KTS

Planning aids and basic knowledge

Cable support systems

Building Connections

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OBO KTS seminars: First-hand knowledge
With a comprehensive range of training courses and seminars on cable support systems, OBO is able to provide users with first-hand support. Alongside the basic theoretical principles, the programme also deals with practical implementation in everyday applications. Special calculation and application examples round off the comprehensive programme of knowledge transfer.

Invitations to tender, product information and data sheets
We can make life easier for you, with our comprehensive selection of materials designed for practical applications, which provide you with effective support with the planning and calculation of a project. These include:
- Invitations to tender
- Product information
- Data sheets
- Data sheets

Invitations to tender for lightning protection/earthing at the highest level:
OBO manufacturers products to RAL GZ642-5 and is dedicated to compliance with the RAL directives. Lightning protection and earthing products can be used for invitations to tender according to RAL.

These documents are continually updated and can be downloaded for free at any time from the Internet download area at www.obo-bettermann.com.

Invitations to tender on the Internet at www.ausschreiben.de
More than 10,000 entries from the cable support systems, fire protection systems, connection and fastening systems, transient and lightning protection systems, cable routing systems, device systems and underfloor systems can be recalled for free. Regular updates and extensions mean that you always have a comprehensive overview of the OBO products. All the current file formats (PDF, DOC, GAEB, HTML, TEXT, XML, ÖNORM) are available.
www.ausschreiben.de

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The new generation is here: OBO Construct Professional and OBO Construct Web

We have reinvented our Construct planning software: We have bundled all the electronic planning aids under the name OBO Construct.

Two versions

There are now two versions of OBO Construct: Construct Web and Construct Professional. They are now aligned to the different requirements of our customers and offer the following scope of service:

OBO Construct Professional

The completely new tool for professional users. The new multilingual AutoCAD plug-in is available in various languages and offers a wealth of benefits:

- Redesigned user dialogues
- Simplified operation
- Improved component depiction
- Individual adjustment of object display
- Completely new system (runs on 64-bit systems)
- Mass determination with additional materials
- Output of the mass determination in various formats (Excel, PDF, Text)
- Simple updates
- Importable and editable invitations to tender

OBO Construct Web

The Internet version for rapid help now no longer needs a CAD system and offers the following benefits:

- Simple operation
- For quick and easy application
- Platform-independent
- No installation required
- Access possible from anywhere
- Option of saving project data
- Plans can be printed out as PDFs
- Exact mass determination in an Excel file
- Additional material bookable

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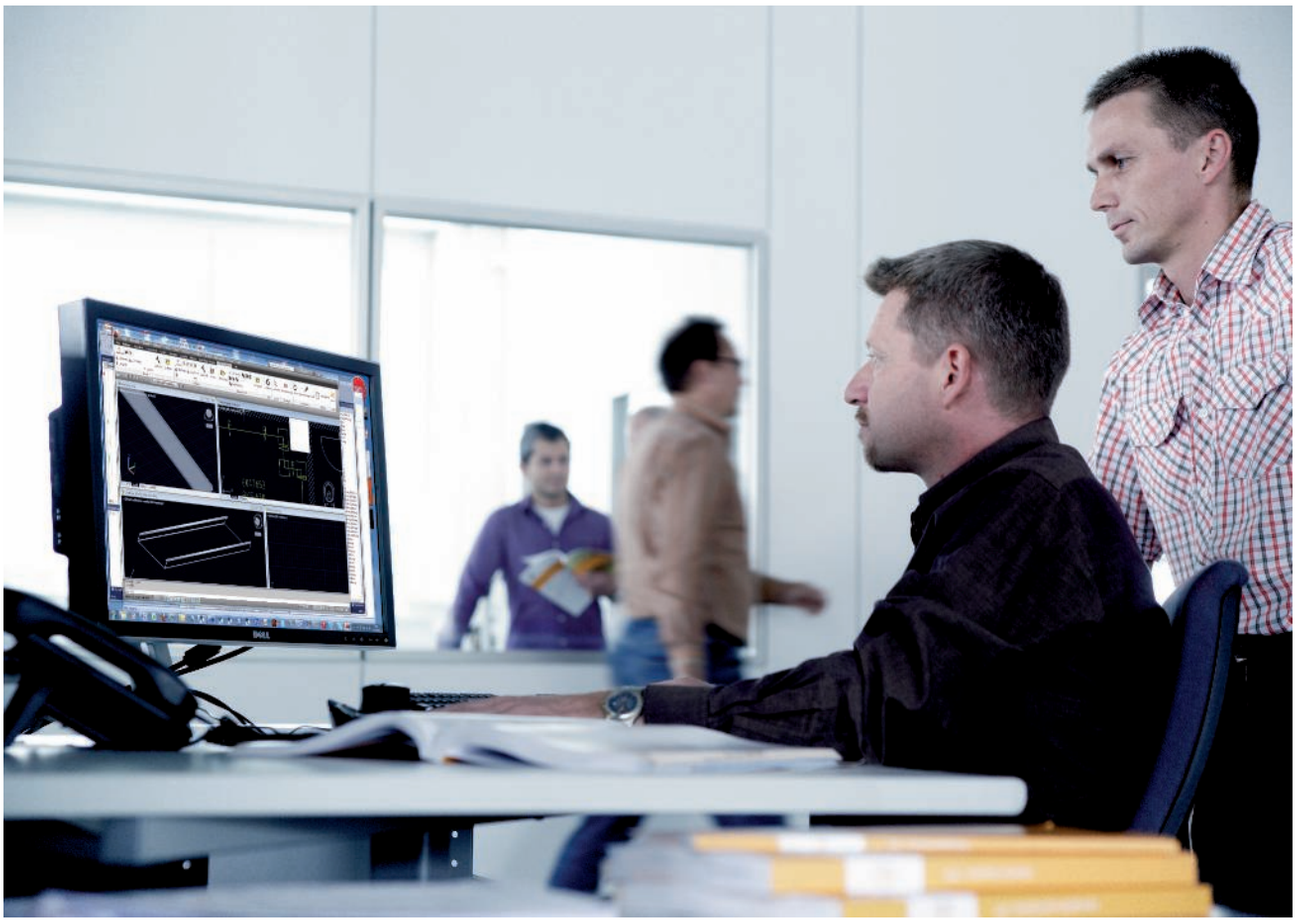
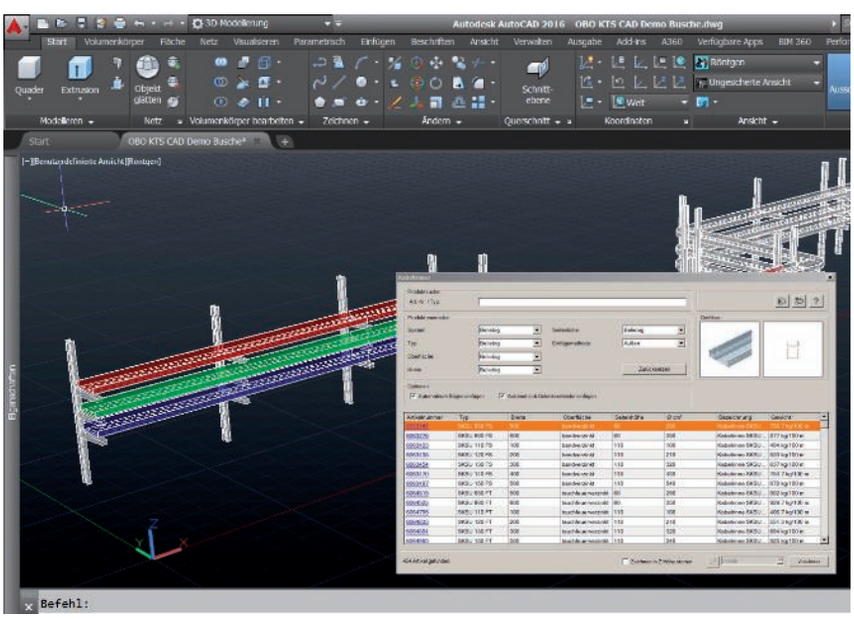
OBO Construct KTS: Project planning, drawing and generation



Find out now
Convince yourself about the new OBO Construct: a new support and training concept makes it easier than ever for you to take your first steps. You can find additional information on the Internet or from our Customer Service.

AutoCAD is a registered trademark of Autodesk Incorporation, USA.



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Standards, specifications and certifications

Standards
OBO offers cable support systems made by professionals for professionals: The technical properties are guaranteed by DIN EN 61537 (follow-up to DIN VDE 0639). It describes all the relevant parameters such as area of application, test conditions, corrosion resistance and temperature classification. As a competent manufacturer of cable support systems, OBO subjects itself to these requirements on a daily basis. Comprehensive test procedures guarantee that systems which conform to standards function safely.

Specifications
All products in this catalogue are CE-compliant in accordance with the appropriate EC directives. This also applies to standard parts such as bolts, washers and nuts that are components of various product systems. The appropriate EC declaration of conformity certifies agreement with the named directives or standards, but does not guarantee properties. The safety instructions in the supplied product information and the general safety regulations must be complied with during installation and use.

Certifications
For OBO, product quality is closely connected to continuous testing and checking – which is why we manufacture almost all our products ourselves. This enormous depth of production is an expression of our demand for quality. From construction and the materials used through production, right up to logistics, our employees personally guarantee the quality and availability of OBO products.
The multitude of approvals emphasise our high demand for quality and product functionality.
Our integrated quality management system forms the solid basis of our ISO 9001 certification, which we have held since 1994. The confirmation of suitability enables defined and workable processes in accordance with KTA 1401 and 10 CFR 50.

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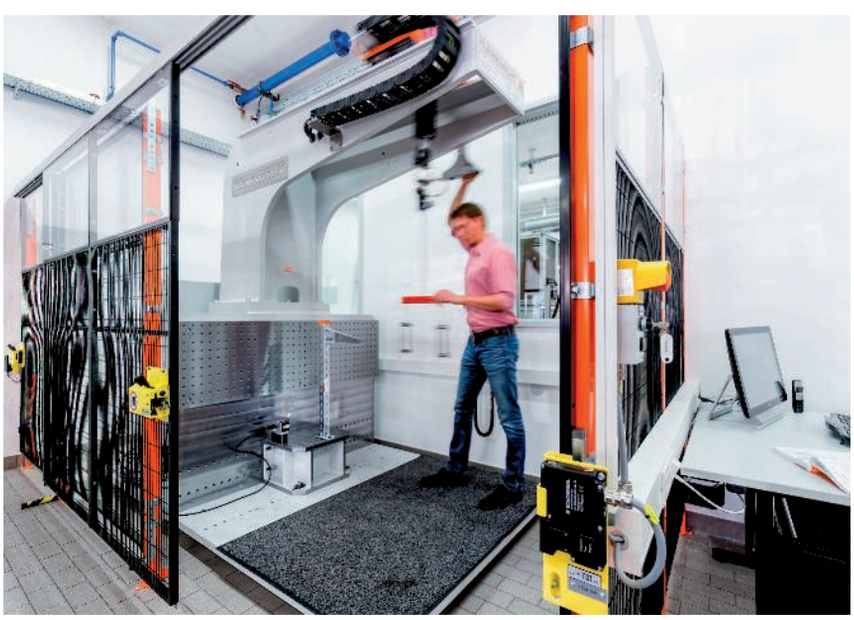
Load tests for cable support systems

All the OBO articles and systems are subjected to practical load testing. The basic principles for the tests of OBO cable support systems are included in IEC 61537. After the load test, the maximum load capacity can be determined for each component, depending on the support distances and specific article parameters, such as component dimensions. This is all shown in a chart, included with each component.

You can find additional information on the load tests for cable trays, brackets and suspended supports in this catalogue. The values given do not take resistance against environmental forces such as snow, wind and other outside influences into account.



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Definition of electromagnetic compatibility (EMC)

In recent years, the use of electronic circuits has increased continually. Whether in industrial systems, medicine, households, in telecommunications systems or electrical building installations – everywhere, we see powerful electric equipment and systems, which switch ever greater currents, achieve greater radio ranges and transport ever more energy in smaller spaces.

However, the use of state-of-the-art technology means that the complexity of applications also increases. The consequence of this is that ever more opposing influences (electromagnetic interferences) can occur from system parts and cables, causing damage and economic losses.

Here, we talk of electromagnetic compatibility.
Electromagnetic compatibility (EMC) is the ability of an electrical unit to function satisfactorily in its electromagnetic environment, without inappropriately influencing this environment, to which other units also belong (VDE 0870-1). In terms of standardisation, electromagnetic compatibility is dealt with by the EMC directive 2004/108/EC. This means that electrical resources emit electromagnetic interferences (emissions), which are picked up by other devices or units (immission) that act as receivers (interference sink). This, in turn, means that the function of an interference sink can be severely reduced, and, in the worst-case scenario, total failure and economic losses. The interferences can then spread along cables or in the form of electromagnetic waves.

Path of faults

Fault source (transmitting emissions)	Coupling of interference variables (spreading of interference)	Fault sink (receiving emissions)
For example - Mobile telephones - Switching components - Ignition systems - Frequency converters - Lighting strike - Welding devices	- Galvanic - Inductive - Capacitive - Electromagnetic	- Process computer - Radio receiver systems - Controllers - Converters - Measuring units

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Guarantee of EMC
A systematic planning process is necessary to guarantee EMC. The interference sources must be identified and quantified. The coupling describes the spread of the interference from the interference source up to the influenced device, the interference sink. The task of EMC planning is to ensure the compatibility at the source, coupling path and sink using suitable measures. During their daily work, planners and installation engineers are confronted with this subject on an increasingly regular basis. This means that EMC is a basic factor to be taken into consideration during the planning of installations and cabling systems.
Due to the high complexity of electromagnetic compatibility, the problems of EMC must be analysed and solved using simplifying hypotheses and models as well as experiments and measurements.

Cable support systems and their contribution to EMC
Cable support systems can make an important contribution to the improvement of EMC. They are passive and can thus make a safe, long-lasting contribution to EMC through the fact that cables are run within cable support systems or are shielded by them. Routing cables inside cable support systems greatly reduces the galvanic decoupling and coupling due to electrical and magnetic fields in the cables. Thus cable support systems can make a contribution to the reduction of coupling from the source to the sink. The shielding action of cable support systems can be quantified by the coupling resistance and the shield attenuation. This gives the planner important engineering parameters for cable support systems for the EMC engineering.

Lightning discharge
From the analysis of the effectiveness of EMC in buildings (EN 62305-4), we know that lightning discharge is one of the greatest sources of interference to be expected. This causes a direct current feed into the entire equipotential bonding system in the building and/or to magnetic decoupling of interference currents in electrical cables. With regard to these couplings, cable support systems can offer an effective contribution to the reduction of interference voltages.

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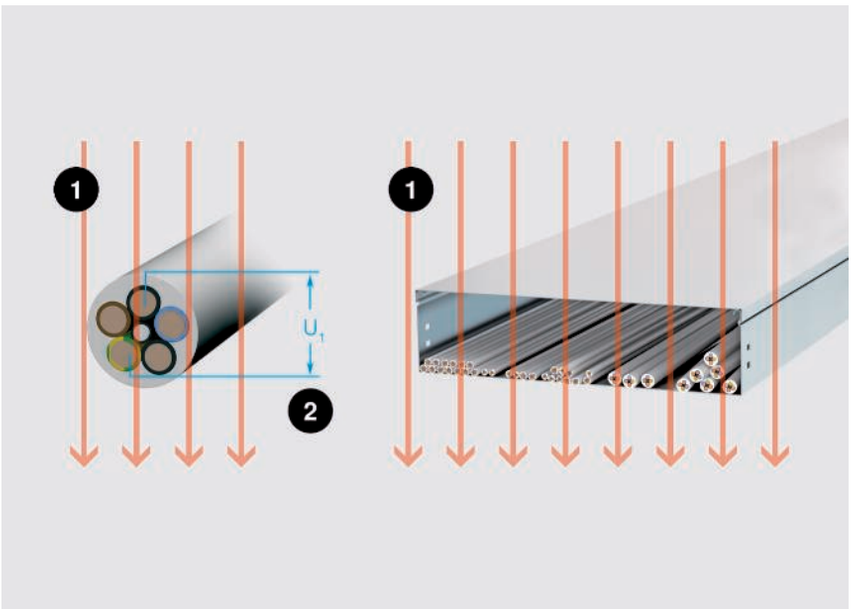
Magnetic shield insulation of cable support systems



The magnetic field (H) of strength 3 kA/m in a defined experimental setup: without cable support system on the left, with cable support system on the right. 1 = Field H, 2 = $V_{1\ LzuPE}$

The magnetic shield insulation of cable support systems is the ratio in decibels (dB) of an induced voltage into an unprotected cable to the induced voltage into the same cable, when this is in a cable support system.

Experimental structure to determine the magnetic shield insulation of cable support systems:
An unshielded cable (NYM-J 5 x 6 mm²) is subjected to an 8/20 magnetic field with a strength of 3 kA/m. Here, the induced voltage V1 is measured in the unshielded cable. The same cable is then positioned in the centre of a cable support system (once with a cover, once without) and subjected to the same magnetic field of 3 kA/m. Here, the induced voltage V2 is measured in the unshielded cable.
The magnetic shield insulation is calculated from the measured values according to the formula:

α_S = 20 log (V1/V2) dB

Experiment result:
The magnetic shield effect α_S of a cable support system could be clearly proved by the experiments and the simulation with an FEM program.
The best result of around 50 dB was achieved with cable support systems (cable trays) with covers.

Note:
The shield insulation against electrical fields is almost perfect as it has a Faraday cage.

Magnetic shield insulation 8/20 dB

Type, cable tray / cable ladder	Without cover	With cover
RKSM 630 FS	20	50
MKS 630 FS	20	50
MKS 630 FT	20	50
MKSU 630 FS	20	50
MKSU 630 FT	20	50
MKSU 630 VA	20	50
GRM 55/300 FS	15	34
LG 630 NS FT	10	15

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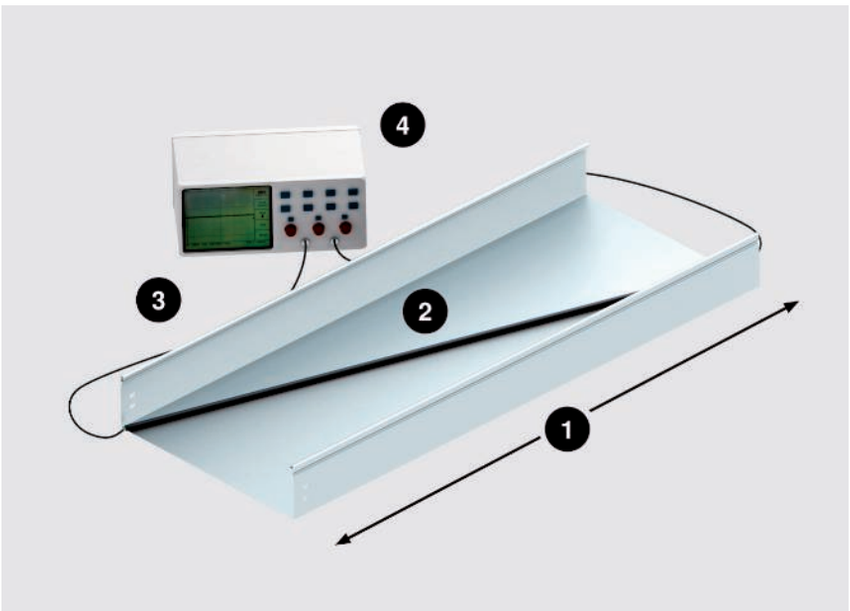
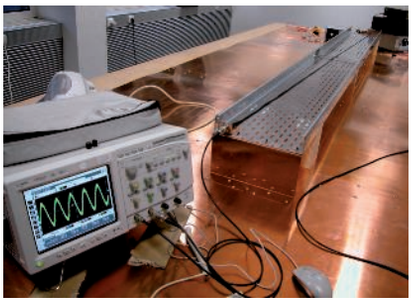
Transfer impendence of cable support systems



Experimental structure for transfer impedance: 1 = Length l, 2 = U, 3 = I, 4 = Pulse source 8/20



$$Z'_T = \frac{U_{Stör}}{I_{Stör} * L}$$

Z_T: Transfer impendence

$V_{Interference}$: Interference voltage measured in cable

$I_{Interference}$: Interference current, fed into the shield from outside (KTS)

L: Length of the cable support system

Transfer impedance (coupling resistance) of cable support systems

The transfer impedance of a cable support system is the ratio of the measured voltage $V_{Interference}$, measured in the lengthwise direction within the cable support system, to the coupled current $I_{Interference}$.

The transfer impedance is determined in the same way as with the measurement of the electrical conductivity properties in Chapter 11.1. (DIN EN 61537).

If there is a lightning strike in a building, partial currents will flow through the entire equipotential bonding system.

Installed cables are best run within a cable support system. Installed cable support systems are always included in the equipotential bonding system. In so doing, the partial current flows via the cable support system. A very small component can therefore still flow along the cables laid within the cable support system. This component is determined by the transfer impedance of the cable support system.

The following applies for the transfer impedance:

$Z_T = V_{Interference}/(I_{Interference} \times L)$ [mΩ/m]

The values given are based on measurements, in which a pulse current of the wave shape 8/20 was passed through a defined length of a cable support system.

Experiment result:

The effect of the cable support system against galvanic coupling was clearly proved by the experiments.

The best result was achieved with cable support systems (cable trays) with covers.

Transfer impedance 8/20 mOhm/m

Type, cable tray / cable ladder	Without cover	With cover
MKS 630 FS	1.14	0.71
MKS 630 FT	1.14	0.71
MKSU 630 FS	0.44	0.09
MKSU 630 FT	0.44	0.09
GRM 55/300 FS	6.17	5.5

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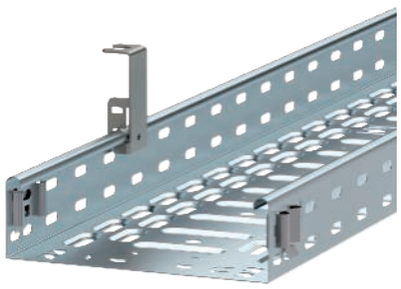
Contact corrosion



Contact corrosion between two different metals poses a considerable risk to the load capacity and lifespan of the components used.

Height of the potential difference
The level of contact corrosion is primarily determined by the level of the potential difference between the contact partners. Contact corrosion occurs at potential differences of 100 mV or greater and the anodic (electrically negative) partner is at risk of corrosion. Therefore, strongly non-precious metals should never be brought into contact with precious metals.

Additional contact corrosion criteria:

- Level of electrical resistance between the contact partners. The higher the resistance, the lower the contact corrosion. Positive on Al and Ti.
- Occurrence of an electrolyte. An electrolyte, such as perspiration or condensate, attacks the protective layers, increasing conductivity. Dirt increases this effect through released ions.
- Length of the impact of the electrolyte. The longer the electrolyte is at work, the greater the corrosion will be.
- The surface ratios of the contact partners influence the current density. The best thing to have is a small surface ratio of the "precious" to the "less precious" contact partner.

Potential difference

Normal potential		Practical voltage series, water pH 6		Practical voltage series, artificial sea water pH 7.5	
Metal	mV	Metal	mV	Metal	mV
Copper	+340	Titanium	136	Nickel	1
Lead	-126	Brass MS 63	100	Brass MS 63	32
Tin	-140	Copper	94	Copper	-35
Nickel	-230	Nickel	73	RF steel 1.4301	-90
Iron	-440	RF steel	-129	Titanium	-156
Zinc	-763	Aluminium	-214	Lead	-304
Titanium	-1630	Hard chromium	-294	Hard chromium	-336
Aluminium	-1660	Tin 98	-320	Steel	-380
Magnesium	-2370	Lead 99.9	-328	Aluminium	-712
Steel	-395				
Zinc	-852				

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Contact corrosion

Land climate

Construction part material (large)		Construction element material (small)					
OBO designation	Basic material Coating	FT	VA	AL	CU	MS	Zamak
Steel, galvanised (FT, FS, DD, G)	DD11/Zn, S234(St37)/Zn, ST4-2/Zn, St500-2/Zn, StW22/Zn, DX51D/Zn	0	0	0	2	1	0
Stainless steel V2A, V4A, V5A	1.4301, 1.4310, 1.4401, 1.4404, 1.4571, 1.4529	0	0	1	1	1	0
Aluminium Al	AlMg3, AlMgSi0.5	0	0	0	2	1	0
Copper Cu	E-Cu S7, F24, Se-Cu(2.0070), SF-Cu F24, St50-2	1	1	1	0	1	2
Brass Ms1	CuZn39Pb3, CuZn40Pb2	0	1	1	1	0	2
Brass MS2	CuZn37	0	2	1	1	0	2
Die-cast zinc Zamak ZnAlCu1	Z410(GD-ZnAl4Cu1)	1	1	0	3	1	0

Legend
0 No risk for contact corrosion
1 Low risk
2 Risk in case of small area ration (area of non-precious metal / area of precious metal)
3 High risk

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Contact corrosion

Industrial atmosphere

Construction part material (large)		Construction element material (small)					
OBO designation	Basic material Coating	FT	VA	AL	CU	MS	Zamak
Steel, galvanised (FT, FS, DD, G)	DD11/Zn, S234(St37)/Zn, ST4-2/Zn, St500-2/Zn, StW22/Zn, DX51D/Zn	0	0	1	3	2	0
Stainless steel V2A, V4A, V5A	1.4301, 1.4310, 1.4401, 1.4404, 1.4571, 1.4529	0	0	1	1	1	0
Aluminium Al	AlMg3, AlMgSi0.5	1	1	0	2	2	0
Copper Cu	E-Cu S7, F24, Se-Cu(2.0070), SF-Cu F24, St50-2	2	2	3	0	1	2
Brass Ms1	CuZn39Pb3, CuZn40Pb2	1	1	2	1	0	1
Brass MS2	CuZn37	1	1	3	1	0	1
Die-cast zinc Zamak ZnAlCu1	Z410(GD-ZnAl4Cu1)	0	0	0	3	2	0

Legend
0 No risk for contact corrosion
1 Low risk
2 Risk in case of small area ration (area of non-precious metal / area of precious metal)
3 High risk

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Contact corrosion

Sea climate

Construction part material (large)		Construction element material (small)					
OBO designation	Basic material Coating	FT	VA	AL	CU	MS	Zamak
Steel, galvanised (FT, FS, DD, G)	DD11/Zn, S234(St37)/Zn, ST4-2/Zn, St500-2/Zn, StW22/Zn, DX51D/Zn	0	1	3	3	2	1
Stainless steel V2A, V4A, V5A	1.4301, 1.4310, 1.4401, 1.4404, 1.4571, 1.4529	1	0	3	1	1	0
Aluminium Al	AlMg3, AlMgSi0.5	3	1	0	2	2	0
Copper Cu	E-Cu S7, F24, Se-Cu(2.0070), SF-Cu F24, St50-2	2	2	3	0	1	2
Brass Ms1	CuZn39Pb3, CuZn40Pb2	1	1	3	1	0	1
Brass MS2	CuZn37	1	1	3	1	0	1
Die-cast zinc Zamak ZnAlCu1	Z410(GD-ZnAl4Cu1)	0	0	0	3	2	2

Legend
0 No risk for contact corrosion
1 Low risk
2 Risk in case of small area ration (area of non-precious metal / area of precious metal)
3 High risk

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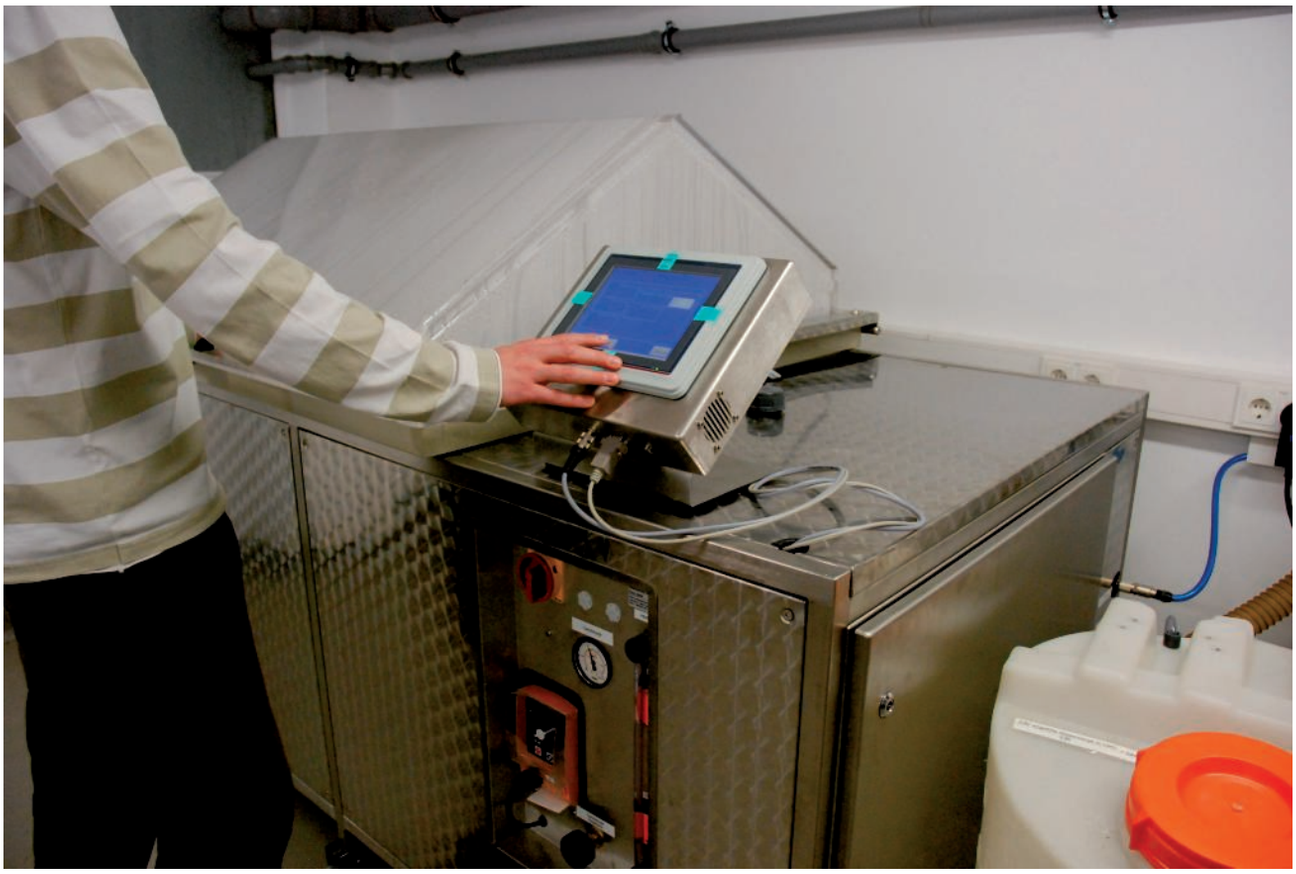
Surface testing and corrosion categories



Salt spray test
All the system components must show sufficient resistance against corrosion in agreement with the KTS standard, DIN EN 61537. The minimum zinc layer thicknesses are determined through a measurement. The grouping into the appropriate class is located in the lower table on the next page. The top table on the next page presents the area of use and the zinc reduction to be expected according to DIN EN ISO 12944.

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Surface testing and corrosion categories

Classification of corrosion resistance according to EN 61537

Class	Reference material and surface treatment
0*	None
1	Electroplated to a minimum thickness of 5 µm
2	Electroplated to a minimum thickness of 12 µm
3	Pre-galvanised to grade 275 to EN 10327 and EN 10326
4	Pre-galvanised to grade 350 to EN 10327 and EN 10326
5	Post-galvanised to a zinc mean coating thickness of (minimum) 45 µm according to ISO 1461
6	Post-galvanised to a zinc mean coating thickness (minimum) of 55 µm according to ISO 1461
7	Post-galvanised to a zinc mean coating thickness (minimum) of 70 µm according to ISO 1461
8	Post-galvanised to a zinc mean coating thickness (minimum) of 85 µm according to ISO 1461 (usually high silicon steel)
9A	Stainless steel manufactured to ASTM: A 240/A 240M – 95a designation S30400 or EN 10088 grade 1-4301 without a post-treatment *
9B	Stainless steel manufactured to ASTM: A 240/A 240M – 95a designation S31603 or EN 10088 grade 1-4404 without a post-treatment *
9C	Stainless steel manufactured to ASTM: A 240/A 240M – 95a designation S30400 or EN 10088 grade 1-4301 with a post-treatment **
9D	Stainless steel manufactured to ASTM: A 240/A 240M – 95a designation S31603 or EN 10088 grade 1-4404 with a post-treatment **

* For materials which do not have a declared corrosion resistance classification
** The end treatment process is used to improve the protection against crack corrosion and the contamination of other steels

Corrosion categories to DIN EN ISO 12944

Corrosion category	Typical environment, inside	Typical environment, outside	Corrosion load	Average zinc removal
C 1	Heated buildings with neutral atmospheres, e.g. offices, shops, schools, hotels	-	Insignificant	<0.1 µm/a
C 2	Unheated buildings in which condensation can occur, e.g. warehouse, sports halls	Atmosphere with low level of impurities. Often rural areas	Low	0.1 to 0.7 µm/a
C 3	Production facilities with a high level of humidity and some air impurities, e.g. plants for food production, laundries, breweries, dairies	City and industrial atmosphere, considerable impurities through sulphur dioxide, coastal areas with low salt load	Medium	0.7 to 2.1 µm/a
C 4	Chemical plants, swimming pools, boat sheds over seawater	Industrial areas and coastal areas with low salt load	Strong	2.1 to 4.2 µm/a
C 5-I	Buildings or areas with almost constant condensation and with high levels of impurities	Industrial areas with high levels of humidity and aggressive atmosphere	Very strong (industry)	4.2 to 8.4 µm/a
C 5-M	Buildings or areas with almost continuous condensation and with high levels of impurities	Coastal or offshore areas with salt load.	Very strong (sea)	> 4.2 to 8.4 µm/a

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Surfaces for indoor use

Whether indoors or outdoors, in aggressive atmospheres or under special hygienic conditions: OBO can offer the perfect surface and materials for your cable support system, no matter what the requirements may be. OBO cable support systems are machined from high-quality sheet steel or steel wire and are available with various surfaces. Different hardening and coating methods ensure tailor-made corrosion protection, specially tailored to the appropriate application. In addition, OBO cable support systems are available in stainless steel and with coloured coatings.

Indoor use
For applications in indoor areas, OBO can offer cable support systems with galvanisation or strip galvanisation. They are particularly suited to dry atmospheres without any impact from aggressive pollutants.

Electro-galvanisation
- Electrolytic galvanisation in accordance with IEC 12329
- Average coating thickness approx. 2.5–10 µm
- According to RoHS guideline

Components: Mesh cable trays and small parts such as bolts, washers and nuts

Strip galvanisation
- Hot-dip galvanised according to the strip-galvanising method in accordance with IEC 10346 (formerly IEC 10327)
- Average coating thickness approx. 20 µm
- Joints in the metal are protected by cathodic corrosion protection up to a thickness of 2.0 mm

Components: Metal products such as cable trays, fittings and barrier strips.

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Surfaces for outdoor use

Outdoor use
OBO can offer versions with hot-dip galvanisation and double-dip galvanisation for outdoor and wet - room use.

Hot-dip galvanisation
- Hot galvanisation using the dipping method according to DIN EN ISO 1461
- Coating thickness to DIN EN ISO 1461 approx. 40–60 µm
- Any interfaces added at a later date must also be galvanised to protect against corrosion

Components: Sheet steel products such as cable trays and welded components such as supports and brackets.

Double-dip galvanisation
- Hot dipping with zinc-aluminium coating in accordance with DIN EN 10346
- Average coating thickness approx. 23 µm
- Joints in the metal are protected by cathodic corrosion protection up to a thickness of 2.0 mm

Components: Metal products such as covers, barrier strips and punched parts

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Surfaces for use in the chemical industry, the food industry or in tunnel construction

Applications: Tunnel construction, food or chemical industries
For special hygiene and quality requirements, as well as for special visual criteria for open wiring, there are also OBO stainless steel systems.

