BELDEN
SENDING ALL THE RIGHT SIGNALS

# Belden Solutions for Material Handling

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The comprehensive Belden product portfolio for material handling applications ticks all the boxes: reliable, flexible, and cost-efficient.

Be certain.
Belden.

# Material Handling is All About Flexibility

Whether conveying, sorting, storing, or picking – consistent communication is crucial for the success of modern material handling. For both standard and complex applications, companies need high-availability, economical, and scalable solutions from a single source, offering maximum flexibility and customization as well as potential for expansion. With our wide range of high-quality products from the Belden, Hirschmann and Lumberg Automation brands, combined with qualified service and support, we are the perfect, long-term partner to support your material handling application and plant design.

Talk to us about your individual requirements and benefit from our solution-oriented approach and comprehensive expertise.

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# Our Competence in the Main Material Handling Technologies

## Conveyor systems – the guarantee for material flow

As a sub-discipline of mechanical engineering, material handling technology is of central importance for intralogistics. When it comes to generating a continuous linear flow of material, reliable handling systems such as automated conveyor belts or modern electric monorail systems ensure a consistent flow of piece goods and bulk material.



## Forklift trucks – the hard-working helpers in logistics

Highly flexible and maneuverable, industrial trucks are indispensable for the horizontal transport of goods. The variety ranges from simple tow tractors, pallet jacks, special warehouse vehicles and forklift trucks through to automated guided vehicles (AGV). The latter, in particular, meet high requirements for availability and thus enable a smooth flow of materials and goods.



## Storage systems – the heart of intralogistics

As an interface between procurement, production and distribution, storage systems are one of the most important components of intralogistics. When it comes to reliable identification, inspection and storage of goods, warehouse system applications such as stacker cranes in high-bay warehouses or shuttle systems control the flow of materials and make a lasting contribution to optimizing production and supply chains.



## Picking – the future of warehouse optimization

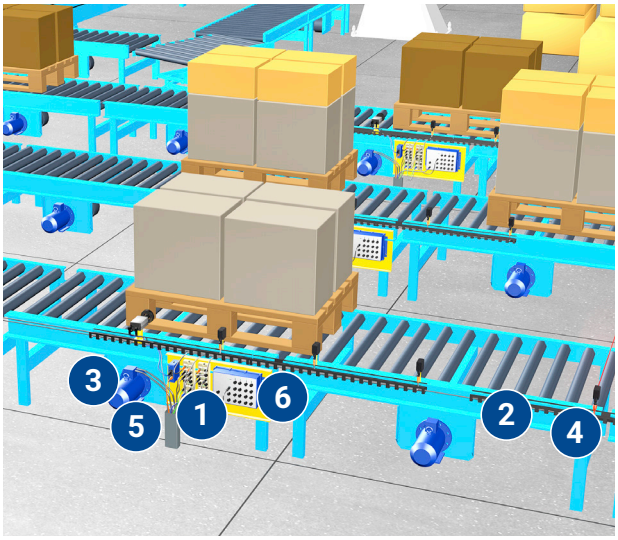
What appears to be a simple process of assembling goods according to specified criteria is increasingly becoming the focal point in every production warehouse as a result of automation. Intelligent sensor solutions such as optical and camera-based (robot-vision) or voice-controlled systems help increase picking performance, minimize error rates, and open up enormous potential for increasing warehouse efficiency.

# Automated Conveyors – Because Performance Matters

These hard-working helpers, which are characteristic features of many production warehouses, work tirelessly to cope with high loads over long distances and ensure a stable and error-free material flow in the field of pallet and container handling technology. The precision and reliability of the drive, presence detection and speed measurement are paramount.


## Key requirements

- Small installation space requires miniaturization of the connectors while increasing the electrical energy transmission to drive more conveyor rollers
- High availability of conveyor belts
- Extensive diagnostics capabilities in the event of failures

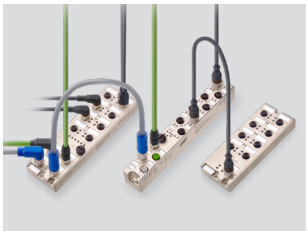



## Key features to meet these requirements

- M8 5 pole with extended power capabilities to ensure reliable operations of servomotors
- IP67 protection for 5-pole M8 cables with PUR sheathing significantly increases service life and meets installation space requirements
- Vibration-proof M12 connectors for the OCTOPUS switches, IP67 rated, guarantee high MTBF* values
- The digital multi-protocol I/O modules from the LioN-P series support PROFINET V2.3 (CC-C), EtherCAT and Ethernet/IP and allow connections of up to 100 m in accordance with Ethernet standards. LioN-P modules are therefore ideally suited to transfer sensor and actuator signals to a control system in a consolidated way across multiple I/O modules, even over large conveying distances

* MTBF = mean time between failures (for repairable units)

# The BELDEN Solution



## Lumberg Automation LioN-Power IO-Link system

1

Connection of the sensors along the conveyor belt to the I/O module

- Configurable LioN-Power modules can be used universally, because digital inputs and outputs can be assigned flexibly per port by the user
- Processes up to 132 I/O signals for longer conveyor belt monitoring
- IO-Link master enables diagnostics and process data to be provided in the cloud via sensors via MQTT and OPC UA

