

Multibarriers with galvanic isolation prevent potential transfers

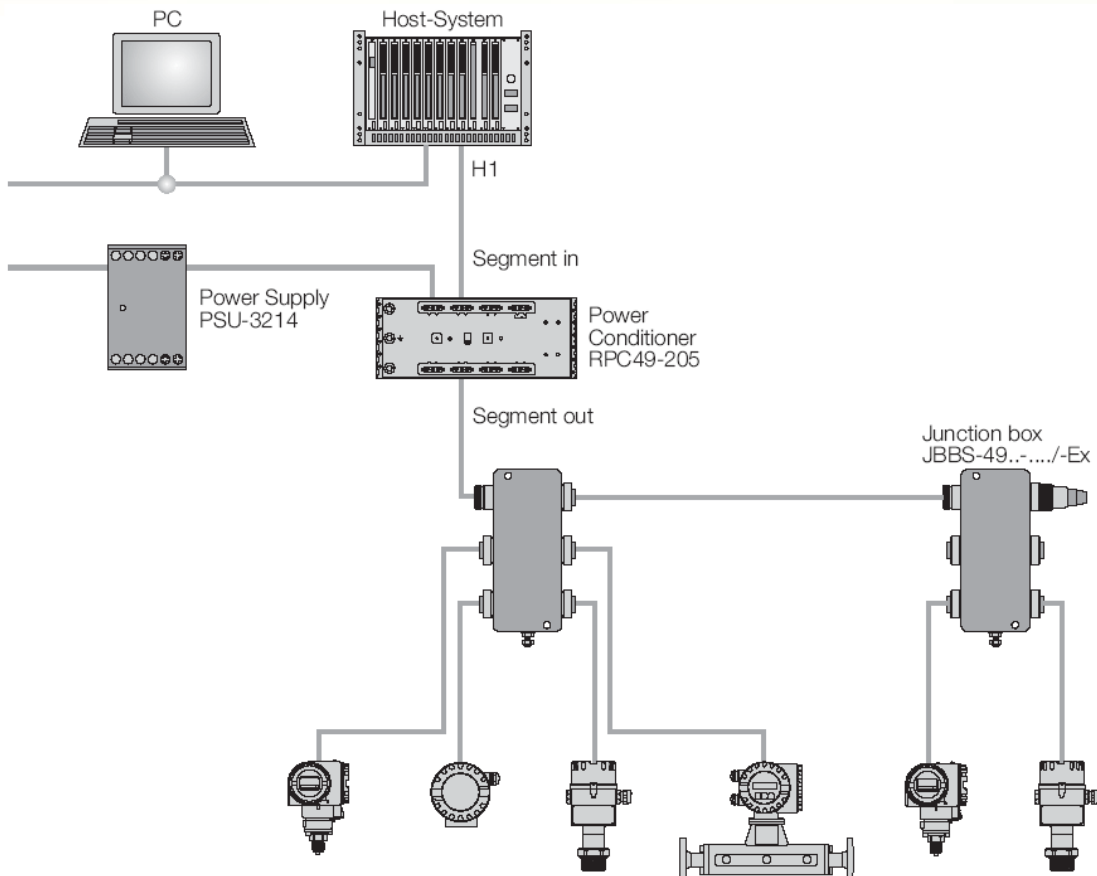
The Foundation Fieldbus and Profibus-PA fieldbus systems have become established in the process automation field. However, many applications in the chemical industry are in the explosion hazardous zone and are declared as Zone 1. The use of modern multibarriers such as the Turck MBD-...-T415/Ex allows the use of a bus segment for the explosion hazardous area with the same segment structures as in the non intrinsically-safe area – without the danger of potential transfers.

Both the Profibus-PA as well as the Foundation Fieldbus operate conform to the IEC 61158-2 and utilise the voltage mode with a transmission speed of 31.25 kbps. Here the data packages are modulated upon the supply voltage and transmitted via a shielded two-wire cable. These bus physics have a decisive advantage: fieldbus communication and the voltage supply of the bus node can be implemented using just a single cable.

