POSITION TRACKING SYSTEM

WCS2B/WCS3B

PoSiTrack

PEPPERL+FUCHS
SENSING YOUR NEEDS
PosiTrack™ Positioning System

The PosiTrack system from Pepperl+Fuchs brings fraction-of-a-millimeter position feedback to a wide range of industrial and commercial applications. Overhead monorails, gantry cranes, automated warehouses...even elevators and theater stage lighting systems can raise their performance to new levels with PosiTrack.

To view many typical PosiTrack application videos check out our website at: www.sensing.net/positrack

The PosiTrack system consists of three basic components:

- Read Head
- Code Rail & Support Hardware
- Network and Control Interfaces

Read Head

PosiTrack’s U-shaped read head optically scans a uniquely coded rail to determine a carrier mechanism’s position. An internal microprocessor translates a multiple sender/receiver LED array status into a 19-bit code, providing 0.8 mm positional resolution over travel distances to 1,030 feet. Communication is provided in RS-485, CANopen, or SSI format (user-specified). Or, it can be converted to one of several network bus protocols using a PosiTrack Control Interface. Setup couldn’t be easier, since PosiTrack read heads require no calibration or “home” reference points.

The read head's sophisticated intelligence provides rock-solid data in some of the toughest conditions. PosiTrack's ultra-forgiving rail/read head alignment tolerances maximize system uptime. Detailed system diagnostic codes are continuously provided, so a controller is never more than a few milliseconds away from verifying a read head’s health.

Contact-free PosiTrack enables precise floor/cab zone positioning without the mechanical wear, linkages, and slippage associated with traditional absolute encoders.

PosiTrack read heads give positional updates every 0.8 mm of movement over the system's coded rail.
Two Read Head Styles: The WCS2B and WCS3B

Two read head styles are available: the WCS2B and WCS3B. From a technology standpoint, they are very similar. Their resolution and the control interface signals are virtually identical. However, they have some differences in mechanical structure and accessory packages that make them uniquely suited for specific applications.

**WCS2B**
PosiTrack WCS2B read heads feature a 10 mm slot width. The close proximity of emitter and receiver LEDs yields a high excess gain, making the WCS2B the best choice for very dirty environments such as galvanizing facilities, foundries, and steel mills.

An optional trolley + track rail system adapts the WCS2B PosiTrack for operation where imprecise mechanical linkages and vibrations are unavoidable, as is common with automatic crane systems.

**WCS3B**
The WCS3B PosiTrack read head features a comparatively larger 31 mm slot width. Thus, in stand-alone mounting, its read head/rail alignment is more forgiving than the WCS2B. WCS3B systems are ideally suited for monitoring overhead or floor-based conveyors, automated warehouse equipment, and lift/lower stations. Unique electronic features exclusive to the WCS3B include status LEDs for alignment and power indication, an optional “over speed” output, and an optional 7-segment display for quick visual access to positional and diagnostic data.

WCS3B systems provide crane position feedback and also prevent “skewing.”

The WCS3B provides continuous positional feedback of the car body throughout the assembly process.

A WCS3B system positions overhead studio theater lighting. Circular stages also utilize the WCS3B for rotational control.
Code Rail

PosiTrack code rail is available in either fiber-laminate or stainless steel and provides a unique positional code for every 0.8 mm of read head travel. General-purpose environments best suit the fiber-laminate material, while those requiring increased mechanical rigidity or corrosion immunity utilize the stainless type. Both are sold in customer-specified lengths (foot increments) with continuous strips from 1 to 1,030 feet. The default start point is position "0" for all types, but custom start/stop values can also be specified.

In addition to providing positional feedback, short code-rail lengths can also be used for carrier/pallet identification. A single reader can both identify and position a carrier, saving the expense of an extra ID system.

All rail types can be horizontally curved with no affect on the read head's accuracy. Fiber-laminate rails can also be flexed for vertical bends.

Code Rail Mounting

A variety of mounting options exists for the system code rail. The simplest form utilizes MB-series right-angle mounting brackets. Here, the code rail is secured between two bracket plates and then directly mounted to a structure such as a wall, ceiling, or Unistrut®.

Aluminum Support Track

A popular method of securing code rail, especially that of the WCS2B system, is via the extruded PS1 aluminum track. The PS1 track contains a groove to support either fiber-laminate or stainless code rails. Special tubing is compressed into the code rail groove securing it. A roller-based tool, run over the length of the PS1 track, locks the code rail with all the simplicity of installing a screen in a door/window framing. Installing hundreds of feet of code rail can literally take only a few minutes! Special support brackets make overhead mounting of profile track to Unistrut a snap. Separate track designs exist for both WCS2B and WCS3B systems.

