

FUSED PROCESS LOOP WIRING

Protecting process signals using CLIPLINE complete process

Application note
3364A

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1 Description

Process applications rely heavily on control signals. Hundreds of flow, temperature, discrete, and level signals are constantly monitored from locations spread all over a facility. Typically these signals are transmitted in an analog or digital fashion using a shielded twisted-pair (STP) cable. This specialized cabling scheme provides a high level of resistance to noise (electromagnetic interference - EMI, or radio frequency interference - RFI) which can result in erroneous data.



Figure 1. Shielded cable

To protect the sensors and I/O of process control loop hardware from damaging fault currents, a fuse is installed in the circuit connecting the controller and field device. In order to correctly wire the STP cables typically used, another termination point is necessary to carry the shield to ground. Phoenix Contact has developed several terminal block configurations to aid in the wiring of control loops and minimize the amount of panel space required to terminate these signals.

1.1 Single-level solution

The basic approach to this application uses three single-level terminal blocks (see Figure 2) resulting in approximately 0.73 in. (19 mm) in rail space per signal. This configuration consists of a fuse block for protection, a disconnect block to isolate the signal return, and a ground block for the shield connection. A unique, push-in bridging system easily plugs into the top of each block, including the fuse block, for quick, secure and reliable potential distribution. A hinged fuse holder accepts a 5 x 20 mm fuse for circuit protection and, when required, can include blown fuse indication.

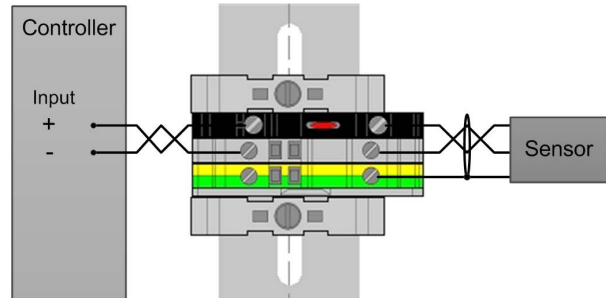


Figure 2. Traditional single-level loop wiring

1.2 Single-level solution with ground foot

As an alternative, Phoenix Contact has developed a series of terminal blocks with an integrated ground foot to attach the shield wire. The solution allows for the elimination of the ground terminal in the standard, single-level three-block configuration resulting in a 33% savings in rail space. The wiring of the UT 4-PE series of terminal blocks is illustrated in Figure 3. As with the standard single-level UT product, this series incorporates the same hinged fuse holder and push-in bridging system along with flexible marking channels for proper connection identification.

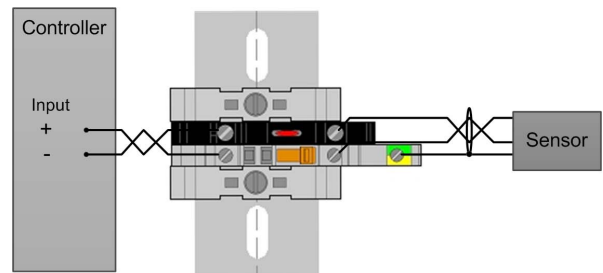


Figure 3. Single-level loop wiring with shield

1.3 Double-level solution with ground foot

To complete this family of process terminal blocks, Phoenix Contact has introduced a two-level, 6.2 mm wide UT 4-PE/L series (Figure 4). These terminal blocks incorporate a top-level fuse or disconnect function with a feed-through level and ground foot for shield connection. This configuration perfectly organizes each wire of the signal loop into one terminal block including providing a ground location for each shield. A hinged fuse plug houses a 5 x 20 mm fuse for circuit protection and, when required, can also include blown fuse indication.

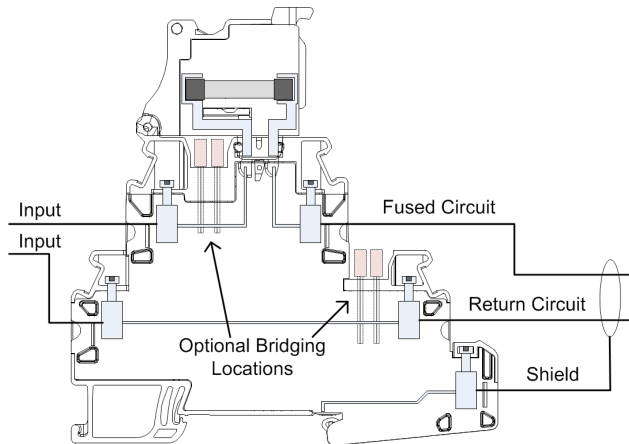


Figure 4. UT 4-PE/L/HESI three-level process block

Phoenix Contact's unique push-in bridging system easily plugs into the two levels of the block to provide simple power distribution between loops. Figure 5 illustrates the use of a push-in bridge to common the pass-through levels of four adjacent terminal blocks. Bridging is supported on the fused level via two bridge channels located underneath the hinged fuse holder as shown in Figure 4.

