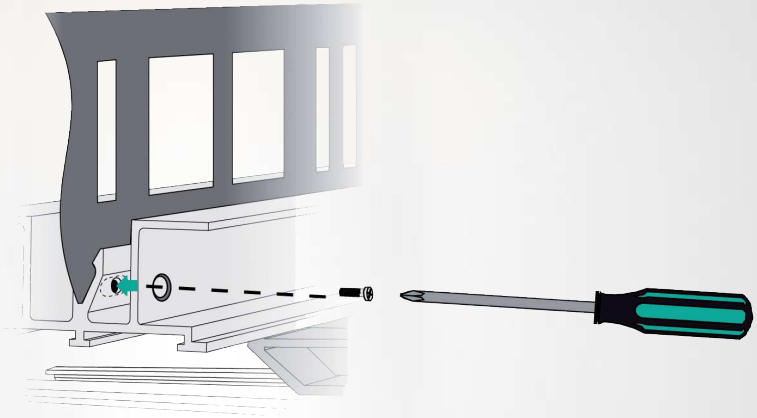
WCS position encoding system

Mechanics

Manual



Your automation, our passion.

PEPPERL+FUCHS

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

Worldwide

Pepperl+Fuchs Group

Lilienthalstr. 200

68307 Mannheim

Germany

Phone: +49 621 776 - 0

E-mail: info@de.pepperl-fuchs.com

North American Headquarters

Pepperl+Fuchs Inc.

1600 Enterprise Parkway

Twinsburg, Ohio 44087

USA

Phone: +1 330 425-3555

E-mail: sales@us.pepperl-fuchs.com

Asia Headquarters

Pepperl+Fuchs Pte. Ltd.

P+F Building

18 Ayer Rajah Crescent

Singapore 139942

Phone: +65 6779-9091

E-mail: sales@sg.pepperl-fuchs.com

https://www.pepperl-fuchs.com

1 Introduction 5
1.1 Content of this Document 5
1.2 Target Group, Personnel 5
1.3 Symbols Used 6
2 Product Description 7
2.1 Functional Description 7
2.2 Areas of Use 10
3 Read Head 13
3.1 Introduction 13
3.2 Overview 13
3.3 Tolerances 15
4 Mounting the Read Head 17
4.1 Attaching the Mounting Base 17
4.2 Replacing Plastic Lenses 19
4.3 Retrofitting the Outdoor Protective Enclosure 20
4.4 Mounting the Outdoor Protective Enclosure 24
5 Code Rail 26
5.1 Introduction 26
5.2 Overview 26
5.3 Identification via ID-Pads 28
6 Mounting the Code Rail 29
6.1 Introduction 29
6.2 Installation Notes 30
6.2.1 Mounting the Code Rail on a Straight Route 31
6.2.2 Mounting in Horizontal Curves 32
6.2.3 Mounting in Vertical Curves 34
6.2.4 Interruptions in the Profile Rail 35
6.3 Mounting the Code Rail with Mounting Brackets 36
6.3.1 Introduction 36
6.3.2 System Overview 37
6.3.3 Attaching the Tensioning Device 41

2019-11

6.4 Mounting the WCS3 Code Rail with the Aluminum Profile System 42
6.4.1 Introduction 42
6.4.2 System Overview 43
6.4.3 Rail Holder 45
6.4.4 Butt Connectors for Profile Rails 46
6.4.5 Mounting the Code Rail 48
6.4.6 Fixed Points 50
6.4.7 Suspended Mounting with Stainless Steel Code Rail 52
6.4.8 Grounding the Aluminum Profile System 53
6.4.9 Integration of the WCS Code Rail in Conductor Lines 54
6.5 Mounting the WCS2 Code Rail with the Aluminum Profile System 55
6.5.1 Introduction 55
6.5.2 System Description 56
6.5.3 Rail Holder 59
6.5.4 Butt Connectors for Profile Rails 60
6.5.5 Mounting the Code Rail 63
6.5.6 Fixed Points 65
6.5.7 Guide Trolley 67
6.5.8 Grounding the Aluminum Profile System 70
6.6 WCS3 Code Rail Extender for "Extended" Read Heads 71
6.6.1 Introduction 71
6.6.2 System Overview 71
6.6.3 Mounting the WCS3 Code Rail Extender 72

7 Maintenance 75
7.1 Maintenance 75
7.2 Cleaning 75
7.3 Repairs 76
7.3.1 WCS Stainless Steel Code Rail (Aluminum Profile) 76
7.3.2 WCS Stainless Steel Code Rail (Mounting Bracket System) 78
7.3.3 WCS Laminate Code Rail (Aluminum Profile) 79
7.3.4 WCS Laminate Code Rail (Mounting Bracket System) 81

8 Model Overview for WCS Read Heads 83

9 Disposal 85

10 Appendix 86
10.1 Cable Overview 86

2019-11

1 Introduction

1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal

Note

For full information on the product, refer to the further documentation on the Internet at www.pepperl-fuchs.com.

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Other documents

1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:



Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols



Note

This symbol brings important information to your attention.



Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

2019-11

2 Product Description

2.1 Functional Description

The WCS position encoding system consists of two main components:

Code Rail

The code rail carries information for the absolute code. The code rail is routed parallel to the track for the material handling equipment and thus assigns a unique position to every point on the track. It is possible to route the code rail at points only where positioning is required. The system allows the code rail to be routed along curves and allows branches to be created. The code rail is built to order and delivered in a bundle. Unless otherwise ordered, the code rail always starts with position value 0 and ends with a maximum position according to the ordered length in meters. The length of a code rail segment ranges from 0 to a maximum total length of 314.573 m (WCS3) or from 0 to a maximum total length of 327 m (WCS2).

Spacers can also be ordered for repair purposes or specific applications, stating the start or end position of the desired section and the desired length in meters.

For identification applications ID-pads are available as short code rail sections, with a length of between 250 mm and 264 mm and a unique identification number.

Read Head

The U-shaped read head scans the code rail photoelectronically without touching it. The read head detects a new position value every 0.8 mm (WCS3) or 0.833 mm (WCS2).

This results in the following data:

	WCS2B	WCS3B
Resolution	± 0.42 mm 1200 pos./m	± 0.40 mm 1250 pos./m
Movement speed [v_{max}]	12.5 m/s	12.5 m/s
Y axis (tolerance)	± 5 mm	± 15.5 mm
X axis (tolerance)	± 5 mm	± 14 mm

After insertion into the code rail, the read head determines a highly accurate position value without reference or delay. The code rail can be scanned at very high speeds. The scanning can be reproduced, is reliable, and is independent of temperature fluctuations.

The position value, movement speed, and error codes such as the contamination detection or the "OUT" message can be transmitted directly from the read head to the control panel via a communication interface. There are a number of types of interfaces available in the WCS3 read head to achieve this, such as RS-485, SSI, CANopen, PROFINET, and EtherNet/IP.

There is a wide range of interface modules available for connecting to other interfaces:

- PROFINET
- PROFIBUS DP
- EtherNet/IP
- EtherCAT
- DeviceNet
- CANopen

Each interface module can simultaneously accommodate up to four read heads with an RS-485 interface and address each separately. This makes it easy to extend your plant at a later stage.

In addition to automatic contamination detection, there are other optional extensions for the WCS read head. The options are indicated in the type code with the corresponding letter:

WCS2B and WCS3B	
H	Integrated heating element for an extended outside temperature range as low as -40 °C.

WCS3B	
D	Integrated display with a seven-segment display for position and diagnostic information.
E	Read head with Extended option for long distances of up to 629.146 meters.
O	Outdoor protective enclosure with degree of protection IP69 for outdoor use.
S	Switching output for signaling when a limit speed is exceeded

The variants available can be found in the product selector at https://www.pepperl-fuchs.com, as well as in the model overview for read heads, see chapter 8.

Mounting System

There are three different mounting systems available for mounting the code rail. The bracket system, the WCS3 aluminum profile system, and the WCS2 aluminum profile system with fixture for a guide trolley. The three mounting systems can be screwed directly to the surface or mounted on standard C profiles.

The bracket system is the easiest to mount as it features mounting brackets for straight section elements and curved sections (vertical, horizontal). The brackets are screwed directly to the code rail and to the surface and C profile.

As an alternative to the mounting brackets, the WCS3 aluminum profile system provides better stabilization of the code rail and simplified mounting for long, straight sections. In this case, the code rail is inserted into an extruded aluminum profile developed for the WCS and fixed in place with a fixing cord. The aluminum profile rail is clipped to plastic brackets and attached to the surface with a C profile.

The WCS2 aluminum profile rail system with guide trolley is intended for applications with high running tolerances. The aluminum profile accommodates the code rail and the guide trolley. The guide trolley is connected to the vehicle via a free-running tappet and guarantees that the read head is always in the optimal position in relation to the code rail. At the same time, the read head is decoupled from vehicle vibrations. Use of the guide trolley is generally recommended with the WCS2 read head due to the low read head gap. For the WCS3 read head with outdoor protective enclosure, an optional guide trolley can be used in combination with the WCS2 profile rail.

2019-11

Properties of the WCS

- Absolute position encoding system
- Photoelectric principle (infrared range)
- Proven and robust
- Easy to maintain
- No reference points required
- No calibration and adjustment work necessary
- Resistant to power failure
- Millimeter-precise positioning with absolute repeat accuracy
- Determination of position value in real time and regardless of temperature fluctuations
- Guaranteed reading up to a speed of 12.5 m/s
- High resolution = ±0.4 mm
- Variable route length:
  - Up to 327 m (WCS2)
  - Up to 314.573 m (WCS3)
  - Up to 629.146 m (WCS Extended)
- The coding system is also suitable for curves with a radius of up to 0.5 m (does not apply to systems with guide trolleys)
- A wide range of areas of application, e.g., automated storage and retrieval systems, moving carriages, monorail conveyors, galvanic plants, automatic and slewing cranes, elevators, as well as outdoors such as in harbors, offshore installations, and ships
- Various mounting systems available for installing the code rail
- Connection to any control panel possible, either directly or via interface module
- Connectivity to many fieldbus systems available
- Support during commissioning and maintenance due to extensive system diagnostics options
- High functional reliability as a result of permanent self-diagnostics
- Contamination warning
- Optional heating for ambient temperatures down to -40 °C
- Digital output of an adjustable limit speed (optional)
- The WCS3-Outdoor has an IP69-compliant protective enclosure

2019-11

2.2 Areas of Use

The WCS can be used anywhere where material handling equipment has to be positioned precisely. The operating principle of the WCS enables it to be used in a diverse range of applications, including:

- Interruptions in the code rail
- Applications with curves and circular paths
- Use of multiple vehicles in a row

Due to the large tolerance between the read head and code rail, the WCS can be used for most applications. In some cases, however, it is advantageous to use the WCS with a special protective enclosure or a guide trolley in conjunction with the aluminum profile system. Here are some examples from the variety of application options:

Automated Storage and Retrieval Systems (High-Bay Warehouses)

Moving carriages, lifting gear, and transversing carriages are each positioned with one read head. The positioning is independent of the length of the code rail and always absolutely reproducible. For new high-bay warehouses we recommend the WCS3 system. For retrofits in older warehouses, it may be beneficial to use the WCS2 in conjunction with the aluminum profile system:

- Easy to retrofit
- High mechanical tolerances between the measuring system and moving carriages possible
- Decoupling of vehicle vibrations

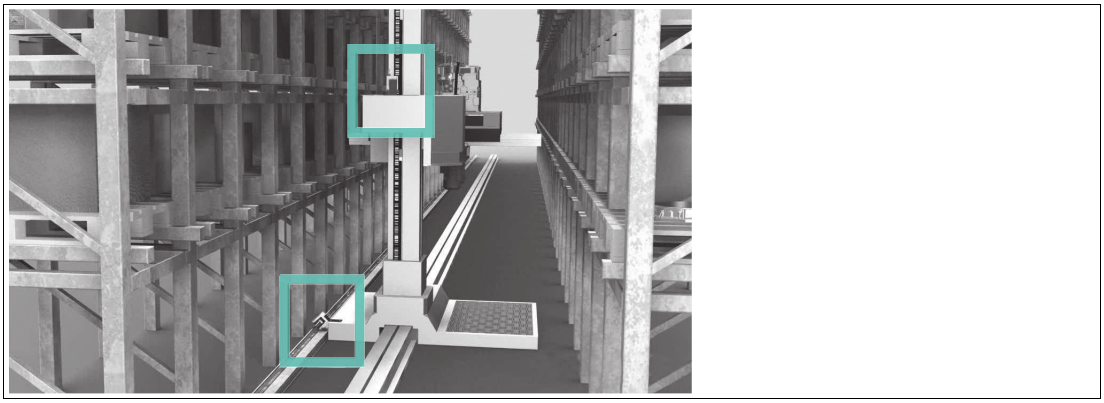


Figure 2.1 Automated storage and retrieval system (high-bay warehouse)

Automatic Cranes

Automatic cranes are a typical application for the WCS2 in conjunction with the aluminum profile system. The crane is positioned using one read head each for the crane and the trolley movement. At each point, the guide trolley ensures the optimal position of the read head in relation to the code rail and decouples any vibrations from the crane track. Optional cleaning brushes for the code rail can be attached to the guide trolley. This means that the WCS can be used in a very dusty environment, such as in cement works or foundries. If the cranes are used outdoors, the WCS3 is used with a special protective enclosure.

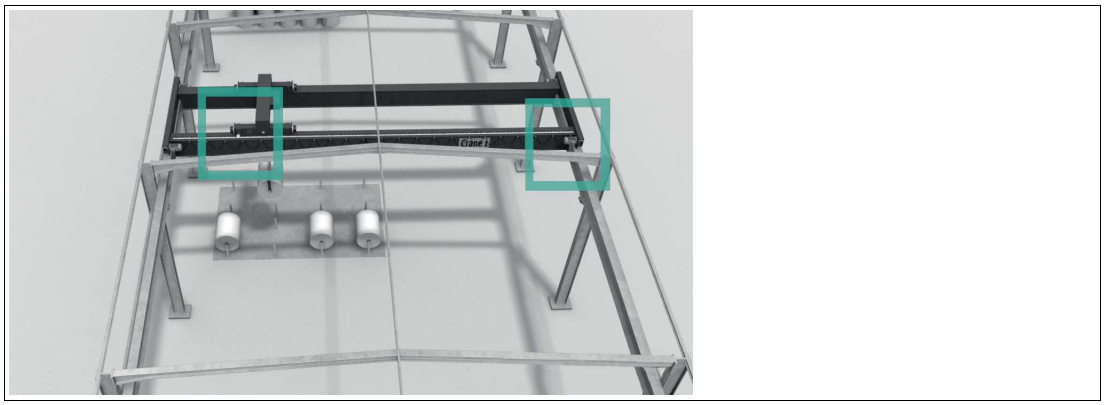


Figure 2.2 Automatic crane

Galvanic Plants

One or more vehicles in succession moving along a straight route. The vehicles automatically bring the material to be galvanized into the corresponding bath. The high and adaptable light output of the read heads has enabled the WCS position encoding system to perform extremely well even under these difficult conditions. The WCS3 with protective enclosure is ideal for galvanic plants. In addition to degree of protection IP69, the enclosure is resistant to acids and alkalis.

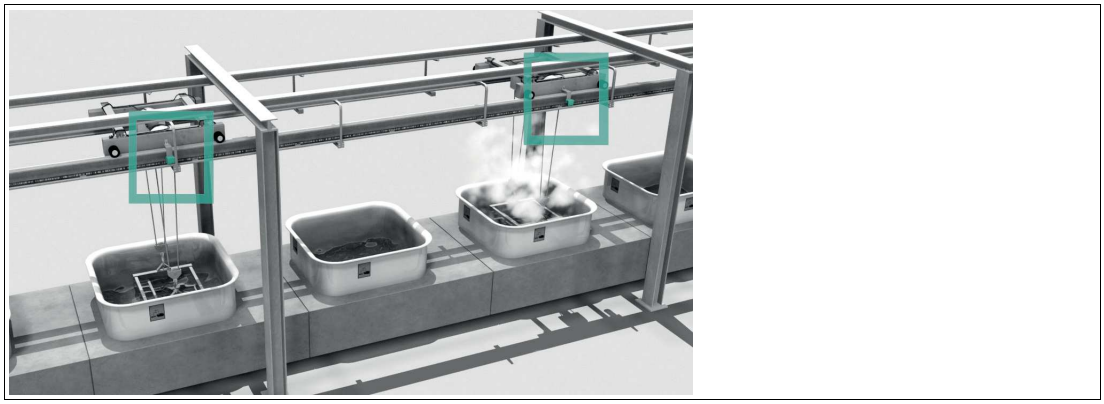


Figure 2.3 Galvanic plant

Overhead Conveyors

Many vehicles have to be positioned on a circular track—the WCS offers the optimal solution for this. Branches (track switches) and curves can be created. The WCS3 is particularly well-suited for this task. After a power failure, the current position of the vehicle is transferred to the control panel immediately; the vehicle does not have to be moved. The WCS can also be used for distances longer than 314.573 m.



Figure 2.4 Overhead conveyor

Harbor Applications

The WCS with protective enclosure is used for material handling plants in particularly demanding areas such as harbors, offshore installations, and ships. To meet the requirements of these areas, the WCS includes an IP69-compliant protective enclosure that, in addition to protecting against dust and humidity, has been specifically designed for resistance to aggressive substances such as salt water, salty air, acids, and alkalis. It offers increased impact resistance compared to typical outdoor sources of interference such as falling branches and hailstorms. In combination with built-in heating, the WCS can even be used in snow and temperatures as low as -40 °C. The indicator LEDs and the display are always visible through the translucent enclosure material.

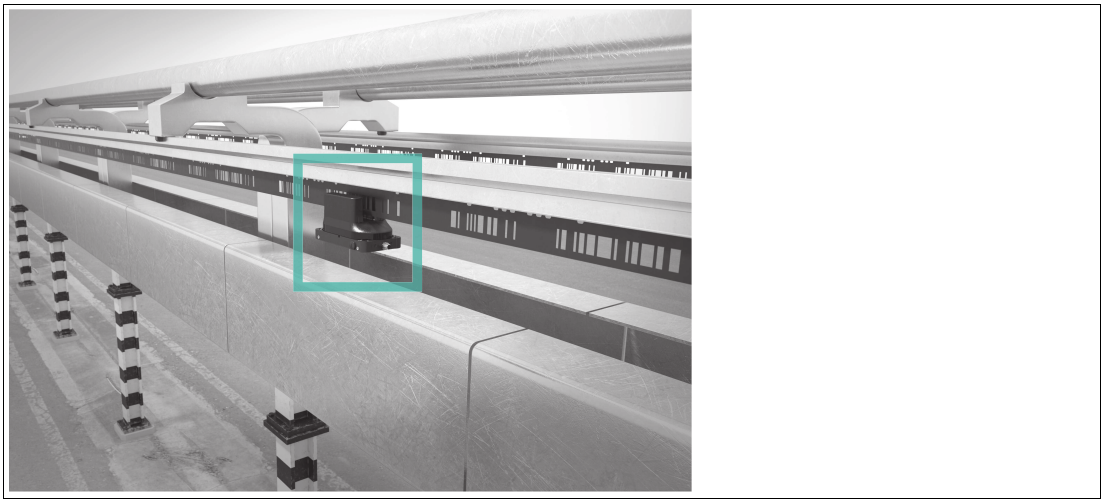


Figure 2.5 Power rail of a gantry crane

2019-11

3 Read Head

3.1 Introduction

The enclosure of the read head is made from robust plastic and has degree of protection IP54. The mounting base for securing the read head is included in the scope of delivery. On the inside of the read head there are easily removable, transparent plastic lenses that protect the reading area against dirt and damage. Identification notches can be found on these lenses. The notches are used for adjustment of the zero point for the vertical play of the read head (= Z axis). The reference point is the top edge of the code rail. Within specified tolerances, the read head may move around this reference point: if the vertical play on the Z axis is exceeded, the read head reports "OUT" to the control panel (read head outside the code rail). The tolerances for the lateral play on the Y axis result from the gap width of the read head. The positions are reliably determined up to a minimum of 500 mm for both an inclined position in the vertical direction and in the horizontal direction, as well as in curves. If the position value cannot be determined, for example due to contamination of the optical system, the read head reports a unique error code.

From a technological point of view, the WCS2B and WCS3B read heads are very similar. The resolution and the signals to the interface are almost identical. However, there are differences in the mechanical systems and in the accessories.

	WCS2B	WCS3B
Resolution	± 0.42 mm 1200 pos./m	± 0.40 mm 1250 pos./m
Movement speed [v_{max}]	12.5 m/s	12.5 m/s

3.2 Overview

WCS2B

WCS2B read heads have a gap width of 10 mm. This results in a distance between the emitter and receiver that offers high reserves. This makes the WCS2B read head suitable for very dirty environments such as galvanizing plants, foundries, and steel mills. An optional guide trolley and the WCS2B rail system are specially designed for operation with imprecise mechanical connections and where vibrations occur, for example, with automatic cranes.

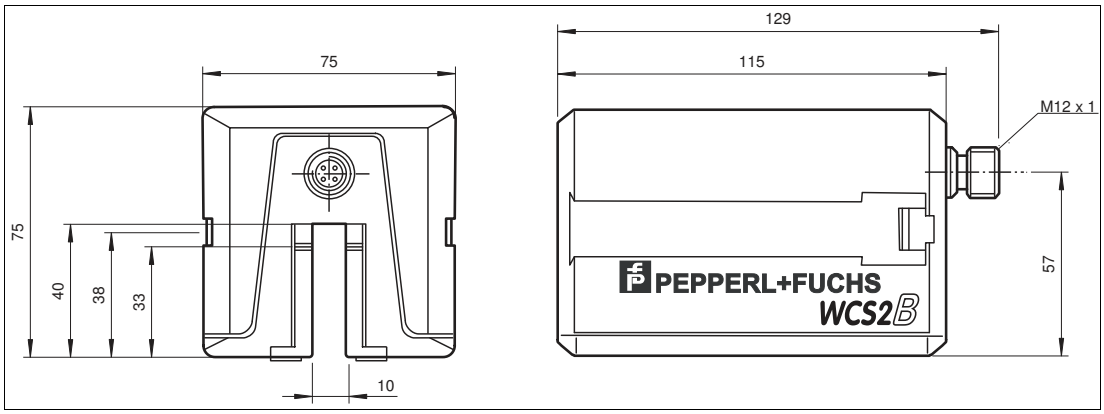


Figure 3.1 WCS2B dimensional drawing

WCS3B

WCS3B read heads have a gap width of 31 mm. This allows a greater tolerance when mounting the read head and aligning it in relation to the code rail. WCS3B systems are ideal for monitoring conveyor belts and automated warehouse and lifting systems.

Special features of the WCS3B read head include the status LEDs for the alignment and performance display, an optional "overspeed" output, and an optional 7-segment display for position and diagnostic data.

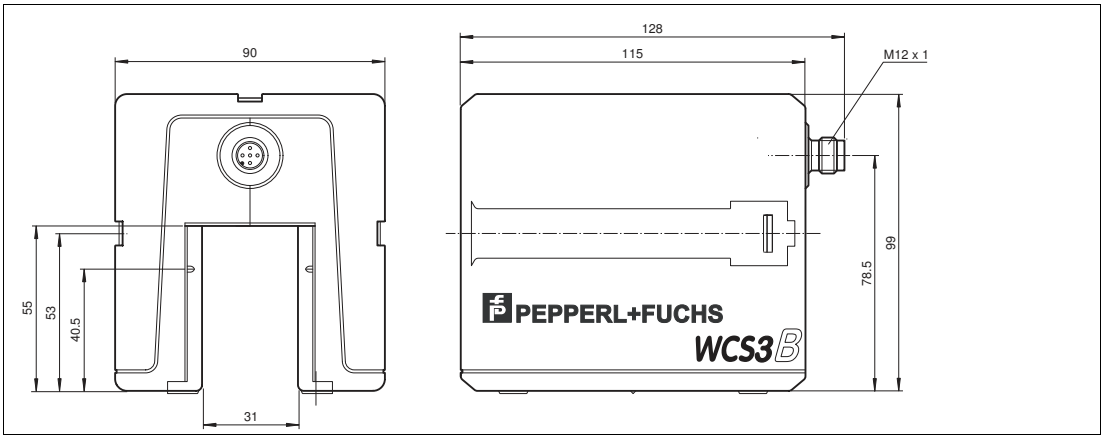


Figure 3.2 WCS3B dimensional drawing

WCS3-Outdoor

WCS3-Outdoor is a WCS3B read head in a special outdoor protective enclosure.

Special features of the WCS3-Outdoor include an IP69-compliant protective enclosure that, in addition to protecting against dust and humidity, has been specifically designed for resistance to aggressive substances such as salt water, salty air, acids, and alkalis. It offers increased impact resistance compared to typical outdoor sources of interference such as falling branches and hailstorms. Integrated heating even allows the WCS3-Outdoor to be operated in snow and temperatures as low as -40 °C. The indicator LEDs and the display are always visible through the translucent enclosure material. The protective enclosure can be used with the WCS3B-LS2**H, WCS3B-LS3**H, WCS3B-LS5**, and WCS3B-LS6** read heads. The protective enclosure has three cable outlets. Depending on the mounting position, you can route the connector plug through one of the three outlets.

