Connectivity
From the cabinet to the field
Cabinet Confidence
Your trusted partner for the control cabinet

From connectivity to control, Phoenix Contact gives you the confidence you need in your production systems. Our longstanding commitment to quality and innovation will give you the peace of mind and competitive edge to succeed in today’s highly complex manufacturing world.

Connectivity
Never take a good connection for granted. Every wire in your control cabinet is there for a reason. The connections of those wires – via spring, screw, IDC, or crimp – are only as reliable as the integrity of the terminations. For nearly a century, Phoenix Contact has been the trusted partner for reliable connections.

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Cabinet connections

The heart of reliability
The control cabinet is the operating headquarters for any sophisticated control system. Without an efficient and dependable control cabinet, the performance of circuits and devices powered outside the cabinet may be compromised, and low-quality connections will degrade the performance of the entire network. A robust and reliable system begins in the control cabinet, and requires robust and reliable connections.

Feed-through terminal blocks
In a control system, many wires are routed in numerous areas and directions to support various applications. Keeping wires clean, organized, and properly connected is vital for the system to operate smoothly. High quality and reliable feed-through terminal blocks allow these connections to perform as intended.

Power distribution with terminal blocks
Distributing power effectively within a control system can improve efficiency and preserve valuable resources. A reliable power source is crucial, and that power must reach every component it is responsible for powering without fault. Power distribution with terminal blocks adds versatility to the scheme, and becomes a trusted element in the control system.

Function terminal blocks
In many wiring schemes, circuits require various functions beyond the basics of carrying current. Functions such as protecting the circuit with fusing, status indication with LEDs, maintenance capability with disconnects, and flow management with diodes and resistors add value. Function terminal blocks improve efficiency and bring functionality to the circuit.

With a comprehensive product portfolio that includes five connection technologies, billions of installations, and millions of satisfied customers worldwide, Phoenix Contact is the most trusted brand for terminal blocks.
Cabinet connections

Feed-through terminal blocks

In a control system, many wires are routed in numerous areas and directions to support various applications. Keeping wires clean, organized, and properly connected is vital for the system to operate smoothly. High quality and reliable feed-through terminal blocks allow these connections to perform as intended.

- Standard feed-through – available in multiple connection technologies
- Multiple connections – minimizes the need for bridging
- Multi-level connections – double- and triple-level options
- Space optimization – maximizes connections in tight areas

**Standard feed-through**

- Available in five connection technologies:
  - Screw clamp, push-in, spring-cage, insulation displacement, ring lug (bolt)
- Sizes range from 1.5-185 mm²
- Full range of terminal block accessories
- Wide variety of marking products for effective identification

**Multiple connections**

- Three or four connections beyond basic feed-through
- Clear, differentiated termination points
- Eliminate the need for multiple wires in one connection
- Twin ferrules not needed

**Multi-level connections**

- Double- and triple-level options available
- Angled or straight configurations
- The same or mixed electrical potentials
- Both horizontal and vertical bridging available

**Space optimization**

- Smaller, more compact versions of standard terminal blocks
- Angled options available for smaller footprint
- Remove unwanted bridging channels to save space
- Feed-through blocks available in the same footprint as function blocks for clean, consistent appearance
Cabinet connections
Power distribution with terminal blocks

Distributing power effectively within a control system can improve efficiency and preserve valuable resources. A reliable power source is crucial, and that power must reach every component it is responsible for powering without fault. Power distribution with terminal blocks adds versatility to the scheme, and becomes a trusted element in the control system.

- High current power – simple late gauge connection
- Distribution – flexible and modular configurations
- Fused terminal blocks – protects crucial circuits
- FBS insertion bridges – allows completely flexible distribution

High current power
- Quick and easy POWER-TURN connection technology
- Connect up to 1/0 AWG wire
- Expand as necessary with robust bridging
- 10 mm² pick-off terminals available
- Compatible with or without a ferrule

Distribution
- Push-in connection technology
- Multiple cross-sections available
- Numerous terminal point configurations
- Larger feed-in contact options for potential distribution
- Six mounting options for every situation

Fused terminal blocks
- Multiple connection technologies to choose from
- Pluggable or hinged fuse holders
- Compatible with different types of fuses, including “auto-style”
- LED blown fuse indication available
- Multiple level options with or without ground foot

FBS insertion bridges
- Simple direct insertion without the need for tools
- Robust patented scissor leg design for shock/vibration reliability
- Available in numerous position configurations
- Compatible with all CLIPLINE complete connection technologies
- Ability to step up/down to larger/smaller cross-sections
Cabinet connections

Function terminal blocks

In many wiring schemes, circuits require various functions beyond the basics of carrying current. Functions such as protecting the circuit with fusing, status indication with LEDs, maintenance capability with disconnects, and flow management with diodes and resistors add value. Function terminal blocks improve efficiency and bring functionality to the circuit.