## Lumberg Automation M8 5-pole snap-in IP67 connector

2

Power supply to the conveyor rollers

- Extended power capabilities with 2 times power transmission at 5 A/35 V
- Mechanical shock resistance > 100 N, dielectric strength 10 kV DC
- Power transmission with a maximum of 4 A current and 60 V voltage
- The ambient temperature ranges from -35°C to +80°C

## Lumberg Automation M23 power connector

3

Power supply to the drive unit

- Established standard solution for connecting servomotors
- Built-in vibration resistance that securely holds the connector in place even when subject to the most severe vibrations
- High power up to 10 A at 120 V

## Lumberg Automation M12 sensor/actuator connector

4

Connection of the sensors along the conveyor belt

- Self-locking screw coupling
- The so-called piggyback circuit ensures correct operation even if the LED display is damaged
- IP67 rated; up to IP68/69K

## Lumberg Automation Fast Ethernet data connector

5

For connecting the drive unit, monitors, and I/O modules to the bus system via industrial Ethernet for higher-level control, for instance

- Compliant with PROFINET type C patch cable for highly flexible applications up to 1 million bending cycles
- Meets the requirements of Cat 5e to Cat 6A in RJ45 <-> M12
- Short assembly time of M12 connectors via screw cap with vibration protection

## Hirschmann OCTOPUS unmanaged IP67 switches

6

Connecting Ethernet devices and ensuring a fail-safe network directly at the conveyor belt

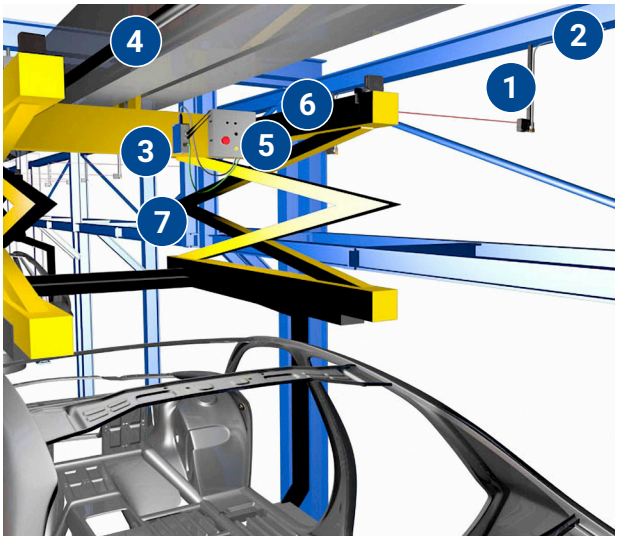
- Compact IP67-rated metal housing with 5 x 100 Mbps TX ports
- Vibration-resistant 4-pole M12 connectors
- High EMC immunity according to EN 61000-4-5 for applications in close proximity to drives

# Electric Monorail Systems – Perfectly Integrated into Logistics Processes

These overhead, rail-bound conveyor systems are already established across many different sectors as internal transport systems. Wireless data transmission is taking on an increasingly central role here. The cable-free nature eliminates the need for maintenance-intensive conductor lines. This also offers greater flexibility and allows transported goods to be pulled out of the line for post-processing without affecting production.

## Key requirements

- Almost 100% system availability
- Increased bandwidth to overcome the limitations of conductor lines
- Higher flexibility due to individually controllable carriages




## Key features to meet these requirements

- Leaky waveguides that act as a special antenna and enable a stable and interference-free radio connection with up to 1,000 times the data throughput of conductor lines
- 2 x MIMO (multiple input multiple output) antenna technology supports seamless roaming of carriers with access points
- Robust design of M12 connectors to protect against dust and dirt as well as mechanical loads such as vibration

## The BELDEN Solution

### Lumberg Automation M12 sensor/actuator connector

1

Connection of sensors for distance measurement and interference measurement for switching off operation when people enter a defined area

- Self-locking screw coupling
- 360° shield technology for protection against noise such as EMI/RFI
- Robust design for long service life

## Hirschmann BAT450-F industrial wireless LAN access point

2

Access point infrastructure for communication with the higher-level control unit of the leaky waveguide

- Supports the 802.11ac standard for fast data transmission
- Dual 3 x 3 MIMO in 2.4 and 5 GHz

## Hirschmann BAT-C2 WLAN client and access point

3

Individual connection of carriages to access point infrastructure via leaky waveguide

- 802.11ac + optimized roaming performance for high availability of the electric monorail system
- Small size (7 x 10 x 3.5 cm) and weight < 250 g plus M12 connector for vibration protection
- Supports 2.4 GHz and 5 GHz and increases the number of available channels

## Hirschmann BAT leaky waveguide

4

Integrated antenna cable in the conveyor rail connected to two WLAN access points per line section

