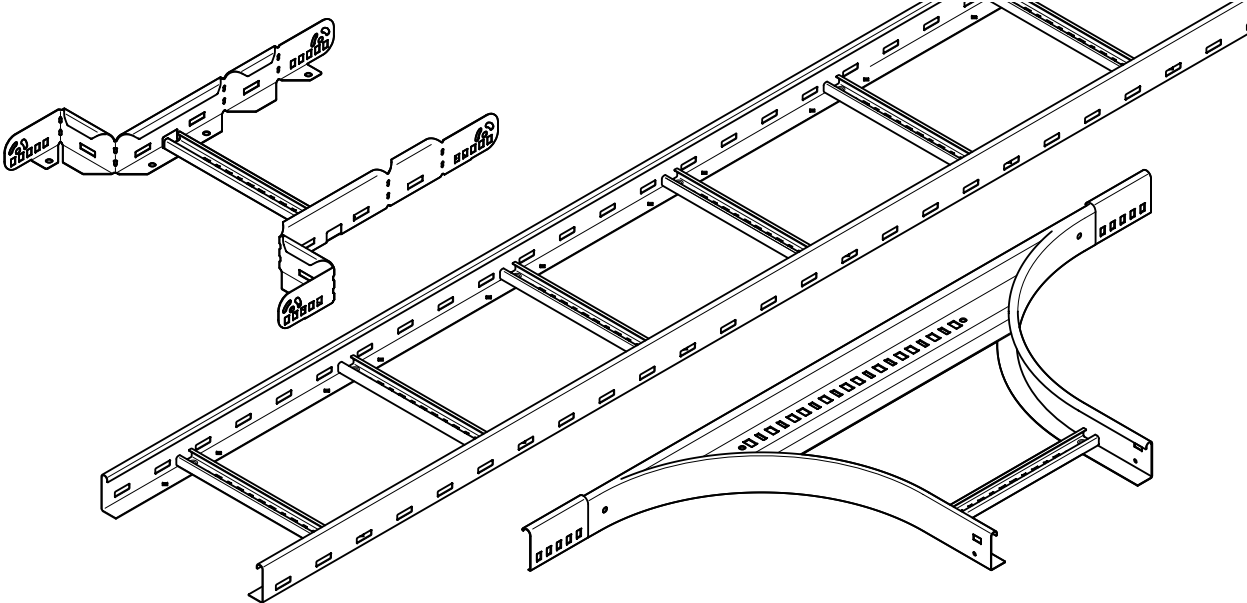


**Cable ladder systems**  
Mounting instructions



## **Cable ladder systems**

Mounting instructions

## Table of contents

<b>1</b>	<b>About these instructions . . . . .</b>	<b>.5</b>
1.1	Target group . . . . .	5
1.2	Using these instructions . . . . .	5
1.3	Types of safety information . . . . .	5
1.4	Correct use . . . . .	6
1.5	Ambient conditions . . . . .	6
1.6	Applicable documents . . . . .	6
1.7	Basic standards. . . . .	6
<b>2</b>	<b>General safety information . . . . .</b>	<b>.6</b>
<b>3</b>	<b>Information on the product. . . . .</b>	<b>.7</b>
<b>4</b>	<b>System components . . . . .</b>	<b>.7</b>
4.1	Cable ladders . . . . .	7
4.1.1	Cable ladder load capacity. . . . .	8
4.2	Fittings . . . . .	9
4.2.1	90° bend . . . . .	9
4.2.2	T piece . . . . .	10
4.2.3	Mounting/branch piece . . . . .	10
4.2.4	Articulated bend . . . . .	11
4.3	Connector. . . . .	12
4.3.1	Straight connector . . . . .	13
4.3.2	Angle connector . . . . .	13
4.3.3	Adjustable connector. . . . .	13
4.3.4	Connector for expansion . . . . .	13
4.3.5	Multifunctional connector. . . . .	14
4.4	Accessories. . . . .	15
4.4.1	Mounting material . . . . .	15
4.4.2	Barrier strip. . . . .	15
4.4.3	Covers . . . . .	16
4.4.4	Connection piece/support profile/drop-out plate . . . . .	17
4.4.5	Clamp clip . . . . .	18
4.4.6	Miscellaneous . . . . .	19
<b>5</b>	<b>Mounting cable ladders. . . . .</b>	<b>20</b>
5.1	Opening the cable ladder. . . . .	20
5.2	Cutting the cable ladder to size. . . . .	21
5.3	Mounting the cable ladder on a support system . . . . .	21
5.3.1	Mounting the cable ladder on the wall and support bracket . . . . .	21
5.3.2	Mounting the cable ladder on the steel girder . . . . .	22
<b>6</b>	<b>Connecting cable ladders . . . . .</b>	<b>22</b>
6.1	Connecting cable ladders with straight connectors. . . . .	23
6.1.1	Inserting connectors for expansion. . . . .	24
6.2	Connecting cable ladders with angle connectors. . . . .	25
6.3	Connecting cable ladders with adjustable connectors . . . . .	26
<b>7</b>	<b>Connecting cable ladders and fittings. . . . .</b>	<b>27</b>
7.1	Support a fitting. . . . .	27
7.1.1	Fitting support up to 300 mm width . . . . .	27
7.1.2	Fitting support from 400 mm width. . . . .	28

7.2	Mounting a mounting/branch piece . . . . .	29
7.3	Mounting the 90° bend and T piece . . . . .	31
7.4	Mounting the articulated bend . . . . .	32
7.5	Mounting the multifunctional connector. . . . .	33
7.5.1	Mounting the multifunctional connector as a reducer . . . . .	33
7.5.2	Mounting the multifunctional connector as a bend . . . . .	34
7.5.3	Mounting the multifunctional connector on an articulated bend . . . . .	34
7.5.4	Mounting the multifunctional connector as a mounting/branch piece . . . . .	36
<b>8</b>	<b>Creating a T exit made of two cable ladders . . . . .</b>	<b>37</b>
8.1	Creating a T exit with a step . . . . .	37
8.2	Creating a T exit without a step. . . . .	38
8.2.1	Mounting the corner plate . . . . .	39
8.2.2	Mounting the support plate. . . . .	39
<b>9</b>	<b>Mounting the drop-out plate . . . . .</b>	<b>40</b>
<b>10</b>	<b>Mounting the barrier strip . . . . .</b>	<b>40</b>
10.1	Mounting the barrier strip without screws. . . . .	40
10.2	Mounting the barrier strip with screws . . . . .	41
10.3	Connecting barrier strips . . . . .	41
<b>11</b>	<b>Mounting the cover . . . . .</b>	<b>42</b>
11.1	Mounting the cover with turn buckle . . . . .	42
11.2	Mounting the cover with cover clamp. . . . .	43
11.3	Mounting the cover with spacer. . . . .	44
11.3.1	Mounting spacers on covers . . . . .	45
11.3.2	Mounting covers on cable ladders . . . . .	46
<b>12</b>	<b>Mounting the clamp clip . . . . .</b>	<b>47</b>
12.1	Suspending the clamp clip in the rung slot . . . . .	47
12.2	Suspending the clamp clip in the rung perforation . . . . .	47
<b>13</b>	<b>Creating equipotential bonding . . . . .</b>	<b>48</b>
<b>14</b>	<b>Mounting end caps . . . . .</b>	<b>49</b>
<b>15</b>	<b>Dismantling cable ladder systems. . . . .</b>	<b>49</b>
<b>16</b>	<b>Disposing of cable ladder systems . . . . .</b>	<b>49</b>

# 1 About these instructions

## 1.1 Target group

These mounting instructions are intended for:

- Engineers and architects charged with the planning of cable ladder systems.
- Electrically trained specialists charged with mounting cable ladder systems.

## 1.2 Using these instructions

- These instructions are based on the standards valid at the time of compilation (September 2021).
- Before commencing work, read these instructions through once completely. Observe the safety information.
- Keep all the documents supplied with the system in an easily accessible location, so that it is accessible when needed.
- We will not accept any warranty claims for damage caused through non-observance of these instructions.
- Any images are intended merely as examples. Mounting results may look different.

## 1.3 Types of safety information



**WARNING**

---

### Type of risk!

Shows a possibly risky situation. If the situation is not avoided, then death or serious injury may result.

---



**CAUTION**

---

### Type of risk!

Shows a possibly risky situation. If the situation is not avoided, then light or minor injury or damage to property may result.

---

**ATTENTION**

---

### Type of risk!

Shows a possibly hazardous situation. If the situation is not avoided, then damage to the product or the surroundings may occur.

---

**Note!**

*Indicates important information or assistance!*

### 1.4 Correct use

The cable ladder system is used for supporting and routing all types of cables. Depending on the corrosion protection used, it can be used indoors and outdoors.

The cable ladder system is not designed for any other purpose than the one described here. If the cable ladder system is used for another purpose, any liability, warranty or damage claims shall be rendered null and void.

### 1.5 Ambient conditions

The cable ladder system is suitable for use at ambient temperatures of  $-20\text{ °C}$  to  $+120\text{ °C}$ . At temperatures below  $-20\text{ °C}$ , the material will become brittle and may not be processed further.

### 1.6 Applicable documents

KTS mounting instructions – applicable for all OBO cable support systems:

<https://obo-bettermann.com/article/display/en-wo/cable-ladder-lg-60-ns-2.html>

→ Technical information → Technical documents

Mounting instructions for different support structures:

- U support systems, see [www.obo.de/out/media/04-150\\_MA\\_U\\_support\\_systems.pdf](http://www.obo.de/out/media/04-150_MA_U_support_systems.pdf)
- I support systems, see [www.obo.de/out/media/04-150\\_MA\\_I\\_support\\_systems.pdf](http://www.obo.de/out/media/04-150_MA_I_support_systems.pdf)
- Universal systems, see [www.obo.de/out/media/04-150\\_MA\\_Universal\\_systems.pdf](http://www.obo.de/out/media/04-150_MA_Universal_systems.pdf)
- Trapezoidal systems, see [www.obo.de/out/media/04-150\\_MA\\_TP\\_support\\_systems.pdf](http://www.obo.de/out/media/04-150_MA_TP_support_systems.pdf)
- Clamp fastenings, see [www.obo.de/out/media/04-150\\_MA\\_Clamp\\_fastening\\_systems.pdf](http://www.obo.de/out/media/04-150_MA_Clamp_fastening_systems.pdf)

### 1.7 Basic standards

The cable ladder system fulfils the requirements of DIN EN 61537 VDE 0639:2007-09 – Cable management – Cable tray systems and cable ladder systems.

## 2 General safety information

Observe the following general safety information on handling the cable ladder system:

- Follow applicable working, accident and environmental protection regulations.
- Protective gloves must be worn during all mechanical mounting work.
- The cable ladder system should be included in the protective measures and the equipotential bonding.
- The inclusion in the equipotential bonding of the overall system must

- be performed by specialist personnel.
- The support system of the cable ladders must be designed according to the loads to be expected.
  - The maximum load capacity of the cable support system may not be exceeded.

### 3 Information on the product

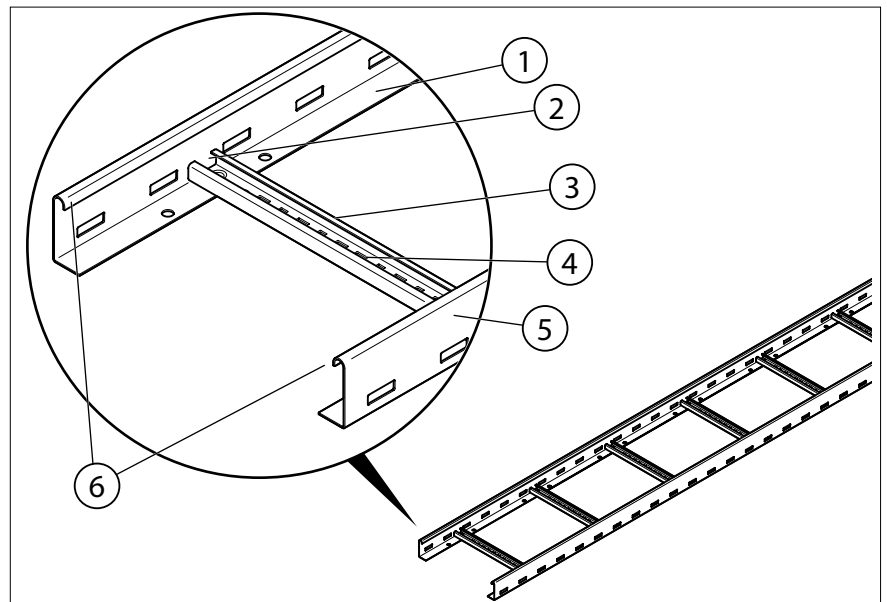
OBO cable ladder systems stand out through their high load capacity and good ventilation. They are thus particularly suited to the installation of power cables and cables with large cross-sections.

They can be used universally. Due to their continuous rail and rung perforation, they offer countless mounting options, e.g. integrated fastening of cables on the rungs using OBO clamp clips.

## 4 System components

### 4.1 Cable ladders

Cable ladders are available in riveted and welded versions.



**Figure 1:** Cable ladders

- ① Lower flange
- ② Slot
- ③ Rung (welded)
- ④ Perforation
- ⑤ Rail
- ⑥ Rounded top edge of the rail

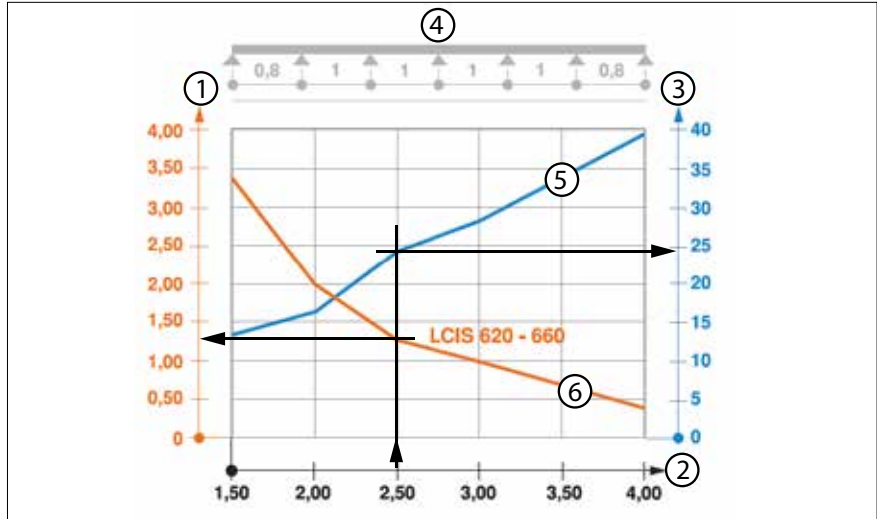
### 4.1.1 Cable ladder load capacity

The approved load capacity of the individual cable ladders can be found in the appropriate load diagrams in the current planner catalogue.

<https://obo-bettermann.com/en-wo/support/3804.html>

Example of LCIS 620 - 660 cable ladders in the cable ladder systems chapter:

At a support width of 2.5 m and a load of ~ 1.3 kN/m, the rail bend by ~ 24 mm.



**Figure 2:** Load diagram LCIS 620 – 660

- ① Approved cable tray/cable ladder load [kN/m]
- ② Support width [m]
- ③ Rail bending [mm]
- ④ Load scheme during testing
- ⑤ Rail bend curve according to support width
- ⑥ Load curve with cable tray/cable ladder width



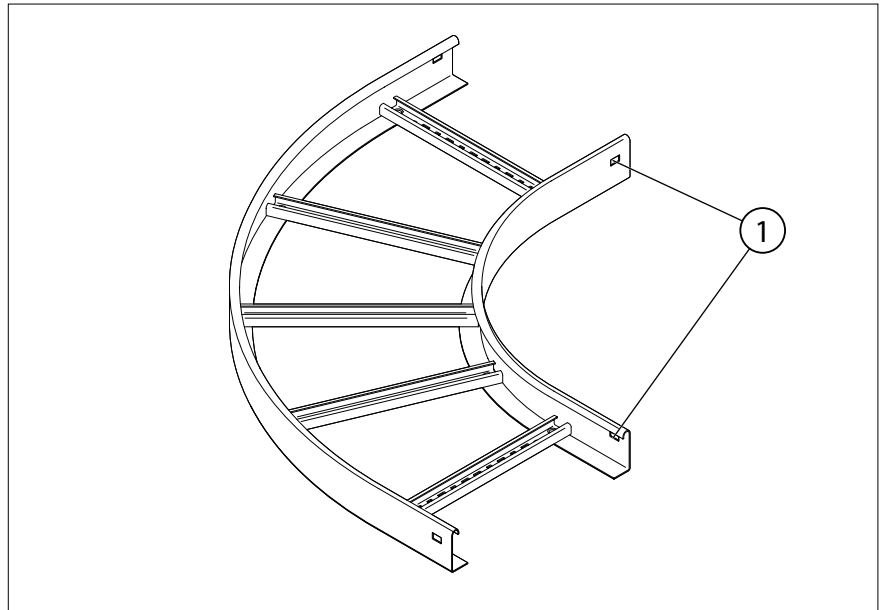
## 4.2 Fittings

Fittings allow vertical or horizontal changes of direction in cable ladder systems. Fittings and cable ladders are mounted with connectors. The equipotential bonding takes place via the screw connection.

**Note!** *Fittings must always be supported in the centre!*

### 4.2.1 90° bend

The 90° bend connects two cable ladders of the same width, which are at an angle of 90° to one another in the horizontal. The standard system radius of the bend is 300 mm.

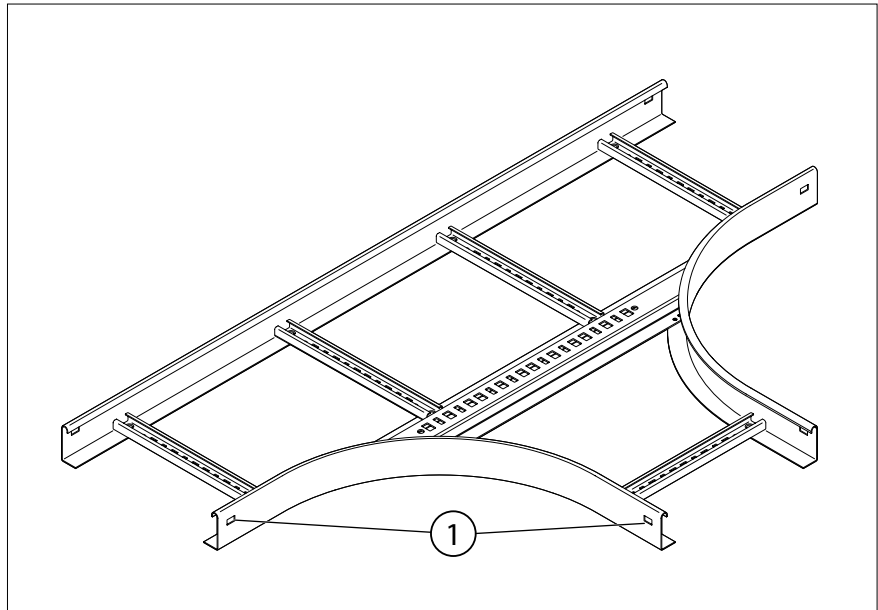


**Figure 3:** 90° bend

① Perforation for connector fastening

## 4.2.2 T piece

The T piece connects three cable ladders of the same width, which connect in the horizontal. This creates a 90° branch. The standard system radius of the T piece is 300 mm.