- Process terminal blocks – combine multiple parts into one
- Sensor/actuator blocks – effective signal management
- Disconnect terminal blocks – fast and simple maintenance
- Component holders – create functional terminal blocks

Process terminal blocks

- Fuse holder, feed-through, and ground all in one block
- LED indication options
- Both push-in and screw connection
- Hinged HESI fuse holder
- Disconnect version available in the same form factor

Sensor/actuator blocks

- Push-in, spring cage, or screw connection
- Numerous configurations available
- LED, component, and grounding options
- Color-coding for ease of identification
- Retains push-in bridging channel

Disconnect terminal blocks

- Allows simple, quick maintenance
- Single and double disconnects
- Disconnect lock-out accessories
- Different methods of actuation, including tool-less or screwdriver

Component holders

- Easy and robust pluggable seating
- Numerous components/component holders available
- All components use the same insertion point
- Quick and simple component swapping process
- Functional with all CLIPLINE complete connection technologies
Panel feed-through systems

Making connections through a panel

Products on DIN rail inside an enclosure need to either collect data from, communicate with, or control devices outside of the cabinet. While there are wireless solutions available for some of these transmissions, it’s generally not practical or possible to make all connections wireless.

When it comes to making wired connections for power, signal, or data transmissions, there are a seemingly infinite number of solutions available. Fortunately, you can count on Phoenix Contact to provide recommendations on secure, water-tight, and vibration-proof methods to bring cabling from the field into the cabinet.

Fixed

Looking for a more permanent solution to pass cables through a panel? Choose from cable glands or a membrane gland to direct-wire your incoming cables to products mounted inside the cabinet. If the cabling is pre-fabricated with a connector already installed, use a split-grommet cable entry system or programming port to secure your fixed connection.

Pluggable

When several disconnects will be required over the lifetime of a system, having a disconnect point on the cabinet wall can be a huge time-saver and convenience. Whether you’re looking at connecting a small number of devices independently using circular connectors, or a single combined disconnect through industrial rectangular connectors, you’ll find there are plenty of choices for any scenario.
Panel feed-through systems

Fixed

When the wiring between your cabinet and a field device does not require a disconnect, or very few disconnects throughout the lifetime of the system, fixed terminations are the most economical solution. However, the wires still need to be managed as they pass through the panel. Phoenix Contact offers a variety of solutions to assist with this.

- **Cable glands** – sealing and strain relief for single unterminated cables
- **Modular cable entry system (CES)** – multiple connectorized cable capture
- **Fixed cable entry system (CES MULTIGATE)** – multiple unterminated cable capture
- **HEAVYPORT** – programming access from outside the cabinet
Panel feed-through systems

**Pluggable**

Sometimes it's much more convenient, if not necessary, to include a disconnect point on the outside of a cabinet wall. This allows permanent wiring to be installed at the cabinet builder, while giving the end user options for cabinet installation, upgrades, and maintenance within the system they're creating. Furthermore, pluggable connectors allow an OEM to reliably break down a machine after final testing, further reducing commissioning time once shipped to the end user location.