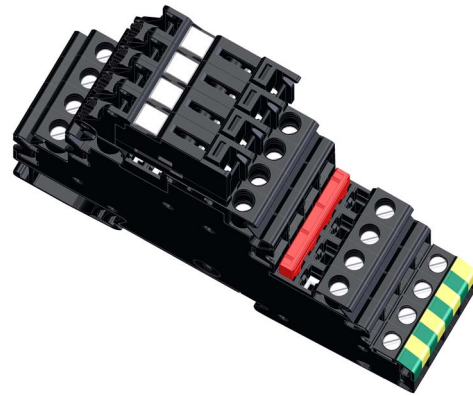


Figure 5. Top view showing bridge

As with a standard single-level UT product, this series incorporates the flexible marking channels for proper connection identification.

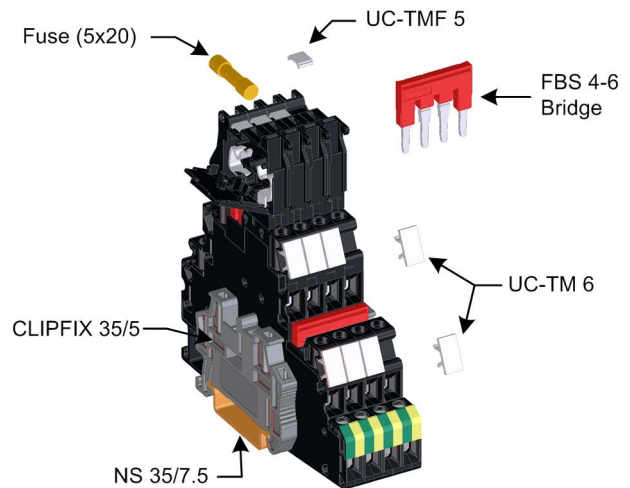


Figure 6. Fuse block with accessories

1.4 Hazardous location approvals

This family of terminal blocks is specifically designed for the process industry and has been released with the appropriate certifications. All products are UL recognized and many of the products also carry ATEX, IECEx nA Class I, Zone 2 and UL Class I, Division 2 listings.

2 Space savings

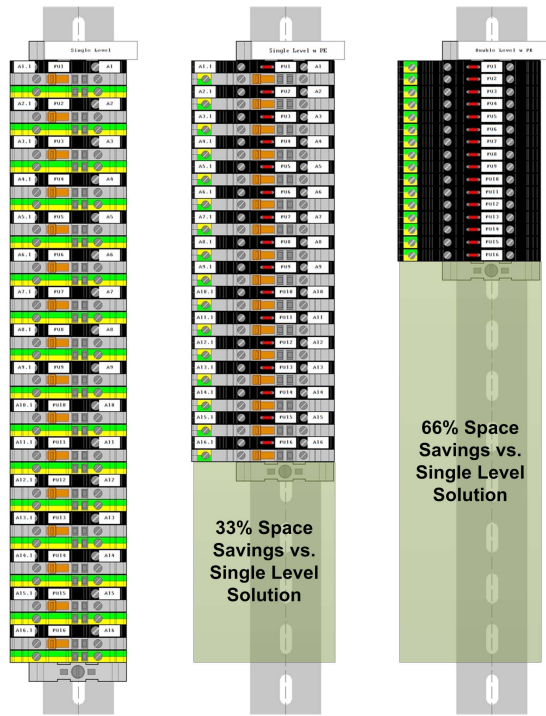


Figure 7. Configuration comparison

Phoenix Contact has a wide range of terminal blocks designed specifically for the wiring of process loops. A side-by-side comparison of the different wiring solutions shows just how much rail space can be saved by switching from single- to double-level solutions. Figure 7 illustrates the space savings when wiring 16 points of I/O using each of the methods described – single-level terminal block, single-level terminal block with ground foot and double-level terminal block with ground foot. The single-level solution requires 48 terminal blocks. With the integration of the ground foot the need for the ground block is removed, thus eliminating 16 terminal blocks. Finally, by incorporating all of the single-level functionality into one multilevel terminal block, the application can be reduced to only one terminal block per signal, or just 16 total blocks. The **total rail length** is reduced from **11.7 in.** to **3.9 in.**

3 Design information

The metal components of UT screw connection terminal blocks from Phoenix Contact are made from high quality, strain- and crack-resistant and corrosion-proof copper alloys. This eliminates the possibility of electrolytic corrosion in the presence of moisture and the risk of rusting. Also, use of high quality components results in a very low temperature rise due to the exceptional electrical conductivity. The surface of the metal parts is protected by lead-free, galvanic nickel or tin plating.