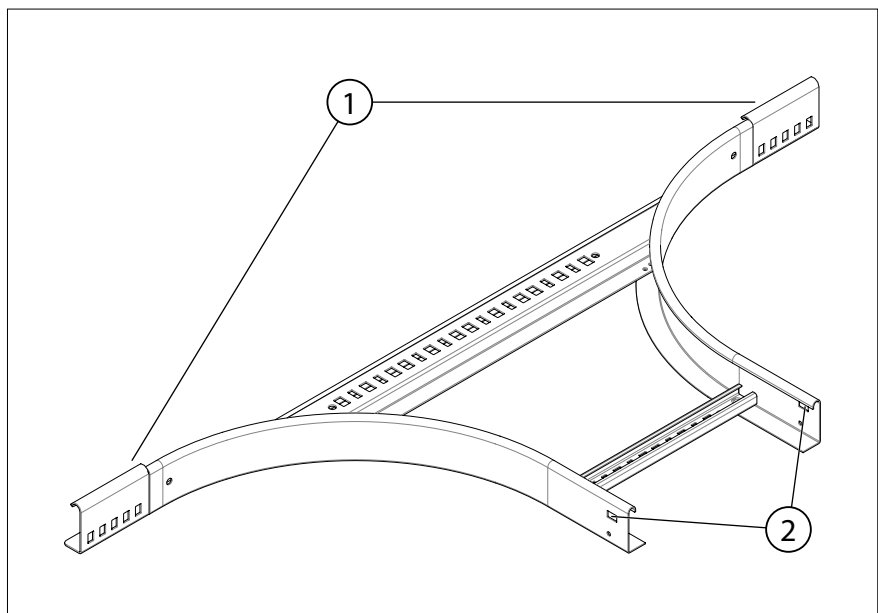


**Figure 4:** T piece

- ① Perforation for connector fastening

## 4.2.3 Mounting/branch piece

The mounting/branch piece is inserted in a cable ladder with its integrated connectors. This creates a 90° branch. The cable ladder and mounting/branch piece can be of different widths. In combination with a second mounting/branch piece, a symmetrical or asymmetrical cross-over can be created. The standard system radius of the mounting/branch piece is 300 mm.

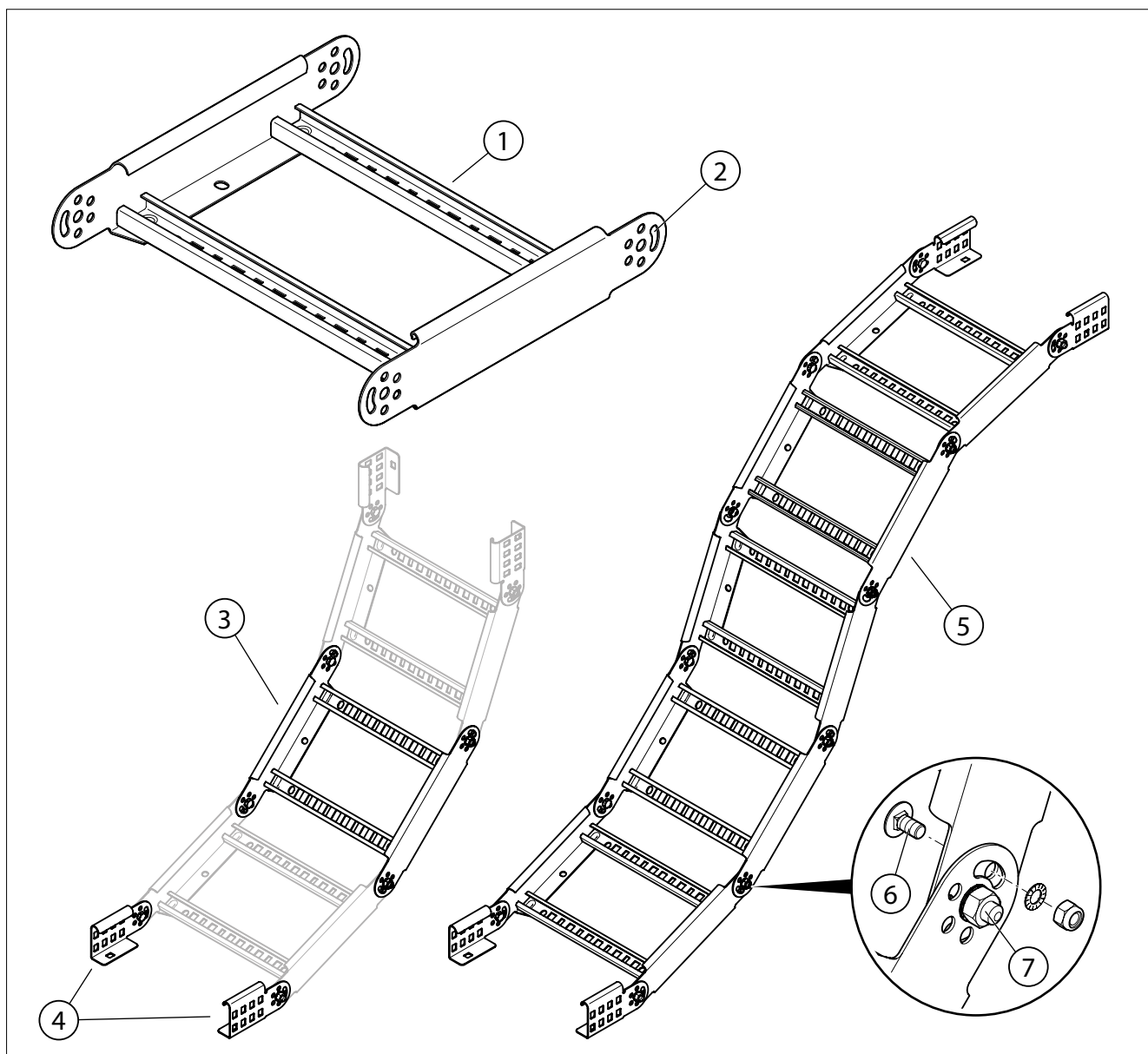


**Figure 5:** Mounting/branch piece

- ① Integrated connector
- ② Perforation for connector fastening

#### 4.2.4 Articulated bend

The articulated bend is comprised of multiple articulated bend elements. Different bend radii are achieved, depending on the number of articulated bend elements used. The articulated bend connects a horizontal cable ladder with a vertical one or compensates for a height offset between two horizontal cable ladders. The articulated bend is constructed in such a way that half an adjustable connector is required for each connection with the cable ladder.



**Figure 6:** Articulated bend

- ① Articulated bend element
- ② Curved slot
- ③ Mounted articulated bend (horizontal/vertical connection)
- ④ Half adjustable connector
- ⑤ Mounted articulated bend (height offset)
- ⑥ Securing screw
- ⑦ Hinge screw

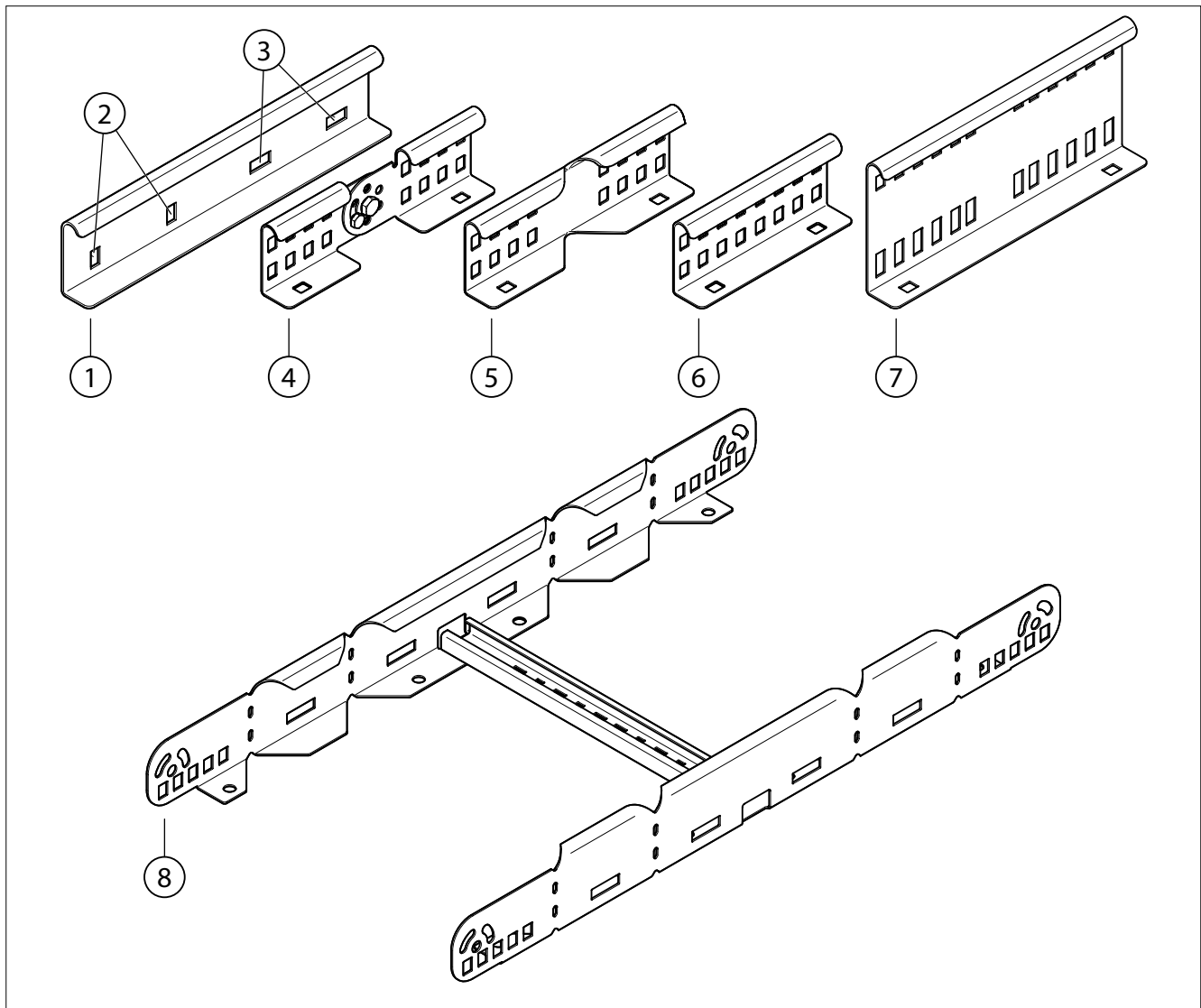
### 4.3 Connector

The following parts can be interconnected using connectors:

- Cable ladder with cable ladder
- Cable ladder with fitting
- Fitting with fitting

**Note!** *Fastening material is included with the connectors.*

**Note!** *Cable ladders and fittings are referred to as elements below.*



**Figure 7:** Connector

- ① Connector for expansion
- ② Fixed bearing
- ③ Moveable bearing
- ④ Adjustable connector
- ⑤ Angle connector
- ⑥ Straight connector, height 60 mm
- ⑦ Straight connector, height 110 mm
- ⑧ Multifunctional connector

**4.3.1 Straight connector**

The straight connector connects elements located in the same direction.

**4.3.2 Angle connector**

The angle connector allows a horizontal change of direction between two elements.

**4.3.3 Adjustable connector**

The adjustable connector allows a vertical change of direction between two elements.

**4.3.4 Connector for expansion**

The connector for expansion is used on long cable ladder sections, in order to compensate for the temperature-dependent expansion of the cable ladder sections.

- Fixed bearings are screwed on with the standard tightening torque.
- Moveable bearings are hand-tightened, in order to give the connection the necessary movement to expand.

**Note!** *Determination of the spacing of the connectors for expansion to be used, see "KTS mounting instructions – Applicable to all OBO cable support systems":*

<https://obo-bettermann.com/article/display/en-wo/cable-ladder-lg-60-ns-2.html>

→ Technical information → Technical documents

### 4.3.5 Multifunctional connector

The multifunctional connector unifies the properties of fittings and connectors. Elements can be connected easily. The side rails of the multifunctional connector can be adjusted to any angle and any installation situation, so that both symmetrical and asymmetrical reductions are possible. In connection with an adjustable connector, vertical changes of direction are also possible.

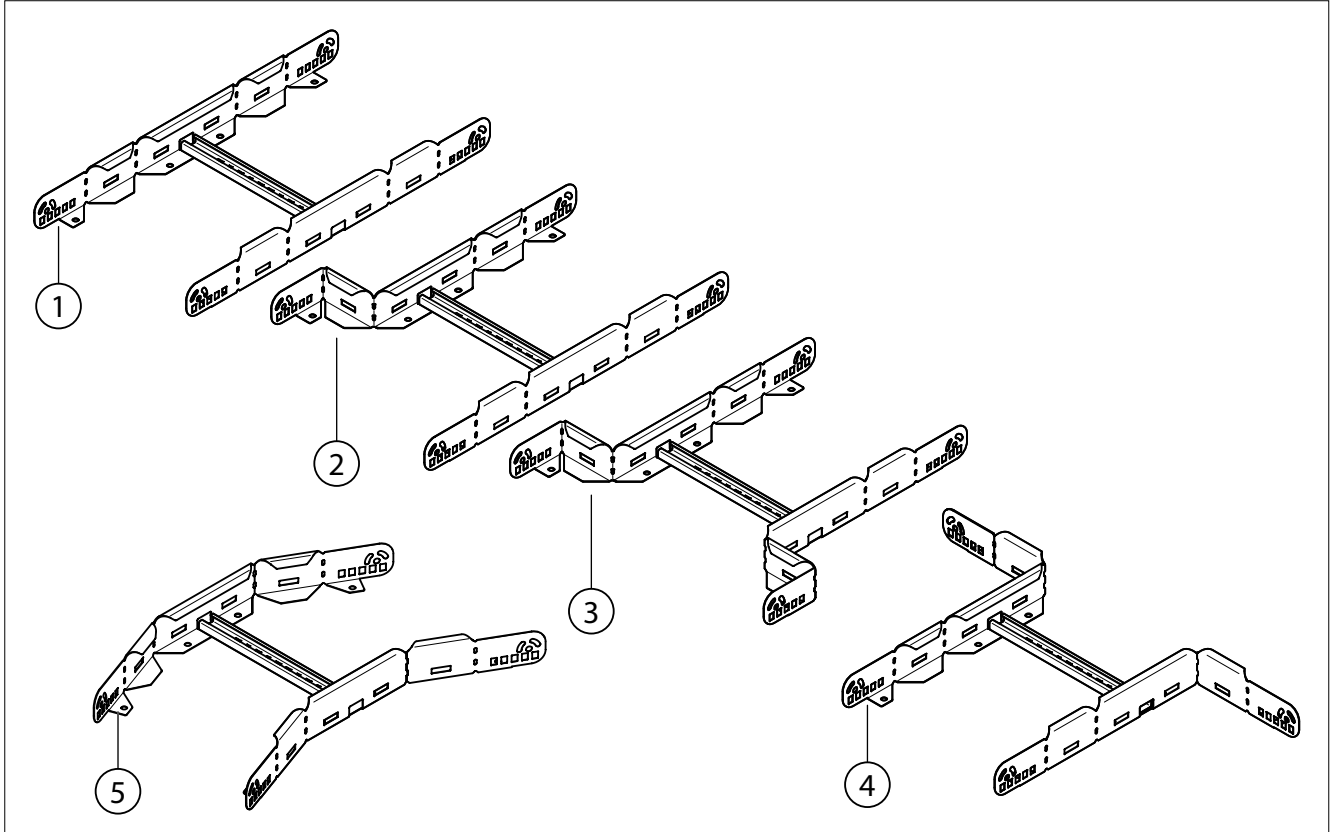


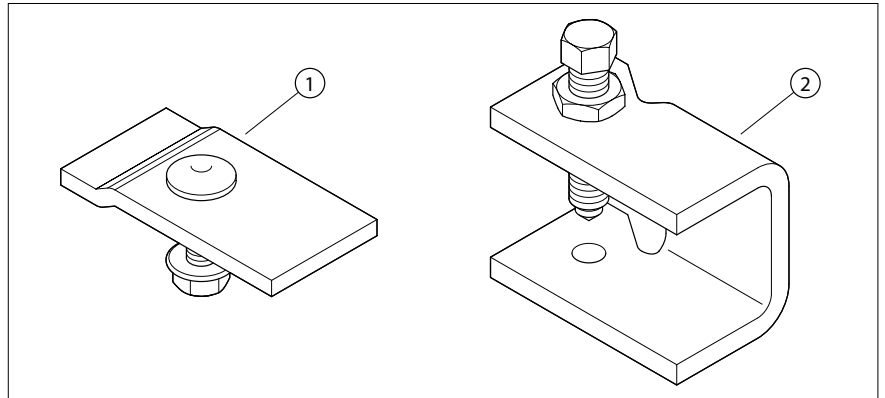
Figure 8: Multifunctional connector

- ① Multifunctional connector
- ② Multifunctional connection as asymmetrical reduction
- ③ Multifunctional connector as symmetrical reduction
- ④ Multifunctional connector as mounting/branch piece
- ⑤ Multifunctional connector as bend 0–60°

## 4.4 Accessories

### 4.4.1 Mounting material

Horizontal cable ladder system can be mounted on brackets or directly on steel girders. Depending on the support type, different mounting material is required for fastening.