- Stable signal pattern due to increased shielding of the radio signal from the surrounding area in the waveguide
- 2.4 GHz leaky waveguides specifically designed to deliver 802.11g and 802.11n
- Cables available in lengths 50 m and 100 m

## Lumberg Automation M23 power connector

5

Power supply to the drive unit

- Established standard solution for connecting servomotors
- Built-in vibration resistance that securely holds the connector in place even when subject to the most severe vibrations
- High power up to 10 A at 120 V

## Lumberg Automation passive distributor ASB series

6

Signal collection of the sensors and transmission to the control unit on the monorail carriage

- Available in 4 or 8 M12 ports with anti-vibration technology
- The all-round molded, zinc die-cast housing, and integrated ports can withstand lubricants as well as shocks and vibrations
- Dual signal options allow for double port capacity when used with a splitter

## Lumberg Automation Fast Ethernet data connector

7

For connecting the drive unit to the control system on the electric monorail carriage via Industrial Ethernet, for instance

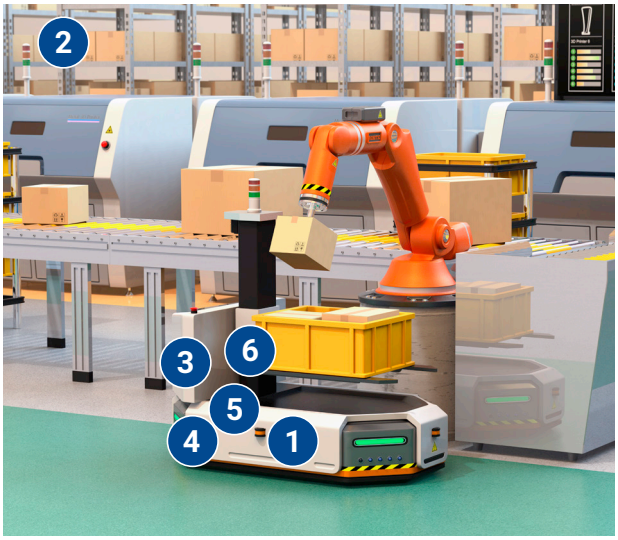
- 4-pole, D-coded M12 industrial Ethernet data cable
- Meets Cat 5e requirements
- Short installation time via screw cap with vibration protection

# Automated Guided Vehicles – The (R)evolution of Warehouse Logistics

These automatically controlled, floor-based conveyor systems with their own drive have become an integral part of the solution portfolio for fully automated intralogistics systems. Their navigation is mostly optical, laser- or sensor-based, and guarantees high material transport reliability by using state-of-the-art (wireless) technology.


## Key requirements

- Provision of the highest possible wireless network speed
- Fast wireless roaming for uninterrupted communication
- Protection against shocks and vibrations




## Key features to meet these requirements

- The technology complies with the 802.11n/ac standard to increase network speed up to 867 Mbps
- Wireless clients that support very low transfer time – up to 100 milliseconds
- Methods such as opportunistic key caching (OKC) provide fast authentication between access points on a network for faster roaming
- Reduced frequency planning – 2.4 and 5 GHz provides more non-overlapping channels
- WLAN device complies with IEC 60068-2 and withstands heavy shocks and vibrations on vehicles
- Industrial WLAN devices with M12 connection technology

# The BELDEN Solution

## Lumberg Automation M8/M12 sensor/actuator connector

1

Connection technology for safety laser scanners and control, drive, and other components in automated guided vehicles

- Self-locking screw coupling
- 360° shield technology for protection against noise such as EMI/RFI
- Resistant to oils, coolants, lubricants, and emulsions

## Hirschmann BAT450-F industrial wireless LAN access point

2

Access point infrastructure for communication with the higher-level network infrastructure and the wireless clients on the automated guided vehicles

- Supports the 802.11ac standard for fast data transmission
- Dual 3 x 3 MIMO in 2.4 and 5 GHz

## Hirschmann BAT-C2 WLAN client and access point

3

Connection of the individual automated guided vehicles to the access point infrastructure

- 802.11ac + optimized roaming performance
- Small size (7 x 10 x 3.5 cm) and weight < 250 g plus M12 connector for vibration protection
- Supports 2.4 and 5 GHz and increases the number of available channels

## Lumberg Automation digital I/O modules with multi-protocol technology

4

Connection of the individual automated guided vehicles to the access point infrastructure

- Compact design with a width of 30 mm; M8/M12 versions even fit small automated guided vehicles
- Power supply connection with M12-Power, L-coded or 7/8"
- The robust housing design meets the requirements of IP65, IP67, and IP69K and enables a high level of fail-safety

## Lumberg Automation M12-Power connector

5

Motor connection for power transmission

- Four different types of coding: S (3 + PE), L (4 + FE), K (4 + PE), and T (4-pole)
- 16 A to 600 V for S and K codings, 16 A to 60 V for L and T codings
- High IP protection class up to IP69K

## Hirschmann unmanaged switches for the SPIDER III DIN rail

6

Connection of automation devices such as control systems, monitors, and drives in the automated guided vehicles