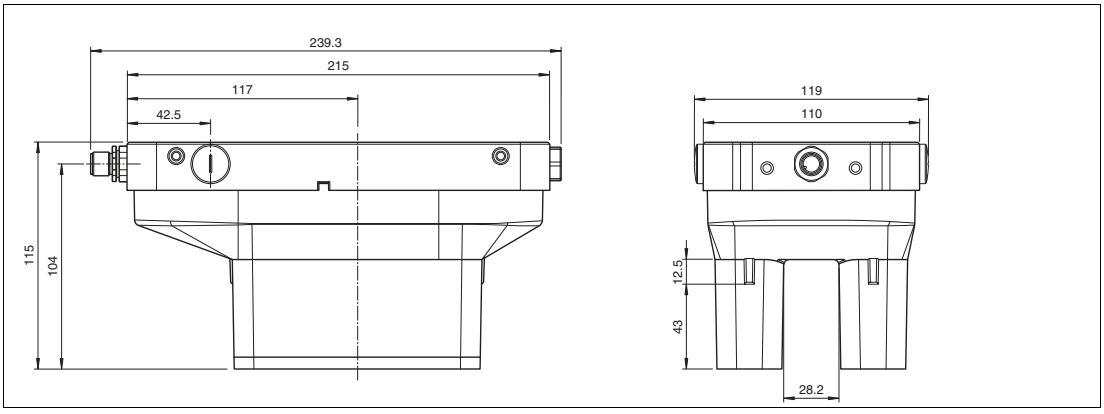


Figure 3.3 WCS3-Outdoor dimensional drawing

3.3 Tolerances

Tolerance for Y and Z Axis

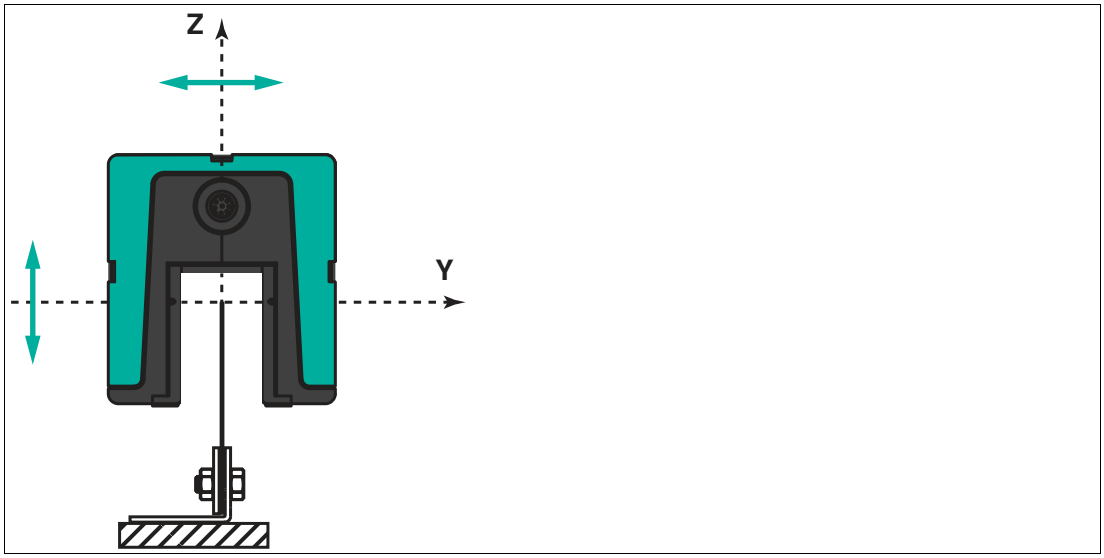


Figure 3.4 Tolerance for Y and Z axis

	WCS2B	WCS3B	WCS3-Outdoor
Y axis	± 5 mm	± 15.5 mm	± 12 mm
Z axis	± 5 mm	± 14 mm	± 12 mm

Tolerance for Inclined Position α

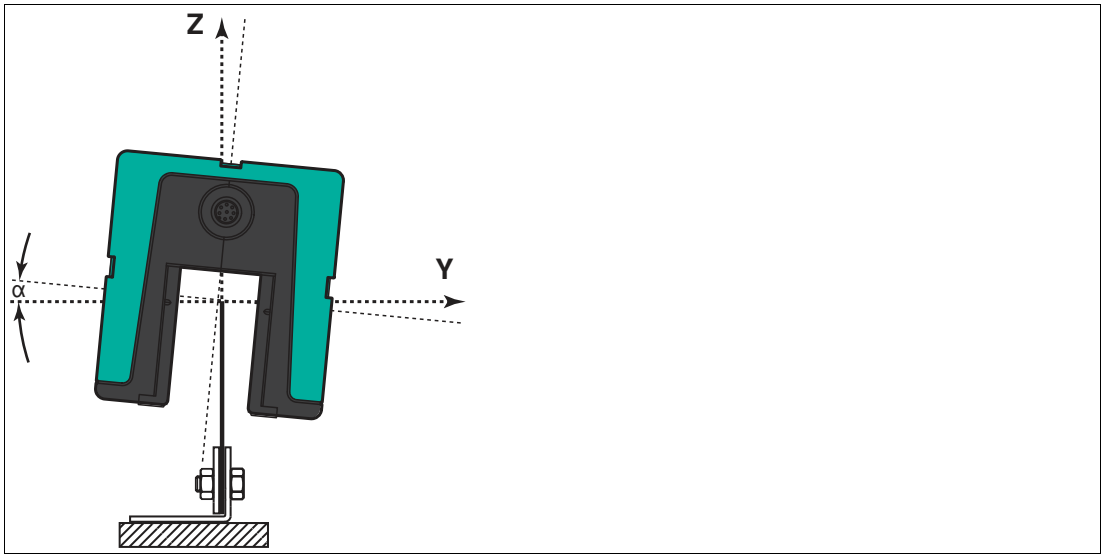


Figure 3.5 Tolerance for inclined position α

	WCS2B	WCS3B	WCS3-Outdoor
α	±10°	±10°	±8°

Tolerance for Inclined Position β

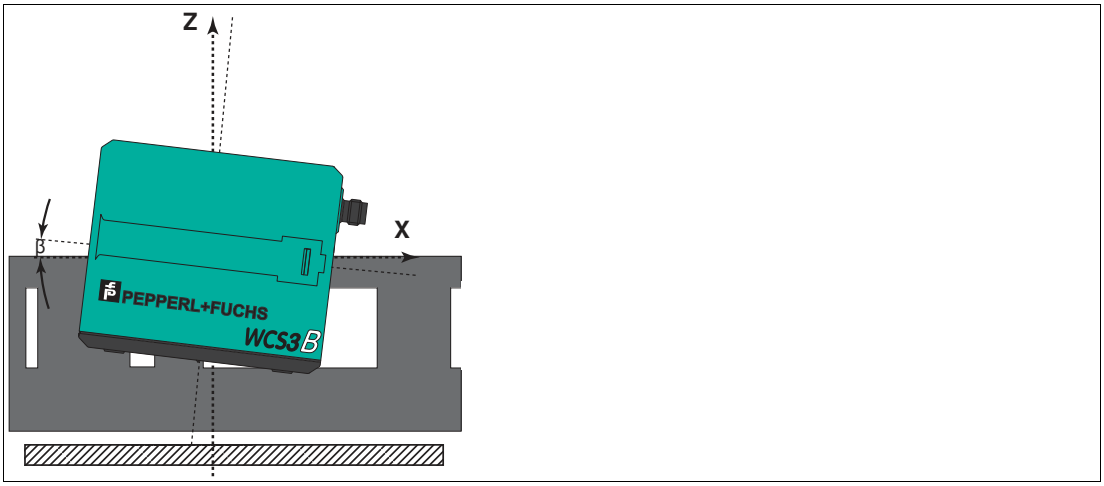


Figure 3.6 Tolerance for inclined position β

	WCS2B	WCS3B	WCS3-Outdoor
β	±5°	±5°	±4°

4 Mounting the Read Head

4.1 Attaching the Mounting Base

As a rule, the read head is mounted on the vehicle. However, the read head can also be mounted stationary. A code rail piece can also be mounted on the carriage (vehicle identification).

A special mounting base is supplied with the read head. This is mounted on the carriage. If the WCS2 is used with an aluminum profile system and guide trolley, the mounting base is already installed in the guide trolley. On three sides of the read head enclosure, dovetail grooves are integrated with a quick-action lock. If required, the read head is pushed onto the base module of the mounting base via one of these grooves and engaged with a spring tongue. This quick-action lock makes it easy to mount and quickly replace the read head when necessary without any adjustment work. The mounting position of the read head is arbitrary. The read head is not sensitive to extraneous light.

Warning!

Improper mounting

Risk of injury if mounted improperly

- Ensure you have sufficient space before starting work.
- Take care when using sharp-edged components and always wear safety gloves.
- Ensure that suspended components cannot fall before mounting.

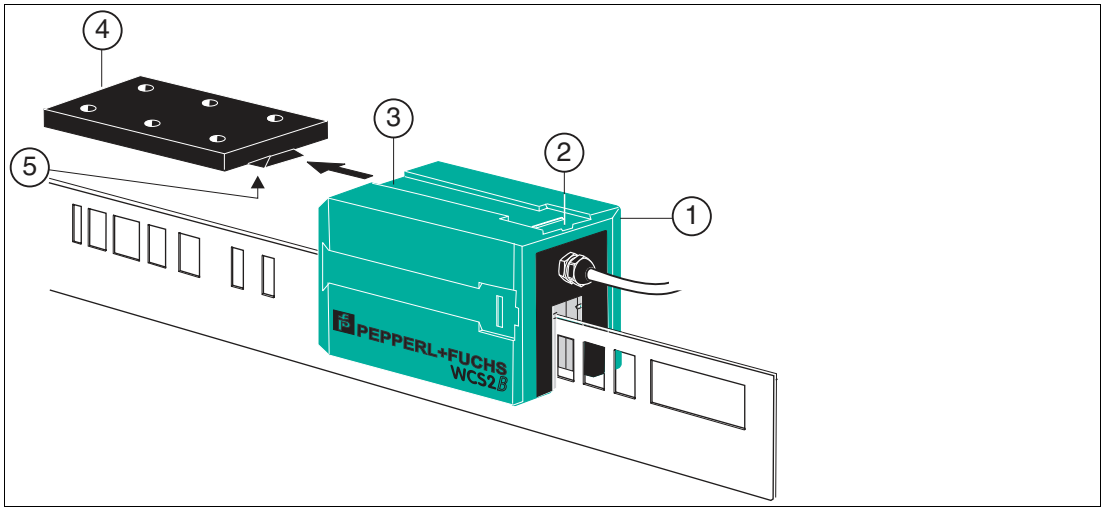


Figure 4.1 Overview

1. Read head
2. Quick-action lock
3. Dovetail groove
4. Mounting base
5. Base module with spring tongue

Note

Mounting Direction

Mount the read head so that the electrical connector plug points in the direction of the ascending position values on the code rail.

Tip

Securing the Mounting Base

Plan elongated holes in the design of the fixture on the carriage. These allow you to correct the position of the mounting base and thus the read head during mounting.

Caution!

Interference from strong sunlight

If strong sunlight shines directly into the read head gap, this can lead to measurement errors.

When planning the plant, avoid a configuration that allows strong sunlight to shine directly into the read head gap.

Caution!

Interference from contamination

If dirt or vapors enter the read head gap, this can lead to malfunctions.

When installing the read head, make sure that the read head gap is protected against dirt and any vapors.

Mounting and Dismounting the Mounting Base

1. Secure the mounting base to the guide trolley with size M4 screws.
2. Slide the dovetail groove on the read head onto the base module of the mounting base. In the end position, the spring tongue engages audibly in the quick-action lock.

   ↳ The read head is mounted.
3. For dismounting, unlock the spring tongue with a screwdriver.
4. Push the read head off the base module of the mounting base.

Note

The mounting base is identical for all read heads.

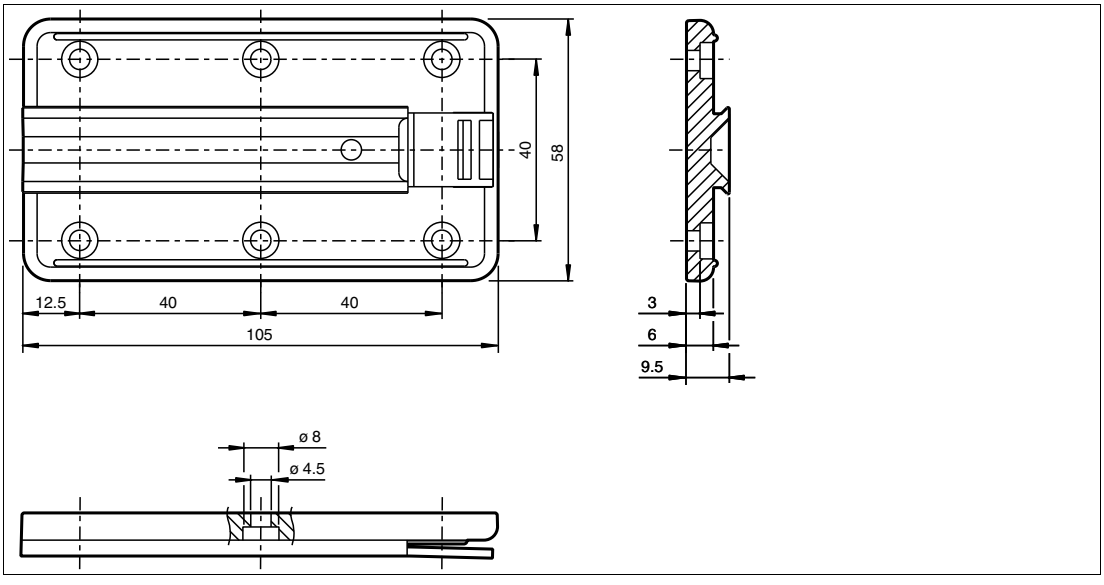


Figure 4.2 WCS-MP1 mounting base

2019-11

PEPPERL+FUCHS

4.2 Replacing Plastic Lenses

In the event of damage or contamination, you can replace the plastic lenses on the inside of the read head gap.

Replacing Plastic Lenses

1. Loosen two screws on each lens.

Note

WCS2 read head: Phillips screws

WCS3 read head: Torx screws (T10)

2. Remove the lens.
3. Slide the new lens into the intended position on the inside of the read head gap.
4. Secure the lens with the screws. The maximum torque is 0.8 Nm.

Tip

Always replace lenses in pairs.

The plastic lenses are available in pairs as spare parts.



Figure 4.3 Plastic lenses

	WCS2B	WCS3B
Model number for two lenses with seals	WCS2-PL2	WCS3B-PL2

4.3 Retrofitting the Outdoor Protective Enclosure

WCS3B-read heads using RS-485, SSI, and CANopen interfaces can be retrofitted with the enclosure. Read heads with EtherNet/IP and PROFINET interfaces can only be used as pre-assembled devices.

Note

When retrofitting your plant, make sure that you differentiate the mechanical outer dimensions and the fixture for the outdoor protection enclosure from the standard read head.

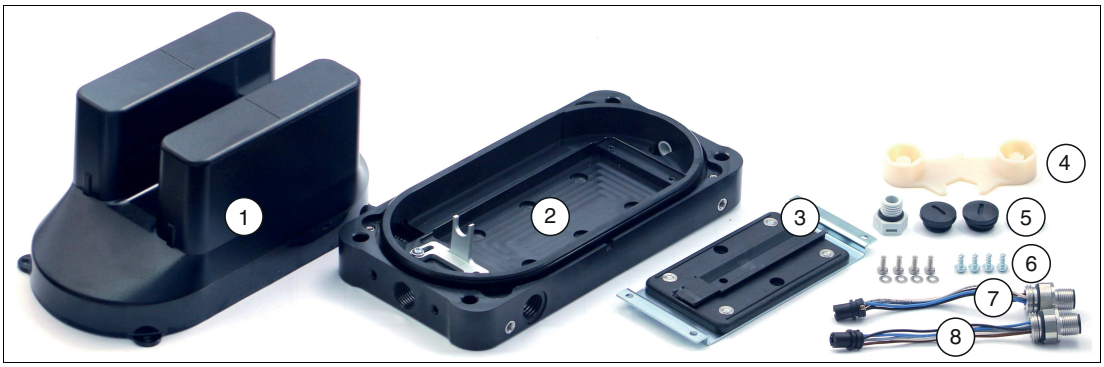


Figure 4.4 Overview of mounting parts

1 Protective cover
2 Protective lid
3 Mounting base
4 Special tool
5 Stopping plugs, pressure relief plugs
6 Fastening screws
7 Five-pin connection cable for RS-485 or CANopen
8 Eight-pin connection cable for SSI

Assembling the Protective Enclosure

1. Loosen two screws on each lens.

   Note

   WCS2 read head: Phillips screws

   WCS3 read head: Torx screws (T10)

2. Remove the lens.
3. Slide the mounting base over the dovetail groove of the read head. In the end position, the spring tongue engages audibly in the quick-action lock.

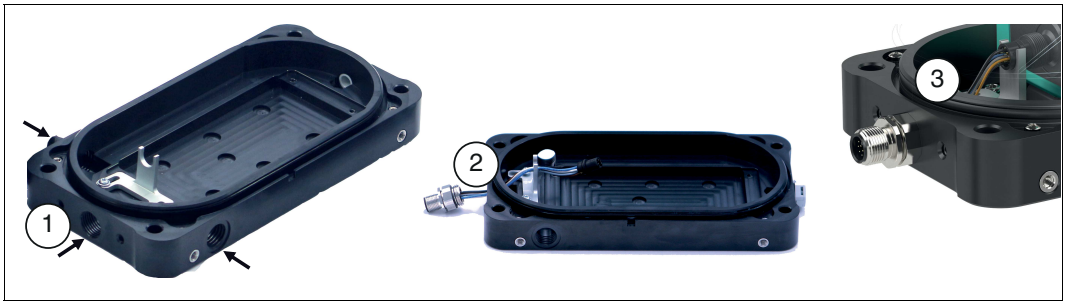


Figure 4.5 Attaching the connection cable

4. Insert the connection cable through one of the three thru-holes in the protective lid and tighten the plug using the special tool. The maximum tightening torque is 1.5 Nm.
5. Press the socket onto the connector bracket by hand.

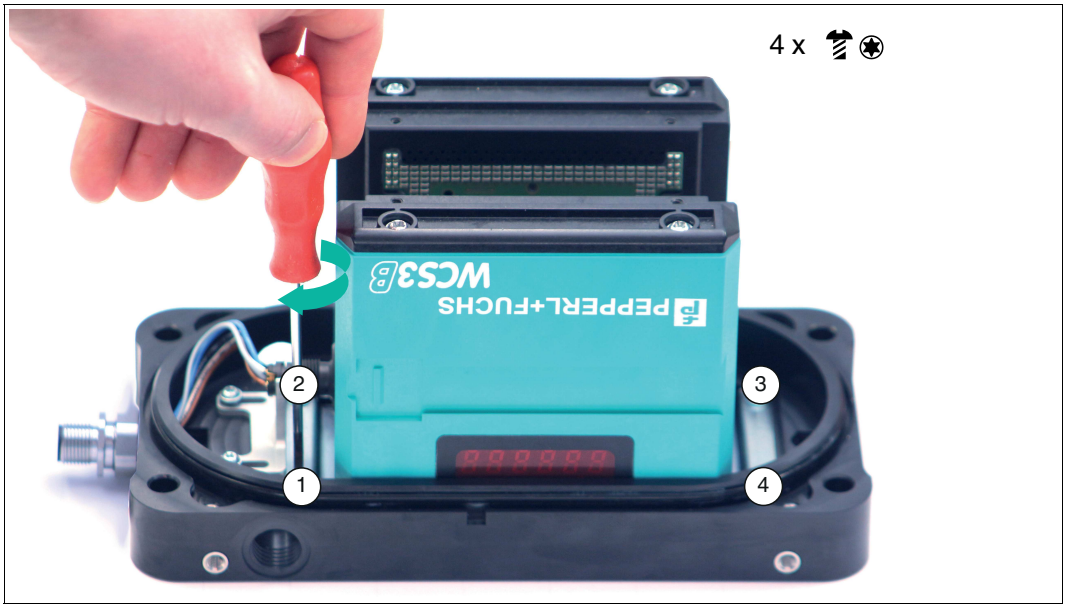


Figure 4.6 Attaching the mounting base

6. Secure the mounting base to the protective lid with four self-tapping screws (galvanized). The maximum tightening torque is 0.7 Nm.
7. Loosen the two fastening screws of the connector bracket by half a revolution each to move the bracket. Move the metal fixture with the socket in the direction of the read head until the socket is connected to the read head. The connector bracket secures the connection between the read head and the socket.
8. Fix the mounting bracket in place with two screws. The maximum tightening torque is 0.7 Nm.

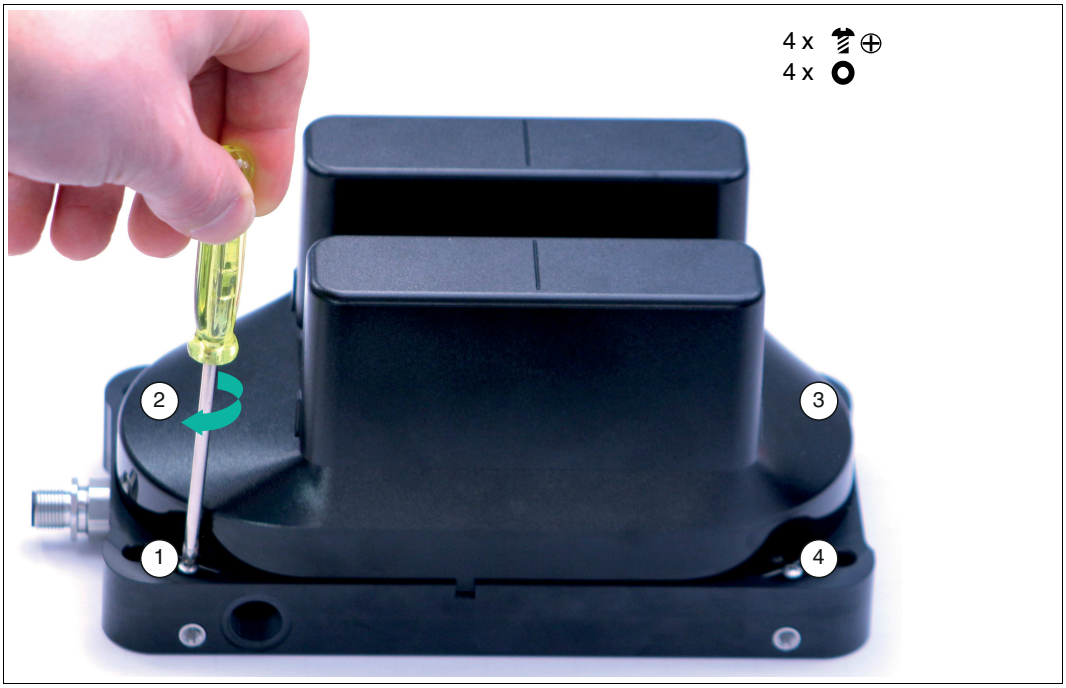


Figure 4.7 Mounting the protective cover

9. Secure the protective cover to the protective lid with four stainless steel screws and four washers. The maximum tightening torque is 1 Nm.
10. Tighten the stopping plugs on the two unused interfaces using the special tool.
11. Tighten the pressure relief plugs in the opposite end of the protective lid using the special tool.

Tip

If you have mounted the protective enclosure completely, you will still be able to see the status LEDs on the front of the enclosure. The green LED lights up if the read head is supplied with power. If the code rail is outside the read range of the read head, the red LED flashes. As soon as the code rail returns to the gap of the read head, the red LED goes out. If the red LED lights up and stays on, there is an internal diagnostic error. The yellow LED lights up when data is being transferred to the device.

If your read head has the seven-segment display, you can read the position status on the side of the enclosure.

Ordering Information

The WCS3B read head with the options -OM, -OL, and -OR are delivered pre-assembled with the outdoor protection enclosure:

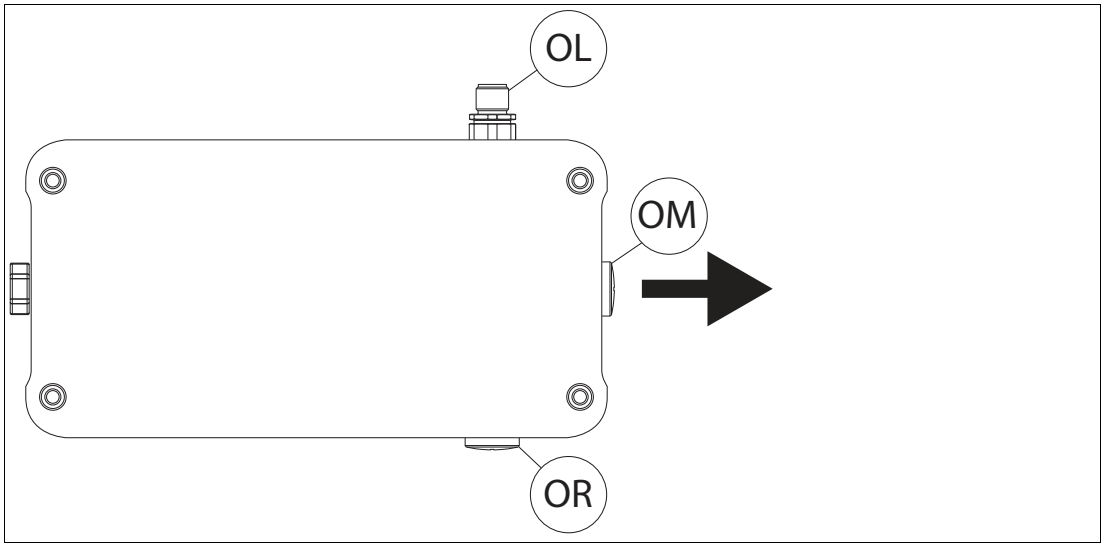


Figure 4.8 Outdoor protective enclosure cable outlet

The options -OM, -OL, and -OR describe the direction of the connector in relation to the nominal direction of travel of the read head. The read head plug always points in the direction of the ascending position of the code rail. The orientation of the plug can also be modified or converted retrospectively. Stopping plugs (WCS3B-OBP) are available for closing unused connections.

Description	Product name
WCS3B-Outdoor protective enclosure Retrofit kit for WCS3B read heads	WCS3B-OPH
WCS3B protective cover Replaces damaged protective covers	WCS3B-OPC
V4A stainless steel stopping plugs for outdoor protection enclosure	WCS3B-OBP
Read head with PROFINET interface, with protective enclosure, central cable outlet, with optional heating	WCS3B-LS610H-OM
Read head with PROFINET interface, with protective enclosure, central cable outlet	WCS3B-LS610-OM
Read head with EtherNet/IP interface, with protective enclosure, central cable outlet, with optional heating	WCS3B-LS510H-OM
Read head with EtherNet/IP interface, with protective enclosure, central cable outlet, with optional display, with optional heating	WCS3B-LS510DH-OM
Read head with RS–485 interface with protective enclosure, central cable outlet, with optional heating	WCS3B-LS221H-OM
Read head with RS–485 interface with protective enclosure, left-hand-side cable outlet, with optional heating	WCS3B-LS221H-OL
Read head with RS–485 interface with protective enclosure, right-hand-side cable outlet, with optional heating	WCS3B-LS221H-OR
Read head with SSI interface with protective enclosure, right-hand-side cable outlet, with optional display, with optional heating	WCS3B-LS311DH-OM

Note

Details for other variants are available online at www.pepperl-fuchs.com and on request.

4.4 Mounting the Outdoor Protective Enclosure

Warning!

Improper mounting

Risk of injury if mounted improperly

- Ensure you have sufficient space before starting work.
- Take care when using sharp-edged components and always wear safety gloves.
- Ensure that suspended components cannot fall before mounting.

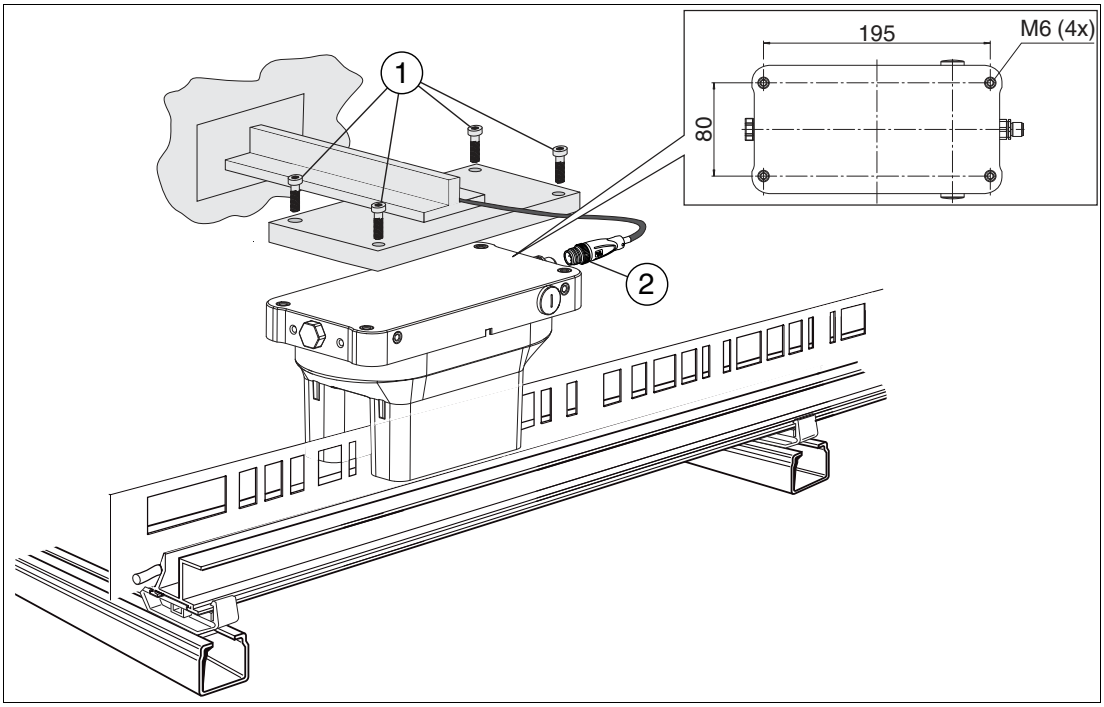


Figure 4.9 Overview

Note

Mounting Direction

Mount the read head so that the electrical connector plug points in the direction of the ascending position values on the code rail.

Tip

Mounting

Plan elongated holes in the design of the fixture for your plant (for dimensions, see the figure above).

Mounting and Dismounting the Outdoor Protective Enclosure

1. Attach the outdoor protective enclosure to your plant using M6 screws (1). The maximum torque is 6 Nm.

   Note

   We recommend using corrosion-resistant stainless steel screws (A2/8.8).

2. Connect the connector plug to the socket of the outdoor protection enclosure.
3. Disconnect the connector plug when dismounting.
4. Loosen the four screws on the outdoor protective enclosure.