- **HEAVYCON EVO** – versatile connector system reduces stock and cost
- **HEAVYCON Standard** – traditional die-cast housing design with pre-drilled gland holes
- **HEAVYCON Advance** – tool disconnect direct-to-panel mount reduces cost
- Circular receptacles – pre-wired leads simplify sensor cable pass-throughs

**HEAVYCON EVO rectangular connectors**
* EVO bayonet cable entry provides multiple cable entries
* Bayonets yield fewer line items but more variations
* UL recognized for use on UL508A Type 4/4X/12 cabinets
* Plastic version still UL Type 12, but reduced cost
* Compatible with industry-standard heavy-duty connectors

**HEAVYCON Standard rectangular connectors**
* High-grade aluminum; no unpredictable powder coating
* Compatible with industry-standard heavy-duty connectors
* Competitively priced
* UL recognized for use on UL508A Type 4/4X/12 cabinets
* Pre-drilled gland holes for metric or Pg threads

**HEAVYCON Advance rectangular connectors**
* Great for use when tool disconnects are required
* Reduced material usage for reduced cost
* Compatible with industry-standard inserts
* UL recognized for use on UL508A Type 4/4X/12 cabinets
* Outdoor versions with UV-protected seals

**Circular receptacles**
* Compatible with industry-standard M8, M12, and Mini 7/8”
* Front or rear mounting options in various panel thread sizes
* Color-coded wires simplify installation
* IEC codings (A-, B-, D-, etc.) prevent miss-mating cables
* IP65 and IP67 rated for spray or submersion
### Common parts for panel feed-through systems

#### Cable glands

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<tr>
<th>A.</th>
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<th>C.</th>
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<th>E.</th>
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<tbody>
<tr>
<td>In shielding required?</td>
<td>Do you prefer metal or plastic material?</td>
<td>Common parts for panel feed-through systems</td>
<td>What is the maximum number of pins needed (how many wires)?</td>
<td>Type description</td>
<td>Does the panel-mount base need to include a pre-installed cover?</td>
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</table>

#### Cable entry systems

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<thead>
<tr>
<th>A.</th>
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<tbody>
<tr>
<td>How many cables do you need to pass through?</td>
<td>What is the best fit for the combined cable's outside diameter (OD)?</td>
<td>Type description</td>
<td>Type description</td>
<td>Accessories</td>
<td>Resulting Phoenix Contact part number</td>
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### HEAVYFORT programming parts

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<th>A.</th>
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<th>D.</th>
<th>E.</th>
<th>F.</th>
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<tbody>
<tr>
<td>What components are needed for part access?</td>
<td>What gender is required for the external cabinet connection?</td>
<td>What is the desirability receptacle gender?</td>
<td>What is the maximum number of pins needed (how many wires)?</td>
<td>Type description</td>
<td>Resulting Phoenix Contact part number</td>
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### Circular receptacles

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<tr>
<th>A.</th>
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<th>D.</th>
<th>E.</th>
<th>F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>What connector thread is required?</td>
<td>What number of pins are needed (how many wires)?</td>
<td>What is the desired receptacle gender?</td>
<td>What is the maximum number of pins needed (how many wires)?</td>
<td>Type description</td>
<td>Resulting Phoenix Contact part number</td>
</tr>
</tbody>
</table>

### Pluggable heavy-duty rectangular connector sets

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<th>A.</th>
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<th>E.</th>
<th>F.</th>
<th>G.</th>
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</thead>
<tbody>
<tr>
<td>What housing material is needed?</td>
<td>Which direction do the cable need to enter the cabinet housing?</td>
<td>What is the number of pins needed (how many wires)?</td>
<td>What mount position is required?</td>
<td>Type description</td>
<td>Part no.</td>
<td>Locknut</td>
</tr>
</tbody>
</table>

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*Note: The document contains a large amount of text and tables, which are not fully transcribed here. The above snippets represent a concise summary of the content.*
Field connections

Robust cabling to the end device

Every end device needs to be powered, as well as communicate its intended information. Device power can be either AC or DC and range from a few milliamps to hundreds of amps. Sensor connectivity collects field-level digital and analog signals and brings them back to the control level. Networks or industrial protocols are used to communicate with devices using the same language.

Power connectivity

Both AC and DC loads on the machine can be outfitted with quick disconnects for easier installation and reduced downtime during maintenance or repair. Typical loads are drives, motors, and servos that require more than 5 amps.

Network connectivity

The physical layer interconnect solution must be matched to the industrial protocol determined by the controller. The cable design, wire and jacket color, and shielding and connector interface are all specifically designed to support the protocol of your choice.