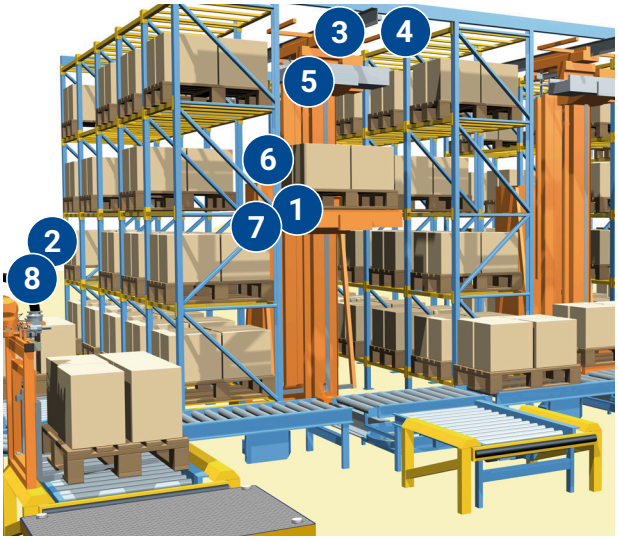
- The small size saves space, allowing easy and quick installation in tight spaces
- Longer battery life thanks to low power consumption
- Multiple switching parameters are easy to configure via one USB port using a free software tool

# Automated Storage and Retrieval Systems – Key for Warehouse Efficiency

The automation of stacker cranes is now an integral part of efficient intralogistics. They can reach every shelf and move enormous loads, enabling smooth, automatic loading and unloading of goods in high-bay warehouses.

## Key requirements

- Maximum acceleration at travel speeds of up to 300 m/min and a lifting speed of up to 150 m/min to make fast picks and increase efficiency
- High positioning accuracy
- Flawless overall process for the avoidance of downtime and ensuring fast warehouse turnover
- Stable radio field with a more flexible travel distance compared to light barriers for data transmission
- Suitable for use in extreme conditions, e.g. in deep-freeze storage (down to -30°C)




## Key features to meet these requirements

- High drag chain capability of the signal and data cable
- Use of leaky waveguides to achieve homogeneous wireless coverage in narrow aisles
- Industrial Ethernet cables for cabling in IP20 cabinets or in harsh industrial IP67 environments
- Gigabit Ethernet switches and PoE ports to meet the bandwidth requirements of cameras
- LioN-P IO-Link masters enable complete data transparency, from sensors and actuators to fieldbuses to controllers (PLCs). IoT protocols such as OPC UA and MQTT allow parallel access to the operating states of the devices connected via IO-Link from company level, for instance in order to enable predictive maintenance or a connection to the cloud
- Communication solutions that withstand extreme temperatures down to -40°C
- Industrial WLAN is maintenance-free and almost completely unaffected by external influences such as condensation, dirt and mist

## The BELDEN Solution

### Lumberg Automation LioN-Power IO-Link system

1

Bundling of the sensors via I/O modules for signal transfer to the various control units in a stacker crane

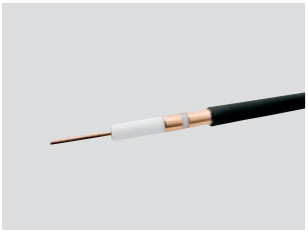
- IO-Link master and IO-Link hubs in numerous versions
- Supports IoT protocols such as MQTT and OPC UA
- Multi-protocol I/O device that supports PROFINET, Ethernet/IP, and EtherCAT in one device

## Lumberg Automation Fast Ethernet data connector

2

Connection technology for sensors, including for optical shelf availability checking, shelf positioning, push-through prevention, inductive sensors for transport safety, and other applications

- CAT5 and CAT6 for Ethernet/IP, PROFINET, and video applications
- High-quality shielding provides excellent EMC protection
- Drag chain compatible up to 2 million bending cycles with abrasion-resistant PUR sheathing



## Hirschmann BAT leaky waveguide

3

Integrated antenna cable along the high-bay warehouse aisles connected to one WLAN access point per line section for connecting the stacker cranes

- Stable signal pattern due to increased shielding of the radio signal from the surrounding area in the waveguide
- 2.4 GHz leaky waveguides specifically designed to deliver 802.11g and 802.11n
- Cables available in lengths 50 m and 100 m

## Industrial WLAN access point BAT867-R

4

Access point infrastructure for communication with the higher-level control unit of the leaky waveguide and for data provision from logistics software

- Supports the 802.11ac standard for fast data transmission
- 2 x 2 MIMO support

## Hirschmann BAT-C2 WLAN client and access point

5

Connection of the stacker cranes to the access point infrastructure via leaky waveguides

- 802.11ac + optimized roaming performance for high availability of the electric monorail system
- Small size (7 x 10 x 3.5 cm) and weight < 250 g plus M12 connector for vibration protection
- Supports 2.4 GHz and 5 GHz and increases the number of available channels

## Lumberg Automation M8/M12 sensor/actuator connector

6

Connection technology for sensors, including for optical shelf availability checking, shelf positioning, push-through prevention, inductive sensors for transport safety, and other applications