5 Code Rail

5.1 Introduction

The absolute code rail is different for the WCS2 system and WCS3 system Therefore, the code rail cannot be swapped between the two systems. For WCS3, the height of the code rail is always 70 mm; for WCS2, the rail can be supplied at a height of 55 mm or 70 mm. Two different materials that have proven successful in practice are available for the code rail: plastic laminate and stainless steel. The code rail is delivered in a coil. Unless otherwise ordered, the code rail always starts with the position value 0.

5.2 Overview

Laminate Code Rail

The black laminate code rail is made from a special polyester laminate. It has excellent physical and chemical properties, as well as a low intrinsic weight. The material has a high tensile strength and behaves neutrally to oils, greases, and solvents. Because of its good resistance to acids, alkalis, and aggressive gases, the laminate code rail is suitable for use in electroplating. The laminate code rail is delivered with mounting holes as standard (WCS3-CS70-L1, see also the drawing below). If you use a bracket system to mount the code rail, use of a code rail without mounting holes is recommended (WCS3-CS70-L0).

The laminate code rail can be used in a temperature range from -40 °C – 60 °C. Temperatures above 70 °C lead to material deformation.

The specific thermal expansion coefficient is approximately 2.8 x 10^{-5} K^{-1}.

Due to its material properties, the laminate code rail must not be mounted at temperatures below 10 °C. In applications with large temperature fluctuations (> 50 K), we recommend the use of the stainless steel code rail.



Warning!

Sanding dust

When mounting the laminate code rail, make sure that sanding dust from current collectors cannot fall directly onto the surface of the code rail. When mounting the laminate code rail on the side, mount it above the sanding lines.

Stainless Steel Code Rail

The stainless steel code rail is made from corrosion-resistant spring steel. It is rust-free and is characterized by high mechanical stability and low thermal expansion.

The stainless steel code rail can be used in the temperature range -40 °C – 100 °C.

The specific thermal expansion coefficient is 1.6 x 10^{-5} K^{-1}.

WCS2 Code Rail

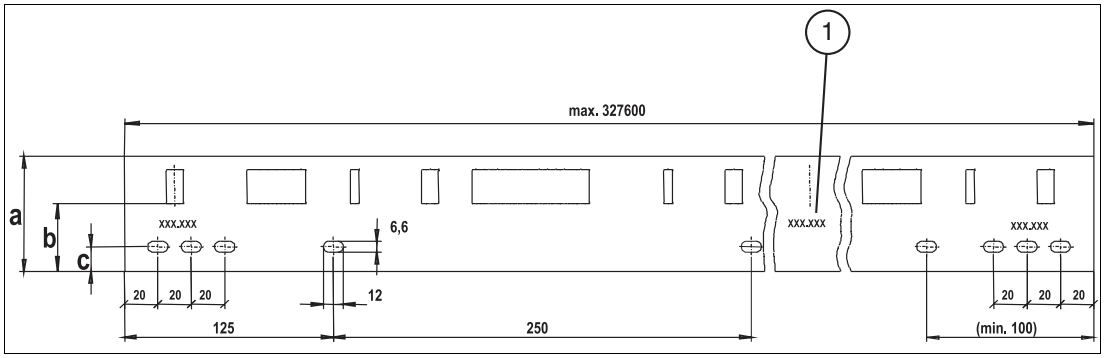


Figure 5.1 WCS2 code rail

1. 6-digit position identifier

Product name	Description	Dimensions [mm]
WCS2-CS55-L1	Laminate, hole 1	a: 55 b: 25 c: 7.5
WCS2-CS55-M1	Stainless steel, hole 1	a: 55 b: 25 c: 7.5
WCS2-CS70-L1	Laminate, hole 1	a: 70 b: 41 c: 15
WCS2-CS70-M1	Stainless steel, hole 1	a: 70 b: 41 c: 15

WCS3 Code Rail

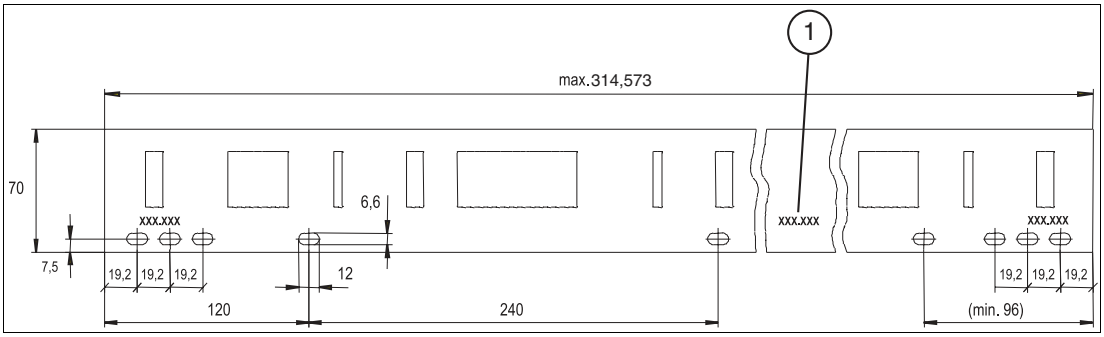


Figure 5.2 WCS3 code rail

1. 6-digit position identifier

Product name	Description
WCS3-CS70-L1	Laminate, hole 1
WCS3-CS70-M1	Stainless steel, hole 1
WCS3-CS70-L0	Laminate, no hole
WCS3-CS70-L2	Laminate, Vahle VKS hole

5.3 Identification via ID-Pads

In applications where the vehicle number is recognized in the plant, special code rail units known as ID-pads are available for the WCS3 system. In these applications, the read head is generally mounted in a fixed position. The ID-pads mounted on the chassis pass through the read head at certain points in the plant. The control panel can use the position value read by the read head to calculate the integer vehicle number based on a formula. In total, 1260 different ID-pads are available.

Vehicle number = INT((WCS position value - 30) / 312) + 1

In addition to the calculation of the vehicle number, the position value determined by the read head enables fine positioning of the ID-pad in the read head gap and thus exact positioning of the vehicle.

ID-pad WCS3-ID70-*1

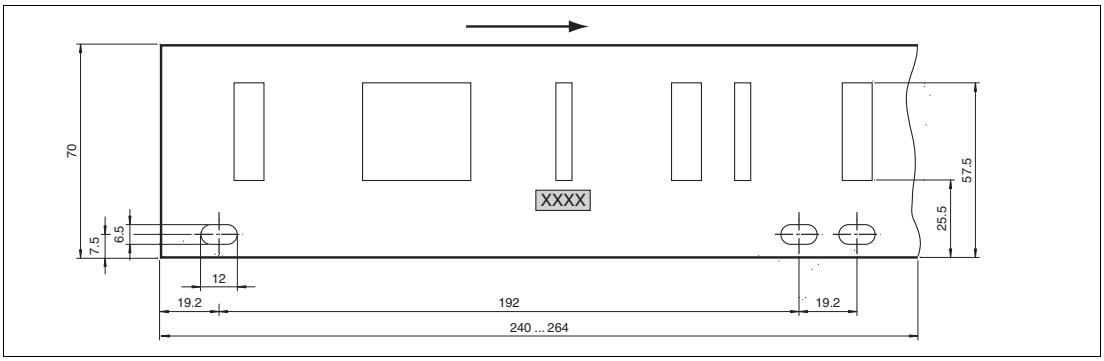


Figure 5.3 ID-pads with the numbers 0001 – 1260, XXXX corresponds to the number on the pad

Designation	Part number	Material
WCS3-ID70-M1[1)]	184073	Stainless steel
WCS3-ID70-L1[1)]	184761	Laminate

[1)]: When ordering, specify the desired ID-pad number

2019-11

PEPPERL+FUCHS

6 Mounting the Code Rail

6.1 Introduction

With continuous position measurement for a route, you have to mount the code rail in one piece. Depending on the operational conditions, there are various options for securing the code rail:

- Mounting bracket
- WCS3 aluminum profile rail
- WCS2 aluminum profile rail for simultaneous accommodation of the WCS2 guide trolley and WCS3 with outdoor enclosure



Warning!

Improper mounting

Risk of injury if mounted improperly

- Ensure you have sufficient space before starting work.
- Take care when using sharp-edged components and always wear safety gloves.
- Ensure that suspended components cannot fall before mounting.



Warning!

Insufficient grounding can result in electrical accidents and property damage.

If the code rail is not properly grounded, this can result in potential equalization currents. These currents may injure operating personnel or cause property damage.

When installing a code rail made from laminate or stainless steel, make sure that the code rail is connected with the plant potential every 30 m with low resistance.

6.2 Installation Notes

Mounting Position

The mounting position of the code rail is arbitrary. When mounting the code rail, make sure that all mounting brackets and rail holders of the profile system are at one level. The surface on which the mounting brackets and rail holders are mounted must be level.

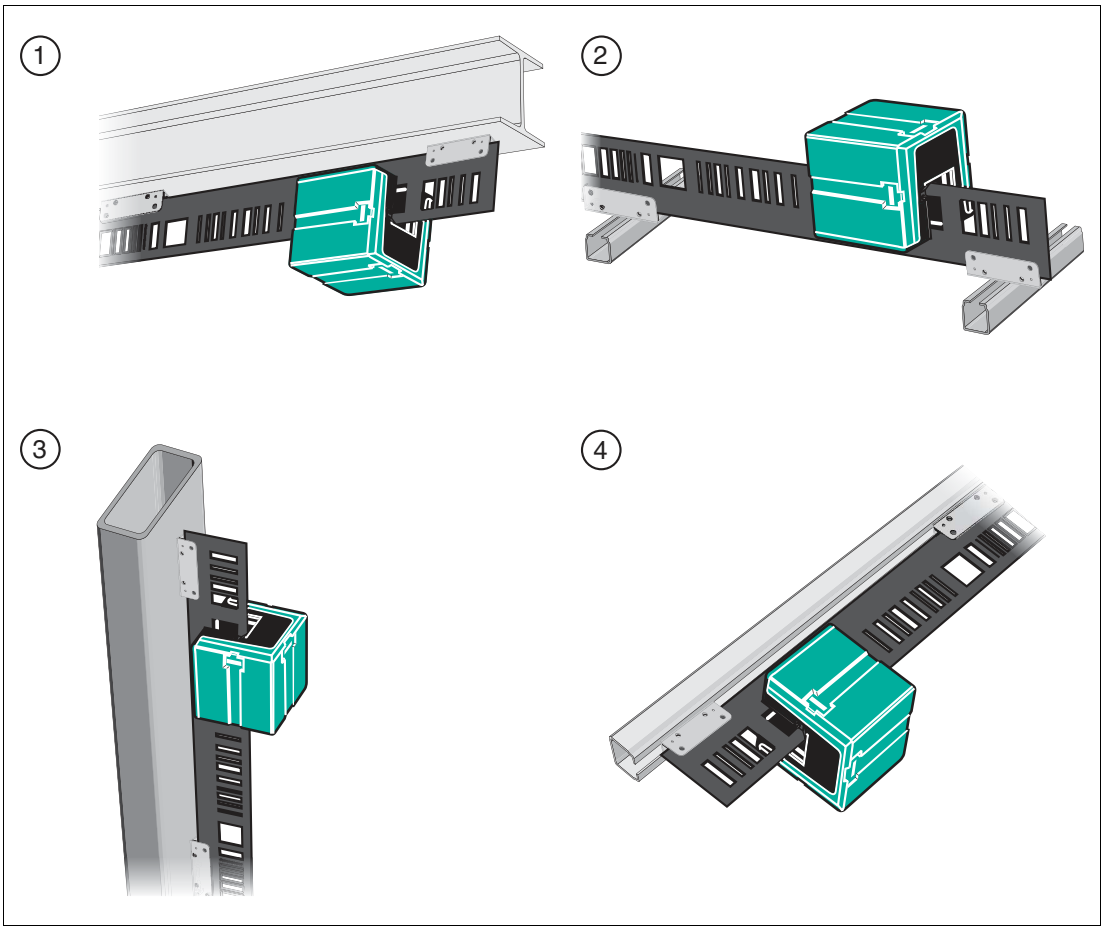


Figure 6.1 Mounting positions with mounting brackets (mounting positions also apply when mounting using the aluminum profile system)

1 Mounting on a ceiling

2 Horizontal mounting

3 Vertical or suspended mounting

4 Lateral mounting on a wall

Note

Outdoor use

If using the WCS system outdoors, we recommend mounting the aluminum profile rails horizontally. This will allow dirt and snow to fall down rather than collecting in the read head gap.

6.2.1 Mounting the Code Rail on a Straight Route

Mounting the Code Rail—Straight Route

1. Mount the mounting brackets at an offset of max. 1.25 m along the route on the substructure.
2. Align the mounting brackets.
3. Slide the code rail up to the stop in each bracket.
4. Tension the code rail by pulling on the free end.
5. Clamp the code rail securely into the bracket by tightening the two M6 x 12 hexagonal screws.

Note

Tightening torque:
For laminate code rail: max. 8 Nm
For stainless steel code rail: max. 5 Nm

↳ When mounted correctly, the tensioning force on the brackets is so great that the code rail can no longer be pulled out of the bracket.

Tip

In addition to clamping, you can screw the code rail to the bracket. To do so, use the top two free holes (M6) of the bracket. Screwing the rail to the bracket creates a fixed point between the code rail and the substructure.

The screws for the fixed point are not included in the scope of delivery.

The use of C profiles is advantageous for bracket mounting. They are arranged lengthwise or crosswise to the intended route. The brackets for mounting in C profile can be easily secured to them and aligned.

Example

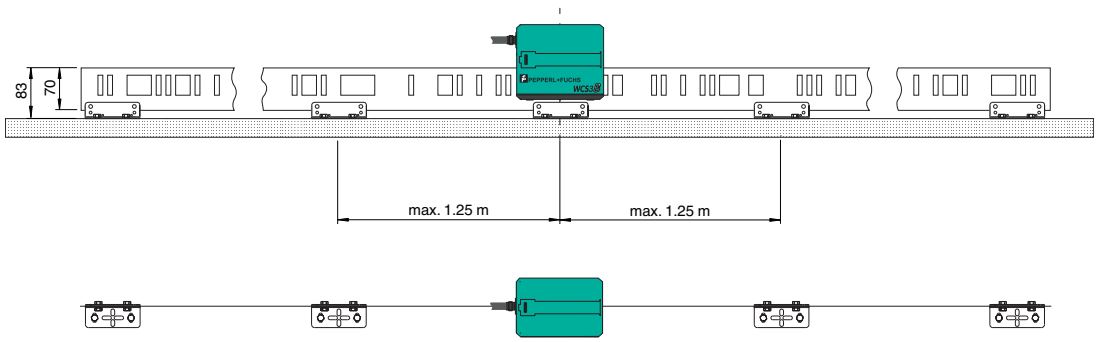


Figure 6.2 Application example: mounting brackets, straight

6.2.2 Mounting in Horizontal Curves

A horizontal curve is a curve to the left/right. The wide read head gap of the WCS3 read head allows for the smallest curve radii of 300 mm in conjunction with the mounting bracket system. When using the WCS2 and WCS3 read head with guide trolleys, the curve radii are limited by the dimensions of the guide trolley.

Curve Radius

Read head and mounting system	Horizontal curve radius
WCS3	> 300 mm
WCS3-Outdoor	> 300 mm
WCS2	> 500 mm
WCS2 with guide trolley	> 1000 mm
WCS3-Outdoor with guide trolley	Not possible

To create curves, the mounting brackets for curves are used together with a special WCS-SP2 stabilizing profile. The stabilizing profile is delivered in a bundle in the length ordered.

Note

The curve brackets are designed so that there is no height or transverse offset of the code rail in the transition from the straight section into the curve.

Mounting the Code Rail—Curve

1. Mount the curve brackets tangentially along the bend of the arc or curve at an offset of max. 0.7 mm.
2. Cut the WCS-SP2 stabilizing profile to the length of the arc or curve.
3. Insert the stabilizing profile into the curve bracket.
4. Press the code rail completely into the groove of the stabilizing profile.
5. Using the M4 hexagon socket head clamping screws, securely clamp the code rail together with the stabilizing profile into the curve brackets.
6. Lock the code rail together with the stabilizing profile using the self-tapping screws supplied.

2019-11

Application Example

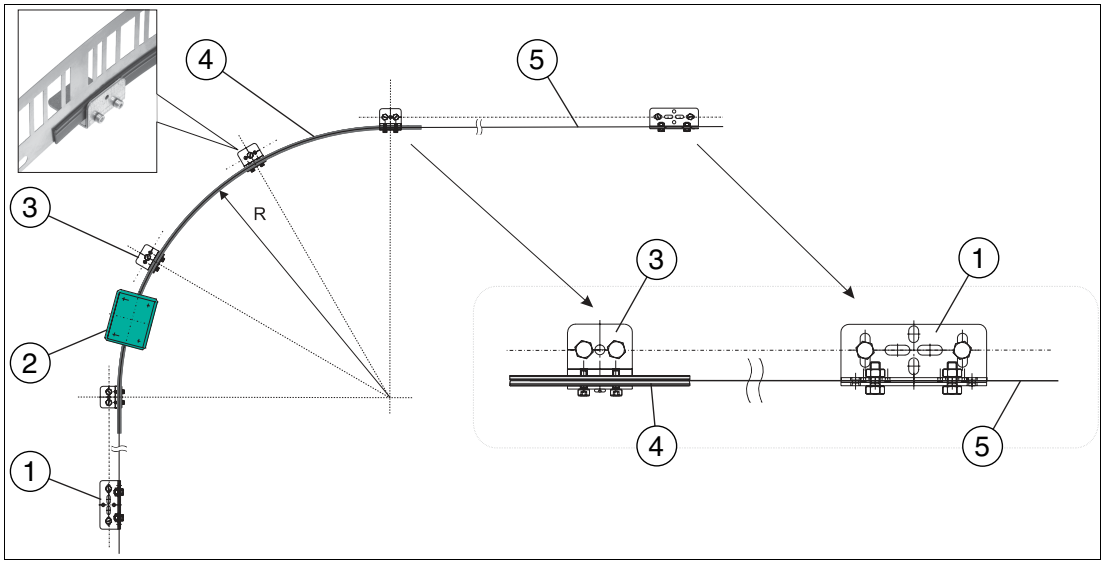


Figure 6.3 Application example: mounting brackets, straight section, and curve

1 Mounting bracket
2 Read head
3 Curve bracket
4 Stabilizing profile
5 Code rail
R Curve radius

Note

Circular Path

Note the following special features of a closed route (circular path, oval, etc.): due to the operating mode of the WCS, you cannot route the code rail continuously along the entire circuit.

Maintain an offset of at least 85 mm between the beginning and the end of the code rail (see chapter 6.2.4). Where the code rail is interrupted, the control panel receives the value "OUT"—read head outside the code rail—from the read head. Using two consecutive staggered heads enables continuous route information at all points of the circular path. In this case, when it receives the "OUT" message, the control panel switches to the position value of the second read head.

6.2.3 Mounting in Vertical Curves

In addition to horizontal curves, vertical curves are required to create inclines/declines.

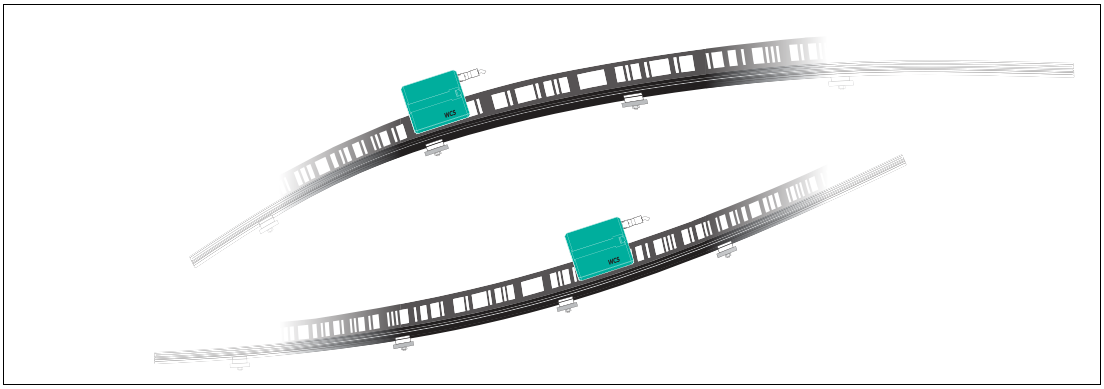


Figure 6.4 Vertical curves

Vertical curves up to a minimum radius of 4 m can be created with the aluminum profile in conjunction with the laminate code rail.

Routing Vertical Curves

1. Mount the required rail holder along the desired route.
2. Carefully bend the required aluminum profiles into the corresponding radius > 4 m.
3. Engage the aluminum profiles in the rail holders.
4. Cut into the required code rail from the beginning to the end of the curve at intervals of approximately 50 mm.

Note

Make sure that you cut into the code rail from below, i.e., from the wider side up into the code window. Cut a small triangle off from each cut to prevent the code rail from overlapping in the aluminum profile.

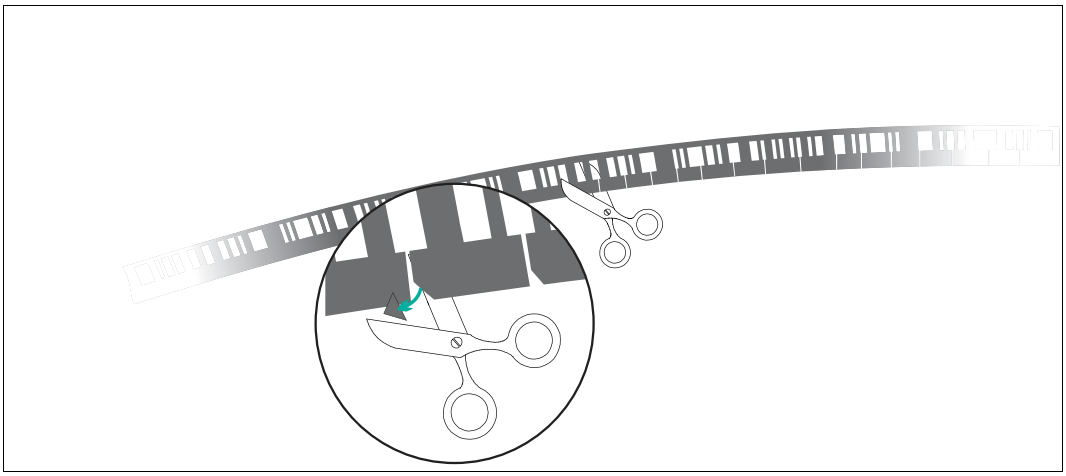


Figure 6.5 Cutting the code rail

5. Insert the code rail into the aluminum profile together with the fixing cord. Secure the code rail with the fixing cord in the aluminum profile rail using the mounting tool (see chapter 6.4.5).

2019-11

6.2.4 Interruptions in the Profile Rail

In some applications, it is necessary to interrupt the course of the code rail, e.g., for crane crossings, for fire protection gates, or for large expansion joints in buildings.

The principle of the WCS allows for interruptions in the code rail. A **minimum distance of 85 mm** must be maintained between each pair of code rail segments for the interruption. The read head recognizes when it leaves the code rail and reports "OUT" to the control panel.

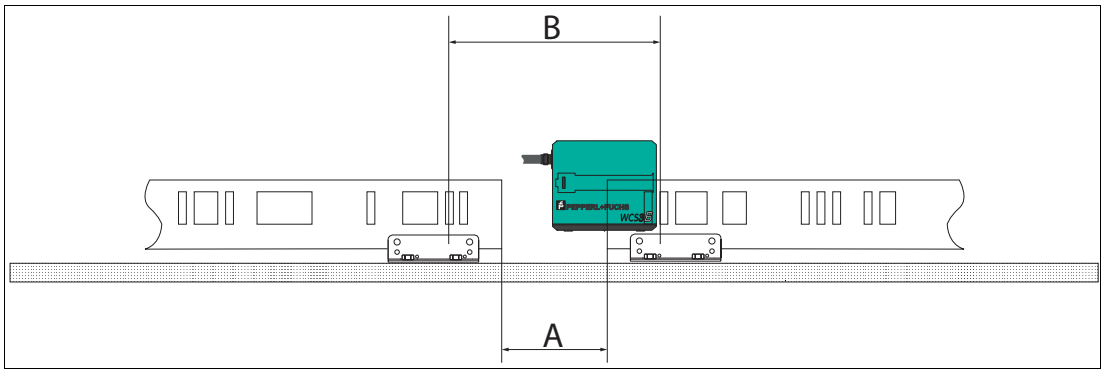


Figure 6.6 An interruption in the code rail

The length of the read head results in a section without valid position values when the code rail is interrupted. This section is calculated as follows: **B = A + 160 mm**

Note

Make sure that interruptions in the code rail are **at least 85 mm** and the two code rail parts are aligned.

The maximum distance from one end of an aluminum profile rail to the next rail holder must not be larger than 50 mm.

Example

In principle, branches of multiple segments or track switches can also be realized with WCS. Make sure that there is a minimum distance of 85 mm between the code rail segments.

