Signal Switching & Conditioning

Advantages of standard digital output I/O cards over relay output cards

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Learn more about

- Relay output cards have hidden pitfalls, including current and voltage output, reliability and maintenance, and density.
- A system cabling approach offers an alternative to relay output cards that can enhance operator safety, reduce costs, increase reliability, and optimize cabinet space.

Introduction

In modern control platforms, the choice between relay output cards and standard digital output (DO) cards can seem obvious when seeking to switch loads with higher current capacities. After all, many relay output cards boast current capacity of 2 to 4 amps per channel, while standard digital output cards typically offer only 500 mA per channel. However, it is important to consider hidden pitfalls associated with relay output cards. This paper discusses three major issues and explores the benefits of employing standard digital output cards as a superior alternative.

Problem #1: Current and voltage output

In addition to having a larger load current capacity, relay output cards also have the ability to switch both AC and DC loads. While this seems like a big advantage, there are several important reasons many users prefer not to have mixed voltages in their I/O.

First, the market trend is to try to keep all I/O at 24 V DC wherever possible. This simplifies installation and reduces the variety of spare parts required. Second, 120 V AC – and especially 230 V AC – are not considered safe voltages and require special precautions for technicians. Finally, having both AC and DC voltages so close together at the I/O could lead to crosstalk, causing faulty switching. Some users try to get around this issue by having the small relay in the output card control another larger relay elsewhere in the cabinet, which then has the differing voltages connected. While this avoids any potential crosstalk at the I/O, it introduces unnecessary redundancy into the application.

Solution: Use standard digital output cards with system cabling

By adopting system cabling and employing transistor-based digital output (DO) cards, technicians can save wiring time and eliminate these pitfalls. Standard DO cards allow a user to shift AC voltage to individual relays at the control cabinet's point of entry. This minimizes crosstalk faults and enhances safety for maintenance personnel. ■

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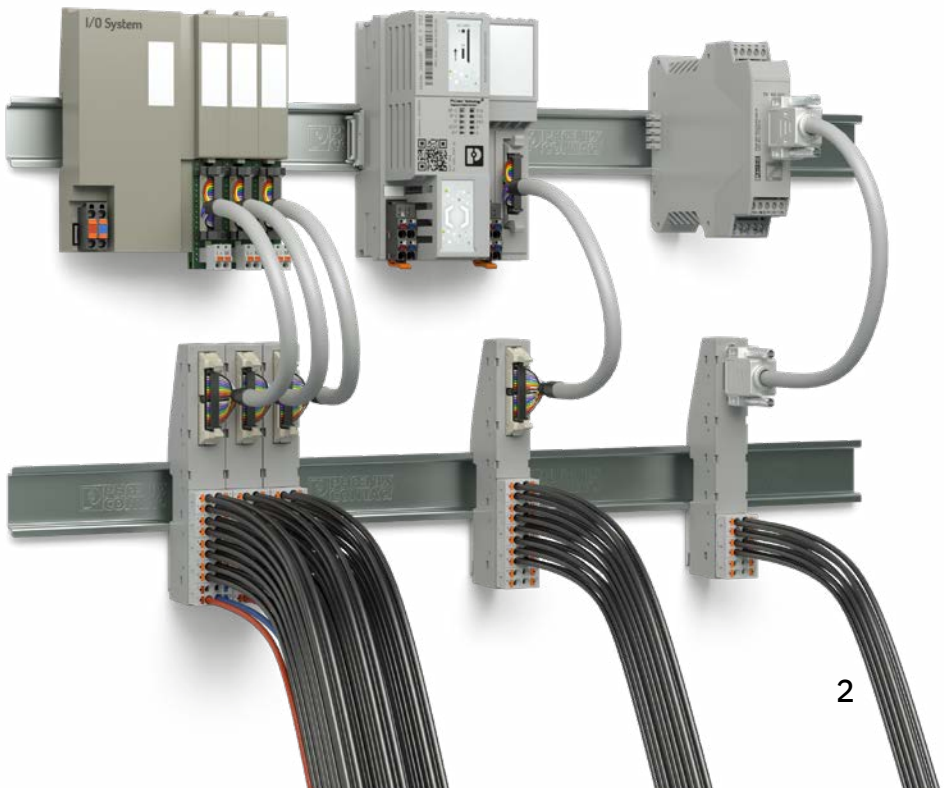
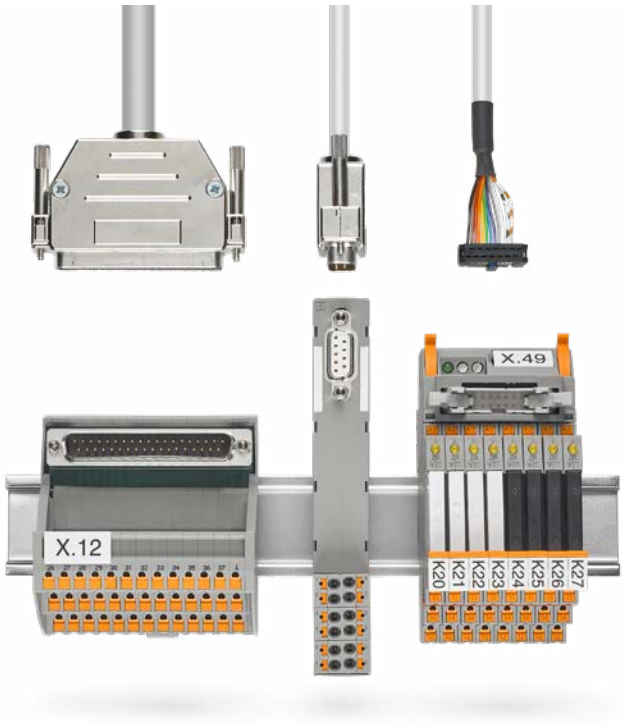