- Resistant to oils, coolants, lubricants, and emulsions
- Shielded cables
- Drag chain capability with a bending radius of 10 x D and acceleration of 5 m/s2 with up to 5 million bending cycles

## Lumberg Automation M12-Power connector

7

Motor connection for power transmission of the drives on the stacker crane

- Four different types of coding: S (3 + PE), L (4 + FE), K (4 + PE), and T (4-pole)
- 16 A to 600 V for S and K codings, 16 A to 60 V for L and T codings
- High IP protection class up to IP69K

## Hirschmann unmanaged switches for the SPIDER III DIN rail

8

Connection of cameras for remote diagnostics and data communication from the stacker crane to the higher-level network

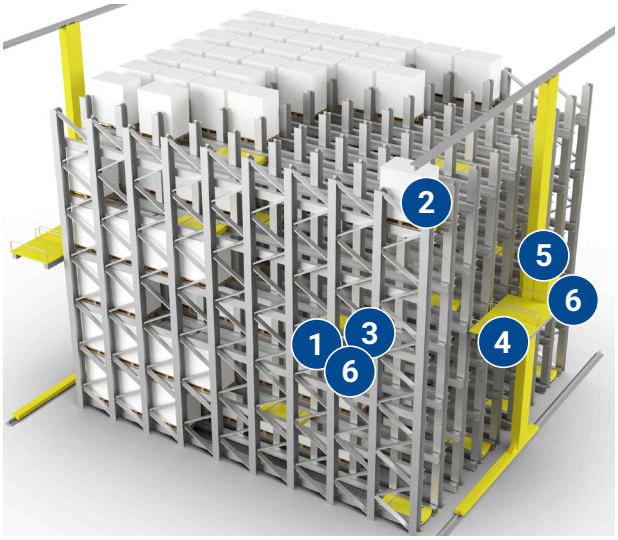
- Up to 8 PoE + ports, each with a capacity of 30 W and a total power of 120 W
- Up to 24 ports for Fast Ethernet or up to 10 ports for Gigabit Ethernet DIN rail mounting and fast commissioning via plug-and-play functions
- Increased temperature range (-40°C to +70°C)

# Shuttle Automated Storage – Consistently Increasing Warehouse Density

When it comes to optimum storage and space utilization, shuttle systems are all but mandatory in modern intralogistics. Shuttle storage systems allow semi- or fully automated loading and unloading of loads along the shelf depth or height in high-bay warehouses, thereby significantly increasing the turnover.

## Key requirements

- Individual shuttle strategies can be implemented through the possibility of expansion as required
- High positioning accuracy
- Flawless overall process to avoid downtime
- Requires a stable radio field for wireless use
- Scalable systems that grow with your business




## Key features to meet these requirements

- Fast routing of wireless components to ensure uninterrupted communication in an environment with interference such as metal reflections
- Scalable wireless network to ensure fast integration of additional shuttles when expansion is required
- The use of IO-Link ensures fast and simple commissioning as well as extended diagnostics options for sensors, actuators, and IO-Link masters
- Easy cabling in the shuttle

# The BELDEN Solution

## Lumberg Automation M8/M12 sensor/actuator connector

1

Connection technology for sensors, including for detecting the position of the shuttle using light barriers, distance sensors for collision avoidance, etc.

- Resistant to oils, coolants, lubricants, and emulsions
- Optional LED function display
- PUR and PVC cables
- Drag chain capability with a bending radius of 10 x D and acceleration of 5 m/s2 with up to 5 million bending cycles

## Hirschmann OpenBAT

2

Access point infrastructure for communication from the wireless client to the higher-level control unit and for data provision from warehouse management

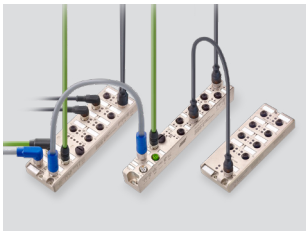
- Simultaneous 3 x 3 MIMO in 2.4 and 5 GHz
- Ultra-fast roaming, even with enterprise security through certificates
- Bridge function with fastest roaming

## Hirschmann BAT-C2 WLAN client and access point

3

Connection of the shuttles to the access point infrastructure

- 802.11ac + optimized roaming performance for high availability of the electric monorail system
- Small size (7 x 10 x 3.5 cm) and weight < 250 g plus M12 connector for vibration protection
- Supports 2.4 GHz and 5 GHz and increases the number of available channels



## Lumberg Automation LioN-Power IO-Link system

4

Bundling of the sensors via I/O modules for signal transfer to the control unit in a shuttle

- IO-Link Device Tool from TMG allows easy configuration of devices and provides full IODD support
- Supports IoT protocols such as MQTT and OPC UA
- 8-port IO-Link master in 30 mm and 60 mm housings with M8 and M12 I/O connector type

## Lumberg Automation M12-Power connector

5

Electric motor connection for power transmission of the drives in the vertical lift system