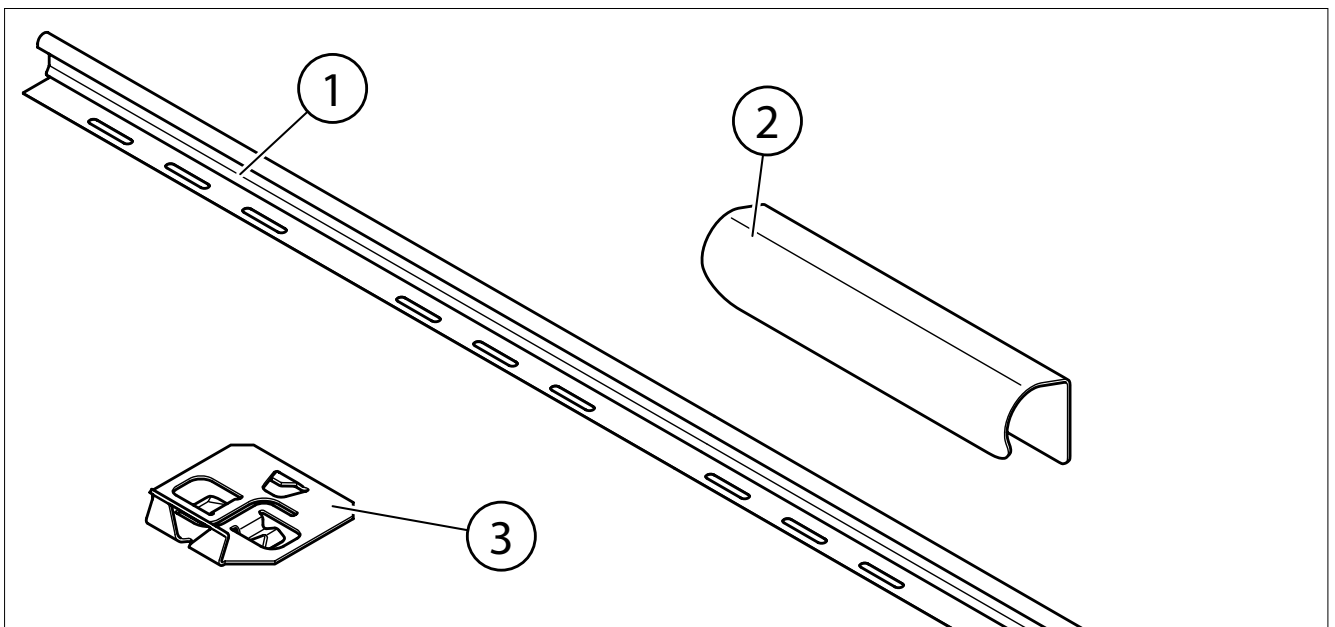


**Figure 9:** Mounting material

- ① LKS clamping piece for mounting on brackets
- ② KLL clamping piece for mounting on steel girders

### 4.4.2 Barrier strip

Barrier strips separate cables of different voltages or functions in cable ladder systems. Barrier strips are fastened to the rungs of the cable ladders. They can be screwed or clamped on. Two barrier strips are connected with a barrier strip connector.



**Figure 10:** Barrier strip with components

- ① Barrier strip
- ② Barrier strip connector
- ③ Clamping piece for barrier strip fastening

### 4.4.3 Covers

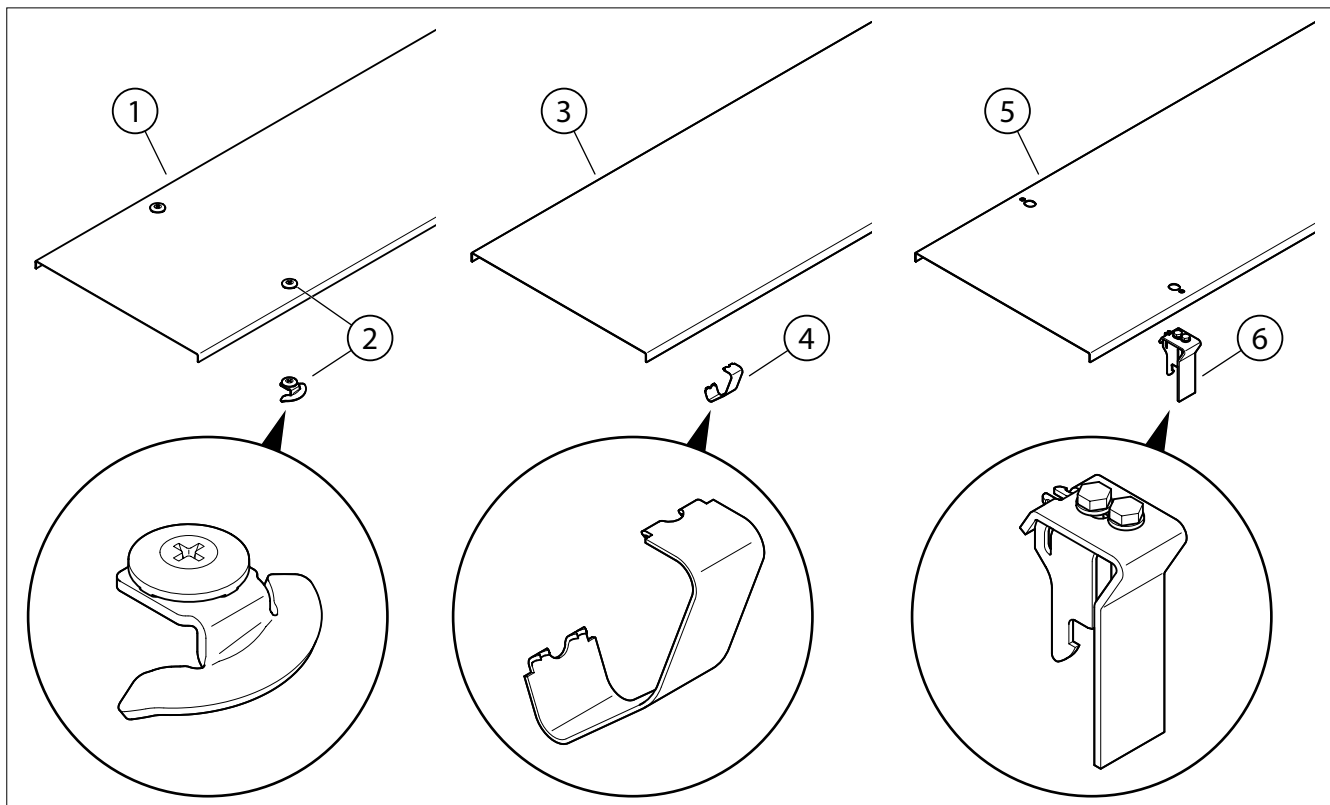
Covers protect cables against dirt, dust and damage. The covers are constructed in such a way that cable ladders and fittings, including the connectors, are fully covered. Covers are offered in three variants:

- Cover with turn buckle
- Cover with cover clamp
- Cover with spacer

Turn buckles and cover clamps clamp the cover directly to the rail of a cable ladder.

Spacers allow good ventilation of the cable ladder systems and the use of clamp clips.

If covers are used outdoors, then measures against the influence of wind must be taken.



**Figure 11:** Covers

- ① Cover with turn buckle
- ② Turn buckle
- ③ Cover for cover clamp
- ④ Cover clamp
- ⑤ Cover for spacer
- ⑥ Spacer



#### 4.4.4 Connection piece/support profile/drop-out plate

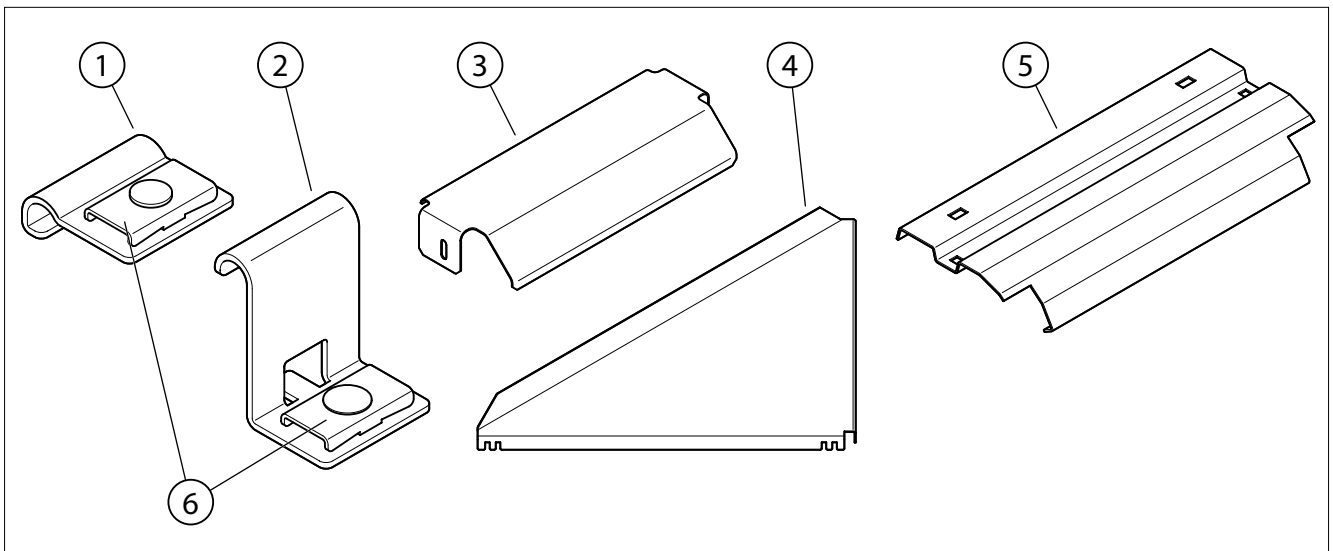
T exits in existing cable support systems can be created with connection pieces or support angles.

- Support angles create branches in cable ladders with a different height level.
- Connection pieces create branches in cable ladders with the same height level.

If cable ladders at the same height level are connected, then the support surface can be expanded to protect the cables:

- With a support plate.
- With a corner plate.

Vertical branches from cable ladders can be fitted with drop-out plates to protect cables. The drop-out plates increase the support surface and are mounted on the rung of the cable ladder.

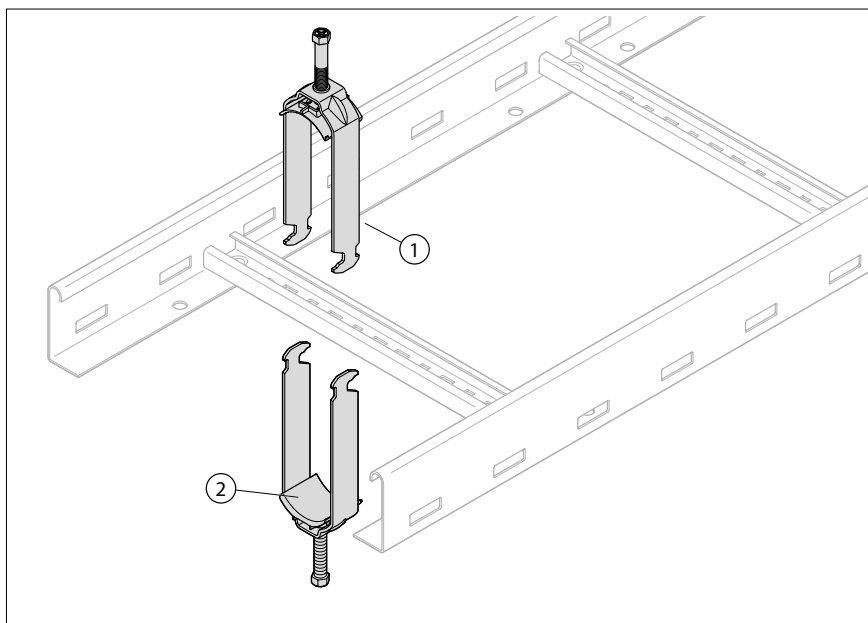


**Figure 12:** Connection piece/support profile/drop-out plate

- ① Support angle LAW
- ② Connection piece LAS
- ③ Support plate LALB
- ④ Corner plate LEB
- ⑤ Exit plate LAB
- ⑥ Clamping piece

### 4.4.5 Clamp clip

Clamp clips are used for the fixed-location mounting of individual cables on the rungs of a cable ladder. The rung of the welded cable ladder can be equipped on both sides. The rung of the riveted cable ladder can be equipped on one side.



**Figure 13:** Clamp clip with welded cable ladder

- ① Clamp clip
- ② Pressure trough

#### 4.4.6 Miscellaneous

##### Earthing terminal

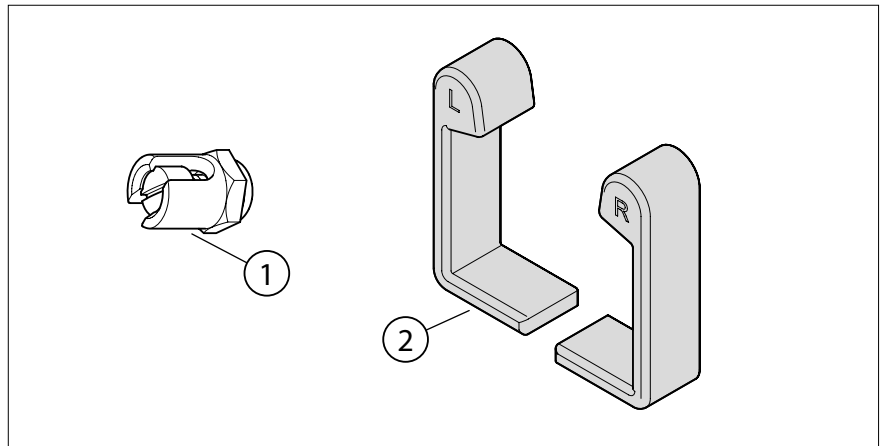
Depending on the mounting situation, equipotential bonding with the overall system may be required, see DIN EN 61537 VDE 0639:2007-09.

**Note!** *OBO Bettermann recommends always creating equipotential bonding to the overall system.*

##### End cap

To protect the cables, the open cable ladder ends can each be covered with an end cap.

**Note!** *OBO Bettermann recommends always placing an end cap on all cable ladder ends.*



**Figure 14:** Earthing terminal, end caps

- ① Earthing terminal
- ② End caps

## 5 Mounting cable ladders

### ATTENTION

#### Cable damage through incorrectly set screw connections!

Sharp-edged threads can damage cables.

- Always insert bolts from the inside to the outside of the rail or rung of the cable ladder and screw on the nut from outside.

### 5.1 Opening the cable ladder

To save space, riveted cable ladders are supplied folded up and must be opened before mounting. With a sufficient ceiling height, the cable ladder can be erected vertically. If the ceiling height is insufficient or the cable ladders are long, then horizontal opening against a wall is recommended.



### CAUTION

#### Risk of trapping through moving rungs!

Hands can be trapped on opening the cable ladder.

- On opening, only hold the rails on the outsides.

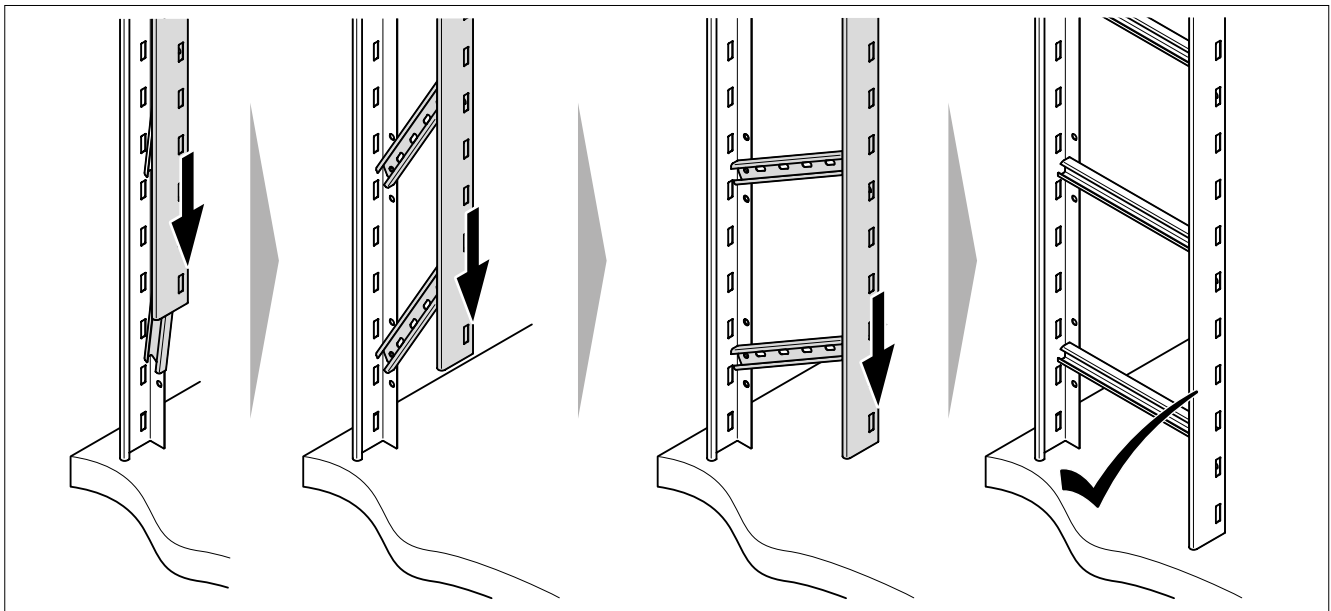


Figure 15: Opening the cable ladder vertically

#### Opening vertically

1. Place the cable ladder on the floor.
2. Pull down the opened rail until both rails are on the floor.

#### Opening horizontally

1. Place the cable ladder on the floor and support it against a wall.
2. Pull the opened rail against the wall until both rails touch the wall.

## 5.2 Cutting the cable ladder to size

**Note!** *Cut the cable ladders according to the local circumstances.*



### **Risk of cutting!**

During cutting work, metal chips or sharp cut edges can cause injuries to eyes and hands!

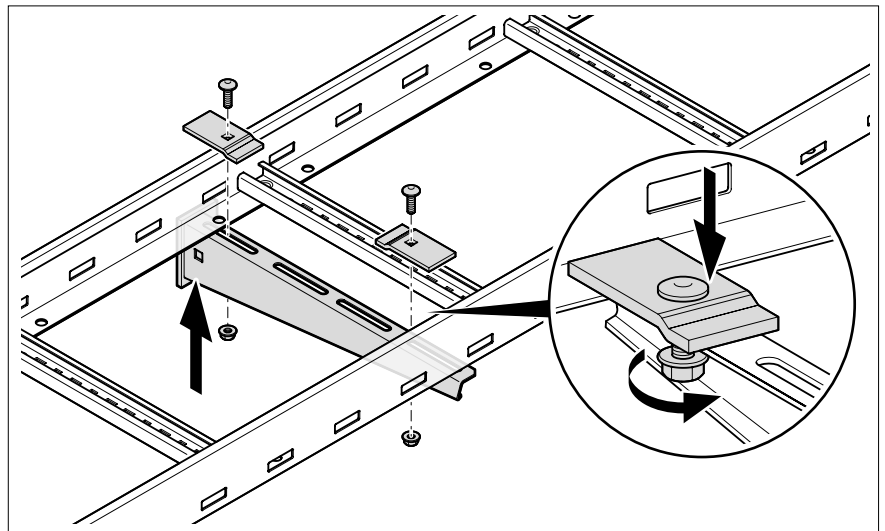
- Wear protective glasses and gloves.
- Deburr cut edges.