Unistrut® is a registered trademark of the Unistrut corporation.
Profile Track (cont.)
Like the code rail, the aluminum track is ordered “per foot.” Eight-foot straight lengths are commonly stocked, but alternate lengths and curved sections are also possible.

WCS2-GT09 Guide Trolley System
The optional WCS2-GT09 guide trolley system (right) utilizes integral casters to glide WCS2B read heads along the aluminum profile track. Its grooved channels secure the trolley, ensuring consistent read head/rail alignment over the entire coded path.

Note: There is no trolley system for WCS3B read heads.

PosiTrack Control Interfaces
If the PosiTrack read head’s integral RS-485, SSI, or CANopen outputs don’t suit your interface needs, there are several additional options. Control interfaces are available that convert the RS-485 signals to most standard network protocols including DeviceNet, PROFIBUS DP, Ethernet, and Modbus RTU. In addition, RS-485-to-parallel converters and SSI controllers that enable extra-long cable runs are also available.

Bus-compatible interfaces can control up to four read heads. To designate a read head bus address, simply configure the two address DIP switches internal to the read head housing.
5 Steps to Building a PosiTrack System

To build a PosiTrack system, the following five criteria need to be defined:

1. Read head type: WCS2B or WCS3B
2. Data communication format:
   • Direct Read Head Communication: RS-485, CANopen, or SSI
   • Communication via Control Interface: SSI, Parallel, DeviceNet, Ethernet TCP/IP/UDP/IP, EtherNet/IP, PROFIBUS DP, or Modbus RTU
3. Code rail material: Fiber-laminate or stainless steel
4. Code rail mounting method: Thru-hole, angle bracket, or track-based
5. Read head mating connection

1. Selecting the Correct Read Head: WCS2B or WCS3B?

From an electrical standpoint, WCS2B and WCS3B read heads are virtually identical, offering similar accuracy, response times, communication protocols, etc. The important differences between the two series involve their “burn-through” power and their guidance method. To quickly determine if a WCS2B or WCS3B reader is required, simply follow the guidelines below.

<table>
<thead>
<tr>
<th>WCS2B-series</th>
<th>WCS3B-series</th>
<th>Mounting Bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="WCS2B-series" /></td>
<td><img src="image2" alt="WCS3B-series" /></td>
<td><img src="image3" alt="Mounting Bracket" /></td>
</tr>
<tr>
<td>Ideal when the environment is very dirty (galvanizing, foundries, etc.) or when trolley-based guidance is preferred.</td>
<td>The WCS3B's 31 mm slot width makes it the preferred solution for all but the dirtiest positioning applications.</td>
<td>A snap-lock mounting bracket is provided with every PosiTrack read head.</td>
</tr>
</tbody>
</table>

WCS2B PosiTrack Systems are ideal for positioning dip racks during anodizing and galvanizing processes. WCS3B PosiTrack Systems are an automotive industry standard for monorail and transfer conveyer position feedback.
2. Selecting the System Communication Format

Positional and diagnostic information can be acquired either directly from the read head or via a control interface. For direct-to-reader communication, the following RS-485, CANopen, and SSI options are available.

**RS-485**

<table>
<thead>
<tr>
<th></th>
<th>WCS2B-LS211</th>
<th>WCS2B-LS221</th>
<th>WCS2B-LS246</th>
</tr>
</thead>
<tbody>
<tr>
<td>187.5 kBaud, Data Protocol 1 and 2</td>
<td>62.5 kBaud, Data Protocol 1 and 2</td>
<td>19.2 kBaud, Data Protocol 3</td>
<td></td>
</tr>
<tr>
<td>(the most popular protocol when directly interfacing to custom RS-485 controllers)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CANopen**

<table>
<thead>
<tr>
<th></th>
<th>WCS2B-LS310</th>
<th>WCS2B-LS311</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary output, 1 Mbit/s transfer rate with switchable termination</td>
<td>25-bit binary code, 100...1000 kHz clock frequency</td>
<td>25-bit Gray code 100...1000 kHz clock frequency</td>
</tr>
</tbody>
</table>

**SSI**

<table>
<thead>
<tr>
<th></th>
<th>WCS2B-LS310</th>
<th>WCS2B-LS311</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-bit Gray code 100...1000 kHz clock frequency</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Read Head Options**

PosiTack read heads are also available with the following optional features:

- **Digital Display** – An on-board 7-segment display aids in system set up and troubleshooting. Add a “D” suffix to any WCS3B reader model number to specify the display option.

