Even with a parallel or angle offset, the NIC series inductive couplers transfer 12 Watts across an air gap of up to 7 millimeters

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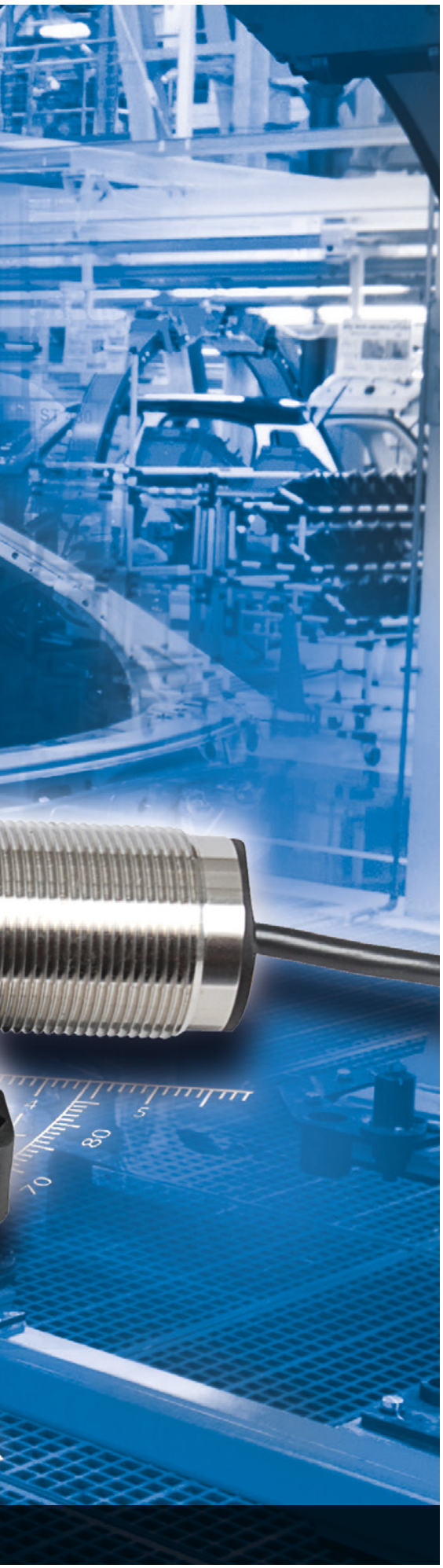


Powerful Coupling

Turck is providing a solution to wear problems on connections subject to severe stress by using contactless power and data transmission based on inductive coupling

Somehow there is always something magical that happens when a smartphone is placed on a contactless charging station. Power transmission without cables? This is made possible through the principle of inductive coupling. The technology is not really new but its widespread use in the consumer sector is still coming. The charging function for electrical toothbrushes and cordless telephones are as of yet the only mass applications of this technology.

It is in the niche markets where the use of inductive coupling as a means of transmitting power is best leveraged. For example, pacemakers and other medical implants often have to be provided contactless power and signal transmission by necessity. The benefit is obvious: The very idea of a USB port on a rib cage for charging the pacemaker conjures images of horror or science fiction films rather than serious medical technology.

Wear-free operation

In these applications, however, one great benefit of inductive coupling for signal and power transmission is hardly used: Inductive coupling is absolutely wear-free. While in household use this benefit is rarely importanct, in industrial applications it can be a key factor in choosing a product. The resulting longer maintenance intervals, the shorter downtimes and the increased cycle rates for machines are ultimately powerful arguments for purchasers and for production planners in particular.

Especially in applications where contacts are plugged in and removed very frequently, wear is a major problem – and is therefore a key cost driver. When manufacturers of terminal and connectivity solutions start gold plating contacts, it becomes clear that there is a genuine need for

Quick read

Robots with tool changers or rotary indexing tables place demanding requirements on the connection technology. Contacts and connectors that are subject to wear require short maintenance times or can even cause the machine downtimes. Turck's contactless inductive couplers now offer an alternative to conventional connection technology. The NIC couplers transfer up to eight switch signals with up to 12 Watts of power and therefore provide a wear-free alternative to slip rings or connectors subject to severe mechanical stress.