1. Cut cable ladders to the desired length, e.g. using an angle grinder.
2. Deburr cut edges.

**Note!** *In the case of cable ladders for use outdoors, the corrosion protection at the cut edges must be renewed with zinc spray, e.g. type ZSF, art. no. 2362970.*

## 5.3 Mounting the cable ladder on a support system

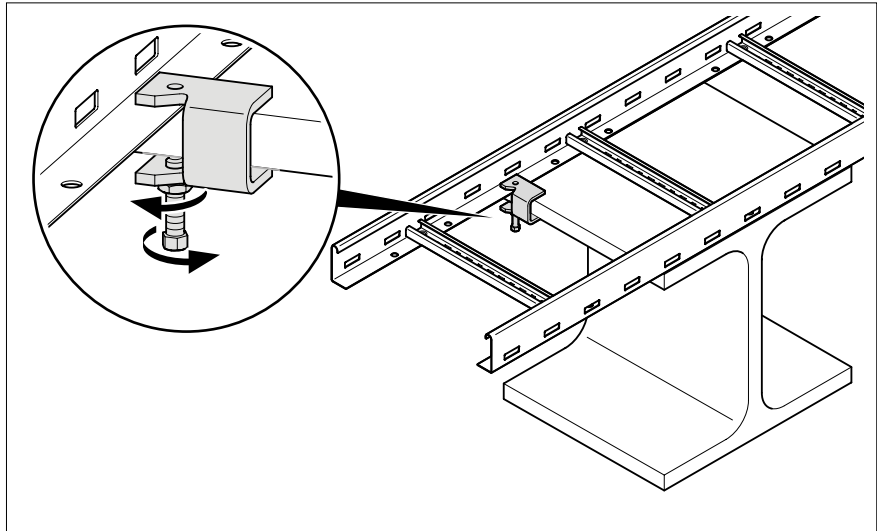
### 5.3.1 Mounting the cable ladder on the wall and support bracket



**Figure 16:** Mounting with clamping piece LKS

1. Place the cable ladder on the bracket.
2. Place the clamping piece on the lower flange of the cable ladder in the area of the bracket. The square perforation of the clamping piece must be located over a slot in the bracket.
3. Insert the truss-head bolt from above through the clamping piece and slot of the bracket.
4. Screw on the clamping piece with a nut.

### 5.3.2 Mounting the cable ladder on the steel girder



**Figure 17:** Mounting with clamping piece KLL

1. Place the cable ladder on the steel girder.
2. Unscrew the bolt from the clamping piece and leave the locknut on the bolt.
3. Push the clamping piece on the lower flange and side rail of the steel girder.
4. Screw the clamping piece with bolt onto the steel girder.
5. Secure the bolt with a locknut.

## 6 Connecting cable ladders

### ATTENTION

#### **Cable damage through incorrectly set screw connections!**

Sharp-edged threads can damage cables.

- Always insert bolts from the inside to the outside of the rail or rung of the cable ladder and screw on the nut from outside.

Usually, two connectors are required per connection. Bolts and nuts must be tightened with the torque to be complied with.

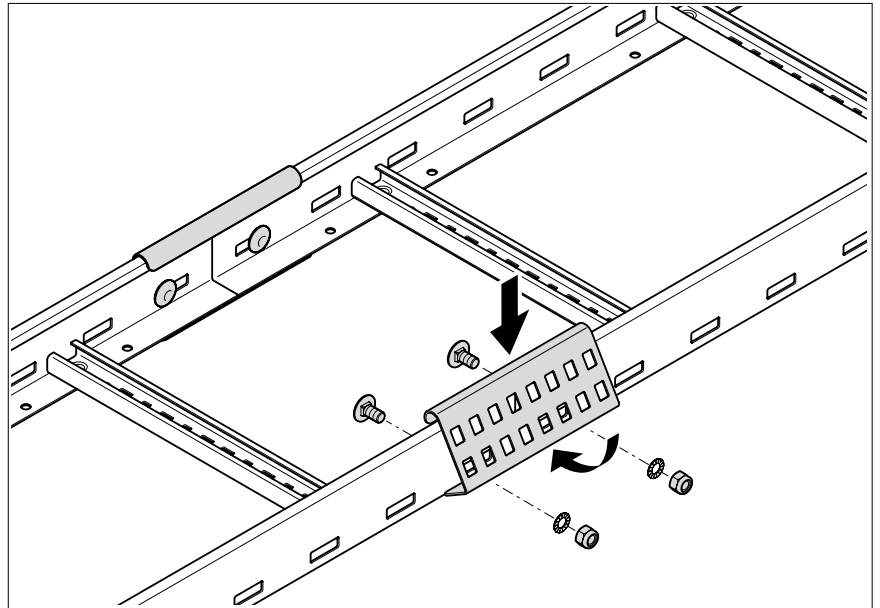
Torques and resistance classes of the supplied bolts:

KTS mounting instructions – applicable to all OBO cable support systems:

<https://obo-bettermann.com/article/display/en-wo/cable-ladder-lg-60-ns-2.html>

→ Technical information → Technical documents

## 6.1 Connecting cable ladders with straight connectors

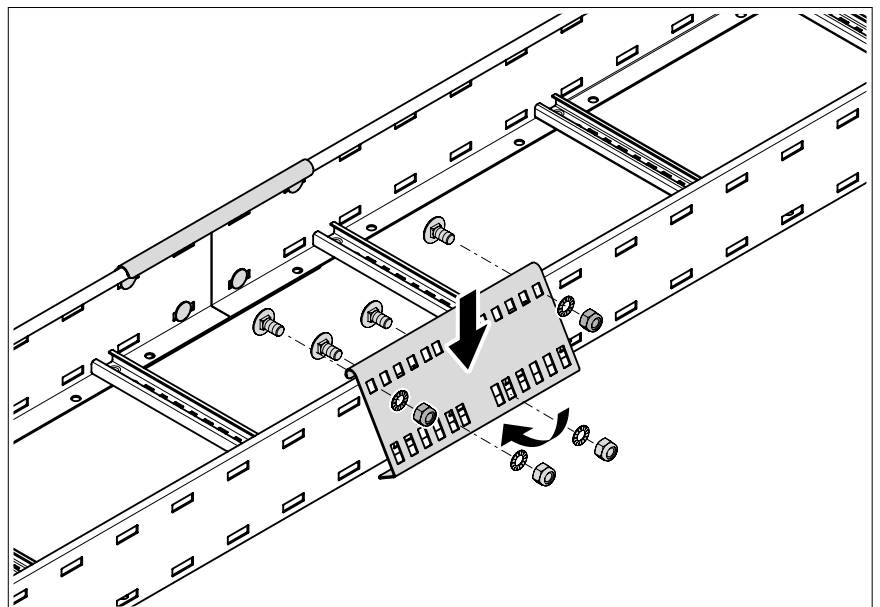


**Figure 18:** Mounting the cable ladders with straight connectors – rail height 60 mm

**Note!**

*In the case of cable ladder systems with a 110 mm rail height, all the connectors must be mounted with the double amount of screw connections. The arrangement of the bolts is identical for:*

- Straight connectors
- Angle connectors
- Adjustable connectors



**Figure 19:** Mounting the cable ladders with straight connectors – rail height 110 mm

1. Place the elements so that they abut.
2. Suspend the straight connectors in the middle of the element joint and fold them down.
3. Connect the straight connectors and elements using the supplied bolts and nuts.

6.1.1 Inserting connectors for expansion

**ATTENTION**

**Material damage through thermal expansion!**

If long cable ladder sections are mounted without sufficient connections for expansion, sagging will occur due to the thermal expansion of the material.

- Use connectors at regular intervals according to the temperature deviations to be expected.

Calculating the thermal length expansion:

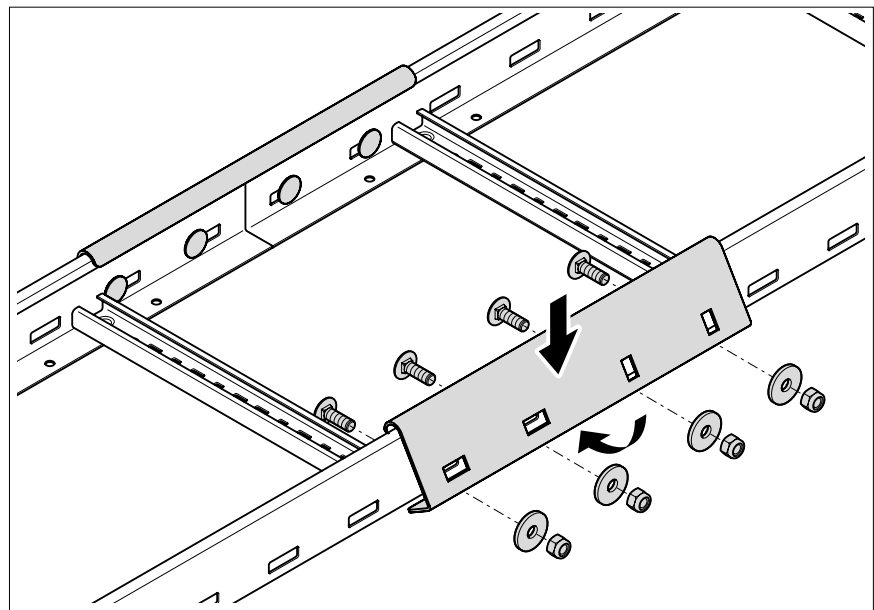
KTS mounting instructions – applicable for all OBO cable support systems:

Difference between the highest and lowest metal temperature to be expected [°C]	Maximum spacing of the connectors for expansion [m]
10	70
25	47
40	35
50	28
65	23
80	20

If necessary, you can find further information via the following link:

<https://obo-bettermann.com/article/display/en-wo/cable-ladder-ig-60-ns-2.html>

→ Technical information → Technical documents



**Figure 20:** Mounting connectors for expansion

1. Place the cable ladders on the joint.
2. Suspend the connectors for expansion in the middle of the cable ladders and fold them down.
3. Connect the connectors for expansion and cable ladders to the side of the fixed bearing using the supplied bolts.
4. Connect the connectors for expansion and cable ladders to the side of the moveable bearing to hand tightness using the supplied bolts.



## 6.2 Connecting cable ladders with angle connectors



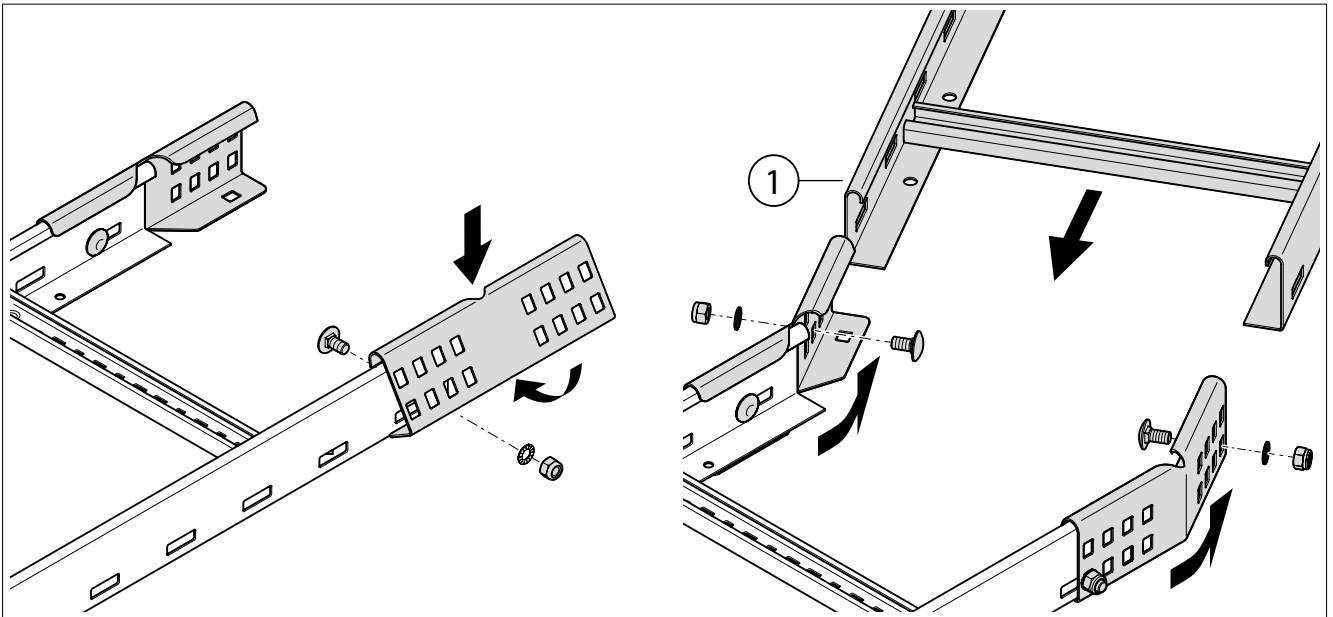
### Risk of cutting!

During cutting work, metal chips or sharp cut edges can cause injuries to eyes and hands!

- Wear protective glasses and gloves.
- Deburr cut edges.

### Note!

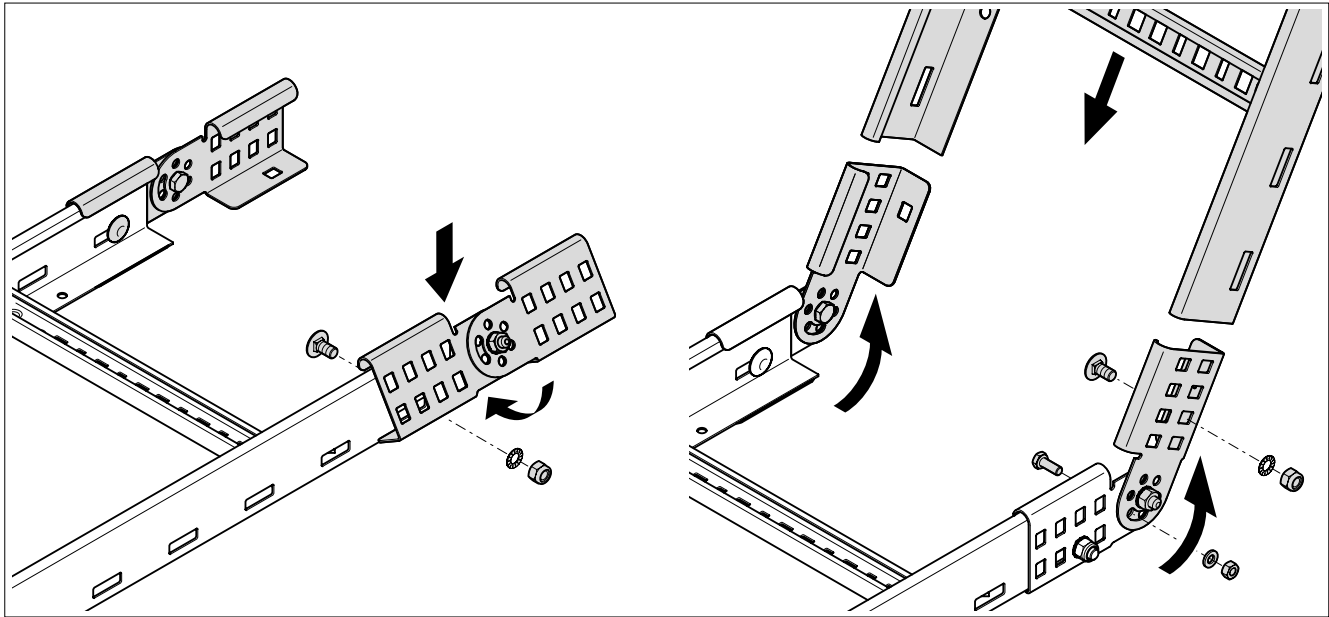
*In the case of cable ladders for use outdoors, the corrosion protection at the cut edges must be renewed with zinc spray, e.g. type ZSF, art. no. 2362970.*



**Figure 21:** Mounting angle connectors

1. Suspend the angle connectors on the first cable ladder and fold it down.
2. Screw on the angle connector.
3. Bend the angle connector into the desired angle.
4. Shorten the rail ① according to the desired angle.
5. Push the second cable ladder into the connector and screw it on.

### 6.3 Connecting cable ladders with adjustable connectors



**Figure 22:** Mounting adjustable connectors

1. Suspend the adjustable connector on the first cable ladder and fold it down.
2. Slacken the hinge screw.
3. Bend the adjustable connector into the desired angle and screw the hinge screw tight.
4. Fix the angle using the locking screw through the bent slot or any hole in the circle of holes.
5. Push the second cable ladder into the connector and screw it on.

## 7 Connecting cable ladders and fittings

### ATTENTION

#### Cable damage through incorrectly set screw connections!

Sharp-edged threads can damage cables.

- Always insert bolts from the inside to the outside of the rail or rung of the cable ladder and screw on the nut from outside.

### 7.1 Support a fitting

Fittings must always be supported by the support system. The mounting of the different support systems is shown in special mounting instructions, see „1.6 Applicable documents“ on page 6.

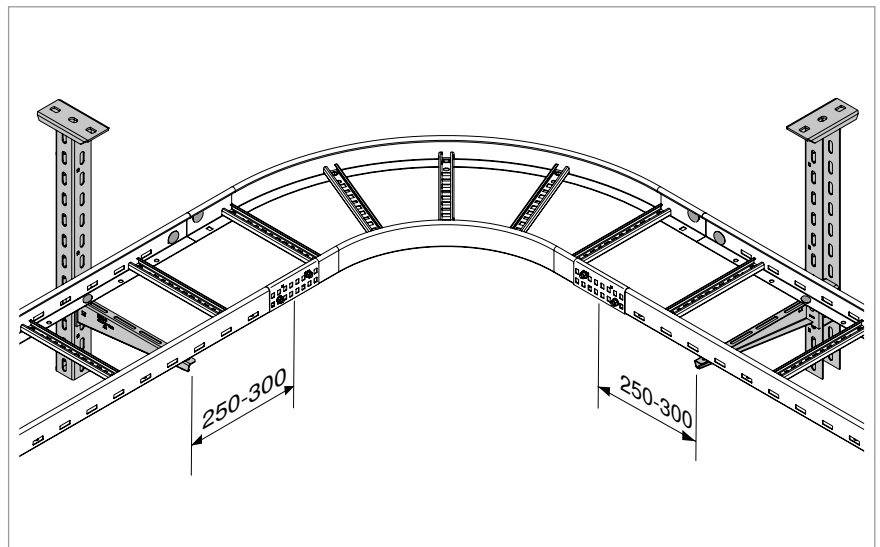
### CAUTION

#### Risk of the support system falling!

If fittings are not supported, cable loads can become too heavy, destabilising the entire support system. There is a risk of the support system falling. Depending on their width, support the fittings with an additional support element

#### 7.1.1 Fitting support up to 300 mm width

Up to a width of 300 mm, mounting of one support of the cable ladders at a distance of 250–300 mm from the edge of the fitting is sufficient.