The insulating housing of the UT series of terminal blocks is made from recyclable Polyamide 6.6. This elastic plastic with high-impact strength is halogen free and UV resistant. Further characteristics include tropical and termite resistance, high chemical resistance, and excellent aging characteristics. Polyamide 6.6 can be used with operating temperatures up to 130°C and is certified for inflammability class V0 in accordance with UL 94.

Phoenix Contact screw terminal blocks are designed for the most demanding applications. For more than 80 years, they have proven themselves a billion times over in all applications. An important characteristic is the maintenance-free conductor connection. There is no need to tighten the terminal block screws. The screws are prevented from loosening by the patented Reakdyn® principle, a screw locking technique developed by Phoenix Contact



Figure 8. Reakdyn principle

4 Products

4.1 Single-level solutions

| Description | Type | Order No. | Pcs./Pkg. |
|---|-----------------------------------|-----------|-----------|
| Single-level fuse block without indicator | UT 4-HESI (5X20) | 3046032 | 50 |
| Single-level fuse block for 24 V signals with blown fuse indicator | UT 4-HESILED 24 (5X20) 120KOHM | 3248005 | 50 |
| Single-level fuse block for 120/250 V signals with blown fuse indicator | UT 4-HESILA 250 (5X20) | 3046100 | 50 |
| Single-level terminal block with hinge disconnect | UT 4-HEDI | 3046249 | 50 |
| Single-level terminal block with knife disconnect | UT 4-TG-EX | 3046143 | 50 |
| Single-level terminal block with plug zone | UT 4-MT-EX | 3046141 | 50 |
| Single-level terminal block | UT 4-MTD | 3046184 | 50 |
| Single-level terminal block with ground foot | UT 4-MTD-PE | 3046223 | 50 |
| Fuse plug without indicator | P-FU 5X20-EX | 3036807 | 50 |
| Fuse plug for 24 V signals with blown fuse indicator | P-FU 5X20 LED 24-EX | 3036821 | 50 |
| Fuse plug for 120/250 V signals with blown fuse indicator | P-FU 5X20 LA 250-EX | 3036836 | 50 |
| Single-level terminal block with plug zone | UT 6-TG-EX | 3046486 | 50 |
| Fuse plug without indicator (1/4" x 1-1/4") | P-FU 6,3x32-EX | 3046499 | 50 |
| Fuse plug for 24 V signals with blown fuse indicator (1/4" x 1-1/4") | P-FU 6,3x32 LED 24-EX | 3046509 | 50 |
| Fuse plug for 120/250 V signals with blown fuse indicator (1/4" x 1-1/4") | P-FU 6,3x32 LA 250-EX | 3046525 | 50 |

4.2 Single-level solutions with ground foot

| Description | Type | Order No. | Pcs./Pkg. |
|--|----------------------------|-----------|-----------|
| Single-level fuse block with ground foot without indicator | UT 4-PE/HESI (5X20) | 3073995 | 50 |
| Single-level fuse block with ground foot for 24 V signals with blown fuse indicator | UT 4-PE/HESI LED 24 (5X20) | 3070053 | 50 |
| Single-level fuse block with ground foot for 60 V signals with blown fuse indicator | UT 4-PE/HESILED 60 (5X20) | 3070066 | 50 |
| Single-level fuse block with ground foot for 120/240 V signals with blown fuse indicator | UT 4-PE/HESI LA 250 (5X20) | 3070079 | 50 |
| Single-level terminal block with ground foot and hinge disconnect | UT 4-PE/HEDI | 3074004 | 50 |
| Single-level terminal block with ground foot and knife disconnect | UT 4-PE/MT P/P | 3046140 | 50 |
| Single-level terminal block with ground foot and plug zone | UT 4-PE/TG P/P | 3070037 | 50 |
| Single-level terminal block with ground foot and diode | UT 4-PE/L-DIO/L-R P/P | 3046834 | 50 |
| Single-level terminal block with ground foot and diode | UT 4-PE/L-DIO/R-L P/P | 3046235 | 50 |

4.3 Double-level solutions with ground foot

| Description | Type | Order No. | Pcs./Pkg. |
|--|-----------------------------|-----------|-----------|
| Double-level fuse block with ground foot and pass-through level without indicator | UT 4-PE//HESI (5X20) | 3214320 | 50 |
| Double-level fuse block with ground foot and pass-through level for 60 V signals with blown fuse indicator | UT 4-PE/L/HESILED 60 (5X20) | 3214322 | 50 |
| Double-level terminal block with ground foot and pass-through level and hinge disconnect | UT 4-PE/L/HEDI | 3214324 | 50 |
| Double-level terminal block with ground foot and pass-through level | UT 4-PE/L/N | 3214361 | 50 |
| Double-level terminal block profile with top pass-through level only | UT 4-L | 3214363 | 50 |
| Double-level terminal block with ground foot, pass-through level and plug zone | UT 4-PE/L/TG | 3214365 | 50 |