Solution 1: Two PNP switch signals can be transferred via the secondary unit (right) if a VB2 splitter is connected

Solution 2: If the primary unit (left) is connected to an IO-Link master, data from measuring IO-Link sensors can be transferred bidirectionally

Solution 3: The primary unit operates as an IO-Link master so that up to eight switch signals can be processed via the I/O-Hub (right)

wear-free solutions. Nobody has the idea of using gold just for decorative purposes. Even if the noble metal reduces contact wear, it can't prevent the process. Applications with connections subject to severe stress, whether through vibration or the frequent closing and opening of a connection are therefore an ideal application field for a "contactless plug connection". Robots with tool changers or rotary indexing tables are examples of these kinds of applications.

Inductive couplers as contactless connectors are also impressive on account of the freedom of movement they offer their coupled components, such as robots with rotating tools or shafts from which sensor signals have to be taken. Here a contactless connection of the interface is a major benefit. Although the slip ring is established in industry as an alternative solution, it is little appreciated due to its wear. Another application area for inductive couplers are overhead conveyor systems as are frequently used in the automotive industry.

Powerful coupler series

Turck's NIC system is a series of inductive couplers that can take on the challenges of the applications mentioned. The coupler sets consist of a primary unit on the controller side and a secondary unit on the sensor/actuator side of the connection. The NIC couplers transfer up to eight PNP switch signals and up to 500 milliamperes of current with an output of 12 Watts.

This enables sensors and actuators such as light curtains, piezo valves or smaller valve terminals to be operated without an additional amplifier being necessary on the secondary side. The primary units are connected via a four-pole M12 male connector or a 30 cm pigtail with a twelve-pole M12 connector. The secondary unit has a 30 cm pigtail with a four-pole M12 connector. With a length of 80 millimeters, the Turck couplers are the most compact devices in the M30 housing.

Three variants – IO-Link included

The inductive couplers can be connected as easily as a plug connection. A sensor or another signal source is connected to the secondary unit (NICS-M30-IOL2P8-0,3-RKC4.4T), the primary unit (NICP-M30-IOL2P8X-H1141) is positioned opposite and connected via a standard four-pole M12 connector to a controller or a fieldbus device. This basic system can transfer without contact two PNP switch signals via a simple VB2 splitter behind the secondary coupler. The air gap here can be up to 7 millimeters apart.

The same system consisting of primary and secondary coupler can also be used to transfer signals from IO-Link-capable measuring sensors. For this the primary coupler only has to be connected to an IO-Link master. On the secondary side the user simply connects an appropriate IO-Link sensor or any other IO-Link-capable device. These combinations even allow bidirectional IO-Link communication including all IO-Link features such as parameter setting and diagnostic data. If the Turck I/O-Hub (TBIL-M1-16DIP for 16 Digital PNP Inputs) is connected on the secondary side, the system can also be used for identification tasks, such as on tool changers, since the hub can transfer a unique ID via IO-Link right into the controller.

The third solution variant is used when more than two signals are to be transferred: In this case, the IO-Link protocol is used to transfer up to eight switch signals. In this way, eight PNP signals can be transferred with a primary and secondary unit as well as an I/O-Hub. The NICP-M30-8P8-0,3-RSC12T twelve-pole primary coupler used here acts as the IO-Link master, and the I/O-Hub as the slave. The primary unit is connected to conventional PNP inputs of a field device using 12-pole M12

connectors so that the fact that the system works internally with the IO-Link technology is not at all noticeable for the user.

Diagnostics with metal detection

Besides the eight PNP sensor signals the system also provides two poles for diagnostic signals. One signal indicates the presence of the secondary unit, the second is used for foreign object detection. If any metal foreign objects such as iron chippings fall between the primary and the secondary coupler and reduce transmission quality, the fault signal is sent to the controller so that the error source can be located immediately. The primary couplers with a 4-pole terminal indicate this diagnostic information directly on the device via the status LEDs which are visible from all sides. If an IO-Link device is connected, the diagnostic data is also available in the controller.

7 millimeter air interface

Turck's inductive couplers differ from other solutions in several aspects: With a maximum air interface of 7 millimeters and 12 Watts of transmitted power they offer the largest distance of all inductive couplers in this housing style. The devices are furthermore immune to shock and twisting of primary and secondary units. If the primary and secondary unit are positioned directly opposite each other at the nominal distance, they can be laterally offset by up to 5 millimeters.

