

# INSTRUMENTATION AND CONTROL SURGE PROTECTION

## Protecting discrete digital signals using the PLUGTRAB PT 4X1... and PT 2X1...

TRABTECH  
Application Note  
2555A

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### 1 Description

Digital input/output (I/O) signals can be protected using the PLUGTRAB PT 4X1... and PT 2X1. The PT 4X1 can protect up to four discrete/digital signal circuits while the PT 2X1... can protect up to two discrete/digital signals.

The PLUGTRAB is installed in one of two base elements: the PT...+F-BE base provides isolation between the shield and ground while the PT...-BE base bonds the shield to ground. The bond in the PT...-BE base provides a drain for noise collected on the shield. Using the PT...+F-BE base prevents unwanted ground loops by isolating the shield and ground.

The most common applications use the PT...-BE base.

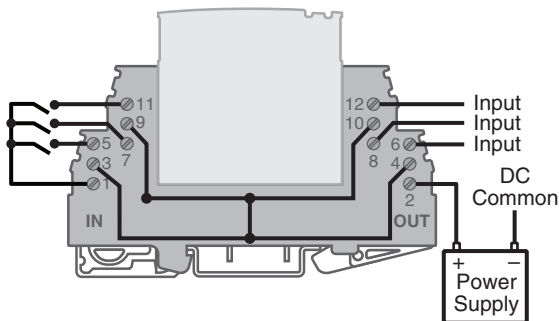


Figure 1. Typical Input Wiring for PT 4X1-BE Base

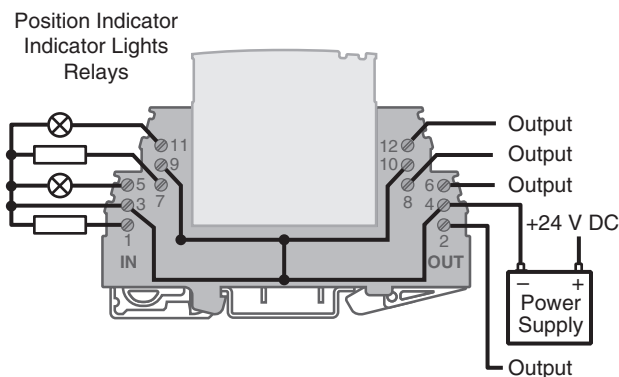


Figure 2. Typical Output Wiring for PT 4X1-BE Base

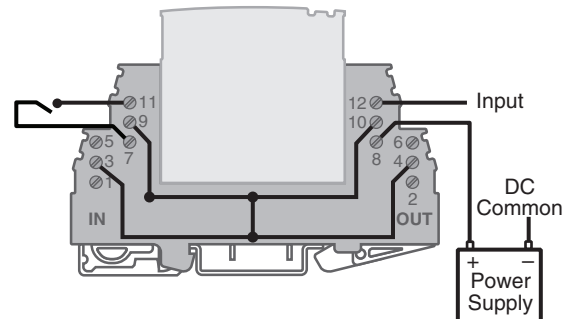


Figure 3. Typical Input Wiring for PT 2X1-BE Base

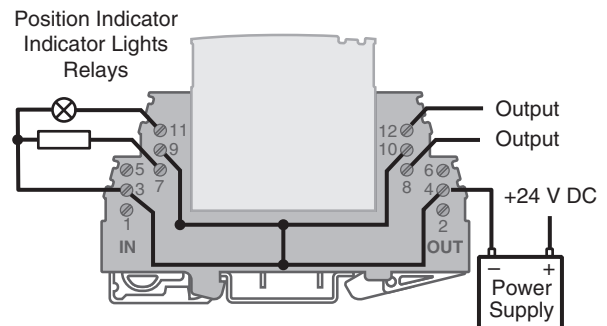


Figure 4. Typical Output Wiring for PT 2X1-BE Base

## 1.1 Proper Grounding

The PLUGTRAB prevents surge energy from reaching the control equipment by diverting this energy to the ground circuit. Figures 5 and 6 show a grounding block attached to the DIN rail. The module is connected to ground through the DIN rail. A ground wire should be connected from the grounding block to the AC power ground. The wire should:

- be the same diameter/gauge as the power ground wire.
- not be placed next to or near a signal wire.