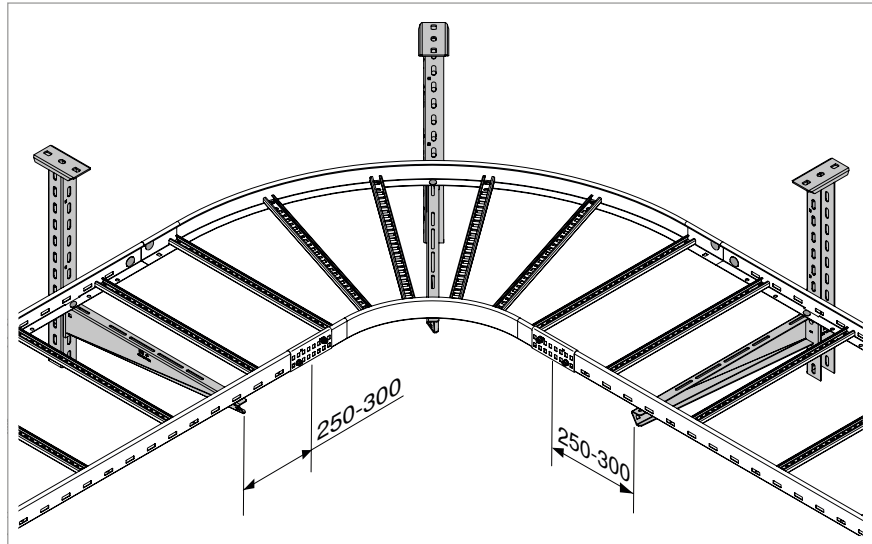


**Figure 23:** Example of 90° bend fitting support up to a width of 300 mm

1. Support the fitting with a support structure at a distance of 250–300 mm from the edge.

### 7.1.2 Fitting support from 400 mm width

From a width of 400 mm, support of the cable ladders is mounted at a distance of 250–300 mm from the edge of the fitting. From a width of 400 mm, a support element must additionally be mounted under the fitting when the system is fully assigned. With fittings of a width of > 400 mm, an additional support element must always be mounted under the fitting.



**Figure 24:** Example of 90° bend fitting support from a width of 400 mm

1. Support the fitting with a support structure at a distance of 250–300 mm from the edge.
2. Mount an additional support element under the fitting.

## 7.2 Mounting a mounting/branch piece



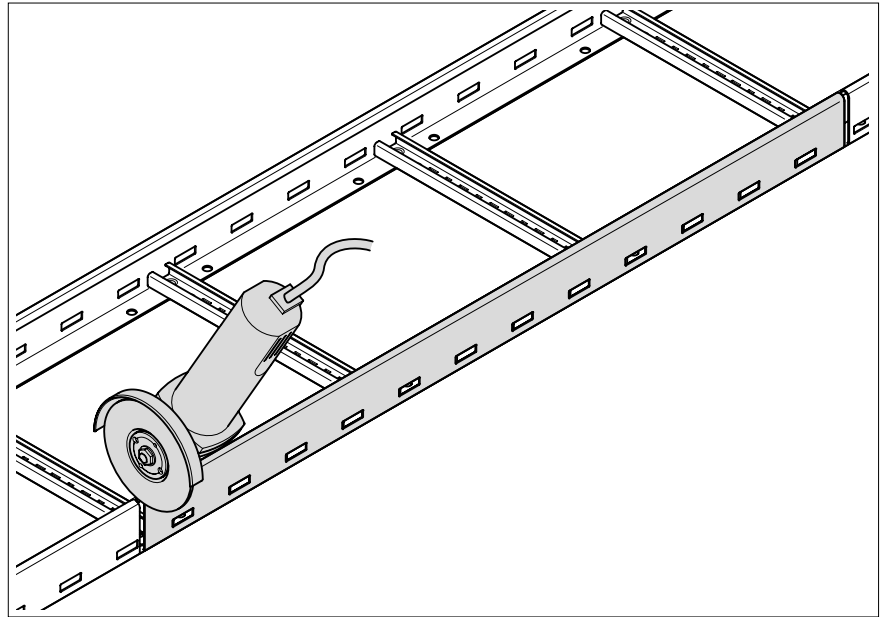
### Risk of cutting!

During cutting work, metal chips or sharp cut edges can cause injuries to eyes and hands!

- Wear protective glasses and gloves.
- Deburr cut edges.

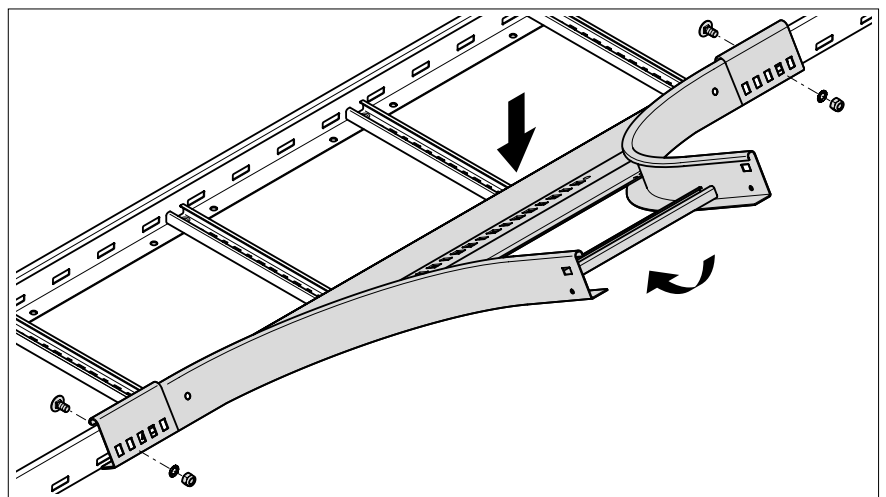
### Note!

*In the case of cable ladders for use outdoors, the corrosion protection at the cut edges must be renewed with zinc spray, e.g. type ZSF, art. no. 2362970.*



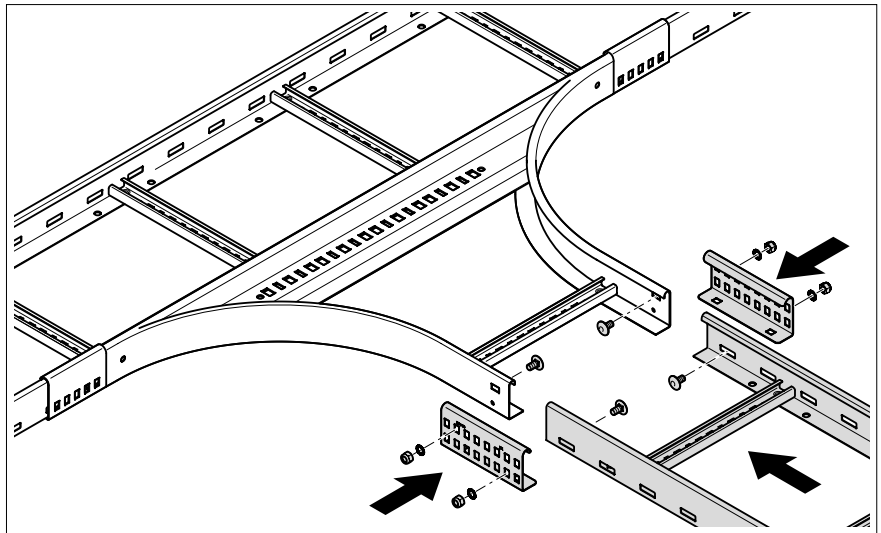
**Figure 25:** Notching cable ladders

1. Notch the cable ladder to the width of the mounting/branch piece (width without integrated connector). In so doing, leave the lower flange alone.



**Figure 26:** Inserting the mounting/branch piece in the cable ladder

2. Suspend the mounting/branch piece with integrated connector in the cable ladder and fold it downwards.
3. Screw the mounting/branch piece to the cable ladder.



**Figure 27:** Attaching the cable ladder

4. Place the second cable ladder so that it abuts the mounting/branch piece.
5. Suspend the straight connectors in the middle of the element joint and fold them down.
6. Connect the straight connectors and elements using the supplied bolts and nuts.

### 7.3 Mounting the 90° bend and T piece

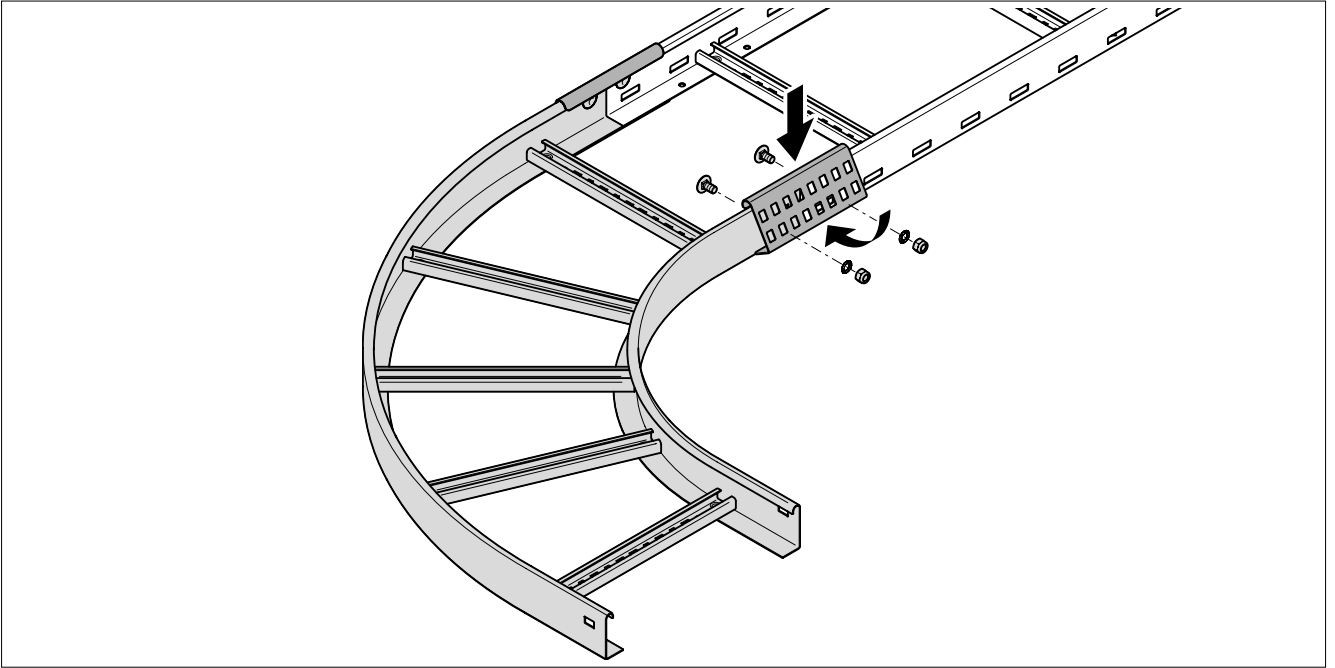


Figure 28: Mounting the 90° bend

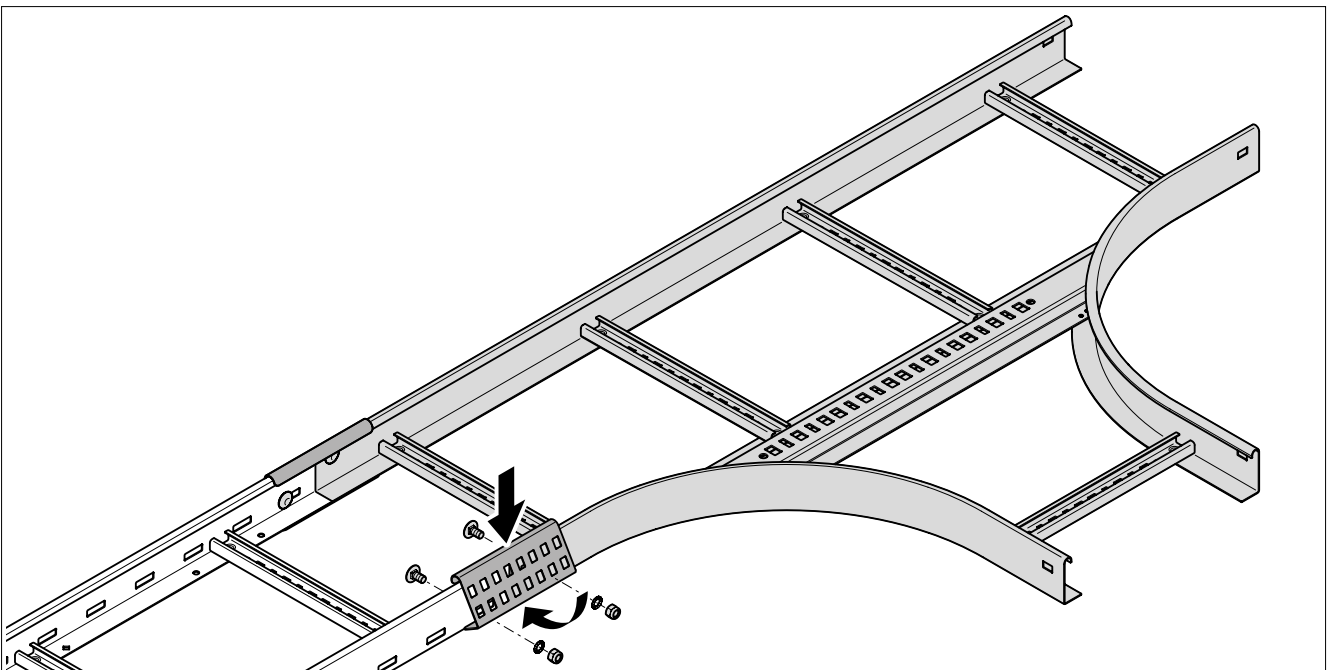
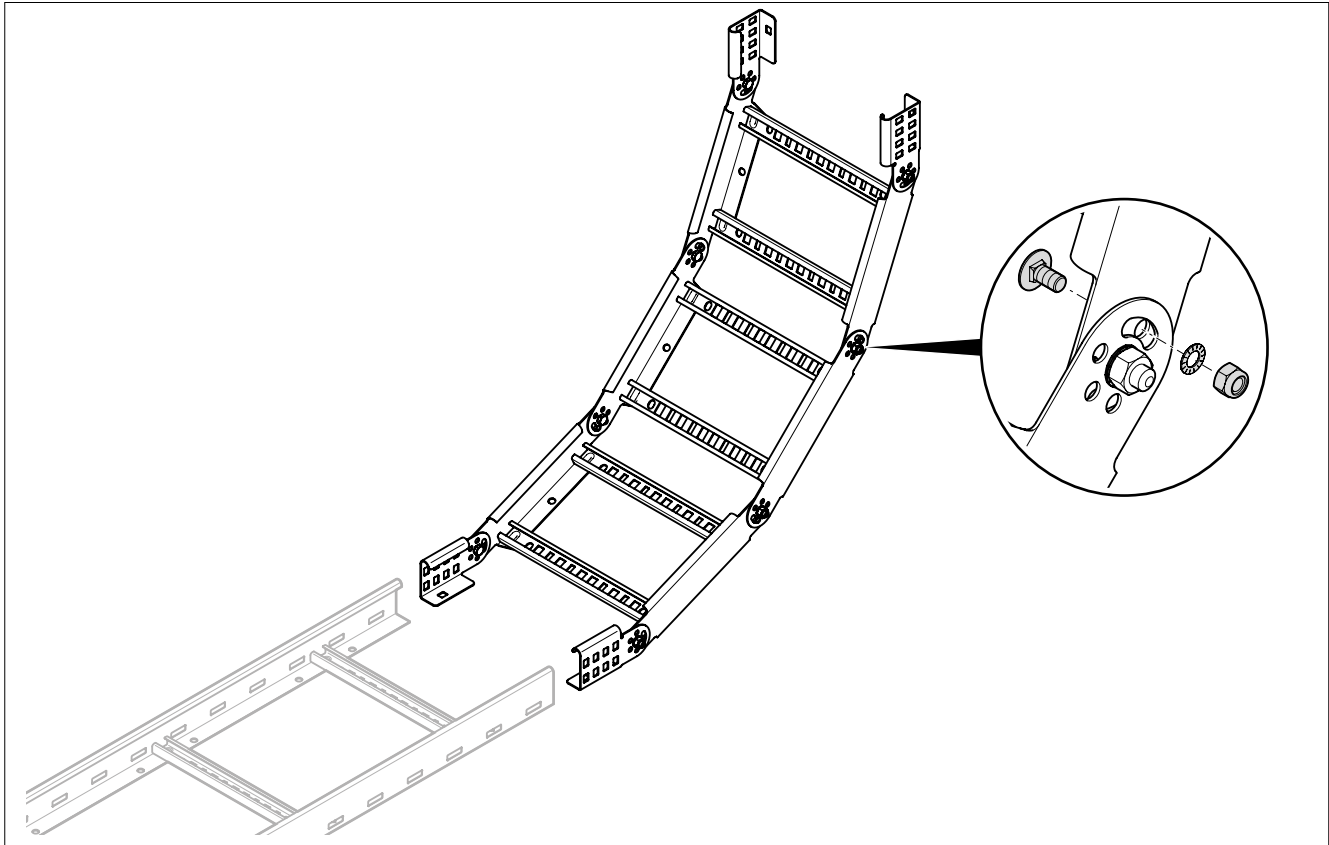


Figure 29: Mounting the T piece

1. Place the elements so that they abut.
2. Suspend the straight connectors in the middle of the element joint and fold them down.
3. Connect the straight connectors and elements using the supplied bolts and nuts.

## 7.4 Mounting the articulated bend

Number of articulated bend elements	Bend radius [~ mm]
1	300
2	450
3	600
4	750
5	900



**Figure 30:** Mounting the articulated bend

1. Connect the required number of articulated bend elements into an articulated bend using hinge screws.
2. Align the articulated bend to the bend radius.
3. Screw the articulation screws tight.
4. Fix all the connections, each using a locking screw through the bent slot or any hole in the circle of holes.
5. Screw each half of an adjustable connector to each rail of the articulated bend and fix each using a locking screw through the bent slot or any hole in the circle of holes.
6. Push the articulated bend on the first cable ladder and screw it on.
7. Push the second cable ladder into the articulated bend and screw it on.



## 7.5 Mounting the multifunctional connector



**CAUTION**

### Risk of trapping through moving rungs!

Hands can be trapped on opening the multifunctional connector.  
 – On opening, only hold the rails on the outsides.

#### Note!

*With asymmetrical reductions, different side lengths are produced on the multifunctional connector. Accordingly, the elements to be installed should therefore be shortened asymmetrically.*



**CAUTION**

### Risk of cutting!

During cutting work, metal chips or sharp cut edges can cause injuries to eyes and hands!

- Wear protective glasses and gloves.
- Deburr cut edges.