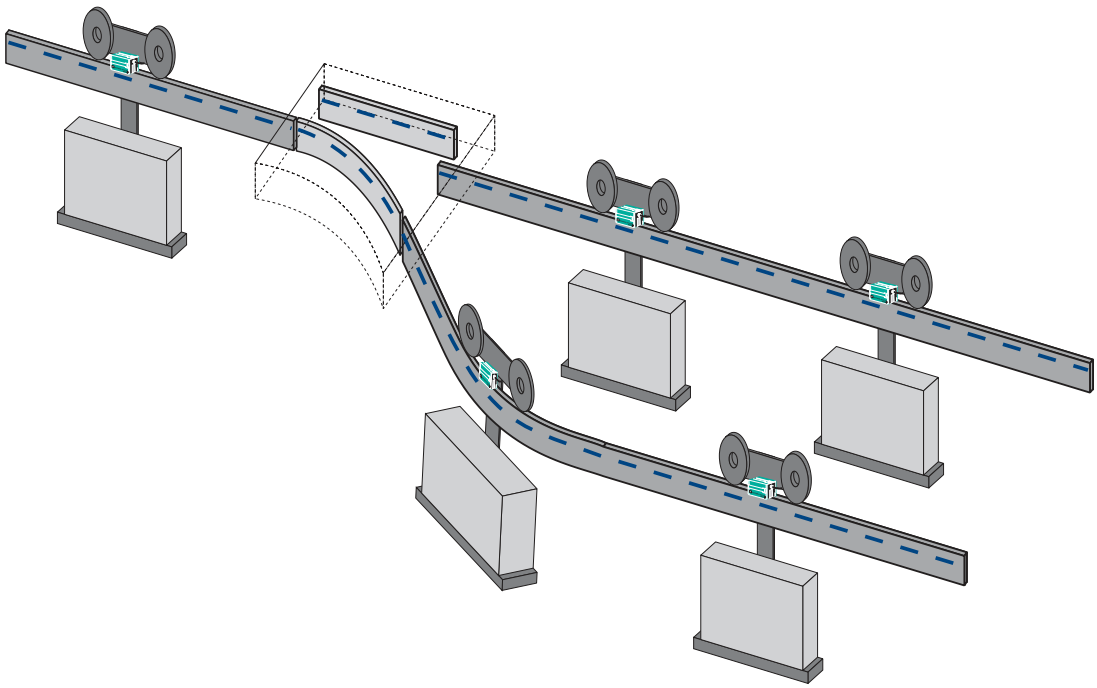


Figure 6.7 Overhead conveyor example

6.3 Mounting the Code Rail with Mounting Brackets

6.3.1 Introduction

The bracket system is an easy way to mount laminate or stainless steel code rails. It consists of brackets for routing the code rail in straight sections, as well as brackets for routing the code rail in curves and circular paths. The brackets are made from galvanized and powder-coated sheet steel and are supplied pre-assembled. The mounting brackets for installation of the code rail can be delivered in three different versions:

- Without fastening screws
- With fastening screws
- With fastening screws for mounting in C profile rails

6.3.2 System Overview

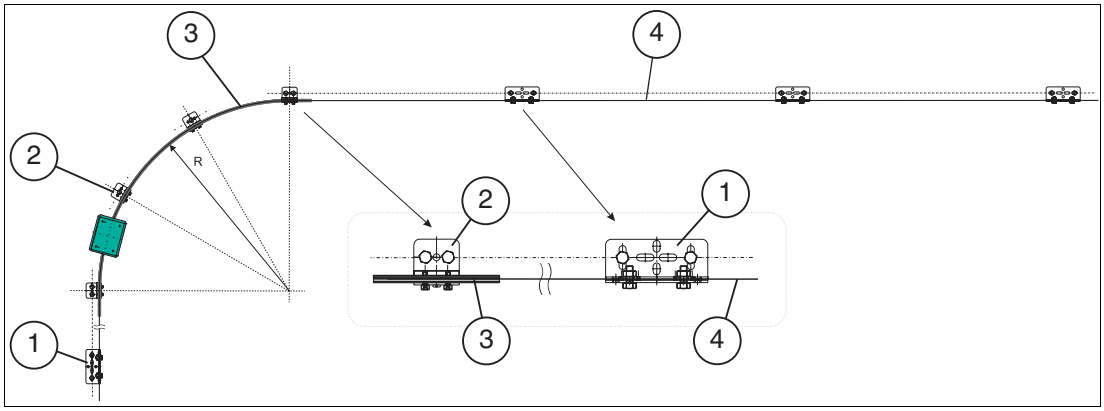
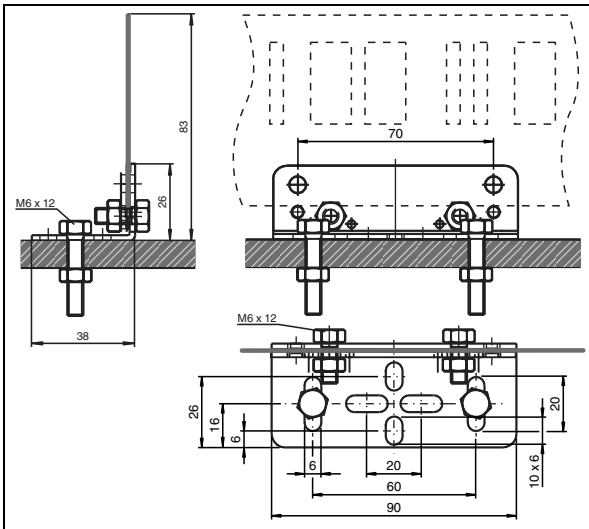


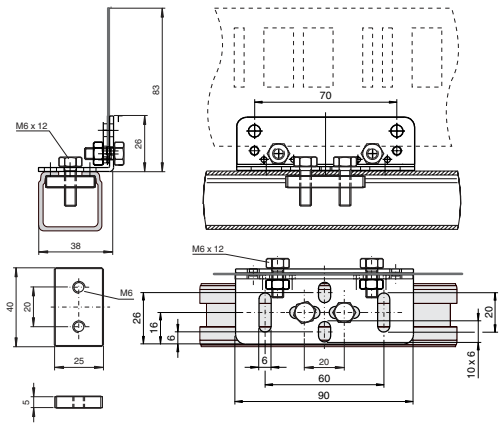
Figure 6.8 Application example: mounting brackets, straight section, and curve

Item	Designation	Product name	Note
1	Mounting bracket	WCS-MB*	Support distance, every 1.25 m
2	Curve bracket	WCS-MB*B	Support distance, every 0.5 m
3	Stabilizing profile	WCS-SP2	-
4	Code rail	WCS3-CS70	Stainless steel, laminated

Mounting Bracket for Straight Routing



WCS-MB1/WCS-MB1-C
Screw connection with M6 screws



WCS-MB2/WCS-MB2-C
Screw connection with C groove

The brackets are made from galvanized sheet steel and are supplied pre-assembled. Various versions of the mounting brackets for installation of the WCS code rail are available:

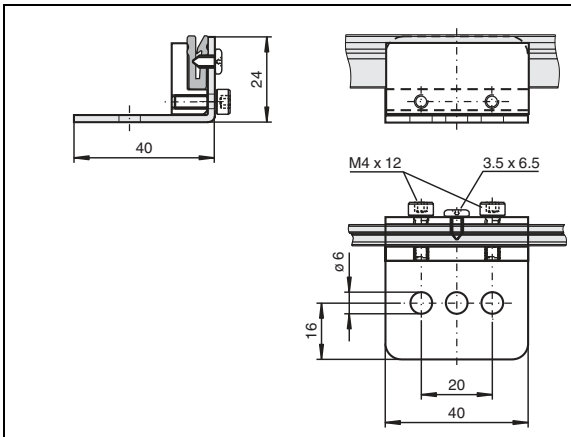
Product name	Description	Product photo
WCS-MB	Bracket for straight sections	
WCS-MB1	Bracket for straight sections With M6 screw connection	
WCS-MB2	Bracket for straight sections With C t-slide	
WCS-MB-C	Bracket for straight sections Powder-coated	
WCS-MB2-C	Powder-coated bracket for straight sections With C t-slide	

2019-11

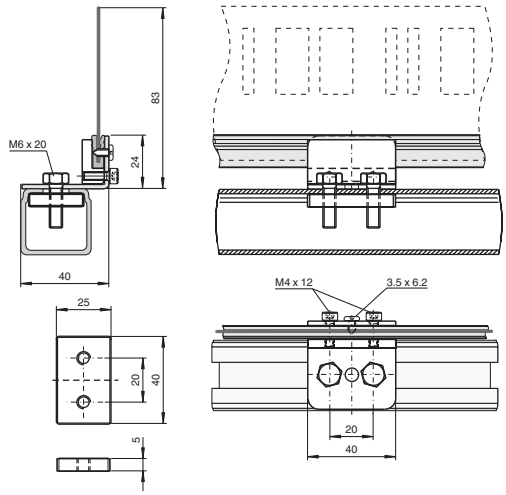
Note

The recommended support distance for straight section elements is at least one bracket every 1.25 m.

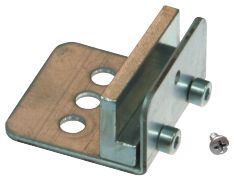
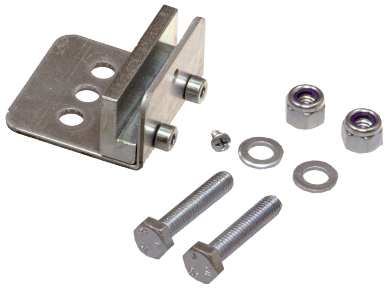
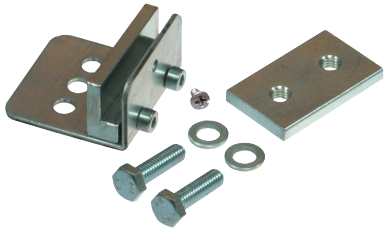
Mounting Bracket for Curves or Circular Paths

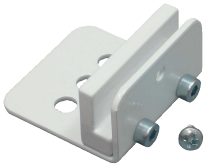
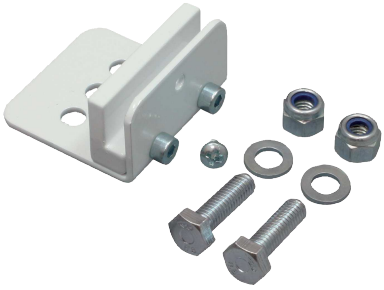
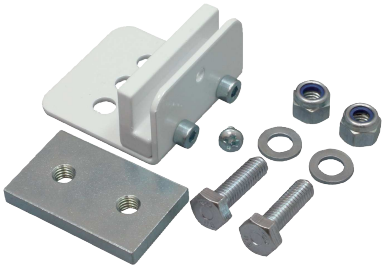
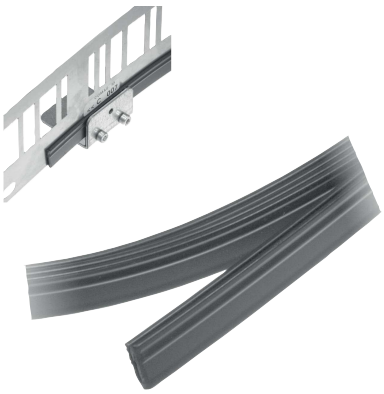


WCS-MB-B
Screw connection with M6 screws available



WCS-MB2-B
Screw connection with C groove

Product name	Description	Product photo
WCS-MB-B	Bracket for curves	
WCS-MB1-B	Bracket for curves With M6 screw connection	
WCS-MB2-B	Bracket for curves With C t-slide	

Product name	Description	Product photo
WCS-MB-B-C	Bracket for curves Powder-coated	
WCS-MB1-B-C	Bracket for curves With M6 screw connection and powder coating	
WCS-MB2-B-C	Powder-coated bracket for curves With C t-slide	
WCS-SP2	Stabilizing profile For curved sections	

Note

The recommended support distance for curves is at least one bracket every 0.5 m. A WCS-SP2 stabilizing profile must also be used in curves.

6.3.3 Attaching the Tensioning Device

Using the tensioning device prevents the stainless steel code rail from warping due to temperature fluctuations after mounting. It also makes mounting easier.

Note

Pretensioning of the stainless steel code rail is not necessary for system function.
Pretensioning is useful only if large temperature fluctuations can occur within a short time.

The tensioning device can only be used together with the stainless steel code rail.

Three mounting holes are stamped in a row at the beginning and end of the stainless steel rail. They are used for screwing on the tensioning device. There are two options for mounting the tensioning device:

1. The code rail is fastened at one end and tensioned at the other end with the tensioning device.
2. The code rail is fixed in the middle and tensioned with the tensioning device at both ends. This method is advantageous for longer distances (> 50 m).

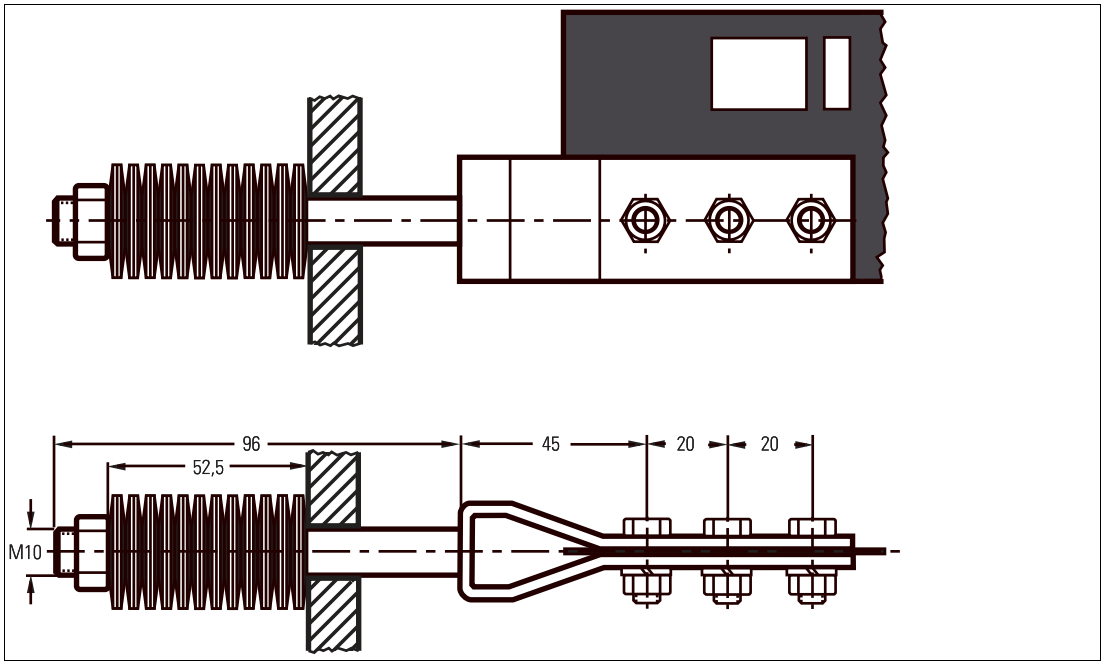


Figure 6.9 WCS-MT1 tensioning device

Stainless steel code rail	Tightening torque
WCS2B, 55 mm	6 Nm
WCS2B, 70 mm	9 Nm
WCS3B, 70 mm	7 Nm

6.4 Mounting the WCS3 Code Rail with the Aluminum Profile System

6.4.1 Introduction

A special aluminum profile system has been developed for quick mounting of the 70 mm WCS3 code rail made from plastic laminate or stainless steel. The aluminum profile is designed such that it supports the code rail. A plastic fixing cord inserted in the groove of the profile rail ensures the code rail is firmly held in place. The aluminum profile system can be mounted in any location. The profile rails are supplied in 6 m long pieces. The aluminum profile rail is powder-coated and can be supplied in curved segments on request.

Tip

For normal industrial applications, using the laminate code rail has proven successful. Alongside its cost advantages, the low weight of the code rail provides benefits during installation, in particular when installing longer sections.

For extreme operational conditions, we recommend the stainless steel code rail:

- Flying sparks in a welding shop
- Heavy contamination during operation (e.g., waste incineration)

6.4.2 System Overview

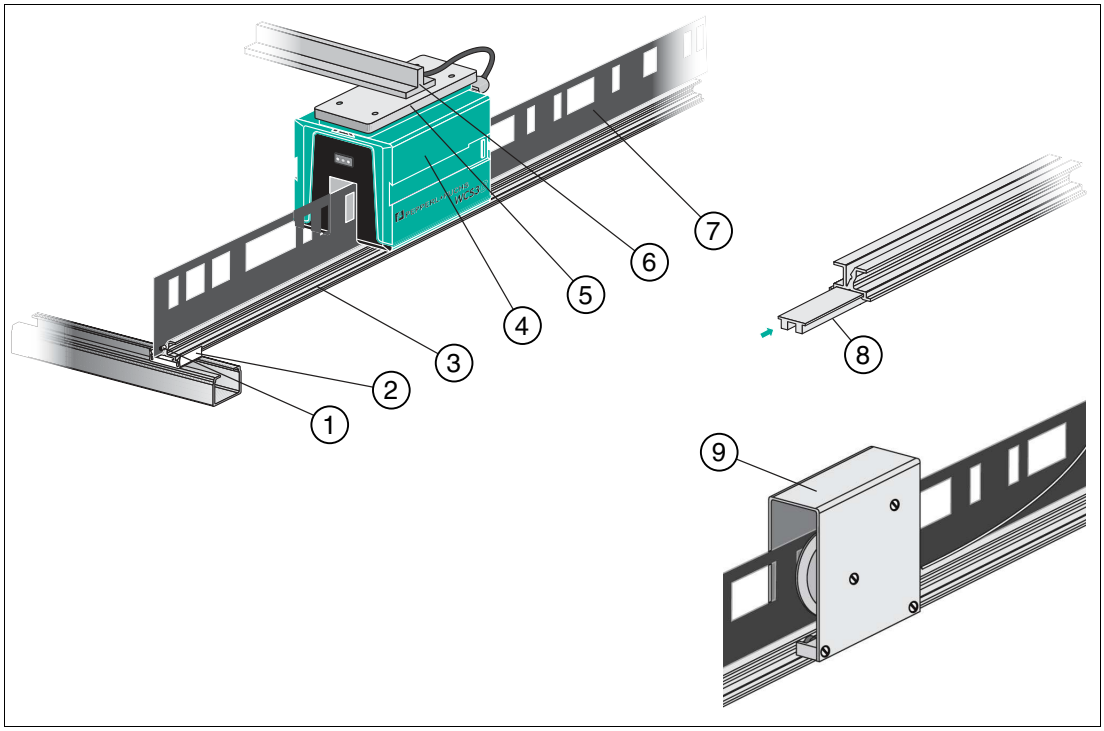


Figure 6.10 Overview

Item	Designation	Product name	Note
1	Fixing cord	WCS-MF1	-
2	Rail holder	WCS3-MH*	Support distances for perpendicular/suspended mounting: < 2.5 m, lateral mounting: < 2 m
3	Aluminum profile rail	WCS3-PS1*	Length: 2 m/6 m
4	Read head	WCS3B-LS**	-
5	Mounting base	WCS-MP1	-
6	Vehicle fixture	-	-
7	Code rail	WCS3-CS70-*	Stainless steel, laminated
8	Butt connector	WCS3-MC1	-
9	Mounting tool for fixing cord	WCS3-FT1	-

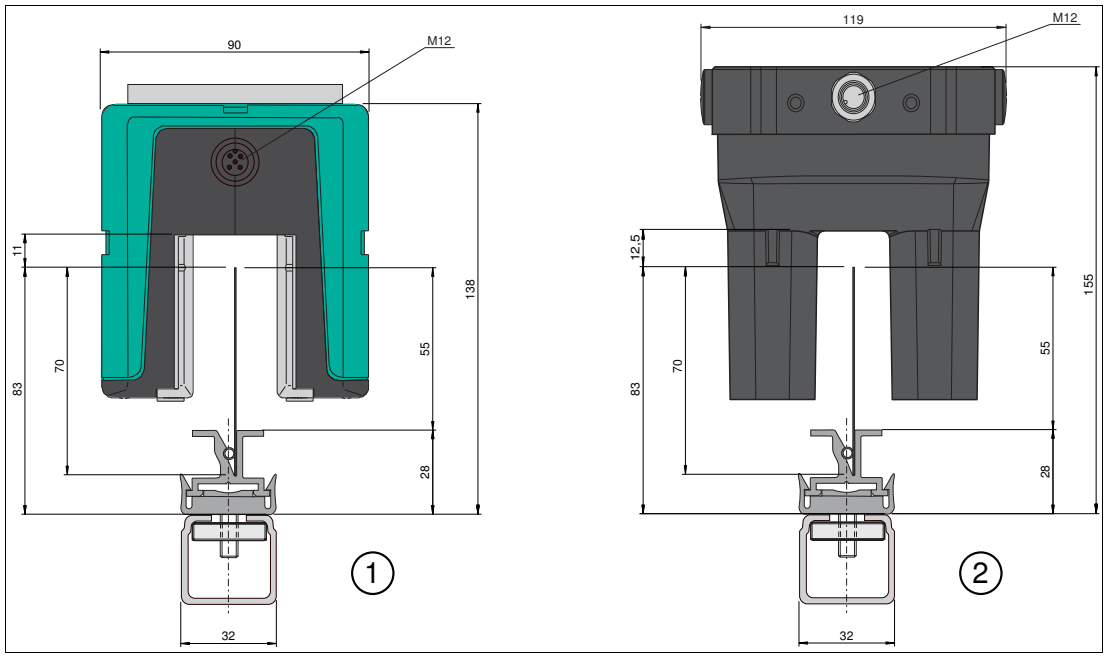
Mounting the Profile Rail

Rail holders are available for mounting the aluminum profile rail quickly. The profile rail is engaged in the rail holders. The rail holders are available in three different versions:

- Without fastening screws
- With fastening screws
- With fastening technology for mounting in C profile rails

The support distance for the profile rail must not exceed 2.5 m for perpendicular and suspended mounting. This corresponds to two to three rail holders for each 6 m rail. If the WCS3 aluminum profile system is mounted laterally, a support distance of 2 m is recommended. This corresponds to three rail holders for each 6 m rail.

Read Head with WCS3 Profile Rail



1. WCS3 profile system with rail holder mounted on C profile rail, with read head
2. WCS3 profile system with rail holder mounted on C profile rail, with outdoor protective enclosure

Rail Holder Overview

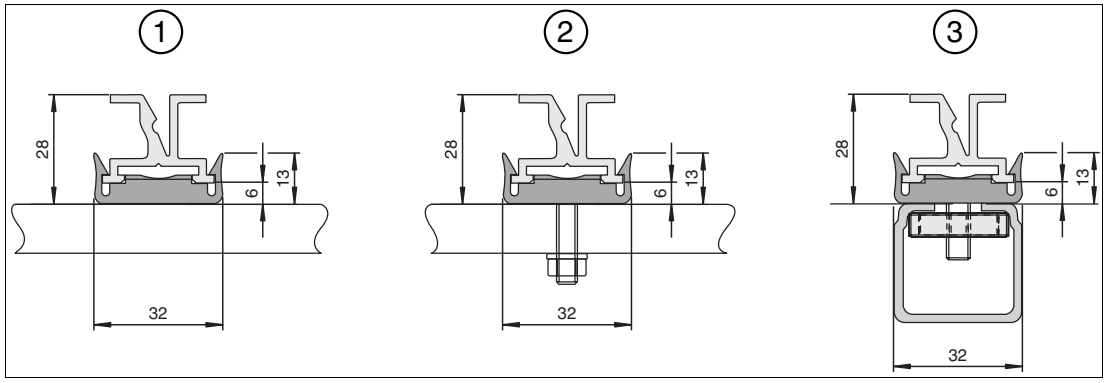


Figure 6.11 Overview

Item	Designation	Product name
1	Rail holder	WCS3-MH
2	Rail holder with screw connection	WCS3-MH1
3	Rail holder with screw connection for C profile rails	WCS3-MH2

Note

Support distance for perpendicular/suspended mounting: < 2.5 m.

Support distance for lateral mounting: < 2 m.

6.4.3 Rail Holder

Mounting the Rail Holders

1. Mount the rail holders at an offset of 2 m along the route on the substructure for a lateral mounting and 2.5 m for a perpendicular or suspended mounting.
2. Align the rail holders along a taut cord.

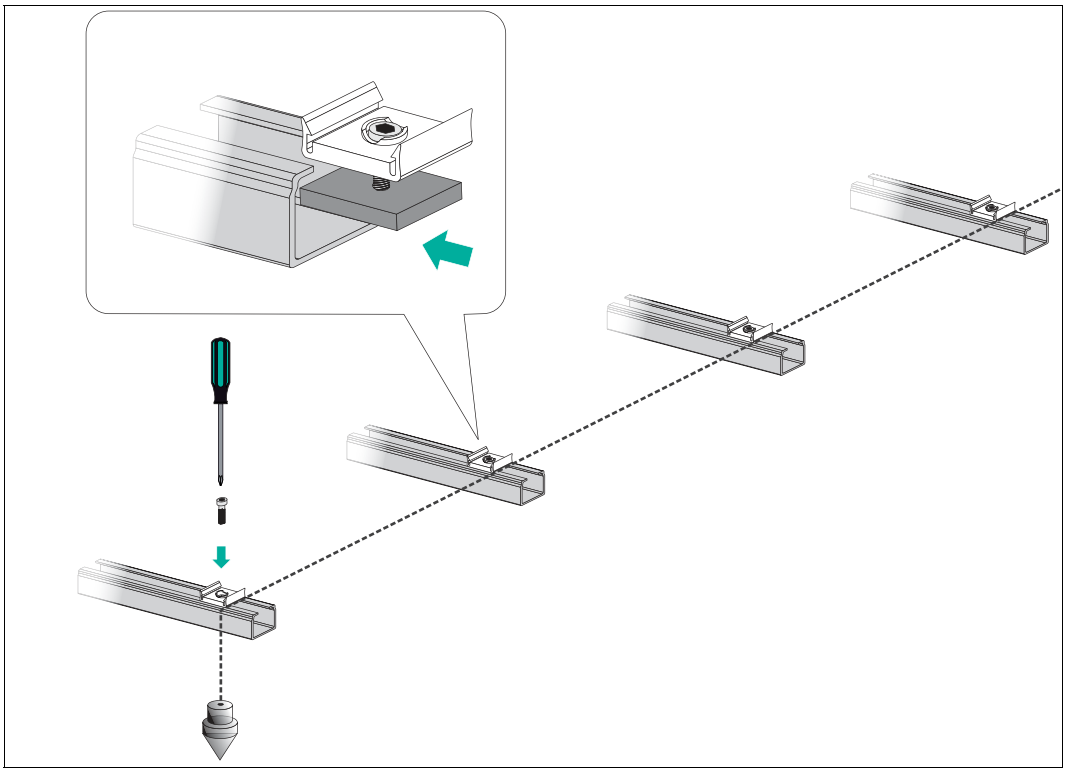


Figure 6.12 Aligning the rail holders (example for WCS3-MH2)

3. Snap the profile rail into the rail holder by pressing lightly.

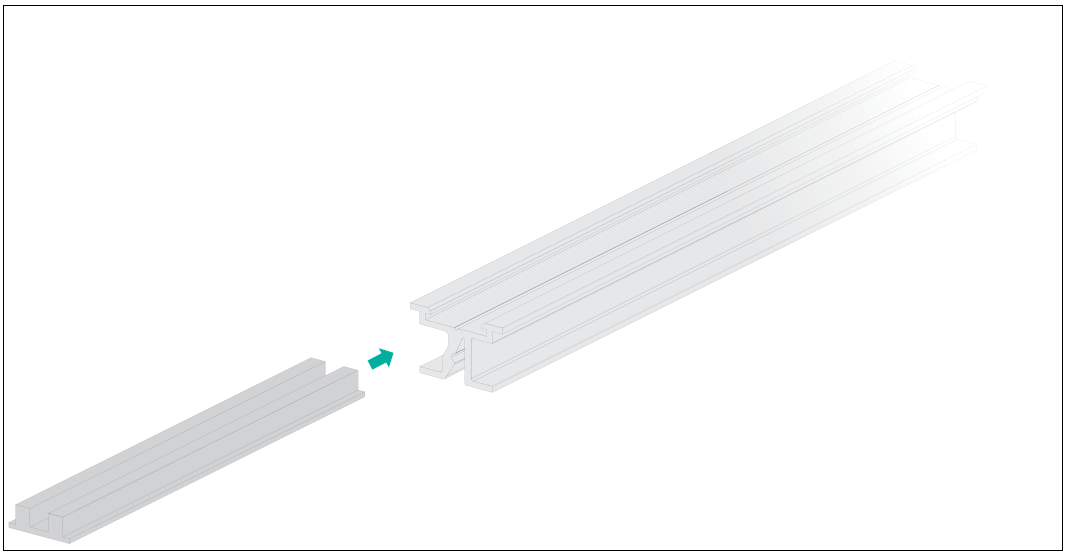
6.4.4 Butt Connectors for Profile Rails

Butt connectors are required for connecting aluminum profile rails. The WCS3-MC1 butt connector consists of a 170 mm long extruded aluminum profile and two self-tapping screws.

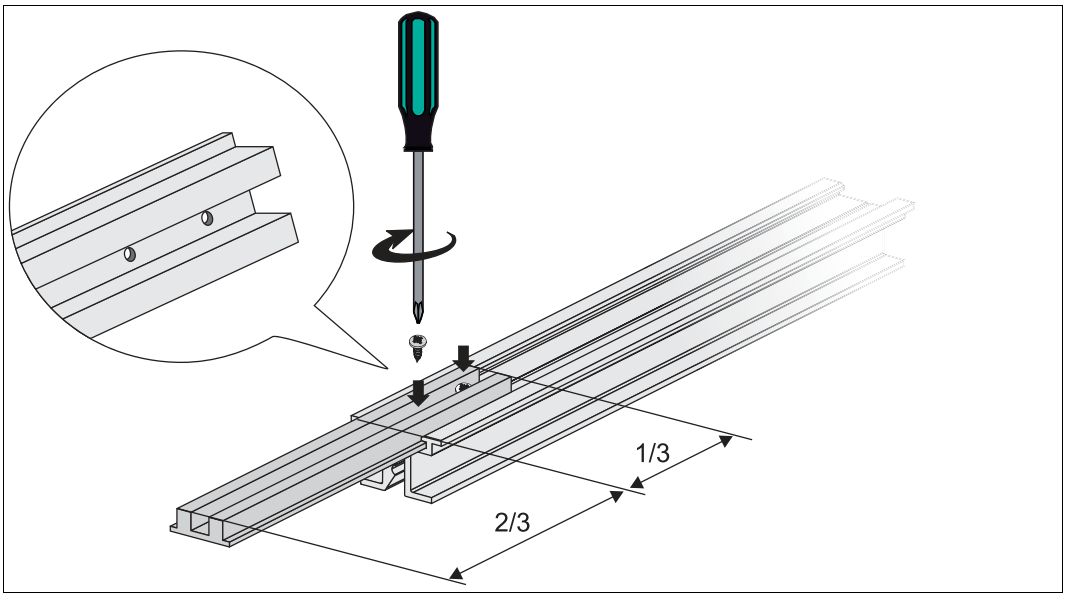
Designation	Part number	Function/use	Material/mounting
WCS3-MC1	184074	Butt connector for aluminum profile rails	Aluminum/steel self-tapping screws M3 x 4.5 mm

Mounting the Butt Connector

1. Slide the butt connector into the bottom grooves of the two profile rails that you want to connect. Push the end of the connector that has the holes in first.



