

Customer-Specific Wiring Solutions



Many international standards
were originally introduced as
customer-specific solutions





About: Belden® – Sending All the Right Signals™

Belden is a world-leading supplier of signal transmission solutions, including cables, connectivity and active components for applications that range from industrial automation to data centers and television studios through to the aerospace industry.

As an industry leader, Belden focuses on segments of the worldwide cable and connectivity market that require specialized, high-performance products. Belden offers a complete, highly specialized range of signal transmission solutions at management-, control- and field-level, which the company manufactures and sells under its Belden®, Hirschmann™ and Lumberg Automation™ brands.

Connectivity Solutions for Automation Technology

The Hirschmann™ and Lumberg Automation™ brands are synonymous with high-quality connectors and innovative wiring solutions for use in almost all areas of automation. In particular, these solutions are used in the fields of machinery and plant engineering, building wiring installation and renewable energies. The product portfolio of these two brands comprises a wide range of connectors for sensors and actuators, single- and double-ended cord sets as well as distribution systems and I/O modules that can be connected to fieldbus systems and Ethernet networks.

Key features of Hirschmann™ and Lumberg Automation™ products:

- High mechanical and electrical loading capacity
- Excellent chemical resistance
- Ease of use
- Extreme robustness and compact size
- User-friendly installation

Hirschmann™ and Lumberg Automation™ products have been designed for direct application usage. There is every good reason why these two brand names are among Europe's leading suppliers of connectors and wiring solutions for automation technology.

Belden offers a broad range of standardized wiring components. The Hirschmann™ and Lumberg Automation™ brands also dominate in customer-specific solutions. State-of-the-art methods and technologies as well as extensive development expertise provide customers with numerous advantages. In fact, it is likely that some of today's customer specific solutions will be adopted as tomorrow's worldwide standards. In bus technology as well as in passive components, the development focus always lies on creating new application solutions, simplifying initial product operation, eliminating the need for additional devices and implementing new technologies and methods.

Content	Page
Introduction	3
Passive Distributors	4
Active Modules & Packaging	5
Cord Sets, Single- and Double-Ended	6 – 7
Rectangular Connectors	8
Receptacles Connectors	9
Complete Solutions	10 – 11

Passive Distributors



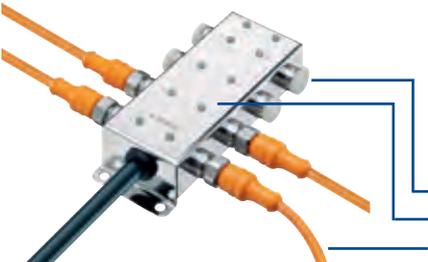
Actuator/Sensor Distributors for Highly Efficient Bundling of Parallel Wiring

The growing level of automation in all areas of manufacturing requires increasingly complex wiring and cabling technologies. The wiring concept traditionally used in the field of machinery and plant engineering involved parallel wiring. In other words, every sensor and actuator was connected directly to the control system. This made it necessary to install huge switch cabinets, large cable conduits and many sub-distributors in order to collect the I/O signals. Both installation and maintenance of such machines and plants were costly and time-consuming for their users. In 1989, engineers from Lumberg Automation™ developed a distribution system with M12 connectors and IP 67 protection rating that would make wiring simpler. The idea was to install a distribution box directly at the I/O nodes to collect signals and transmit them to the control system via only one multi-conductor cable. This enabled up to 16 signals to be bundled in one distributor, keeping space needs to a minimum.

Benefits of this solution:

- Reduced installation and maintenance times by minimizing wiring complexity
- Cost savings on the basis of fewer terminals and distributors
- Standardized wiring from sensor/actuator to switch cabinet through use of cord sets as well as M8 and M12 circular connectors
- Shorter downtimes due to process-oriented LED operation and function indicators
- Reduced machinery and plant sizes due to compact construction and decrease of cabling

Application Examples



Customer's requirements: Distributors in its beverage bottling plants kept failing, since the components used were not resistant to cleaning agents, aggressive chemicals and pressure washers. In addition, the customer was looking for a solution that offered a distributor with a horizontal instead of a vertical layout.

Solution from the Lumberg Automation™ Product Portfolio:

- Development of a distribution box with lateral ports
- Use of materials such as stainless steel V4A
- PVC molding and PVC cable

Customer's requirements: The customer needed distributors for a new generation of handling robots. The requirements were that the distributors had to be as light as possible and easy to install.