During a surge event, energy can come from several signal cables. If multiple PLUGTRABs are used to protect different signal lines, they will all divert the surge energy to the ground, via the DIN rail. This energy needs a low impedance path to ground. A grounding wire the same size as the power ground wire ensures low impedance.



A complete protection solution requires surge protection on the power and signal lines as shown in Figures 5 and 6. The input power to a power supply should be protected.

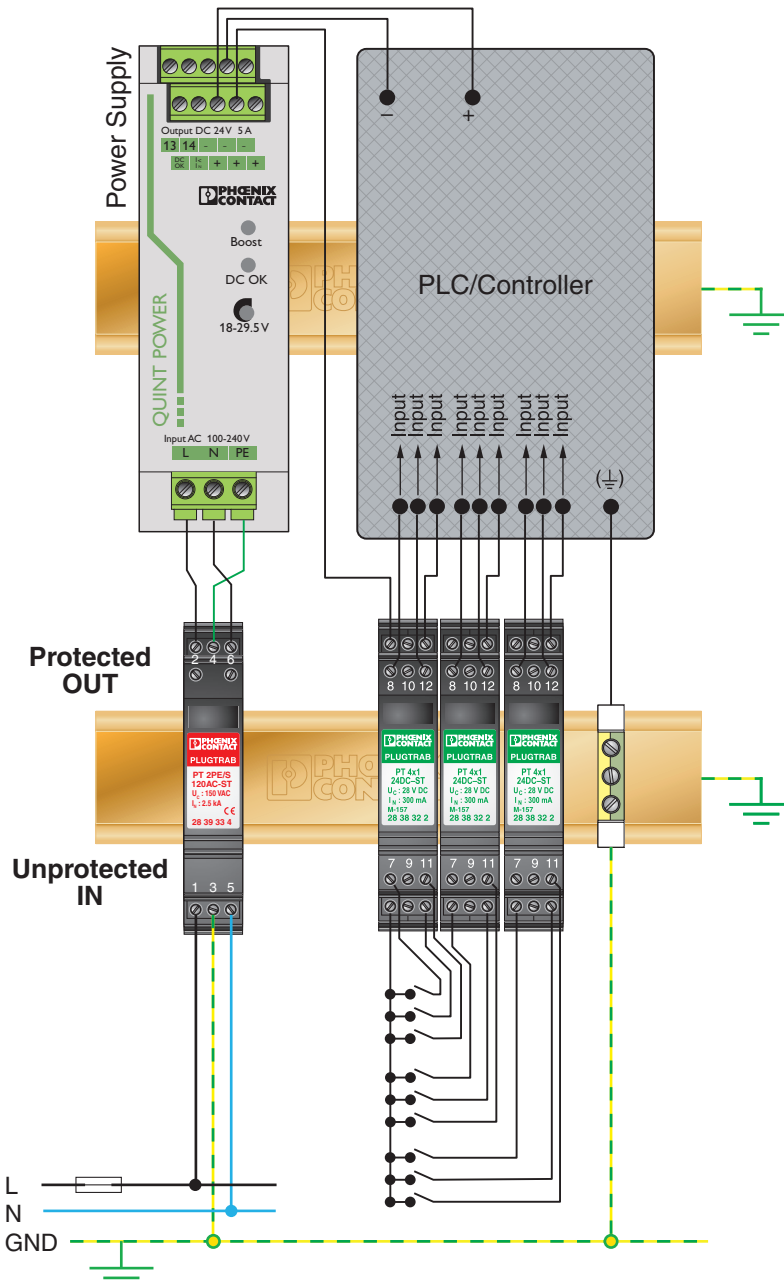


Figure 5. PT...X1-BE with common reference for Inputs

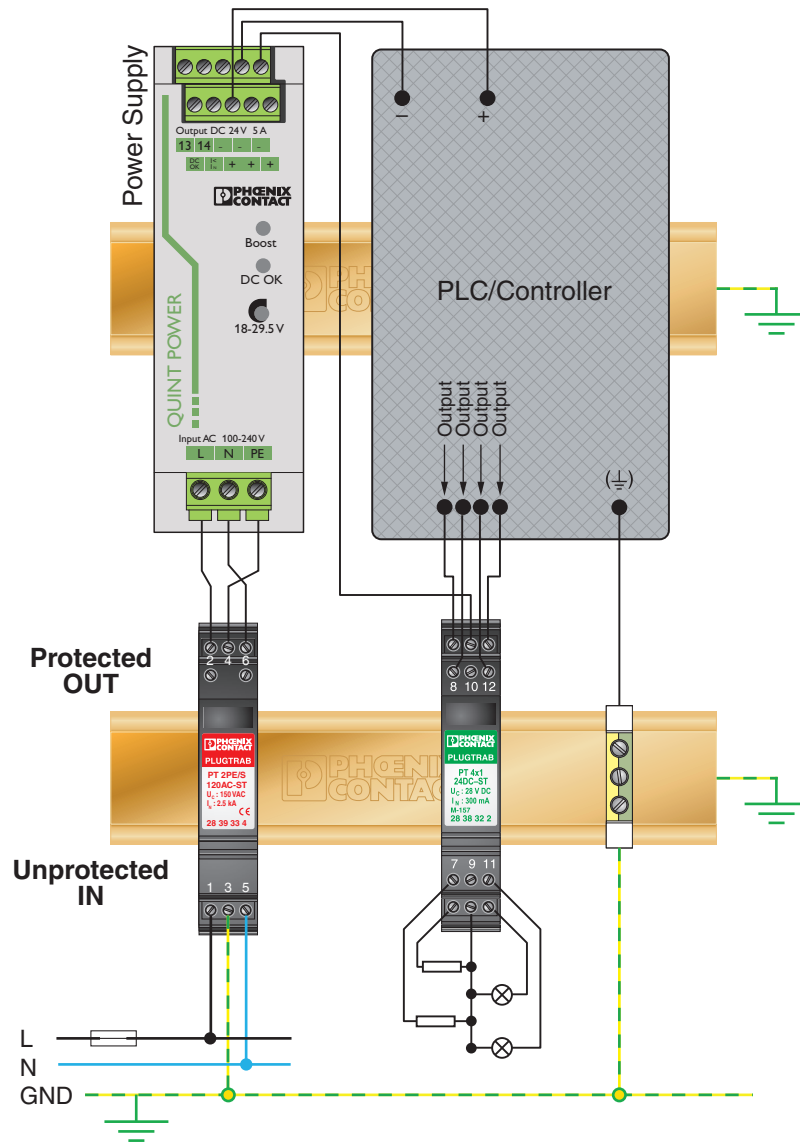


Figure 6. PT...X1-BE with common reference for Outputs

Figures 5 and 6 display the complete surge protection solution with proper grounding and bonding. The power supply is protected from a surge using PLUGTRAB PT on the signal line from the field. Both units are bonded to the same ground, single point grounding, using low impedance DIN rail and grounding wire.

