Executive summary

Equipping machines, systems, and automation components with separate cables for signals, data, and power is time consuming and costly. With more complex regulations and control tasks comes greater cabling complexity and, thus, a greater impact on the availability of the entire system. Hybrid connectors – for transmitting signals, data, and power over a single cable – offer a way out of this dilemma.

The versatile hybrid connectors are more than the sum of their parts: they provide a new level of flexibility when cabling highly automated systems. Along with the established application for cabling servo motors, M23 and M40 hybrid connectors are well suited for a variety of sophisticated tasks.

Hybrid connectors for serial cabling

In frequency-controlled drive solutions, the circuit connecting the control cabinet to the engine still commonly uses a star distribution. Previously, almost all serial cabling solutions were bus systems. Hybrid connector technology, now available in M40 size, can now be paired with hybrid servo cables. This makes it possible to implement serial communication with signals,
data, and power. To do this, each device in the supply chain is equipped with two device connectors. One of these is equipped with pin contacts and the other with socket contacts. The connectors are based on the familiar servo motor design and combine suitable contacts for transmitting signals, data, and power in one housing. This makes hybrid connectors suitable for high voltages and currents.

Higher system availability, lower costs

Hybrid connection technology does more than just reduce the space requirements on the device or in the control cabinet. Machine and system cabling has become much more organized, because it only requires routing a single cable. The resulting narrower cable routes also reduce the costs for the cable run and cable duct.

Hybrid system cabling also offers easy start-up and repairs for devices, machines, and system parts, as it reduces required connections by two-thirds. For example, many machine and system builders carry out the startup process during in-house manufacturing. After successfully passing this test, the systems must be quickly and securely dismantled, packaged, and shipped, and then once again brought into operation by the end customer. A fast-locking connection system is particularly helpful in these cases. Just half of a turn reliably locks the cable connector system to its counterpiece. Devices can be connected quickly and reliably in this way with only two hand movements (Figure 1).

More functionality, same size

The newest M40 hybrid connectors have a broad area of application. For example, for distributed servo drivers, some models implement a three-phase supply including L1-3, N, PE signals as well as direct current supplies with up to 850 V DC. Connectors that use different codings and colored housing markings can help prevent incorrect insertion.

Easy, reliable assembly can be enabled by choosing models designed with larger, more robust contacts. Regardless of the connector size, variations that use four-position CAT5 elements for data transmission are great due to their compatibility with nearly all common bus systems and custom data interfaces.

Versions for numerous applications

The CAT5 data element can be replaced by a four-position unshielded signal element in applications that do not require a shielded data interface. For this reason, a connector is available with eight 1 mm signal contacts, which offers the same performance features as the power contacts. Currents up to 8 A per contact and a wire cross section up to 1.5 mm² make it possible to implement applications for control electronics including hardware shutdowns. Signal contacts allow voltages of up to 500 V AC to be supplied, thanks to appropriate air clearances and creepage distances (Figure 3).

Numerous housing designs are available both in terms of cabling and devices. Customer-specific designs, even entire system cabling options, are available. The user receives fully tested cables, even for high power and data rates.
M40 hybrid connectors – technical data

- Pin assignments: 4+4+4+PE as well as 8+4+PE
- Operating temperature: 
  -40°C to +130°C
- Shielding: 360° external shielding as well as independent shielding of the CAT5 data element
- Interlock: SPEEDCON fast locking system
- Vibration resistance: up to 25g
- Degree of protection: IP66, IP67, and IP68, optional IP69k
- Accessories: Protective caps made from metal and plastic, colored rings for visual marking
- Approvals: cUL in preparation
- 2 x 2 data: 50 V AC/V DC, 3.6 A, 0.5 mm², optional
  - 4 x signal: 50 V AC/V DC, 8 A, 1.0 mm²
  - 4 x signal: 500 V AC/V DC, 8 A, 1.5 mm²
  - 4 x power + PE: 630 V AC/850 V DC, 70 A, 16.0 mm²
- Shock protection on the socket side
- All housings can be optionally assembled with pin or socket inserts

Figure 3: Transmission in the most confined space: featuring four contacts per signal (top left and right), data (center), as well as power (bottom), and +PE (top), the M40 hybrid connector allows for versatile use

Summary

Automation technology is advancing steadily, especially in relation to the Industrial Internet of Things (IIoT). As part of this, companies in the automation industry are opting to consistently network their products on the controller and communication level. Industrial applications, machines, and systems are equipped with intelligent control units and interfaces on an ever more regular basis. There is an enormous range of applications for M23 and M40 hybrid connectors, as this affects almost all areas of automation.

ABOUT PHOENIX CONTACT

Phoenix Contact develops and manufactures industrial electrical and electronic technology products that power, protect, connect, and automate systems and equipment for a wide range of industries. Phoenix Contact GmbH & Co. KG, Blomberg, Germany, operates 50 international subsidiaries, including Phoenix Contact USA in Middletown, Pa.

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