V2A stainless steel
- OBO Code: V2A
- European material number: 1.4301
- American material designation: 304
- Welded components are additionally passivated
- Unwelded components are rinsed and degreased

Product range: V2A programme with the title "Stainless steel systems, grade 2"

SS4 stainless steel
- OBO Code: V4A
- European material number: 1.4571
- American material designation: 316 / 316 Ti
- Welded components are additionally passivated
- Unwelded components are rinsed and degreased

Product range: V4A programme with the title "Stainless steel systems, grade 4"

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Surfaces for special visual requirements or special environmental loads

Applications with specific optical requirements or special environmental conditions

Colour-coated cable support systems are becoming ever more popular. The coating may be required for optical reasons or for reasons of corrosion protection.

Colour coatings for reasons of corrosion protection

- Cable support system in FT (hot-dip galvanised version)
- All RAL colours available
- Coating of the visible surfaces and/or the complete system
- Suitable for the colour of the structure when routed openly
- Separation of different voltages/functions (e.g. blue 230/400 V power supply; red weak current such as telephone line and IT)

Colour-coated systems are not indicated specially in this catalogue. You can obtain details of these systems by contacting our telephone hotline on
+49 23 73 89 - 12 38.

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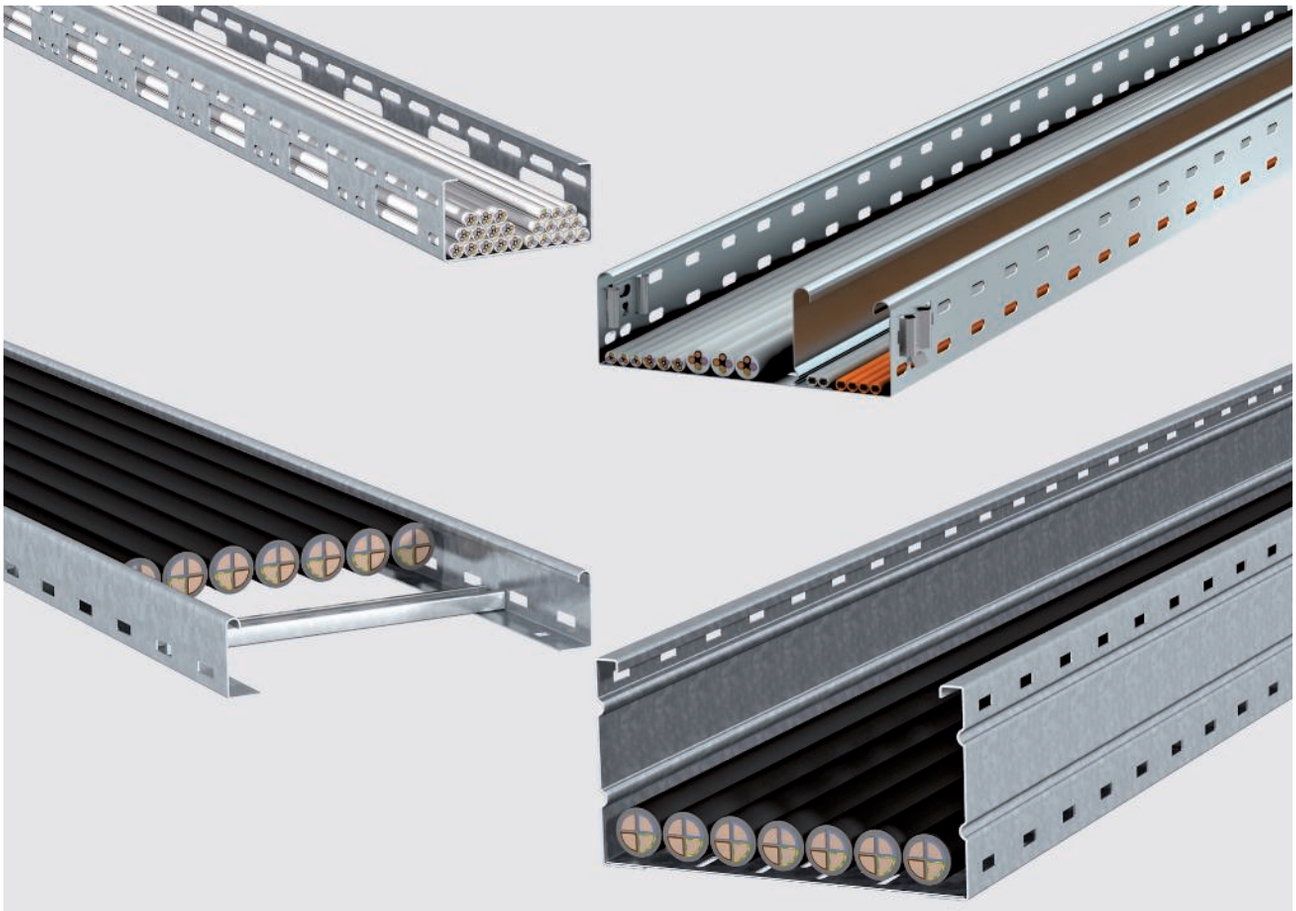
Which cabling method is used?



Not all cables are the same. To select the perfect cable support system, you need to know which type of cables are to be laid: Are they sensitive data cables, which must be laid at a certain distance from each other on account of the necessary shielding? Or power cables, for which a not inconsiderable heat build-up must be allowed for? For all these applications OBO can offer tailor-made system solutions.

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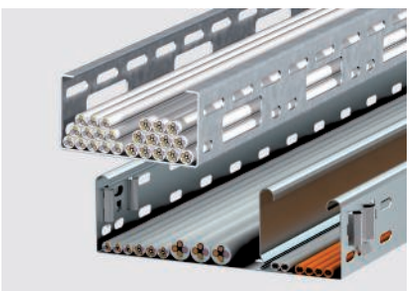
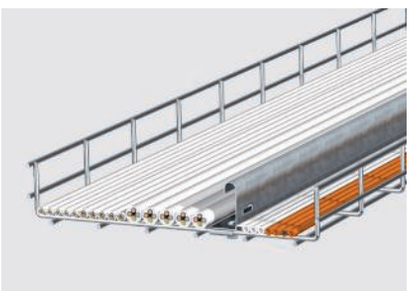
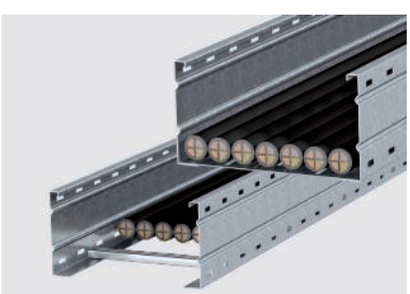


Universal cable trays
Areas of application: From low-voltage cabling to power supply.

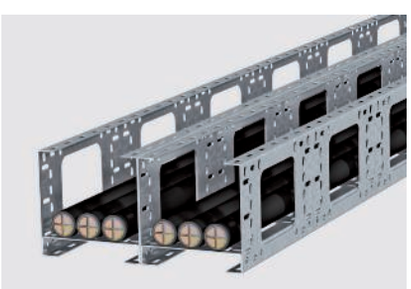


Mesh cable trays for the installation of light cables
Areas of application: IT cabling, telephone cabling and control cables. Also suitable for use in false ceilings and cavity floors.

Cable ladders for power cables with a large cross-section
Areas of application: Cables and power conductors with large cross-sections. These can be fastened to the rungs using clamp clips. The high load capacity and good ventilation ensure perfect cable laying.



Wide span cable trays and ladders for large support distances
Areas of application: For installations in which the support distances are more than three metres, on account of the construction conditions.



Modular system for special tasks
The product range that knows no bounds. The range of individually combinable products is particularly suited to complex installation tasks.

AZ channel for universal use
Areas of application: for luminaire support systems through to low-voltage cabling and power supply.

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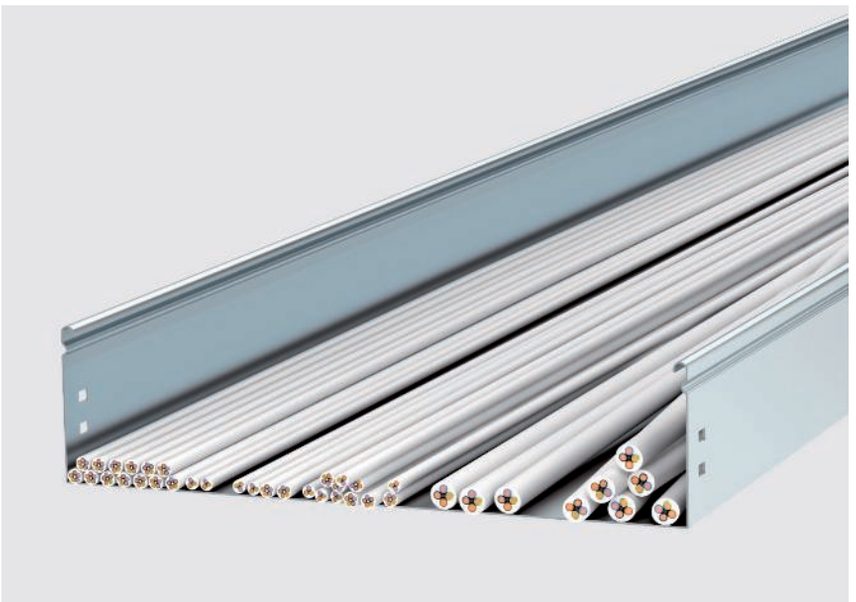
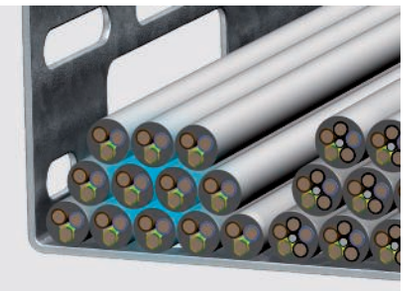
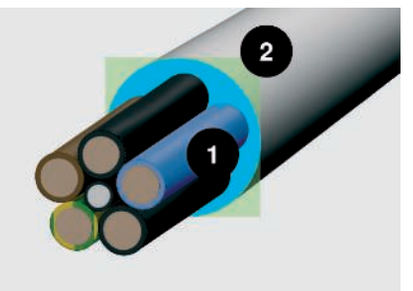
How can I work out the volume of cables?



The usable cross-section of the cable simulates the cavity in real laying.





Cable diameter (1) and space required (2)

An important criteria for the selection of the correct cable support system is the cable volume, for which there must be sufficient space in the cable tray. As the cables are never packed tightly together or are absolutely parallel, it is not enough to base the volume calculation solely on the cable diameter. A realistic calculation is provided by the formula $(2r)^2$. To save you work, we have listed the diameter and usable cross-section of the most important cable types below.
Important: These values are average values, which may vary from manufacturer to manufacturer. Please refer to the manufacturer's specifications for the exact values.

Calculation with the formula $(2r)^2$
The diameter says little about the actual space required by a cable. Calculate: $(2r)^2$. This value reflects the realistic space requirements, including the compartments.

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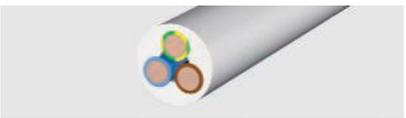
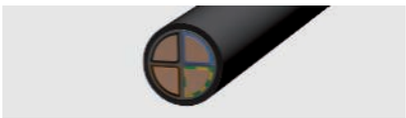
Cable volume



Insulated power cables

Type	Diameter mm	Usable cross-section cm²
1 x 4	6.5	0.42
1 x 6	7	0.49
1 x 10	8	0.64
1 x 16	9.5	0.9
1 x 25	12.5	1.56
3 x 1.5	8.5	0.72
3 x 2.5	9.5	0.9
3 x 4	11	1.21
4 x 1.5	9	0.81
4 x 2.5	10.5	1.1
4 x 4	12.5	1.56
4 x 6	13.5	1.82
4 x 10	16.5	2.72
4 x 16	19	3.61
4 x 25	23.5	5.52
4 x 35	26	6.76
5 x 1.5	9.5	0.9
5 x 2.5	11	1.21
5 x 4	13.5	1.82
5 x 6	14.5	2.1
5 x 10	18	3.24
5 x 16	21.5	4.62
5 x 25	26	6.76
7 x 1.5	10.5	1.1
7 x 2.5	13	1.69



Insulated power cables

Type	Diameter mm	Usable cross-section cm²
1 x 10	10.5	1.1
1 x 16	11.5	1.32
1 x 25	12.5	1.56
1 x 35	13.5	1.82
1 x 50	15.5	2.4
1 x 70	16.5	2.72
1 x 95	18.5	3.42
1 x 120	20.5	4.2
1 x 150	22.5	5.06
1 x 185	25	6.25
1 x 240	28	7.84
1 x 300	30	9
3 x 1.5	11.5	1.32
3 x 2.5	12.5	1.56
3 x 10	17.5	3.06
3 x 16	19.5	3.8
3 x 50	26	6.76
3 x 70	30	9
3 x 120	36	12.96
4 x 1.5	12.5	1.56
4 x 2.5	13.5	1.82
4 x 6	16.5	2.72
4 x 10	18.5	3.42
4 x 16	21.5	4.62
4 x 25	25.5	6.5
4 x 35	28	7.84
4 x 50	30	9
4 x 70	34	11.56
4 x 95	39	15.21
4 x 120	42	17.64
4 x 150	47	22
4 x 185	52	27
4 x 240	58	33.6
5 x 1.5	13.5	1.82
5 x 2.5	14.5	2.1
5 x 6	18.5	3.42
5 x 10	20.5	4.2
5 x 16	22.5	5.06
5 x 25	27.5	7.56
5 x 35	34	11.56
5 x 50	40	16

Telecommunications cables

Type	Diameter mm	Usable cross-section cm²
2 x 2 x 0.6	5	0.25
4 x 2 x 0.6	5.5	0.3
6 x 2 x 0.6	6.5	0.42
10 x 2 x 0.6	7.5	0.56
20 x 2 x 0.6	9	0.81
40 x 2 x 0.6	11	1.12
60 x 2 x 0.6	13	1.69
100 x 2 x 0.6	17	2.89
200 x 2 x 0.6	23	5.29
2 x 2 x 0.8	6	0.36
4 x 2 x 0.8	7	0.49
6 x 2 x 0.8	8.5	0.72
10 x 2 x 0.8	9.5	0.9
20 x 2 x 0.8	13	1.69
40 x 2 x 0.8	16.5	2.72
60 x 2 x 0.8	20	4
100 x 2 x 0.8	25.5	6.5
200 x 2 x 0.8	32	10.24

Coax cable (standard)

Type	Diameter mm	Usable cross-section cm²
SAT/BK cable	6.8	0.48

IT cables type Cat...

Type	Diameter mm	Usable cross-section cm²
Cat. 5	8	0.64
Cat. 6	8	0.64

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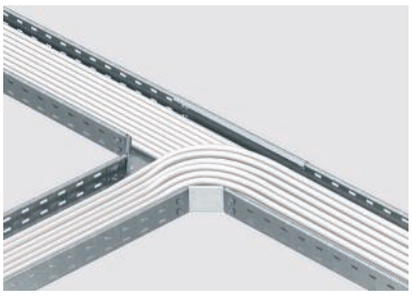
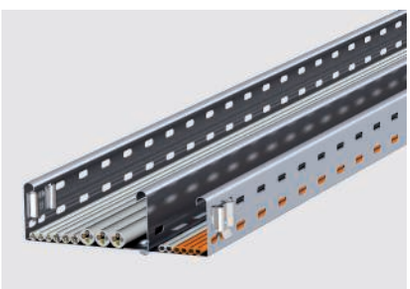
How can I find a system of the appropriate volume?

Cable height
The cable height may not exceed the edge height of the cable tray.

Volume reserve
When selecting the system, a volume reserve of at least 30% should be planned for possible later installations.

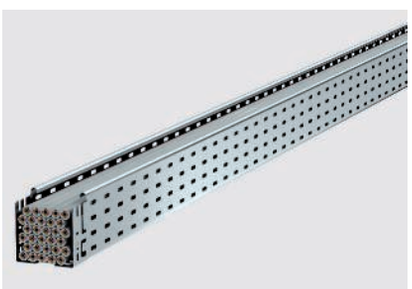


Branches
When dimensioning branches, the bending radii of the cables must be taken into account.



Separation of system levels
When selecting the volume, pay attention to the different conductors. To separate different voltage levels, you must take the required spacings into account.

Same usable cross-section, different requirements
The following table will help you to choose a cable support system of the right volume. It underlines the interplay of tray or ladder width, slant height and usable cross-section. The difference when laying the same volume of data and power cables should be taken into account: while it is possible to select a narrow, high tray for data cables, a wide, flat tray is necessary for power cables.



Examples
Flat, wide variant:
- e.g. for power cables
- Cable tray width: 300 mm
- Side rail height: 35 mm
- Usable cross-section: 103 cm^2

Narrow, high variant:
- e.g. for data cables
- Cable tray width: 100 mm
- Side height: 110 mm
- Usable cross-section: 108 cm^2

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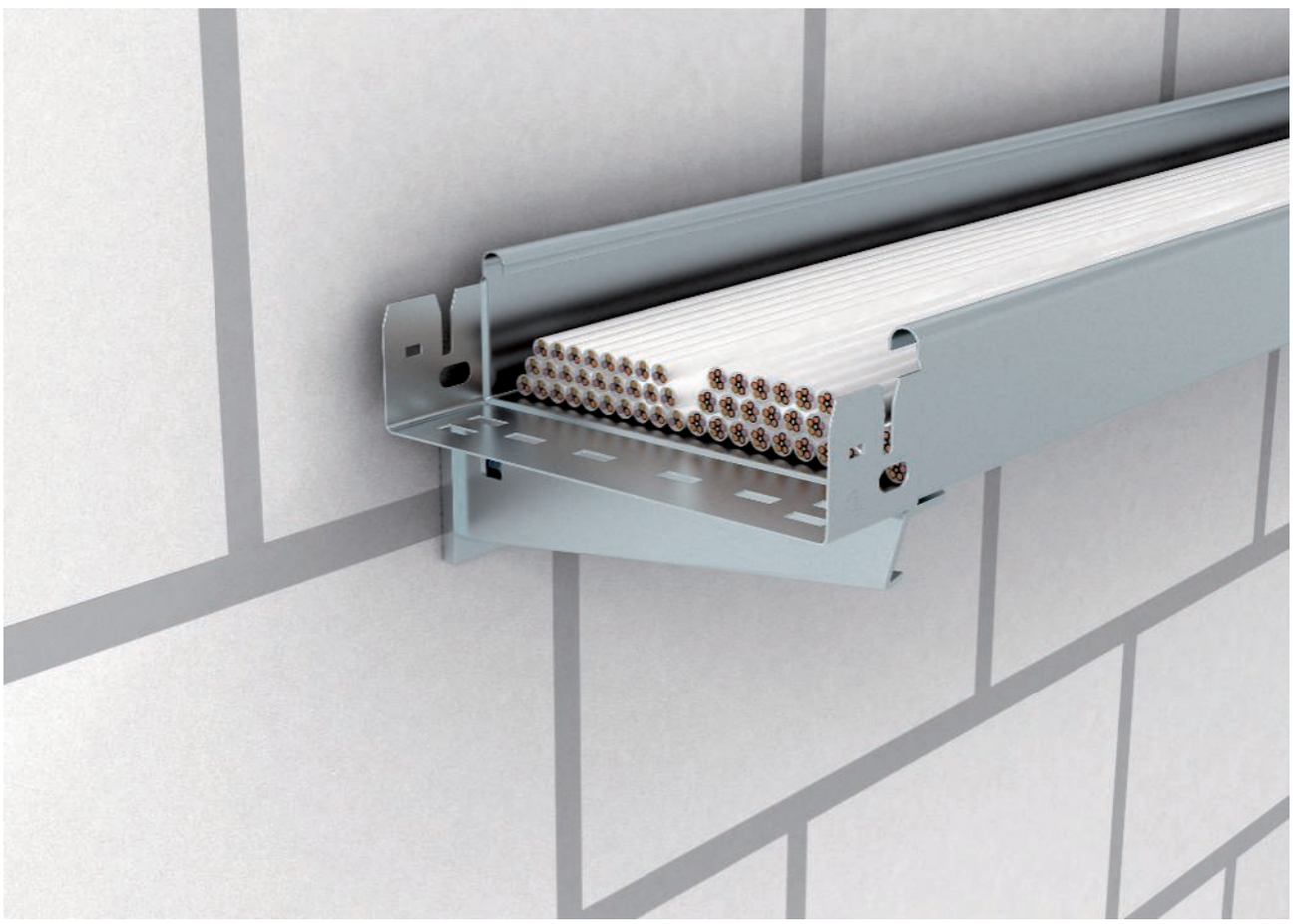
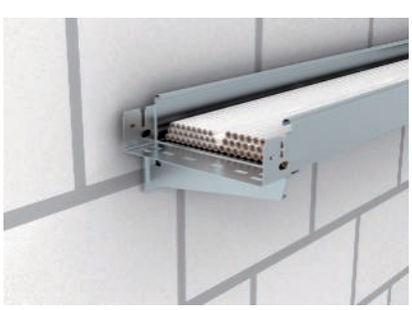
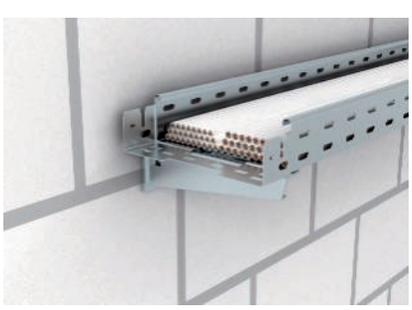
Reference laying types



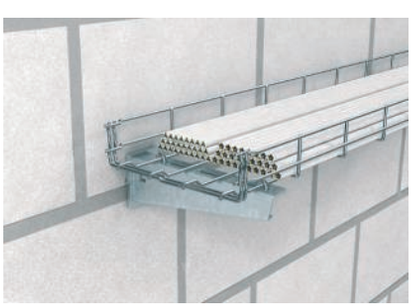
When selecting the correct system, also observe the current DIN/VDE standards (0298 T1 to T4). They provide information on the heating of conductors, depending on the amassment and the ambient temperature.



Reference laying type: C
Cable on unperforated cable tray, e.g. type MKSMU



Reference laying type: E or F
Cable on perforated cable tray, horizontal/vertical, e.g. type RKSM/MKSM



Reference laying type: E, F or G
Cable or installation cable on mesh cable trays, e.g. type GR-Magic

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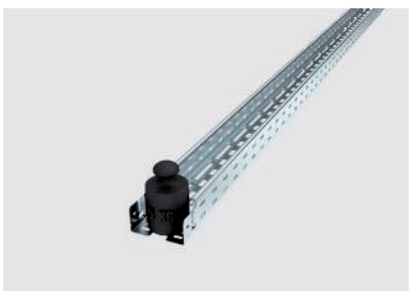
How do I calculate the cable weight?



100 mm = 15 kg/m

200 mm = 30 kg/m

300 mm = 45 kg/m

400 mm = 60 kg/m

500 mm = 75 kg/m

600 mm = 90 kg/m

Of equal significance for the selection of the cable support system most suited to the application is the load capacity of the system. This must be matched with the expected cable weight (including the reserve for later installation). There are three variants for determining the cable weight:

Variant 1: Orientation to experience values

The average load capacity of a cable tray can be calculated roughly using experience values. For a system with a strut height of 60 mm, a value of 15 kg per 100 mm width is valid for each metre of cable tray or cable ladder. However, more accurate than orientation to experience values is to calculate the cable load using the formula from DIN VDE 0639 Part 1 (Variant 2) or the manufacturer's specifications (Variant 3).
The graphics show the load capacities, based on experience values, of cable trays with a rail height of 60 mm, relative to cable tray widths of 100 to 600 mm.

Variant 2: Calculation formula according to VDE 0639 T1

To calculate a maximum approved cable load, DIN VDE 0639 Part 1 (cable support systems) can offer a formula.
In the example calculation, the maximum approved cable load for a cable tray is worked out using the dimension 60 mm x 300 mm and a usable cross-section of 178 cm².

Variant 3: Exact calculation according to manufacturer's specifications

Most cable manufacturers offer a very accurate method of calculating cable weights, and appropriate lists or tables can be obtained from them. Important: The tables only provide a rough overview. They are average values, which may vary from manufacturer to manufacturer. Please refer to the manufacturer's specifications for the exact values.

	0.028 N	
Cable load (F) =	**————**	**x Usable cross-section**
	m x mm²	

	0.028 N	
1. Cable load (F) =	**————**	**x 17,800 mm² = 500 N/m**
	m x mm²	

2. Conversion from Newtons (N) to kilogrammes (kg)
10 N ~ 1 kg – in our example, this means: 500 N/m = 50 kg/m

3. Maximum occurring load = 50 kg/m

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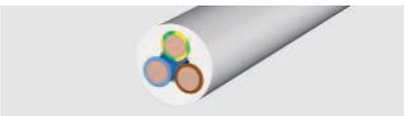
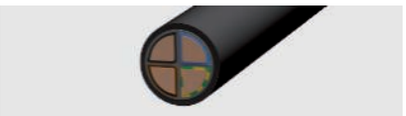
Actual cable weights of different cable types



Insulated power cables

Type	Cable load kg/m
1 x 4	0.08
1 x 6	0.105
1 x 10	0.155
1 x 16	0.23
1 x 25	0.33
3 x 1.5	0.135
3 x 2.5	0.19
3 x 4	0.265
4 x 1.5	0.16
4 x 2.5	0.23
4 x 4	0.33
4 x 6	0.46
4 x 10	0.69
4 x 16	1.09
4 x 25	1.64
4 x 35	2.09
5 x 1.5	0.19
5 x 2.5	0.27
5 x 4	0.41
5 x 6	0.54
5 x 10	0.85
5 x 16	1.35
5 x 25	1.99
7 x 1.5	0.235
7 x 2.5	0.35



Insulated power cables

Type	Cable load kg/m
1 x 10	0.18
1 x 16	0.24
1 x 25	0.35
1 x 35	0.46
1 x 50	0.6
1 x 70	0.8
1 x 95	1.1
1 x 120	1.35
1 x 150	1.65
1 x 185	2
1 x 240	2.6
1 x 300	3.2
3 x 1.5	0.19
3 x 2.5	0.24
3 x 10	0.58
3 x 16	0.81
3 x 50	1.8
3 x 70	2.4
3 x 120	4
4 x 1.5	0.22
4 x 2.5	0.29
4 x 6	0.4
4 x 16	1.05
4 x 25	1.6
4 x 35	1.75
4 x 50	2.3
4 x 70	3.1
4 x 95	4.2
4 x 120	5.2
4 x 150	6.4
4 x 185	8.05
4 x 240	11
5 x 1.5	0.27
5 x 2.5	0.35
5 x 6	0.61
5 x 10	0.88
5 x 16	1.25
5 x 25	1.95
5 x 35	2.4
5 x 50	3.5

Telecommunications cables

Type	Cable load kg/m
2 x 2 x 0.6	0.03
4 x 2 x 0.6	0.035
6 x 2 x 0.6	0.05
10 x 2 x 0.6	0.065
20 x 2 x 0.6	0.11
40 x 2 x 0.6	0.2
60 x 2 x 0.6	0.275
100 x 2 x 0.6	0.445
200 x 2 x 0.6	0.87
2 x 2 x 0.8	0.04
4 x 2 x 0.8	0.055
6 x 2 x 0.8	0.08
10 x 2 x 0.8	0.115
20 x 2 x 0.8	0.205
40 x 2 x 0.8	0.38
60 x 2 x 0.8	0.54
100 x 2 x 0.8	0.875
200 x 2 x 0.8	1.79

Coax cable (Standard)

Type	Cable load kg/m
SAT/BK cable	0.06

IT cables Type Cat...

Type	Cable load kg/m
Cat. 5	0.06
Cat. 6	0.06

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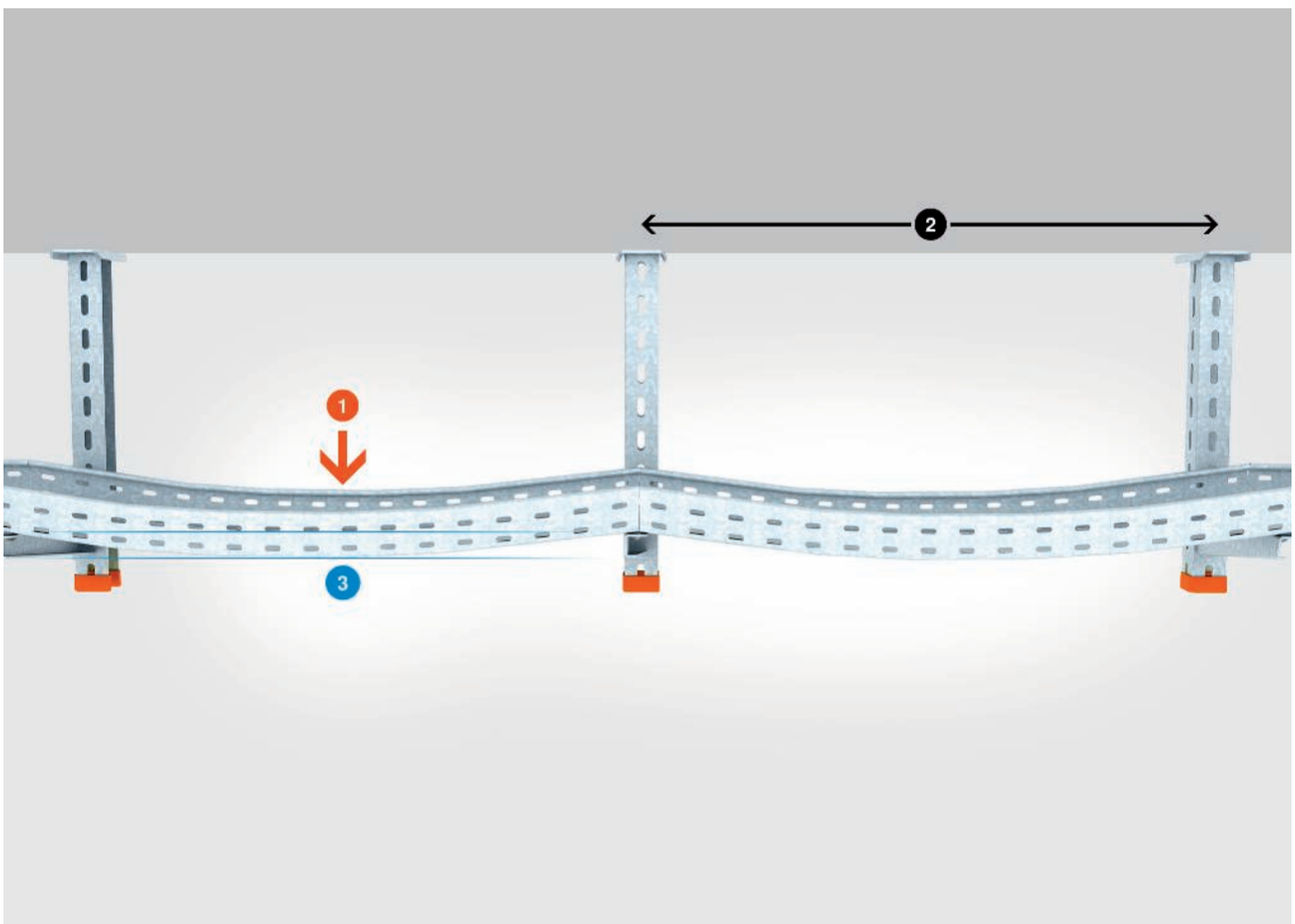
Which trays and ladders can support which cable load?



Explanation of the pictograms: 1 = load in kN without man load, 2 = support width in m, 3 = strut bend in mm

Load tests for cable support systems

All the OBO articles and systems are subjected to practical load testing. The basic principles for the tests of OBO cable support systems are included in IEC 61537 and DIN VDE 0639. After the load test, the maximum load capacity can be determined for each component, depending on the support distances and specific article parameters, such as component dimensions. This is shown in a diagram, included with each component.

You can find additional information on the load tests for cable trays, brackets and suspended supports in this catalogue. The values given do not take resistance against environmental forces such as snow, wind and other outside influences into account.

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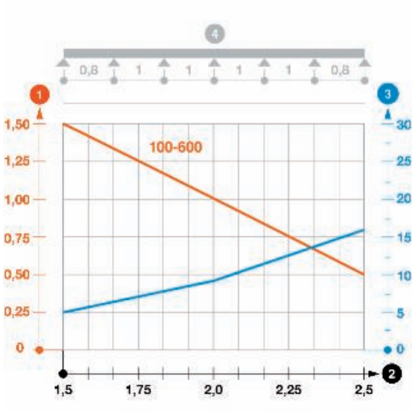
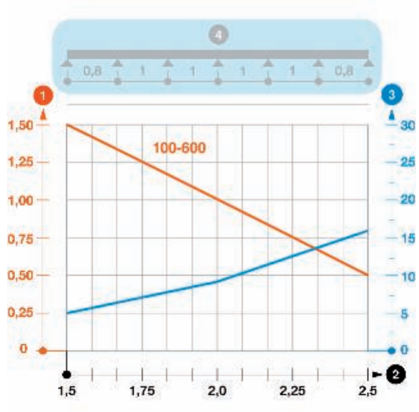
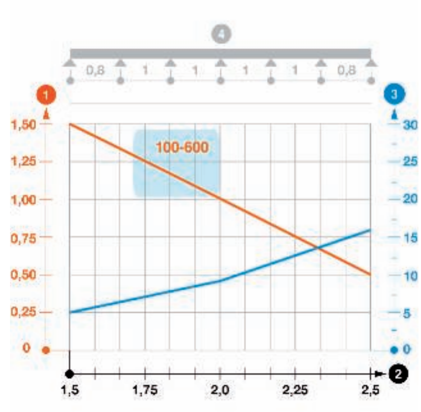
Which trays and ladders can support which cable load?







Load diagram, legend
1 = Load in kN/m
without human weight
2 = Support width in m
3 = Strut bending in mm
4 = Schematic diagram
of the spans during
the testing process
– = Approved load depending on
support width for the different
tray widths
– = Rail bend depending on
span

Information 1: The testing process

The basic principles of the tests of OBO cable support systems is VDE 0639 Part 1 and IEC 61537. The purpose of the tests is to determine the maximum load capacities for each component, depending on parameters such as component width, support spacing, etc. and to present this in a diagram to be included with each component. The area highlighted in blue in the above example schematises the experiment setup with a variable support spacing (L) in the central area and a factor of 0.8 x L at the front and rear ends of the cable tray.

Information 2: Load curves for selected cable tray or cable ladder widths

The load capacity of the cable trays according to the support width can be read off in the diagram using the load curves – this is an example for a cable tray for the tray widths 100 to 600 mm. It may occur that, in the load curves, width differences must be made, allowing multiple curves to be visible simultaneously in the diagram. A key factor for the load capacity of the cable trays is, beside the support spacing and side height, the material thickness, which varies according to type.