2. Screw the self-tapping screws into the 1.8 mm diameter holes in the flat pieces.

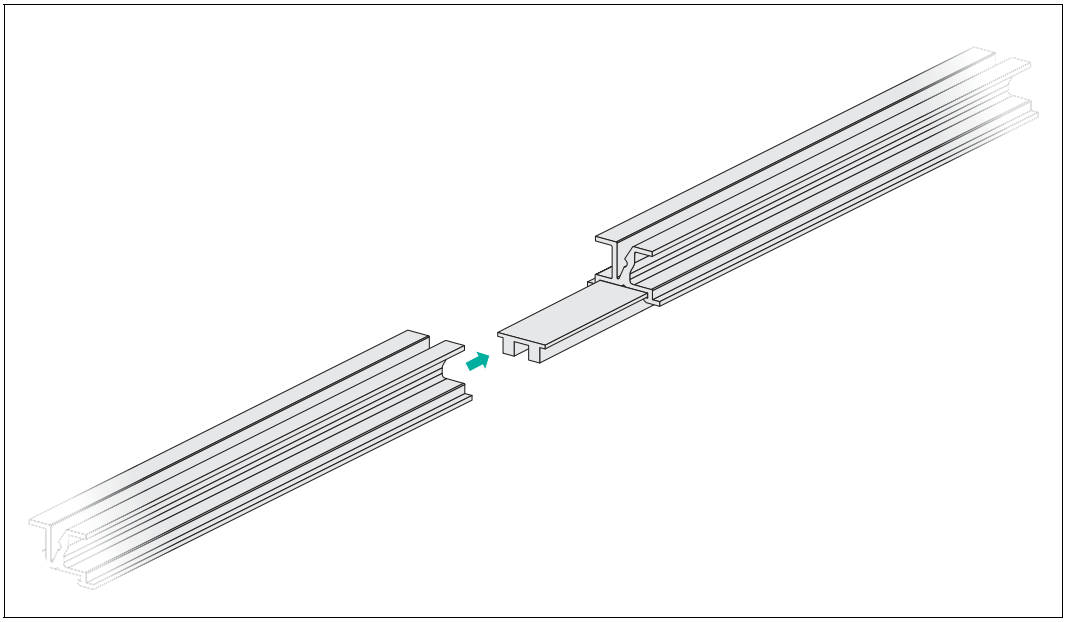


↳ The tips of the screws press into the aluminum profile and fix the butt connector in place

3. Slide the profile rails together with the butt connectors.

2019-11

PEPPERL+FUCHS



Note

When you slide the aluminum profile rails together with the butt connectors, make sure there is a gap to compensate for thermal expansion. A gap is necessary if the maximum possible operating temperature is greater than the temperature during the assembly.

Calculate the necessary gap width as follows:

Gap width in mm = 0.12 * $\Delta\vartheta$

$\Delta\vartheta = \vartheta_{\text{max. operating temp.}} - \vartheta_{\text{assembly temp.}}$

Examples:

$\Delta\vartheta$ = 10 K, gap width = 1.2 mm
$\Delta\vartheta$ = 20 K, gap width = 2.4 mm
$\Delta\vartheta$ = 30 K, gap width = 3.6 mm

6.4.5 Mounting the Code Rail

Mounting the Code Rail in the Profile Rail

1. Insert the code rail into the groove of the profile rail.

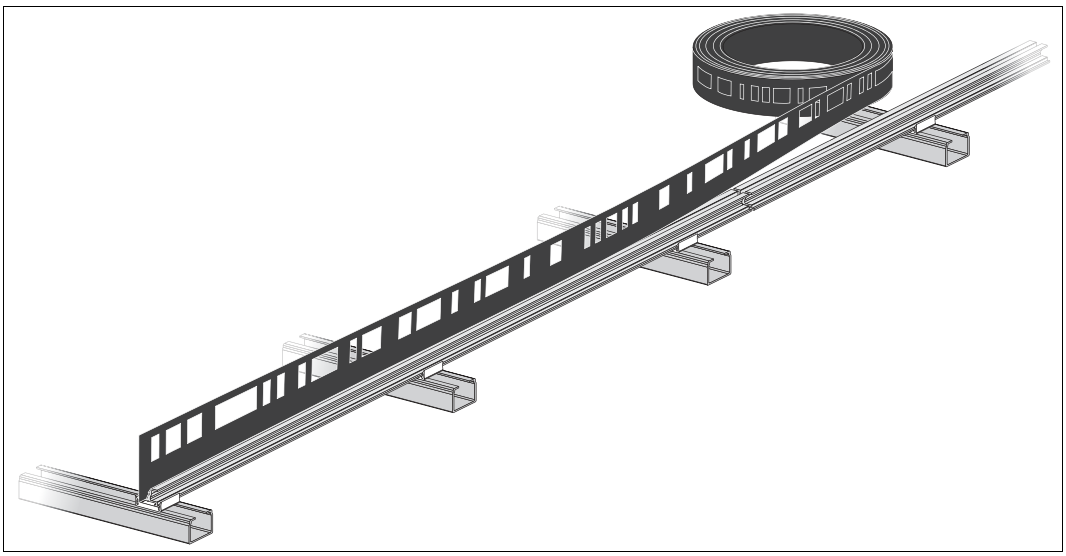


Figure 6.13 Mounting the code rail

2. Fix the code rail in place by pressing the plastic fixing cord into the groove of the profile rail and simultaneously pressing on the code rail.

Warning!

Falling components

A suspended mounting position presents a risk of injury due to falling components.

Make sure that all components are correctly installed.
Do not stand under hanging components during the mounting.

Mounting Tool (WCS3-FT1)

A special mounting tool is available for fixing the code rail in place securely and quickly. The mounting tool is recommended if the aluminum profile system is installed suspended. The tool consists of a housing with casters, similar to the guide trolley.

Mounting the Code Rail with the Mounting Tool

1. Insert the code rail into the groove of the profile rail.
2. Place the plastic fixing cord on the groove of the profile rail.
3. Pull the mounting tool over the profile rail.

   ↳ The code rail is held in position by the guide roller and contact pressure roller.
   The fixing cord is pressed into the groove of the profile rail by the pressing wheel.
4. Move the mounting tool back and forth on the profile rail.

2019-11

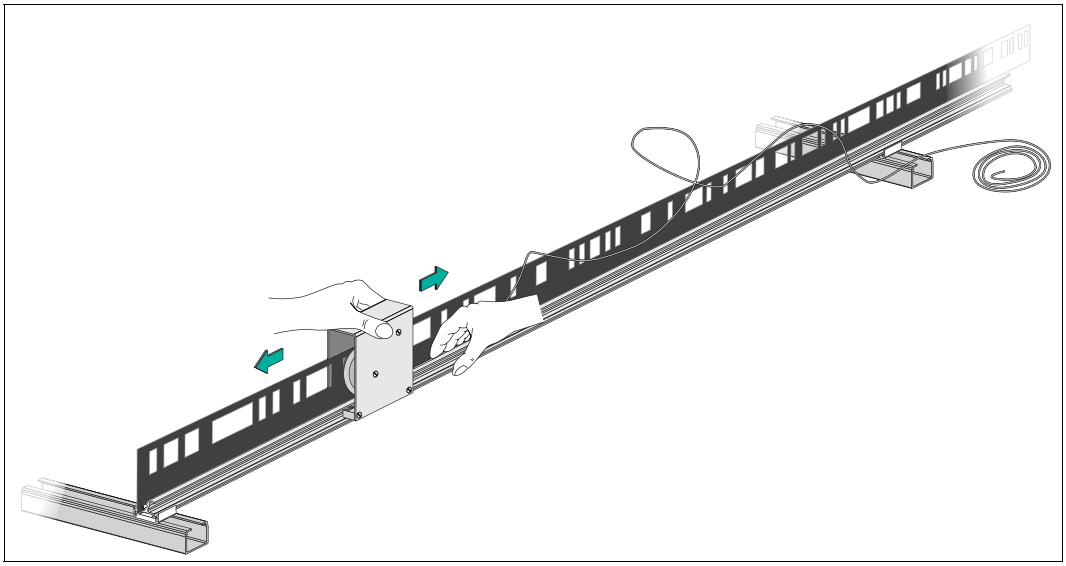


Figure 6.14 Mounting tool

↳ This ensures that the fixing cord sits correctly in the groove.
The contact pressure of the fixing cord is so great that the code rail cannot slip out of the profile rail even when it is mounted suspended.

Note

As part of regular plant maintenance, check that the fixing cord and code rail are securely in place, especially if the profile rail is mounted suspended.

6.4.6 Fixed Points

To prevent the aluminum profile rails slipping in the rail holders when mounted horizontally, the profile must be securely connected to the substructure.

Positioning a Fixed Point

1. Position a fixed point in the middle of the section that you want to fix in place.
2. Pierce the rail holder on both sides with a metal drill with 1.8 mm diameter.

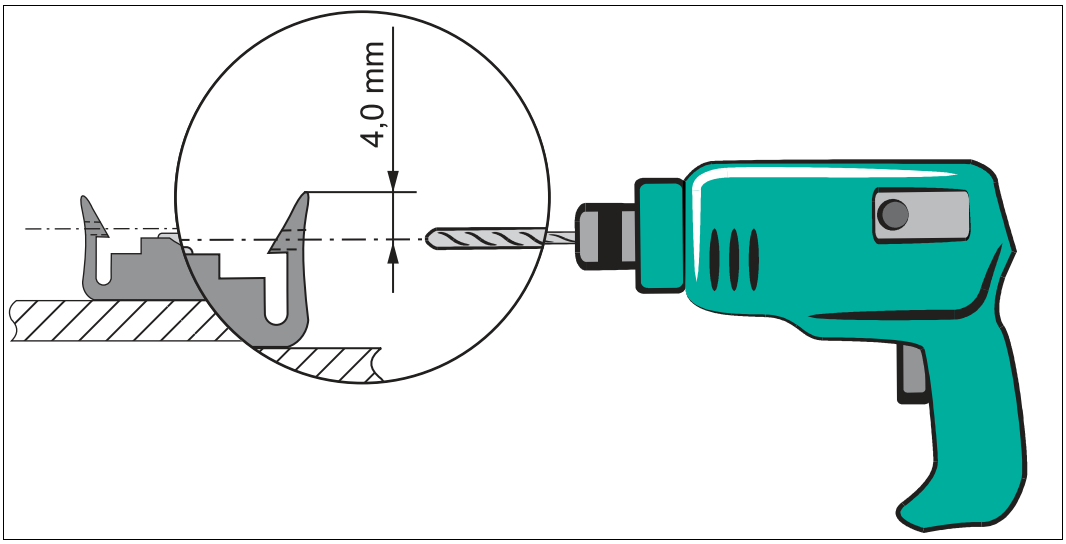


Figure 6.15 Piercing a rail holder

3. Drill two 3 x 6 mm self-tapping screws into the holes.

Note

The self-tapping screws are not included in the scope of delivery.

↳ The screws press into the aluminum profile, establishing a tight-fitting connection between the rail holder and the aluminum profile.

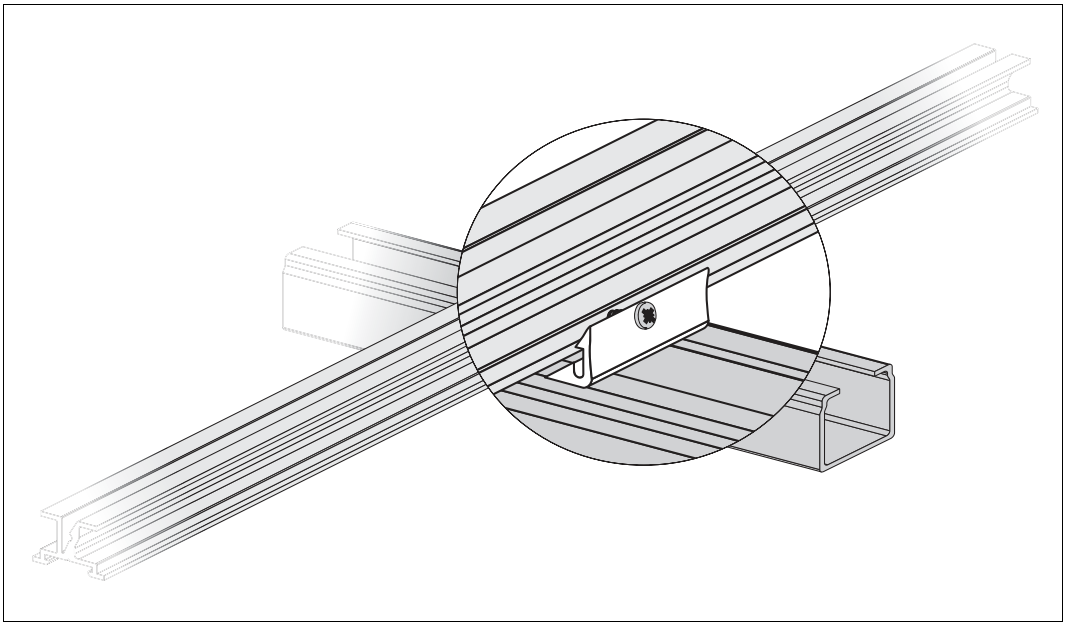


Figure 6.16 Connection between the rail holder and the aluminum profile

2019-11

PEPPERL+FUCHS

Tip

We recommend that you fix the aluminum profile in place at multiple points along a route using the method described. Make sure that there are sufficient expansion gaps between the aluminum profiles (see chapter 6.4.4).

Tip

For vertical mounting, secure the aluminum profile with a suitable support bracket (on site).

6.4.7 Suspended Mounting with Stainless Steel Code Rail

If you want to mount the stainless steel code rail suspended, you have to secure the code rail against falling down. This applies in particular when there are frequent changes in temperature. For lengths up to 25 m, using the tensioning device (see chapter 6.3.3) is sufficient.

For lengths beyond this, we recommend further securing the stainless steel code rail every 12 m with a self-tapping screw or a spring dowel pin in the aluminum profile.

Securing the Code Rail

1. Pierce the aluminum profile and the code rail from the side.

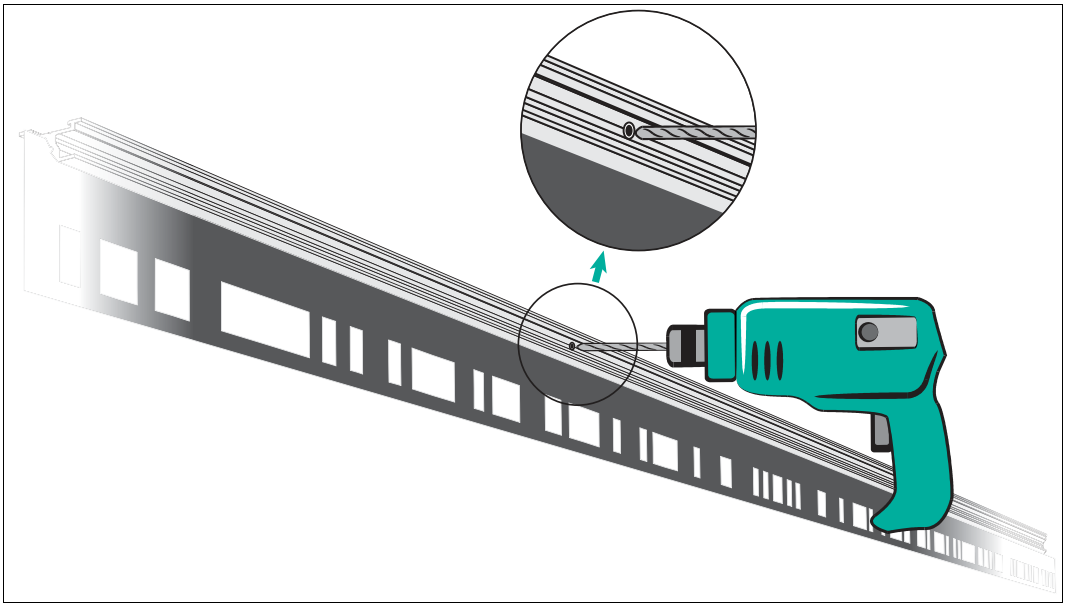


Figure 6.17 Piercing the aluminum profile and the code rail

2. Screw a suitable self-tapping screw into the hole.

Note

Alternatively, you can use a suitable spring dowel pin.
The self-tapping screw or spring dowel pin are not included in the scope of delivery.

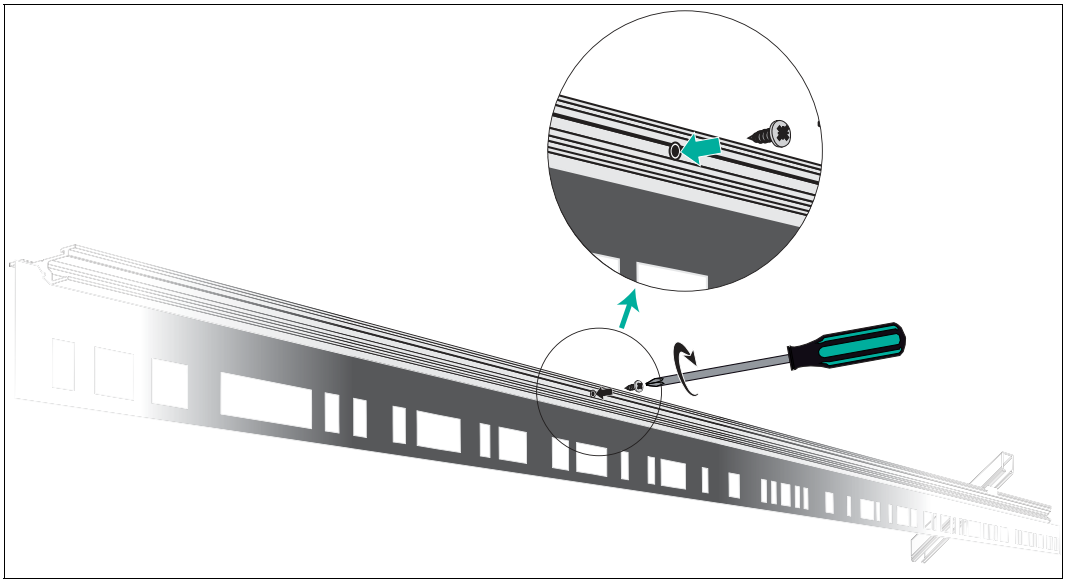


Figure 6.18 Screwing in a self-tapping screw

6.4.8 Grounding the Aluminum Profile System

Connect the aluminum profile with the plant potential at low resistance at least every 30 m.

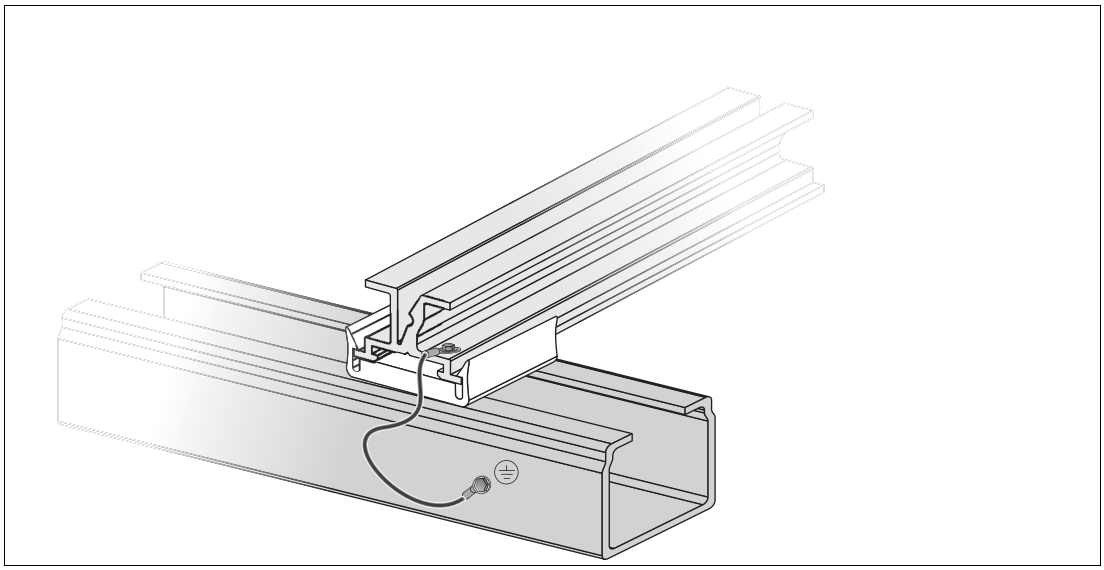


Figure 6.19 Grounding

6.4.9 Integration of the WCS Code Rail in Conductor Lines

In many applications, electrical energy is transferred to the carriage via conductor lines. Pepperl+Fuchs offers an integrated solution of power transmission and position measurement. This requirement was taken into account in the development of the new Vahle VKS 10 conductor line. The VKS 10 is flexible in terms of the number of conductors and cross-sections and facilitates cost-effective integration of the WCS code rail in the plastic base body of the conductor line.

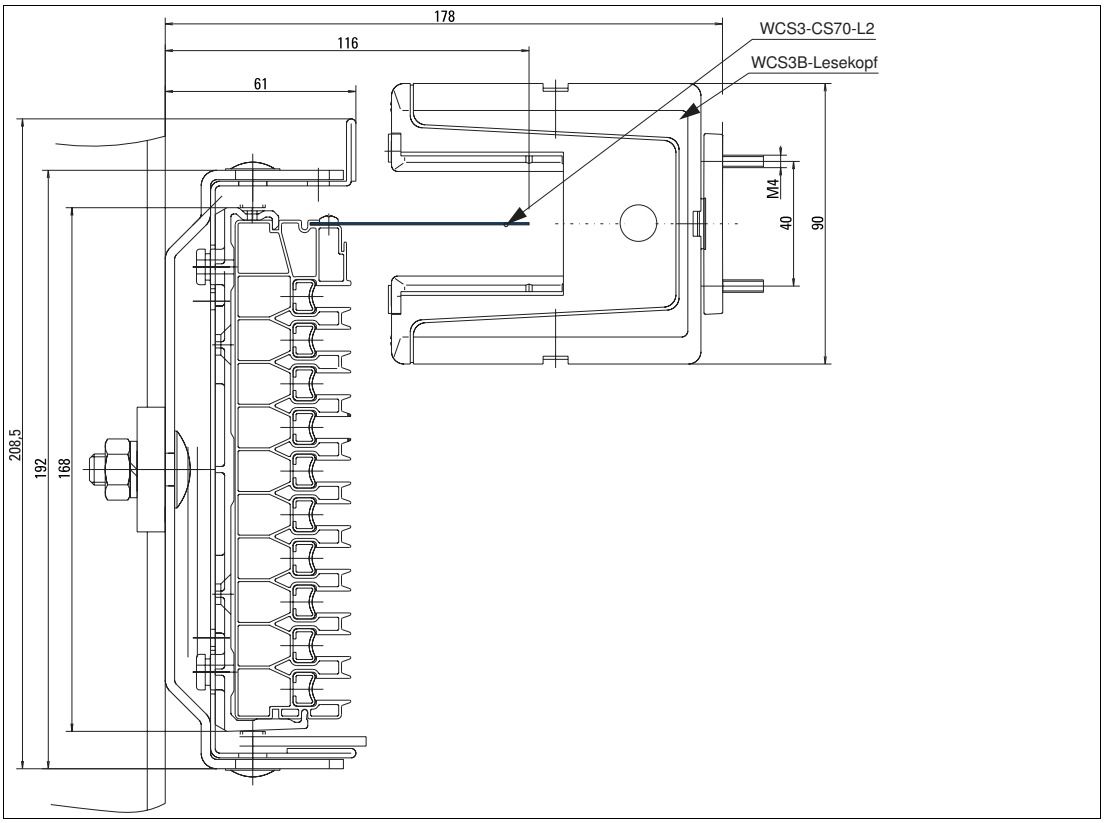


Figure 6.20 Integration of the WCS3-CS70-L2 code rail in the Vahle VKS 10 power rail

To mount the WCS3 code rail in the VKS 10 system, a special mounting hole and therefore a special code rail are required. The laminate code rail is characterized by a high degree of flexibility and tear resistance. Using the code rail guarantees that local coordinates can be reproduced regardless of the prevailing ambient conditions. Due to the light transmission method used with the WCS, reliable system function is guaranteed even in very harsh industrial environments.

Designation	Part number	Function/use	Material
WCS3-CS70-L2	184070	Code rail with Vahle VKS hole	Polyester laminate

For product information on the VKS 10, see www.vahle.de.

6.5 Mounting the WCS2 Code Rail with the Aluminum Profile System

6.5.1 Introduction

A profile rail system with WCS guide trolley has been developed for applications where the moving carriage has high mechanical tolerances. The guide trolley safeguards the optimal position of the read head in relation to the code rail at all times and compensates for running tolerances between the vehicle and the WCS system. At the same time, the read head is decoupled from vehicle vibrations. The aluminum profile system is mounted in a perpendicular and suspended position. Due to its lower weight, the WCS2 guide trolley can also be mounted in a lateral position. The profile rails are supplied in 5 m long pieces and are sawed with a 45° miter at the ends. The aluminum profile rail is powder-coated and is also available in curved segments on request.



Tip

For normal industrial applications, using the laminate code rail has proven successful. Alongside its cost advantages, the low weight of the code rail provides benefits during installation, in particular when installing longer sections.