Solution from the Lumberg Automation™ Product Portfolio:

- Development of non-encapsulated IP67 distributors
- Staggered M12 or M8 connector layout enables easy mounting of molded as well as field-attachable connectors



Customer's requirements: In a roller conveyor system, every fourth roller was supposed to be motor-driven. The customer wanted to implement the wiring with a switch cabinet and M12 panel jacks.

Solution from the Lumberg Automation™ Product Portfolio:

Development of a compact distribution box with nine interfaces (Q-Box):

- four ports for monitoring sensors
- four ports for drive of motors
- one interface for parameter settings such as torque and speed



Active Modules & Packaging

LioN: I/O Network from Lumberg Automation™

The innovative passive distributors were merely the first step toward optimized machine wiring. As early as 1993, Lumberg Automation™ launched the market's first field-attachable IP67 distributors for Interbus. As an electronics packaging specialist, Lumberg Automation™ have played a major role in shaping the market for modular IP67 fieldbus systems, which has experienced steady growth for many years. The entire production process, from construction design to the final product, is flanked by a tried-and-tested quality management system complying with ISO 9001. This applies equally to the manufacture of connectors, the mechanical packaging of electronics, for the company's own production or for custom packaging, e.g. in the area of safety and wireless. Today, the Lumberg Automation™ brand offers fieldbus modules, which provide the perfect solution for every I/O concentration and environment:

- LioN-Classic (fully encapsulated IP67 stand-alone modules with M12 connections)
- LioN-S (IP67 stand-alone modules without encapsulation, featuring a slim design and M8 or M12 connections)
- LioN-M (IP67 stand-alone modules without encapsulation, featuring a broad design and M12 connections)
- LioN-Link (IP67 distribution system with bus head and bus-independent I/O modules, featuring a slim or broad design and M8 or M12 connections)

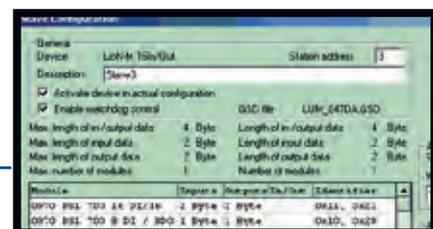


Application Examples

Customer's requirements: Insufficient flexibility when changes become necessary during the planning, commissioning or retrofitting phases.

Solution from the Lumberg Automation™ Product Portfolio:

- Development of universal modules for the LioN-S, LioN-M and LioN-Link series
- Each signal pin of these modules can be used for input or output – without configuration work
- In addition to the 16 I/O variant, the modules can also be configured as 16 I, 16 O and 8 I / 8 O modules via GSD or EDS file => Reduction in I/O storage space
- Lower costs since fewer parts need be stored



Customer's requirements:

- Similar level of wiring, whatever bus protocol specification the end-customer has
- Elimination of manufacturer-specific wiring components
- Individual configuration of equipment levels in an assembly line while retaining the original hardware configuration and the control program
- Exchanging tool couplings on automatic assembly machines or robot systems during operation

Solution from the Lumberg Automation™ Product Portfolio, here with LioN-Link:

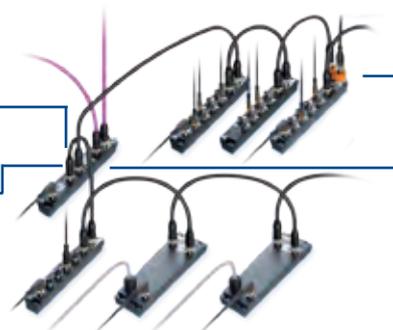
a. Bus-independent LioN-Link distribution system

enabling the same I/O wiring to be used irrespective of which fieldbuses are deployed now and in future

- Enables long-term planning with respect to wiring concepts

c. LioN-Link bus coupler with shadow mode

- Options-handling-function enables up to 30 inactive secondary components to be activated
- Higher-level Profibus communication is not compromised
- A single dynamically adaptable, yet downward compatible, control software is used for management over the entire life or production cycle of machinery and plants



b. Use of standard M12 or M8 components

- Guaranteed procurement and spare parts availability thanks to vendor independence

d. LioN-Link bus coupler with tool changer mode

- Modules can be connected or disconnected during operation (Hotplug function)
- No interference with the superimposed Profibus strand
- Bus errors are therefore no longer a problem

Cord Sets, Single- and Double-Ended



Reliable Signal Transmission Even Under Tough Conditions

Lumberg Automation™ sensor connectors and cables are available in a broad range of standards and special types. The product portfolio comprises a wide range of M5, M8, M12, M23 and 7/8" connectors. Through continuous compatibility tests with modern chemical substances, coolants, lubricants and cleaning agents, the connectors always keep abreast with the state of the art.