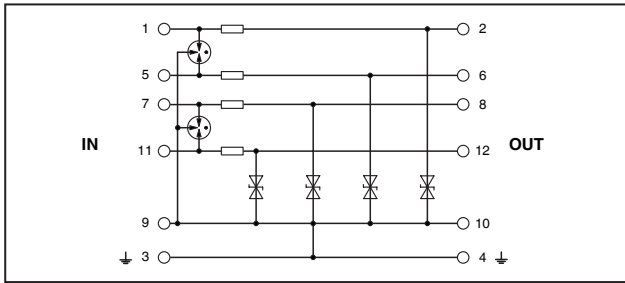


Figure 7. PT 4X1 circuit schematic

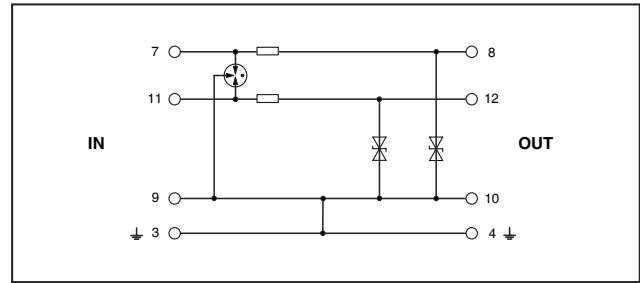


Figure 8. PT 2X1 circuit schematic

## 2 Products

Description of signal protection	Type	Order No.
<b>PLUGTRAB plug</b> , 5 V DC	PT 2X1-5DC-ST	2856061
<b>PLUGTRAB plug</b> , 12 V DC	PT 2X1-12DC-ST	2856074
<b>PLUGTRAB plug</b> , 24 V DC	PT 2X1-24DC-ST	2856087
<b>PLUGTRAB plug</b> , 12 V AC	PT 2X1-12AC-ST	2856090
<b>PLUGTRAB plug</b> , 24 V AC	PT 2X1-24AC-ST	2856100
<b>PLUGTRAB base element</b> , accepts PT 2X1 plugs	PT 2X1-BE	2856139
<b>PLUGTRAB base element</b> , includes integrated gas discharge tube, accepts PT 2X1... plugs	PT 2X1+F-BE	2856142
<b>PLUGTRAB plug</b> , 5 V DC	PT 4X1-5DC-ST	2838306
<b>PLUGTRAB plug</b> , 12 V DC	PT 4X1-12DC-ST	2838319
<b>PLUGTRAB plug</b> , 24 V DC	PT 4X1-24DC-ST	2838322
<b>PLUGTRAB plug</b> , 48 V DC	PT 4X1-48DC-ST	2858014
<b>PLUGTRAB plug</b> , 12 V AC	PT 4X1-12AC-ST	2838348
<b>PLUGTRAB plug</b> , 24 V AC	PT 4X1-24AC-ST	2838351
<b>PLUGTRAB base element</b> , accepts PT 4X1 plugs	PT 4X1-BE	2839363
<b>PLUGTRAB base element</b> , includes integrated gas discharge tube, accepts PT 4X1... plugs	PT 4X1+F-BE	2839376
Power protection	Type	Order No.
<b>MAINS-PLUGTRAB</b> , 120 V AC	PT 2-PE/S-120AC/FM	2856812
<b>MAINS-PLUGTRAB</b> , 230 V AC	PT 2-PE/S-230AC/FM	2858357
<b>MAINS-PLUGTRAB plug</b> , 120 V AC	PT 2PE-120AC-ST	2839334
<b>MAINS -PLUGTRAB plug</b> , 230 V AC	PT 2PE-230AC-ST	2839347

## 3 Accessories

Description	Type	Order No.
<b>Tester</b> , for checking the functions of TRABTECH protective devices, includes adapter for PLUGTRAB devices	CHECKMASTER	2838924
<b>Test adapter</b> , for PLUGTRAB	CM-PA-PT/A	2816933
<b>Shield, fast connection</b> , 3-6 mm diameter	SSA 3-6	2839295
<b>Zach marker strip</b> , 10-section, printed horizontally	ZB 5 :UNBEDRUCKT	1050004
<b>Zach marker strip</b> , 10-section, printed horizontally	ZB 18 :UNBEDRUCKT	2809128