For extreme operational conditions, we recommend the stainless steel code rail:

- Flying sparks in a welding shop
- Heavy contamination during operation (e.g., waste incineration)
- Use of the cleaning brushes on the guide trolley

6.5.2 System Description

WCS2 Read Head with Guide Trolley

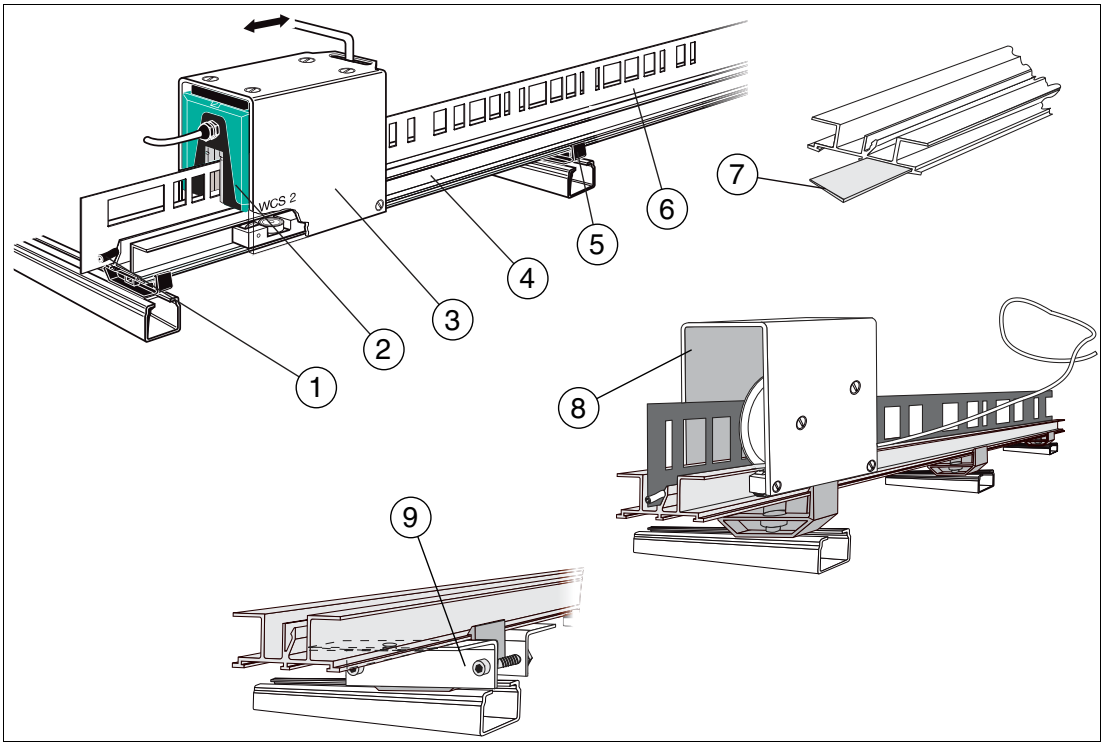


Figure 6.21 Overview

Item	Designation	Product name	Note
1	Fixing cord	WCS-MF1	-
2	WCS read head	WCS2B-LS**	-
3	Guide trolley	WCS2-GT*	-
4	Aluminum profile rail	WCS2-PS1(-C)	2.5 m or 5 m long, optional (-C: powder-coated)
5	Rail holder	WCS2-MH*	-
6	Code rail	WCS2-CS55*	-
7	Butt connector	WCS2-MC*	-
8	Mounting tool for fixing cord	WCS2-FT1	-
9	Locking bracket	WCS2-LB1*	-

2019-11

WCS3 Read Head with Outdoor Protective Enclosure and Guide Trolley

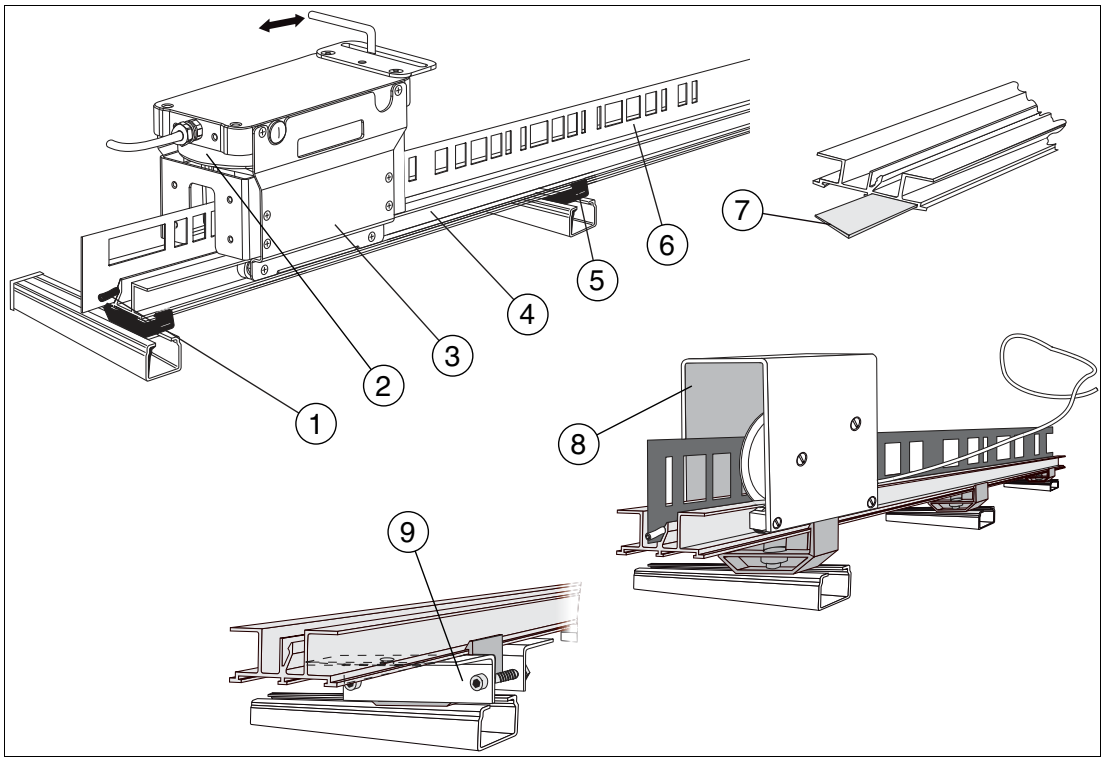
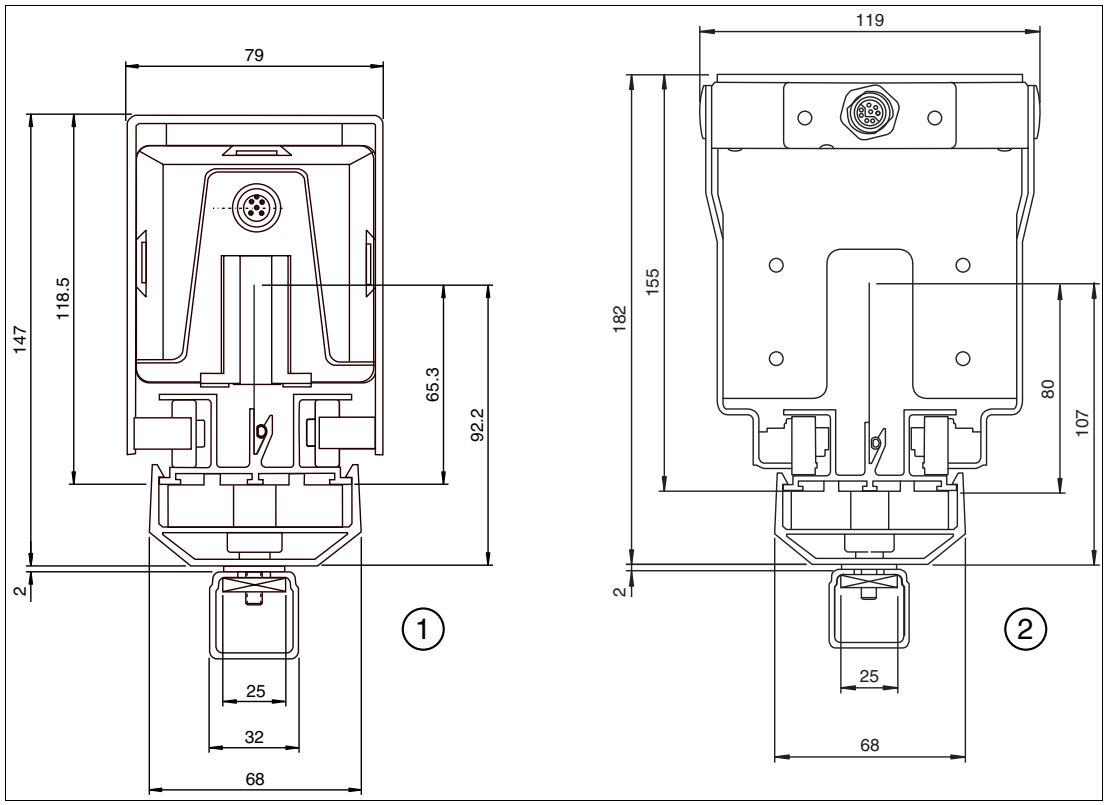


Figure 6.22 Overview

Item	Designation	Product name	Note
1	Fixing cord	WCS-MF1	-
2	WCS3-Outdoor	WCS3B-LS*-O*	Read head with outdoor protective enclosure
3	Guide trolley	WCS3-GT09-P1-O	-
4	Aluminum profile rail	WCS2-PS1(-C)	2.5 m or 5 m long, optional (-C: powder-coated)
5	Rail holder	WCS2-MH*	-
6	Code rail	WCS2-CS70-*	-
7	Butt connector	WCS2-MC*	-
8	Mounting tool for fixing cord	WCS2-FT1	-
9	Locking bracket	WCS2-LB1*	-

WCS Read Head with Profile Rail



1. WCS2 profile system with rail holder mounted on C profile rail, with read head in the guide trolley
2. WCS2 profile system with rail holder mounted on C profile rail, with the WCS3-Outdoor read head in the guide trolley

Rail Holder Overview

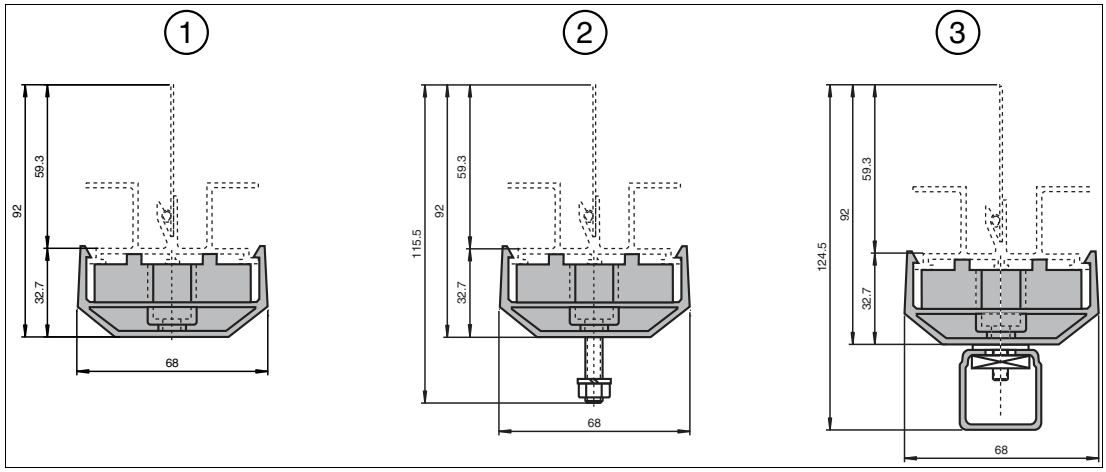


Figure 6.23 Overview

Item	Designation	Product name
1	Rail holder	WCS2-MH
2	Rail holder with screw connection	WCS2-MH1
3	Rail holder with screw connection for C profile rails	WCS2-MH2

2019-11

6.5.3 Rail Holder

Mounting the Rail Holders

1. Mount the rail holders at intervals of 1.5 m along the route on the substructure for a perpendicular or suspended mounting.

Note

For lateral mounting with a WCS2 guide trolley, the support distance must be reduced to 1.25 m.

2. Align the rail holders along a taut cord.

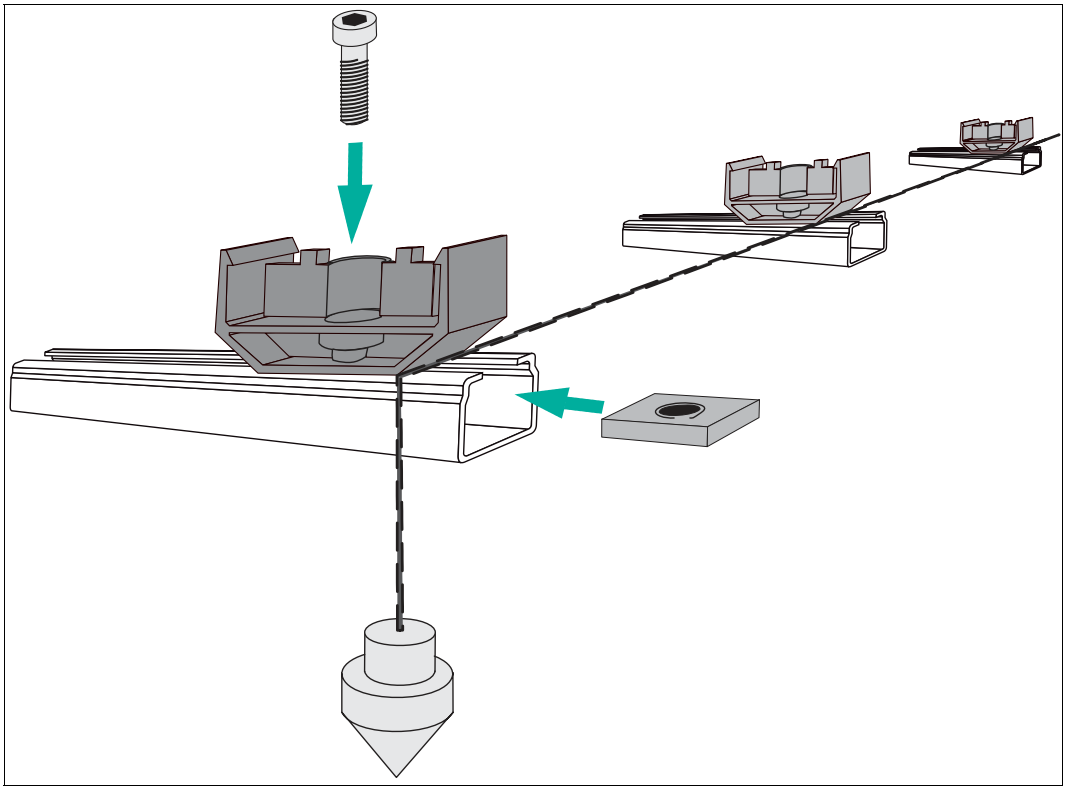


Figure 6.24 Aligning the rail holders (example for WCS2-MH2)

3. Snap the profile rail into the rail holder by pressing lightly.

6.5.4 Butt Connectors for Profile Rails

Butt connectors are required for connecting aluminum profile rails. The WCS2-MC* butt connector consists of two flat pieces and four self-tapping screws.

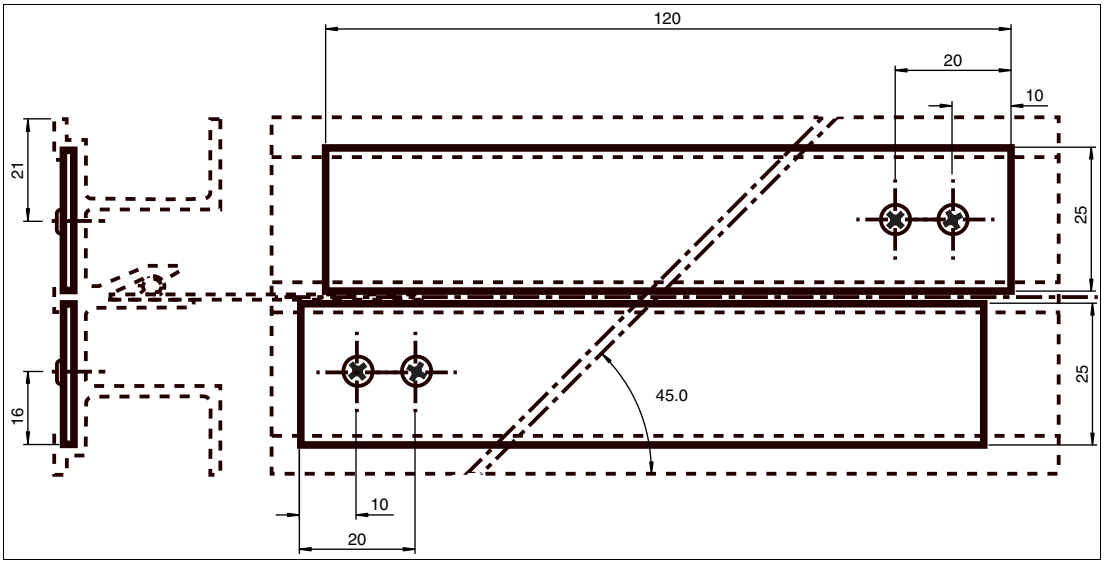
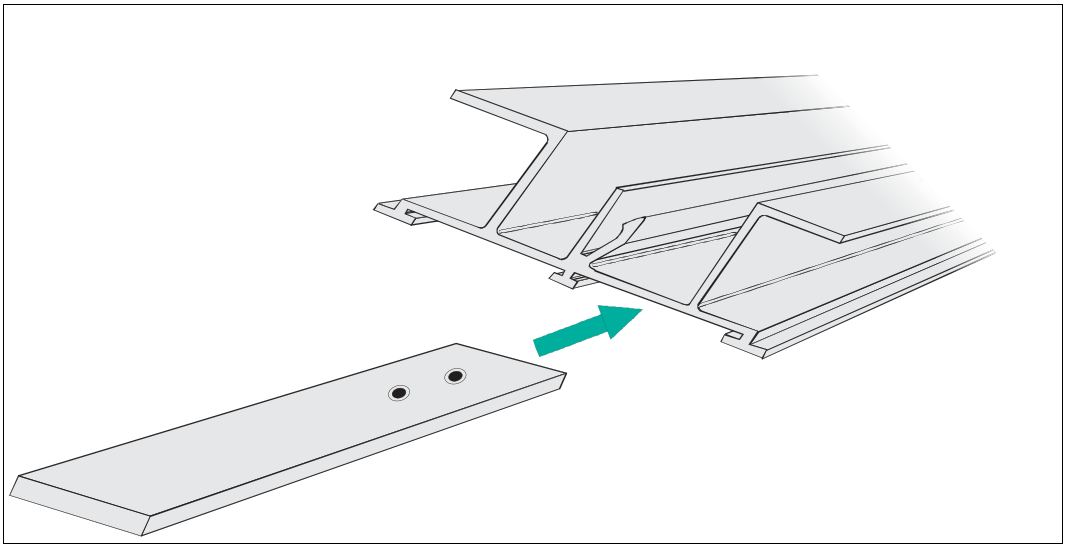


Figure 6.25 WCS2-MC1/WCS2-MC2

Designation	Part number	Function/use	Material/mounting
WCS2-MC1	184050	Butt connector for aluminum profile rails	Aluminum/steel self-tapping screws M3 x 4.5 mm
WCS2-MC2	184051	Butt connector for powder-coated aluminum profile rails	Stainless steel/stainless steel self-tapping screws M3 x 4.5 mm

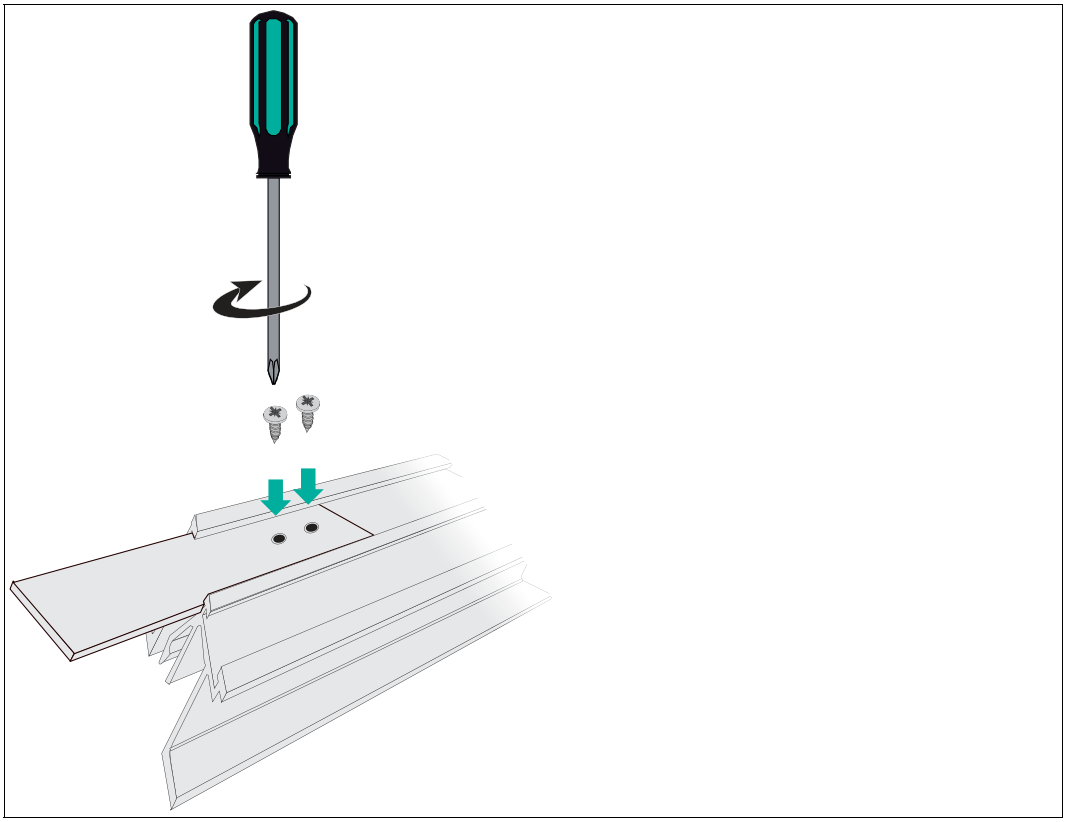
Mounting the Butt Connector

1. Slide the two flat pieces into the bottom grooves of the two profile rails that you want to connect. Push the end of the connector that has the holes in first.



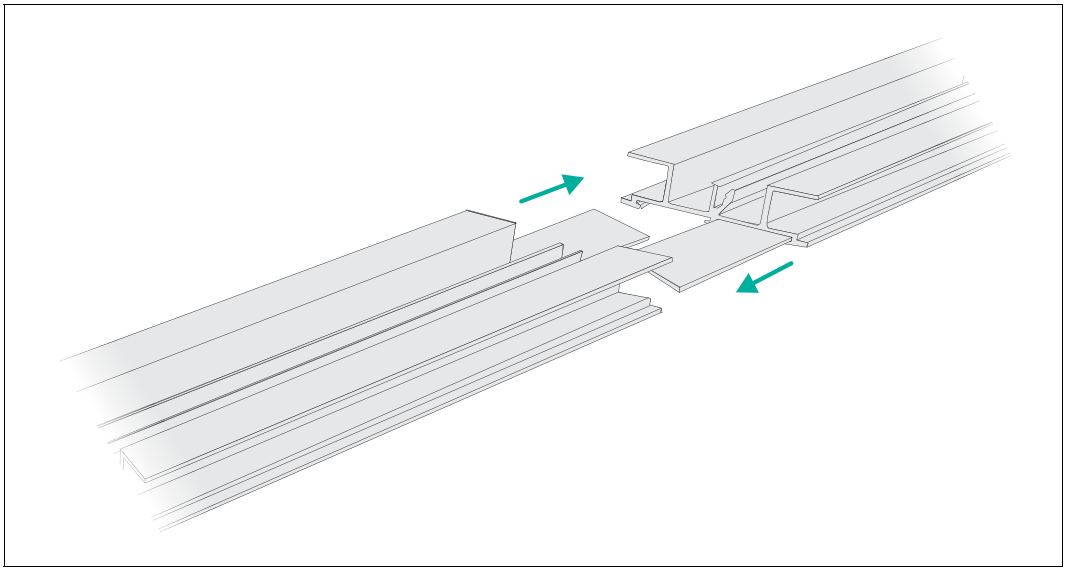
2. Screw the self-tapping screws into the 1.8 mm diameter holes in the flat pieces.

2019-11



↳ The tips of the screws press into the aluminum profile and fix the butt connector in place.

3. Slide the profile rails together with the butt connectors.



Note

When you slide the aluminum profile rails together with the butt connectors, make sure there is a gap to compensate for thermal expansion. A gap is necessary if the maximum possible operating temperature is greater than the temperature during the assembly.

Calculate the necessary gap width as follows:

Gap width in mm = 0.11 * $\Delta\vartheta$

$\Delta\vartheta = \vartheta_{\text{max. operating temp.}} - \vartheta_{\text{assembly temp.}}$

Examples:

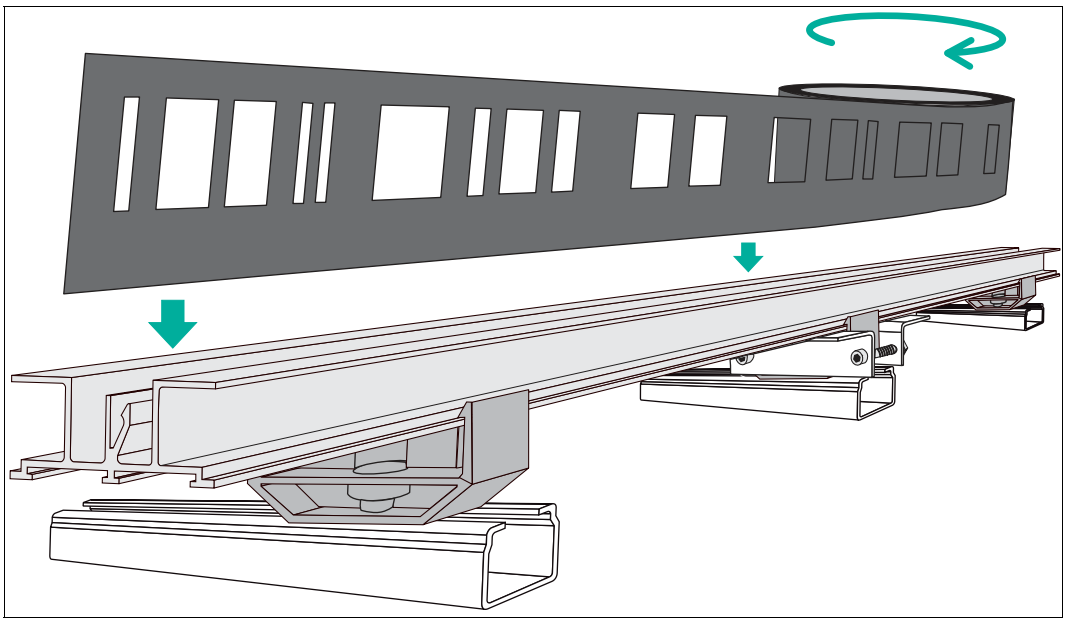
$\Delta\vartheta$ = 10 K, gap width = 1.1 mm
$\Delta\vartheta$ = 20 K, gap width = 2.2 mm
$\Delta\vartheta$ = 30 K, gap width = 3.3 mm

2019-11

6.5.5 Mounting the Code Rail

Mounting the Code Rail in the Profile Rail

1. Insert the code rail into the groove of the profile rail.



2. Fix the code rail in place by pressing the plastic fixing cord into the groove of the profile rail and simultaneously pressing on the code rail.

Warning!

Falling components

A suspended mounting position presents a risk of injury due to falling components.

Make sure that all components are correctly installed.
Do not stand under hanging components during the mounting.

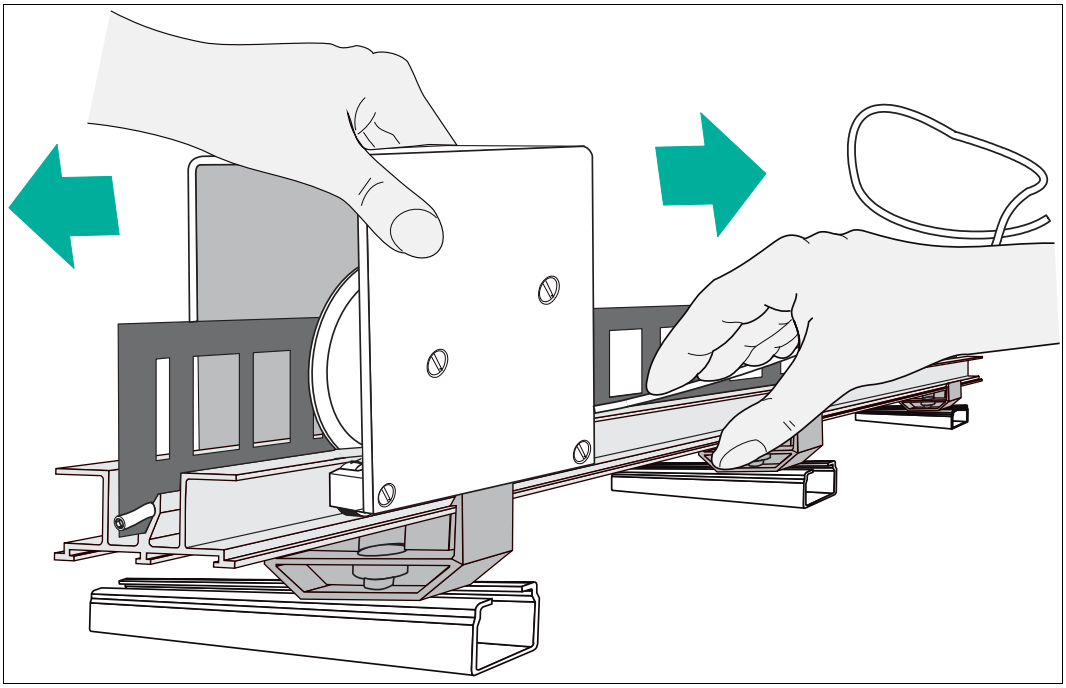
Mounting Tool

A special mounting tool is available for fixing the code rail in place securely and quickly. The mounting tool is recommended if the aluminum profile system is installed suspended. The tool consists of a housing with casters, similar to the guide trolley. Use the mounting tool with order designation WCS2-FT1 for WCS2 aluminum profile systems and the mounting tool with order designation WCS3-FT1 for WCS3 aluminum profile systems.