Patented features such as the self-locking screw coupling for guaranteed shock and vibration resistance, the rolled spring contacts and the so-called "piggyback circuit", which ensures correct operation even if the LED display is damaged, are all available as a matter of course.

Application Examples

Customer's requirements:

Connection of lamps and lighting that are partially laid underground.

Solution from the Lumberg Automation™ Product Portfolio:

- Development of PUR-molded connectors that are microbe- and hydrolysis-resistant and feature a molded-on Lumflex cable



Customer's requirements:

Wiring in commercial and special-purpose vehicles that often have to withstand adverse conditions such as dusty fields, swampy forest floors or – in the winter – salt on the roads.

Solution from the Lumberg Automation™ Product Portfolio:

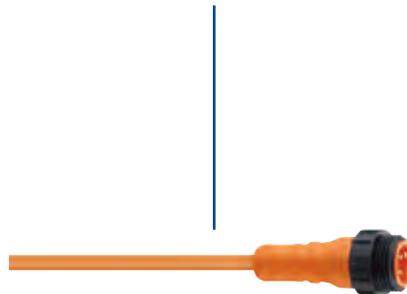
- Connector systems with threaded joints made of non-corrosive or stainless steel

Customer's requirements:

Flexible wiring of underwater lamps.

Solution from the Lumberg Automation™ Product Portfolio:

- 7/8" connectors that are characterized by their high mechanical and electrical loading capacity as well as watertightness up to 10 bar. Due to direct molding with a special type of PUR, moisture is prevented from penetrating them, even in the case of temperature fluctuations. It is therefore hardly surprising that almost all cable lamps are nowadays equipped with high-quality 7/8" connectors from Lumberg Automation™





Customer's requirements:

Pluggable signal collection unit for the mining industry, which complies with the EN 50281-1-1 standard (areas with combustible dust) and meets the requirements for ATEX 95 areas (category 3D, zone 22).

Solution from the Lumberg Automation™ Product Portfolio:

- Tried-and-tested, standard M12 connectors with blue molding and cable
- Development of the STS securing clip, a locking ring for electrical equipment connectors. The split plastic sleeve is clipped on to the connector's screw nut and can only be removed with the aid of tools. This makes the connector a "connection assembly that cannot be released without tools", which may be used in zone 22



Customer's requirements:

The customer required a pluggable solution for his motor drives. In addition to this internal motor interface issue, he was also looking for a connector solution. A conventional M12 connector with an outer diameter of 14.5 mm could not be used, since the motor connection cable had to pass through a 12 mm borehole in the carrier section.

Solution from the Lumberg Automation™ Product Portfolio:

- Use of FIXCON quick-connection connectors
- Development of a special FIXCON sleeve with a diameter of only 11.6 mm. This enabled the motor's breakout cable to be connected with a standard FIXCON connection cable via the Q-Box (see page 4)

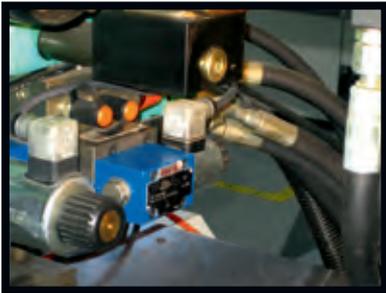


FIXCON®

FIXCON is a vibration-proof IP67 connector system for M12 connection applications, retaining the materials as well as electrical and mechanical characteristics of traditional connectors and simply revolutionizing the connection method. The connection is made with the help of a patented push-pull locking mechanism that enables the connector to be inserted and removed with only one hand movement. FIXCON connectors can therefore be installed twice as quickly as M12 screw connectors, thereby reducing maintenance times and costs.



Rectangular Connectors



GDM-Series

Rectangular connectors from the Hirschmann™ GDM series for hydraulic, pneumatic and electromagnetic actuators and sensors meet all the stringent requirements of day-to-day operation. These connectors, which come as type A, B and C, are available as field-attachable models, with molded-on cable or as an adapter. The large cable terminal compartment makes them very easy to install. What is more, the GDM connectors are ideal for a wide range of applications thanks to patented combination contacts, which can be used to connect stranded wires, fork-type cable lugs and ring eyelets.