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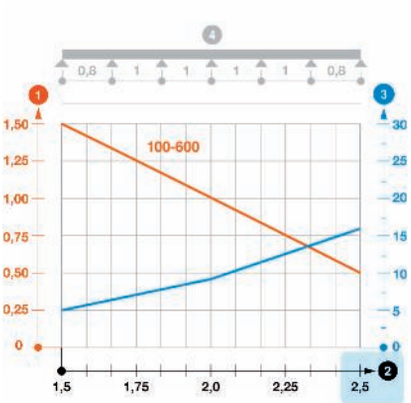
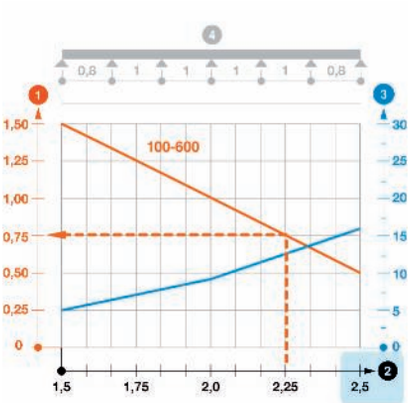
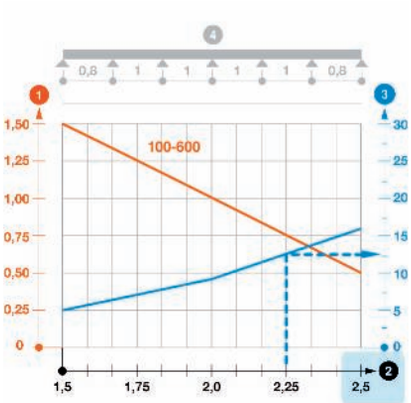
Which trays and ladders can support which cable load?



Information 3: Possible support spacings
The theoretically possible spans for the cable tray can be read off on the axis at the foot of the table. Using the load curves, it is easy to read off to what extent the load capacity of the system falls as the support spacing grows. On all OBO cable support systems (with the exception of the wide span trays), we recommend not exceeding a support spacing of 1.5 m, if possible.



Information 4: Ratio: load/span
Which load is possible at which support spacing? With the diagram, you can find the appropriate information at a glance. In our example (with the blue background) a span of 2.25 m for the tray produces a maximum load capacity of 0.75 kN for each running metre of cable tray. Please note that, in this example, the volume of the cable tray may exceed the permitted load. Therefore, if at all possible, do not exceed the support spacing of 1.5 m, as recommended by OBO.



Information 5: W = Strut sag
To what extent does the load on a cable tray cause the strut to bend? This information is supplied by the blue curve (w) in millimetres (orientation values on the axis on the right-hand side of the diagram).

The course of the blue curve clearly shows how quickly the cable tray will sag as the support spacing increases. In our example, the bend at a support spacing of 2.25 m is shown, here approximately 12 mm.

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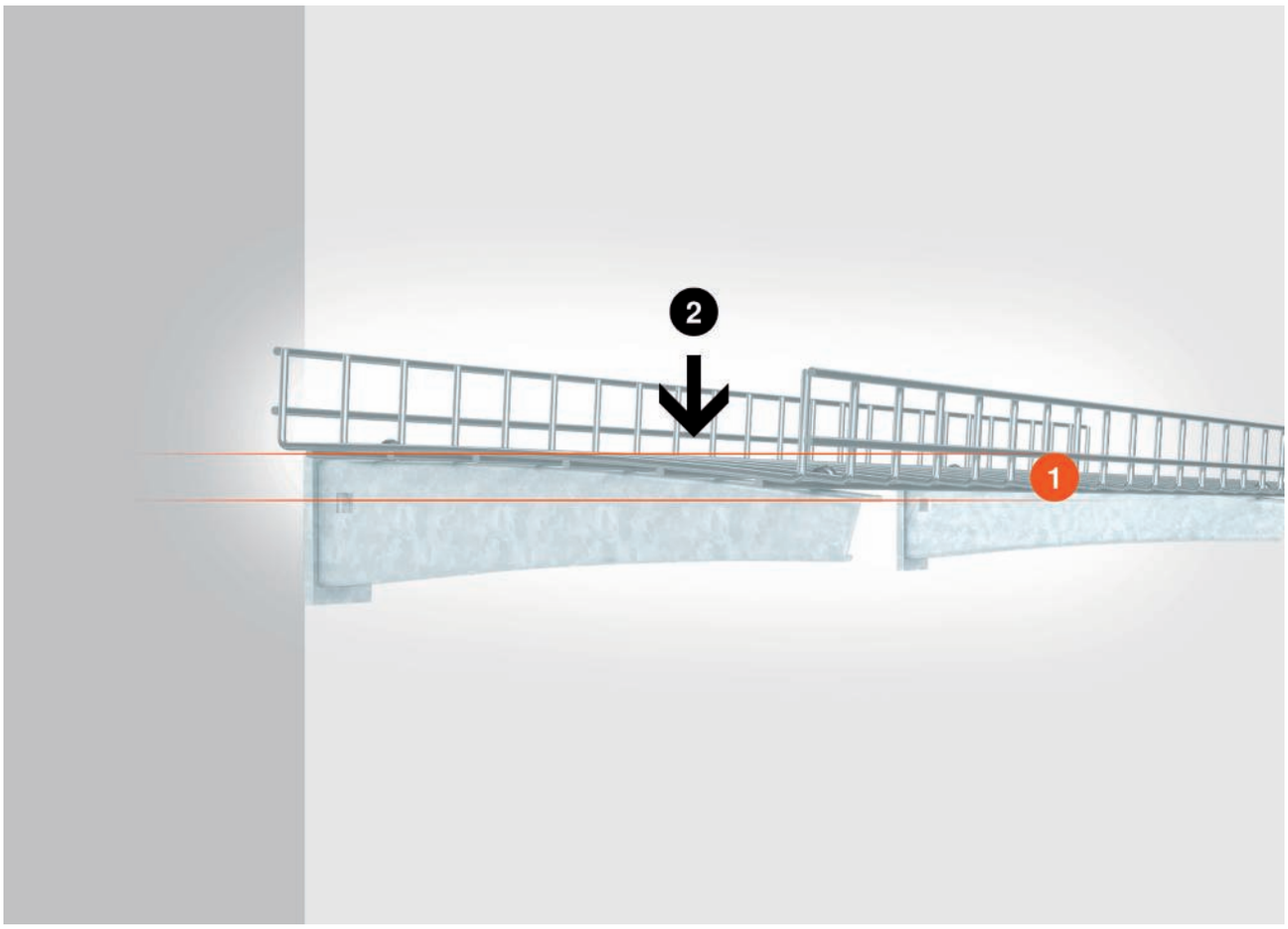
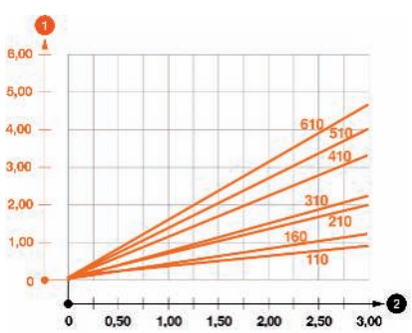
Which bracket can support which cable load?



Key components of the OBO cable support systems are the installation components, in particular the brackets and suspended supports. They connect the cable trays and ladders to the wall and to the ceiling, and are thus an important construction element of the overall system. When calculating the load capacity of a cable support system, the brackets and suspended supports must not be forgotten. The test diagram is also useful in selecting the right products.



Load diagram, legend
1 = Bend in mm at the bracket tip
2 = Load without man load in kN/m
– = Load curves for the various bracket lengths

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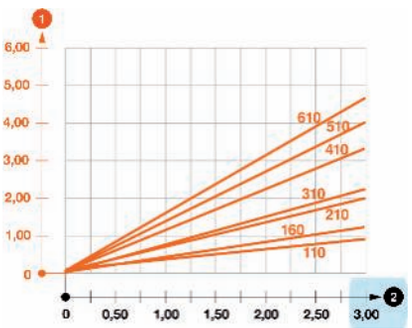
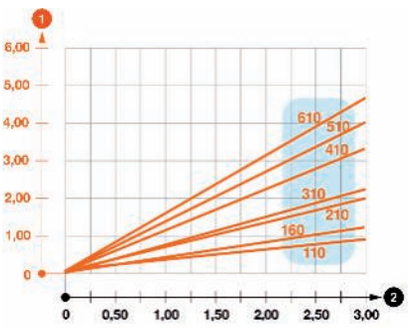
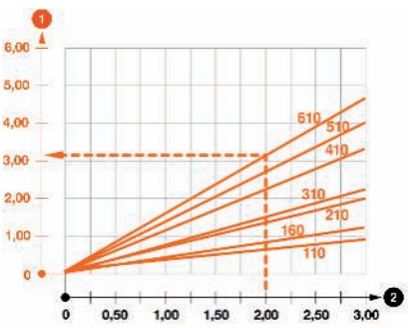
Which bracket can support which cable load?



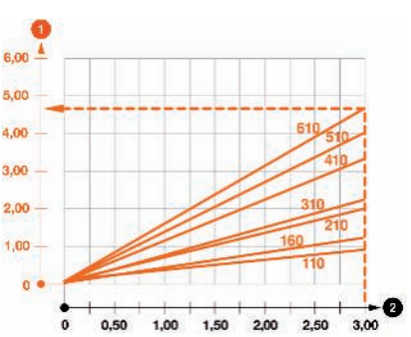
Information 1: Recommended maximum load of the brackets
The bracket is the part of the installation system upon which the cable tray or mesh cable tray is located. It is either directly connected to the wall or is connected to the ceiling using supports. The grey bar on the right edge of the diagram provides information on the maximum load capacity of the bracket.



Information 2: Load curves for all bracket widths
The bending of the bracket is dependent on its width, which, in our example, can range from 110 mm to 610 mm. The load curves are assigned to the appropriate bracket type.



Information 3: Bending of the bracket tip at a specific load
The load curve in the diagram provides information on the bending of the boom tip at a specific load. In our example (dotted orange line), a 610 mm wide bracket with a load of 2 kN bends by approx. 3.1 mm. A basic rule of thumb is: The shorter the bracket, the less the bend will be.



Information 4: Bending of the bracket tip at maximum load
The bending factor of the bracket at maximum load can also be seen in the diagram. In our example (shown in orange), the bend value for a 610 mm wide bracket at a maximum load of approx. 3.0 kN is approximately 4.5 mm. To minimise the bend, the centre of gravity of the cable load should be as close as possible to the wall or the support fastening.

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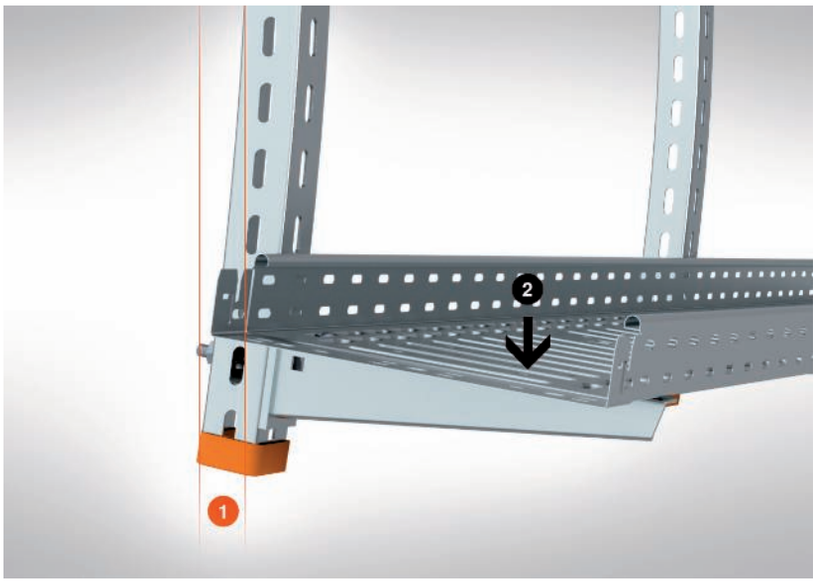
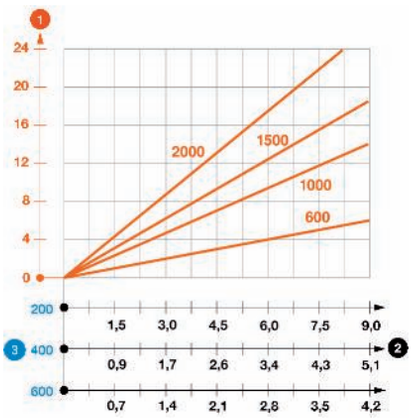
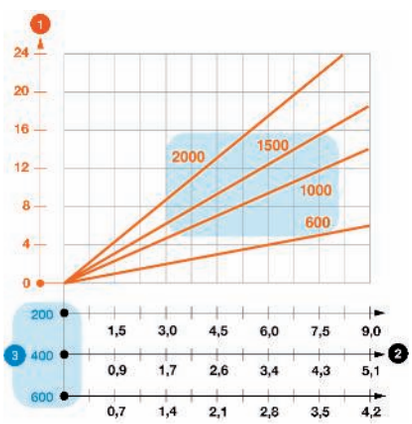
Which support can support which cable load?

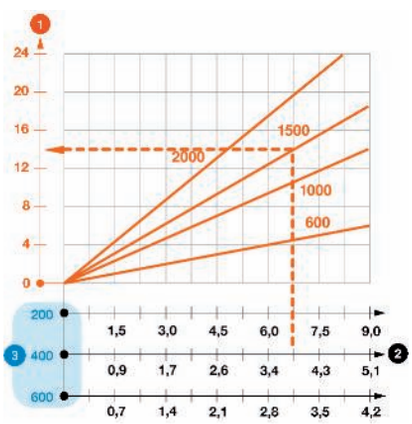




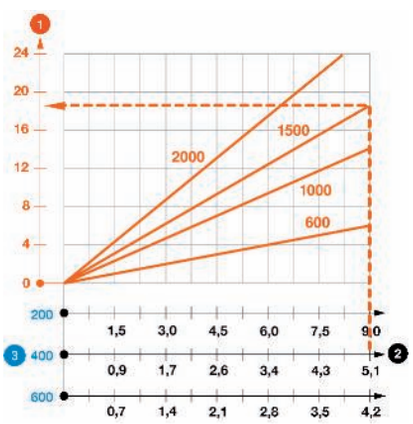
Load diagram, legend
1 = Bend in mm at the bracket tip
2 = Load without man load in kN/m
– = Load curves for the various bracket lengths



Information 1: Various support lengths and bracket widths
The load capacity of a cable support system is not just dependent on the width of a bracket, but also on the length of a suspended support. The load curves in the diagram provide information on the load capacity of a suspended support of length 600, 1,000, 1,500 or 2,000 mm, taking the bracket width into account.



Information 2: Calculation of the deflection for the example
The weight of the total suspended support/bracket/cable tray system causes an excursion of the suspended support from the vertical. The excursion value can be read off from the axis on the left edge of the diagram. In our example (blue background), a 1,500 mm long suspended support, together with a 400 mm wide bracket and a weight load of 4 kN at the end of the support, will produce an excursion of approximately 14 mm.



Information 3: Calculation of the excursion at maximum load for the example
The excursion of the suspended support at a maximum load can also be read off on the diagram. Our blue example shows an excursion of roughly 18 mm at the end of the support for a 1,500 mm long suspended support, in combination with a 400 mm wide bracket at a maximum cable load of approximately 5 kN.

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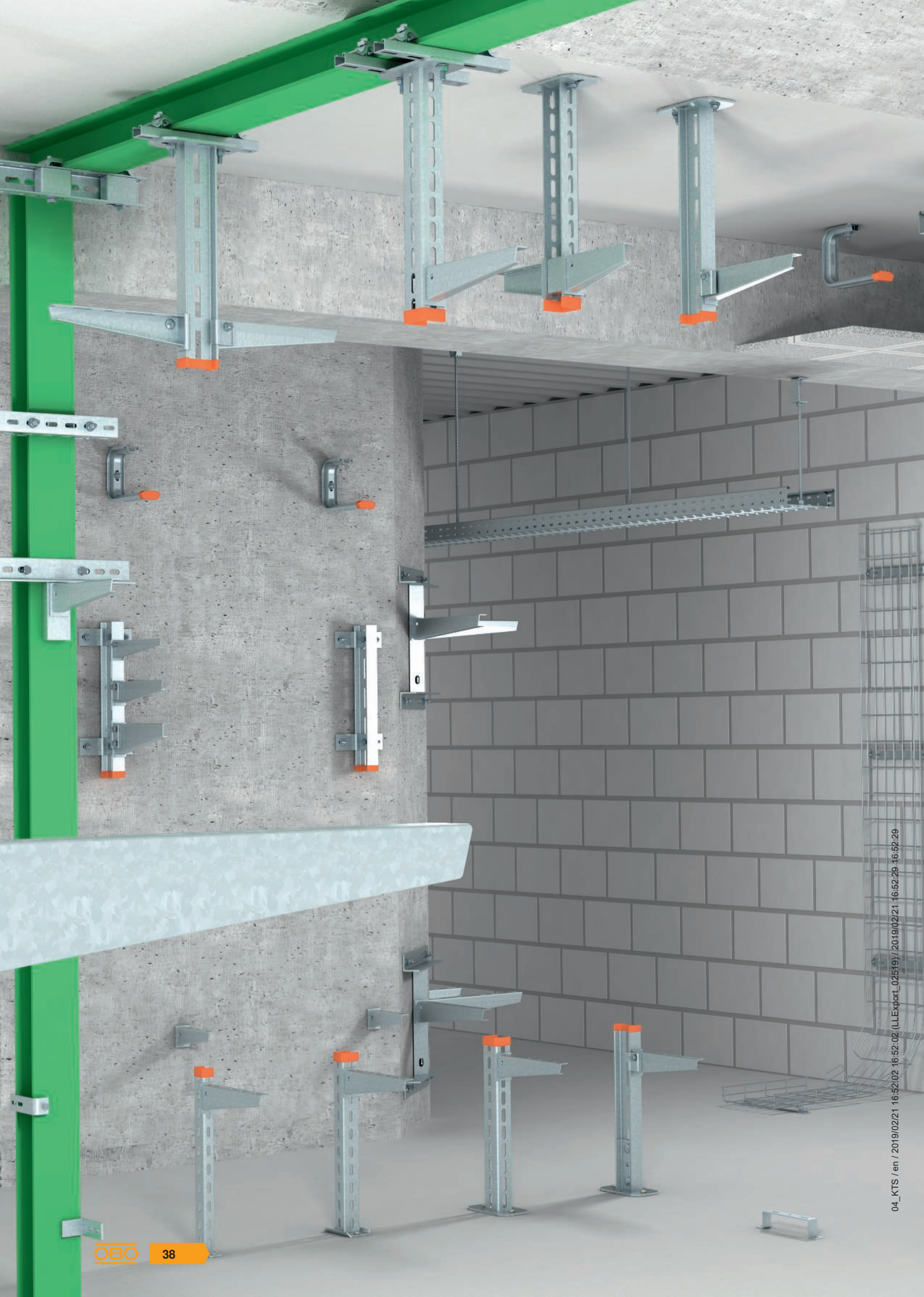

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Planning aids, mounting systems

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System description, universal systems

The universal systems are used for small loads. Whether the installation is to be a ceiling fastening, wall fastening or as a floor stand-off: in the Universal systems, you can find functional fittings with matching system accessories for any application.
These suspension systems, which can be called basic installations, include centrally loaded ceiling clamps or trapezoidal fastenings, which are used with threaded rods and centre suspensions. When using central suspensions, the load should be even on both sides of the system. If an even load cannot be guaranteed, then other systems should be used.
The TP system is a range of light supports and brackets. This product range, which consists of TP suspended supports and brackets, can be used universally as ceiling and wall mounting.
On the following pages, you can select your preferred mounting variant from the installation diagrams shown and combine the corresponding articles in the order section.

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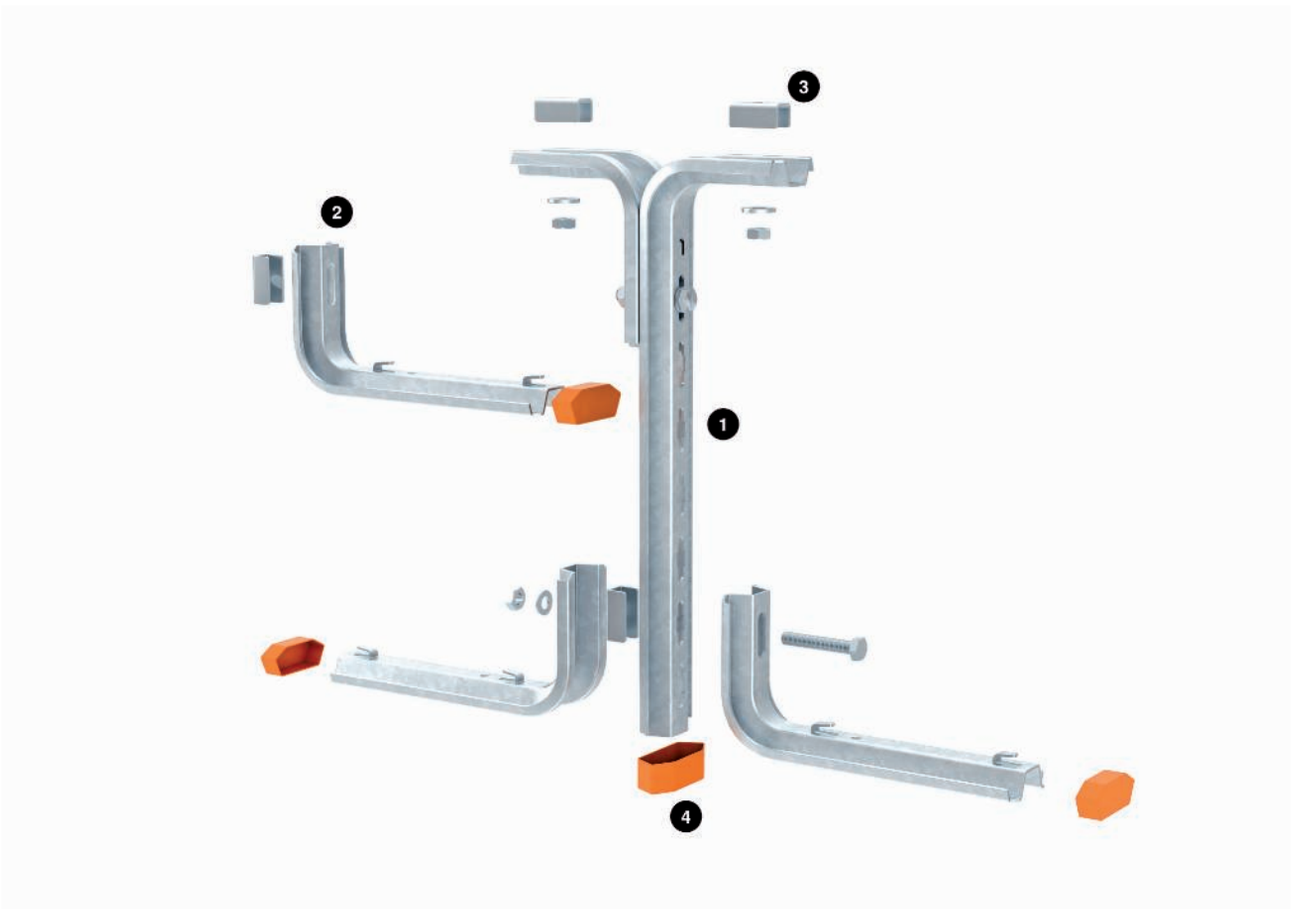
Installation principle, TP systems

System components

1	TP support
2	TP support / wall and support bracket
3	Spacer
4	End cap



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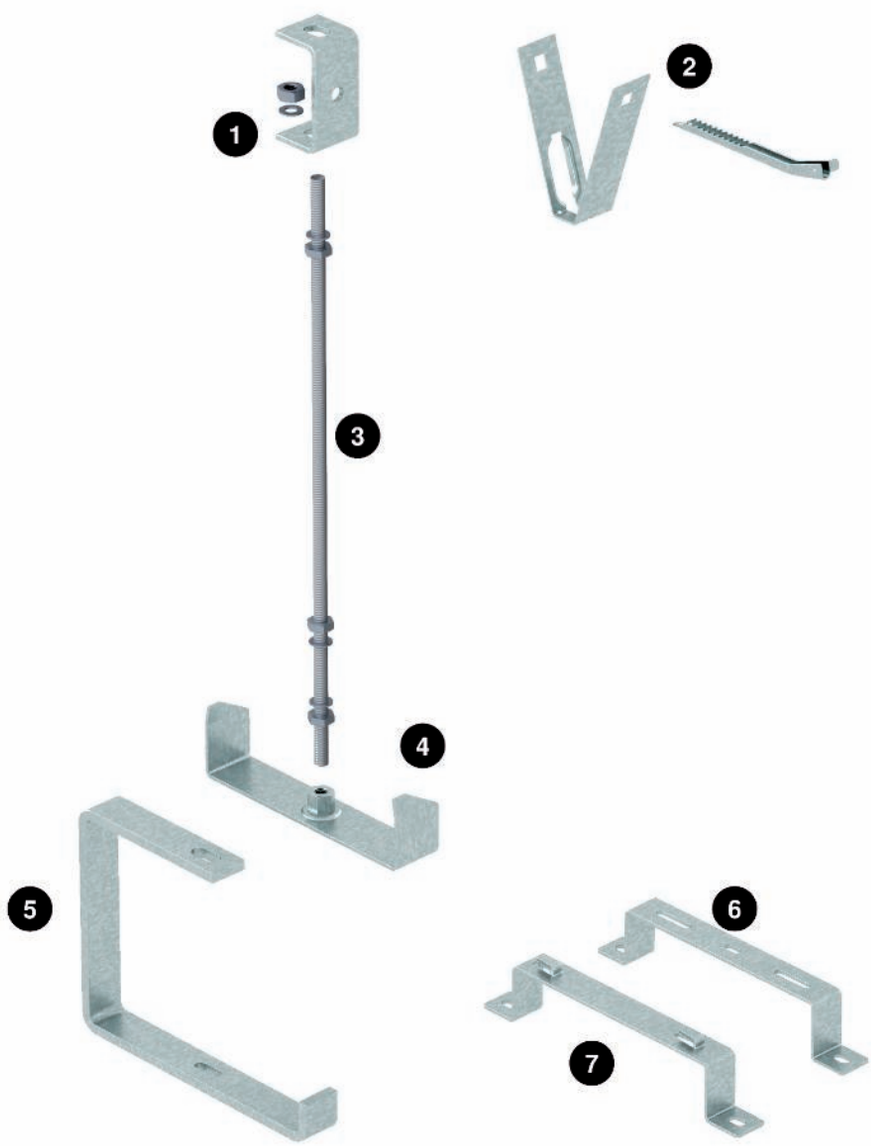
Installation principle, universal systems

System components

1	Ceiling bracket
2	Ceiling bracket, trapezoidal
3	Threaded rod
4	Central suspension
5	Ceiling bracket
6	Stand-off bracket
7	Stand-off bracket



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Mounting aid, universal systems

Application on the ceiling
Ceiling fastening for low loads on straight and sloping ceilings.

Installation of centre suspension
Installation of the central suspension MAH 60 on the ceiling using threaded rod 2078/M10 and ceiling bracket 12050. Maximum cable tray width 300 mm.

Universal mounting on the ceiling
The variable ceiling bracket, type DBV, allows threaded rod suspensions on straight and sloping ceilings.

Centre suspension with threaded rod
Direct centre suspension at low loads of a cable tray with threaded rod 2078/M10.

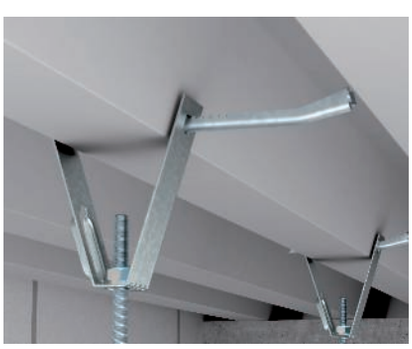
Installation of central hanger MAH 35
Insertion and alignment of the central hanger, MAH 35, in the cable tray.

Installation of central suspension MAH 60
Insertion and alignment of the central suspension, MAH 60, in the cable tray.

Threaded rod suspension RKSM > 400 mm
The threaded rod suspension of RKSM cable trays > 400 mm can take place using two threaded rods.

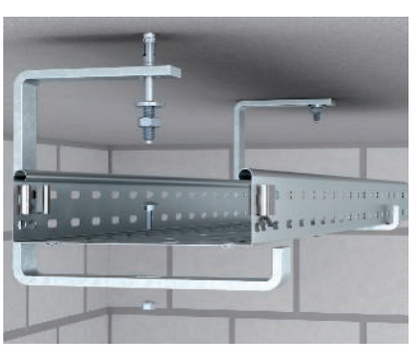
Cable ladder centre suspension with threaded rod
Installation of a cable ladder with central suspension MAHU and a threaded rod.

Trapezoidal plate application
Simple, quick fastening of a cable support system to trapezoidal metal roofs.



Installation of trapeze suspension
Installation of a cable tray on a trapezoidal ceiling using a ceiling bracket, type TPB 100 and central suspension, type MAH 60. Maximum cable tray width 300 mm. The trapezoidal fastening is mounted using the lock, type TPB R.

Threaded rod suspension with ceiling bracket
Ceiling mounting of a cable tray with AHB ceiling bracket and threaded rod 2078/M10. Maximum cable tray width 400 mm.



Direct fastening of the ceiling bracket
Direct mounting of the AHB ceiling bracket with anchor bolt on the ceiling. Maximum cable tray width 400 mm.

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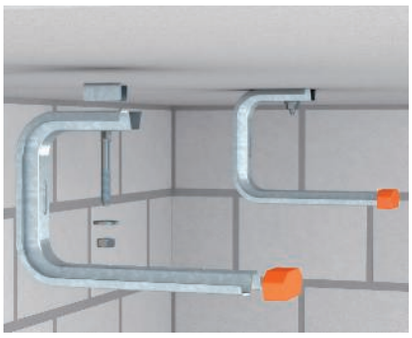
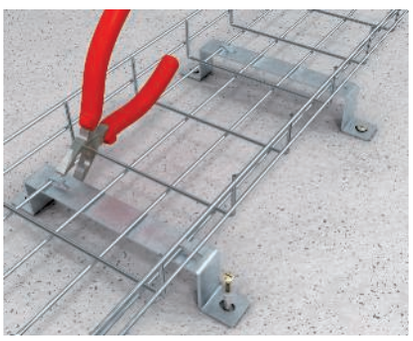


Ceiling mounting of TP wall and ceiling bracket
Universal mounting of the TPD wall and ceiling bracket on the ceiling (with DS 4 spacer). Maximum tray width 300 mm.

Installation of TP support with single-sided bracket fixing
Ceiling mounting of a TP support with spacer DS 4 and one-sided bracket mounting. Maximum tray width 300 mm.

Complete mounting of a TP system
Installation of the TP support with head reinforcement and double-sided bracket mounting and mounting directly on the wall.

Floor fastening at a distance
Installation of a cable tray at a distance using the stand-off bracket DBL. Maximum cable tray width 600 mm.



Stand-off of mesh cable trays
Floor stand-off of mesh cable trays with the stand-off bracket, type DBLG 20/... Screwless fastening of the mesh cable tray on the stand-off bracket using clamping lugs.

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System description, U support and bracket systems

The perfectly matched U support family consists of US 3 (light-duty system), US 5 (medium-duty system) and US 7 (heavy-duty system). The U support range is particularly noted for its versatility. The U supports can be used as ceiling suspension, floor stand-off or as construction profiles.
Besides the U support family with comprehensive accessories, you can also find the wall and support brackets in this chapter. These can be fastened directly on the wall or on U supports. Classification takes place according
to load capacity. The appropriate maximum load can be easily derived from the type of the different wall and support brackets MWA 12 (max. load 1.2 kN), AW 15 (max. load 1.5 kN), AW 30 (max. load 3.0 kN) and AW 55 (max. load 5.5 kN).
On the following pages, you can select your preferred mounting variant from the installation diagrams shown and combine the corresponding articles in the order section. You can find a comprehensive article description and additional information for the articles, such as load and anchor diagrams, which can help you when selecting the system.