- Four different types of coding: S (3 + PE), L (4 + FE), K (4 + PE), and T (4-pole)
- 16 A to 600 V for S and K codings, 16 A to 60 V for L and T codings
- High IP protection class up to IP69K and temperature range from -40°C to +125°C

## Lumberg Automation Fast Ethernet data connector

6

RJ45 connection technology for peripheral components such as displays, controllers, and shuttle drives

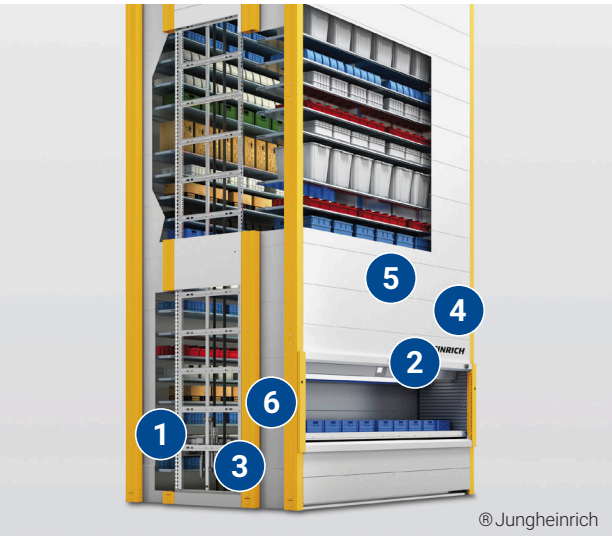
- CAT5 and CAT6 for Ethernet/IP and PROFINET
- High-quality shielding provides excellent EMI protection
- Drag chain compatible up to 2 million bending cycles with abrasion-resistant PUR sheathing

# Vertical Sorter Systems – Storage Space Utilized to Perfection

In contrast to their horizontal cousins, vertical systems make use of the height of warehouse spaces. Following the "goods to person" principle, fully automated, IT-supported vertical systems are highly versatile and replace pen-and-paper picking processes in order to meet high demands on productivity and cost-effectiveness.


## Key requirements

- High system performance for fast and unrestricted access
- High access accuracy thanks to integrated pick-to-light systems, barcode readers, or software interfaces
- Optimally tuned frequency converters and use of energy-efficient drive technology
- High system availability and the possibility of remote access to the system
- Controlled temperature range from -35°C to +60°C
- Network must be able to integrate additional components such as optional cameras for online documentation of the current inventory of all shelves in real time




## Key features to meet these requirements

- High-security remote access such as encrypted data transfer and device access rights set for the predefined user group only
- Cable solutions with high drag chain capability of up to 5 million bending cycles
- The specified temperature ranges are fully available and extend from -40°C to +80°C.
- Gigabit Ethernet switches and PoE ports meet the energy supply and bandwidth requirements of cameras
- M12 cables from 3- to 12-pole comply with sensor connection variants with a high IP 65/67 protection class as standard
- The plug-and-play principle of the Spider switches can be quickly put into operation without time-consuming configuration
- Simple parameterization of automation components such as frequency converters using IO-Link technology

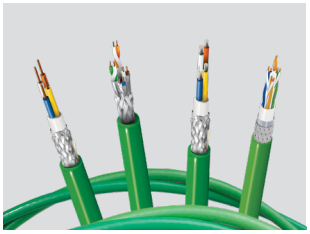
# The BELDEN Solution

## Lumberg Automation M12 sensor/actuator connector

1

Connection technology for sensors such as light barriers for personal protection and height detection of load sizes, barcode readers, and other sensors

- Resistant to oils, coolants, lubricants, and emulsions in PUR or other material designs
- IP protection class up to IP67
- Drag chain capability with a bending radius of 10 x D and acceleration of 5 m/s2 with up to 5 million bending cycles



## BELDEN DataTuff industrial Ethernet cable

2

RJ45 connection system for peripheral components such as displays, pick-by-light controllers, and central control units in vertical lift systems

- CAT5 and CAT6 for Ethernet/IP, PROFINET, and video applications
- High-quality shielding provides excellent EMI protection
- Twisted (22AWG 19x0.15 mm) TX cables and abrasion-resistant sheathings

## Lumberg Automation M12-Power/M23-series connectors

3

Motor connection for power transmission of the drives in the vertical lift system

- High-performance energy transmission in hot, damp, dusty, or moving applications
- Flexible solutions thanks to a wide variety of designs with angled and overmolded versions as well as versions that can be freely assembled

## Hirschmann unmanaged switches for the SPIDER III DIN rail

4

Creation of a local network for connecting the controller, drives, monitor, and other components in the vertical lift system as well as connection to a higher-level network for an external warehouse management program

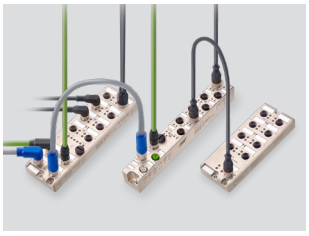
- Up to 8 PoE + ports, each with a capacity of 30 W and a total power of 120 W
- Up to 24 ports for Fast Ethernet or up to 10 ports for Gigabit Ethernet DIN rail mounting and fast commissioning via plug-and-play functions
- Increased temperature range (-40°C to +70°C)

