

The modular BL67 I/O fieldbus system can optimally process numerous signals in the welding systems



Routing Station

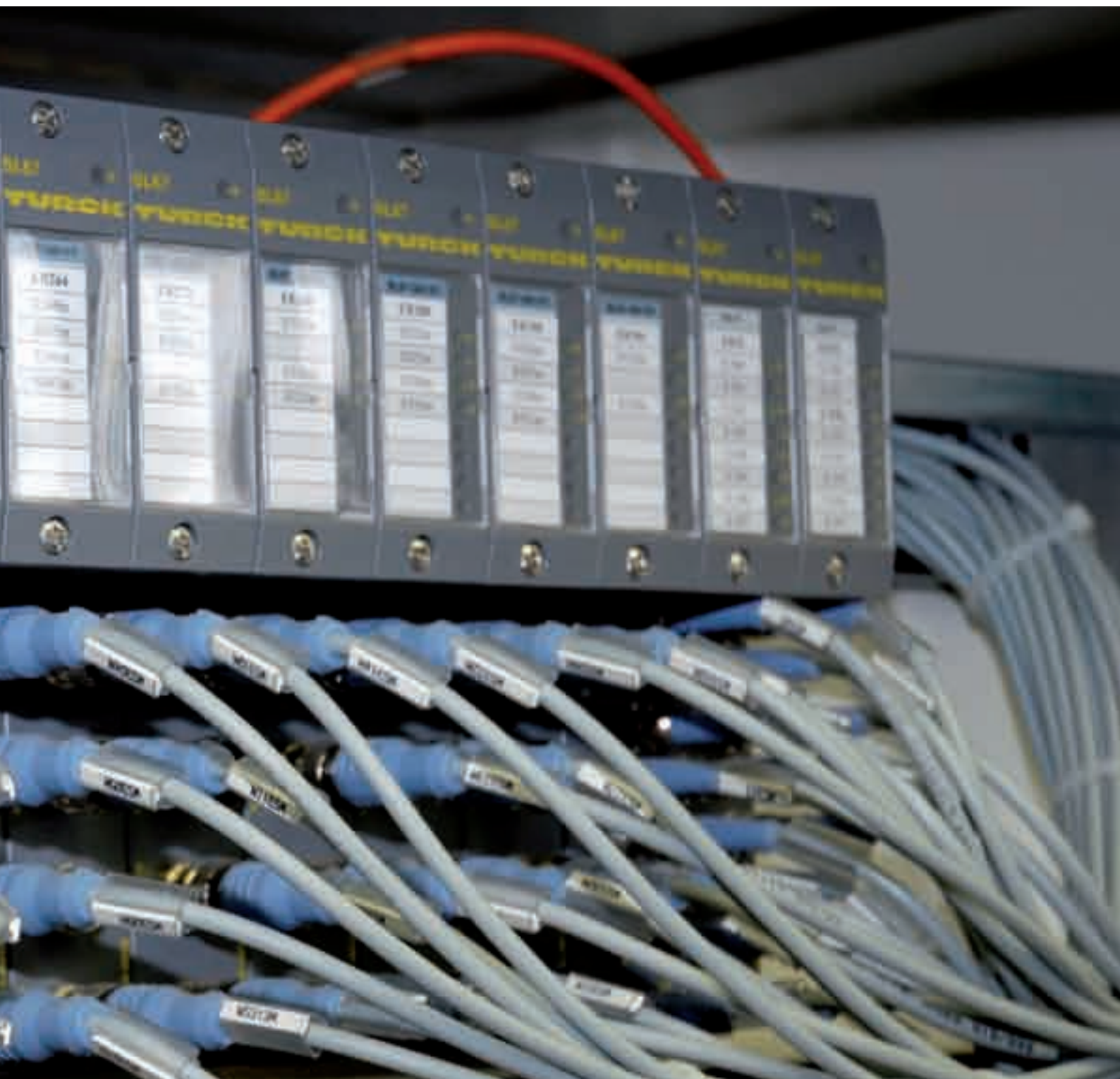
The Turck I/O System BL67 processes signals on the FRIMO ultrasonic welding systems – including high-frequency

Whether gluing, riveting, screwing or welding – when it comes to joining materials together, the right joining technique is playing an increasingly important role – for the design of a product as well as its efficient manufacture. Even if it involves “just” joining two plastic parts, the user is spoiled for choice between numerous technologies, including heated-tool welding, hot-air riveting, heat contact riveting, infrared welding, laser welding or ultrasonic weld-

ing/riveting. The latter is primarily used for interiors in the automobile industry because it is particularly well suited for surface welding and riveting with cold tools.

Ultrasonic welding

Ultrasonic welding involves using high-frequency oscillations (ultrasound between 20 and 40 kHz) beyond the human hearing range to join plastics



together. Ultrasound is produced using a generator that converts the low-frequency energy in the AC power supply into higher-frequency ultrasonic oscillations. The mechanical resonance unit combined with the generator (consisting of a converter, amplitude transformation unit and sonotrode) is mounted on a pneumatic cylinder. Using the sonotrode, the mechanical oscillations generated in the converter under pressure are forwarded to the thermoplastic adherends. In the joining areas, the

▶ Quick read

Typical of ultrasonic welding systems is the multitude of signals that have to be processed in these plants. In addition to the information on position and penetration depth of the sonotrodes, it is primarily the high-frequency signals that stimulate the numerous weld heads to oscillate. In the new ultrasonic welding systems from FRIMO, Turck's IP67 I/O system BL67 ensures that all signals are processed, including the welding process.