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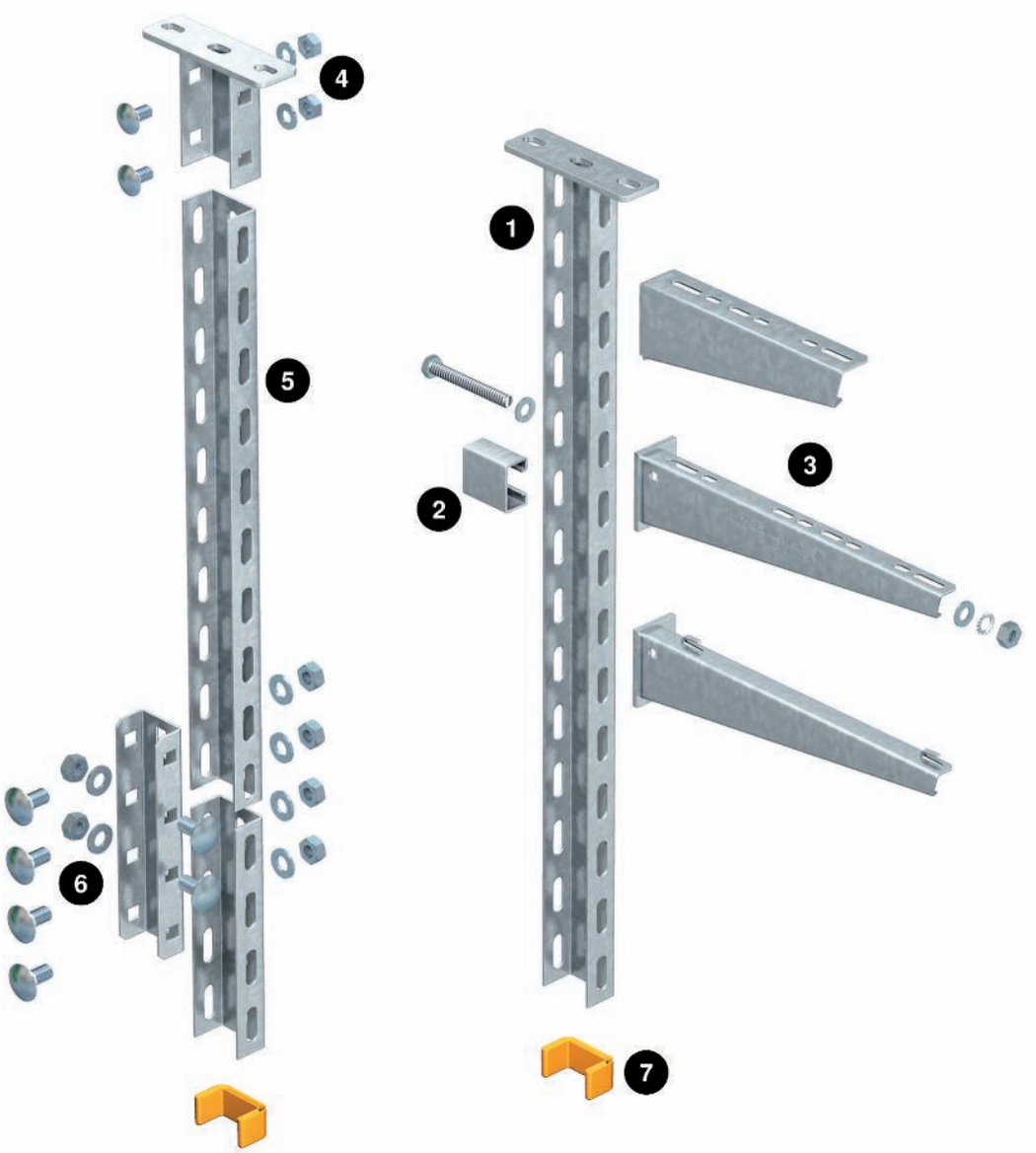
Installation principle, U support US 3

System components

1	US 3 support
2	Spacer
3	Wall and support brackets
4	Head plate
5	US 3 support
6	U support connector
7	End cap



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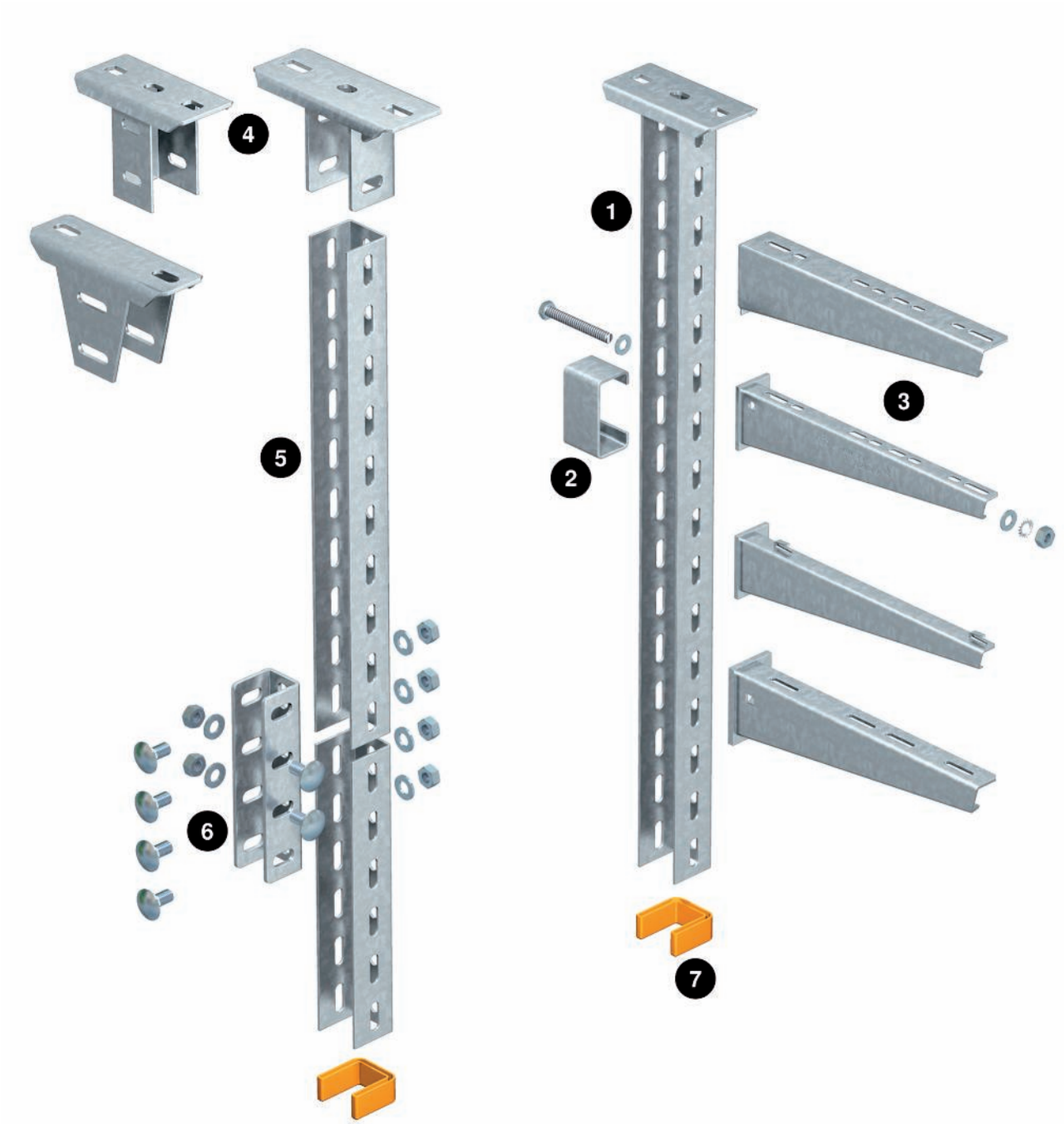
Installation principle, U support US 5

System components

1	US 5 support
2	Spacer
3	Wall and support brackets
4	Head plate
5	US 5 support
6	U support connector
7	End cap



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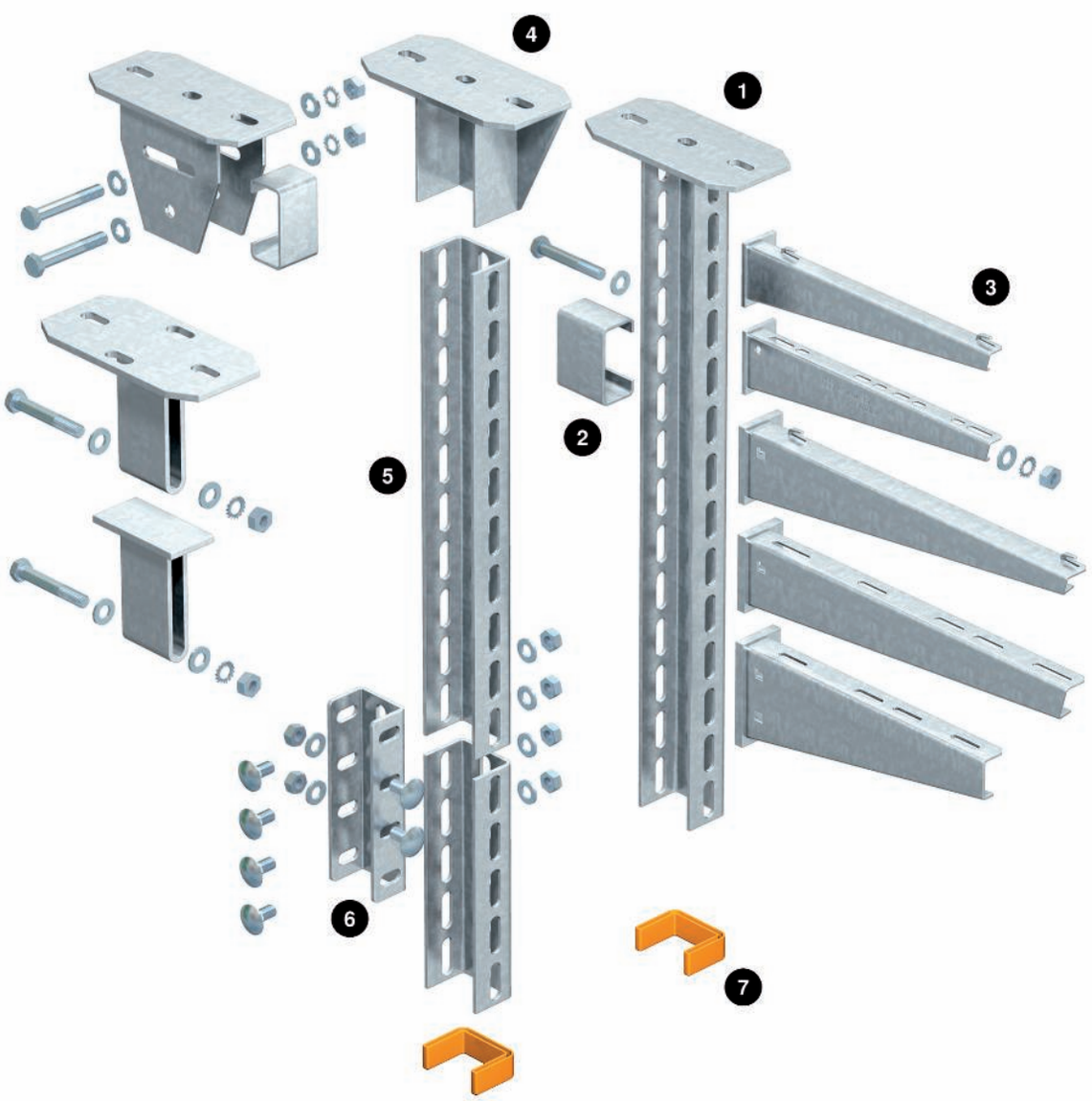
Installation principle, U support US 7

System components

1	US 7 support
2	Spacer
3	Wall and support brackets
4	Heavy-duty head plate
5	US 7 support
6	U support connector
7	End cap



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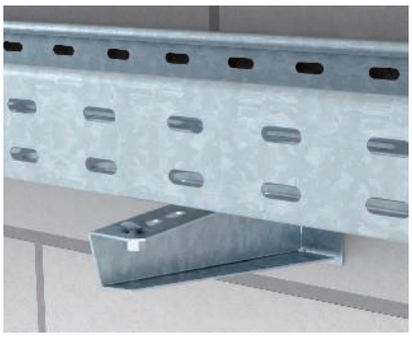
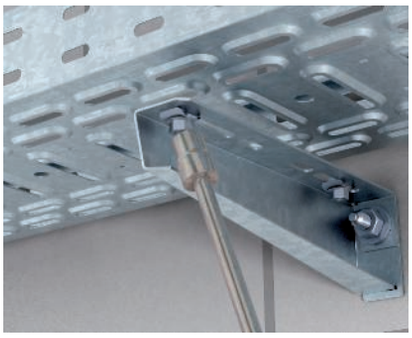
Mounting aid, U support and bracket systems

Wall mounting application
Direct fixing of wall and support brackets of type AW... on the wall.



Quick fastening of cable tray on bracket
Positioning the cable tray on the bracket.



Quick fastening of tray on bracket
Fixing of the cable tray on the bracket using quick connector.

Wall bracket, variable
Fastening of the variable wall bracket, type AWV, with anchor bolt to vaulted or sloping walls/ceilings.

Standard mounting of suspended support with wall bracket, single-sided without spacer
Cover fixing of a suspended support with single-sided bracket fixing. No spacer is required for widths up to and including 300 mm.

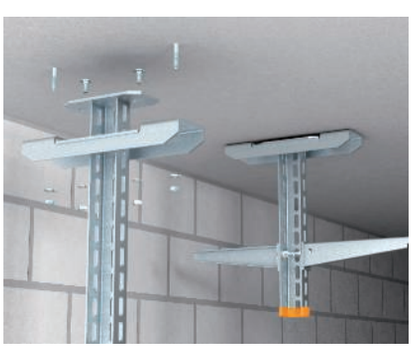
Standard mounting of support with wall and support bracket, single-sided with spacer
Cover fixing of a suspended support with single-sided bracket fixing. For widths of over 400 mm, we recommend using a spacer.

Standard mounting of support with wall and support bracket, double-sided
Cover fixing of a suspended support with double-sided bracket mounting.

Ceiling mounting
Standard mounting of U supports US 3 K, US 5 K and US 7 K on the ceiling with fastening of the wall and support brackets.

Head plate mounting
Mounting of the standard head plate to support and ceiling. Use with spacer DSK 25 (US 3), DSK 45 (US 5) or DSK 61 (US 7).

Adapter head plate, asymmetrical
Asymmetrical head plate KA-ASY to increase the load capacity for the combination with suspended supports, type US 7 K and IS 8 K.



Adapter head plate, symmetrical
Symmetrical head plate KA-SY to increase the load capacity for the conjunction with supports, types US 7 K and IS 8 K.

Traverse
Installation of U suspended supports US 3 K, US 5 K and US 7 K under the ceiling using anchor bolts and use of a trapeze, consisting of U profile US 3, US 5 or US 7.

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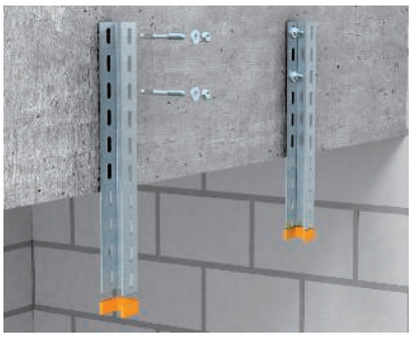

U support wall mounting
U supports are installed on walls or girders using anchor bolts, directly through the system perforation in the U support.

U support connection
To connect U supports, use the appropriate U support connectors, types VUS 3, VUS 5 and VUS 7.

Installation of spacer
Installation of the spacer DSK 47 with US 5 supports or DSK 45 with US 7 supports in conjunction with a variable head plate KU 5 V or KU 7 VQP.

Variable head plate with US 3 support
Installation of the variable head plate, type KU 3 V on US 3 support.

Variable head plate
Fastening of the variable head plate KU 5 V to sloping concrete ceilings using anchor bolts and spacer DSK 47.

Variable head plate
Fastening of the variable head plate KU 7 VQP to sloping concrete ceilings using anchor bolts and spacer DSK 45.

45° adapter plate, concrete mounting
Installation of the 45° adapter plate, type KA-E, on a concrete wall. For additional support and implementation of trays at room corners.

45° adapter plate, steel clamping
Installation of the 45° adapter plate, type KA-E 45, on the steel girder using clamping angles or chuck jaws. For additional support of trays at room corners.

Direct girder clamping
Direct girder clamping a U suspended support using KWS clamping bracket. Route in longitudinal direction of steel girder.

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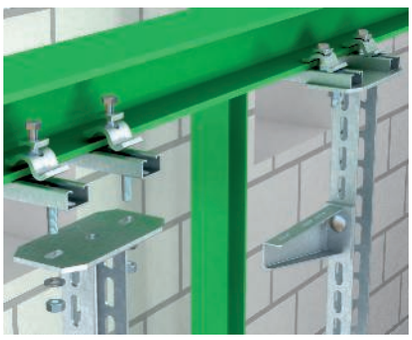
Steel clamping with C profile, route in longitudindal direction
U suspended support mounting, clamped to steel girder with C profile CPS 4 G and TKH-L-25 clamping claw. Route longitudinal to steel girder.



Steel clamping with C profile, route in transverse direction
U suspended support mounting, clamped to steel girder with C profile, type CPS, and TKH-L-25 clamping claw. Route transverse to steel girder.

Head plate mounting
Installation of the head plate using the example KU 7 AOX for direct welding on steel girders.

Cantilever beam on steel
U supports can be used as cantilever beams on steel girders with chuck jaws of type TKS-L-25. Use DSK spacers for safe functioning.

Clamp fixing of heavyweight bracket
Clamp fastening of a heavy-duty bracket with clamping angles or clamping lugs on a vertical steel girder.

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System description, I support and bracket systems

The I support system from OBO Bettermann really comes into its own in situations where high loads must be carried, large distances must be bridged and difficult routes must be implemented. The I support system fulfils all the requirements of a heavy-duty cable mounting system. The high load capacities of all the system components permit the mounting of complex structures. The comprehensive range of head plates allows the implementation of all conceivable solutions. This heavy-duty system is used with large support spacings of wide span systems or for multi-layer setups of standard cable trays and cable ladder systems. The combination of I supports and support brackets of type AS 15, AS 30 and AS 55 form a perfectly matched product range, the height of which can be infinitely adjusted.
On the following pages, you can select your preferred mounting variant from the installation diagrams shown and combine the corresponding articles in the order section. You can find a comprehensive article description and additional information for the articles, such as load and anchor diagrams, which can help you when selecting the system.

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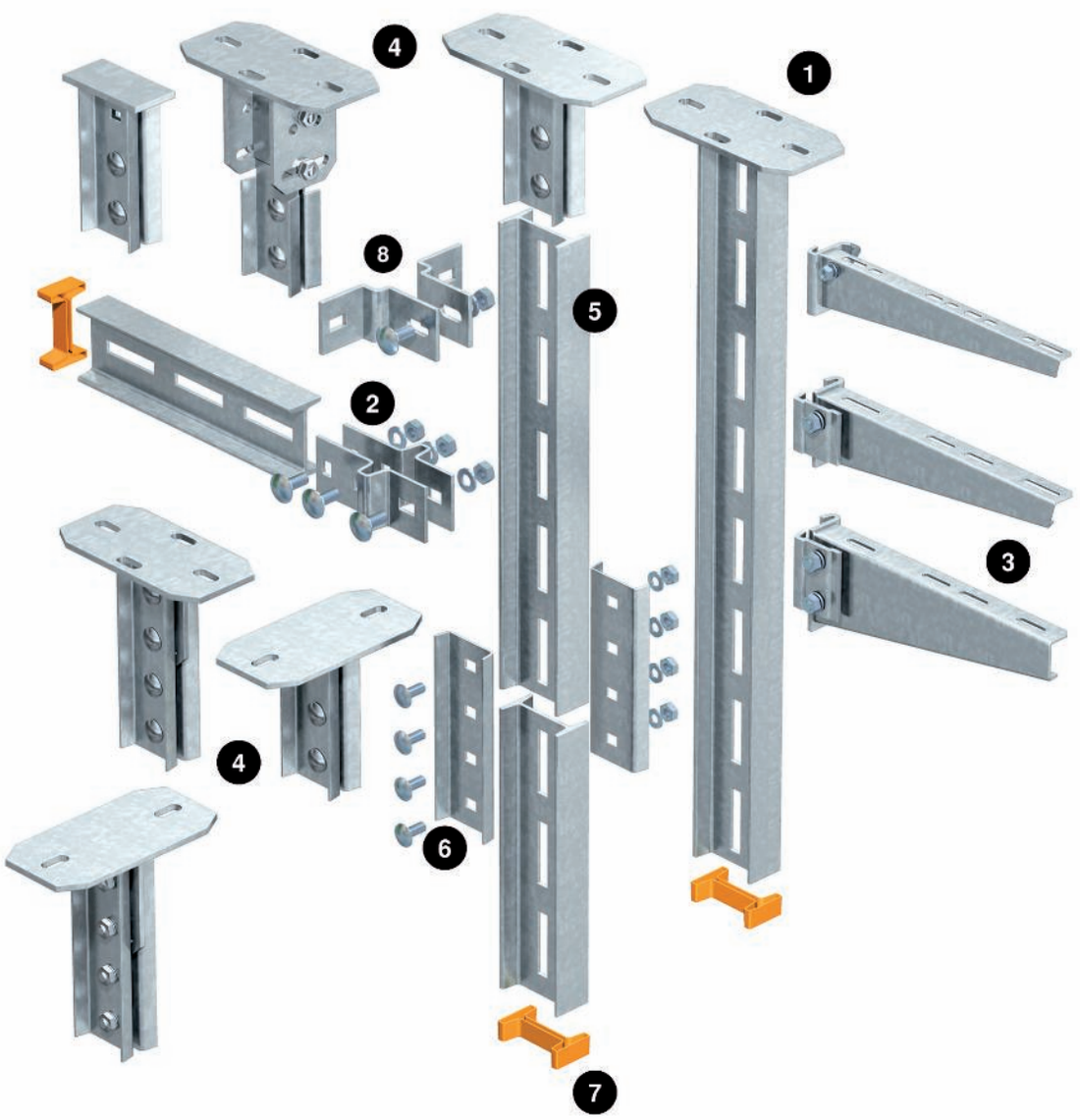
Installation principle, I support and bracket systems

System components

1	I support
2	Support strap
3	Support bracket
4	Head plate
5	I support
5.5	I support connector
7	End cap
8	Mounting angle



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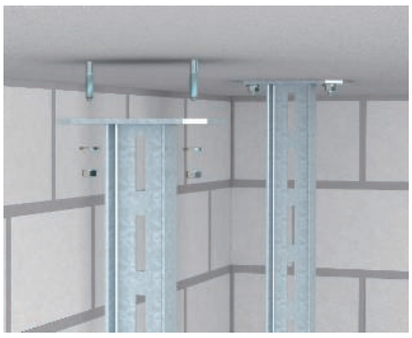
Mounting aid, I support and bracket systems



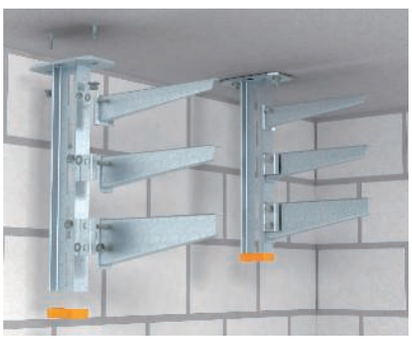
Application on the ceiling
Standard mounting of suspended supports to concrete ceilings using anchor bolts.

Head plate mounting
Fastening of the standard head plate, KI 8, for I suspended support to concrete ceilings using anchor bolts.

Head plate, variable (rotated through 90°)
Installation of the variable head plate, type KI 8 VLK, rotated through 90°, to sloping concrete ceilings using anchor bolts.

Variable head plate
Installation of the variable head plate, type KI 8 VQP, to sloping concrete ceilings using anchor bolts.

I support connection
Installation of the I support connector VIS 8 to connect IS 8 supports.



Bracket mounting
Installation of a three-layer cable support system on the concrete ceiling using support bracket mounting, AS 15, AS 30 and AS 55.

Adapter head plate, asymmetrical
Asymmetrical head plate KA-ASY to increase the load capacity for the combination with suspended supports, type US 7 K and IS 8 K.

Adapter head plate, symmetrical
Symmetrical adapter head plate KA-SY to increase the load capacity for the conjunction with supports, types US 7 K and IS 8 K.

Wall mounting, I support
Installation of an I support on the wall using mounting angles, type BW 80/55, and anchor bolts to accept multiple support brackets, type AS.

Special structure
Example of installing of a special structure, consisting of I supports (ceiling/wall mounting) with transverse profile and various support brackets, type AS.

Application on steel girder
Clamp fastening of supports on steel girders using various chuck jaws, lengthwise or transverse to the steel girder.

Direct girder clamping
Direct girder clamping an I support using heavy-duty chuck jaw, type TKS-S-30. Route in longitudinal direction of steel girder.

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Steel clamping with C profile, route in longitudindal direction
I support with welded head plate mounting, clamped to steel girder with C profile and TKH-L-25 chuck jaw. Tray route along steel girder.

Steel clamping with C profile, route in transverse direction
I support with welded head plate mounting, clamped to steel girder with C profile and TKH-L-25 chuck jaw. Tray route transverse to steel girder.

Head plate, variable (transverse)
Installation of the variable, transversely adjustable head plate, type KI 8 VLP, on rising or falling steel structures with profile rail, type CPS 5 G and clamping angles, type KWH.

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System description, clamp fastening systems

The clamp fastening systems with reduced installation times and work are a clear argument for the use of this system in all areas of professional electrical installations. Clamp fastening can be attached without difficult, often unpermitted drilling. The load range runs from light-duty clamping angles to heavy-duty chuck jaws.
The clamping lugs / clamping angles, type KL, KWH and KWS, and the chuck jaws, type TKH and TKS, permit excellent connections without drilling or welding, on account of the perfect matching to additional system articles.
On the following pages, you can select your preferred mounting variant from the installation diagrams shown and combine the corresponding articles in the order section.

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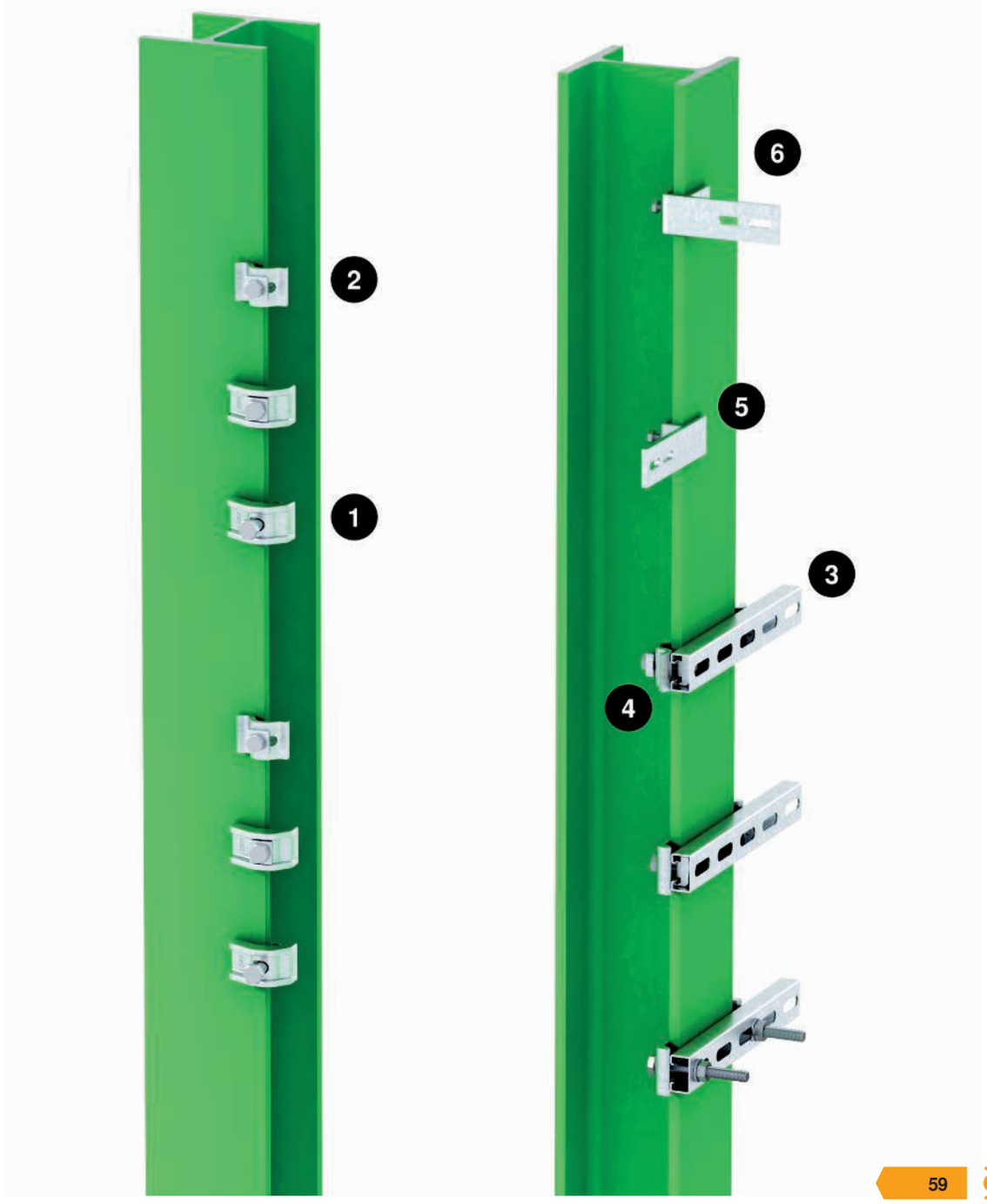
Installation principle, clamp fastening systems

System components

1	Chuck jaw, heavy-duty
2	Chuck jaw, light-duty
3	Profile rails
4	Clamping angle
5	Beam clamp, horizontal
6	Beam clamp, vertical



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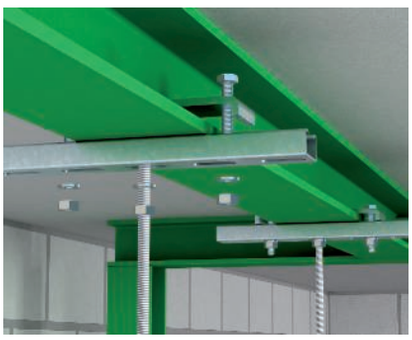
Mounting aid, clamp fastening systems

Application on horizontal steel girder
Clamp fastenings using clamping angles and chuck jaws on horizontal steel girders.

Application on sloping steel girder
Clamp fastenings using clamping angles and chuck jaws on sloping steel girders.



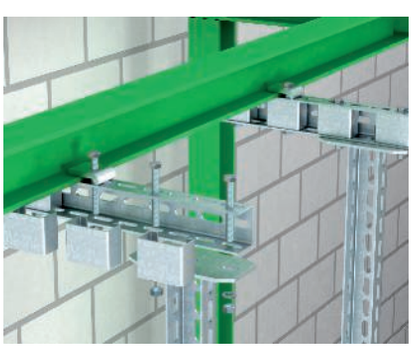
Steel clamping, C profile rail
Fastening of a C profile, type CPS 4 G or CPS 5 G, to steel girder using clamping angles, type KWS.

Direct girder clamping
Direct girder clamping an I support using chuck jaw (heavy-duty), type TKS-S-30. Route along steel girder.

Clamp fastening with addition C profile
Use of an additional C profile rail, type CPS, for wider steel girders. Route along steel girder.

Clamping transverse to steel girder
Use with two C profile rails for tray mounting transverse to the steel girder.

Cantilever beam on steel
Installation of U support as cantilever beam on steel girder. Fastening with clamping angles or chuck jaws depending on load. Fastening with spacers, type DSK.



Cantilever beam with support
Cantilever beams made of U support construction clamped to steel girder for installing supports.

Clamp fastening on vertical steel girder
Installation of the adapter plate, type KA-AW, on the vertical steel girder using clamping angle or chuck jaws. Wall brackets of type AW are fixed to the adapter plate, using the hexagonal bolt SKS 12 x 40 GF.

45° adapter plate, steel clamping
Installation of the 45° adapter plate, type KA-E 45, on the steel girder using clamping angles or chuck jaws. For additional support of trays at room corners.

Vertical clamp fastening
Clamp fastening of a heavy-duty bracket with clamping angles or clamping lugs on a vertical steel girder.

Vertical clamp fastening
Installation of a mesh cable tray vertically on a steel girder, mounting with a beam clamp BFK and clamp GKS 50.

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Horizontal clamp fastening
Installation of AZ channel using BFK beam clamp in a longitudinal direction on the steel girder. Maximum cable tray width 100 mm.

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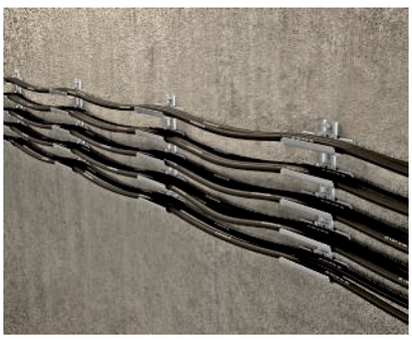
Mounting aid, Cable carrier tray

The cable carrier trays are used in areas with limited mounting space
Such as. Underground supply tunnels or used.



Factory pre-assembled cable carrier trays help in a fast installation.

Cable carrier trays for single installation to serve a flexible connection of cables.

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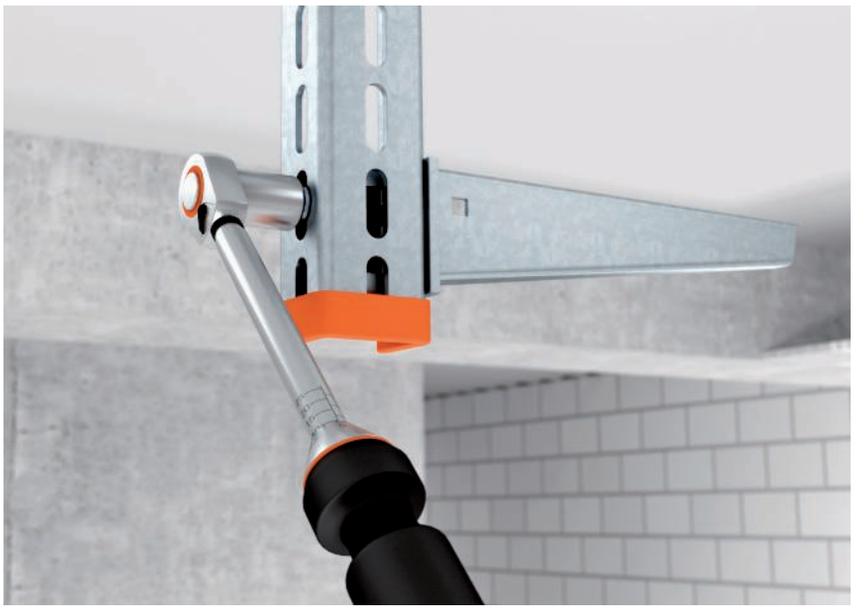
Tightening torques



Different tightening torques apply when mounting a cable support system. Please note that the specified torques are only intended as rough, non-binding guide values. (See VDI 2230)!

Tightening torques of bolts with metric thread

Thread	Grade 5.6	Grade 6.9	Grade 8.8	Grade 10.9	Grade 12.9
M6	3.9 Nm	8.5 Nm	10 Nm	14 Nm	17 Nm
M8	9.8 Nm	21 Nm	25 Nm	35 Nm	41 Nm
M10	19.6 Nm	41 Nm	49 Nm	69 Nm	83 Nm
M12	33.4 Nm	72 Nm	86 Nm	120 Nm	145 Nm
M14	54 Nm	115 Nm	135 Nm	190 Nm	230 Nm
M16	82 Nm	180 Nm	219 Nm	295 Nm	355 Nm
M18	114 Nm	245 Nm	290 Nm	400 Nm	485 Nm
M20	163 Nm	345 Nm	410 Nm	580 Nm	690 Nm

Tightening torques of bolts with metric thread made of stainless steel

Thread	Resistance grade 50	Resistance grade 70	Resistance grade 80
M6	3.8 Nm	8.2 Nm	10.9 Nm
M8	9.2 Nm	19.6 Nm	26.2 Nm
M10	19 Nm	39 Nm	53 Nm
M12	31 Nm	67 Nm	89 Nm
M14	50 Nm	106 Nm	142 Nm
M16	76 Nm	162 Nm	216 Nm
M18	105 Nm	225 Nm	299 Nm
M20	148 Nm	316 Nm	422 Nm

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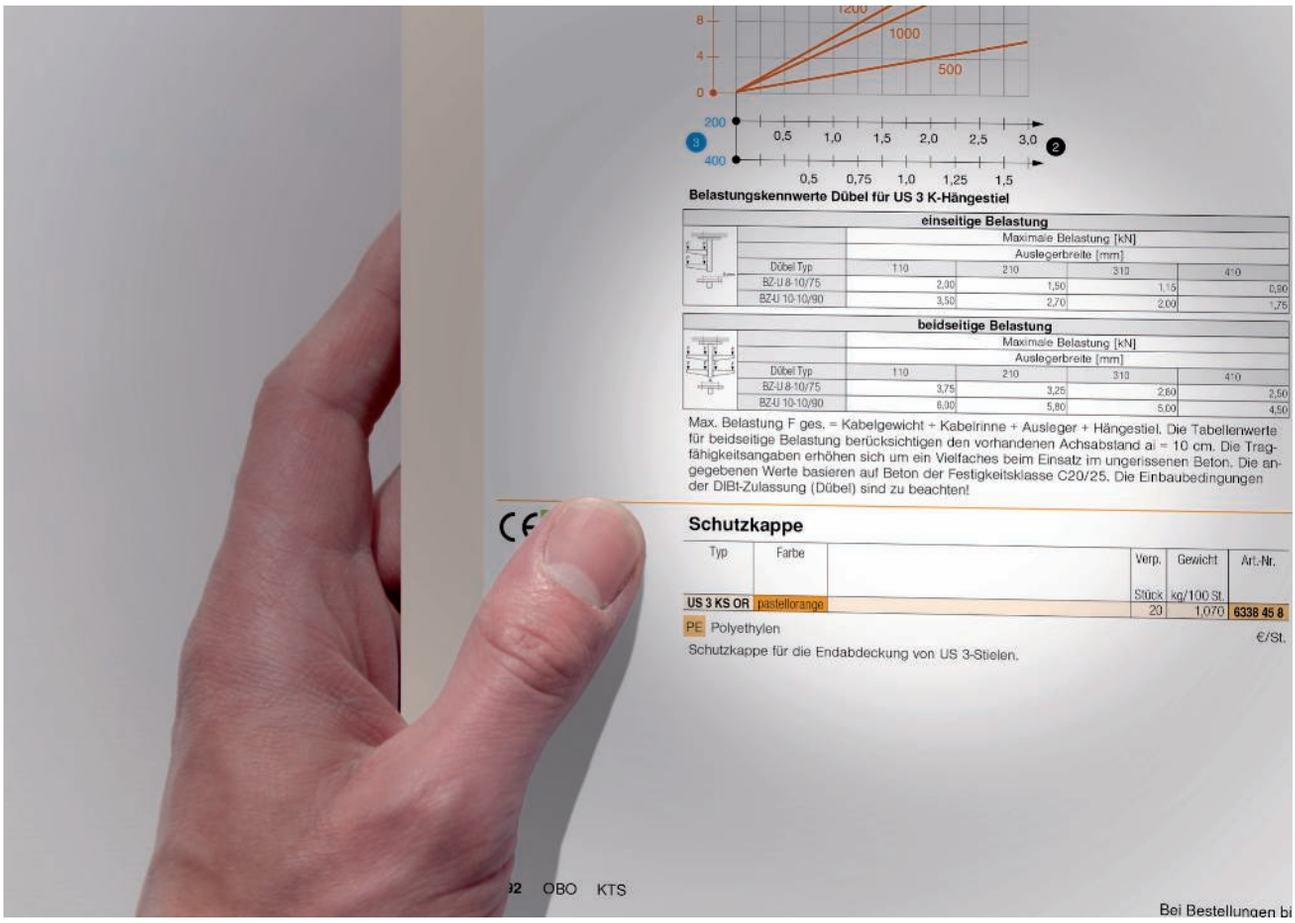
Choice of anchor



Not only the individual components of the cable support system are important for the load capacity of the installation. Also of importance is the anchoring.