Application Examples

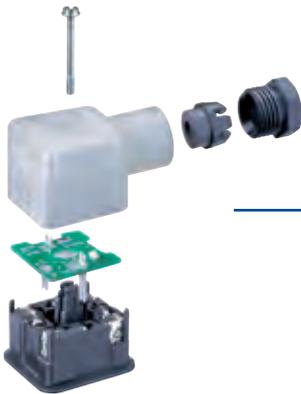
Customer's requirements:

Steadily growing demand for highly compact rectangular connectors.

Solution from Hirschmann™:

The new generation of field-attachable GDMF valve connectors

- IP65/67 protection rating
- Extremely space-saving due to a height of only 26 mm
- Adapt perfectly to individual application scenarios
- The tried-and-tested, patented combination contact guarantees shock and vibration resistance
- Designed for a wide range of cable cross-sections up to a maximum of 1.5 mm² with diameters from 4.5 to 8 mm (or 4.0 to 6.7 mm for the UL variant)



Customer's requirements:

Connectors for pressure sensors that are too small for standard valve connectors to be used.

Solution from Hirschmann™:

Development of a new adapter housing

- Female section of a field-attachable M12 connector at one end
- Valve connector at the opposite end
- Both parts are connected with wires

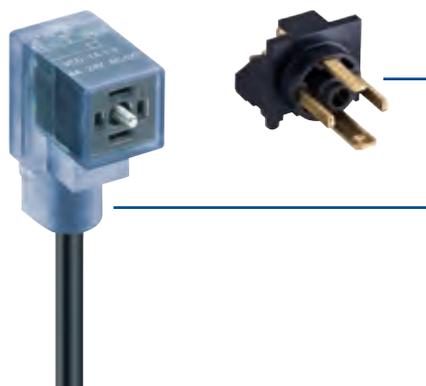


Customer's requirements:

A connector system to control care or hospital beds. The system needed to be small, suitable for medical applications and able to withstand temporary high currents. In addition, both a reflow solderable mounting version and a molded-cable version were required.

Solution from Hirschmann™:

- Development of a plug connector based on a reflow-capable valve connector, type C (EN 175301-803)
 - Can be equipped with pick-and-place machines
 - A special protective cap can optionally be used as a faceplate
- Modification of a standard Hirschmann™ valve connector, type C (EN 175301-803):
 - Contact support without PE symbol
 - Captive seal
 - Cable developed especially for the specific environmental conditions





Receptacles Connectors

Many applications in the industrial equipment industry require receptacle connectors. In many cases, standard connectors are used either for technical reasons or because of their faster availability. However, these connectors often have to be subsequently adapted to individual installation scenarios, which is time-consuming as well as costly.

Belden can offer individual customer solutions from its modular range of receptacle connector components. Different material qualities, chassis-side threads, cable cross-sections and colors, for instance, can be supplied for many product sizes on the basis of the existing components – even if only small quantities are ordered. In order to streamline processing and installation, various assembly options are available for the open conductor ends.



Application Examples

Customer's requirements:

The customer required an M8 sensor with high contact density. The interface (direct contact) needed to be accommodated in a two-piece sensor housing and designed as a) a molded cable solution and b) a pigtail solution with M8 and M12 connectors.

Solution from the Lumberg Automation™ Product Portfolio:

- a) Development of a molded eight-pole M8 connector
 - Adapted housing design with special contours, similar to a cable bushing
- b) Same as solution a), plus a molded-on M8 or M12 connector

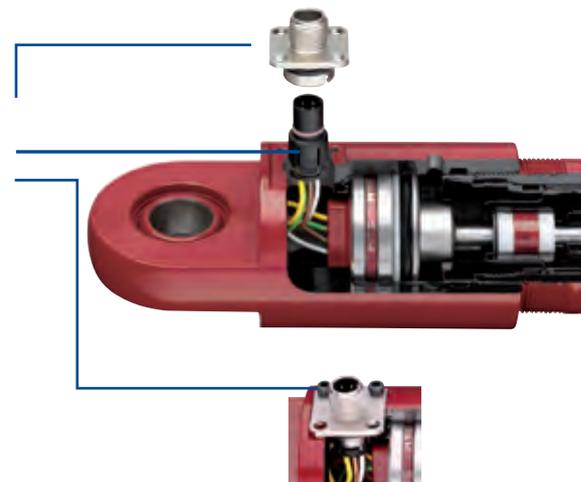


Customer's requirements:

The customer was looking for a sensor connector system that is easy to integrate in hydraulic cylinders and suitable for use in construction machines, industrial trucks or agricultural machines.