In the bus physics both fieldbus protocols are differentiated by the integration of the host systems which can be found today on the market. All other components can be used in the same way in both bus systems. Each segment requires a power supply. Specified fieldbus cables connect the host to the field. All the well-known topologies from the network technology field can be implemented with differing junction components, whereby these fieldbusses can be adapted to match every system structure. A segment must be terminated at each end with terminating resistors in order to avoid possible reflection of the signals.

Segment structures

The Field Intrinsic Safe Concept (Fisco) model has been developed in the explosion protection field for the supply of power. This enables the user to install and use the fieldbus in zone 1 with justifiable cost and effort. The proof of intrinsic safety has been made easier with fieldbus systems by the Fisco model. Intrinsically-safe networks can be engineered and expanded without complex calculations, and operated without system certification. Turck supports varying installation concepts in the intrinsically-safe field with a range of Fisco products. A segment structure has established itself in this area.



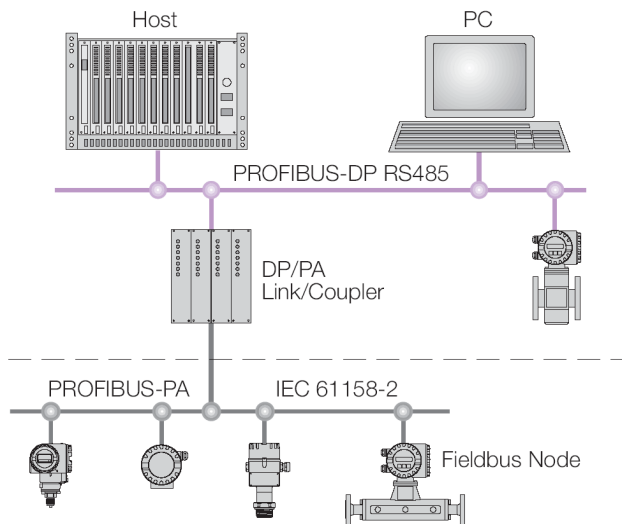
(figure 1left)

By the use of multibarriers it is possible to implement a bus segment for the explosion hazardous area with the same segment structures as in the non intrinsically-safe area. The supply of energy to the physical layer is implemented in the non-explosion hazardous area – in the control room. The segment cable is subject to the regulations governing enhanced safety (Exe). Junction boxes (multibarriers) can now be connected to this bus cable, which subdivide the Exe cable into 4 Exi trunk lines. As a result, it is possible to supply energy for segments designed for longer distances.