The load capacity of a suspended support or a wall bracket is dependent on the quality of the anchoring in the wall or ceiling. You can find the maximum load values in the anchor diagrams. The appropriate load classes allow direct assignment to the appropriate anchor bolts and heavy-duty anchors.

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Installation example, metal spreading anchor

The majority of metal spreading anchors from OBO Bettermann have a European Technical Assessment ETA. Some versions have shock approval from the Federal Office for Civil Protection in Bern, Switzerland. Most metal spreading anchors have also been tested in terms of fire protection for a fire resistance time of up to 120 minutes. You can find detailed information regarding the permitted loads (also in the event of a fire) and the installation conditions that must be observed in the corresponding approvals.

System benefits:

- Wide range of application areas thanks to variety of versions, load classes and material qualities
- Quick and easy installation
- High tensile loads and shear loads
- Small edge and axis spacings
- Can be used indoors and outdoors (depending on material)

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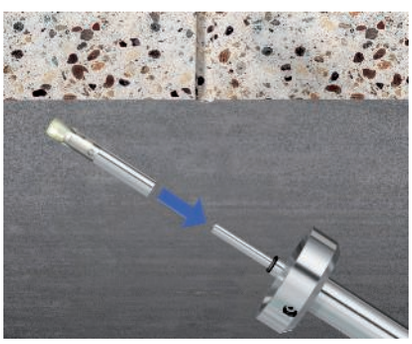
Mounting preparations metal spreading anchor

Drilling an anchor hole
Drilling of the anchor hole according to the anchor approval information for the drill hole diameter and the drill hole depth.

Blowing out of the drill hole
Removing dust from the drill hole by blowing it out several times.

Drilling an anchor hole
Drilling of the anchor hole according to the anchor approval information for the drill hole diameter and the drill hole depth.

Blowing out of the drill hole
Freeing the drill hole of dust by blowing it out.



Placing the bolt anchor BZ IG
The Wedge Anchor BZ-IG is placed on the setting tool BZ-IGS. It must be ensured that the thread size of the setting tool fits to the corresponding anchor bolt.

Hammering the bolt anchor BZ IG
Hammering the bolt anchor BZ-IG with the appropriate setting tool. Subsequently, the component to be mounted can be secured.

Mounting of threaded rod
Mounting of a threaded rod into the Wedge Anchor BZ-IG. The direct mounting of a component with a Six Can aiming screw is also possible.

Application of torque
Fastening of the threaded rod by tightening the hexagon nut with the specified torque in the approval.

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Mounting aid, metal spreading anchor, bolt tie

Nail anchor, type N, with threaded connection
Nail anchor, type N, with M6 threaded connection, usable in cracked or non-cracked standard concrete C20/25 to C50/60.

Nail anchor, type N-K, with drive-in head
Nail anchor, type N-K, with drive-in head, usable in cracked or non-cracked standard concrete C20/25 to C50/60.

Bolt tie, type BZ
Anchor bolt, type BZ, for fastening heavy-duty anchorings in cracked or non-cracked standard concrete C20/25 to C50/60, suitable for push-through mounting, with M8, M10 or M12 thread.

Bolt tie, type BZ-IG
The anchor bolt BZ-IG with internal thread is approved for normal drill holes which are not undercut. Within the scope of the European Technical Assessment ETA-99/0010 for cracked and non-cracked concrete, a system comprising nut and washer and a standard threaded rod can be used, as well as hexagonal bolts and counter-sunk head screws.

Drop-in anchor, type E
Drop-in anchor, type E, with M8, M10, M12 internal thread. To accept small loads, approved for multiple fixings in cracked and non-cracked concrete of non-load-bearing systems.

Heavy-duty anchor, type SZ
Heavy-duty anchor, type SZ, with M12 thread connection for fastening components with high loads, approved for cracked and non-cracked standard concrete C20/25 to C50/60.

Hollow core anchor, Easy type
Cavity ceiling tie, type Easy, with M8 or M10 internal thread. For use in stressed concrete core slab ceilings.

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Installation principle, injection tie

The VMS Plus injection mortar system is particularly suitable for fire-protection fastening in hollow brick, concrete, calcareous limestone, sand-lime brick and masonry. The non-spreading connection is created through the use of the plastic wire sleeve and a threaded anchor rod. The components are tested and approved for a fire-resistance period of 90 minutes.
The maximum load capacity depending on the fire resistance period and the fastening substrate is documented accordingly in the available fire protection certificate. Although the load capacity of the injection mortar system is below the load capacity when cold, it is completely sufficient for fireproof fastening of the various components of the different routing types.

System benefits

- Injection tie tested and approved for fire
- Determined load capacity according to fire resistance period
- Use in calcareous limestone, masonry, hollow brick and sand-lime brick.
- Various dimensions for the different routing components and applications
- Proven fastening with plastic wire sieves

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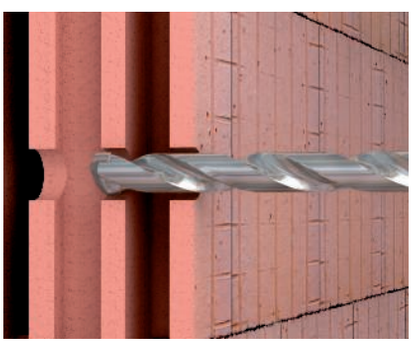
Mounting preparations, Injection anchor

Drilling
Making a hole of suitable diameter

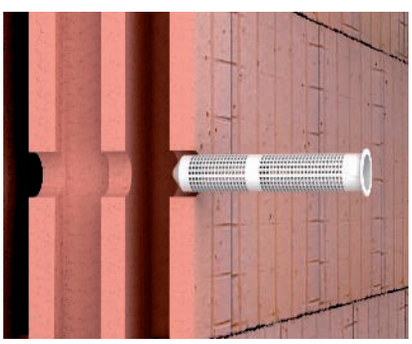
Cleaning of the Drill hole
Blow out the hole for cleaning with compressed air

Cleaning with steel wire brush
The cleaning process with blow and brush must be carried out twice.

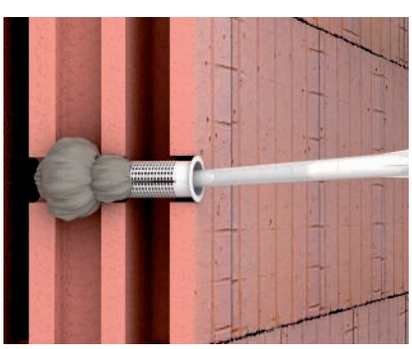
Application of the injection mortar
Pressing the injection mortar into the hole



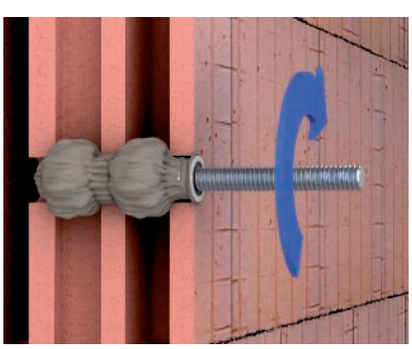
Use in hollow brick
Drill the hole in the hollow brick according to the selected anchor size and then clean it.



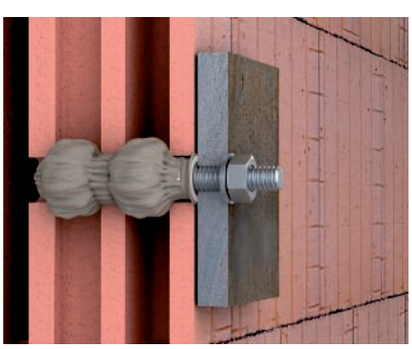
Mounting preparations
Insert the fitting plastic sieve sleeve in the drill hole.



Applying the injection mortar
Press in the injection mortar from the cartridge from the base of the drill hole to the opening. In so doing, draw the point back slowly.



Inserting the anchor rod
Attach the anchor rod in the filled wire sleeve up to the set marking. The mortar pushes through the openings of the wire sleeve, forming a closure.



Mounted component, hollow brick wall
Mount the component with a washer and nut on a hollow brick wall. Comply with the tightening torque in the approval.

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Installation principle, bolt tie

Screw anchors MMS, MMS-ST and HMS-KS from OBO Bettermann offer optimum fastening options in solid masonry types. The various dimensions and head shapes provide installation options for the different routing components. The screw anchors ties are screwed directly into the drill hole. There is no need for an additional anchor. No spreading forces develop and mounting near masonry edges is not required. You can find detailed information in the corresponding approvals.

System benefits:

- Quick and easy installation
- High level of safety
- Can be loaded immediately
- Torque control not required
- Mechanical setting is possible without any problems
- Fire protection tested

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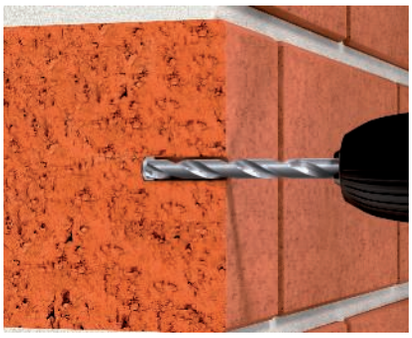
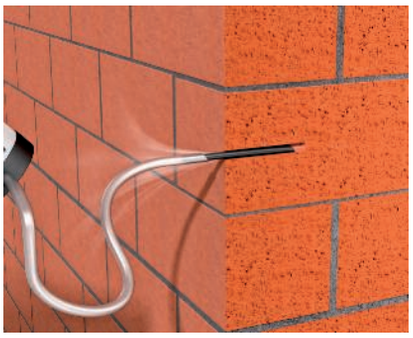
Mounting aid, bolt tie



Drilling an anchor hole
Drilling of the anchor hole according to the anchor approval information for the drill hole diameter and the drill hole depth.



Blowing out of the drill hole
Removing dust from the drill hole by blowing it out several times.

Screw-in anchor, type MMS
Screw anchor MMS with pan head for direct installation without anchors. Suitable for use in concrete and different types of masonry.

Screw anchor, type MMS10
Screw anchor MMS10 with hexagonal head for direct installation without additional anchors. Suitable for use in concrete and different types of masonry.

Screw anchor, type MMS-ST
Screw anchor MMS-ST with M6 thread and hexagonal head for direct installation without additional anchors. Suitable for use in concrete and different types of masonry.

Screw anchor, type HMS
Screw anchor HMS with countersunk cone head for direct installation without additional anchors. Suitable for use in concrete and different types of masonry.

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Perfectly matched: the modular Magic system

Side height 35 mm

RKSM 35

Side height 60 mm

RKSM 60

MKSM 60

SKSM 60

MKSMU 60

SKSMU 60

Side height 85 mm

MKSM 85

SKSM 85

MKSMU 85

SKSMU 85

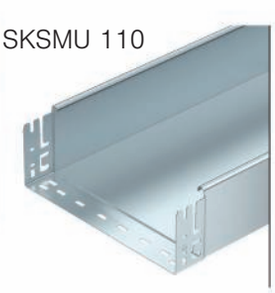
Side height 110 mm

MKSM 110

SKSM 110

MKSMU 110

SKSMU 110



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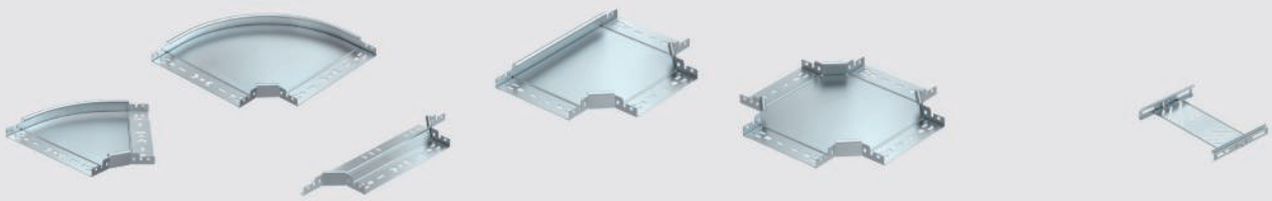
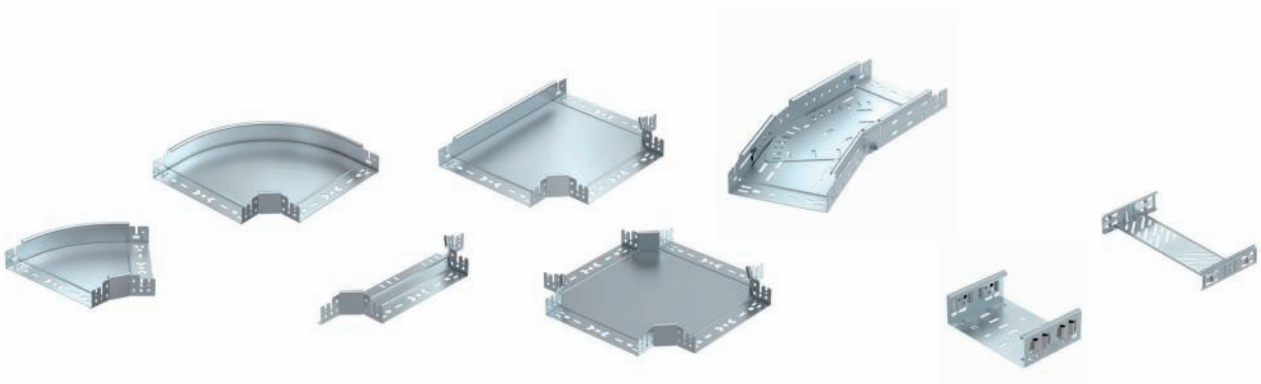
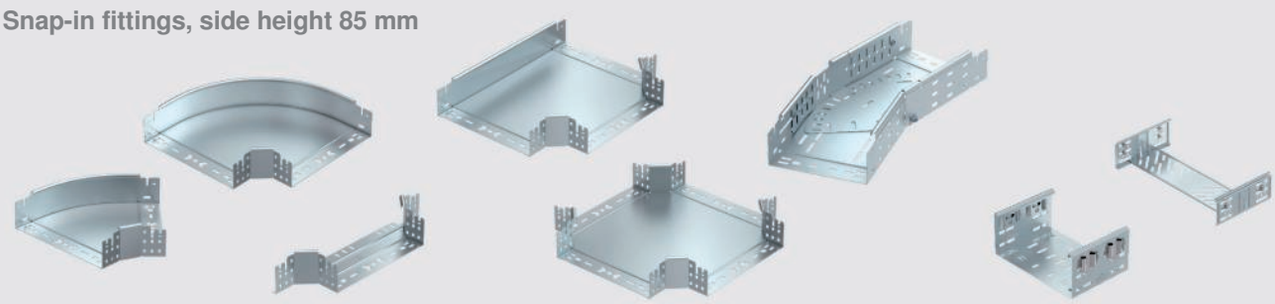
Snap-in fittings, side height 35 mm



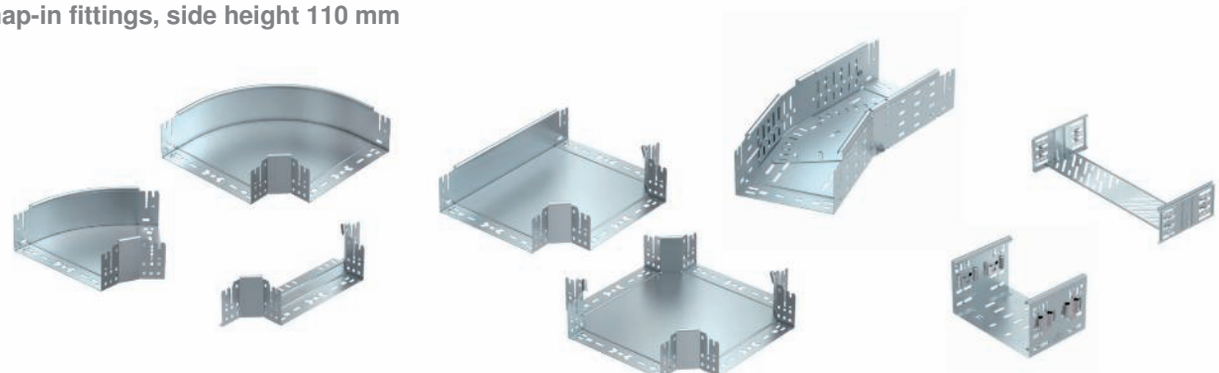
Snap-in fittings, side height 60 mm



Snap-in fittings, side height 85 mm



Snap-in fittings, side height 110 mm



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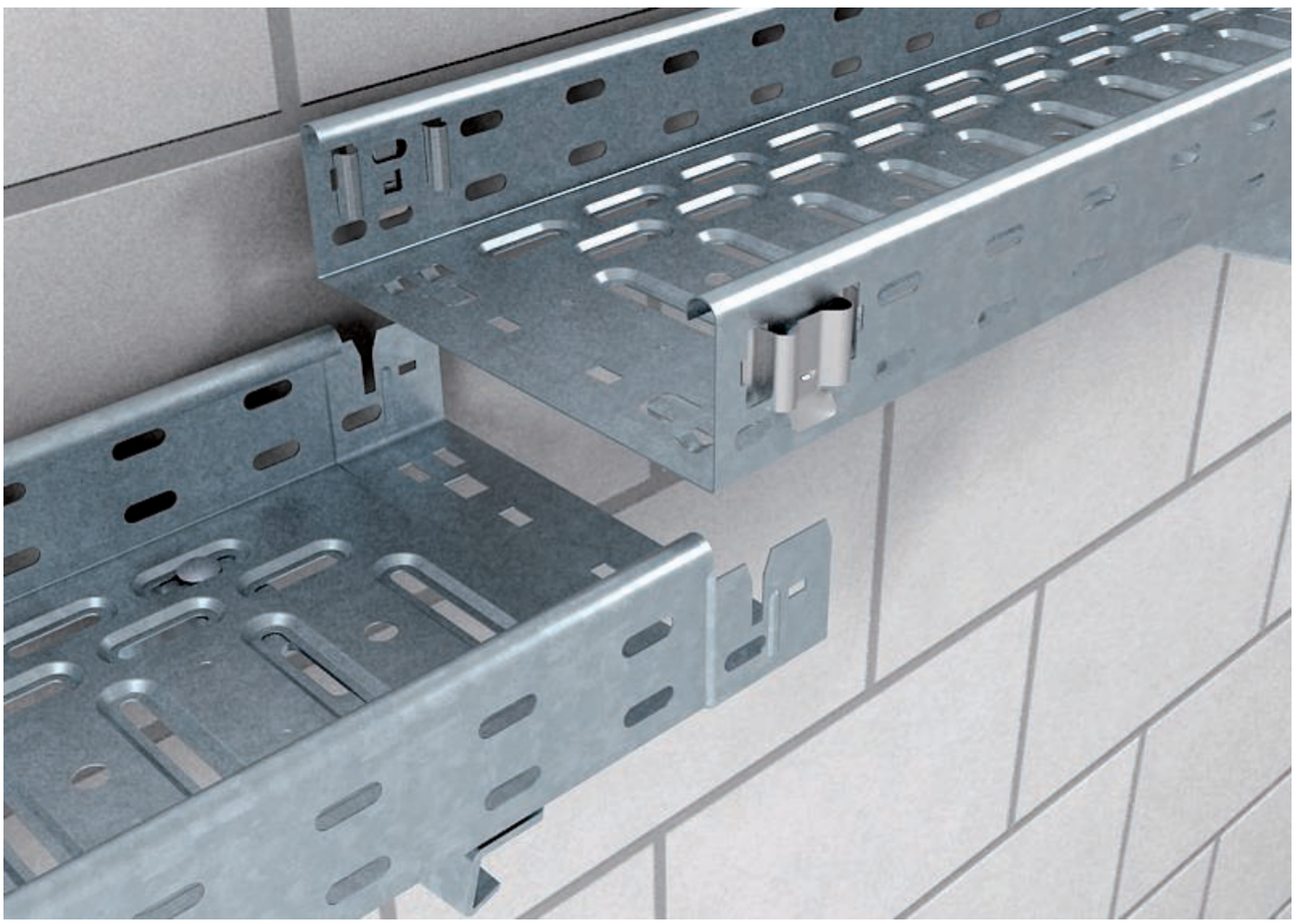
System description, cable tray system RKSM



The RKS-Magic® cable tray system permits even faster straight connection of the cable trays. The innovative, screwless straight connector can be mounted in the blink of an eye. Just connect the ends of the cable tray, lock them in place - and you're done! The long-lasting, static straight connectors can be permanently stabilised by bending the connection flaps. The RKS-Magic® cable tray is available with the side heights 35 and 60 mm. A comprehensive range of fittings with bends (45° and 90°), tees, add-on tees and cross-overs completes the system. 90° bends and adjustable vertical riser (rising/falling) are available for vertical changes of direction. When installing fittings, always plan additional supports.
Besides the various fittings, the system also includes all types of connectors (straight, angle and adjustable connectors) and additional accessories such as barrier strips, joint plates, mounting plates and covers.
You can find detailed mounting examples and article descriptions on the following pages. The RKS-Magic® cable tray is tested for function maintenance. You can find comprehensive information on this in our new catalogue for BSS fire protection systems.

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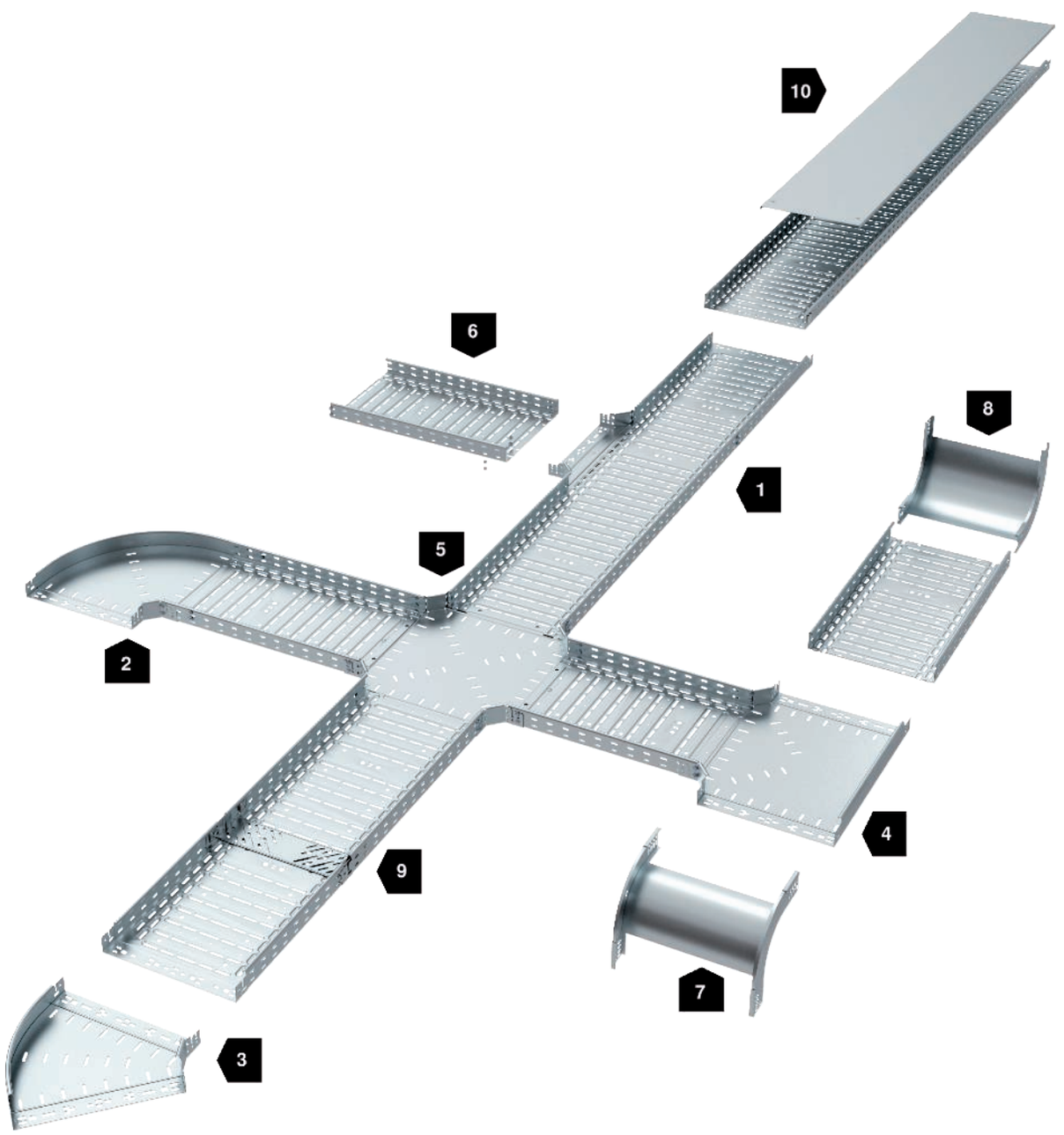
Installation principle, cable tray systems RKSM

System components

1	RKSM cable tray
2	90° Magic bend
3	45° Magic bend
4	Magic Tee
5	Magic cross-over
6	Magic add-on tee
7	90° vertical bend, falling
8	90° vertical bend, rising
9	Magic straight connector set
10	Cover with turn buckle



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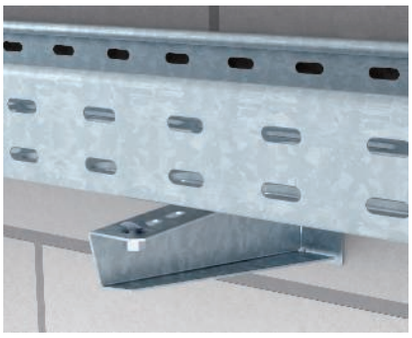
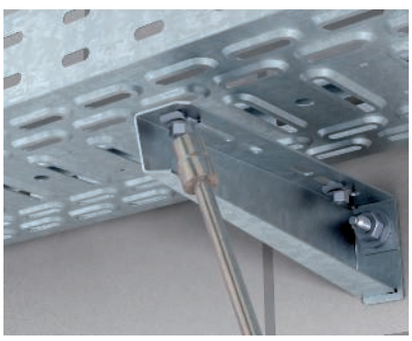
Mounting aid, cable tray system RKSM

Centre suspension application
Direct centre suspension with threaded rod, type 2078/M10. This mounting variant is possible for RKS cable trays of width 50 to 200 mm.

Ceiling mounting application, U support and bracket
Standard mounting of a cable tray with support, type US.., and suitable support bracket, type AW.

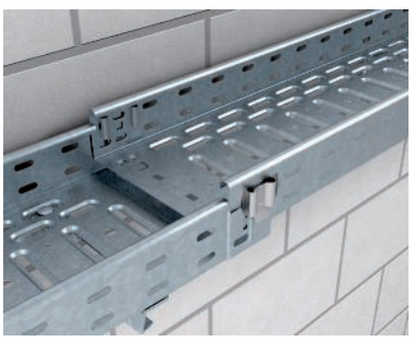


Wall mounting application with bracket
Standard cable tray mounting on the wall with wall and support brackets.

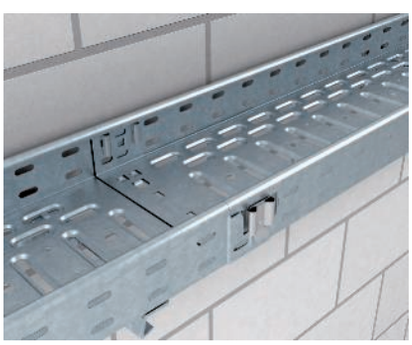


Quick fastening of cable tray on the bracket
The quick fastening is pushed upwards and turned through 90°. After locking, the quick fastening is fastened permanently by tightening it.

Straight connection, cable tray interconnection
The straight connection is created by simple connection of the cable trays. Please observe the mounting direction.



Straight connection, cable tray interconnection
The ongoing cable tray is inserted from above from the existing sleeve opening.



Straight connection, cable tray interconnection
The optimum straight connection is confirmed by an audible click. Then use a screwdriver, to turn over the connection lugs in the bottom – and you're done!

Straight connection, cable tray interconnection
It is possible to turn over the connection flap in the floor of the cable tray using a normal screwdriver.

Slackening the connection
Of course the connection can be loosened again. To do this, simply push a screwdriver under the spring element. This releases the lock function.

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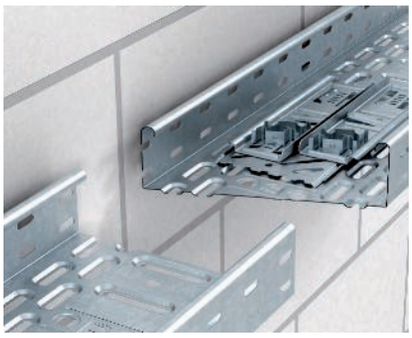
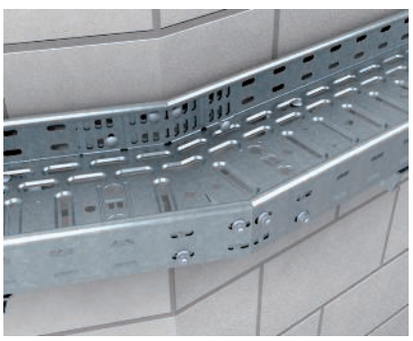


Magic KTSMV straight connector set
Cable tray connector set with quick fastening for straight, screwless connection of cable trays and fittings. The optimised design means that the connector can be used to create radii and as a length compensation piece for large temperature deviations.

Mounting of Magic KTSMV straight connector set
The straight connector set Magic KTSMV is used for cut ends. Simply clamp the two side sections in the side rail and push the corresponding joint plate down until it has locked in place - and you're done.

Mounting of Magic KTSMV straight connector set
To strengthen the connection, we recommend screwing on the joint plate for widths of more than 400 mm.

Floor fastening
Floor fastening at a distance with stand-off bracket, type DBL.

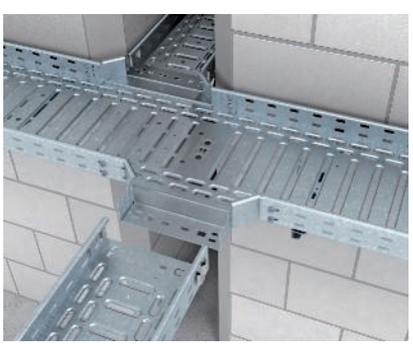


Horizontal angle connection of cable trays
Horizontal angle connection of cable trays for brackets created during construction and cut cable tray ends.

Vertical adjustable connection of cable trays
Vertical adjustable connection of cable tray for construction-side height jumps of any angle.

Width change and end closure
Illustration of a width change through the installation of the reducer. This component allows the implementation of an end closure of cable trays.

Mounting of Magic bend
Mounting of fittings by simple interconnection. For this, the cable tray with the spring side is locked into the fitting connection from above.



Mounting of Magic mounting/branch piece
Mounting of fittings by simple interconnection. For this, the cable tray with the spring side is locked into the fitting connection from above.

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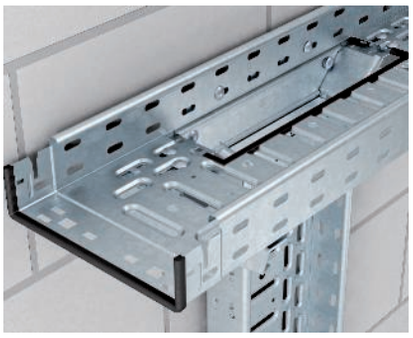
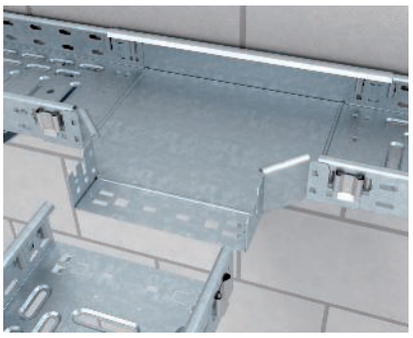
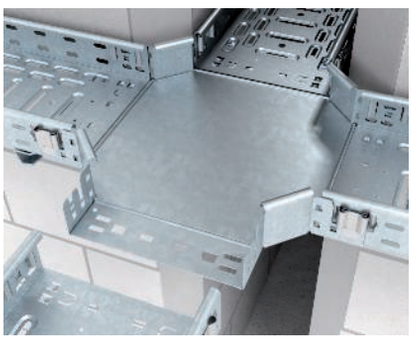
Mounting of Magic vertical mounting/branch piece (bottom view)
Vertical mounting of the add-on tee as lengthwise funnel. Perforation in the cable tray is created on site. For widths > 400 mm, please order connectors separately.



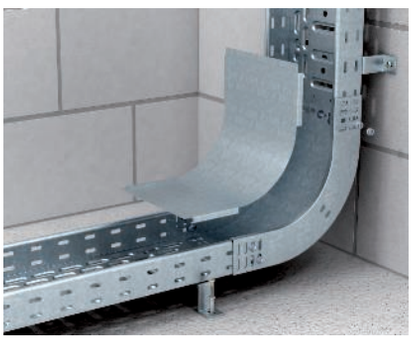
Mounting of Magic vertical mounting/branch piece (top view)
Vertical mounting of the add-on tee as lengthwise funnel. Perforation in the cable tray is created on site. For widths > 400 mm, please order connectors separately.



Mounting of Magic T branch piece
Mounting of fittings by simple interconnection. For this, the cable tray with the spring side is locked into the fitting connection from above.



Mounting of Magic intersection
Mounting of fittings by simple interconnection. For this, the cable tray with the spring side is locked into the fitting connection from above.



90° bend (rising/falling)
The 90° vertical bend is pushed over the rail of the cable tray and bolted with truss-head bolts, FRSB M6x12 mm. The cover is placed on loosely and fastened using the incoming cable tray lid.
The cover clamp DKU can be used for additional fastening.

Installation of rising adjustable vertical bend
Adjustable vertical bend to bridge height offsets or when changing from horizontal to vertical. The adjustable vertical bend is fastened to the cable tray directly using the adjustable connectors.

Installation of falling adjustable vertical bend
Installation of the adjustable vertical bend, falling, to bridge height differences and changes from the horizontal to the vertical.

Installation of bottom end plate
The bottom end plate is fastened to the end of the cable tray. It is used to protect outgoing cables.

Mounting plate with quick fastening
Fastening of the mounting plate, type MP, on the side rail of the cable tray. The mounting plate can be fastened to the rail with quick connectors, and permanently fastened using truss-head bolts of type FRSB 6x12 mm.

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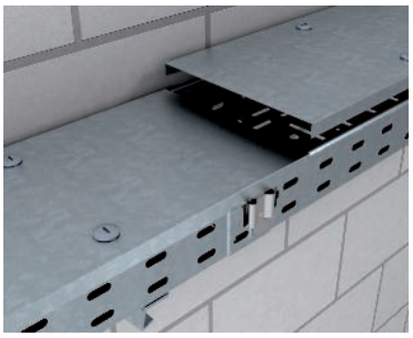
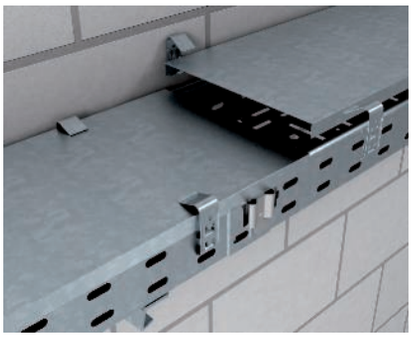
Universal mounting plate
The MP UNI mounting plate is fastened on the side rail of the cable tray using a truss-head bolt.



Installation of cover with turn-buckle.
Cover with turn-buckles are fastened by turning the turn-buckle through 90°. Clamp fastening takes place under the rolled side rail of the cable tray.

