Speed, density and connectivity

Just how are connector companies looking to address the demanding requirements of the industrial sector?

By **Neil Tyler**

It's a given that designers of electronic products are under pressure to develop new, or look to the evolution of, products. But whatever their approach they have to address key trends such as the need for higher densities, greater speeds, expanded connectivity and improved power management.

These pressures are just as acute for those involved in the development of industrial connectors. Engineers find themselves under pressure to provide solutions that ensure that data is delivered more quickly and securely, or have to deliver more power, while at the same time ensuring connectors take up less space.

The impact of Industry 4.0 digitalisation processes on existing production plant environments, as companies look to use technology to raise productivity levels and reduce costs, is proving challenging.

"Industry 4.0 has led to more complex set-ups. Large quantities of low latency data, acquired from sensing or monitoring devices, has to be distributed throughout the system and, of course, the factory floor presents an extremely challenging environment for any form of electronic component that is incorporated into the equipment being utilised - including connectors," says Wendy Jane Preston, Technical Marketing Engineer, at Harwin.

"A direct consequence of this approach is that we are seeing a more modular approach to production platforms," explains Howard Forryan, a product marketing specialist at Harting. "This can involve either the application of new modular machines into a production line or the retrofitting of existing installed equipment, to support a more modular and decentralised interconnected control system solution."

It's an approach being used in even the harshest environmental plant conditions, for example where there are very high operating temperatures.

"Connectivity in industrial applications is a critical element and so the components providing this aspect need to be rugged enough to function accordingly. In this context there is the potential for not only on-going exposure to elevated temperatures, but heavy shocks or strong vibrational forces," says Preston.

"In the past, limitations in the operating performance of a connector have often meant that equipment has had to be hard-wired in such situations," Forryan explains. "However, new types of connectors are able to support greater flexibility in such conditions. As a result, reduced wiring complexity means that such an installation can be optimised and maintenance costs reduced."

Harting has developed a range of special connectors to provide reliable solutions for such high-temperature environments. In the case of a bulkhead-side connector, seals must not melt or adhere to other integrated component parts over the full operating temperature range.

Many hood and housing coatings and lacquers, that are currently available on the market, are not suitable for long-term use at high temperatures as they can cause melting which can, in turn, lead to mated parts sticking together.

"In response Harting has developed a special surface treatment of the aluminium die-cast hoods and housings, meaning that we have been able to dispense with any potentially detrimental additional protective coating finish," Forryan explains.

Insulating body and contacts must be able to withstand the high ambient conditions of the location and the additional heat generated inside the housing when under mated load. Harting uses a high-temperature-resistant copper alloy contacts that maintain constant electrical properties when heated. In addition, high-temperature LCP plastic insulators ensure long service life.

Above: Using tools, such as the Han Configurator from Harting, engineers can speed up the selection of heavy industrial connectors for their design

Higher density an issue

"With ever more sophisticated systems to deploy, but less and less room in which to deploy them, higher density arrangements need to be utilised," suggests Preston.

"Not only will the constituent components have to fit into the confined space available, but they should also not create an obstacle that impinges on the system's thermal management activities (by obstructing the airflow passing over the boards on which they are situated).

"Though 2mm pitch connectors were quite acceptable a few years back, now lower profile connectors with much narrower pitches are being mandated."

A durable plastic construction is also normally recommended, explains Preston, in order to maximise mechanical robustness.

"It also, almost, goes without saying that a wide working temperature range will be considered obligatory," she adds.

In response to the changing needs of the industrial space, Harwin has come up with the Archer Kontrol series.

"Suited to a broad array of heavy industrial tasks, these 1.27mm pitch interconnect solutions exhibit a high degree of mechanical robustness, while at the same time delivering substantial flexibility.

"They have a current rating of 1.2A per contact, and a choice of 12, 16, 20, 26, 40, 50, 68 or 80 pin versions for edge-to-edge, parallel board-to-board or right-angle mother-to-daughterboard orientations," explains Preston. "An extensive variety of different stacking heights are available for design flexibility, so that boards can be stacked together at spacings that are suitable for the rest of the equipment layout."

With a fully shrouded design, these connectors have strong resilience to vibration and other mechanical forces, while polarisation of the shroud and lead-in chamfers facilitate blind mating procedures.

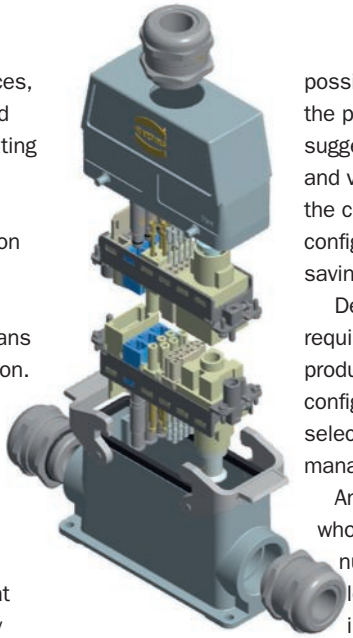
"They support 500 mating/un-mating cycles, possess an insulation resistance of 1000MΩ (minimum), can deal with 500V AC and have a working temperature range that spans from -55°C to +125°C," says Preston.

Configurator

In a move designed to aid and speed up the selection of heavy-duty industrial connectors Harting has created what it calls the Han Configurator, an interactive tool that helps in the selection of heavy-duty industrial connectors.

It allows engineers to access all the necessary information and relevant data on the individual interface components prior to producing a design that can be viewed as a 3D model in real time. It helps generate solutions from an extensive portfolio, without the user having to be or become a component specialist himself.

The designer starts by selecting three inputs (contacts, voltage and current) to generate the first possible solution. At each stage of the process the user can receive suggestions for alternative interfaces and via the "smart assistant" feature the configurator will only allow valid configurations to be implemented, saving valuable design time.



Above: The Han Configurator enables engineers to produce a design that can be viewed in 3D

Despite increasingly complex requirements and a high level of product diversification, the smart configurator makes the connector selection process much more manageable.

An "expert" mode, enables user who already know the product numbers or names they are looking to set up their interfaces in the configurator, making them easily manageable for subsequent processing. The choice of housing (top/bottom) or insert (pin/socket) is all that is necessary to begin the configuration process.

An on-screen 3D visualisation of the configuration, allows the design to be viewed from a range of angles. Each configuration is assigned its own number, allowing it to be saved for revision at a later date.

Challenging as the industrial space can be, solutions and tools are on hand to aid engineers in their designs.