- **Integral Heater Element** – Permits application in low-temperature environments (to -40 °F). Also helpful if moisture ingress is a concern. Add an “H” suffix to any reader model number to specify the heater option.

- **Over Speed Output** – A transistor output can be preconfigured to indicate a maximum travel speed has been exceeded. Add an “S” suffix to any reader model number to specify the over speed limit in m/s (factory default is 0.7 m/s).
2. Selecting the System Communication Format (cont.)

Control Interface Communication Formats

If the data formats directly accessible from the read heads don't match your system requirements, a variety of control interfaces are also available. These convert RS-485 communication to DeviceNet, PROFIBUS DP, Ethernet, or Modbus RTU.

Additionally, controllers with digital displays are available that convert RS-485 data to parallel binary, Gray code or SSI (SSI controllers extend permissible cable runs from 50 feet to over 4,000 feet).

Network Interface Options

Standard network interfaces include: DeviceNet, PROFIBUS DP, Ethernet TCP/IP/UDP/IP, EtherNet/IP, Modbus RTU

### SSI (Synchronous Serial Interface)

Since SSI communication has length restrictions, Pepperl+Fuchs offers RS-485-to-SSI converters. These enable reader-to-interface cable runs of over 4,000 feet. A more robust communications format, the RS-485-to-SSI configuration is also recommended for SSI installations where heavy industrial noise is present.

Use RS-485 reader head model WCS2B-LS211 or WCS3B-LS211 with:

<table>
<thead>
<tr>
<th>SSI (Synchronous Serial Interface)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCS-IS310</td>
</tr>
<tr>
<td>WCS-IS311</td>
</tr>
<tr>
<td>Binary Code</td>
</tr>
<tr>
<td>Gray Code</td>
</tr>
</tbody>
</table>

### Parallel Converters: Binary and Gray Code

Two controllers are available that convert the read head's RS-485 data to straight binary or Gray code. They also feature a digital display.

Use reader head model WCS2B-LS211 or WCS3B-LS211 with controllers:

<table>
<thead>
<tr>
<th>Parallel Controllers</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCS-IP110</td>
</tr>
<tr>
<td>WCS-IP111</td>
</tr>
<tr>
<td>Binary Code</td>
</tr>
<tr>
<td>Gray Code</td>
</tr>
</tbody>
</table>
3. Code Rail

**WCS2 or WCS3 Rail?**
The WCS2B and WCS3B read heads utilize custom, non-interchangeable coded rail. WCS2B rail is 55 mm tall, while the WCS3B version is 70 mm tall. Both are available in fiber-laminate or stainless steel.

**Fiber-laminate or Stainless Steel?**

<table>
<thead>
<tr>
<th>Fiber-laminate</th>
<th>Stainless Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCS2-CS55-L1</td>
<td>WCS2-CS55-M1</td>
</tr>
<tr>
<td>WCS3-CS70-L1</td>
<td>WCS3-CS70-M1</td>
</tr>
</tbody>
</table>

The best choice for most applications, fiber-laminate code rails offer low cost, easy handling, and excellent durability.

The best choice for environmentally challenging installations, stainless steel code rails offer immunity to liquids, steam/high temperatures, excellent corrosion resistance, high rigidity, and tensile strength.

Both laminate and stainless code rails are ordered in foot increments. Unless otherwise specified, all rails begin at code value “0.”

4. Code Rail Mounting Options (Thru-hole, Angle Bracket, or Track-based)

**Thru-hole: No Brackets**

Both laminate and stainless steel code rails feature integral mounting holes. To save on hardware costs, utilizing these holes to secure the code rail is a great option.

**Angle Bracket Systems**

WCS2B and WCS3B code rails can also be mounted using several “clamp-type,” right-angle mounting brackets. For straight code rail installations, one bracket is required every four feet. Curved sections require a support bracket every two feet. Options are shown below.

**Straight Code Rail Installations**

- **WCS-MB1**
  - Angle bracket, thru-hole with mounting screws included

**Curved Code Rail Installations**

- **WCS-MB2-B**
  - Angle bracket, w/nut for securing code rail to “C-track”

- **WCS-MB2-UNI**
  - Angle bracket, w/nut for securing code rail to Unistrut

- **WCS-SP2**
  - Grooved support track for curved laminate code rail sections

- **WCS-MB1-B**
  - Angle bracket, thru-hole with mounting screws included

- **WCS-MB2-B**
  - Angle bracket, w/nut for securing code rail to “C-track”

- **WCS-MB2-B-UNI**
  - Angle bracket, w/nut for securing code rail to Unistrut

Code rail can be secured using the pre-punched mounting holes. No brackets required.
4. Code Rail Mounting Options (cont.)