Sensor connectivity

The most common signal types within most industrial applications are the inputs and outputs of sensors and actuators. The largest breadth of interconnect products are found here to support the collection and transmission of these signals in order to communicate on/off functions within an application.
Field connections

Power

Power is the lifeblood of any system, but power can also do the most damage if improperly sized or isolated from sensitive electronics. In the field, the most common method for connecting loads is to utilize compact circular connectors. High power requirements are met with traditional M17-M58 connectors. More compact solutions can be implemented with the M12 Power line. Turning hydraulic or pneumatic valves on or off while protecting upstream devices from kickback is the sweet spot for pre-made molded valve connectors. Finding the right quick-disconnect solution for a load is simply a matter of defining one’s requirement.

- M12 Power – big power in a small, robust package
- MINI 7/8 – traditional circular to power devices
- M17-M58 circular – reliable motor and servo power and feedback
- Valve connections – a better approach to DIN valve wiring

M12 Power

- New industry-standard IEC 61076-2-111 now implemented
- UL Listed, tested under UL 2237
- T- and L-code up to 16 A 63 V DC circuits
- S-, K- and M-code up to 16 A 600 V for 3-phase AC circuits
- NFPA 70 and NFPA 79 compliant
- Market-leading EMI protection with new AST (Advanced Shielding Technology)

MINI 7/8

- Traditional drop cable for conveyor trunk and drop power
- 2- through 6-pin versions with PVC cable jackets
- 18, 16, and 14 AWG deliver up to 15 A at 600 V
- Industry-standard compatible
- Color coding schemes for both IEC and US
- Receptacles with 1/2” NPT mounting threads allow easy integration into process instrumentation

Traditional motor connections

M17-M58 circular

- Industry-standard circular connector for up to 150 A/630 V
- M17, M23, M40, and M58 for drives and servo motors
- Reliable transmission via shielded metal housings
- Time-saving with innovative connection solutions
- No risk of mismatching AC and DC applications
- All-in-one hybrid versions provide data, power, and signal in one circular interface

Valve connections

- Pre-made cables replace the need to field-wire every valve
- Molded connector provides up to IP69K protection
- Convert DIN head to common M12 for easier cabling
- Visual indication at valve with embedded LED
- Protect upstream controller by selecting a version with built-in Zener diode, varistor, or free-wheeling diode
In automation technology, different industrial sectors place different requirements on data transmission. This has led to a variety of fieldbus and Ethernet-based systems. The relevant user organization creates a requirement profile for each fieldbus or network system that contains all key technical data, such as the maximum possible transmission speed or the longest permitted cabling path. The physical layer is supported by designated connector interfaces, shielding, cable materials, colors, and wire gauges.

- **Ethernet** – connects office and industrial networks
- **PROFINET** – automation through a powerful and flexible protocol
- **DeviceNet** – suited for clear automation tasks
- **Industrial protocols** – sealed physical layer connections for all automation levels

### Ethernet
- Broad range of water-tight Ethernet interfaces
- M8 D-code cables for CAT5
- M12 D-, A-code cables and connectors for CAT5
- M12 X-code cables and connectors for CAT6
- Push-pull variants for sealed RJ45 up to CAT6a
- Easy field installation with QUICKON IDC, crimp, and push-in variants

### PROFINET
- Broadest range of water-tight PROFINET interfaces
- M8 D-code cables for CAT5
- M12 D-code cables and connectors for CAT5
- M12 X-code cables and connectors for CAT6
- Push-pull variants for sealed RJ45
- Easy field installation with QUICKON IDC, crimp, and push-in variants

### DeviceNet
- Common trunk and drop system for power and data
- MINI 7/8” trunk with thick or thin cable
- M8 or M12 drops with thin cable
- PLTC-rated M12 mid cable with 2x2x22 AWG
- Various shield designs and cable jackets for outdoor use
- Commonly used network for conveyor and commercial/industrial vehicles

### Industrial protocols
- INTERBUS supported through M12 B-code
- PROFIBUS DP and PA supported through M12 B-code
- DeviceNet supported through M8, M12, and MINI 7/8”
- CC-Link supported through M12 A-code
- VARAN supported through M12 A-code
- AS-Interface supported through flat-ribbon conductor punch-down adapters to M12 A-code
Field connections

Sensor/actuator

Collecting signals from the field in a compact circular has never been easier. Overmolded cables and cordsets are delivered 100% factory-tested in either standard or custom lengths. Bulk cable and field-wired connectors deliver fast, error-free assembly on-site. Sensor boxes collect I/O on the machine itself, reducing cable runs back to the main control cabinet. A wide range of cable jackets and metal materials allows easy adaptation to the exact application requirements.