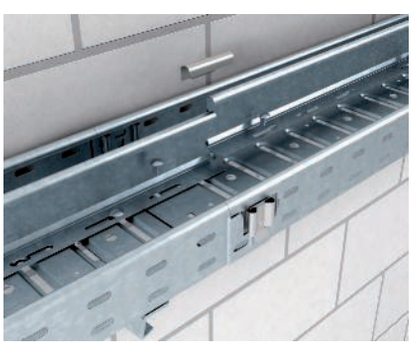


Screwless cover fastening with cover clamp
Screwless cover mounting takes place with covers and the cover clamps, type DKU. The cover clamp is simply fixed in the perforation of the cable tray.

Installation of cover for fitting
The fitting cover is installed using turn-buckles. To fit it, turn the turn-buckle through 90°.

Edge protection strip for plate ends
The edge protection strip can be used to cover the edges of plates. When selecting the strip, please take the appropriate plate thickness into account.

Screwless barrier strip mounting
Screwless mounting of the barrier strip TSG ... with clamping piece KS KR. The barrier strip can be run over the joint without machining and can be connected without bolts using the TSGV barrier strip connector.



Screwed barrier strip mounting
Screwed barrier strip fastening of the barrier strip, TSG 60, with truss-head bolts M6x12. The barrier strip can simply be run over the joint and connected without bolts using the barrier strip connector TSGV.

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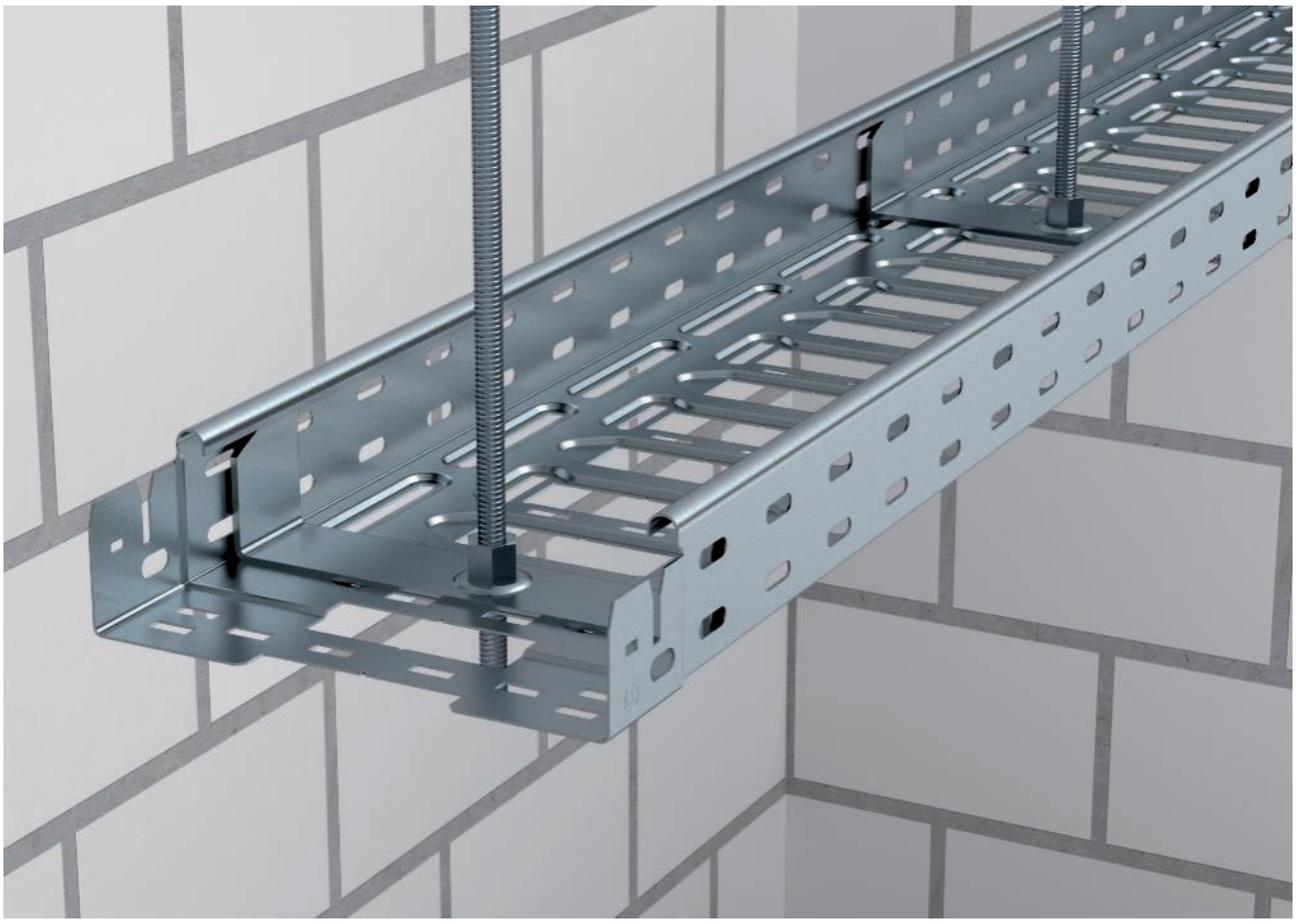
System description, cable tray system MKSM, SKSM



The cable tray is suitable for universal cable routing. From low-voltage cabling to power supplies, from data cables to telecommunications networks. A full product range with suitable system components can create perfect solutions to any task. No matter whether used in dry inner areas or in aggressive atmospheres: Different surface versions and materials ensure safe corrosion protection. Side heights of 60, 85 and 110 mm are available. Due to the high hole proportion of 30% and more, the perforated cable trays MKSM and SKSM of widths of 200 mm or greater are ideally suited for use beneath sprinkler systems. The IKSM cable tray also has large openings in the side rail, which can be used for cable entries or exits.
The complete system is supplemented by connectable, screwless fittings with Magic connection. The system also includes all types of connectors and additional accessories such as barrier strips, joint plates, mounting plates and covers.
You can find detailed mounting examples and article descriptions on the following pages.

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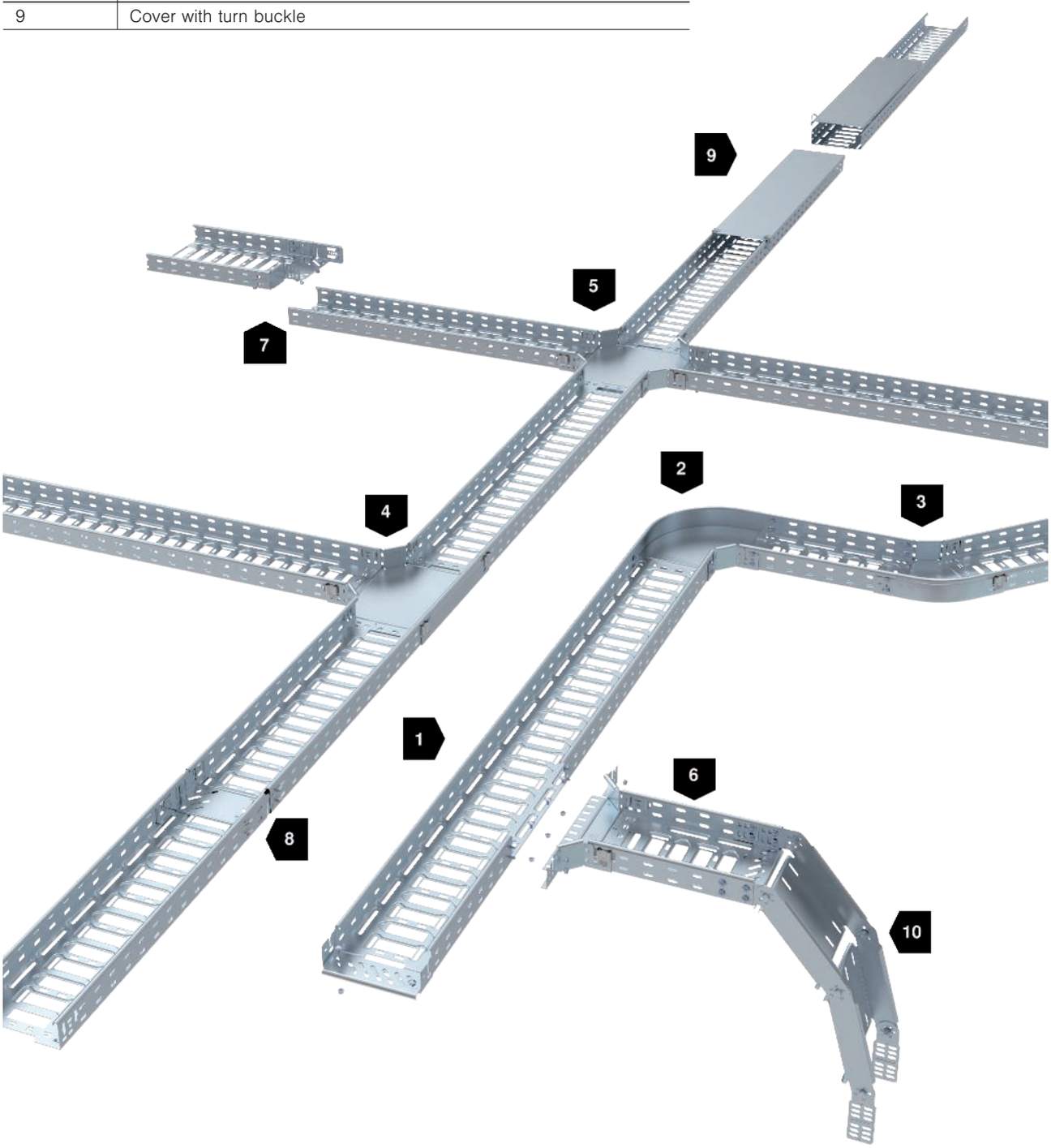
Installation principle, cable tray system MKSM, SKSM

System components

1	Cable tray MKSM / SKSM
2	90° Magic bend
3	45° Magic bend
4	Magic Tee
5	Magic cross-over
5.5	Magic add-on tee
7	Reducer / stop-end
8	Magic straight connector set
9	Cover with turn buckle



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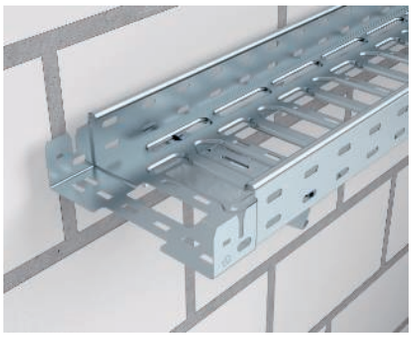
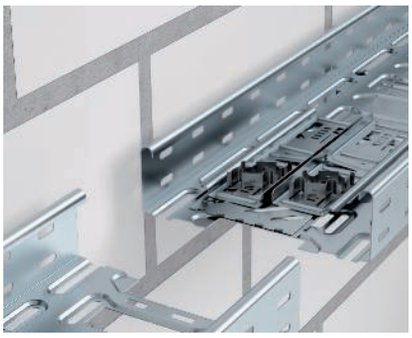
Mounting aid, cable tray system MKSM, SKSM

Centre suspension application
Centre suspension of the cable tray systems MKSM, SKSM and IKSM with a central hanger, type MAH, and threaded rod 2078/M10.



Wall mounting application with bracket
Standard mounting of a cable tray on the wall with wall and support brackets.

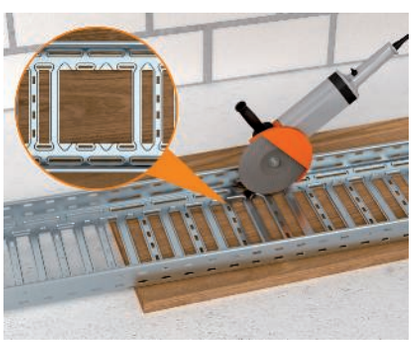


Magic KTSMV straight connector set
Cable tray connector set with quick fastening for straight, screwless connection of cable trays and fittings. The optimised design means that the connector can be used to create radii and as a length compensation piece for large temperature deviations.

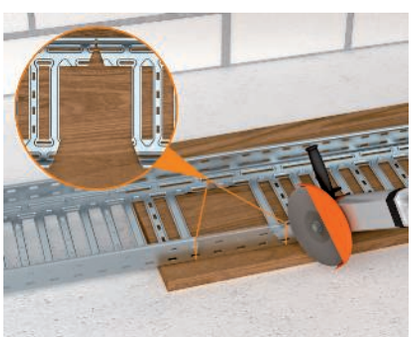
Mounting of Magic KTSMV straight connector set
Simply clamp the two side sections of the connector set in the side rail.

Mounting of Magic KTSMV straight connector set
Insert the corresponding joint plate, push it down and simply lock it in place. To strengthen the connection, we recommend screwing on the joint plate for widths of more than 400 mm.

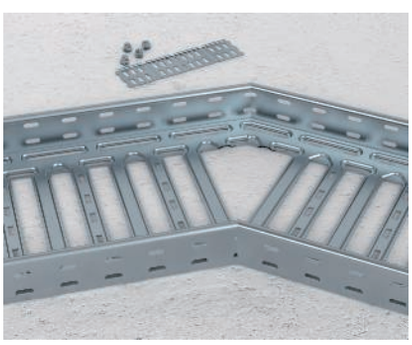
Mounting of Magic KTSMV straight connector set
Correctly used KTSMV straight connector set.



Creating a change of direction by cutting the cable tray
By cutting a cable tray to any change in direction of 0°-90° can be produced. The interface is fixed at an angle connector. First, at the subsequent interface the central webs z.B.Deburr carefully with an angle grinder deburring cut edges carefully.



Creating a change of direction by cutting the cable tray
Determine angle and cut cable tray as shown, so that the opposite spar is not damaged. In addition, on the opposite spar cut the notch in the round-shaped edge spar. Deburring cut edges carefully.



Creating a change of direction by cutting the cable tray
Bend the cable tray and fix the cut rail with an angle connector, type RWVL.

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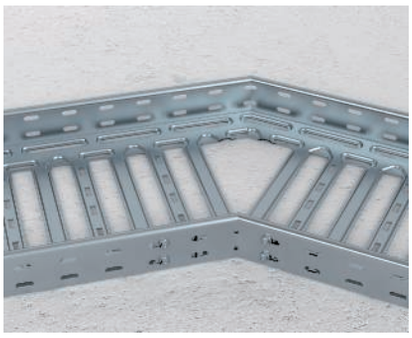
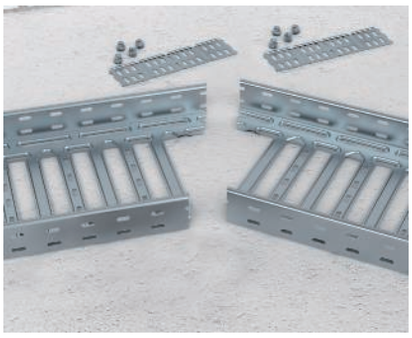
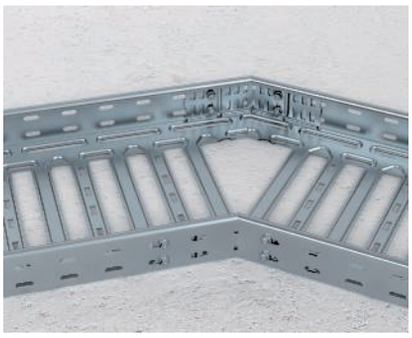


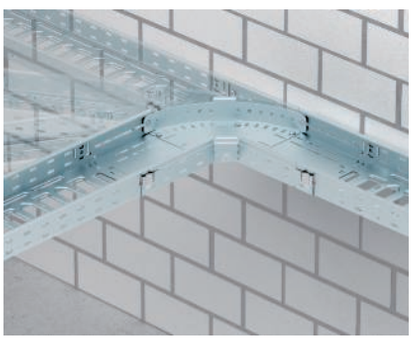
Creating a change of direction by cutting the cable tray
The correctly mounted angle connector produces a stable, load-bearing connection.



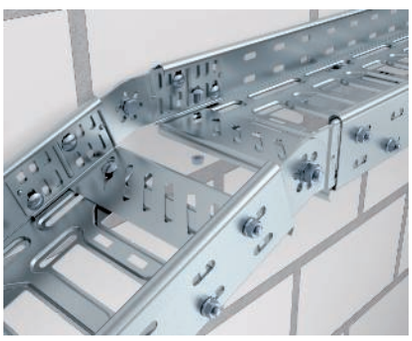
Creating a change of direction by cutting the cable tray
You can also create this change of direction with two separate cable trays. In this case, use two angle connectors to fix the cable trays.



Creating a change of direction by cutting the cable tray
Combine the cut trays and fix them from inside with two angle connectors, type RWVL.

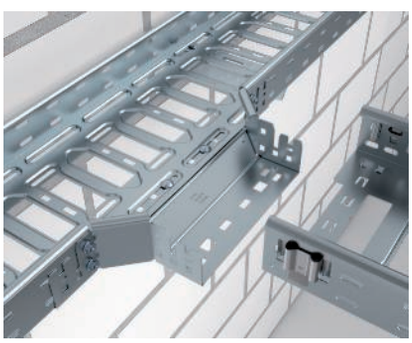


Mounting a change of direction with variable bend
The variable Magic bend, type RBMV..., can be used to install infinitely variable direction changes of 0°-90° to the route.

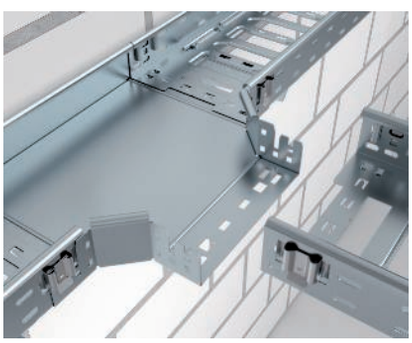


Vertical adjustable connection of cable trays
Vertical adjustable connection of cable tray for construction-side height jumps of any angle.

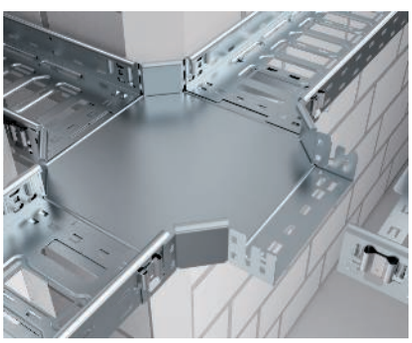
Mounting of Magic bend
Mounting of fittings by simple interconnection. For this, the cable tray with the spring side is locked into the fitting connection from above.



Mounting of Magic mounting/branch piece
Mounting of fittings by simple interconnection. For this, the cable tray with the spring side is locked into the fitting connection from above.



Mounting of Magic T branch piece
Mounting of fittings by simple interconnection. For this, the cable tray with the spring side is locked into the fitting connection from above.



Mounting of Magic intersection
Mounting of fittings by simple interconnection. For this, the cable tray with the spring side is locked into the fitting connection from above.

90° bend (rising/falling)
90° bend, rising or falling, for the creation of simple vertical changes of direction.

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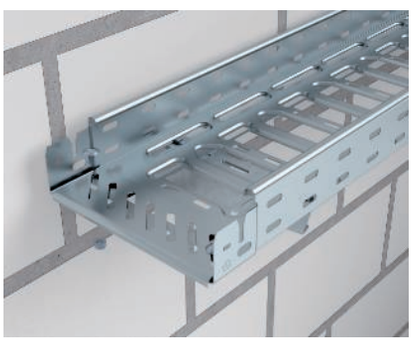
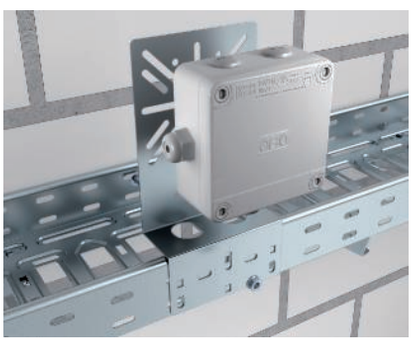
Installation of adjustable vertical bend element
Installation of the adjustable vertical bend element for the creation of adjustable bends. The adjustable vertical bend element is connected to the cable tray using adjustable connectors.

Installation of rising adjustable vertical bend
Adjustable vertical bend to bridge height offsets. The adjustable vertical bend is connected with to the cable tray using the adjustable connectors.

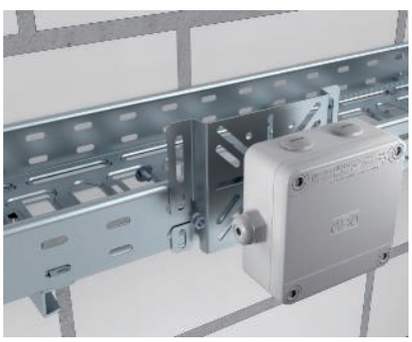
Screwless cover mounting
Screwless installation of the cover, type DRLU, on a cable tray using the cover clamp, type DKU. The cover clamp locks in the top hole of the side rail.



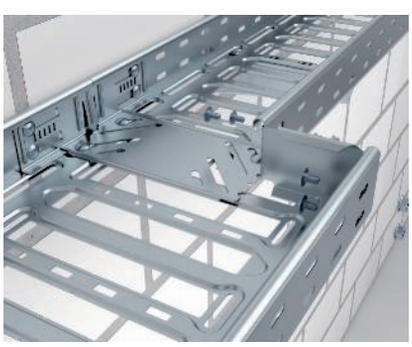
Installation of bottom end plate
Fastening of the bottom end plate, type BEB, to protect the cables.



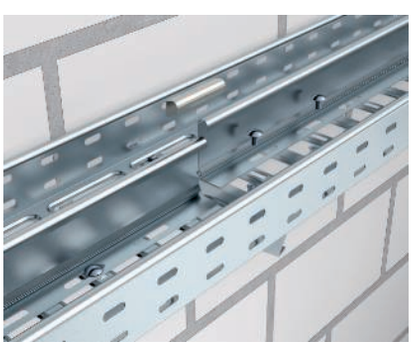
Mounting plate with quick fastening
Fastening of the mounting plate, type MP, on the cable tray. The mounting plate can be fastened to the rail with quick connectors, and permanently fastened using truss-head bolts of type FRS B.



Universal mounting plate
Fastening of the mounting plate, type MP UNI, on the cable tray.



Installation of reducer / stop-end
The reducer / stop-end plate component is used as closure and to reduce the width of cable trays.



Barrier strip mounting with screw connection
Screwed barrier strip fastening of the barrier strip, TSG 60, with truss-head bolts M6x12. The barrier strip can simply be run over the joint and connected without bolts using the barrier strip connector TSGV.

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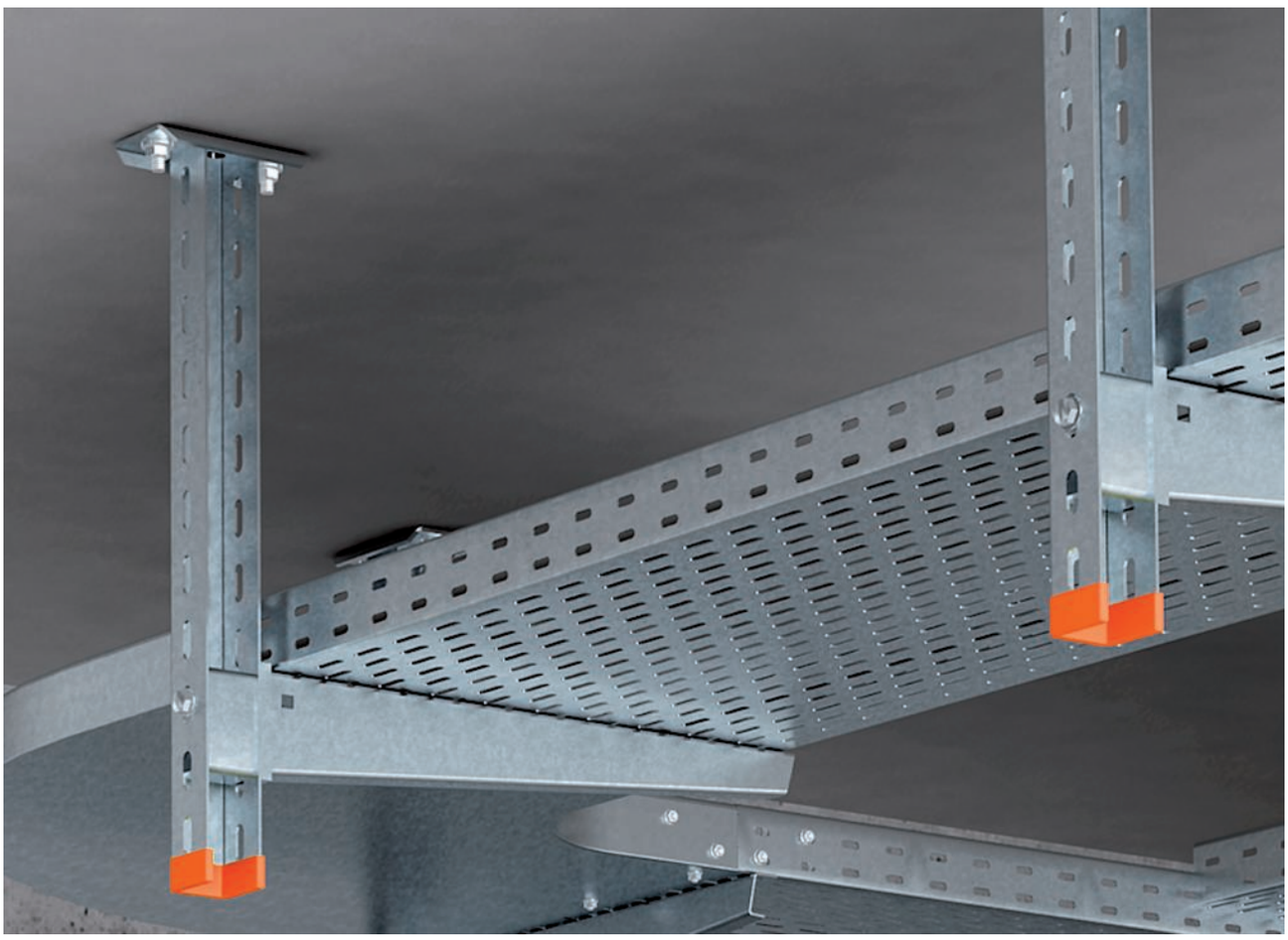
System description, cable tray system MKS, SKS, DKS, IKS



The cable tray is suitable for universal cable routing.
From low-voltage cabling to power supplies, from data cables to telecommunications networks.
A full product range, with suitable system components, can create perfect solutions for any task.
And it doesn't matter whether the products are to be used in dry inner areas or in aggressive atmospheres: Different surface versions and materials ensure safe corrosion protection.
Side heights of 35, 60, 85 and 110 mm up to the special cable tray systems DKS and IKS with 30% perforations and large entries and exits are available.
When installing fittings, always plan additional supports.
Besides the various fittings, the system also includes all types of connectors and additional accessories such as separating retainers, joint plates, mounting plates and covers.
You can find detailed mounting examples and article descriptions on the following pages.
Comprehensive information on maintaining the electrical supply in the event of fire can be found in our new BSS fire protection systems catalogue.

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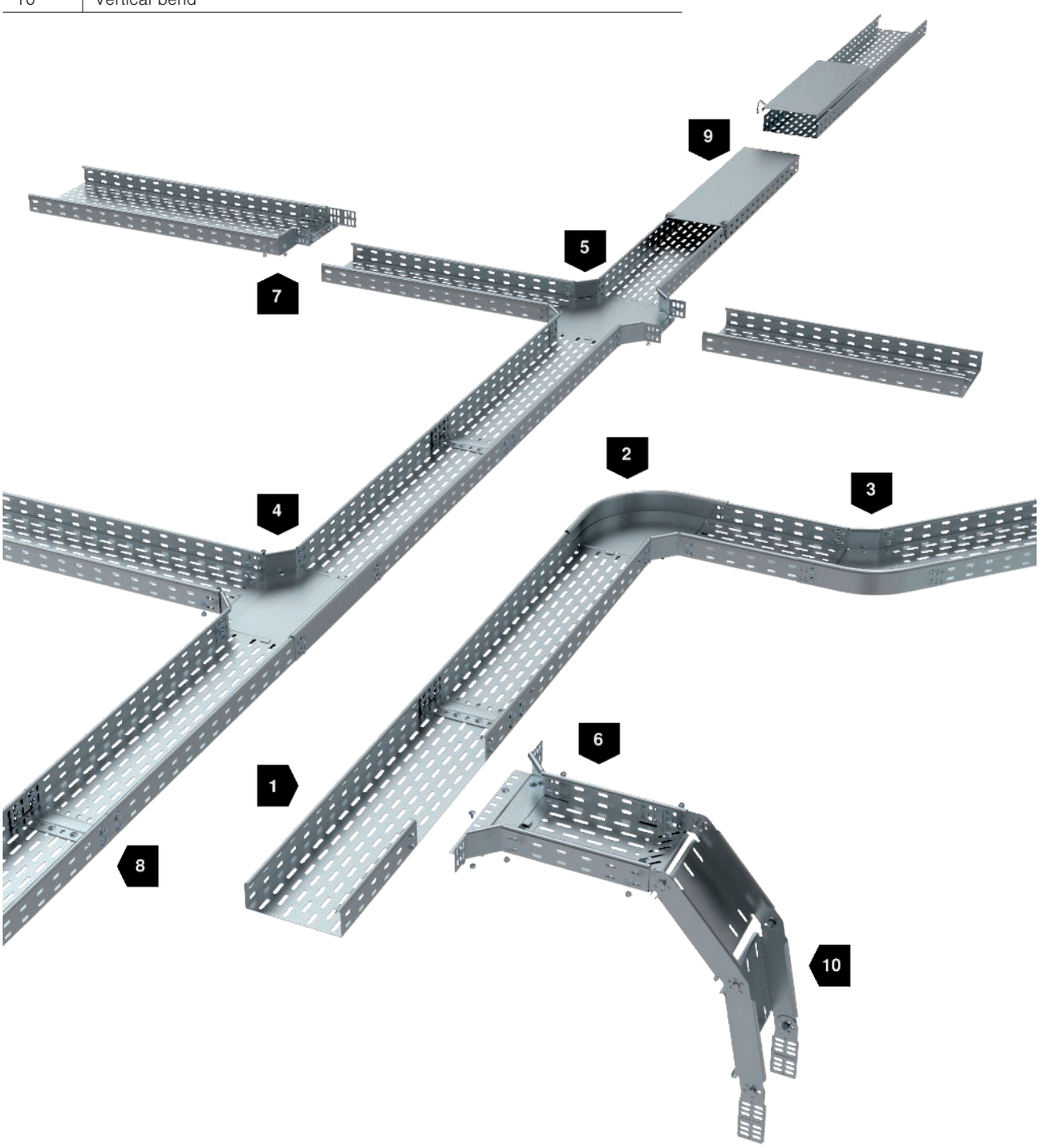
System components

1	Cable tray
2	90° bend
3	45° bend
4	T branch piece
5	Cross-over
6	Mounting/branch piece
7	Reducing bracket and end closure plate
8	Straight connectors and joint plate
9	Cover
10	Vertical bend



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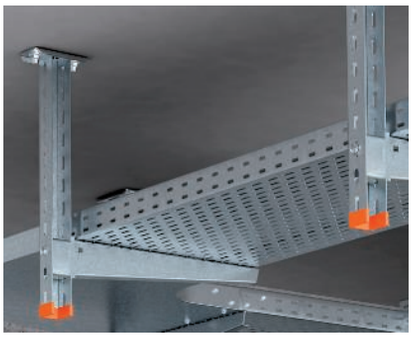
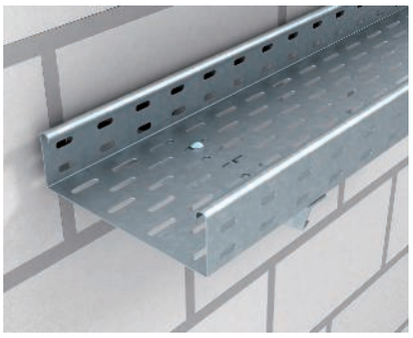
System description, cable tray system MKS, SKS, DKS, IKS

Centre suspension application
Centre suspension of the cable tray systems MKS, SKS, EKS, DKS and IKS with a central suspension hanger, type MAH, and threaded rod 2078/M10.



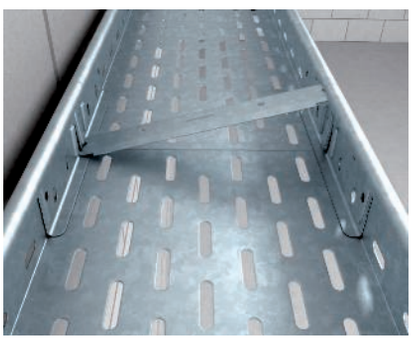
Ceiling mounting application
Ceiling mounting of a cable tray with support and wall and support bracket.



Wall mounting application with bracket
Standard mounting of a cable tray on the wall with wall and support brackets.

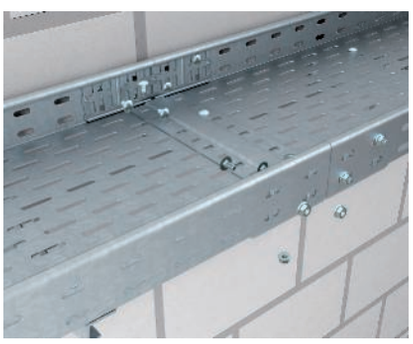
Screwless straight connector set, type RV
Illustration of the quick connector set RV.. contained in the scope of delivery, for strip galvanised cable trays (you can find information on the connectors in the article description).

Installation of RV straight connector set
Simply clamp the two side sections of the connector set in the side rail.

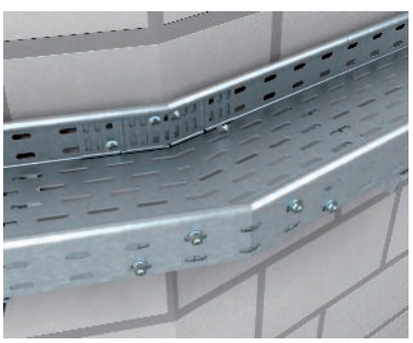


Screwless straight connector set, type RV
Push the corresponding joint plate down until it has locked in place.

Screwless straight connector set, type RV
Correctly used RV straight connector set.



Straight connection with joint cover
Cable tray with screwed straight connection and joint plate, type SSLB. The joint plate can also be mounted above the bar of the RV straight connector set.



Horizontal angle connection of cable trays
Horizontal angle connection of cable trays for brackets created during construction and cut cable tray ends.

Vertical adjustable connection of cable trays
Vertical adjustable connection of cable tray for construction-side height jumps of any angle.

Bend creation with corner connector
For 90° bends to be created at site, the corner connector, type REV, can be used to increase the internal radius.

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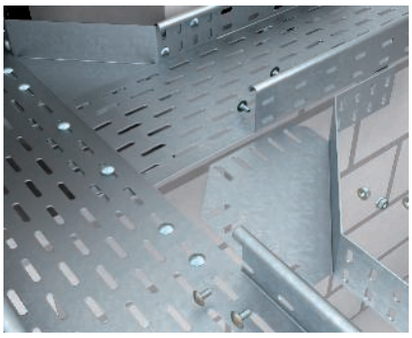
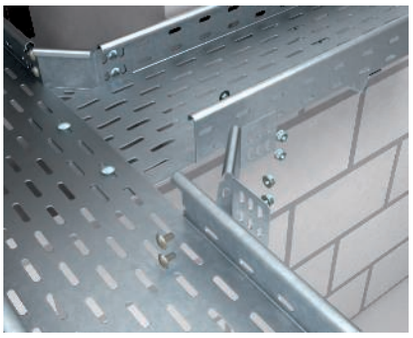
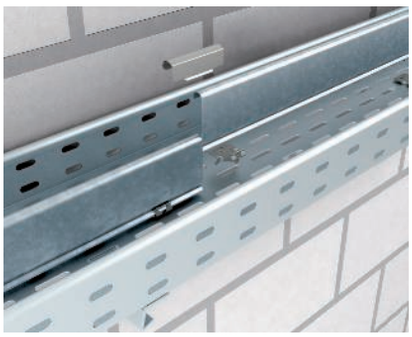


Direct connection with corner connectors
Corner connector, type REV, to increase the angle when creating tees without fittings. Additional supports should be planned for the area of the branches.