Solution from the Lumberg Automation™ Product Portfolio:

- Development of a connector system comprising a contact support and flange housing
- A ready-made connector system (contact support + flange housing) is delivered to the customer, i.e. the contact support is already connected to the sensor's conductors
 - The contact support is led out of the cylinder through a borehole. The flange housing is simply clicked on from the outside and fastened to the cylinder with four standard screws
 - Thanks to this easy click installation, the time-consuming process of making contact with conductors through soldering or screwed clamp terminals as well as voltage reversals or cold solder joints are things of the past
 - When the cylinder is installed in the machine, the sensor is easily connected at various angles via a standard M12x1 connector
 - Due to minimal overall height, cylinder installation is easy even in cramped installation conditions



Complete Solutions

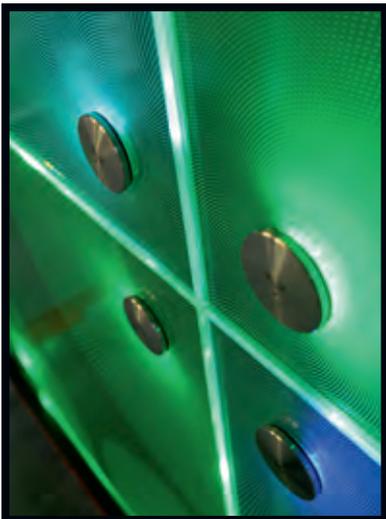


Versatile and Innovative Solutions

Belden produces wiring solutions for all globally uniform, standard interfaces, whatever features the internal interfaces of their customers offer. The omission of conventional wiring in favor of connector systems and signal bundling generates significant cost reductions.

No matter whether its task involves customizing a standard product, solving a specific customer problem or developing a completely new connector solution, Belden is the professional partner for future connection solutions. After all, the tougher the technical conditions, the more complex the demands made on the connection technology. In such cases, it's good to be able to rely on an experienced specialist like Belden.

The success achieved in implementing tailor-made applications and system solutions depends to a great extent on the ability to respond to customers' requirements. The fast completion of concrete tasks and the consistency, versatility and quality of products from Hirschmann™ and Lumberg Automation™ have already convinced many big-name customers from widely differing automation technology sectors.



Application Examples

Customer's requirements:

Development of a system for color highlights and illumination of glass facades through edge lighting, consisting of a light point and control unit based on customer-specific LED technology. Each fitting was to include internal wiring for the LED lighting so that large indoor and outdoor glass facades could be illuminated.

Solution from the Lumberg Automation™ Product Portfolio:

- Distribution module:
A connection to digital building services is established via a bus system that enables convenient control and programming of lighting scenarios
- Actuator/sensor connection cable:
Connection between point fitting and distribution modul
- M8 receptacle connector to flat plug:
For connection to the printed circuit board, incl. M8 external thread. The connector developed for this application serves as the interface between the exterior M8 interface and the interior pluggable printed circuit board for the panel lighting. To get within the radius of the panel opening, a Z-structure has been implemented to shift the contact interface inward
- Glass panel fitting:
The interior swivel head of the panel fitting absorbs the forces coming from the panel and transfers them to the substructure – arising loads are therefore ideally distributed.
- Fiber-optic ring:
Plastic ring for the safe holding of the printed circuit board