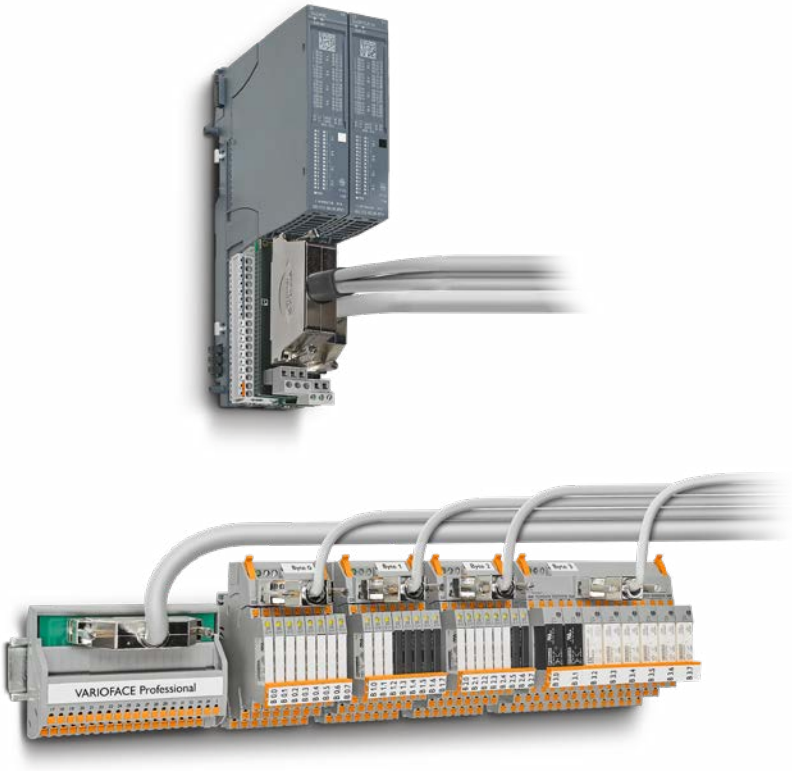
Problem #2: Reliability and maintenance

The reliability issue with relay output cards lies in the potential failure of a relay on the card. When a relay fails in one of these cards, the majority of cards must be replaced instead of repaired, which adds up to high replacement costs. Keeping spare relay cards in inventory can be cost-prohibitive and increase warehousing space requirements. Additionally, during a repair or replacement of a relay card, the system loses all of the remaining channels of that card, not just the channel with the failed relay.

Solution: Replace relay output cards with DC output cards

Switching to standard DC output cards reduces the overall cost of operating the PLC. Standard DO cards are typically less expensive and more readily available than relay output cards. Removing relay output cards from the bill of materials will also save on maintenance budgets by removing the need for spares. Phoenix Contact's system cabling solutions enable quicker panel builds with single cable runs to groups of DIN rail-mounted relays, streamlining field wiring. When a relay fails in a DIN rail-mounted cabling solution, maintenance personnel merely need to swap out a single inexpensive relay rather than an entire 8- or 16-channel relay output card. This single relay replacement allows the other channels in the group to remain active, increasing system upkeep and facilitating faster maintenance.





Another hidden benefit of moving the relays to the cabinet in a system cabling solution is that a user can mix and match different relays on a per-channel basis. For example, Relay 1 can be an electromechanical relay, while Relay 2 can be solid-state, and Relay 3 can be double-pole double-throw, etc. This allows for much greater flexibility in an application compared to the uniform nature of all identical relays in a relay output card. ■

Problem #3: Density

Relay output cards are limited to 8 or 16 channels due to the space consumed by relays on the card's internal printed circuit board. This limitation can lead to larger control systems than necessary when multiple relay output cards are employed, consuming valuable panel real estate.

Solution: Improve space and cost efficiency with system cabling

System cabling solutions reduce both the controller's space usage and overall cost. By employing standard digital output cards, a single slot on the rack can handle 32 points of output, as opposed to two slots required for relay outputs. Employing cabling solutions may even save expansion rack space in larger systems with many DO signals. Relocating relays to the lower cabinet area allows combining relays and terminal blocks into functional modules, which saves even more DIN rail space. ■

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Conclusion

The advantages of standard digital output cards over traditional relay output cards are evident. Phoenix Contact offers system cabling solutions that enhance operator safety, reduce costs, increase reliability, and optimize efficient space utilization. By adopting these advanced solutions, control platforms can achieve optimal performance and maintain a competitive edge in today's evolving industrial landscape.

What is system cabling?

System cabling is a way to significantly reduce the time and effort of connecting the signals from the cabinet marshaling (individual terminal blocks, relays, fuses, etc.) to the terminals on the PLC or DCS I/O cards. It typically consists of an adapter that sits in place of the I/O card terminal blocks, board assembly that replaces the individual relays and terminal blocks in the cabinet, and a high-density cable that plugs into both of those components. To learn more, please visit **https://www.phoenixcontact.com/en-us/products/system-cabling-for-controllers/controller-specific-system-cabling**. ■

About Phoenix Contact

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