Heavy-duty modular plug-in connectors
Modular design increases flexibility

Dynamic and flexible production processes rely on local components – in other words, machines and plants need to be arranged and installed using functional assemblies. These assemblies are interconnected with reliable industrial plug-in connectors that need to be flexible enough to accommodate future modifications and expansions. Heavycon Modular – the latest range of heavy-duty plug-in connectors from Phoenix Contact – features modular inserts for a broad range of applications (Figure 1).

![Figure 1 - Data plug-in connectors in Heavycon EVO housing: The deployed modules comprise an RJ45 data plug-in connector, 12-pin signal plug, 100 A axial screw module for power transmission, LC module for fibre-optic cables, and a pneumatics module (top to bottom).](image)

The next step in optimising manufacturing involves enabling even more flexible installation and operation of machines and plants, as is called for by the Industrie 4.0 initiative. Heavy-duty plug-in connectors for linking up data, signals, and power lines offer a confusing variety of modules and housings with an overwhelming number of configuration options.
Plant components of modern and forward-looking production facilities must be put together individually to ensure maximum performance and enable production runs from single units through to mass production. Another key goal is to increase plant and system availability, i.e., to reduce downtimes. These are all essential prerequisites if a company competing in an industrialised nation wants to succeed, grow, and secure workplaces over the long term. Many different demands are placed on these plug-in connectors: They need to be individually tailored to the application, they must support deployment in industrial environments, and they need to facilitate smooth operation. Finally, they should also support easy and quick installation and assembly.

Snap-in frames simplify the installation process

When designing the new Heavycon Modular range of plug-in connectors, Phoenix Contact consolidated its comprehensive experience gained over years of developing different series of heavy-duty plug-in connectors, and very successfully so (see sidebar text). The individual modules of the new series are precisely aligned within the newly developed snap-in frame, which is equipped with a holding spring mechanism, before they are snapped in and fastened (Figure 2). This renders the modules in the correct position and alignment in a manner that also prevents accidental loosening. The design further prevents the modules from moving or tilting within the frame. This greatly speeds up and simplifies installation.

Even if the housing has already been installed at the facility and the snap-in frame is already inserted, it is still possible to insert modules into the module frame at a later time. The Heavycon Modular frames are available in the four common housing sizes HC-B6, HC-B10,
HC-B16, and HC-B24 – for 2, 3, 4, or 6 modules respectively. Rapid module assembly in combination with optimised connection technology results in up to 40 percent time savings during installation.

Data transmission based on copper and fibre optics

Both the facility’s production controller data as well as the production data itself are transmitted via data lines. Transfer can take place via shielded copper cables or fibre-optic cables. Heavycon Modular provides modules for connecting RJ45 plug-in connectors and supports fully preassembled and tested RJ45 patch cables (Figure 3). The flexibility of the Heavycon Modular system is further enhanced by IDC (Insulation Displacement Connector) connection technology, which also supports connections based on RJ Industrial. Another data module is designed for an RJ45 plug-in connector with crimp connection.

Yet another plug-in connector module from the Heavycon Modular family built for Industrial Ethernet in the Gigabit range shields the conductor pairs in the connector itself, and meets the minimum requirements of the Cat 6 transmission class. Thanks to the module’s end-to-end shielding, data is transmitted without any interference whatsoever. For applications that rely on fibre optics due to extreme EMC interference, both SC and LC contacts from Phoenix Contact are viable options. In order to simplify installation and startup, differently configured fibre-optic cables can be utilised. This means there can be a consistent deployment of components from the plant system through to the network system.

Convenient signal transmission

In general, plants with a high level of automation are controlled via Ethernet-based protocols; this means that signals from sensors and actuators are also connected using the corresponding plug-in connectors.

Here, too, various requirements need to be observed. In signalling installations, low currents in the mA range are frequently used. Gold-plated contacts are employed to ensure optimal, undistorted signal transmission. For applications with higher currents, silver-plated contacts are used as well. To accommodate such applications, the Heavycon Modular plug-in connector range includes single modules with
Compatible plugging – flexible combination

Heavycon Complete heavy-duty plug-in connectors

The heavy-duty plug-in connectors of the Heavycon family deliver the ideal connection technology for any data, signal, or power transmission requirement (sidebar figure). The various plug-in connector series can be flexibly combined with each other:

**Heavycon Standard**
This broad range of robust metal housings offers different cable outlet orientations and locking mechanisms in addition to:
- High corrosion resistance
- Flexible longitudinal and transverse bracket locking mechanism
- Suitable for installation and plugging

**Heavycon Evo**
The flexible tiltable bayonet locking mechanism of the Evo range allows users to adjust the cable outlet orientation as needed during installation. Additional benefits:
- Low storage and logistics costs
- Flexible longitudinal and transverse bracket locking mechanism
- Suitable for installation and plugging

**Heavycon Advance**
The rugged Advance housings with direct screw locking and no panel mounting base are built for maximum service life. Additional benefits:
- Ideal for applications with demanding environmental conditions thanks to high protection class
- Low cost due to direct assembly
- Suitable for installation

Connecting power the easy way

Growing demands placed on machines and plants also impact the design of connections for conductors and cables, which are being optimised on an ongoing basis. The push-in connector Phoenix Contact initially introduced for the Cipline Complete terminal block system has by now also become widely established as a system for heavy-duty industrial plug-in connectors. The 5-pin power modules of the Heavycon Modular range similarly offer push-in connection technology, thus facilitating simple and fast installation (Figure 4).

During connection, a ferrule is placed over the individual wires. All that needs to be done to establish a long-lasting and vibration-proof connection is to insert the prepared wire into the contact chamber. The compact push-in module supports applications of up to 400 V and 16 A. There are also various power modules available for voltages of up to 5,000 V and currents of up to 200 A. The connection technologies of our various tried and proven power modules, based on crimp and axial connections, make for a highly flexible deployment of the Heavycon Modular product range.

Summary

Modular inserts enable users to combine various interfaces within a single plug-in connector. While the same is possible using a fixed contact insert, this also entails tool costs or minimum purchase quantities. For users who need to be flexible or only need low numbers of a single type – as is common in special mechanical engineering – the latter method
would not be viable. The modular inserts represent the best solution as users can select their components from the available modules to build precisely the heavy-duty plug-in connector they require.

The new snap-in frame is a holding frame with a lock-in function that allows for easier installation compared to other common mounting methods. These heavy-duty plug-in connectors resist dirt, water, vibration, and high mechanical stress, and they offer tightness up to protection class IP69K. By combining compatible housings from the different Heavycon ranges with suitable contact inserts, installation is always simple, fast, and safe.

Additional information
www.phoenixcontact.co.uk

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