

# White Paper – Flexible and efficient marshalling for modern Distributed Control Systems

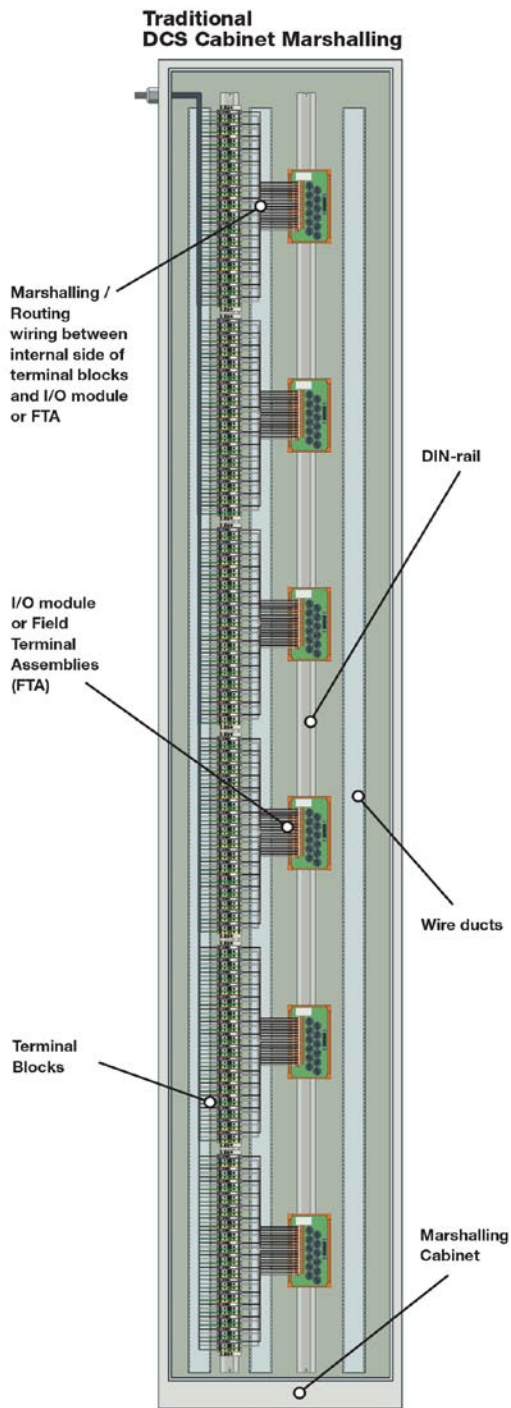


Figure 1

For reliable and safe marshalling in modern Distributed Control Systems (DCS), modular terminal blocks are still the first choice – especially for very large and complex systems – although alternative technologies are available. Terminal blocks offer good value and availability because they are easy to use and provide a high level of design flexibility. Modern terminal blocks also offer a variety of additional features, including clear and fast identification, and are available in many configurations such as ground blocks and fuse blocks. Additionally, terminal blocks with screw connections are well-known world wide in the Process Industry as the most common and reliable interface for the connection of signals to and from the field.

Typically incoming and outgoing signals are not connected directly to the control unit, often due to large distances between the field devices and the control room, and the extended time that can occur between initial start and completion of a large project. Therefore the signal loops will be connected to the control, one by one, over long periods of time. In order to be most efficient and flexible during planning, as well as the final wiring, it is common to locate all field wiring in marshalling cabinets. This allows all signals to be collected, sorted and routed to their correct destination on the control unit.

Depending on the complexity of the project, different methods of marshalling are common. In most cases, the marshalling configuration in Figure 1 is applied

In this marshalling configuration, all incoming and outgoing field wiring is connected to the external sides of the terminal blocks. Marshalling and routing of signals is done between the internal side of the terminal blocks and the I/O modules or Field Termination Assemblies (FTAs), so that every signal is connected to the associated control I/O. With today's marshalling approach, and the available products and technologies, all marshalling and routing of signals is done individually with screw connections. This requires a significant amount of wiring time because every signal loop is wired between the terminal block and the I/O module or FTA. In addition, the high number of individual connections increases the probability of wiring failures. Finally, the wide variety terminal block types that are necessary to provide the functions required by the application can add another layer of complexity during design and assembly.

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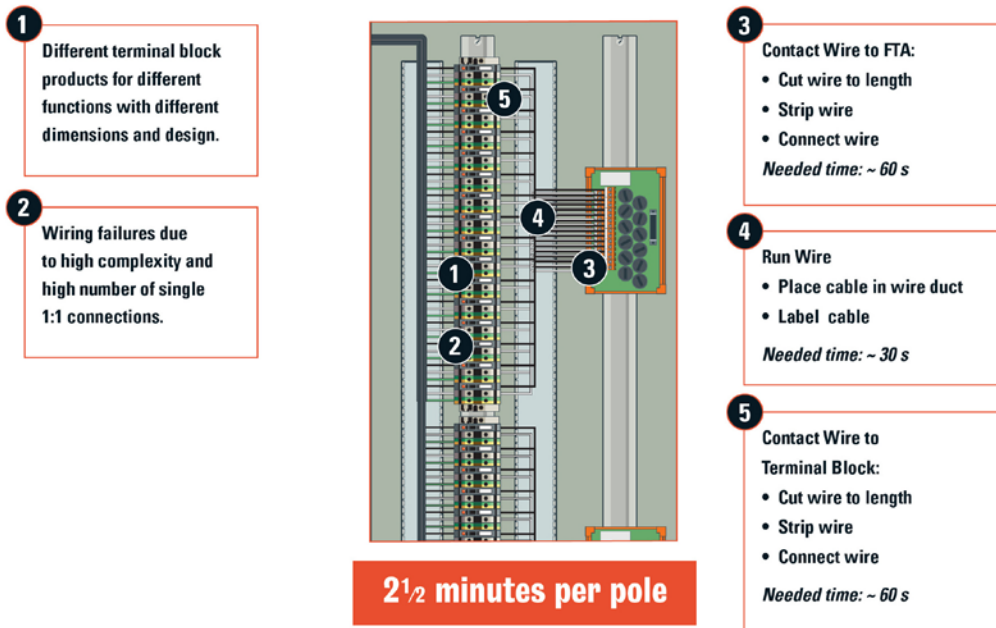