## Hirschmann Secure Remote Access solutions

5

Remote access to the local network of a vertical lift system for early fault detection and extensive system analysis

- A protected cloud system with low configuration effort
- No reconfiguration of firewalls or permanent IP addresses required
- A combined system of hardware and software



## Lumberg Automation LioN-Power IO-Link system

6

IO-Link for transferring measured values from the sorting unit or integrating converters for easy parameterization

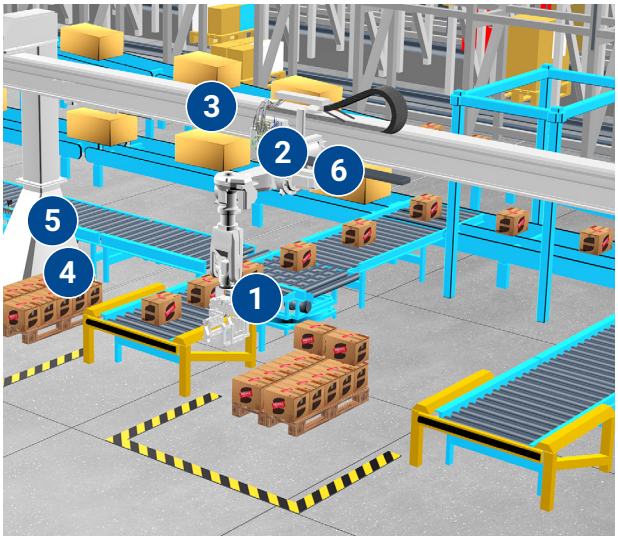
- The LioN-Power IO-Link system includes IO-Link masters and I/O hubs in numerous versions
- The IO-Link Device Tool from TMG allows easy configuration of devices and provides full IODD support
- 8-port IO-Link master in 30 mm and 60 mm housings with M8 and M12 I/O connector type

# Automated Cranes Systems & Robots – The Tireless Top Performers in the Warehouse

Automated crane systems and robots can be used around the clock thanks to their low susceptibility to errors and ability to autonomously perform various tasks in the picking process. When used in combination with people, they can be integrated step by step into existing warehouse systems. As completely autonomous systems, they are causing a major upheaval in the intralogistics world and are becoming key players in the warehouse & industry 4.0.

## Key requirements

- Standardized design of automated cranes and robots
- High system availability of more than 95%
- Drag chain compatible and torsion-resistant cabling
- Decentralized safeguarding of automated cranes and robots
- Coverage of high data rates for future bandwidths




## Key features to meet these requirements

- Multi-protocol technology in the active I/O modules from LioN-Power supports the three most common Ethernet protocols (PROFINET, Ethernet/IP, and EtherCAT) in a single, configurable device
- Avoidance of downtime costs by ensuring the highest network load and resilience with PROFINET Conformance Class C V2.3 and Netload Class III
- Use of control cables that can withstand 5 million torsion and bending cycles at 10 x AD
- M8 I/O modules with corresponding cable sets for standardized use of smaller robot arms

# The BELDEN Solution

## Lumberg Automation M12 sensor/actuator connector

1

Connecting cables along the robot axes are routed internally or externally in dress packs up to the central control unit

- Broad portfolio of panel-mounted connectors, ready-to-assemble, and overmolded connectors
- Shielded cables
- Drag chain capability with a bending radius of 10 x D and acceleration of 5 m/s2 with up to 5 million bending cycles

## Lumberg Automation Fast Ethernet data connector

2

Connecting cables along the robot axes inside or outside, e.g. in dress packs, to the central controller; encoder cable for transmitting the data on the position and speed of the motor

- CAT5 and CAT6 for Ethernet/IP, PROFINET, and video applications
- Reliable data transmission up to 100 Mbps
- Up to 2 million bending cycles

## Lumberg Automation M23 power connector

3

Drive wiring of the servomotors of automated cranes and robots

- Reliable power transmission in extreme conditions
- Available in overmolded and freely configurable versions 12-pole (11 + PE) and 19-pole (18 + PE)
- 120V AC/DC

## Hirschmann EAGLE30/40 industrial firewalls

4

Advanced security functions and the installed HiSecOS software protect robots against unauthorized access to the control system

- Up to 7 Gbit ports
- Defense in depth on layer 3 by combining filtering and deep packet inspection
- Network address translation (NAT)

## Hirschmann BOBCAT compact managed switches

5

Switching in the robot cabinet to connect the robot and its components to the higher-level switch for the robot cell network

- Supports data rates up to 2.5 Gbps
- Innovative security features such as wire-speed access control lists (ACL) and automatic denial-of-service (DoS) protection
- Additional interface options through digital input provide greater flexibility