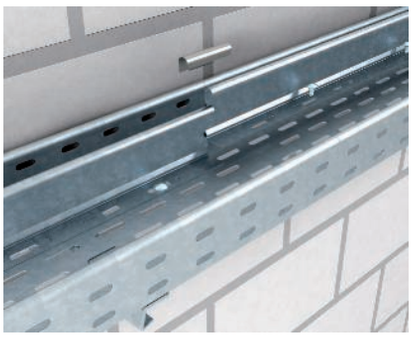


Branch with angle connectors
Installation of built T exit with angle connectors, type WKV. Additional supports should be planned for the area of the branches.

Installation of reducer / stop-end
The reducer / stop-end plate component is used as closure and to reduce the width of cable trays.

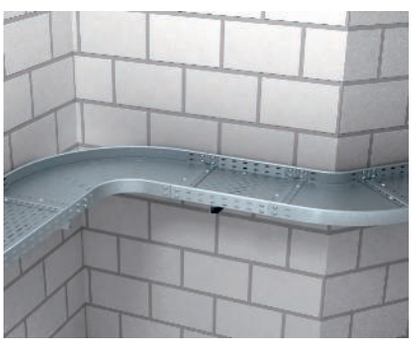


Screwless barrier strip mounting
Screwless mounting of the barrier strip TSG ... with clamping piece KS KR. The barrier strip can be run over the joint without machining and can be connected without bolts using the TSGV barrier strip connector.

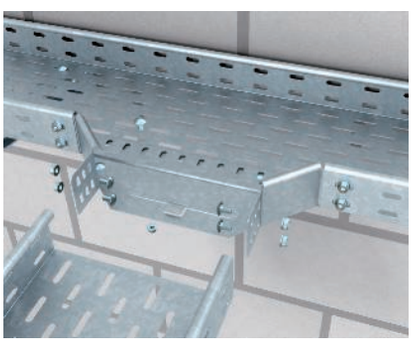


Barrier strip mounting with screw connection
Screwed barrier strip fastening of the barrier strip, TSG 60, with truss-head bolts M6x12. The barrier strip can simply be run over the joint and connected without bolts using the barrier strip connector TSGV.

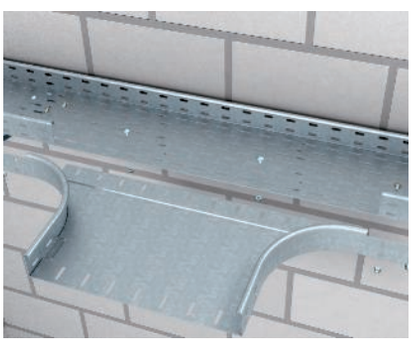
Installation of bend (width 100 – 300 mm)
The bend in widths 100 to 300 mm is pushed into the rail on the one side and over the connector on the other. Additional supports should be planned for the area of the fittings.



Installation of bend (width 400 – 600 mm)
The bend in widths 400 to 600 mm is connected to the cable tray using connectors and a joint plate. Additional supports should be planned for the area of the fittings.

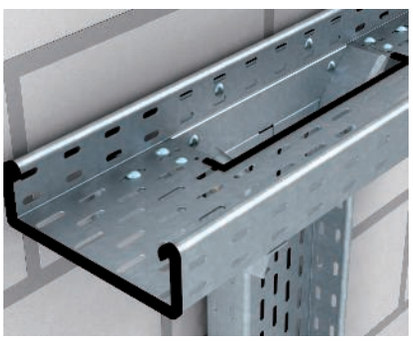


Installation of add-on tee (width 100 – 300 mm)
To mount the add-on tee, separate the cable tray rail and screw it tight. Additional supports should be planned for the area of the fittings.



Installation of add-on tee (width 400 – 600 mm)
To mount the add-on tee, separate the cable tray rail and screw it tight. Additional supports should be planned for the area of the fittings.

Installation of vertical add-on tee
Vertical mounting of the add-on tee as lengthwise funnel.



Installation of vertical add-on tee
Vertical mounting of the add-on tee as lengthwise funnel.

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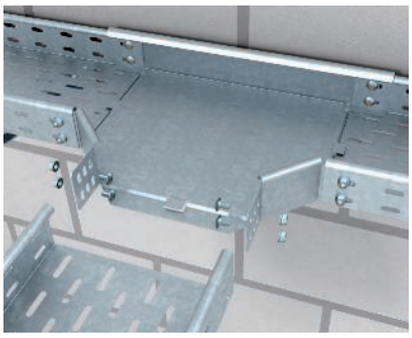
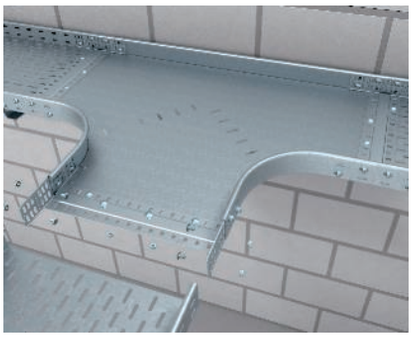
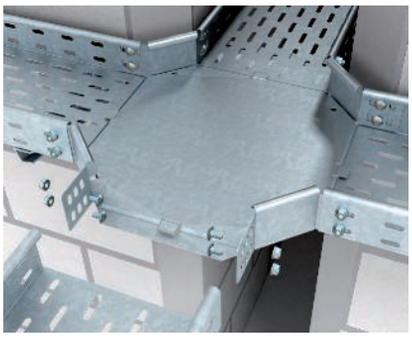


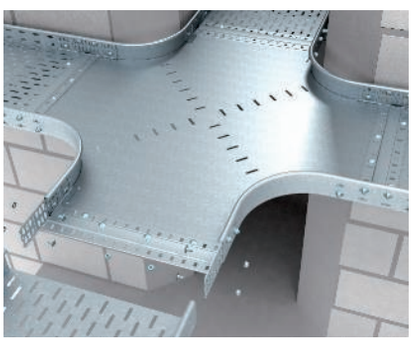
Installation of tee (width 100 – 300 mm)
The tee in widths 100 to 300 mm is pushed into the rail on the one side and over the connector on the other. Additional supports should be planned for the area of the fittings.



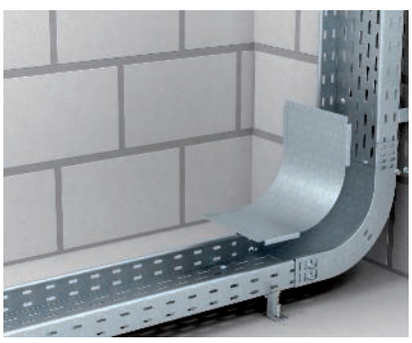
Installation of tee (width 400 – 600 mm)
The tee in widths 400 to 600 mm is connected to the cable tray using connectors and a joint plate. Additional supports should be planned for the area of the fittings.



Installation of cross-over (width 100 – 300 mm)
The cross-over in widths 100 to 300 mm is pushed over connectors and screwed tight. Additional supports should be planned for the area of the fittings.



Installation of cross-over (width 400 – 600 mm)
The cross-over in widths 400 to 600 mm is connected to the cable tray using connectors and a joint plate. Additional supports should be planned for the area of the fittings.

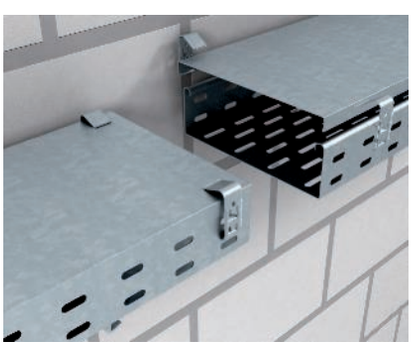


90° bend (rising/falling)
90° bend, rising or falling, for the creation of simple vertical changes of direction.

Installation of adjustable vertical bend element
Installation of the adjustable vertical bend element for the creation of adjustable bends. The adjustable vertical bend element is connected to the cable tray using adjustable connectors.

Installation of falling adjustable vertical bend
Adjustable vertical bend to bridge height offsets. The adjustable vertical bend is connected with to the cable tray using the adjustable connectors.

Installation of rising adjustable vertical bend
Adjustable vertical bend to bridge height offsets. The adjustable vertical bend is connected with to the cable tray using the adjustable connectors.



Screwless cover mounting
Screwless installation of the cover, type DRLU, on a cable tray using the cover clamp, type DKU. The cover clamp locks in the top hole of the side rail.

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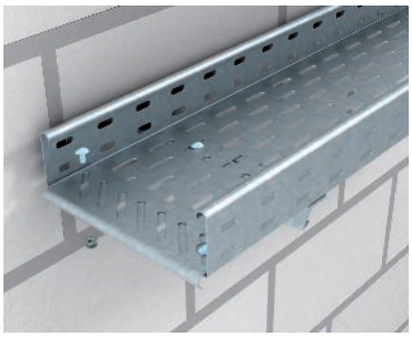
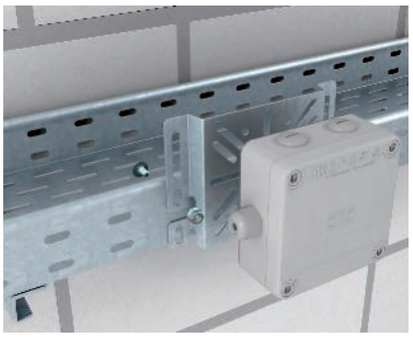
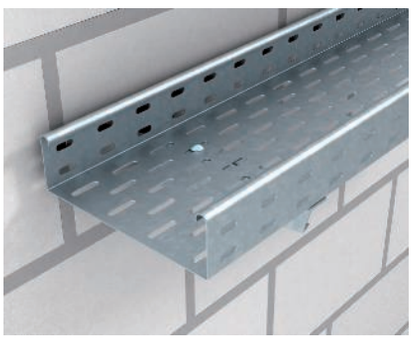


Installation of bottom end plate
Fastening of the bottom end plate, type BEB, to protect the cables.

Mounting plate with quick fastening
Fastening of the mounting plate, type MP, on the cable tray. The mounting plate can be fastened to the rail with quick connectors, and permanently fastened using truss-head bolts of type FRS B.

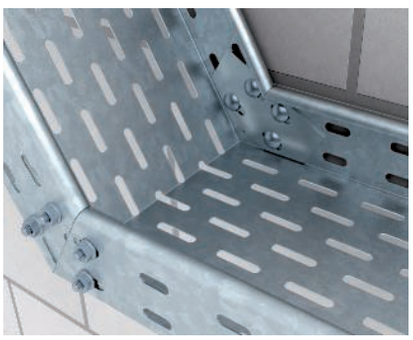


Universal mounting plate
Fastening of the mounting plate, type MP UNI, on the cable tray.



Fastening on bracket
The cable tray is fastened to the bracket with truss-head bolts FRS M6 x 12.

Cable tray mounting on steel girder
Cable tray mounting with chuck jaws of type TKS-L-25 and U supports as cantilever beams on steel girders. Use spacers, type DSK, for safe functioning.



Creating a height increase or decrease
After cutting into the side rail, the cable tray is bent manually at an angle of 0-60° and fixed with the straight connector RLVKV 60 FS. It is not necessary to cut into the bottom plate.

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System description, cable tray system, walkable

Optimised for worldwide use in systems construction and in the automotive industry with its automated production lines, the walk-on cable tray system from OBO Bettermann is ready for any task. The non-slip, impact-resistant aluminium profile-reinforced covers and the unperforated cable trays, type BKRS, which serve as the base, are absolutely suitable for the rough and tumble of everyday work. Comprehensive accessories, such as support profiles, Z-shaped barrier strips, end closure plates, dust protection, guard plate and all the fastening materials optimise this system for universal use and ensure a flexible system, which allows low-cost installations.

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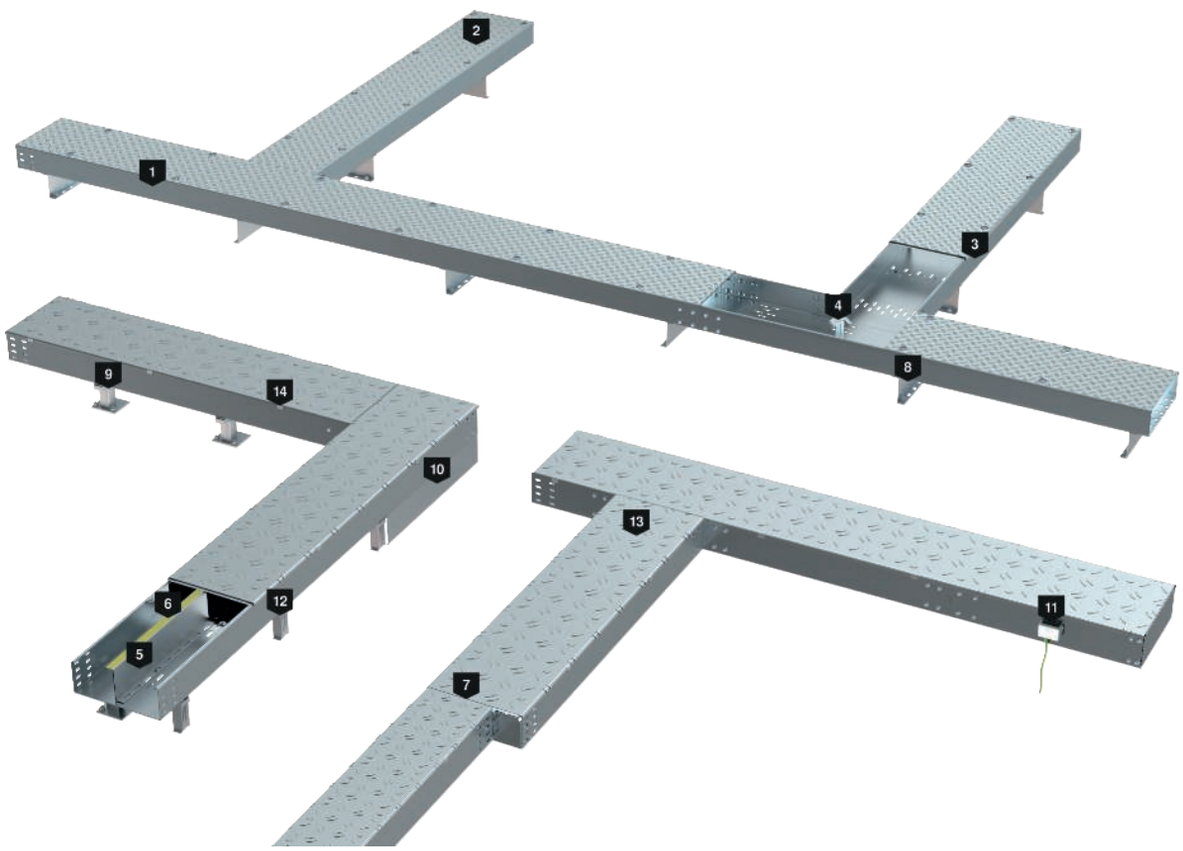
Installation principle, cable tray systems

System components

1	Cable tray BKRS
2	Cover with chequer plate and turn buckle
3	Dust protection element
4	Cover support
5	Z-shaped barrier strip
6	Anti-slip strip
7	Reducing bracket
8	Support profile
9	Stand-off bracket
10	Protective panel
11	Equipotential busbar
12	Support element



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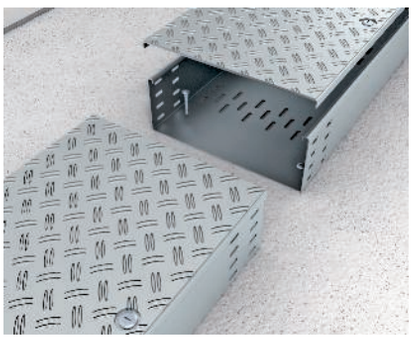
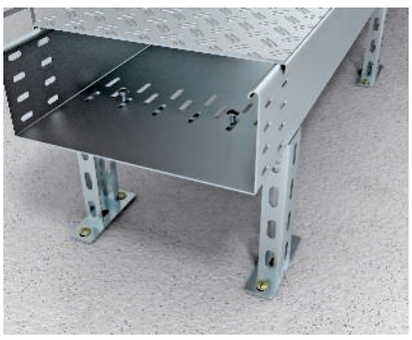
Mounting aid, cable tray system, walkable



Direct floor mounting
Installation of the walkable cable tray system directly on the ground.



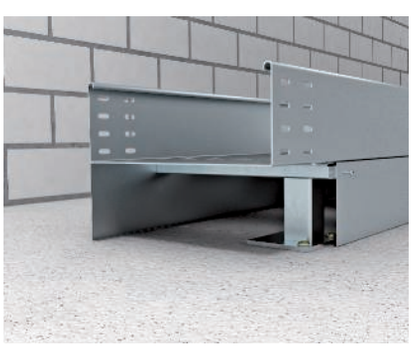
Stand off application
Installation and fastening of the walkable cable tray system for floor stand-off.

Stand off application
Installation of the walkable cable tray system directly on the ground.

Mounting on outriggers
Installation of the walkable cable tray system directly on the ground.

Mounting below the walkable cable tray system
Below the outrigger type STA other media such as hydraulic, pneumatic or water can be mounted under the walk-in cable tray system. The rails of the support arm allows the use of U-clamps.

Straight connection
The longitudinal connection of the walk-in cable tray system by means of straight connector type RLVL.



Mounting Protective panel
The fender type SB is fastened by means of self-drilling screws type BS to the outriggers and is designed to protect people, to prevent accidental tread down the walk-in cable tray system and therefore to avoid accidents.

Mounting with Supplementary bracket

Mounting of separating retainer
The barrier strip type TSG is screwed by means of coach bolts in the bottom of the cable tray. Depending on the width of the cable tray system multiple partitions can be used. Here, the divider serves as a lid support.

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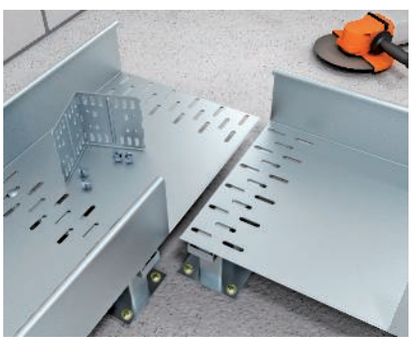
Use of anti-slip tape
The anti-slip strips is a safety feature in the cover assembly, when they have not yet attached final. The strip is stuck and prevents its rubber slipping the still unattached lid on the top of the separation pad and thus contributes to accident prevention.

Cover mounting
The specially developed for the walkable cable tray system cover are simply placed on the cable trays and fixed by means of an integrated rotary latch.

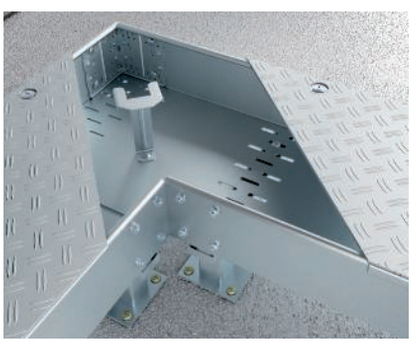
Using the dust protection element
The dust protection element type SSE is there to prevent the intrusion of foreign particles such as sweat, dust or similar at the butt joints of the covers. The dust protection element is simply pushed between steel sheet and aluminium sheet of the first cover and is therefore easily held in position.

Using the dust protection element
In the second step, the dust protection element is pushed completely between the steel sheet and aluminium sheet.

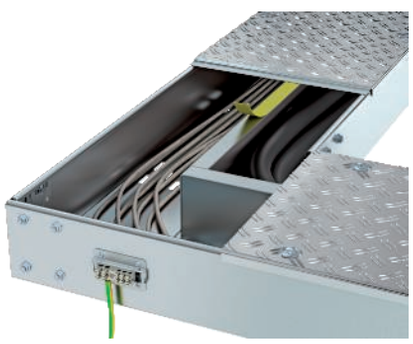
Using the dust protection element
In the final step, the following cover is simply laid onto the cable tray thereby overlapping the dust protection element.



Creating changes of direction 90 °
For this, the cable trays with the appropriate tools and machines are so cut that this blunt lie to each other. After nesting of cut cable trays they are screwed together by means of longitudinal angled connectors.



Cover support for BKRS
In moldings that cover additional support type DST is used which reliably prevents a sagging of the lid with larger dimensions. The lid prop is screwed by means of screws in the bottom of the cable tray / the molding.



Cover in the molding area
When internally generated changes in direction 90 ° to the lid for the walkable cable tray system is as shown in the image to edit and use.

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Planning aids, mesh cable tray systems

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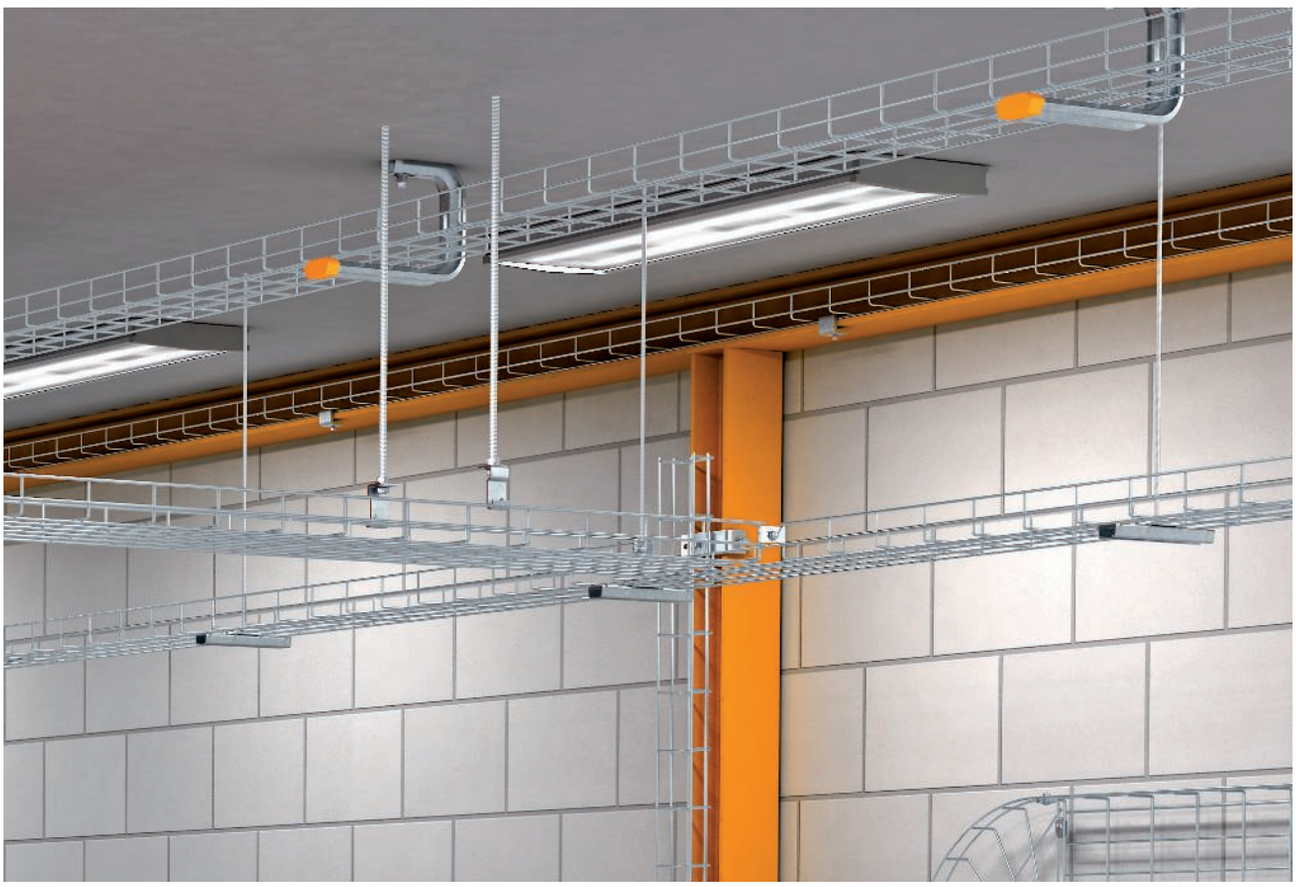
System description, mesh cable tray GR-Magic



OBO Bettermann's mesh cable tray systems are the ideal basis for quick, safe and economical cable routing in all areas of professional electrical installations. The GR-Magic mesh cable tray system with shaped connector for screwless quick mounting guarantees the shortest possible installation times, even for complex installation operations. The mesh cable trays are available with side heights of 35, 55 and 105 mm in the electrogalvanised "Titan look" version, hot-dip galvanised version and in stainless steel. The comprehensive range of practical accessories, such as mesh cable tray bends, clamping pieces, quick connectors, separating retainers, suspension profiles, brackets, etc. ensures that the product range is complete down to the smallest detail.

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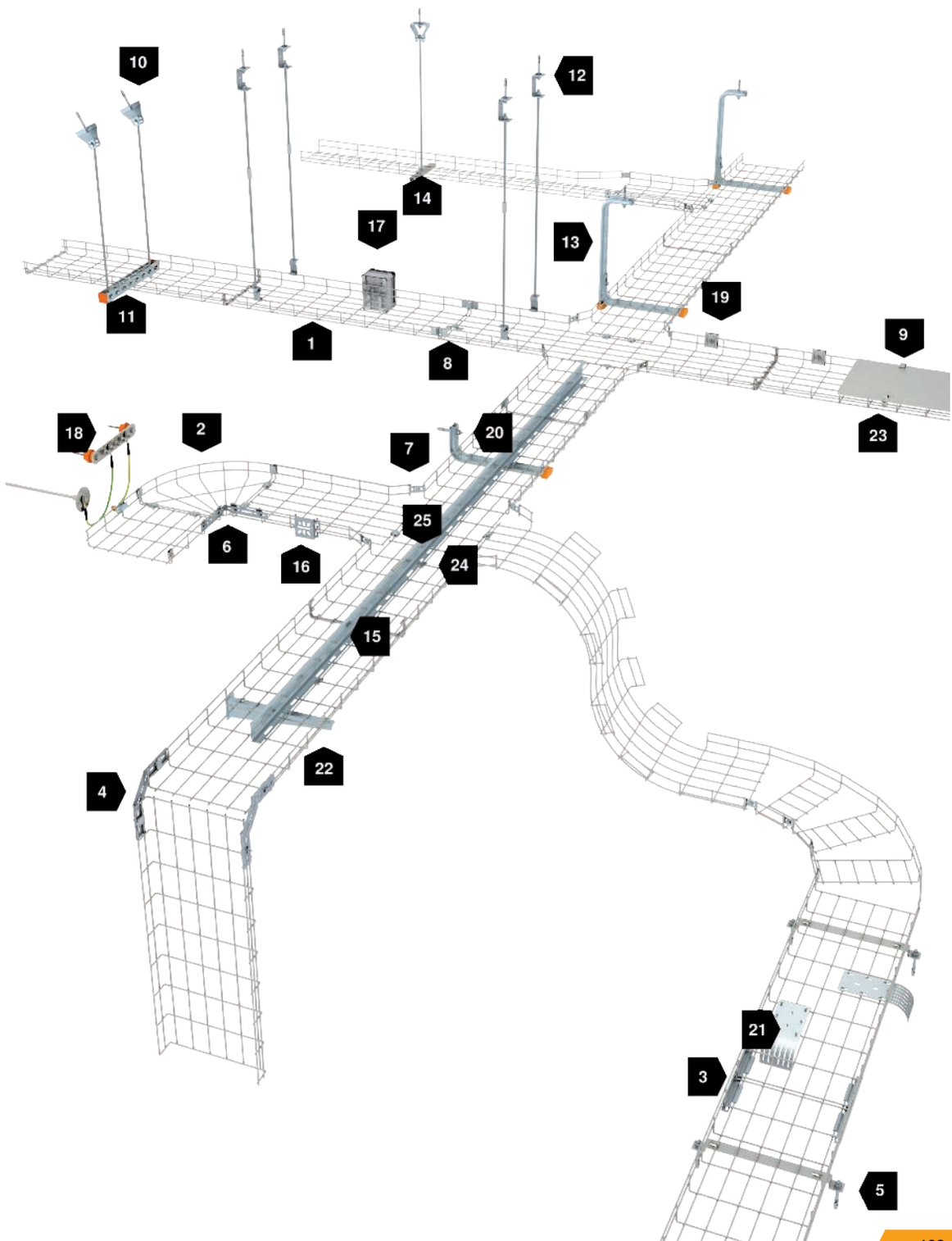
Installation principle, GR-Magic mesh cable tray

System components

1	Mesh cable tray GR-Magic	11	Mounting rail MS41
2	90° mesh cable tray bend	12	Ceiling bracket, DB
3	Mesh cable tray connector, long	13	TP support
4	90° mounting angle	14	Central hanger, GMS
5	Stand-off bracket	15	Barrier strip, TSG
6	Slotted steel strap, bent	16	Mounting plate, MPG
7	Corner connector	17	Fastening element for junction boxes
8	Joint connector	18	Connection and earthing terminal
9	Cover	19	Wall and ceiling bracket, K12 1818
10	Ceiling bracket, variable	20	Wall and support bracket, TPSAG



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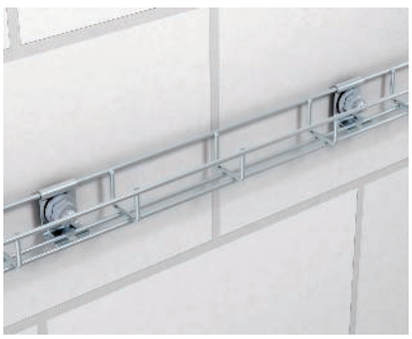
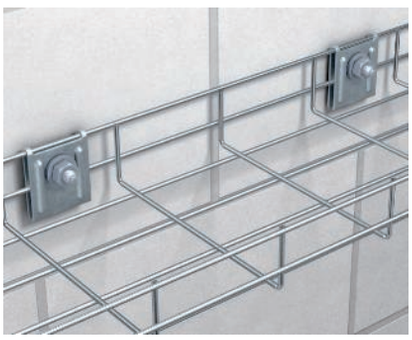
System description, G mesh cable tray GR-Magic

Ceiling mounting application
Mounting of mesh cable tray with support, type US 3 K/... and appropriate wall and support bracket AW 15/...



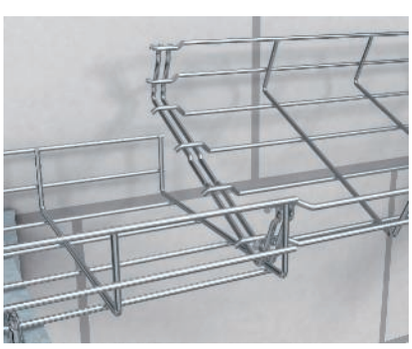
Wall mounting GRM 35 50
Wall mounting for direct wall fastening of mesh cable trays GRM 35 50.



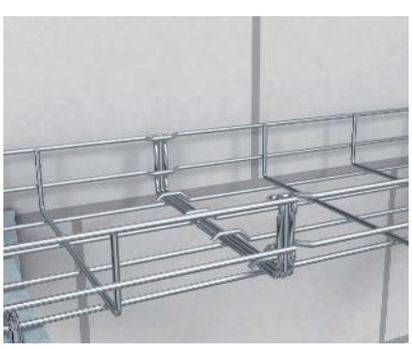
Wall mounting of mesh cable trays
Wall mounting of mesh cable trays with wall bracket, type K 12 1818. Maximum mesh cable tray width 200 mm.

Ceiling mounting with TP wall and ceiling bracket
Ceiling mounting of a mesh cable tray with TP wall and ceiling bracket, type TPDG. The mesh cable tray is fastened to the ceiling bracket without screws.

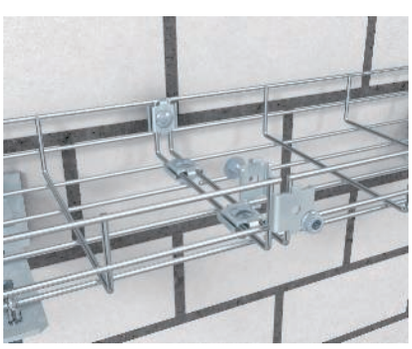
Ceiling mounting with TP support and bracket
Screwless mounting of a mesh cable tray on brackets of type TPSAG/...



Straight connection of Magic® mesh cable tray
Creation of a screwless straight connection of the mesh cable tray, type GR-Magic®, by interconnecting two stock lengths.



Straight connection of Magic® mesh cable tray
The permanent, stable connection is created by simple joining together.



Screwed straight connection of mesh cable trays
Creation of a screwed straight connection of mesh cable trays with joint connectors, type GSV 34.

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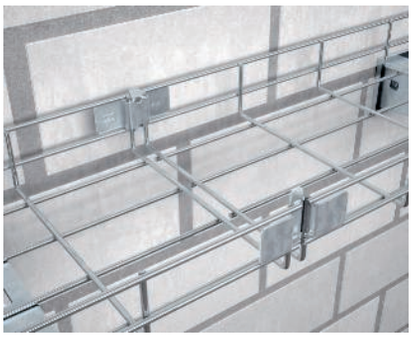
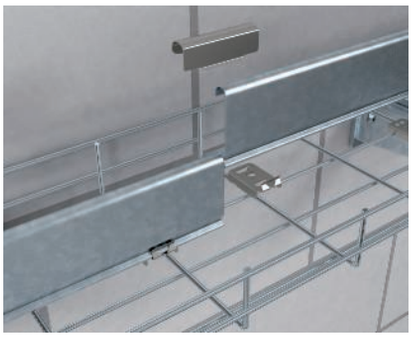
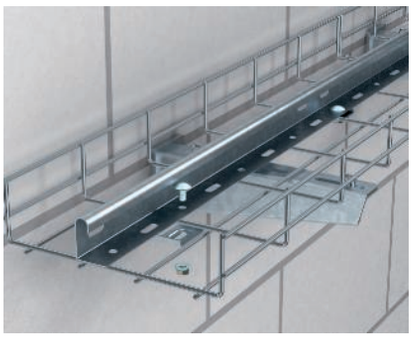
Screwless straight connection with quick connectors
Creation of a screwless straight connection of mesh cable trays using a quick connector, type GRV.



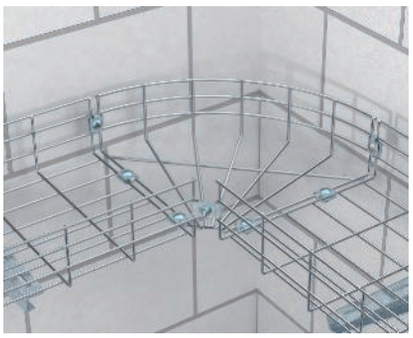
Screwless straight connection of mesh cable trays
Creation of a screwless straight connection of mesh cable trays with joint connectors, type GRS.



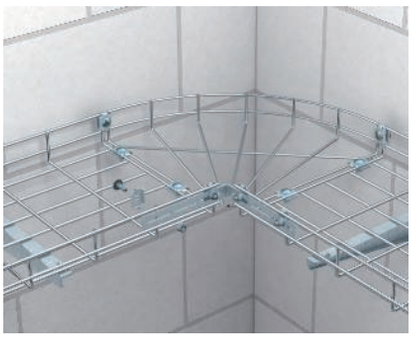
Screwless barrier strip fastening
Screwless fastening of a barrier strip in mesh cable trays with clamping piece, type KS GR. The screwless straight connection of the barrier strip is made using the barrier strip connector TSGV.