Figure 2

Using the Weidmuller WMF terminal block family, routing and marshalling of signals between the terminal blocks and the I/O modules or FTA can be accomplished via pluggable connections, which save significant time and labor.

A number of case studies with well-known DCS manufacturers and their system integrators have been conducted in order to demonstrate, evaluate and document the positive impact of pluggable marshalling on the total wiring costs. In the first study of wiring diagrams and cabinet configuration (Figure 2), the total wiring time costs using existing non-pluggable products was determined to take approximately 2 1/2 minutes per pole. Applying this knowledge, terminating a two-pole connecting cable takes approximately 5 min, a four-pole cable takes about 10 minutes and an eight-pole cable takes approximately 20 minutes. This same study was performed using the Weidmuller WMF 2.5

terminal block Series. The results demonstrated that instead of taking 2 1/2 minutes per pole for termination, it took 2 1/2 minutes to terminate a cable (Figure 3).

The study determined that wiring times for DCS marshalling could be reduced dramatically with pluggable terminal blocks. The degree of potential savings depends mainly on the pole count of the plugs on the pre-assembled cables that are used. An eight or sixteen-pole cable results in the most significant savings, however

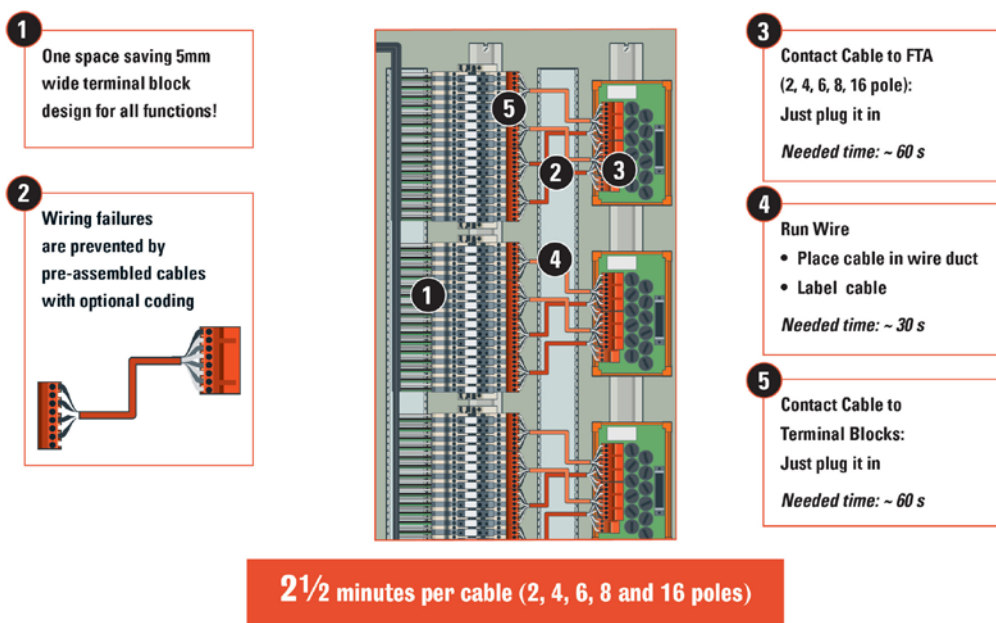


Figure 3

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a two or four-pole cable will still result in a sizable reduction in wiring time. Another factor to consider is the availability of pluggable I/O modules and FTAs. Depending on the manufacturer, there are many modules with pluggable connections currently available for faster marshalling times. Other modules will almost certainly be available in the near future.

The findings of four actual DCS marshalling projects were analyzed, and produced the following results:

- Project 1: 500 I/O using non-pluggable FTAs - 46% reduction in wiring time
- Project 2: 750 I/O using non-pluggable I/O modules - 41% reduction in wiring time
- Project 3: 1000 I/O using pluggable I/O modules - 92% reduction in wiring time
- Project 4: 1,100 I/O, using pluggable FTAs - 88% reduction wiring time

Examining the total wiring cost, including labor for the wiring time and hardware components such as terminal blocks and cables, the total cost savings is between 15% and 46%, when compared to traditional methods.

Another important factor is the space savings that can be achieved with the new WMF terminal block Series. The WMF terminal blocks are 5.1 mm wide, which is 20% smaller than typical blocks used today. In addition, the WMF blocks are available with an integrated shield connection that adds to the space savings. Installers and designers will realize 20% more space on the DIN-rail, enabling a reduction in total cabinet size.

## Summary

Weidmuller's new WMF (Weidmuller Multi-Functional) line of terminal blocks provides a cost saving and flexible solution for routing and distributing signals, particularly in DCS marshalling applications. This space-saving terminal block combines all the necessary functionality into a single solution. It features an integrated shield connection and can be used for feed-through, fuse and disconnect functionality. The three cross-connection channels and wide variety of labelling options offer additional design and installation flexibility.