Modern concept

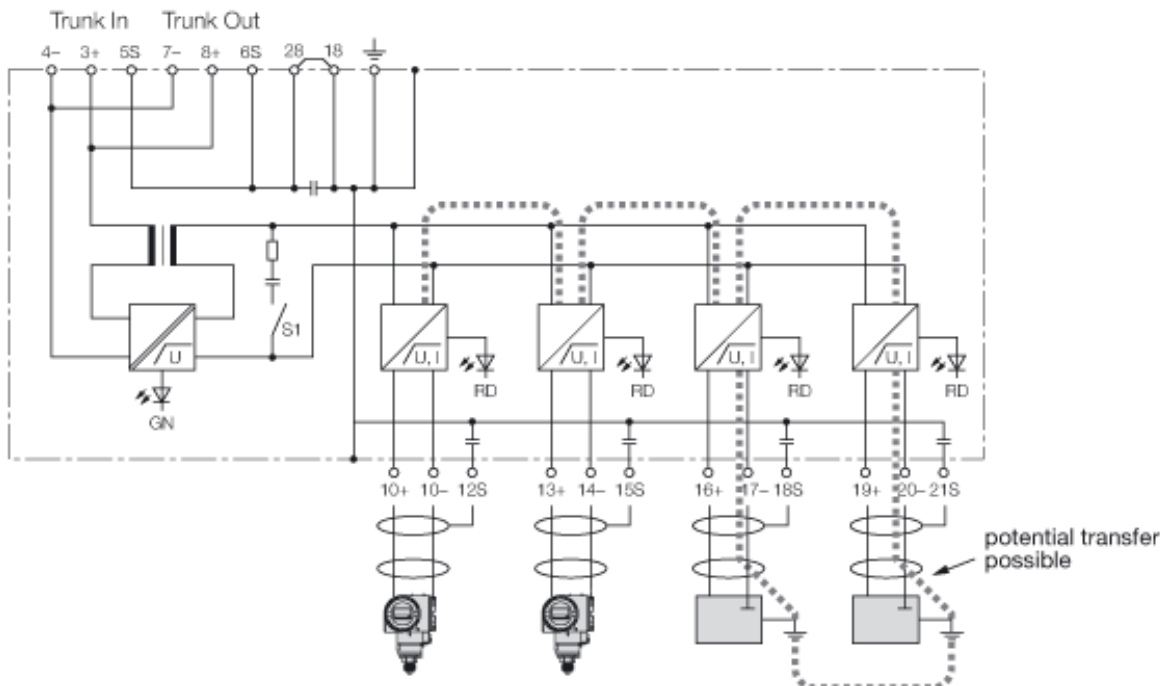
Multibarriers are available in different technical solutions. The simplest variant separates the Exe from the Exi area using a Zener diode concept. But this technical concept was subject to communication problems in practice, so that multibarriers for the fieldbus which galvanically isolate the main bus cable from the trunk lines have been available on the market for a number of years. Equalization currents between the individual trunk lines and the associated problems for the fieldbus are still not prevented (figure 2, left).

With the MBD-...-T415/Ex Turck now has a multibarrier concept in its range, which allows Exi trunk lines of up to 120 m in length. In this manner devices which are located at different locations can be connected to an Exi star point. In order to now prevent the differences in potential caused by equalisation currents, the individual Exi trunk lines of the MBD-...-T415/Ex are also galvanically isolated to one another. The galvanic isolation of a signal carrier in the explosion hazardous area plays an important role for safety reasons. The multibarrier provides four intrinsically-safe and galvanically isolated outputs.



(figure 1 right)

Figure 1: The different fieldbus topologies of the two most important systems: FF topology (left) and PA topology (right)



(figure 2 left)