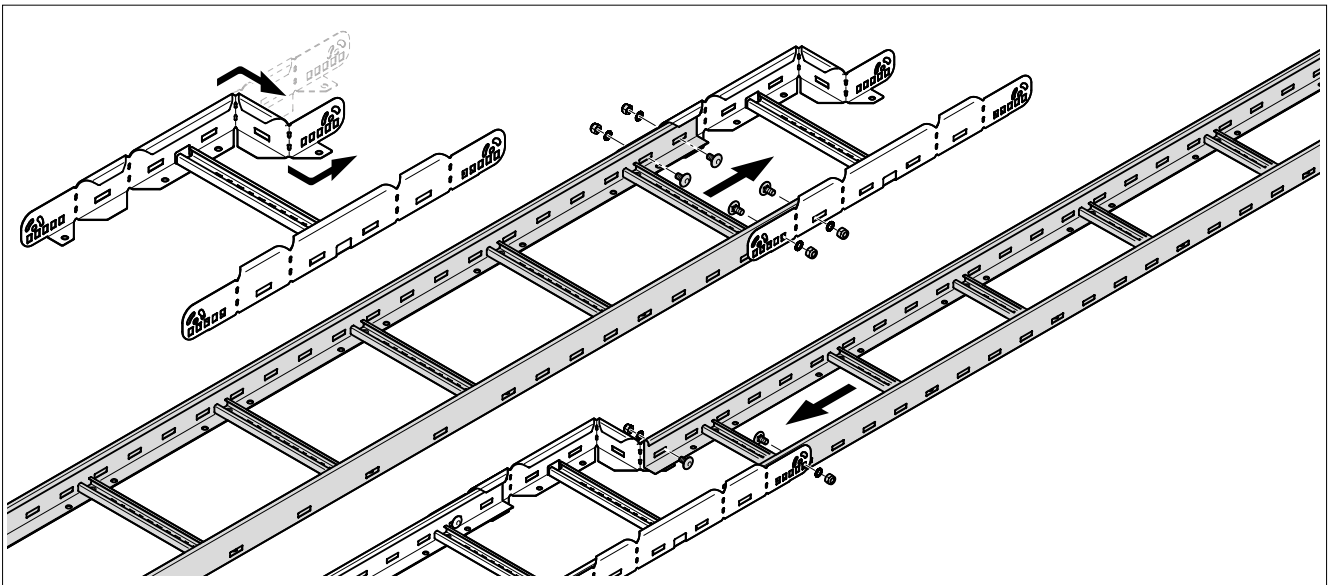
#### Note!

*Always screw the multifunction connector onto the element from outside.*

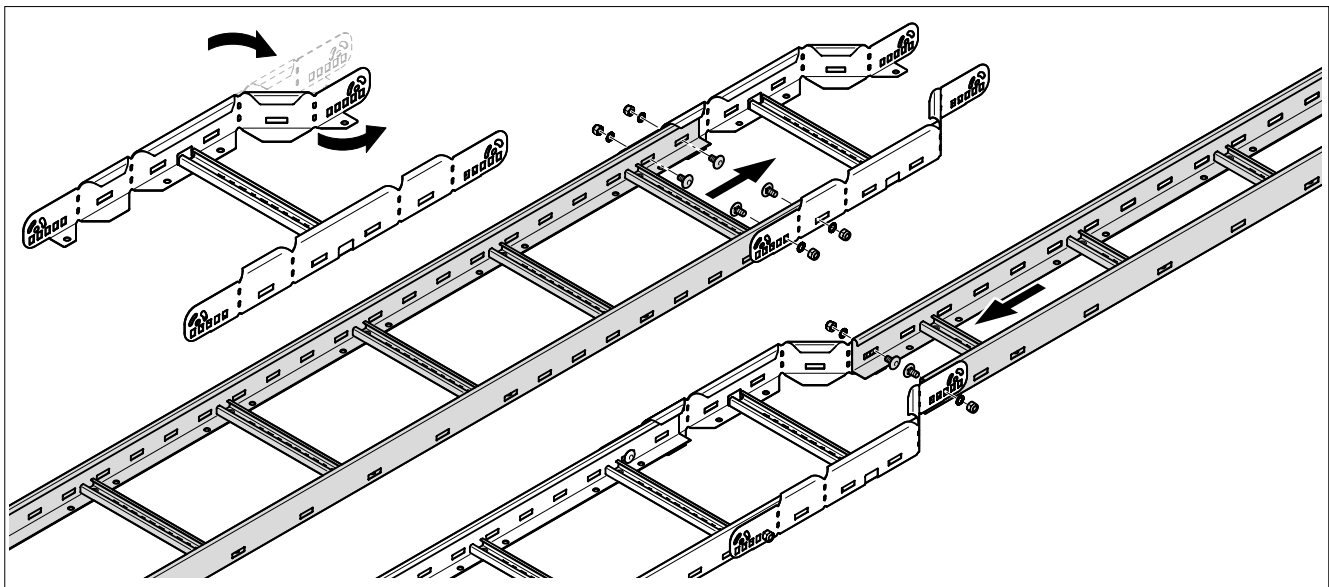
#### Note!

*In the case of cable ladders for use outdoors, the corrosion protection at the cut edges must be renewed with zinc spray, e.g. type ZSF, art. no. 2362970.*

### 7.5.1 Mounting the multifunctional connector as a reducer



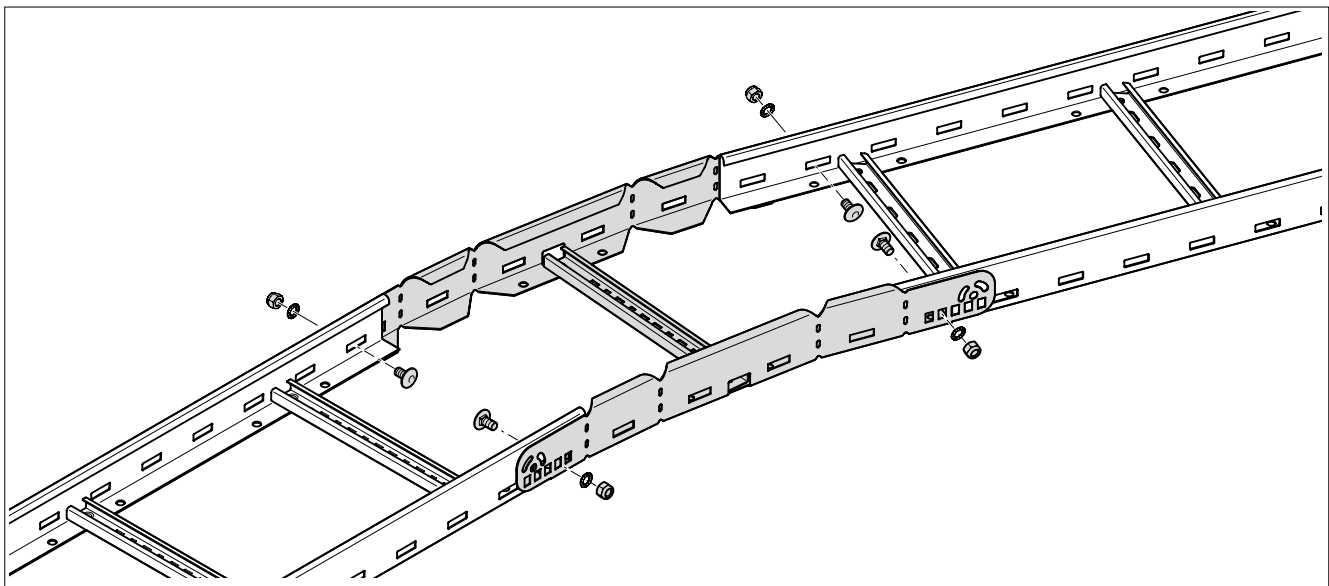
**Figure 31:** Mounting an asymmetrical reduction with multifunctional connector



**Figure 32:** Mounting a symmetrical reduction with multifunctional connector

1. Bend the multifunctional connector into the desired shape.
2. Screw the multifunctional connector to the first cable ladder.
3. If necessary, shorten the second cable ladder on one side.
4. Screw the second cable ladder to the multifunctional connector.

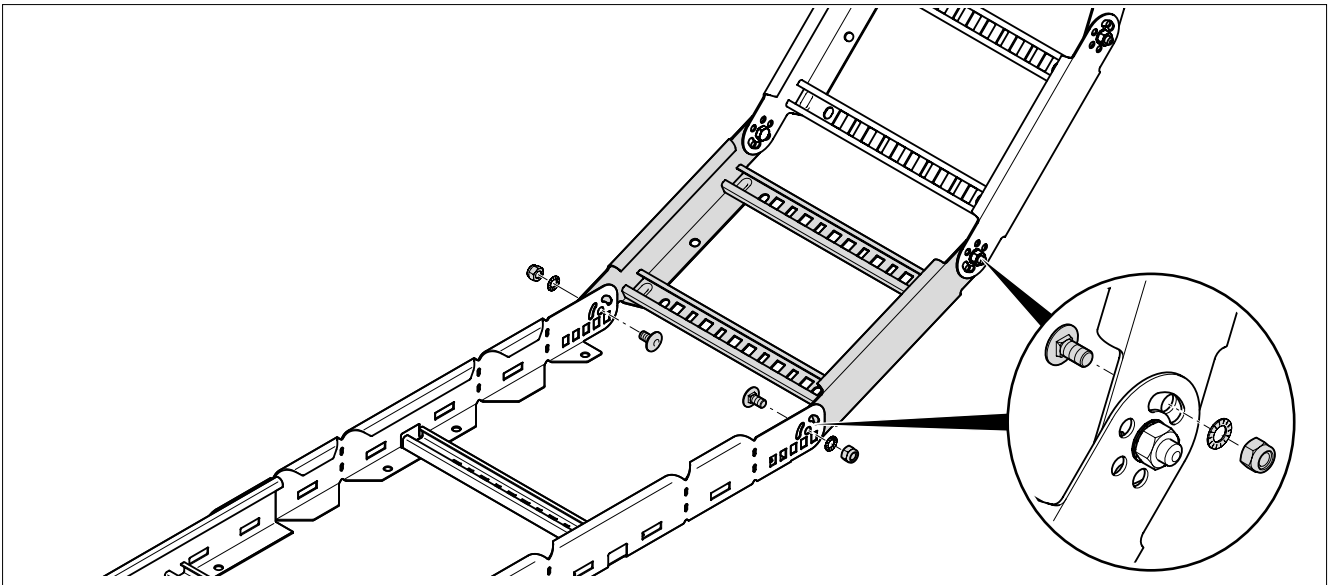
### 7.5.2 Mounting the multifunctional connector as a bend



**Figure 33:** Mounting the multifunctional connector as a bend

1. Bend the multifunctional connector into the desired shape.
2. Screw the multifunctional connector to the first cable ladder.
3. If necessary, shorten the second cable ladder on one side.
4. Screw the second cable ladder to the multifunctional connector.

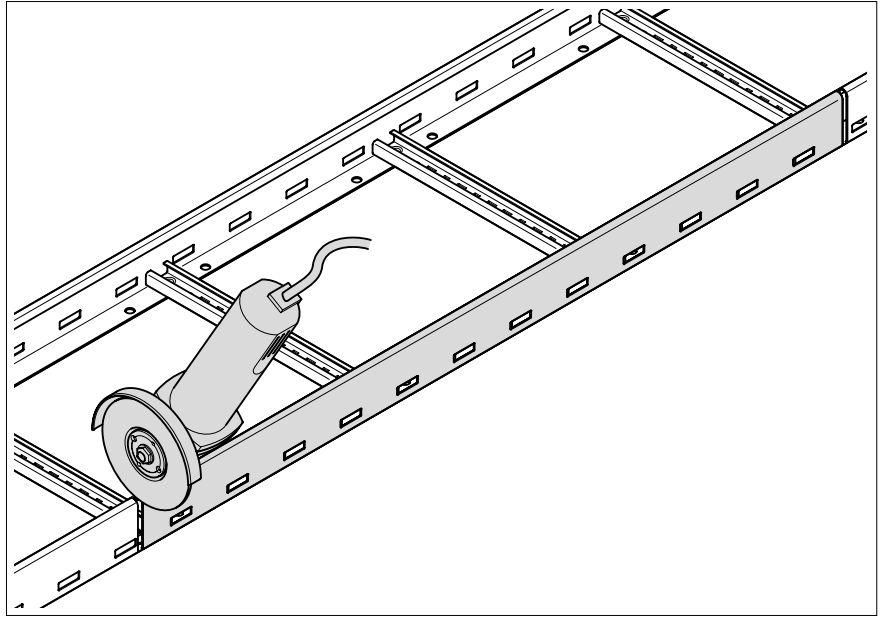
### 7.5.3 Mounting the multifunctional connector on an articulated bend



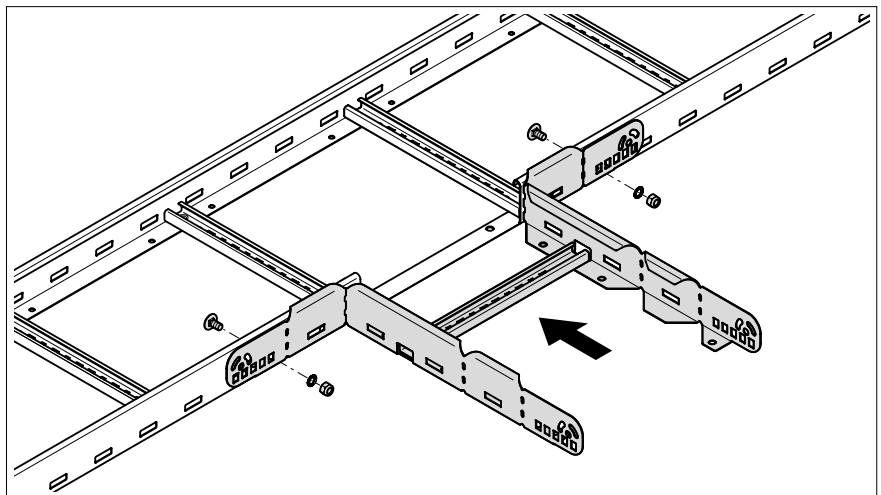
**Figure 34:** Mounting the multifunctional connector on an articulated bend

1. Using hinge screws, screw the articulated bend to the multifunctional connector.
2. Fix all the connections, each using a locking screw through the bent slot or any hole in the circle of holes.

### 7.5.4 Mounting the multifunctional connector as a mounting/branch piece



**Figure 35:** Notching cable ladders

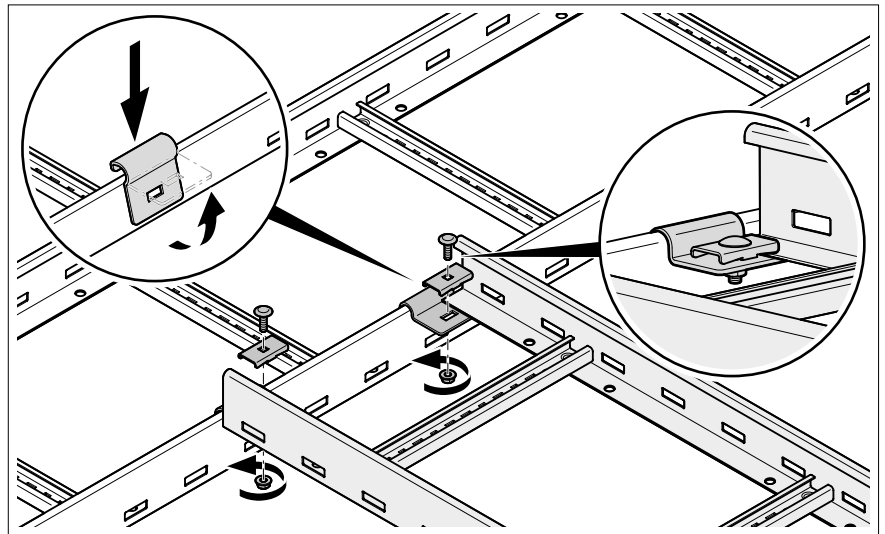


**Figure 36:** Mounting the multifunctional connector as a mounting/branch piece

1. Notch out the first connector at the width of the multifunctional connector. In so doing, leave the lower flange alone.
2. Bend the multifunctional connector into shape.
3. Screw the multifunctional connector to the first cable ladder.
4. Screw the second cable ladder to the multifunctional connector.

## 8 Creating a T exit made of two cable ladders

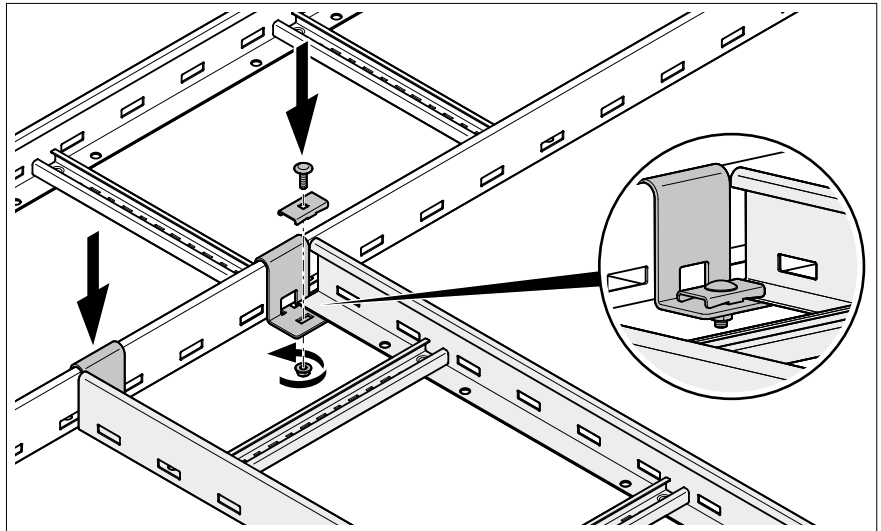
### 8.1 Creating a T exit with a step



**Figure 37:** Creating a T exit with a support angle

1. Loosen the glands of the support angle.
2. Suspend two support angles on the first cable ladder.
3. Place the second cable ladder on the support angle.
4. Position the support angle so that the slots of the support angle are not covered by the lower flange of the second cable ladder.
5. Attach the clamping piece.
6. Pass the bolt through the clamping piece and support angle from above.
7. Using a nut, screw the clamping piece to the support angle. In so doing, clamp the lower flange.