## Lumberg Automation digital I/O modules with multi-protocol technology

6

Sensor/actuator data transfer to the central controller

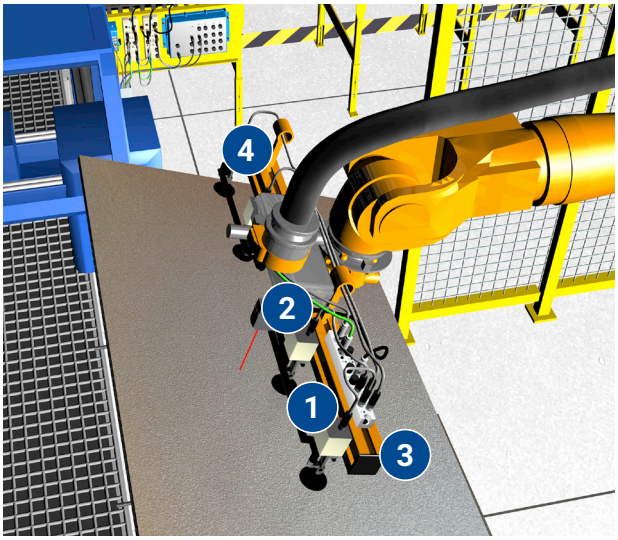
- PROFINET V2.3 (CC-C), network load class III, FSU, MRP
- I/O function available in 16 DIO (universal), 16DI, 16DO and 8DI 8DO
- Multi-protocol I/O device supports PROFINET, Ethernet/IP and EtherCAT

# Robot Vision & End of Arm Tooling Technology – Performance Meets Precision

Camera-based solutions that optimize the field of vision and gripping performance of robots are becoming increasingly important in modern picking operations. The use of state-of-the-art technology enables robots to identify pre-defined objects and independently adjust their gripping power accordingly. Speed and precision are of central importance.

## Key requirements

- Highly flexible system with low changeover times to handle changing batch and packaging sizes with different gripping tools
- No cable change in the tool area throughout the entire service life: cables withstand five million bending and torsion cycles
- Customer-specific diagnostics of the sensor/actuator through extended diagnostics capability to further increase the availability of the handling technology
- Provision of cabling technology that already meets the growing requirements of optical image processing systems
- Simple wiring for quick, error-free commissioning




## Key features to meet these requirements

- Reduced changeover times by means of the prioritized start in less than 1 second of the IO modules
- By using I/O modules with an output current of 2 A compared to the market standard of 1.6 A, more effective control with more valves is possible via one device, which minimizes the number of I/O modules
- IO-Link support to gain access to parameters and data that were previously locked and to make customer-specific diagnostic settings
- Use of control cables that can withstand 5 million torsion and bending cycles
- Use of CAT6a torsion-resistant data lines that transmit up to 10 Gbit/s in combination with industrial RJ45- or M12X-coded connectors for faster image data transfer and increased investment security
- Standardized use of M12 connector technology enables simple and fast wiring

# The BELDEN Solution

## Lumberg Automation M12 sensor/actuator connector

1

Connection technology for sensors such as light barriers for personal protection and height detection of load sizes, barcode readers, and other sensors

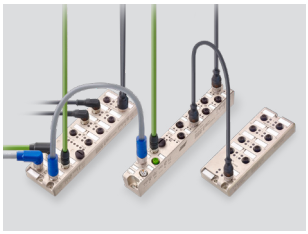
- Different codings and pole numbers: A-, B- and U-coded in 4-, 5-, 6-, 8- and 12-pole configurations
- Shielded cables
- Drag chain capability with a bending radius of 10 x D and acceleration of 5 m/s2 with up to 5 million bending cycles

## Lumberg Automation Fast Ethernet data connector

2

Connectors between the I/O module and the controller (valve station) as well as along the robot axes up to the central controller

- High network availability and long service life due to robust design
- High-quality shielding provides excellent EMI protection
- Up to 2 million bending cycles



## Lumberg Automation LioN-Power IO-Link system

3

Transfers digital and analog values between the controller and the valve for the tool, such as a gripping tool

- Supports tool changes of less than 1 second with PROFINET and Ethernet/IP
- Supports IoT protocols such as MQTT and OPC UA
- 8-port IO-Link master in 30 mm and 60 mm housings with M8 and M12 I/O connector type

## Hirschmann GAN valve connector

4

Valve connection to valve stations on the gripper system

- Complies with all relevant international standards and is the only one on the market to have UL 2238 approval
- In addition to versions without protective circuitry, versions with more than 20 different circuits are available to ensure that the downstream electronics are not damaged by overvoltages
- Protection classes up to IP69K together with an increased temperature range (-40°C to 105°C) and high shock and vibration resistance guarantee maximum functional reliability

BELDEN
SENDING ALL THE RIGHT SIGNALS

# About Belden

Belden Inc., a global leader in high quality, end-to-end signal transmission solutions, delivers a comprehensive product portfolio designed to meet the mission-critical network infrastructure needs of industrial, enterprise, and broadcast markets. With innovative solutions targeted at reliable and secure transmission of the rapidly growing amounts of audio and video data needed for today's applications, Belden is at the center of the global transformation to a connected world. The company is headquartered in St. Louis, USA, was founded in 1902, and operates manufacturing facilities in North and South America, Europe, and Asia.

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