**“All inclusive”:
Even the high
frequency signals
for actuating the
sonotrodes
(orange cables) are
routed via the Turck
I/O system BL67**



“With his competence in the area of fieldbus-oriented signal processing and the sensor technology, Turck was able to offer us a solution that met our high requirements for this project”

**Detlev Böhl,
FRIMO Technology**

ultrasonic energy produces molecular and boundary friction, which heats up and softens the plastic parts. The sonotrode's penetration depth into the plastic is a yardstick for the quality of the joined area in which case each material has its specific optimal value.

Demand for strong I/O system

The enormous number of input and output signals to be processed in an ultrasonic welding system makes a powerful I/O fieldbus system essential. After an intensive market analysis, FRIMO, one of the leading suppliers of ultrasonic welding systems, decided to place its trust in the Turck BL67 solution. “After comparing traditional market I/O fieldbus systems, we came to the conclusion that the Turck system was the best suited due to its high transmission speed that met our requirements,” is how Thorsten Geldmacher, technical project manager responsible for introducing the I/O systems, explains FRIMO's decision in favor of the BL67. This system combines all the benefits of modern IP20 bus terminal systems for the switchgear cabinet and consequently transfers them into the raw IP67 world.

The benefits of such a solution are obvious. The BL67 system can be brought directly to the sensor without a switchgear cabinet. This saves on materials and assembly time and with a multitude of signals contributes to cost reduction. Furthermore, the BL67 system is enormously flexible and can thus be adapted to meet future needs. If further I/O channels should be required in the future, the additional modules can be simply added to the existing installation without further expense. The BL67 system is connected to the FRIMO system

via a profibus, but it is also available for other fieldbus systems. Besides the high speed, the FRIMO decision-makers were impressed by the complete separation of electronics and connection level in the BL67. In case of a service call, the “hot swap” functionality developed ensures smooth plant operation while the defective module is replaced by the new one in the blink of an eye.

High frequency through the I/O system

Anyone who takes a quick glance at such a system will immediately appreciate the value of each cubic centimeter of space saved by an ultrasonic welding system. For FRIMO, a decisive factor was being



**Turck produces analog magnet field sensors
“FRIMO by Turck” especially for this application**

able to do without an additional switchgear cabinet by routing the high frequency signals necessary for welding via the I/O system. In close cooperation with Turck, this concept could finally be implemented. While 19” racks with relay printed circuit boards

The user

With around 1,200 employees at 17 locations worldwide, the FRIMO Group is a leading specialist for turnkey machine tool and plant technology for the manufacture of high quality plastic components in the automobile industry and other plastic processing industries. These include, for example, manufacturing facilities for laminating, backfoaming or thermoforming instrument panels or door paneling. At FRIMO Technology GmbH PlasticJoining in Hamburg, the company focuses its competence in the area of plastic joining technologies. FRIMO gives customers process-neutral advice when selecting the appropriate technology and supplies the corresponding systems. Its product lines range from heated-tool welding, to hot-air riveting, thermal contact riveting, infrared welding, laser welding to ultrasonic welding/riveting.



were used to distribute the high-frequency signals, FRIMO now uses the I/O system BL67 for high-frequency transmission in its current serial systems. The sonotrodes can therefore be comfortably controlled by software. With its competence in the area of fieldbus-oriented signal processing and sensor technology, Turck was able to offer us a solution that met our high requirements for this project,” explained Detlev Böl, technical director of FRIMO Technology GmbH PlasticJoining in Hamburg.

The BL67 has meanwhile proven itself during comprehensive field tests in FRIMO ultrasonic welding systems. One of the many companies to purchase FRIMO welding systems with the Turck I/O system is automobile supplier Johnson Controls Interiors in Lüneburg, Germany. At its Lüneburg plant, Johnson Controls produces door panels for the new Volkswagen Tiguan which was launched in September at the International Motor Show.

Sensors and connection technology

As a specialist for sensor, fieldbus, interface and connection technology, Turck has not only equipped the FRIMO ultrasonic welding systems with fieldbus technology, but has also supplied special sensors for detecting the pneumatic cylinder, as well as the associated connection technology. In order to make a material change possible – from art leather to plastic – without manual intervention – a sensor was required that can detect contact-free the penetration depth of the sonotrodes during the welding process regardless of the materials used. “Turck was even able to deliver a solution for this task that not only met the technical specifications, but also the high FRIMO quality standards,” says Böl.

The analog FRIMO magnet field sensor that was a result of this cooperation now makes it possible to change over to new materials during ongoing operation without retrofitting the system. Thanks to its compact design, the sensor can be mounted directly on the T or dovetail joint pneumatic cylinders; a standard plug-in connector is used for connection.

The sensors from the FRIMO series have a current or a voltage output. The measured length of the analog path sensor is about 40 mm, with an average accuracy of 0.1 mm, in which case the repeating accuracy comes to 0.3%. Due to the analog measuring process, the actual reproducibility is even better with brief movements. The very brief blind zones (only 8 mm on both sides) further ensure an exact recording of the end positions of the pneumatic cylinder. Additionally, the sensor has a measurement range display, called the “in-range” function with LED display. Thanks to this functionality, it is immediately obvious whether the actuation magnet on the pneumatic cylinder is in the measurement range or not.

Successful together

Using the example of ultrasonic welding systems, it becomes clear how the close cooperation between manufacturer and supplier is mutually beneficial. With competency and innovative solutions, Turck supports the distinctive know-how of its clients and thereby does its part to allow FRIMO customers to manufacture goods faster, more safely and at lower cost using the company's systems.

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