- Sensor cables – most versions made in America with fast lead times
- Sensor boxes – easily collect I/O and reduce long cable runs
- Field-wired connectors – fast connection technologies designed by Phoenix Contact
- High density – industry-leading pin density in M8 and M12

Sensor cables
- M8, M12, and MINI 7/8” factory-tested cordsets
- 105°C PVC cable for non-flex and PLTC applications
- 80°C PUR cable for abrasion and lateral flex
- 105°C TPE cable for torsional and lateral robotic flex
- Shielded or unshielded cable jackets
- Configurable material program for custom lengths

Sensor boxes
- M8 or M12 combiner boxes with or without LEDs
- Distributed power to each slot simplifies wiring
- Collect up to 16 points of field I/O with one box
- Integrated, field-wired, or quick-disconnect master cable
- General, heavy-duty, outdoor, and stainless options
- Configurable material program for custom lengths

Field-wired connections
- Connection technologies suited for your application
- Push-in: Easy and reliable tool-free connection
- QUICKON: Fast and efficient insulation displacement
- Crimp: Compact and can be automated
- Piercecon: Designed for high-density pin positions
- Screw: Trusted classic termination

High density
- Increased functionality within one small interconnect
- M8 high density in 5-, 6-, and 8-positions
- M12 high density in 8-, 12-, and 17-positions
- PUR or PVC cable jacket in most variants
- Shielded or unshielded cable jackets
- Shielded M12 versions come with twisted pairs
### Common parts for field connections

#### Power connectivity

<table>
<thead>
<tr>
<th>Connector</th>
<th>B.</th>
<th>Power connectivity</th>
<th>A.</th>
<th>What type of product do you need?</th>
<th>C. Number of wires</th>
<th>D. What type of wiring, if any?</th>
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#### Sensor connectivity

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<thead>
<tr>
<th>Sensor cable</th>
<th>A.</th>
<th>What type of product do you need?</th>
<th>B.</th>
<th>Connector type you are mating with!</th>
<th>C. Number of wires</th>
<th>D. What type of shielding, if any?</th>
<th>E. What connection if preferred?</th>
<th>F. Cable jacket</th>
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#### Cable

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<thead>
<tr>
<th>DIN V10 Plug</th>
<th>A.</th>
<th>What connector type are you mating with?</th>
<th>B.</th>
<th>How many wires do you need?</th>
<th>C. What is your max current/voltage requirements?</th>
<th>D. Type of coding</th>
<th>E. Type description</th>
<th>F. Part no.</th>
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#### Data rate

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<th>Data rate</th>
<th>A.</th>
<th>What protocol are you using?</th>
<th>B.</th>
<th>What type of shieldin g, if any?</th>
<th>C. Number of wires</th>
<th>D. What type of connector are you mating with?</th>
<th>E. What industrial protocol are you using?</th>
<th>F. Cable type</th>
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#### Network connectivity

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<tr>
<th>Network connectivity</th>
<th>A.</th>
<th>What type of product do you need?</th>
<th>B.</th>
<th>Connector type you are mating with!</th>
<th>C. Number of wires</th>
<th>D. What type of shielding, if any?</th>
<th>E. What connection if preferred?</th>
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#### Sensor box

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<tr>
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<th>A.</th>
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#### Field-wireable

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<th>A.</th>
<th>What type of product do you need?</th>
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Build with confidence

Our Limited Lifetime Warranty is our promise to you that the products you install in your control cabinets are built to last. In industry and infrastructure, we stand with you. Simply register and relax. Isn’t it time you trusted Phoenix Contact to build your cabinet confidence?

Register today at: www.phoenixcontact.com/LLW
Ongoing communication with customers and partners worldwide

Phoenix Contact is a global market leader based in Germany. We are known for our future-oriented components, systems, and solutions in the fields of electrical engineering, electronics, and automation. With a global network reaching across more than 100 countries with over 17,400 employees, we stay in close contact with our customers, something we believe is essential for success.

Our wide variety of innovative products makes it easy for our customers to find future-oriented solutions for multiple applications and industries. We focus predominantly on the fields of energy, infrastructure, process, and factory automation.

You can find your local partner at www.phoenixcontact.com