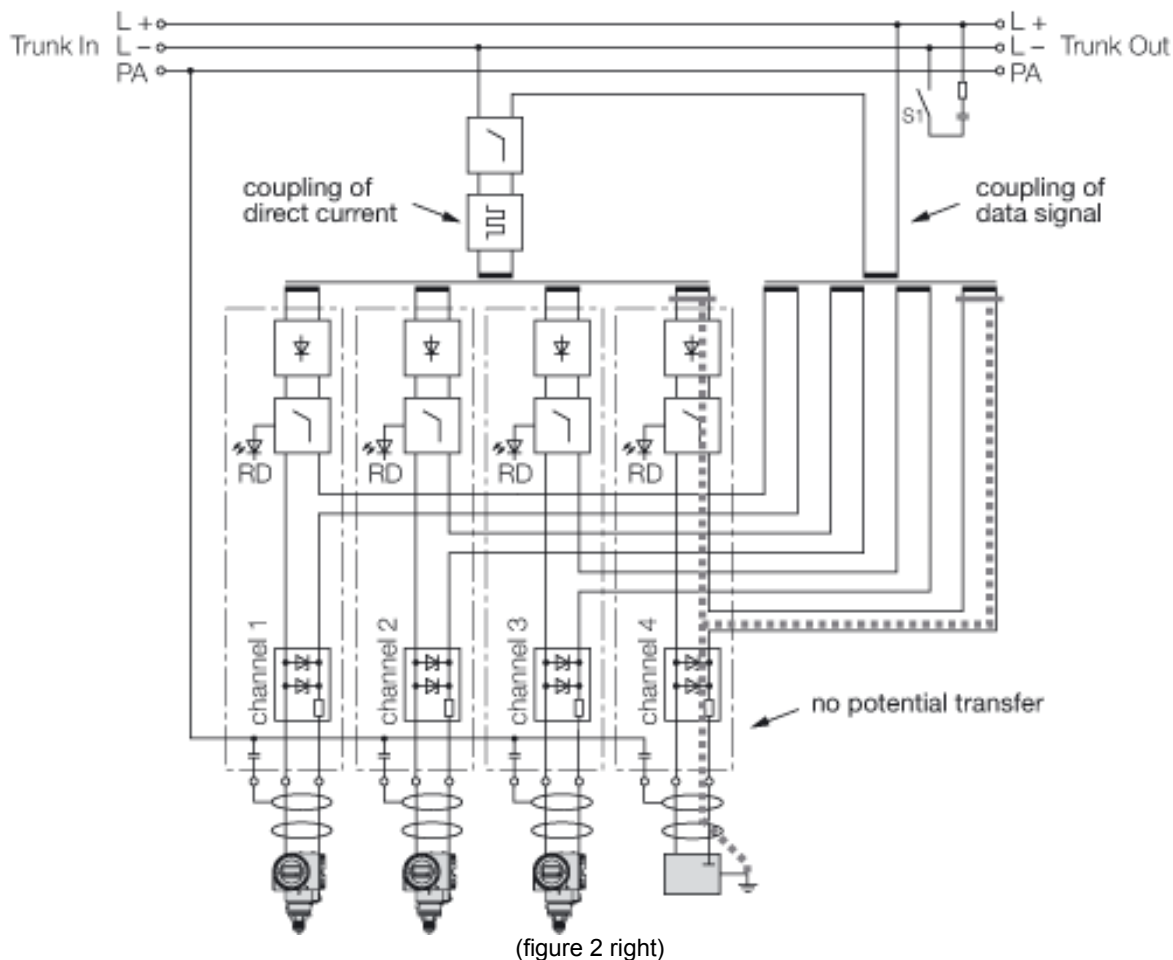


Figure 2: Multibarriers without galvanically isolated outputs (left) and the Turck multibarriers with galvanically isolated Exi outputs (right)

The complete galvanic isolation exists both between the trunk line and the output circuits as well as between the four output circuits to one another. Thus, the galvanic isolation demanded by the industry with intrinsically-safe circuits particularly for zone 0 is achieved.

In addition to the enhanced EMC immunity, this complete galvanic isolation prevents potential transfers and equalisation currents and thus guarantees safe transmission of data. The four outputs of the multibarrier each provide an output current of 40 mA.

Enhanced availability

Complete galvanic isolation of the Turck multibarriers enhances the operational security and availability and reduces the commissioning time when a fault occurs. Continuous changes and improvements are carried out in order to modernise process-related installations and to keep them up-to-date. This does not however exclude that any conversions of the fieldbus Physical Layer are influenced by the above mentioned effects. The double galvanic isolation prevents any unpleasant surprises in the future, as some malfunctions may only become evident years after commissioning.

The operational readiness of the bus system must also be guaranteed when there is a fault or malfunction of a bus node. If a fieldbus node suffers a short-circuit, the integrated short-circuit protection comes into play. Only the corresponding output is shut-down, the main line and the other outputs of the fieldbus segment remain operational. Local indication of a short-circuit is implemented on a channel-based basis via a red LED inside the housing. The service engineer is directed to the malfunctioning trunk line by the optical signal. This saves the need to measure for faults, which cannot be undertaken with conventional measurement devices in the explosion hazardous area.

