

The Revolution in Ethernet Connectors?

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Fig. 1: The new industrial Category 6A: ix Industrial™ connectors from HIROSE with Ethernet cables from HELUKABEL®

Hardly any other connector is as widely used as the RJ45 (also known as the western plug). It has been around since the 1970s, and in the decades that followed, technologically superior variations were developed for use in industrial applications. It's hard to imagine the industrial world today without them, not just for their convincing price to performance ratio, but because they are almost synonymous with Ethernet connections. However, this could change as the ix Industrial™ interface has recently emerged as a promising alternative with a significantly smaller design and more robust construction (Fig. 1). It is opening up new opportunities in device manufacturing and offers benefits to end users.

RJ connectors were introduced in the 1970s by Bell Laboratories in the USA and standardized a few years later by the FCC (Federal Communications Commission). One of the best-known versions is the RJ45 connector – used for telecommunications and data transmission in offices for decades – that connects PCs to wall outlets with patch cables ranging from Category 5 to Category 7. Over the years, more technologically advanced, industry-approved

RJ45 connectors have been developed. These are compatible with larger cables and wires, can be assembled without crimping tools, and are shielded to meet industry EMC requirements. A popular example is the RJ45 connector used in Siemens DRIVE-CLiQ systems, which has two integrated power contacts that allow data and power transmission over a single cable; up to eight data cables (four pairs) and two power cables can be connected to it.

The RJ45 is a barrier to miniaturization

While the features listed above are adequate for the RJ45, it does pose significant drawbacks. First, the connector is not robust enough for many applications; industrial versions only have one locking hook, which unlike the plastic office version, is made of metal and thus provides at least some durability. A far more serious drawback, however, is the size of the plugs and sockets.

As miniaturization advances, devices get smaller and smaller, as do the circuit boards upon where the sockets are mounted. As a result, the dimensions of a RJ45 socket become comparatively large and the product designer

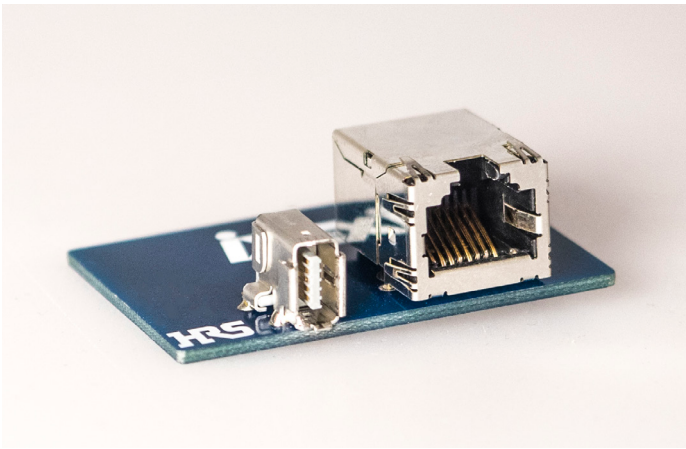


Fig. 2: With the new ix Industrial connector, a packing density 5-times larger than a conventional RJ45 can be achieved.

must ensure sufficient space is allocated. The limits of miniaturization, especially for compact mobile devices, displays, small programmable controllers, cameras, and sensors, are then defined by the size of the RJ45 connector. It's easy to understand why a smaller Ethernet connector would be desirable.

Robust and 70 percent less space required

A modern alternative that could replace the RJ45 industrial version has recently emerged: the ix Industrial™ interface with 10 contacts, Cat 6_A classification, and data transmission rates of up to 10 Gbit. It is compliant with IEC/PAS 61076-3-124 and due to multiple advantages could potentially supersede the standard industrial RJ45 in its implementation as a robust, miniaturized Ethernet interface.



Fig. 3: Two data connectors in two sizes: RJ45 with 8 pins and ix Industrial™ with 8 plus 2 pins

Some advantages of the ix Industrial™ interface include a more compact mating surface and high mechanical robustness. Designed with

industrial settings in mind, it has two sturdy locking mechanisms with metal hooks to ensure resistance to vibrations and contact durability. It is suitable for ambient temperatures from -40°F to 185°F (-40°C to +85°C) and shielding provides EMC robustness. The space-saving aspect of the ix female connector is truly impressive: it only requires 30 percent of the space of a RJ45 female connector (Fig. 2), thus allowing circuit board size to decrease even further, which is key to device miniaturization. Thanks to the 10 contacts it is possible to interconnect Cat 6_A plus two additional power supply conductors. At the same time, efficiency and sustainability also improve, as smaller housings require fewer raw materials. A smaller fan with lower power consumption is also more likely to suffice, given less air is needed to circulate in the housing. Therefore, the ix Industrial™ interface makes sense from an economic and ecological point of view. Furthermore, it could be a far more reliable alternative to USB connectors on inspection cameras.



Fig. 4: The ix Industrial™ connector is supplied in various codings for reliable connection.

Assembly solutions with the new Ethernet interface

New connector technology often requires cable manufacturers to adapt existing products or develop new cable technologies. Given its early stage, HELUKABEL®, one of the leading global manufacturers and suppliers of cable, wires and accessories, is optimistic about the opportunities offered by the new Industrial Ethernet

interface and their ability to provide plug-and-play assembly solutions with ix Industrial™ connectors to device manufacturers (Fig. 3). The industry focus is currently automation technology, video and camera technology, visualization in mechanical engineering (e.g. detection, quality assurance, etc.), and companies that manufacture measurement systems, all whom require patch cables to transmit power and data. Additionally, cables with "mixed" connections, i.e. ix coding at one end and RJ45 coding at the other, can also be assembled. All cables are tested, and can be delivered in a short time frame.

Product Name	Part Number
HELUKAT® PROFINET A	800653
HELUKAT® PROFINET B	800654
HELUKAT® PROFINET C	800655
HELUKAT® 100S Cat 5 SF/UTP	82839
HELUKAT® 600IND Cat 7 SF/UTP	802184

Currently HELUKABEL® is able to provide three different code styles:

- A-coding for standard Ethernet (4/8 pins, plus two power conductors rated at 3A for 50V AC or 60V DC).
- B-coding for application-specific installation e.g. bus, control or power applications (max. 1.5A per PIN if all conductors are used for power transmission OR max. 3A if only PIN 1, 2, 6, 7 in use) (Fig. 4).
- C-coding for standard Ethernet 4/8 pins, plus two power conductors rated at 3A for 50V AC or 60V DC.
- Two 90°-angle plug versions as well as a field-wireable plug with C-coding for standard Ethernet will be launched in 2020.

The significant space-savings compared to their RJ45 counterparts open additional miniaturization opportunities to device manufacturers, especially since horizontal, vertical, or upright versions of the corresponding housing are also available (Fig. 3). Durability, compactness, high data transmission rates, and

a double locking mechanism clearly speak for the new ix Industrial™ interface. Now the wait begins to see how the market responds.

The HELUKABEL® Group, headquartered outside of Stuttgart, Germany is one of the world's leading manufacturers and suppliers of cable, wires, and cable accessories. With 57 manufacturing sites and sales locations in 36 countries, the company is regarded as a reliable partner for customers in industry and infrastructure. The extensive range of more than 33,000 stocked items and application-specific cables guarantees electrical connection technology from a single source.

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