Aluminum Track Systems

The WCS2B “Trolley + Track” System

When using a WCS2B-series reader and trolley system (the most popular WCS2B configuration) the following components are necessary:

**Code Rail**

Laminate: WCS2-CS55-L1 or Stainless Steel: WCS2-CS55-M1

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**WCS2B Trolley + Track System Components**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCS2-PS1-8FT</td>
<td>Aluminum track that secures the code rail and guides the trolley. Stocked in 8 ft sections</td>
</tr>
<tr>
<td>WCS2-MC1</td>
<td>Adapter plates (2) used to interconnect WCS2-PS1 track sections</td>
</tr>
<tr>
<td>WCS2-MF1</td>
<td>Compression tubing required to secure code rail within the WCS2-PS1 track. Ordered per foot</td>
</tr>
<tr>
<td>WCS2-FT1</td>
<td>Roller-based code rail installation tool. Locks the rail within the WCS2-PS1 track</td>
</tr>
<tr>
<td>WCS2-LB1</td>
<td>Centrally mounted locking bracket. One required per complete track installation</td>
</tr>
<tr>
<td>WCS2-MH2-UNI</td>
<td>Snap-lock bracket system secures WCS2-PS1 track sections to Unistrut. One bracket is required every 4 feet</td>
</tr>
<tr>
<td>WCS2-GT09-P1</td>
<td>WCS2B reader guide trolley. One trolley is required per reader</td>
</tr>
</tbody>
</table>

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**Accessory (Optional)**

**WCS-GT-BR**

Trolley-mounted brushes that keep the code rail free of debris.
4. **Code Rail Mounting Options (cont.)**

**WCS3B Series Aluminum Track System**

When using a WCS3B-series system, options exist for either aluminum track mounting or bracket mounting. Note: For WCS3B systems, there is no trolley option.

When using the WCS3B aluminum track, you'll require the following components:

**Code Rail**

Laminate: WCS3-CS70-L1 or Stainless Steel: WCS3-CS70-M1

<table>
<thead>
<tr>
<th>WCS3-PS1-8FT</th>
<th>WCS3-MC1</th>
<th>WCS3-MF1</th>
<th>WCS3-FT1</th>
<th>WCS3-MH_</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum track that secures the code rail. Stocked in 8 ft sections.</td>
<td>Adapter plate used to interconnect WCS3-PS1 track sections</td>
<td>Compression tubing required to secure code rail within the WCS3-PS1 track. Ordered per foot</td>
<td>Roller-based code rail installation tool. Locks the rail within the WCS3-PS1 track</td>
<td>Snap-lock bracket system secures WCS3-PS1 track to structure. Options exist for through hole, C-track, or Unistrut installation. One bracket is required every 8 feet</td>
</tr>
</tbody>
</table>

5. **Mating Connectors and Cordsets**

The final step required to build a PosiTrack system involves specifying the connection between the reader and controller. WCS2B and WCS3B systems offer an industry standard 12 mm quick disconnect: RS-485 models use a 5-pin connector, while SSI models require an 8-pin type. Below is a chart to help select the appropriate Pepperl+Fuchs' cordset or field-attachable connector:

<table>
<thead>
<tr>
<th>RS-485 Connection</th>
<th>SSI Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>V15-G-PG9</td>
<td>V15-G-5M-PUR ABG*</td>
</tr>
<tr>
<td>5-pin, M12 female field-attachable connector (cable is user-specified)</td>
<td>5-pin, M12 female cordset - PUR jacket - shielded - 5 meter length</td>
</tr>
<tr>
<td>V15-G-5M-PUR ABG*</td>
<td>V17-G-PG9</td>
</tr>
<tr>
<td>V17-G-PG9</td>
<td>8-pin, M12 female field-attachable connector (cable is user-specified)</td>
</tr>
<tr>
<td>V19-G-5M-PUR ABG*</td>
<td>V19-G-5M-PUR ABG*</td>
</tr>
<tr>
<td>8-pin, M12 female cordset - PUR jacket - shielded - 5 meter length</td>
<td>8-pin, M12 female cordset - PUR jacket - shielded - 5 meter length</td>
</tr>
</tbody>
</table>

* P+F offers cordsets in a variety of lengths and jacket materials. Please contact the factory if the listed models do not meet your requirements.
Pepperl+Fuchs sets the standard in quality and innovative technology for the world of automation. Our expertise, dedication, and heritage of innovation have driven us to develop the largest and most versatile line of industrial sensor technologies and interface components in the world. With our global presence, reliable service, and flexible production facilities, Pepperl+Fuchs delivers complete solutions for your automation requirements—wherever you need us.