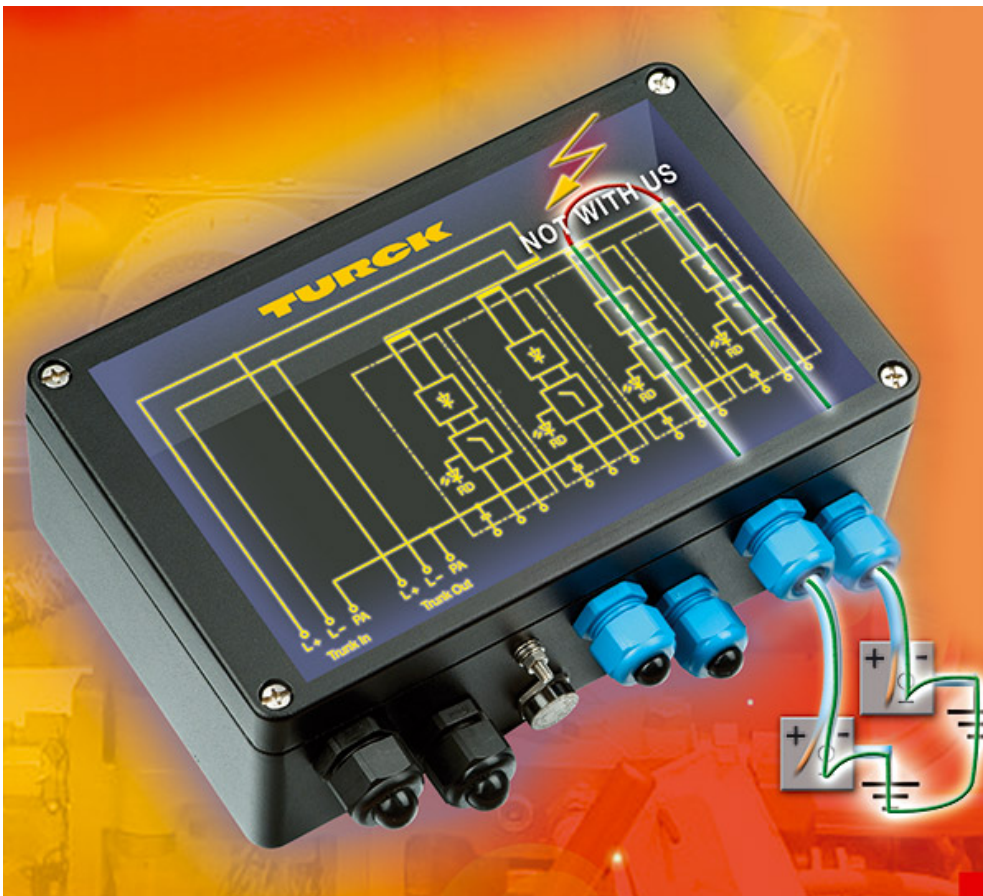


Figure 3: The multibarrier from Turck prevents potential transfers

Industrial standard housing

Industrial environments are frequently harsh and aggressive. Therefore a housing suited to these conditions is required. The high protection degree to IP 66 and the special housing material (die-cast aluminium) – in conjunction with the module electronics – meets these demands and guarantees a high level of operational safety.

A direct installation of the multibarrier in the system is thus unproblematic. The EExe cable glands in conjunction with high-quality spring-loaded terminals guarantee a safe and secure method of connection. The shield terminals are capacitively coupled to the housing potential in order to dissipate any interference voltages which may arise. The riveted earthing bolts connect the housing to the main potential equalisation. Data transmission on bus lines is frequently influenced by reflection of the signals which can occur when the ends of the bus are not terminated.

The fieldbus must be terminated at both ends with a bus termination resistor to avoid this phenomena. The multibarriers feature an integrated termination resistor which can be activated if the multibarrier is the last device connected in the trunk line. As every multibarrier features a switch-in terminating resistor, future segmentation expansion is possible with a minimum of effort. The maximum length of a segment may not exceed 1,900 m.

Climatic compensation

In regions subject to high temperature deviations and varying levels of air humidity it is possible that condensation can be formed in the housing during operation. The multibarrier features a pressure compensation element on the cable connection end to avoid condensation build-up. The pressure compensation element features IP 67 degree of protection and guarantees permanent and reliable ventilation and bleeding of the multibarrier. The ePTFE membrane in the interior of the support features a very high water entry pressure and rejects oil. Salt crystals are also kept at bay.

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