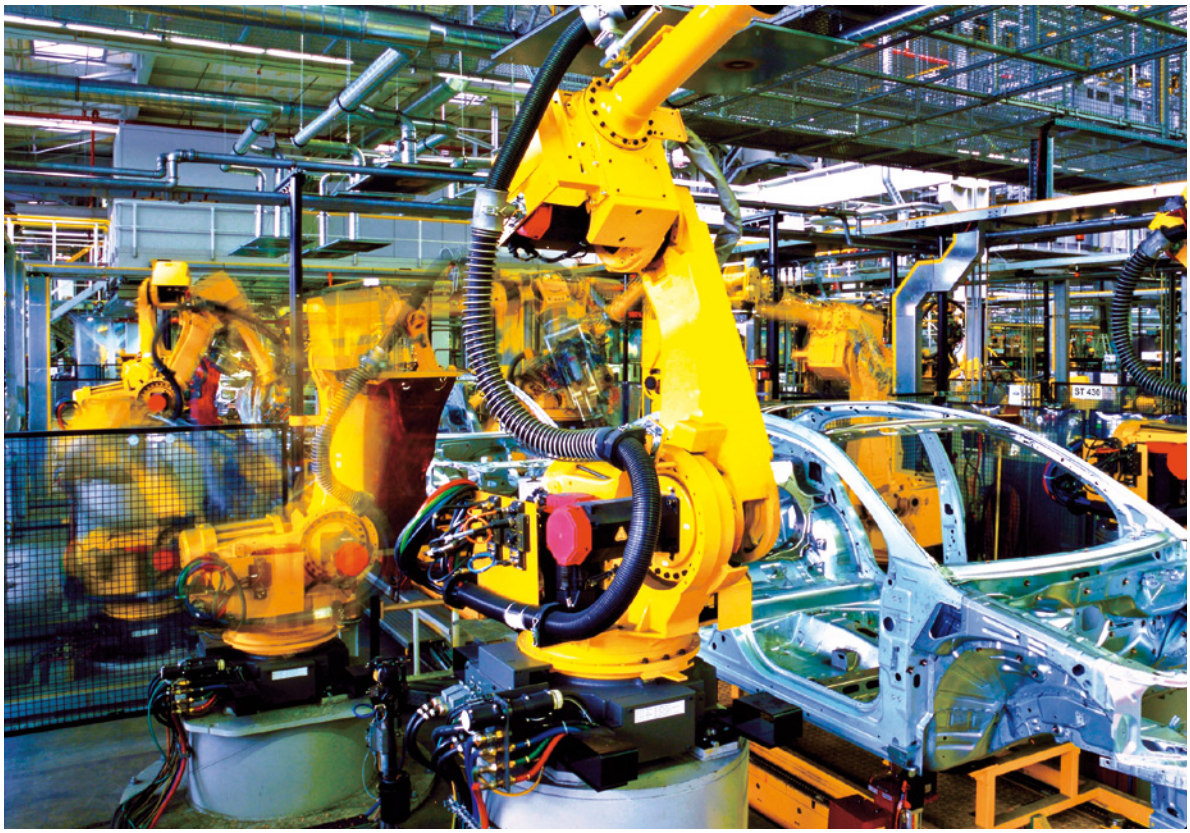
If the application prevents the two coupler sections from being mounted in line, the coupler systems can also be mounted at an angle to each other. With a 4 millimeter gap between each other an angle of up to 15 degrees is possible. The signal is not interrupted directly, even at greater angles. Although the power is progressively weaker, it may still be sufficient, depending on the application.

Operational in 10 milliseconds

In many applications with frequently changing connections, the operational readiness of the secondary unit is also important. With robot tool changer applications in particular, the cycle times that the connection solution allows are a key factor. The secondary unit of the Turck coupler is operational in less than 10 milliseconds. The fixed primary unit is permanently fed with power. With this startup time, the system is one of the fastest on the market. Naturally primary units can be combined with any number of secondary units as required – and vice versa. More complex applications with several primary and secondary units can then be implemented easily with dynamic pairing.

Connection technology and sensors

Customers can draw on the extensive range of Turck connectivity, fieldbus technology and sensor products to ensure the simple mounting and use of the new NIC couplers. Several options are available, from standard four-pole M12 connectors and several different variants of Y splitters, to the I/O-Hub, right through to the appropriate 12-pole adapter cable for the BL67 modular fieldbus system. The automation specialist also offers a broad portfolio of sensors for the many different applications possible. ■



For tool changer applications on robots the NIC coupler offers an impressive performance with a startup time of 10 milliseconds