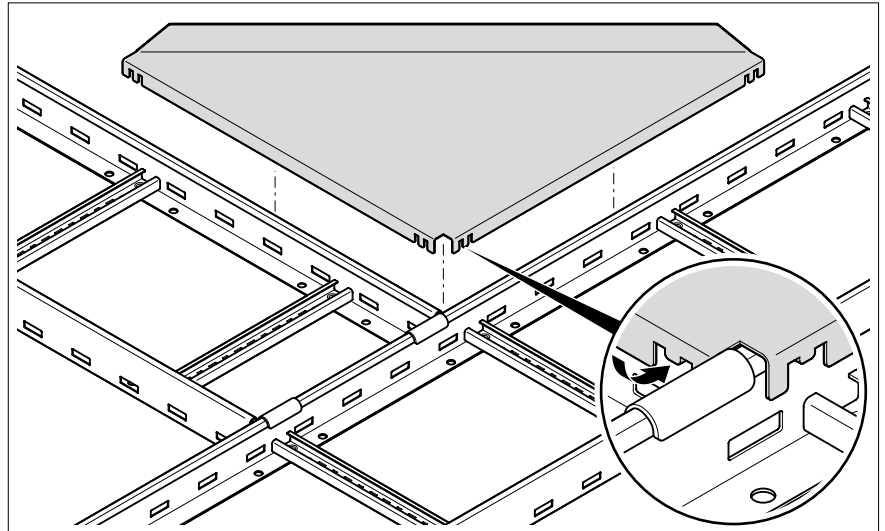
## 8.2 Creating a T exit without a step



**Figure 38:** Creating a T exit with a connection piece

1. Loosen the glands of the connection pieces.
2. Suspend two connection pieces on the first cable ladder.
3. Place the second cable ladder on the connection pieces.
4. Position the connection pieces so that the slots of the connection piece are not covered by the lower flange of the second cable ladder.
5. Attach the clamping piece.
6. Pass the bolt through the clamping piece and connection piece from above.
7. Using a nut, screw the clamping piece to the support angle, thus clamping the lower flange.

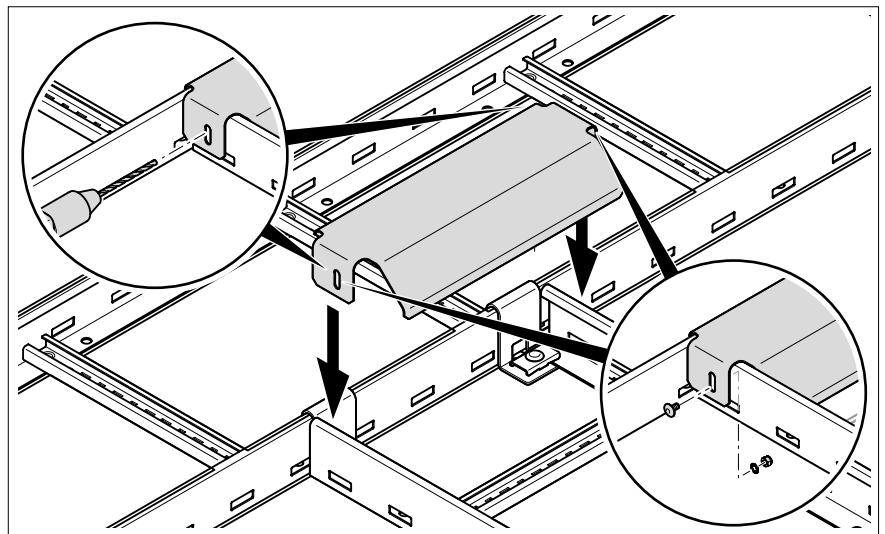
### 8.2.1 Mounting the corner plate



**Figure 39:** Mounting the corner plate

1. Place the corner plate on the corner of two cable ladders of equal height.
2. Bend the clamping lugs.

### 8.2.2 Mounting the support plate



**Figure 40:** Mounting the support plate

1. Attach the support plate to the cable ladder. The slanting side points towards the junction.
2. Drill fastening holes in the rail and screw on the support plate.

## 9 Mounting the drop-out plate

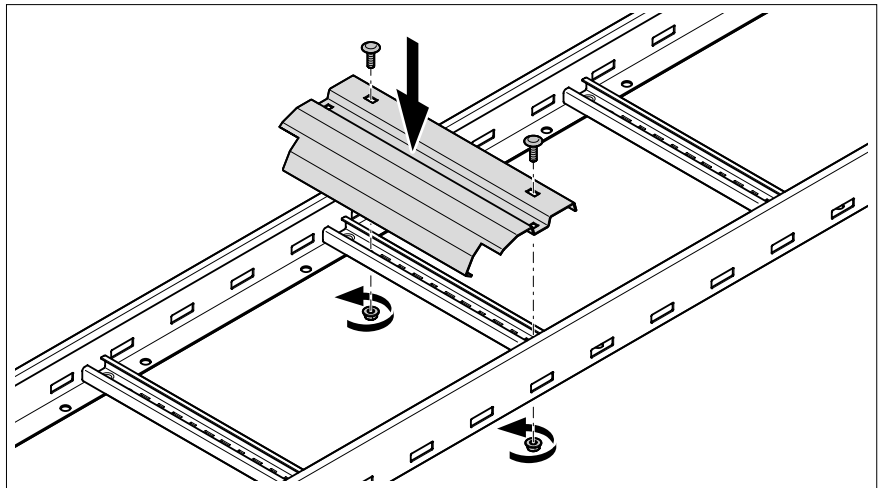


Figure 41: Mounting the drop-out plate

1. Place the drop-out plate on the rung and screw it on.

## 10 Mounting the barrier strip

### 10.1 Mounting the barrier strip without screws

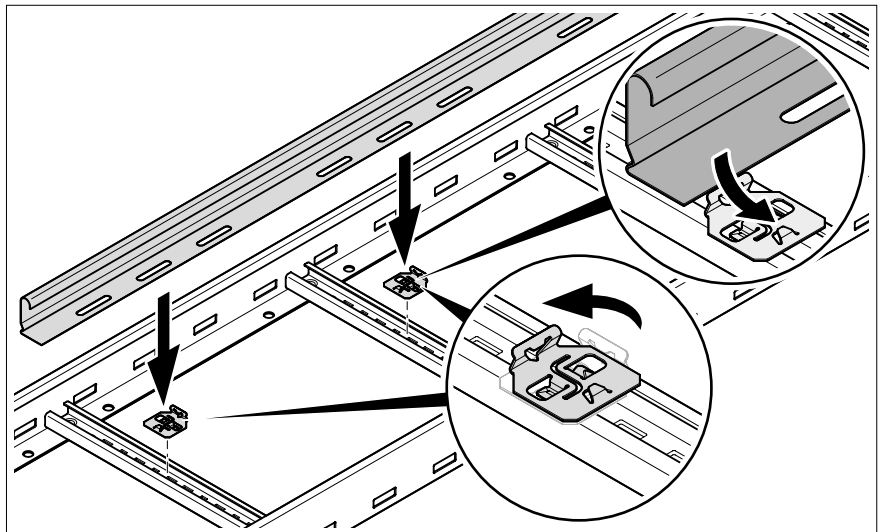
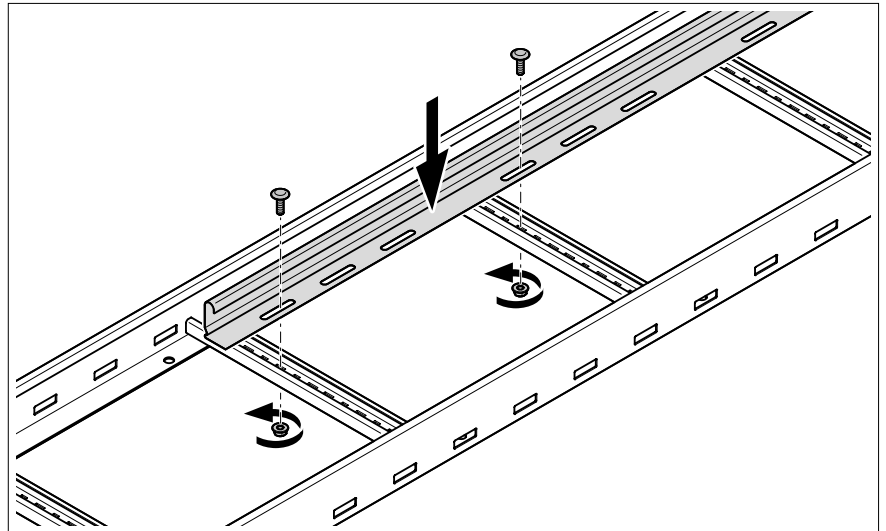


Figure 42: Clamping the barrier strip

1. Place the clamping pieces on the rungs and clamp them to the rungs with a rotation of 90°.
2. Lock the barrier strip in.



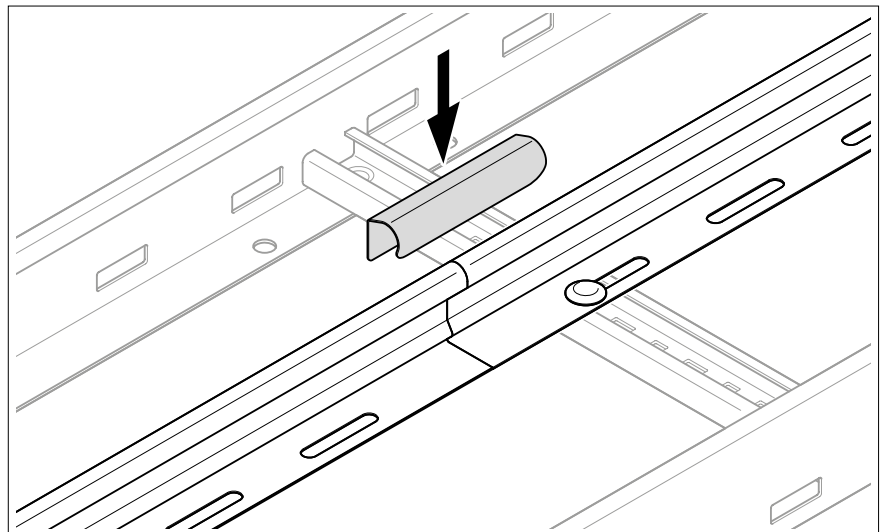
## 10.2 Mounting the barrier strip with screws



**Figure 43:** Screwing on the barrier strip

1. Place the barrier strip on the rungs and screw it on.

## 10.3 Connecting barrier strips

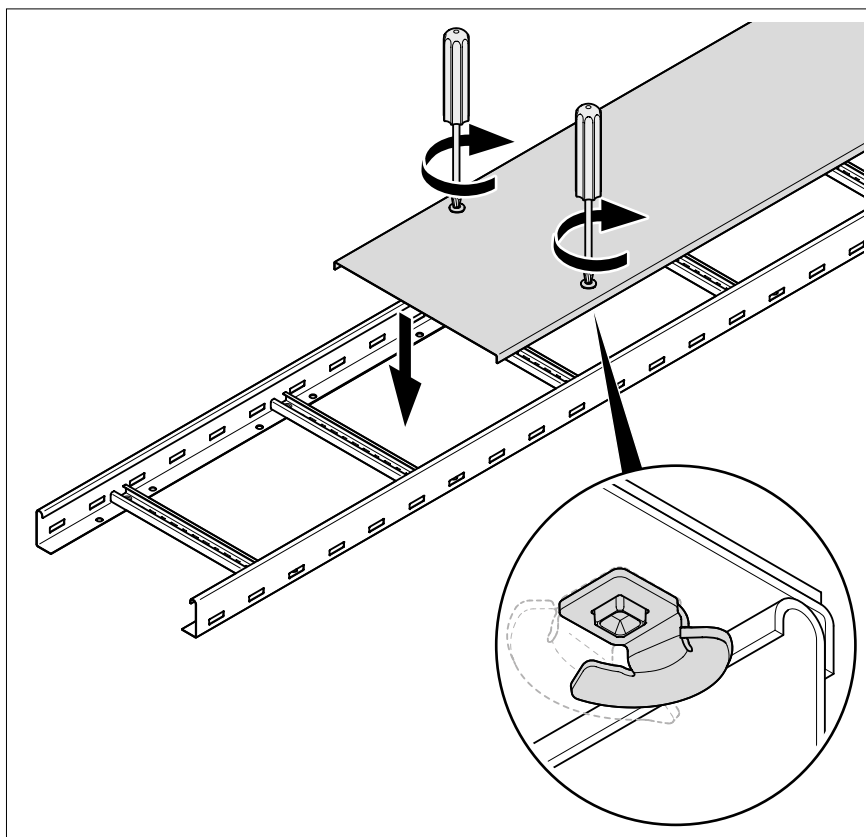


**Figure 44:** Connecting barrier strips

1. Engage the barrier strip connector in the middle of the joint of two barrier strips.

## 11 Mounting the cover

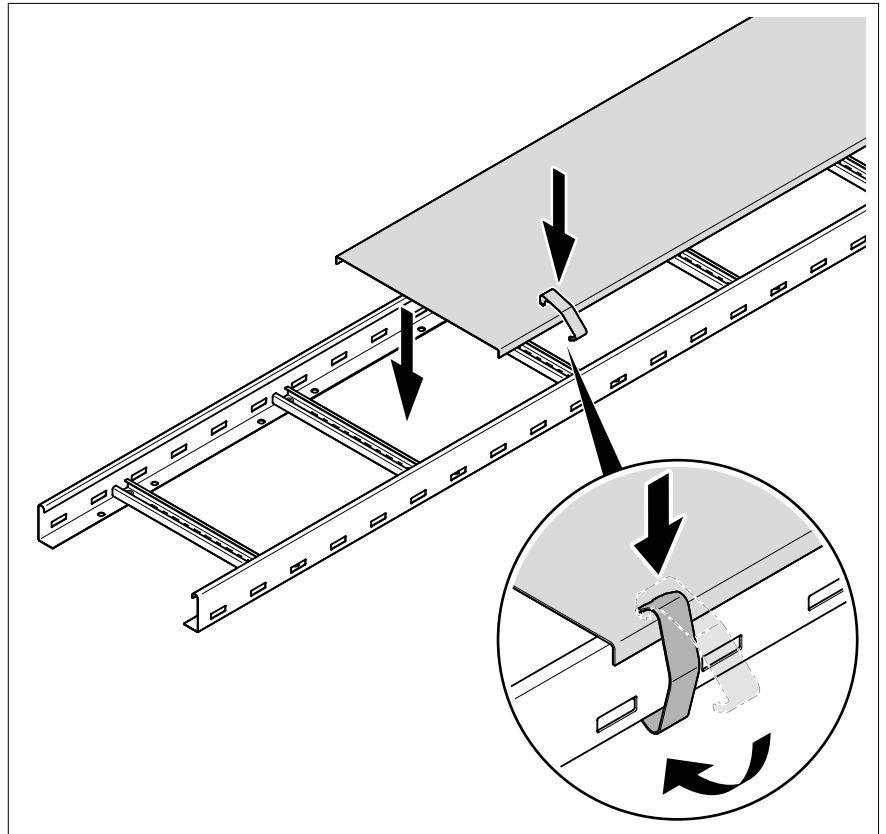
### 11.1 Mounting the cover with turn buckle



**Figure 45:** Mounting the cover with turn buckle

1. Place the cover on the cable ladder.
2. Using a screwdriver, lock the turn buckle in a clockwise direction.

## 11.2 Mounting the cover with cover clamp

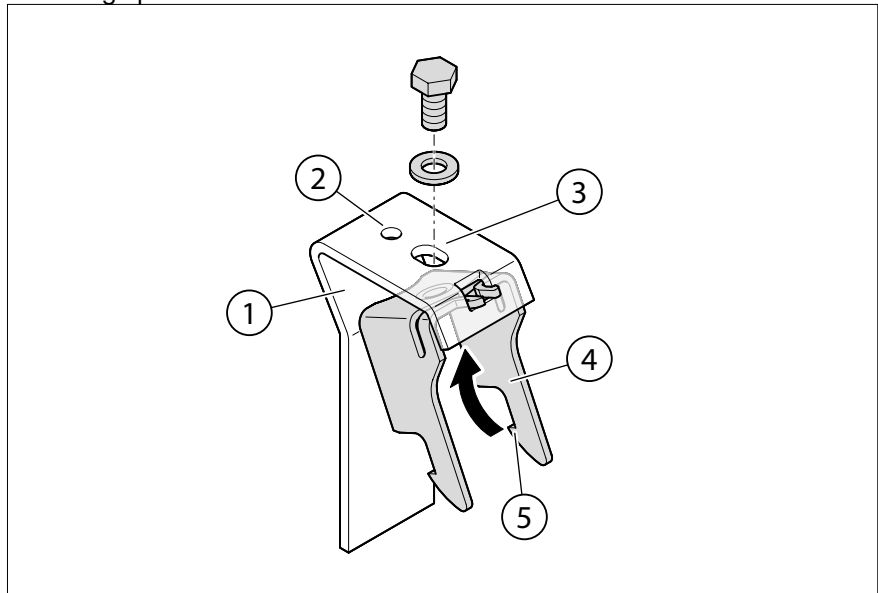


**Figure 46:** Mounting the cover with cover clamp

1. Place the cover on the cable ladder.
2. Using the cover clamp, clamp the cover to the cable ladder.

### 11.3 Mounting the cover with spacer

#### Mounting spacers

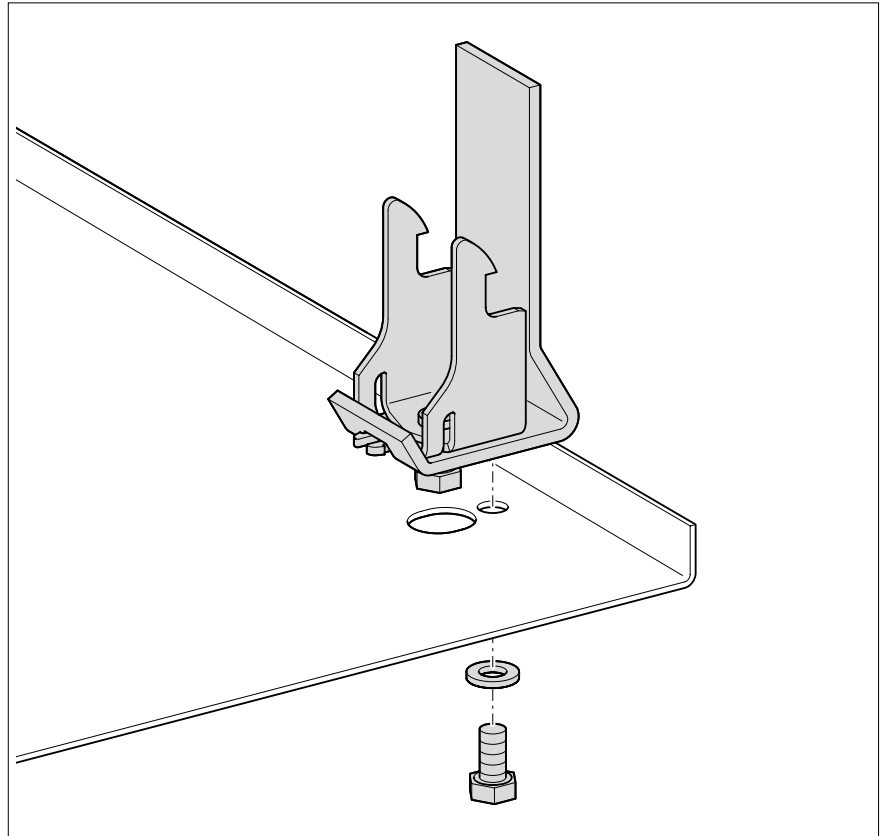


**Figure 47:** Mounting spacers

- ① Cover holder
- ② Round hole for second bolt
- ③ Slot for first bolt
- ④ Cover clamp
- ⑤ Hook

1. Pass the first bolt with washer through the slot of the cover holder and, using the cover clamp, screw it together with a few turns. In so doing, the cover clamp must remain fully mobile. The hooks of the cover clamp point towards the cover holder.

