rules can result in severe personal injury or property damage. Only qualified personnel may work with described devices after being familiar with warnings and safety notices in this paper and other safety regulations.

Following instruction must be taken into consideration:

- ◆ The device must be accessible to qualified personnel only.
- ◆ The device is permitted to operate in enclosed housing or cabinet only.
- ◆ The device location must be vibration-free.
- ◆ The admissible operating temperature must be observed.
- ◆ Check the device for damage at unpacking. If device is damaged it must not be installed, but it should be send to the manufacturer for repair.
- ◆ The device should not be opened.
- ◆ For connection single core or stranded wire 0,25 mm²–2,5 mm² must be used. Recommended stripping lenght is 8 mm.

Safety of any system incorporating the device is the responsibility of the assembler of the system.

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6 COMMISSIONING AND MAINTENANCE

6.1 COMMISSIONING



Warning!

Hazardous voltage is present inside the device during operation. Disregarding of safety rules can result in severe personal injury or property damage.
Only qualified personnel may work with described devices after being familiar with warnings and safety notices in this paper and other safety regulations.

Following instruction must be taken into consideration:

- ◆ Device must operate completely assembled! Device must be used as described. No modifications of the device should be made.
- ◆ Check if the power supply voltage complies with device operation voltage.
- ◆ Do not open device while it is energized! Hazardous voltage is present inside the device.
- ◆ If the device is used in a manner not specified in this manual, the protection provided by the device may be impaired.

6.2 MAINTENANCE

Device is maintenance-free. Do not use liquids for cleaning the unit. Use water moisturised mop. Disconnect all connectors before cleaning.

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7 TECHNICAL DATA

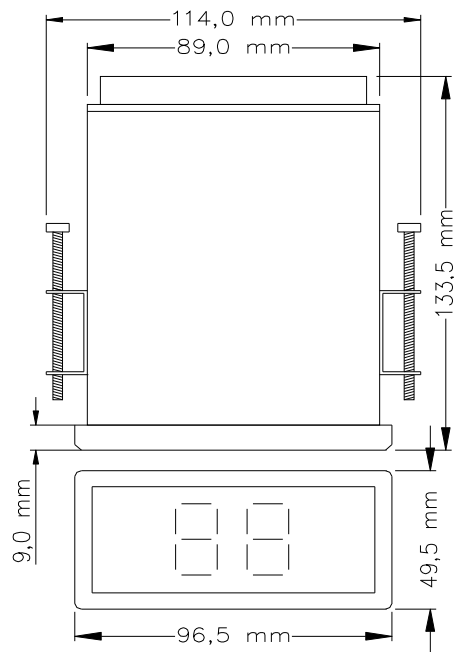
Power supply		
Rated input voltage	TPI 1xx	24 V DC
	TPI 2xx	48 V-60 V DC
	TPI 3xx, 4xx, 5xx	110 V-250 V DC, 230 V AC
Permissible voltage range	TPI 1xx	19,2 V–29 V DC
	TPI 2xx	38 V–72 V DC
	TPI 3xx, 4xx, 5xx	88 V–300 V DC, 80 V-264 V AC
Power consumption	< 1 W (DC), < 2,5 VA (AC)	

Digital inputs (TPI xBx only)		
Rated input voltage	TPI 1xx	DC 24 V
	TPI 2xx	DC 48 V
	TPI 3xx	DC 110 V – 125 V
	TPI 4xx	DC 220 V
	TPI 5xx	AC 230 V
Permissible voltage range	TPI 1xx	DC 19,2 V – 29 V
	TPI 2xx	DC 38 V – 53 V
	TPI 3xx	DC 88 V – 140 V
	TPI 4xx	DC 176 V – 242 V
	TPI 5xx	AC 180 V – 253 V
Input current	all types	1,2 mA
Frequency	50 Hz	

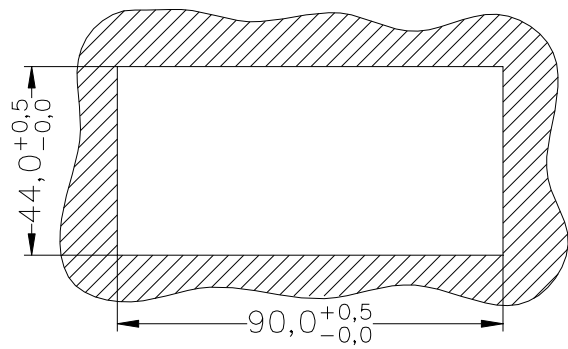
Device		
Mounting type	panel mount 96 x 48 mm	
Connector type	Screw type, moving cage	
Wire	crosssection	0,25 mm ² – 2,5 mm ²
	type	single core or stranded wire
	voltage rating	500 V
	colour	follow appropriate standard
Weight	0,3 kg	
Temperature range	-10 °C to + 55 °C	
Humidity operating	up to 95 % (noncondensing)	

Device		
Enclosure	Material	ABS, UL 94 V-0
Overvoltage category	III	
Altitude	up to 2000 m	

7.1.1 DIMENSIONS



Picture 4: TPI dimensions (panel mount)



Picture 5: TPI recommended cut-out (panel mount)

8 ORDERING

ORDERING CODE:

	TPI		
	☐	☐	☐
Digital inputs and power supply voltage:	↓		
24 V DC*	1		
48 V-60 V DC *	2		
110 V-125 V DC	3		
220 V DC	4		
230 V AC	5		
Inputs:	↓		
6x digital inputs BCD	B		
20 mA analog input*	A		
Resistance measurement*	R		
Communication:	↓		
None	0		
RS485, ModBus protocol*	M		
RS485, IEC 60870-5-103 protocol*	3		

* in development

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