Mounting the Code Rail with the Mounting Tool

1. Insert the code rail into the groove of the profile rail.
2. Place the plastic fixing cord on the groove of the profile rail.
3. Pull the mounting tool over the profile rail.

   ↳ The code rail is held in position by the guide roller and contact pressure roller.
   The fixing cord is pressed into the groove of the profile rail by the pressing wheel.
4. Move the mounting tool back and forth on the profile rail.



↳ This ensures that the fixing cord sits correctly in the groove.
The contact pressure of the fixing cord is so great that the code rail cannot slip out of the profile rail even when it is mounted suspended.

Note

As part of regular plant maintenance, check that the fixing cord and code rail are securely in place, especially if the profile rail is mounted suspended.

6.5.6 Fixed Points

When the rails are mounted horizontally, a locking bracket is required to prevent the aluminum profile rails slipping in the rail holders.

Designation	Part number	Function/use	Material
WCS2-LB1	184048	Locking bracket for aluminum profile rails	Sheet steel, galvanized
WCS2-LB1-C	184049	Locking bracket for powder-coated aluminum profile rails	Sheet steel, galvanized, powder-coated

Mounting the Locking Bracket

1. Mount the locking bracket around a rail holder in the middle of the section that you want to fix in place.
2. Pierce the profile rail with a metal drill, diameter 7 mm. The drill hole must be aligned with the hole in the locking bracket.
3. Connect the profile rail and the locking bracket with the screw provided.

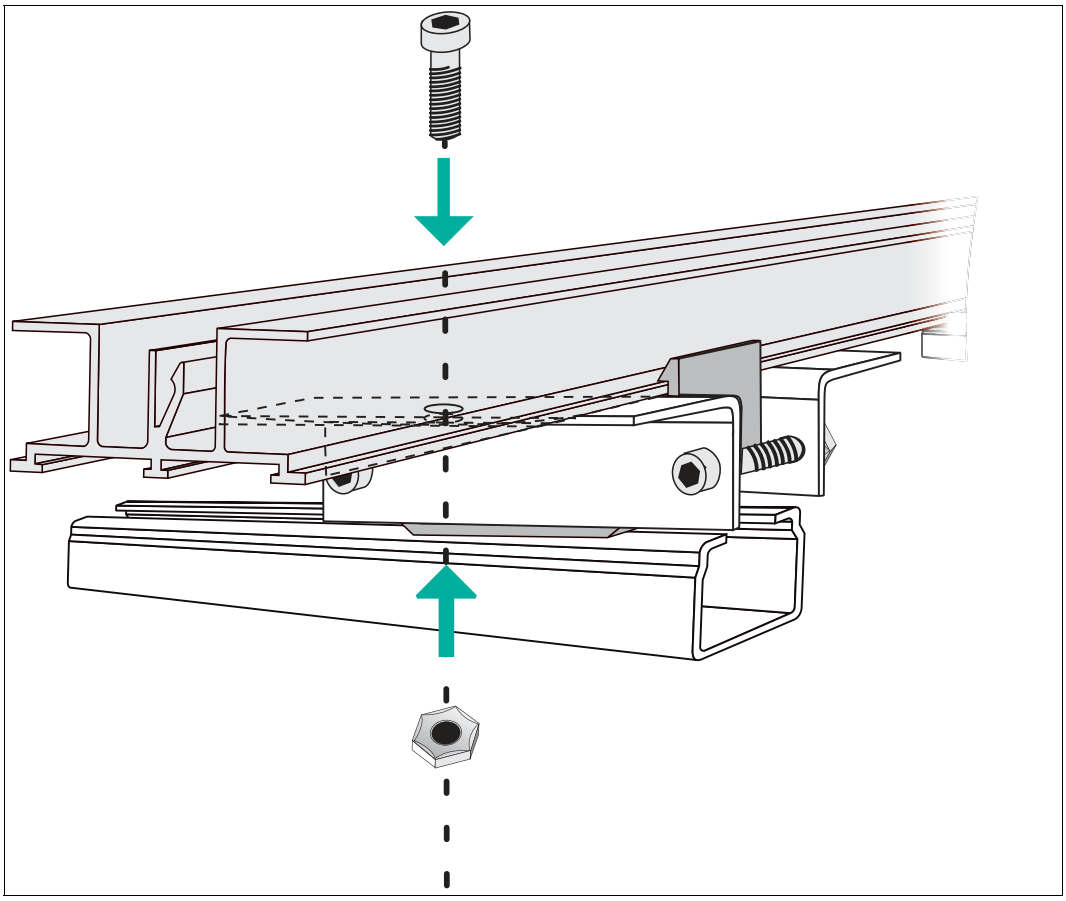


Figure 6.26 Mounting the locking bracket

Tip

For vertical mounting, secure the aluminum profile with a suitable support bracket (on site).

To ensure that the code rail does not slip in the aluminum profile rail, you can fix the code rail in place by using a spring dowel pin or a self-tapping screw in the middle of the section.

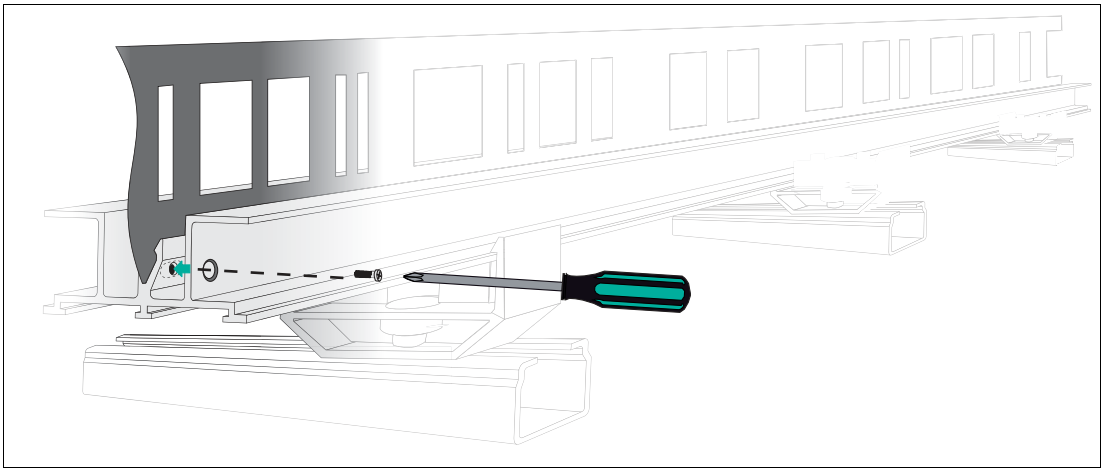


Figure 6.27 Code rail fixed point

6.5.7 Guide Trolley

Caution!

When mounting and using the tappet, make sure that the guide trolley is not subjected to any forces.

There must be no rigid connection between the vehicle and the guide trolley.

Note

Slide the guide trolley with the read head into the profile rail such that the electrical connector points in the direction of the ascending position values.

Guide Trolley for the WCS2 Read Head

The guide trolley for the read head always guarantees the optimal position between the read head and the code rail.

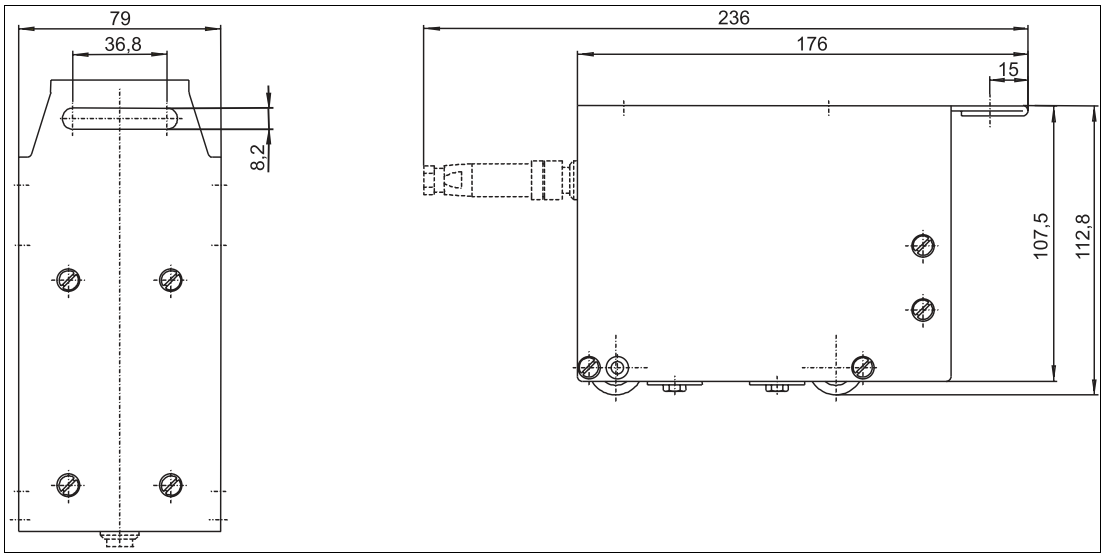


Figure 6.28 Guide trolley dimensions

Designation	Part number	Function/use	Material	Max. speed
WCS2-GT09-P1	184046	Guide trolley for read head for aluminum profile rails	Plastic rollers Sheet steel, galvanized	8 m/s
WCS2-GT09-P1-C	184047	Guide trolley for read head for powder-coated aluminum profile rails	Plastic rollers Sheet steel, galvanized, powder-coated	8 m/s
WCS2-GT09-M1	184480	Guide trolley for read head for aluminum profile rails	Metal rollers[1)] Sheet steel, galvanized	8 m/s
WCS2-GT-BR	184057	Cleaning brushes	Polyamide (PA)	-

[1)]: In dusty applications, such as in foundries or in the building materials industry, use the guide trolley with metal rollers.

If the WCS2 aluminum profile system is mounted laterally, you can use the guide trolley with the extended WCS2-GT09-P2 or WCS2-GT09-M2 guide rails.

Tip

The guide trolley housing has holes for mounting cleaning brushes for the code rail. The cleaning brushes (optional) are only necessary if the code holes in the WCS code rail can become clogged as a result of the application, e.g., with bird feathers or leaves. The brushes can also be retrofitted.

Mounting the Read Head in the Guide Trolley

The mounting base for the read head is pre-assembled in the guide trolley, which means that the read head only has to be pushed on:

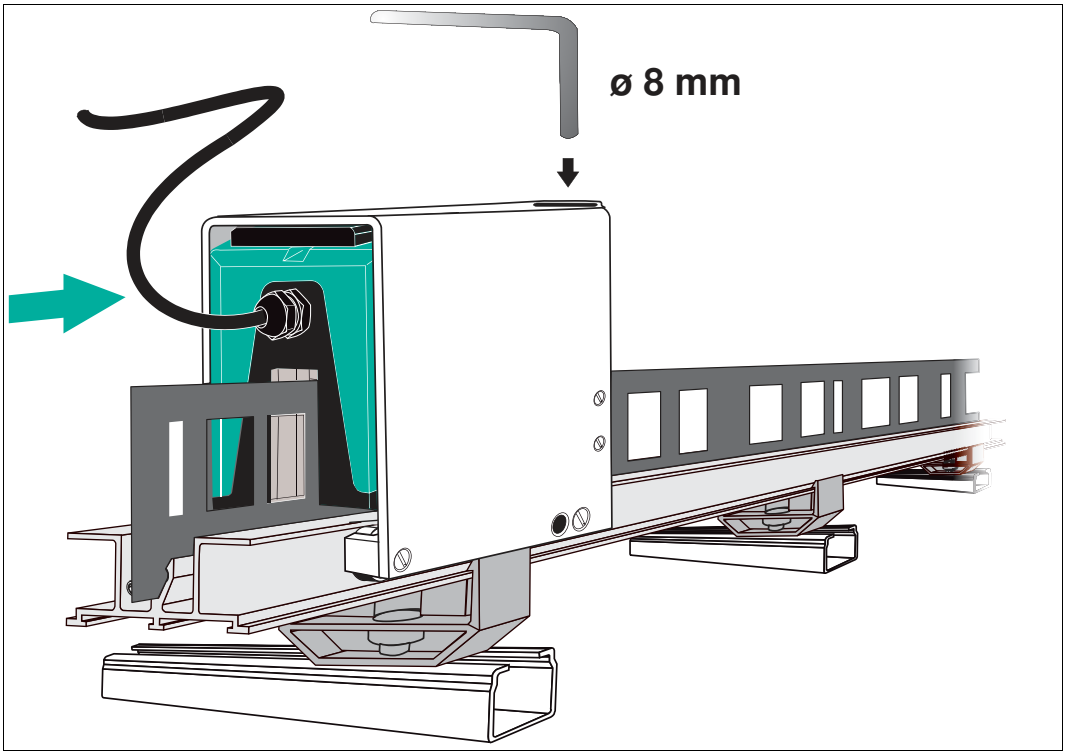


Figure 6.29 WCS2 guide trolley and tappet

1. Slide the dovetail groove on the read head onto the base module of the mounting base. In the end position, the spring tongue engages audibly in the quick-action lock.

   ↳ The read head is mounted.

2. For dismounting, unlock the spring tongue with a screwdriver.
3. Push the read head off the base module of the mounting base.

Connect the guide trolley on the profile rail with the vehicle via a free-running tappet of diameter 8 mm and a slot. This decouples the movement between the vehicle and the read head and compensates for mechanical running tolerances. Make sure that the tappet runs freely for the entire route and cannot tilt. Shear forces and lateral forces must be avoided.

Guide Trolley for the WCS3-Outdoor Read Head with Protective Enclosure

The protective enclosure with the read head is mounted in the guide trolley (WCS3-GT09-P1-O). The guide trolley is guided over the profile rails to the optimal position between the protective enclosure and code rail.

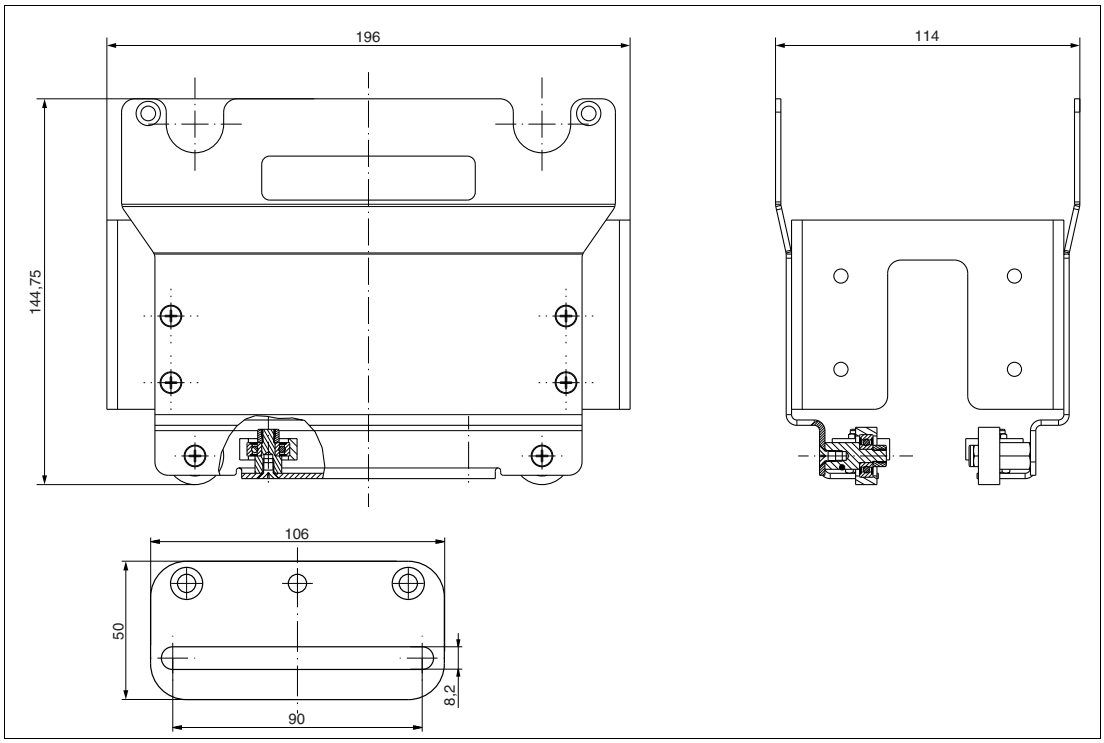


Figure 6.30 Guide trolley and tappet plate dimensions

Mounting the Protective Enclosure with the Read Head in the Guide Trolley

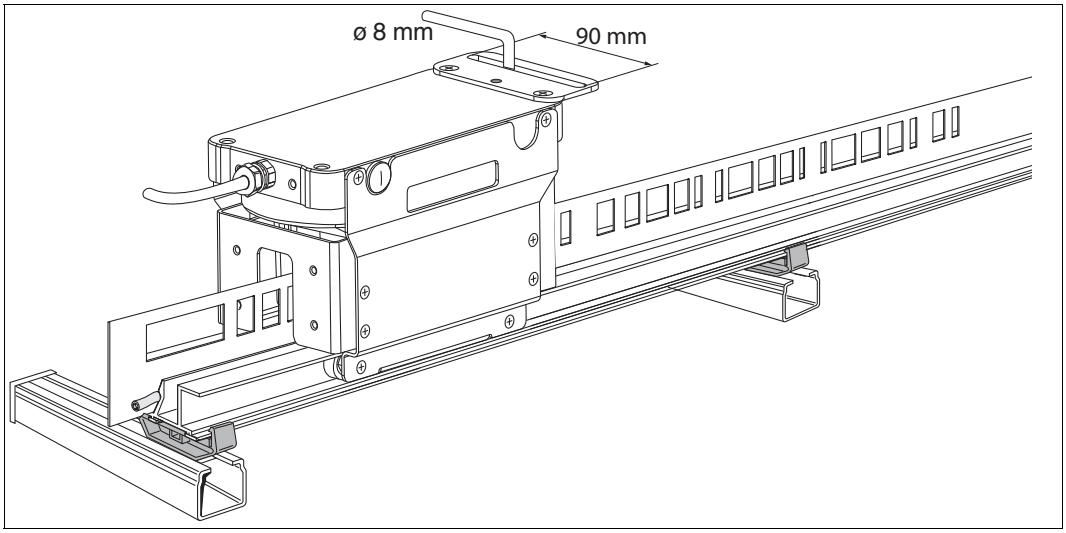


Figure 6.31 Guide trolley with protective enclosure

1. Slide the protective enclosure into the guide trolley from above so that the mounting holes on the guide trolley align correctly with the threaded holes on the protective enclosure.
2. Securely attach the protective enclosure to the guide trolley using the four fastening screws.
3. You can attach the tappet plate to the protective enclosure of the read head using the two fastening screws if required.

4. To dismount, loosen the four fastening screws.
5. Remove the protective enclosure from the guide trolley.

Note

More information, as well as detailed mounting instructions are included with the guide trolley. These mounting instructions are also available at www.pepperl-fuchs.com.

6.5.8 Grounding the Aluminum Profile System

Connect the aluminum profile with the plant potential at low resistance at least every 30 m.

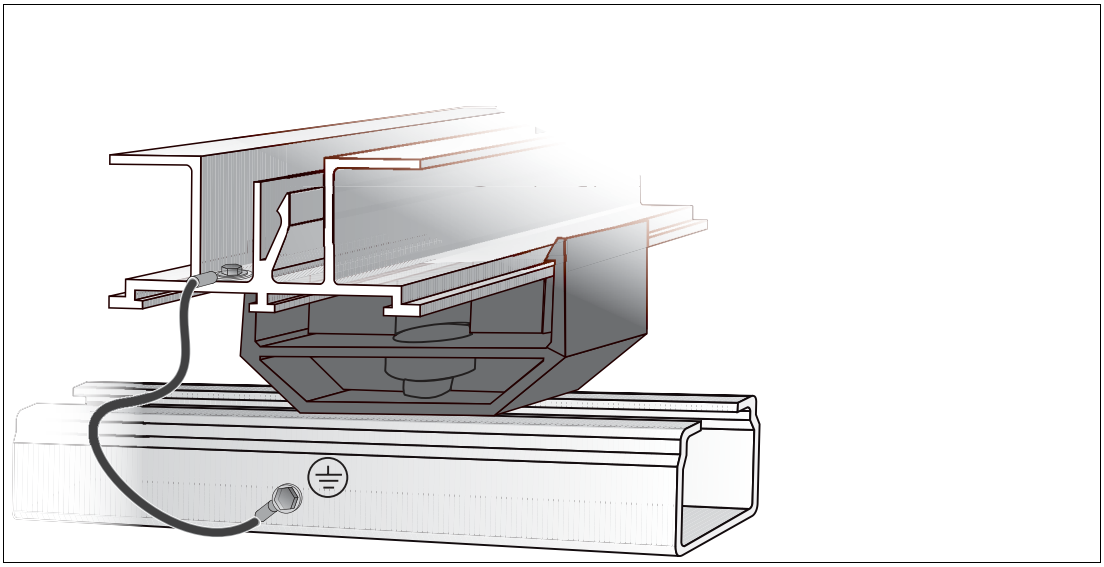


Figure 6.32 Grounding

6.6 WCS3 Code Rail Extender for "Extended" Read Heads

6.6.1 Introduction

The WCS3 code rail extender is used to extend the WCS3 code rail system. The WCS3 code rail extender connects two code rail segments to achieve lengths up to a maximum of 629.146 m. The WCS3 code rail extender is used exclusively in straight track sections.

6.6.2 System Overview

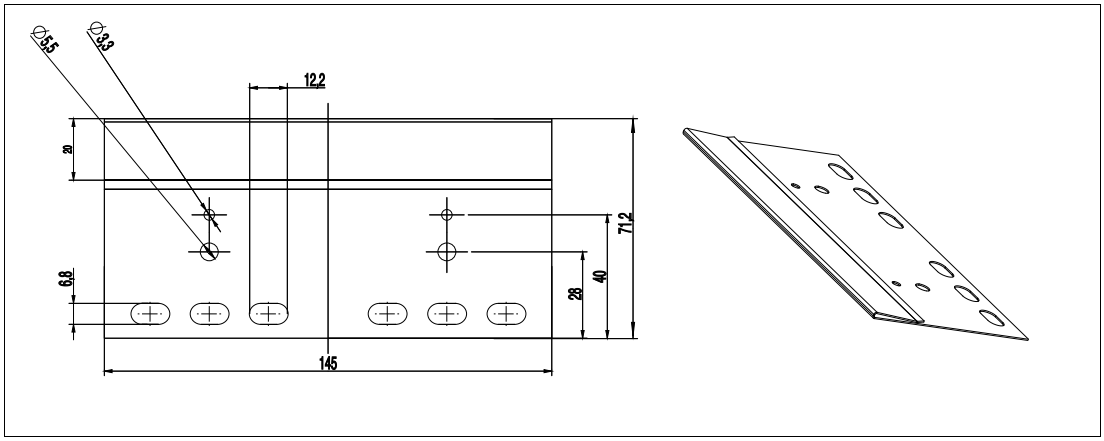


Figure 6.33 WCS3 code rail extender

Designation	Product name	Note
WCS3 code rail extender	WCS3-CS70-E	Use the WCS3 code rail extender exclusively with the WCS3 read heads with the "Extended" option.

6.6.3 Mounting the WCS3 Code Rail Extender

Connecting the Code Rail (Aluminum Profile System)

Caution!
Improper mounting!

- Always mount the WCS3 code rail extender at end position 314.573 m.
- A complete code rail segment always begins at 0 m and ends at 314.573 m.
- Mount the WCS3 code rail extender only in straight code rail areas.
- Use only read head WCS3B-LS*ES in combination with the extended code rail.

1. Connect the end segments of the two code rail elements with the WCS3 code rail extender at the **314.573 meter** end position. The second code rail segment must be in a **descending** order of position relative to the existing first code rail segment, which is in an **ascending** order of position (see the following function diagram).

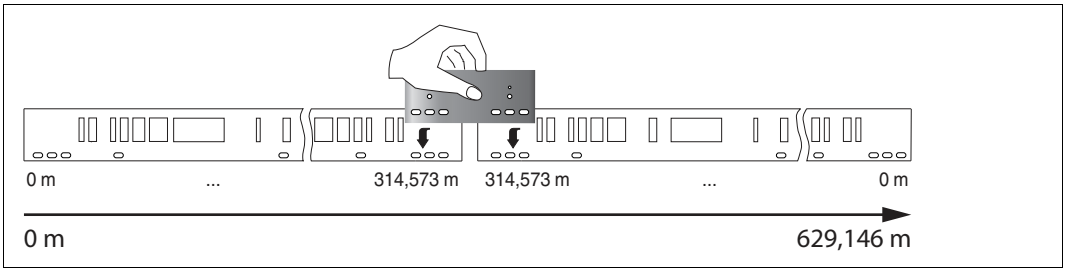


Figure 6.34 Inserting the WCS3 code rail extender

2. Insert the extended code rail into the groove of the profile rail and fix the fixing cord in place. To fix the code rail in place securely and quickly, we recommend using the mounting tool (WCS2-FT1).

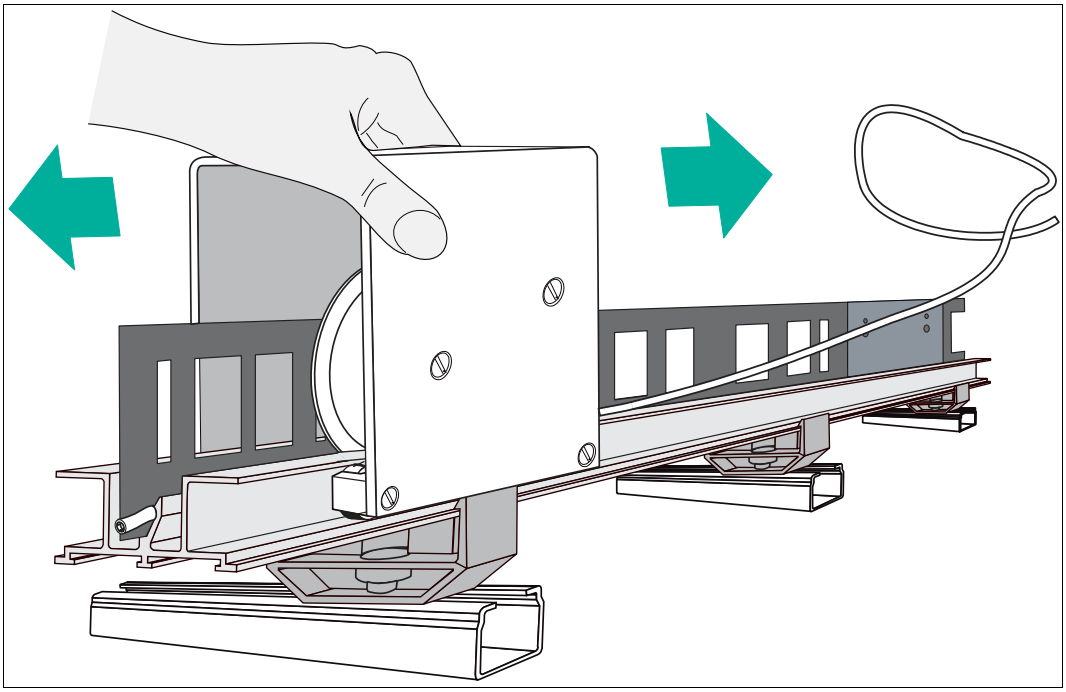


Figure 6.35 Fixing the fixing cord in place using the mounting tool

2019-11

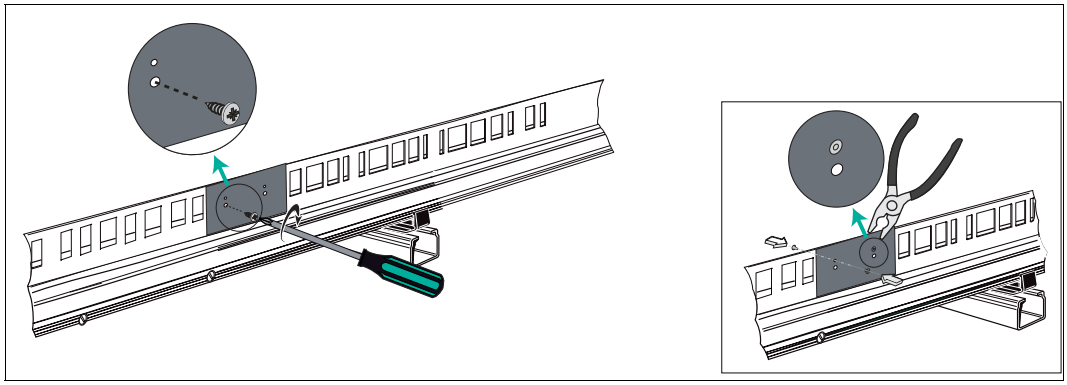


Figure 6.36 Fixing the WCS3 code rail extender in place

3. To prevent the WCS3 code rail extender from slipping, you can fix the WCS3 code rail extender in place with the code rail by using spring dowels in the additional holes, as seen in the figure. Optionally, rivets can be attached to the WCS3 code rail extender via the smaller of the two holes to fix the code rail in place.

