

## Securely connected with ease

### M12 with push-pull fast locking system

Falk Daniel Clemens, B. Eng., and  
Dipl.-Ing. Jörg Hohmeier,  
Industrial Field Connectivity,  
Phoenix Contact GmbH & Co. KG, Blomberg, Germany

Circular connectors in size M12 have established themselves in many industrial sectors – from production to infrastructure projects. The new M12 push-pull system will give users even more advantages – along with simplified handling, it features a high level of mechanical and electrical stability (Figure 1 lead image).

Originally used in machine building, the success of M12 as a highly versatile solution goes back many years. When it was originally launched, users were looking for a compact standardized interface with cross-manufacturer availability. At that time, there was less focus on the mechanical requirements. Today, users are far more discerning – they predominantly require interfaces that can withstand mechanical influences or reliably transmit high volumes of data. In many cases, they require both of these features simultaneously. On the one hand, the user does not always have sufficient knowledge about the M12 interface's operating conditions. On the other hand, the user wants to manage and maintain as few components as possible in the procurement and warehouse logistics. In addition, it should be possible to process the connectors without risk, even without electrical engineering expertise.

To satisfy mechanical requirements such as tightness of seal with respect to dust and liquid materials in the industrial environment, standard M12 connectors must be tightened to a defined torque. To do this, the installer first requires sufficient space to access the coupling nut of the M12 connector with their hand. Second, the installer must be able to properly feel connectors with their fingertips when inserting and removing them. If both aspects are not met, the interface can sometimes fail with unforeseeable consequences, unless the installer has a torque screwdriver with the appropriate tip on hand. The M12 coupling nut can then be tightened to a defined torque even in restricted spaces, creating a reliable connection.

#### Reliable M12 interface with push-pull

The new M12 push-pull locking system can easily overcome the challenges described. The operating principle is a simple push-and-pull procedure. The connector is inserted and locked, and then released by simply pulling an element of the connector. An internal mechanism unlocks the connection. The connector can be easily removed without any further action.

Unlocking and locking are performed in a single linear movement. This feature offers a range of advantages for handling in numerous areas of application, and significantly increases the reliability of the M12 interface. It also increases the packing density of the interfaces – without using torque tools.

The requirements for tightness of seal and mechanical strength are also satisfied, without requiring any tools. For connectors with the standard M12 interface, the sealing O-ring inside the M12 female connector is axially deformed by the torque of the M12 coupling nut, and the interface is sealed. A defined torque is therefore crucial at the M12 coupling nut. Because the seal inside the new M12 push-pull connectors has a radial action, a defined torque is not required to achieve the IP degree of protection.

The push-pull locking spring offers mechanical advantages over an interface with M12 standard thread. If the standard M12 coupling nut is not sufficiently tightened, self-locking does not occur at the M12 thread, so the screw connection can loosen when exposed to mechanical influences, such as shock and vibration. The M12 push-pull connector also offers advantages here: when inserted, the connector engages with a click that the user can feel. Thanks to this tactile feedback, the user can be sure that their M12 interface will work reliably in the long term (Figure 2). The connector springs back if it is not snapped into place correctly – again giving the user clear feedback. The M12 push-pull interface therefore permanently offers its guaranteed properties.

### **Broad product range**

The new range of M12 push-pull connectors from Phoenix Contact includes connectors with crimp connection technology for assembly as well as device connectors. Using crimp contacts tends to take longer than fast-connection technology, such as insulation displacement or Push-in technology. By using suitable tools or machinery, however, this method also creates a fast and secure connection in series production and cable assembly, allowing you to take full advantage of potential savings – for example, in automation.

Assembly line production is a good example of this: the individual process and assembly steps can be defined precisely here and broken down further, for example, into the individual process steps of cable preparation, individual contact crimping or final assembly of the connector. Crimp connection technology also offers advantages, as the connection is independent of the insulation materials. In addition to greater reliability, the user also has more flexibility when choosing the cable.

The product range has been extended to include one-piece device connectors for front and rear wall mounting with A and D-coding as well as two-piece connectors for the THR process with A, D, and X-coding. The one-piece versions have pre-assembled litz wires for flexible PCB connection or soldering posts for direct PCB mounting. The contact carriers of the two-piece versions enable pick-and-place

assembly and offer identical mechanical installation conditions, thanks to uniform device screw connections regardless of the number of positions and coding.

Depending on the application and device design, this offers device manufacturers uniform and consistent connection solutions for signal and data transmission. All versions have a consistent shield connection, which enables interference-free transmission in the long term, even with extreme mechanical loads and vibrations – such as those encountered in the rail industry (Figure 3).

## Conclusion

The new M12 push-pull system may not revolutionize M12 connectors; however, this interface now offers even more advantages for many users. The M12 push-pull connectors also significantly extend the area of application for the standardized M12 interface. Thanks to the robust locking mechanism and simplified handling, M12 interfaces with push-pull locking can be used securely and reliably in applications involving increased vibrations and mechanical loads. Many users will therefore benefit from an M12 interface with long-term reliability and high mechanical and electrical stability.

## Sidebar

### **Ideal for railway applications**

#### **M12 with push-pull fast locking system**

(Figure 4)

Railway transportation is an interesting area of application for the new M12 push-pull connectors. With digitalization well underway in this industry, data transmission is gaining in importance alongside signal transmission. Due to increased networking within locomotives and cars, simple control boxes are no longer suitable. Due to the large number of necessary interfaces, the connection would also be confusing and expensive. Here, M12 connectors support the implementation of reliable interfaces, not just in the area of communication. With M12 connectors – which must satisfy special requirements in the rail industry regarding load and vibration resistance – cabling within the rail vehicles is becoming increasingly fast and easy. M12 push-pull locking is an interesting option here.

## Captions

### **Figure 1, lead image**

The new M12 connectors with push-pull fast locking system from Phoenix Contact lock easily and securely with just one click

### **Figure 2**

Easily inserted and reliably locked: the connector springs back if it is not snapped into place correctly (left) – or it locks with a click that can be felt

### **Figure 3**

Uniform and consistent connection solutions for signal and data transmission: connectors with D-coding (left), A-coding (center), and X-coding (right)

### **Figure 4**

**[Box text]**

### **More information**

[www.phoenixcontact.com/m12pushpull](http://www.phoenixcontact.com/m12pushpull)