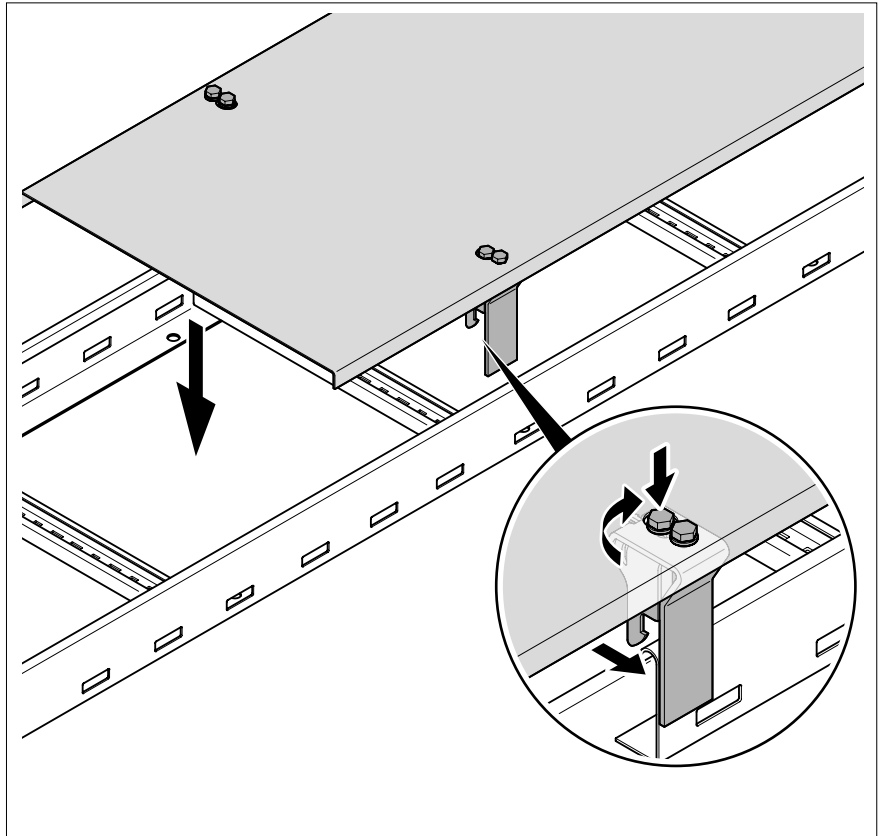
### 11.3.1 Mounting spacers on covers



**Figure 48:** Mounting spacers on covers

1. Position the cover with the inner side pointing up.
2. Position a spacer above a double hole in the cover. Place the first bolt of the spacer in the first hole of the cover. The cover holder points upwards; the cover clamp points inward.
3. Run the second bolt with the washer through the small hole in the cover from below and screw it to the round hole of the spacer.
4. Mount all the further spacers on the cover according to the same principle.

### 11.3.2 Mounting covers on cable ladders



**Figure 49:** Mounting covers on cable ladders

1. Turn the cover around and place it on the cable ladder with the spacers, until the cover clamps engage under the rounded edges of the rails.
2. Tighten all the first screws. The hooks of the cover clamps are fixed under the rounded edges of the rails.
3. With vertically routed cable ladders: Using bolts through the square holes of the cover holders and the slots in the cable ladder rail, secure the cover against slipping.

## 12 Mounting the clamp clip

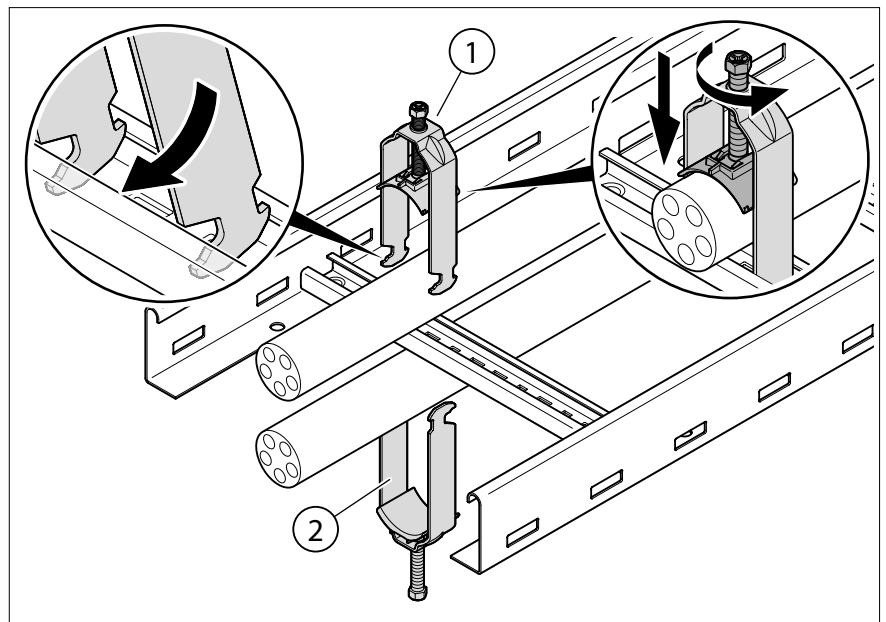


Figure 50: Mounting the clamp clip – ① in the slot, ② in the perforation

### 12.1 Suspending the clamp clip in the rung slot

1. Place the cable on the cable ladder and surround it with the clamp clip.
2. Hook the large hook of the clamp clip on one side of the slit.
3. Swivel the clamp clip and hook in small hooks on the other side of the slot.
4. Screw the pressure trough against the cables.

### 12.2 Suspending the clamp clip in the rung perforation

1. Position the cable under the cable ladder and surround it with the clamp clip.
2. Hook the large hook of the clamp clip on one side of the perforation.
3. Swivel the clamp clip and hook in small hooks on the other side of the perforation.
4. Screw the pressure trough against the cables.

**Note!**

*If the cable ladder is used as a vertical ladder, the large hooks must point upwards if they are hung in the slot or perforation of the rung.*

## 13 Creating equipotential bonding

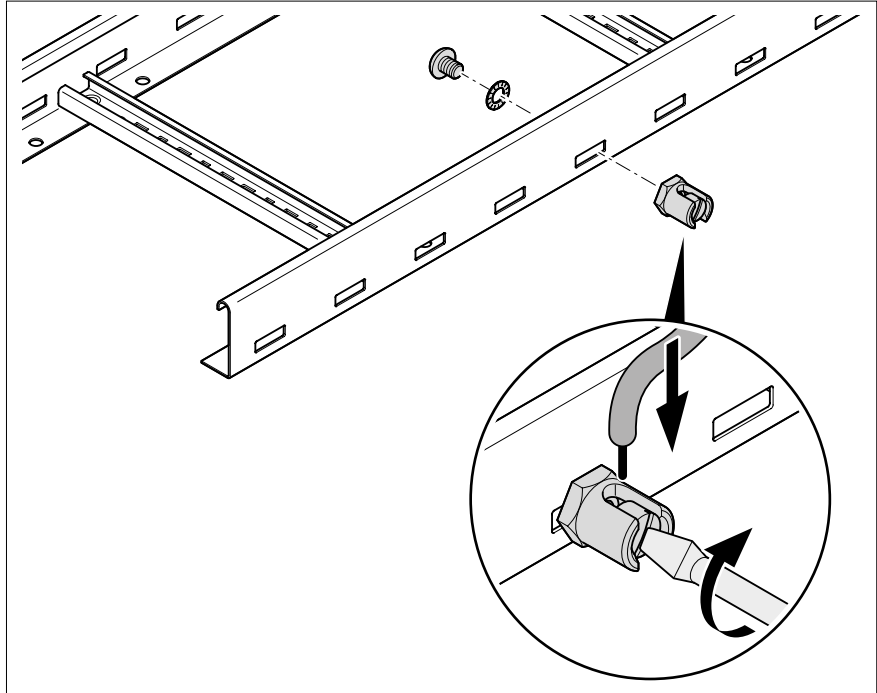


**WARNING**

### **Risk from lightning strike!**

A lack of equipotential bonding can, in cases of damage, mean that parts of the cable ladder system may be energised. If contact creates a conductive connection, this can lead to fatal injuries.

- Creating equipotential bonding.



**Figure 51:** Mounting the earthing terminal

1. Screw the earthing terminal to the rail of the cable ladder.
2. Electrically connect the earthing terminal to the overall equipotential bonding.



## 14 Mounting end caps

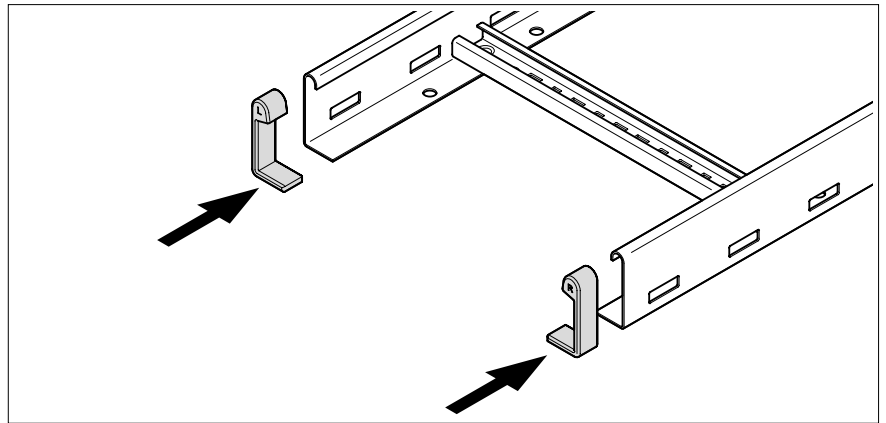


Figure 52: Mounting end caps

1. Push end caps onto the ends of the elements.

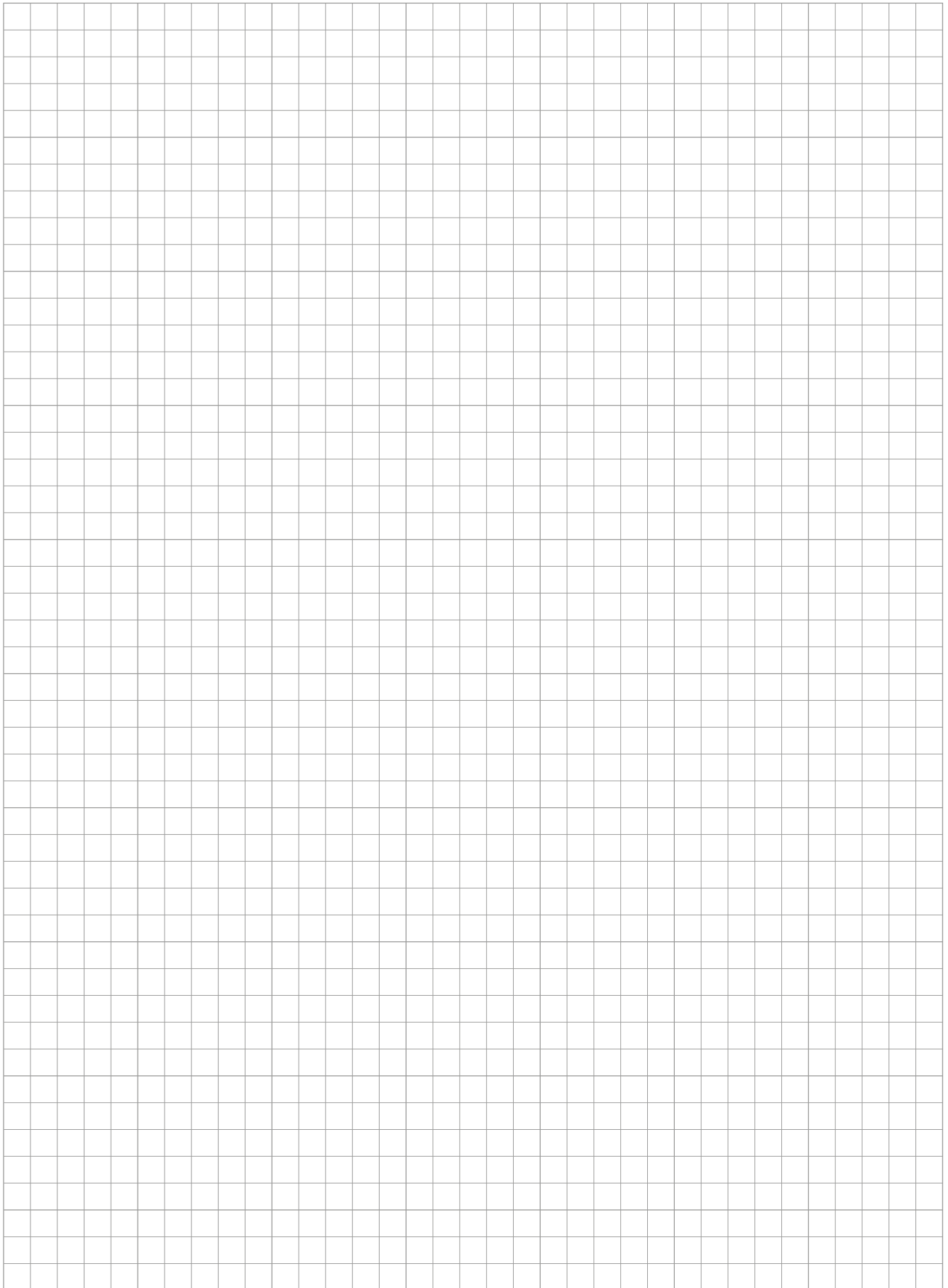
## 15 Dismantling cable ladder systems

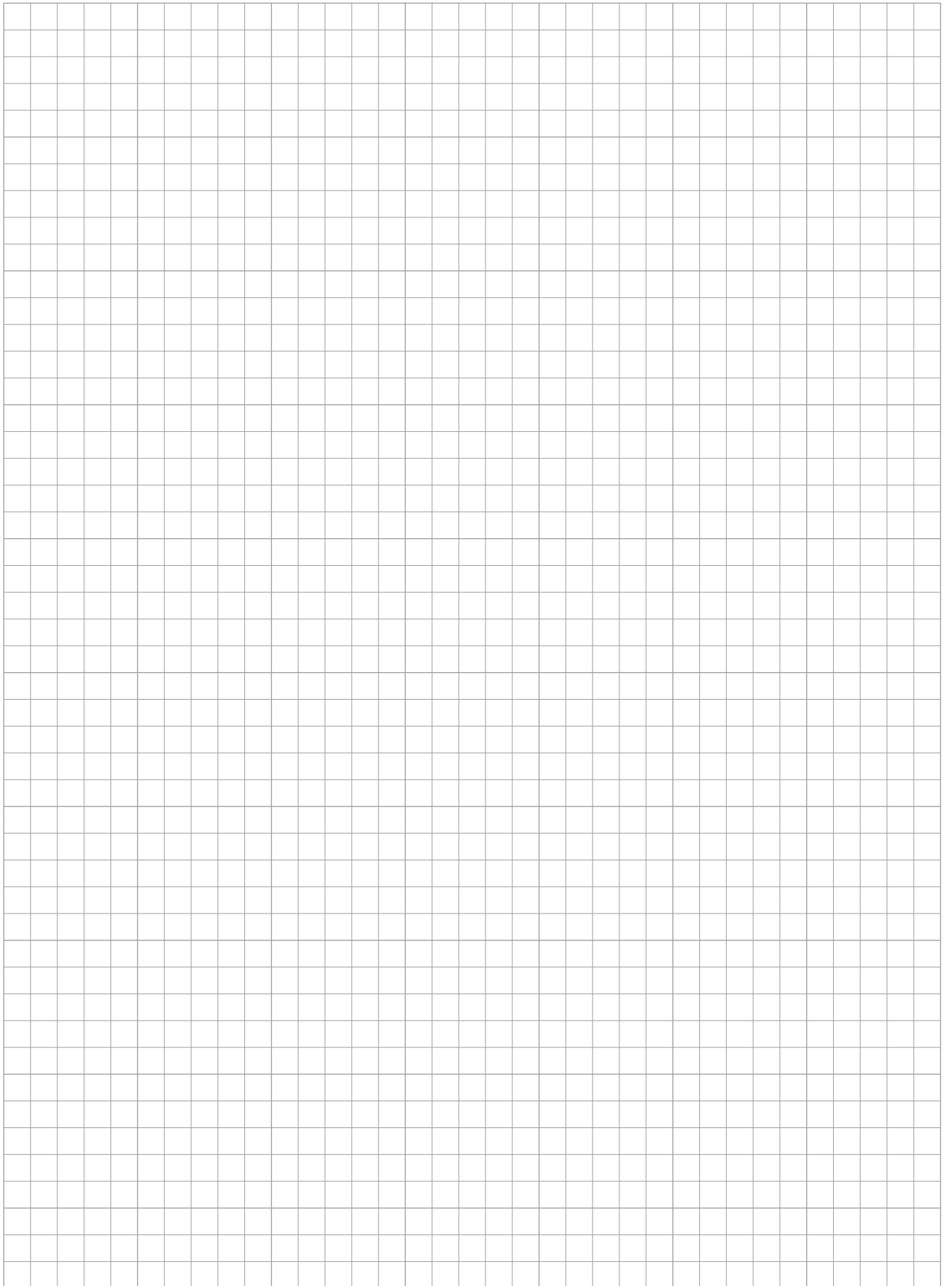
Dismantling of all the elements of the cable ladder systems takes place in the reverse order to mounting.

## 16 Disposing of cable ladder systems

1. Residual metal: As scrap metal
2. Packaging: As household waste

Comply with the local waste disposal regulations.





**OBO Bettermann Holding GmbH & Co. KG**

P.O. Box 1120  
58694 Menden  
Germany

**Customer Service Germany**

Tel.: +49 (0)2371 7899-2000  
Fax: +49 (0)2371 7899-2500  
E-mail: [info@obo.de](mailto:info@obo.de)

[www.obo-bettermann.com](http://www.obo-bettermann.com)

**Building Connections**