Caution!

Device damage due to protruding screws and rivets

Improper mounting of the screws and rivets can lead to undesirable contact between read heads and screws and rivets.

Make sure that the read head does not touch screws and rivets when passing over this piece.

Connecting Code Rails (Mounting Bracket System)

1. Connect the end segments of the two code rail elements with the WCS3 code rail extender at the **314.573 meter** end position. The second code rail segment must be in a **descending** order of position relative to the existing first code rail segment, which is in an **ascending** order of position (see the following function diagram).

Note

The connector plug of the read head always points in the direction of travel.

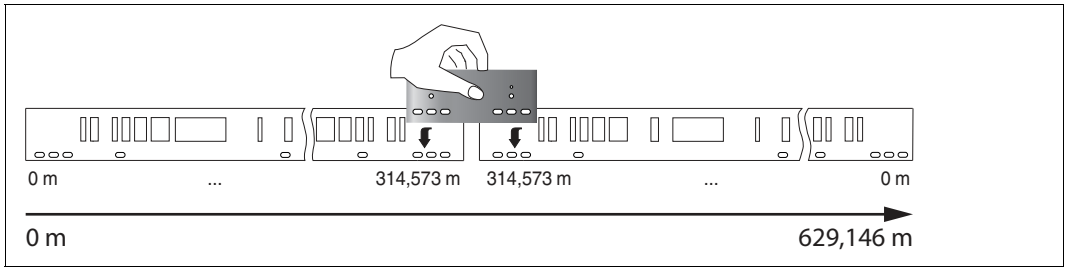


Figure 6.37 Inserting the WCS3 code rail extender

2. Slide the code rail with the WCS3 code rail extender up to the stop in each bracket.
3. Clamp the code rail securely into the bracket by tightening the two M6 x 12 hexagon head screws.

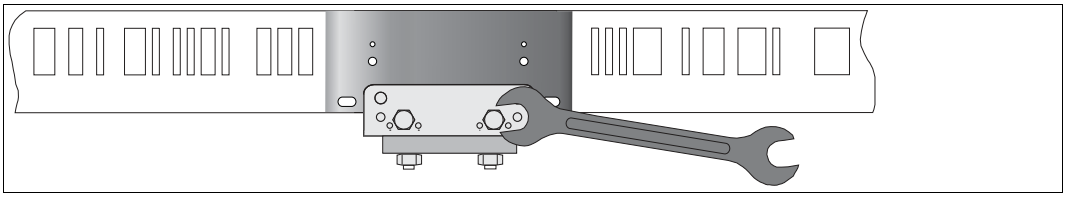


Figure 6.38 Fixing the WCS3 code rail extender in place

↳ When mounted correctly, the tensioning force on the brackets is so great that the code rail can no longer be pulled out of the bracket.

Tip

In addition to clamping, the WCS3 code rail extender can be screwed or riveted to the code rail. To do this, use the top two free holes of the WCS3 code rail extender. Make sure that the read head does not touch screws and rivets when passing over this piece. The screws and rivets are not included in the scope of delivery.

Procedure for a Total Length Less than 629.146 m

For code rails with a total length of less than 629.146 meters with continuous position indication, you can calculate the position for the second code rail segment using the following formula:

1. Use the first code rail segment as a complete code rail from 0 m – 314.573 m.
2. Calculate the second code rail segment from its subsequent **total length X**:

Example

Example calculation

The calculation example shows how to determine the subsequent **end position Z** with a total code rail length of X = 500 m.

629.146 m - 500 m = 129.146 m
Formula: 629.146 m - X = Z
X: total length
Z: subsequent end position

Order the second code rail segment from a starting position of between **314.573 m and 129.146 m** for a total subsequent length of 314.573 +(314.573 m - 129.146 m) = 500 m

Note

It is **not** possible to determine the position within the section of the code rail extender.

The WCS3 code rail extender is designed exclusively for connecting straight track route segments.

2019-11

7 Maintenance



Danger!

Danger to life due to electrical current!

Contact with live parts causes immediate danger to life.

- Allow only qualified electricians to carry out work on the electrical installation.
- Switch off the power supply before carrying out servicing, cleaning, and repairs, and prevent the supply from being switched on again.
- Keep the live parts free from moisture.

7.1 Maintenance

The device requires the following maintenance work at regular intervals:

Interval	Maintenance activity	Performed by
Cleaning interval depends on the ambient conditions and the climate	Cleaning the read head and protective enclosure	Specialist
Cleaning interval depends on the ambient conditions and the climate	Code rail	Specialist
Every six months	Checking the screws and connectors	Specialist

7.2 Cleaning



Caution!

Damage to the equipment caused by incorrect cleaning!

Incorrect cleaning may damage the device.

Do not use cleaning agents containing aggressive substances.
Do not use sharp objects to clean the device.



Cleaning the Read Head and Protective Enclosure

Clean the read head and protective enclosure using a lint-free cloth and a plastic cleaning agent at regular intervals. The cleaning interval is determined by the ambient conditions.



Cleaning the Code Rail

If the code rail is heavily contaminated with oil or grease, clean the code rail with a lint-free cloth.



Note

The WCS2 read head can also be cleaned by a guide trolley with cleaning brushes. This ensures the code rail is always clean.

7.3 Repairs

Damage to the Read Head

The read head must not be independently repaired, modified, or manipulated. In the event of a failure, always replace the device with an original device.

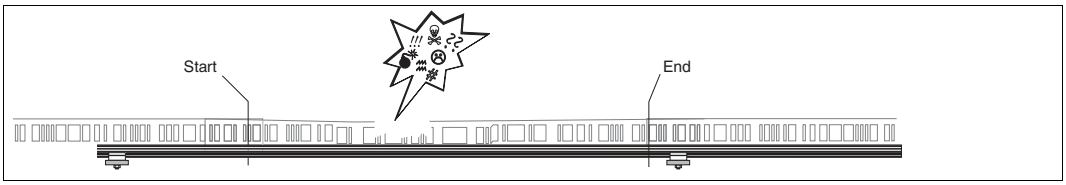
Damage to the Code Rail

For high-quality and lasting results, the use of original Pepperl+Fuchs code rails is recommended. The procedure for replacing damaged code rail sections is described below.

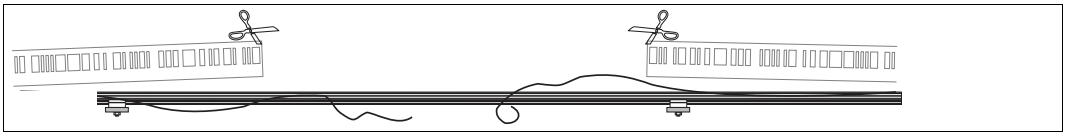
7.3.1 WCS Stainless Steel Code Rail (Aluminum Profile)

Replacing a Damaged Section

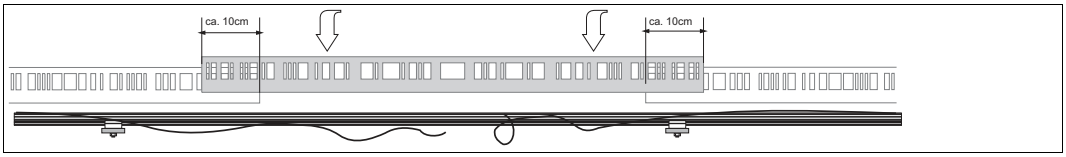
1. When ordering the replacement code rail, specify the beginning and end position, as well the 10 double hollow rivets (WCS-CS-RV) for connecting the replacement code rail with the existing code rail.



2. Determine the position values in front of and behind the damaged area.



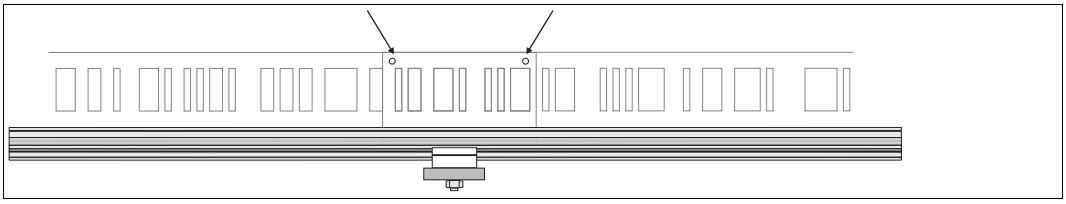
3. Extract and disconnect the fixing cord using a small screwdriver or similar. Lift the code rail out of the aluminum profile by a few meters and cut out the damaged section.



4. Attach the replacement code rail to the existing code rail.

Note

The "old" and "new" (replacement) code rails must each overlap by around 10 cm to ensure that the hole pattern of the two rail sections align correctly. Larger overhangs are cut off.



5. To prevent the code rails slipping against each other, securely fasten overlapping sections in place (e.g., using a screw clamp).

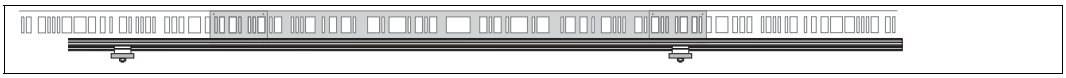
2019-11

PEPPERL+FUCHS

6. Weld the two code rails to each other at four points, e.g., using shielding gas welding equipment.

Note

Alternatively, you can connect the code rails using blind rivets. Blind rivets can be used only on the upper edges of the code rails because they do not fit in the V-groove of the aluminum profile. The bore hole diameter depends on the type of blind rivets used. The rivet heads must not protrude into the coding.

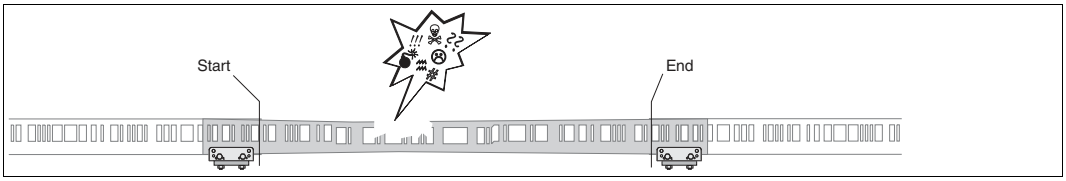


7. Insert the repaired code rail back into the aluminum profile and press the fixing cord in to reinsert it.

7.3.2 WCS Stainless Steel Code Rail (Mounting Bracket System)

Replacing a Damaged Section

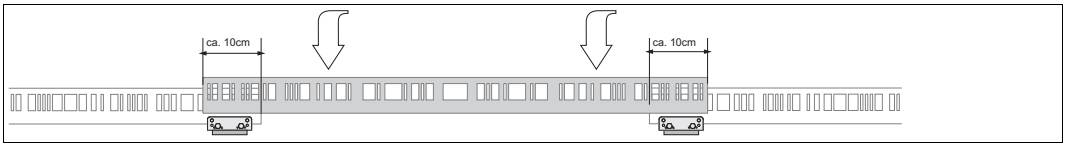
1. When ordering the replacement code rail, specify the beginning and end position, as well the 10 double hollow rivets (WCS-CS-RV) for connecting the replacement code rail with the existing code rail.



2. Determine the position values in front of and behind the damaged area.



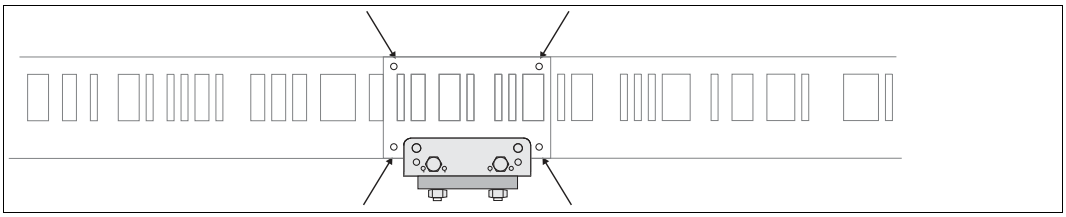
3. Cut out the damaged code rail section using sheet metal shears. Align and deburr the cut edges.



4. Attach the replacement code rail to the existing code rail.

Note

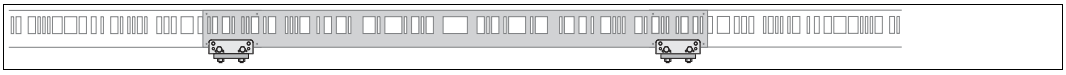
The "old" and "new" (replacement) code rails must each overlap by around 10 cm to ensure that the hole pattern of the two rail sections align correctly. Larger overhangs are cut off.



5. To prevent the code rails slipping against each other, securely fasten overlapping sections in place (e.g., using a screw clamp).
6. Weld the two code rails to each other at four points, e.g., using shielding gas welding equipment.

Note

Alternatively, you can drill (or punch) four holes through the code rails and connect the code rails using blind rivets. The bore hole diameter depends on the type of blind rivets used. The rivet heads must not protrude into the coding.



7. Tighten the code rail slightly as needed.

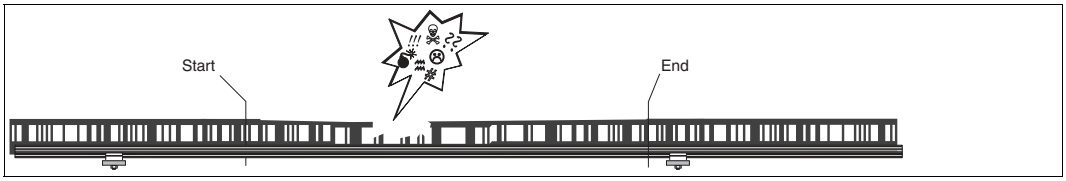
2019-11

PEPPERL+FUCHS

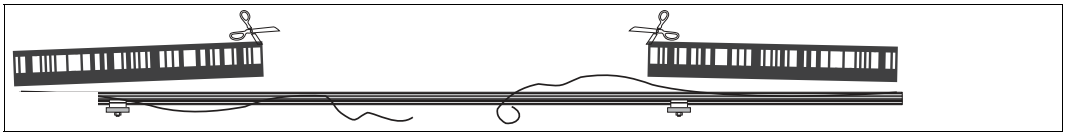
7.3.3 WCS Laminate Code Rail (Aluminum Profile)

Replacing a Damaged Section

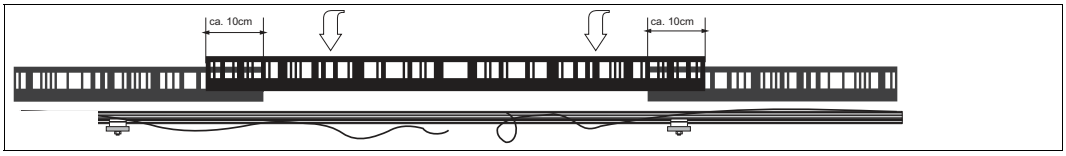
1. When ordering the replacement code rail, specify the beginning and end position, as well the 10 double hollow rivets (WCS-CS-RV) for connecting the replacement code rail with the existing code rail.



2. Determine the position values in front of and behind the damaged area.



3. Extract and disconnect the fixing cord using a small screwdriver or similar. Lift the code rail out of the aluminum profile by a few meters and cut out the damaged section.



4. Attach the replacement code rail to the existing code rail.

Note

The "old" and "new" (replacement) code rails must each overlap by around 10 cm to ensure that the hole pattern of the two rail sections align correctly. Larger overhangs are cut off.



5. Hold the overlapping code rails firmly to prevent them from shifting. Punch four holes with a diameter of 3 mm through the two code rail sections using a punch as shown in the figure.



6. Insert the hollow rivets from the reparation set in the holes; insert the counterparts and press them together with flat nose pliers or multigrip pliers.

↳ The code rail holds together firmly.

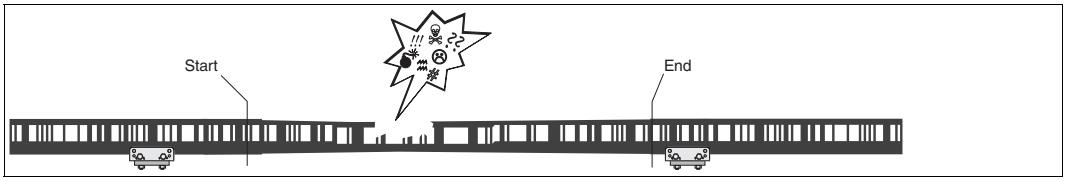


7. Insert the repaired code rail back into the aluminum profile and press the fixing cord in to reinsert it.

7.3.4 WCS Laminate Code Rail (Mounting Bracket System)

Replacing a Damaged Section

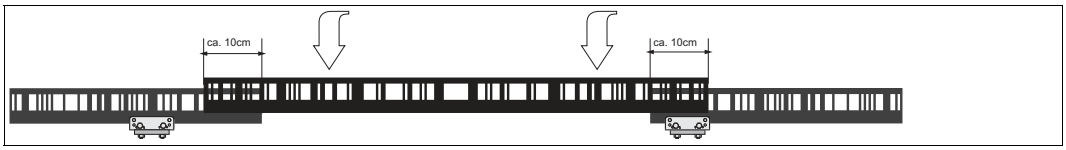
1. When ordering the replacement code rail, specify the beginning and end position, as well the 10 double hollow rivets (WCS-CS-RV) for connecting the replacement code rail with the existing code rail.



2. Determine the position values in front of and behind the damaged area.



3. Cut out the damaged code rail section.



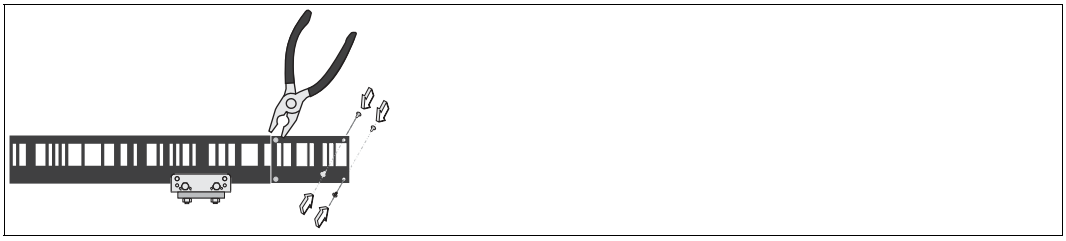
4. Attach the replacement code rail to the existing code rail.

Note

The "old" and "new" (replacement) code rails must each overlap by around 10 cm to ensure that the hole pattern of the two rail sections align correctly. Larger overhangs are cut off.



5. Hold the overlapping code rails firmly to prevent them from shifting. Punch four holes with a diameter of 3 mm through the two code rail sections using a punch as shown in the figure.



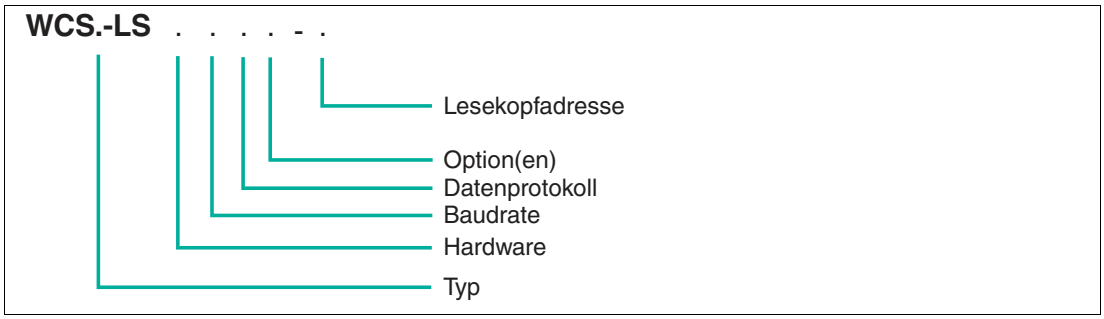
6. Insert the hollow rivets from the reparation set in the holes; insert the counterparts and press them together with flat nose pliers or multigrip pliers.

↳ The code rail holds together firmly.



7. Tighten the code rail slightly as needed.

8 Model Overview for WCS Read Heads



Type	2B	WCS2B read head (smaller enclosure, 1200 pos./m with a maximum of 327 m)
	3B	WCS3B read head (1250 pos./m with a maximum of 314.573 m)
	3R	WCS3R read head (833 pos./m with a maximum of 39.3 m)
	3T	WCS3T read head (416 pos./m with a maximum of 78.6 m)

Hardware	1	Read head with RS-485 interface, no RS-485 terminator
	2	Read head with RS-485 interface, with RS-485 terminator
	3	Read head with SSI interface
	4	Read head with CANopen interface
	5	Read head with EtherNet/IP interface
	6	Read head with PROFINET Interface

Baud rate	Read head with RS-485 interface	
	1	187.50 kBaud
	2	62.50 kBaud
	3	31.25 kBaud
	4	19.20 kBaud
	5	9.60 kBaud
	6	38.40 kBaud
	Read head with SSI interface	
	1	100 kHz – 1000 kHz
	Read head with CANopen interface	
	1	125 kBaud, 250 kBaud, 500 kBaud, 1 MBaud
	Read head with EtherNet/IP interface	
	1	100 Mbit/s
	Read head with PROFINET Interface	
	1	100 Mbit/s

Data log	Read head with RS-485 interface	
	1	Data log 1, data log 2 [1]
	6	Data log 3 with even parity (9 bit/byte)
	7	Data log 3 without parity (8 bit/byte)
	Read head with SSI interface	
	0	Data output in binary code
	1	Data output in Gray code
	Read head with a CANopen, EtherNet/IP, and PROFINET interface	
	0	Data output in binary code

1. Data log depends on read head request byte

Option	D	Read head with optional integrated display
	E	Read head with "Extended" option
	H	Read head with optional heating
	S	Read head with optional velocity output
	OM	Read head with "Outdoor" option (IP69K) and central cable outlet
	OL	Read head with "Outdoor" option (IP69K) and left-hand-side cable outlet
	OR	Read head with "Outdoor" option (IP69K), and right-hand-side cable outlet

Read head address	Read head with RS-485 interface	
	0	Read head address 0
	1	Read head address 1
	2	Read head address 2
	3	Read head address 3
	-	Read head address 0

2019-11

9 Disposal

The device, built-in components, packaging, and any batteries contained within must be disposed in compliance with the applicable laws and guidelines of the respective country.

10 Appendix

10.1 Cable Overview

The cable types listed below represent a selection of the types offered by Pepperl+Fuchs. Further cable types can be found on our website.

Note

For cables that you can assemble yourself, observe the cable length restrictions specified by the interface specification. In the respective interface chapters you will find recommendations for the maximum cable length.

RS-485 (LS1xx*, LS2xx*)

Cable	Description
Pre-configured cable	
V15-G-2M-PUR-ABG	M12 single-ended female cordset, five-pins, straight, 2 m PUR cable, shielded,
V15-G-5M-PUR-ABG	M12 single-ended female cordset, five-pins, straight, 5 m PUR cable, shielded,
V15-G-10M-PUR-ABG	M12 single-ended female cordset, five-pins, straight, 10 m PUR cable, shielded,
Configurable female cordset and meter goods	
V15-G-ABG-PG9	Five-pin single-ended female cordset, field attachable, shielded
V15-G-ABG-PG9-FE	Five-pin single-ended female cordset, field attachable, shielded with grounding terminal
WCS-DCS	Available by the meter, six-pin data cable + shield, 0.14 mm^2 3 x 2 twisted wire pair
WCS-DCF	Available by the meter, six-pin data cable + shield, 0.25 mm^2 3 x 2 twisted wire pair, suitable for drag chains

SSI (LS3xx*)

Cable	Description
Pre-configured cable	
V19-G-2M-PUR-ABG	M12 single-ended female cordset, eight-pin, straight, 2 m PUR cable, shielded,
V19-G-5M-PUR-ABG	M12 single-ended female cordset, eight-pin, straight, 5 m PUR cable, shielded,
V19-G-10M-PUR-ABG	M12 single-ended female cordset, eight-pin, straight, 10 m PUR cable, shielded,
V19-G-2M-PVC-TP	Female cordset, M12, eight-pin, shielded, 2 m PVC cable Shielded twisted pair
V19-G-5M-PVC-TP	Female cordset, M12, eight-pin, shielded, 5 m PVC cable Shielded twisted pair
V19-G-10M-PVC-TP	Female cordset, M12, eight-pin, shielded, 10 m PVC cable Shielded twisted pair
Configurable female cordset and meter goods	
V19-G-ABG-PG9	Eight-pin single-ended female cordset, field attachable, shielded
V19-G-ABG-PG9-FE	Eight-pin single-ended female cordset, field attachable, shielded with grounding terminal
WCS-DCS	Available by the meter, six-pin data cable + shield, 0.14 mm^2 3 x 2 twisted wire pair
WCS-DCF	Available by the meter, six-pin data cable + shield, 0.25 mm^2 3 x 2 twisted wire pair, suitable for drag chains

CANopen (LS4xx*)

Cable	Description
Pre-configured cable	
V15-G-2M-PUR-CAN	CANopen bus cable, M12, 2 m PUR cable, five-pin
V15-G-2M-PUR-CAN-V15-G	CANopen bus cable, M12 to M12, 2 m PUR cable, five-pin
V15-G-5M-PUR-CAN-V15-G	CANopen bus cable, M12 to M12, 5 m PUR cable, five-pin
V15-G-10M-PUR-CAN-V15-G	CANopen bus cable, M12 to M12, 10 m PUR cable, five-pin
Configurable female cordset and meter goods	
V15-G-ABG-PG9-FE	Female connector, M12, five-pin, shielded, field attachable
WCS-DCS	Available by the meter, six-pin data cable + shield, 0.14 mm^2 3 x 2 twisted wire pair
WCS-DCF	Available by the meter, six-pin data cable + shield, 0.25 mm^2 3 x 2 twisted wire pair, suitable for drag chains

2019-11

EtherNet/IP (LS5xx*) & PROFINET (LS6xx*)

Cable	Description
Hybrid cable with common data line and supply voltage	
V19SY-G-BK2M-PUR-ABG	Single-ended male cordset, M12, 8-pin, Y coding, 2 m PUR cable, shielded
V19SY-G-BK5M-PUR-ABG	Single-ended male cordset, M12, 8-pin, Y coding, 5 m PUR cable, shielded
V19SY-G-BK10M-PUR-ABG	Single-ended male cordset, M12, 8-pin, Y coding, 10 m PUR cable, shielded
Y-splitter and cable (data cable and supply voltage separated)	
V19SY-Y-V1D/V1S	Y-splitter, M12 plug Y-coded to A-coded M12 plug/D-coded socket
V1SD-G-*M-PUR-ABG-V45-G[1]	Cordset, M12 to four-pin RJ-45 PUR cable, CAT5e, in conjunction with Y-plug (data cable)
V1-G-BK10M-PUR-U	Single-ended female cordset, M12, four pins, PUR cable, in conjunction with Y-plug (supply voltage)

1. This cable type is available in various lengths 2 ... 45 m.

2019-11

Your automation, our passion.

Explosion Protection

- Intrinsic Safety Barriers
- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
- Industrial HMI
- Mobile Computing and Communications
- HART Interface Solutions
- Surge Protection
- Wireless Solutions
- Level Measurement

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
- AS-Interface
- Identification Systems
- Displays and Signal Processing
- Connectivity

Pepperl+Fuchs Quality
Download our latest policy here:

www.pepperl-fuchs.com/quality

PEPPERL+FUCHS

www.pepperl-fuchs.com

© Pepperl+Fuchs · Subject to modifications

Printed in Germany / DOCT-3785