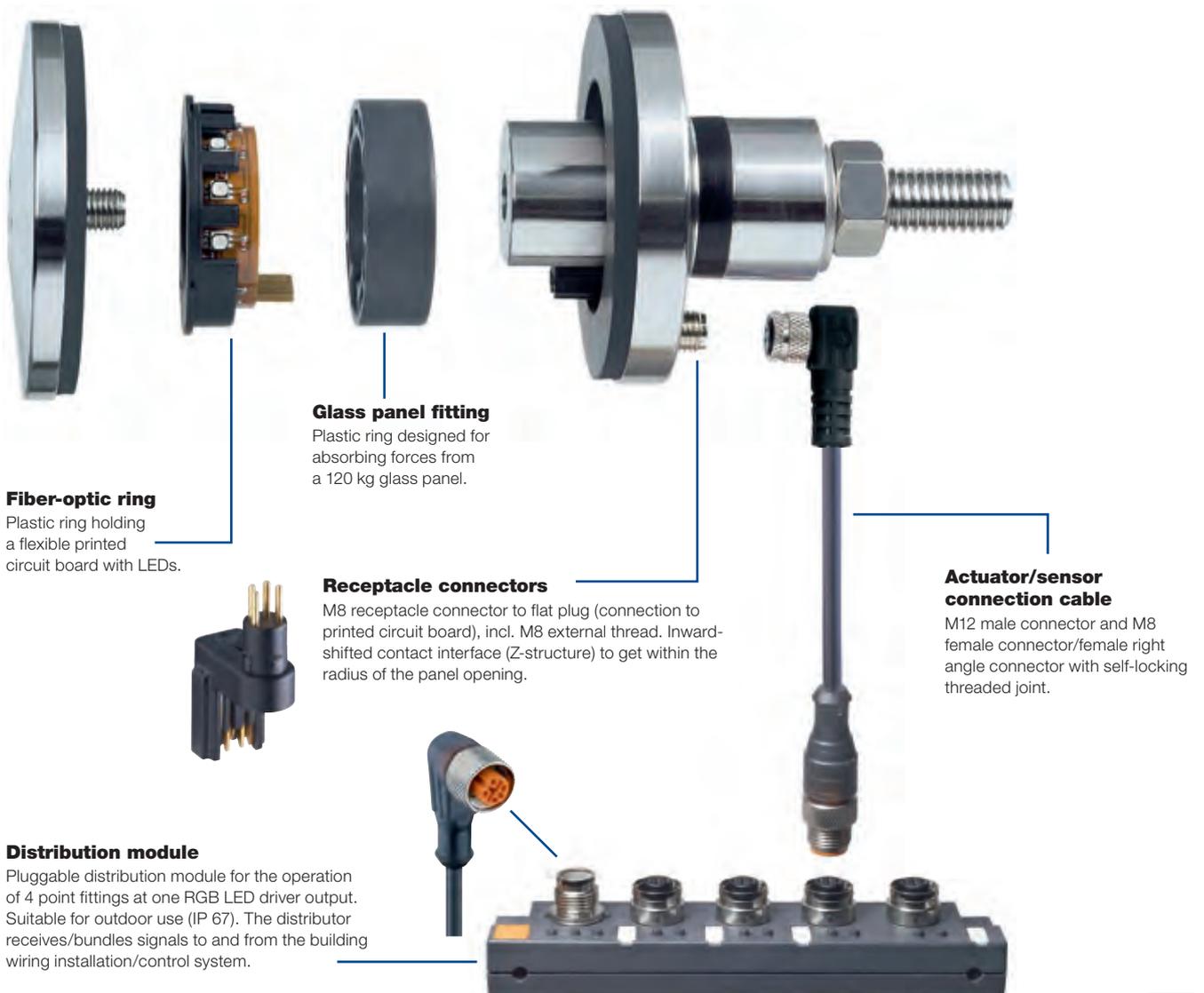




Initially, many experts could not visualize a point fitting with integrated LED glass facade lighting. Since then, our customer's vision has become a patented product that holds glass facades securely in place and presents them in a completely new light. We are proud to say that – by creating a connector and distributor system specifically for this purpose – we played a major part in the development of this product.

Benefits of the system opposite:

- Simplified on-site installation – the complex individual wiring of light points is no longer necessary, since the contact interface integrated in the glass panel fitting bundles the signals using proven M8 technology
- The system's convenient reset function and easy adjustability greatly simplify installation.
- Easier maintenance, since all elements are pluggable and therefore no tools are needed for wiring



GLOBAL LOCATIONS

We always have the right data communications solution for your specific application.

Talk to us about what you need now and where you are going tomorrow.



CONTACT FOR BELDEN® BRAND

Edisonstraat 9
5928 PG Venlo
The Netherlands

Phone: +31-77-3878-555
Fax: +31-77-3878-488
www.beldensolutions.com
venlo.salesinfo@belden.com

CONTACT FOR INDUSTRIAL CONNECTING PRODUCTS OF THE HIRSCHMANN™ BRAND AND LUMBERG AUTOMATION™ BRAND

Im Gewerbepark 2
58579 Schalksmühle
Germany

Phone: +49-2355-5044-000
Fax: +49-2355-5044-333
www.beldensolutions.com
lac-info@belden.com

CONTACT FOR INDUSTRIAL NETWORKING PRODUCTS OF THE HIRSCHMANN™ BRAND

Stuttgarter Straße 45-51
72654 Neckartenzlingen
Germany

Phone: +49-7127-14-0
Fax: +49-7127-14-1970
www.beldensolutions.com
inet-sales@belden.com