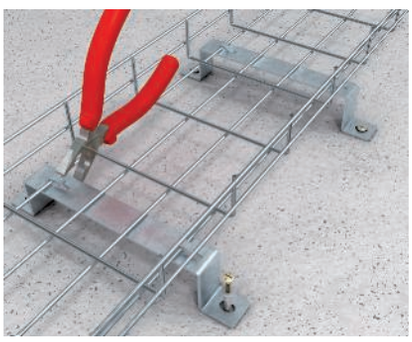
Screwed-on barrier strip fastening in mesh cable trays
Fastening a barrier strip in mesh cable trays with clamp, type GKT 38.



Installation of a mesh cable tray bend
Installation of a mesh cable tray bend, type GRB 90, with joint connectors, type GSV 34, and corner connector, type GEV 36.

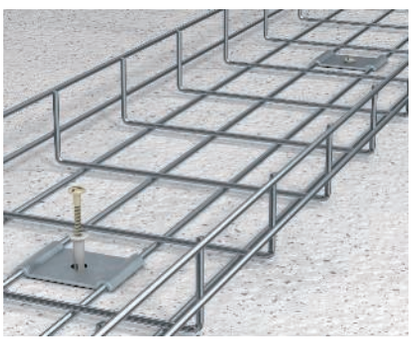


Installation of a mesh cable tray bend
Installation of a complete mesh cable tray bend using joint connectors, type GSV 34, and bent slotted steel strap.



Stand-off of mesh cable trays
Floor stand-off of mesh cable trays with the stand-off bracket, type DBLG 20/... Screwless fastening of the mesh cable tray on the stand-off bracket using clamping lugs.

Mounting adapter for mesh cable trays on stand systems
Mounting system TrayFix for fastening mesh cable trays on FangFix blocks of 10 or 16 kg for cable routing on flat roofs.



Direct floor fastening
Direct floor mounting of mesh cable trays using clamp, type GKS 50.

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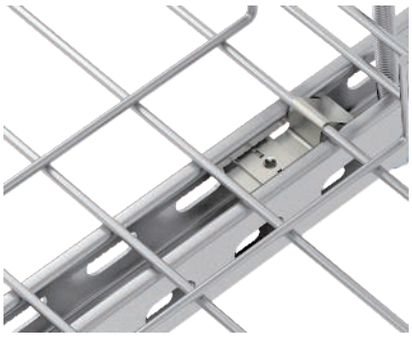
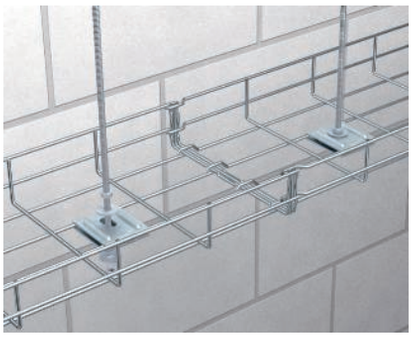
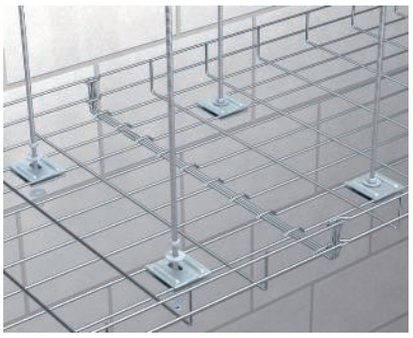


Fastening clip on MS profile rail
Screwless and quick fastening of mesh cable trays onto MS profile rails using fastening clips of type BD GR 4.8 VA for wire thicknesses of 3.9 or 4.8 mm, or BC GR 6.0 VA for wire thickness of 5.9 mm.

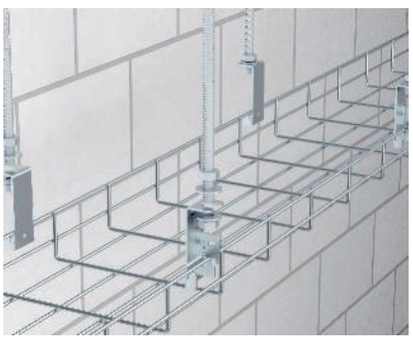


Centre suspension
Suspension of a mesh cable tray using threaded rod, type 2078, and central suspension hanger, type K12 1818. Use with widths of up to 200 mm.



Trapeze suspension
Suspension of a mesh cable tray using threaded rod, type 2078, and central suspension hanger, type K12 1818. Use with widths of 300 mm or more.

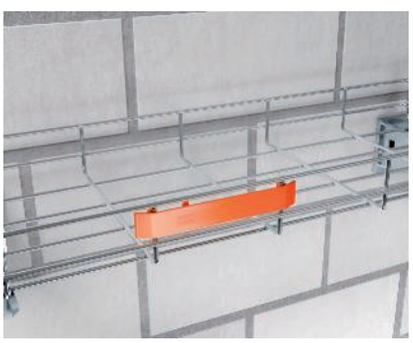
Suspension with central suspension hanger
Suspension of a mesh cable tray with central suspension hanger, type GMS, and clamp, type GKS 50.



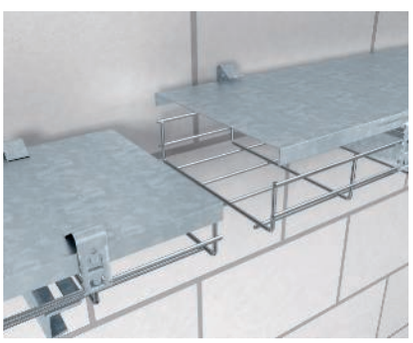
Suspension with side holder
Suspension of a mesh cable tray with side holders, type SH M 10 and threaded rods, type 2078/M10.

Side holder
Installation of the conduit take off bracket, type SH KAB, for accepting cable glands.

Mounting plate
Screwless quick fastening of the mounting plate, type MP UNI.



Identification plate
Installation of the identification plate, type KS-GR, in the side rail of the mesh cable tray.



Cover mounting
Mesh cable tray with cover, type DRLU. Cover fastening with cover clamp, type DKU, on the transverse wire of the mesh cable tray.

Girder clamping application
Vertical mesh cable tray mounting, fixed with beam clamp, type BFK, and clamp, type GKS 50, to steel girder.

Installation of mesh angle
Fastening of the mesh angle, type GW 40/80, to steel girders using beam clamps, type KL 20 or KL 30.

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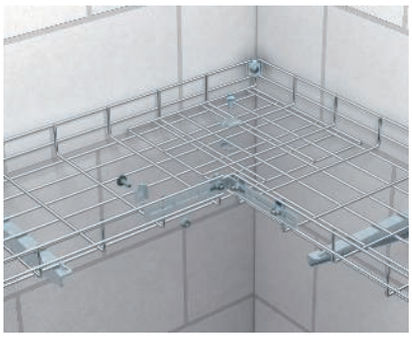
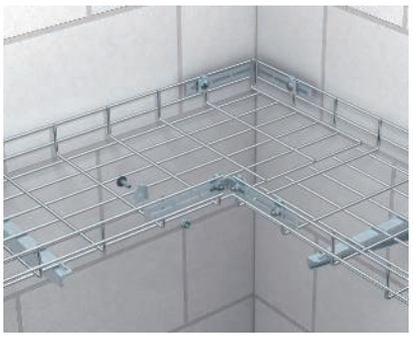
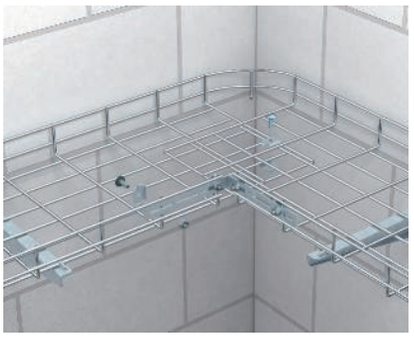


Creation of a mesh cable tray bend – angular, overlapping
After appropriate cutting of the mesh cable trays, they can, together with joint connectors, type GSV 34, and an overlapping bent slotted steel strap, be combined to an angular mesh cable tray bend.



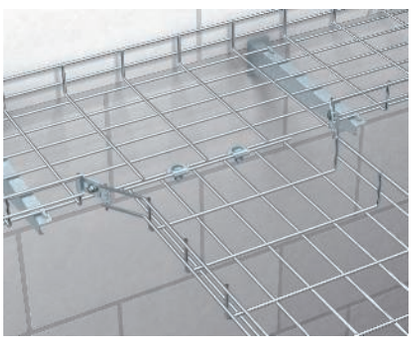
Creation of a mesh cable tray bend – angular
After appropriate cutting of the mesh cable trays, they can, together with joint connectors, type GSV 34, and a bent slotted steel strap, be combined to a non-overlapping, angular mesh cable tray bend.



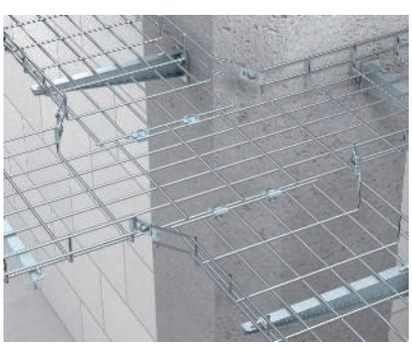
Creation of a mesh cable tray bend – round, overlapping
After appropriate cutting of the mesh cable trays, they can, together with joint connectors, type GSV 34, and an overlapping bent slotted steel strap, be combined to a round mesh cable tray bend.

Creation of a mesh cable tray bend - round
Cutting out every second grid allows the creation of mesh cable tray bends with a larger radius. Fixing takes place using corner connectors, type GEV 36.

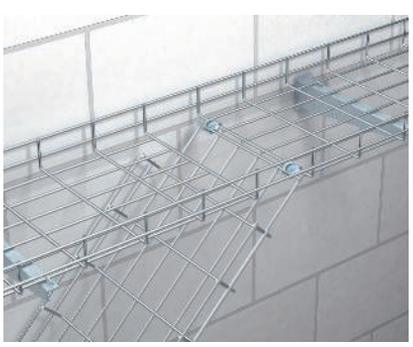
Rising and falling bends
Rising and falling vertical bends can be created by cutting every second grid in the side rail of the mesh cable tray.



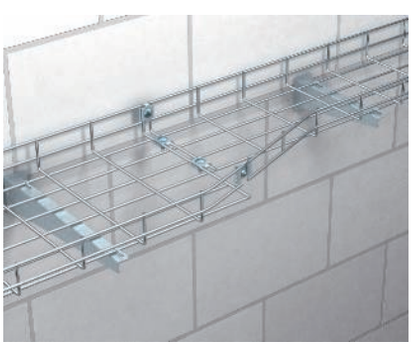
Creation of a mesh cable tray tee
After cutting the side rails and bending the straps, the corner connector, type GEV 36, and the joint connector, type GSV 34, can be used to create tees.



Creation of a mesh cable tray cross-over
After cutting the side rails and bending the straps, the corner connector, type GEV 36, and the joint connector, type GSV 34, can be used to create cross-overs.



Creation of a vertical exit
After cutting the mesh cable tray base, the vertically branching, cut mesh cable tray can be fixed using the joint connector, type GSV 34.



Creation of a reduction
Reductions are possible by single-sided cutting of the different mesh cable tray widths, bending the flaps in the required direction and using the corner connectors, type GEV 36, and the joint connector, type GSV 34.

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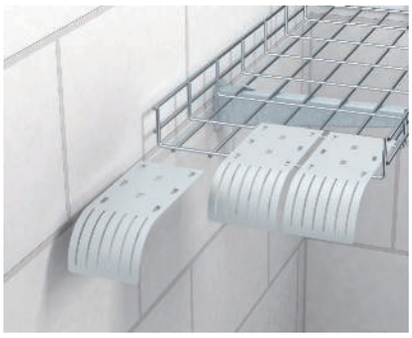
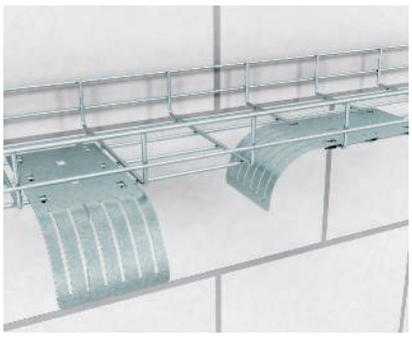
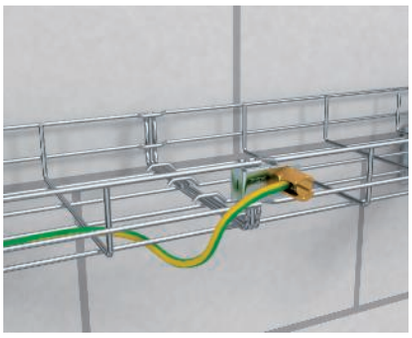


Mesh cable tray with cable exit plate
Cable exit plate for screwless mounting in mesh cable trays. The cable exit plate allows maintenance of pre-specified bend radii.



Mesh cable tray with cable exit plate
The cable exit plate can be installed in lengthwise and transverse directions.



Earthing terminal / earth connection
Earthing terminal for fastening the equipotential bonding wire to the cable support system.

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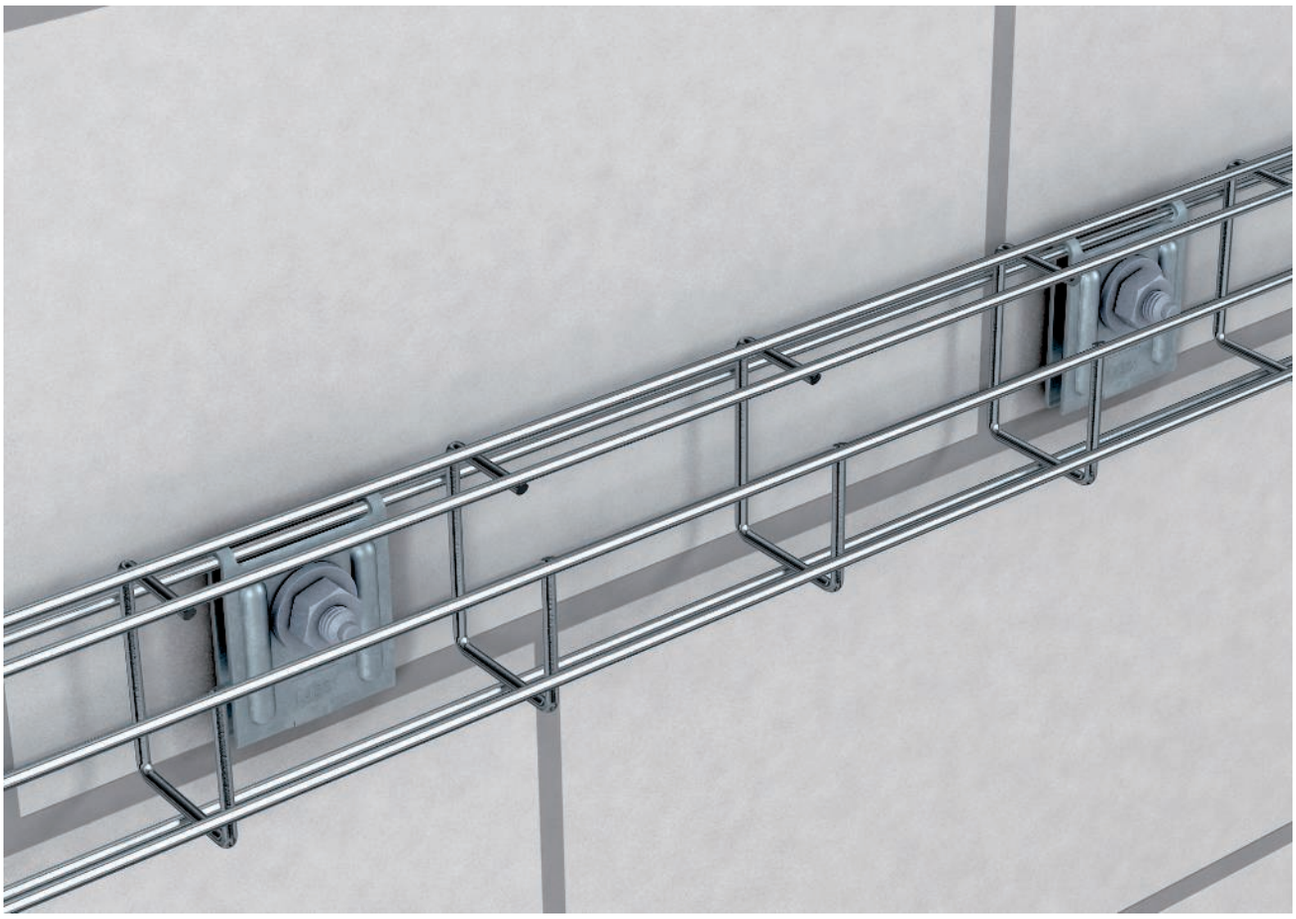
System description, G mesh cable tray systems



The Magic G mesh cable tray is the ideal extension of the Magic solutions for the OBO Bettermann mesh cable tray systems.
The quick Magic connection means that a screwless and easy-to-mount variant is now offered for the G mesh cable tray system as well.
Even in false ceiling mounting, it is an ideal alternative through direct wall or ceiling mounting. The Magic G mesh cable tray is available in four sizes and three surfaces, thus offering ideal solutions for all kinds of tasks.

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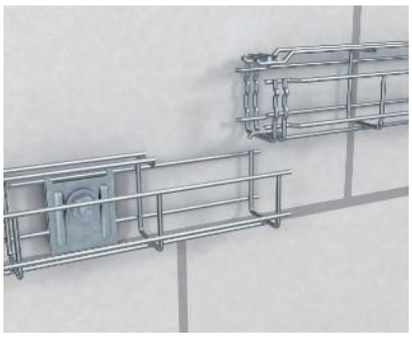
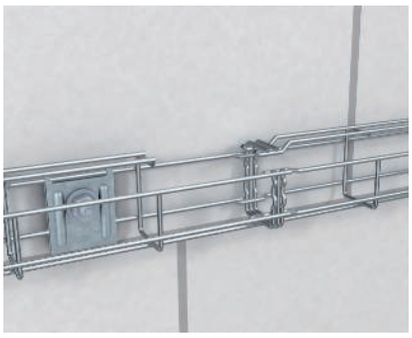
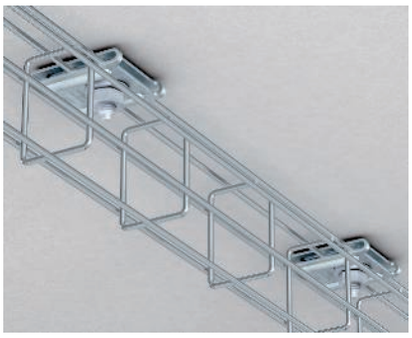
Mounting aid, G mesh cable tray systems



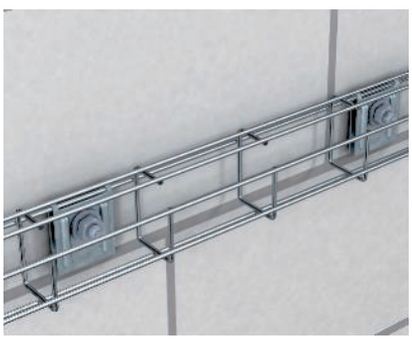
Straight connection of G Magic mesh cable tray
Creation of a screwless straight connection of the G mesh cable tray, type G GR-Magic®, by interconnecting two stock lengths.



Straight connection of G Magic mesh cable tray
The permanent, stable connection is created by plug connection.



Direct ceiling mounting
Direct ceiling mounting of the G mesh cable tray Magic using the clamping piece, type K 12 1818.



Wall mounting of G mesh cable trays
Wall mounting of G mesh cable trays with wall bracket, type K 12 1818.

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System description, C mesh cable tray

The C mesh cable tray system from OBO Bettermann can fulfil the highest requirements for load capacities and versatility. The C shape allows support widths of up to three metres. This system, with its 50 mm side height, together with the optimised accessories such as clamping pieces, quick connectors, separating retainers, suspensions profiles, installation profiles, etc. is an ideal addition to the overall mesh cable tray system and is used both in industry and in all other areas of professional electrical installations.

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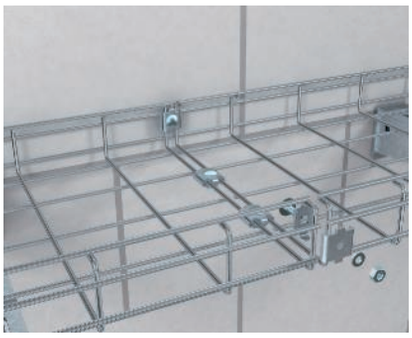
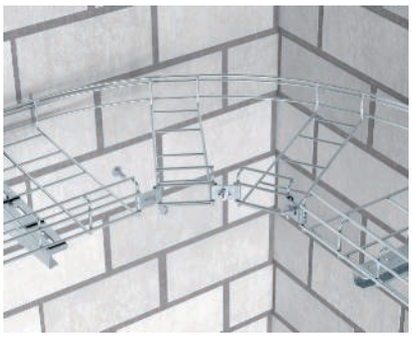
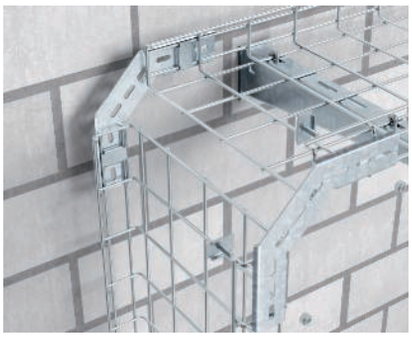
Mounting aid, C mesh cable tray



Straight connection of C mesh cable tray
Creation of a straight connection on C mesh cable trays with the joint connector, type GSV 34.



Horizontal bends
Implementation of a horizontal bend for C mesh cable trays with corner connector, type GEV 36.



Vertical bend application
Vertical bend mounting with 90° installation profile.

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R0UBA14GZ024PN26
R0UBA14GZ024PN27
R0UBA14GZ024PN28
R0UBA14GZ024PN29

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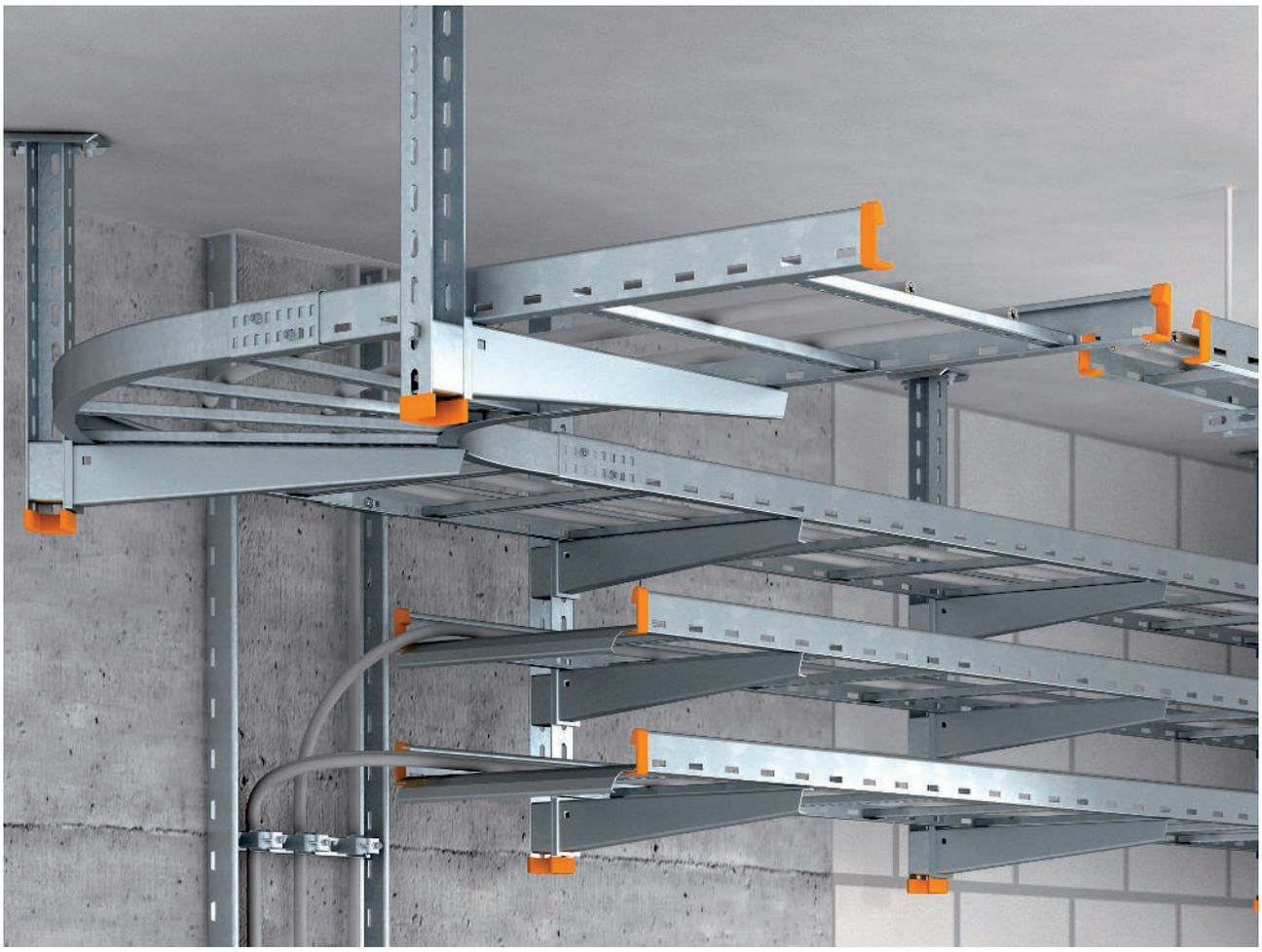
System description, cable ladder systems



The high load capacity and good ventilation of the OBO cable ladder systems can offer tangible benefits, in particular during the installation of power cables. OBO Bettermann's cable ladder systems can be used universally and, due to the continuous rail and rung perforation, can offer countless installation benefits. A factor guaranteeing easy mounting is the option of integrated fastening of cables using OBO U clamps to the rungs, which are available in various different versions. OBO cable ladder systems are shipped folded up, thus saving space during transport and storage. OBO cable ladder systems can be supplied in lengths of 3 m and 6 m, in all standard widths from 200 to 600 mm and width rail heights of 45, 60 and 110 mm. On the following pages, you can select your preferred mounting variant from the installation diagrams shown and combine the corresponding articles in the order section.

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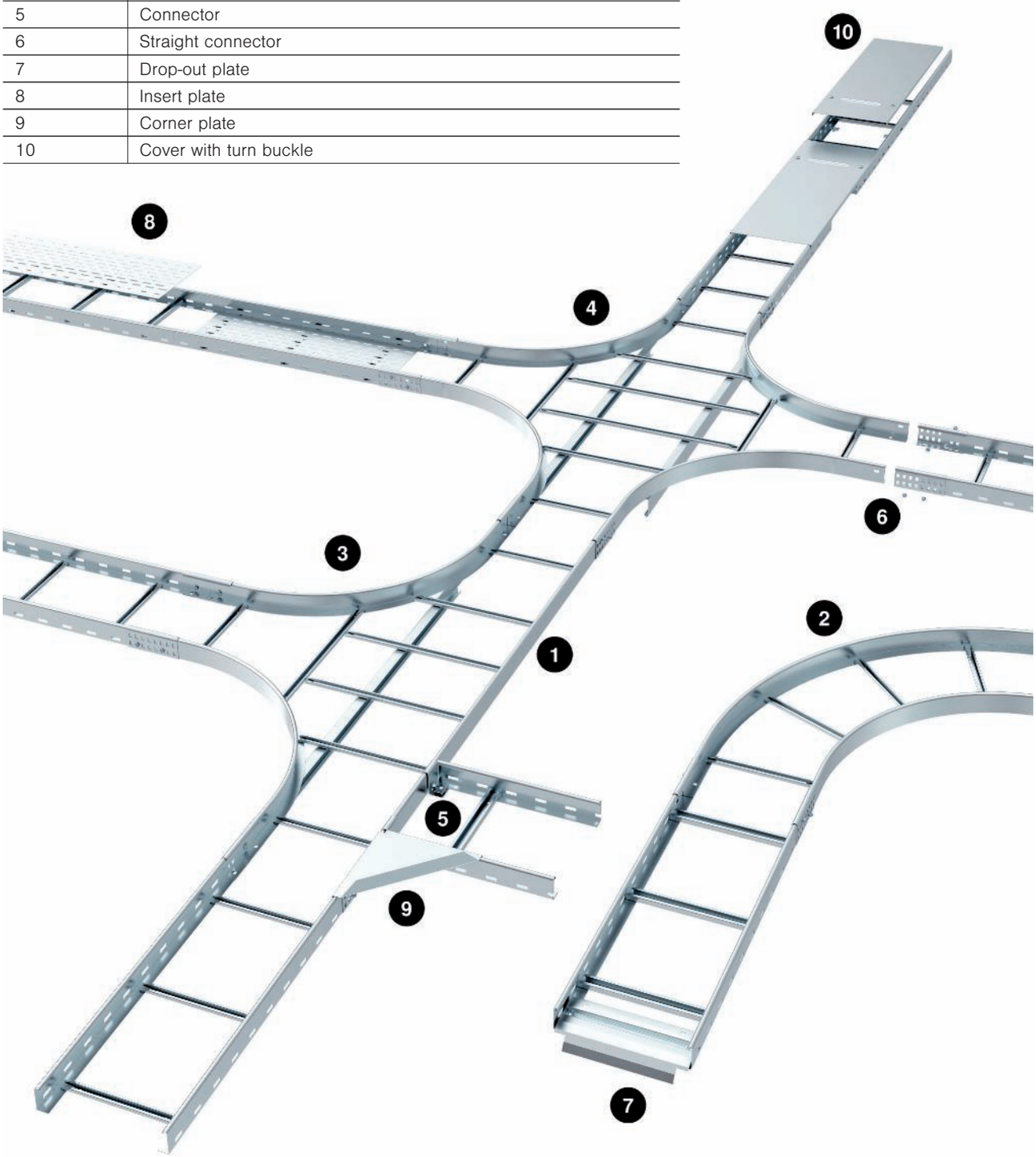
System components

1	Cable ladder
2	90° bend
3	Tee
4	Cross-over
5	Connector
6	Straight connector
7	Drop-out plate
8	Insert plate
9	Corner plate
10	Cover with turn buckle



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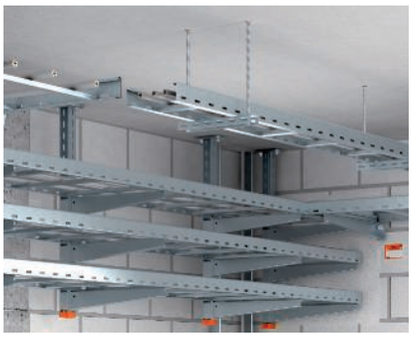
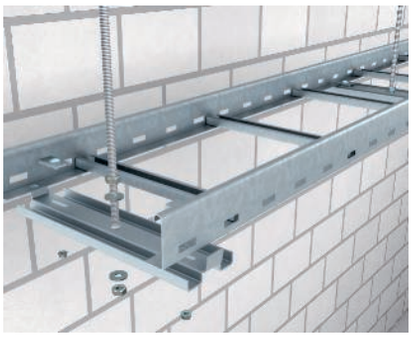
Mounting aid, cable ladder system

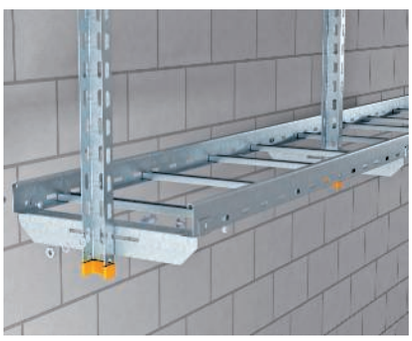


Support and threaded rod suspension application
Example of installing cable ladders with supports of U profiles and threaded rod suspension.

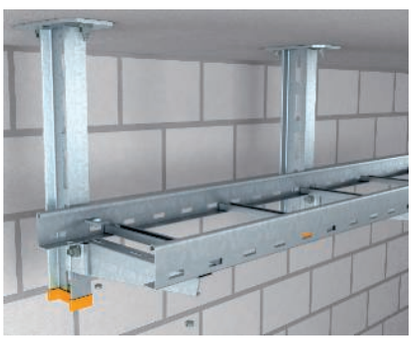
Jump application
Implementation of vertical jumps with adjustable connectors, e.g. for ceiling joists.



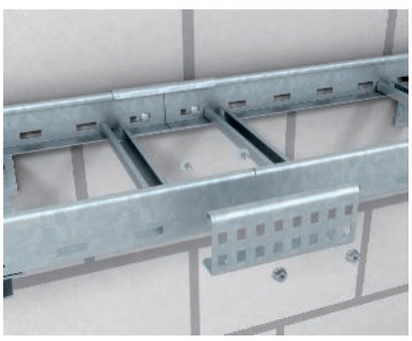
Centre suspension
Threaded rod suspension of a cable ladder using the central hanger, type MAHL, and threaded rod, type 2078/M12.



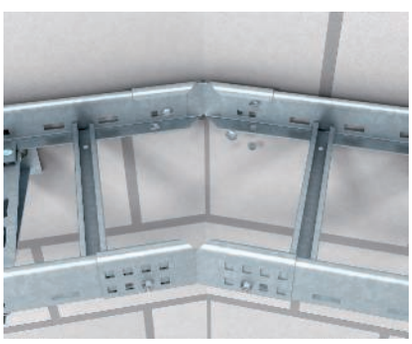
Cable ladder centre suspension with U profile
Installation of a cable ladder with central suspension hanger MAHU and a U support.



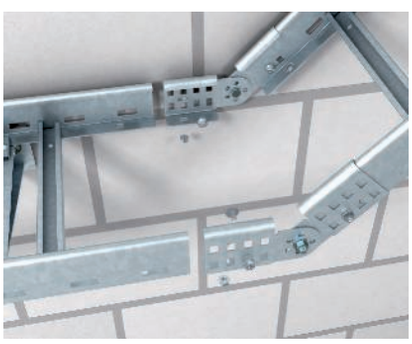
Support suspension
Suspension of a cable ladder with supports and support brackets.



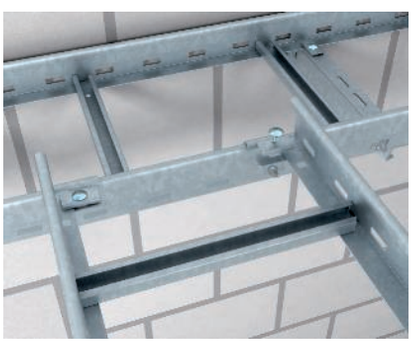
Straight connection of cable ladders
Straight connection of cable ladder with straight connector, type LVG.



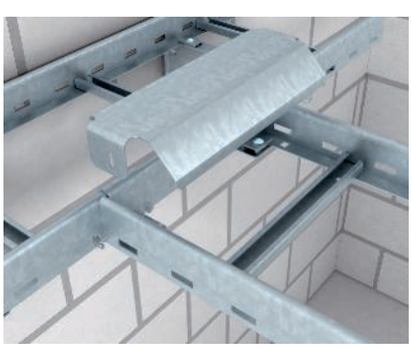
Horizontal angle connection of cable ladders
Horizontal angle connection with straight and angle connectors, type LWVG.



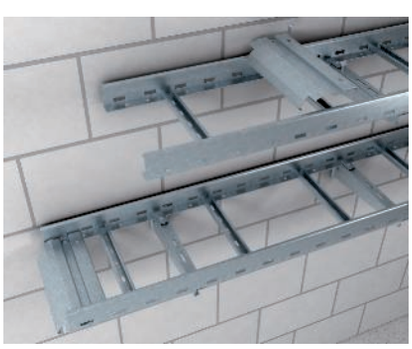
Vertical angle connection of cable ladders
Creation of a vertical angle connection using adjustable connectors, type LGVG.



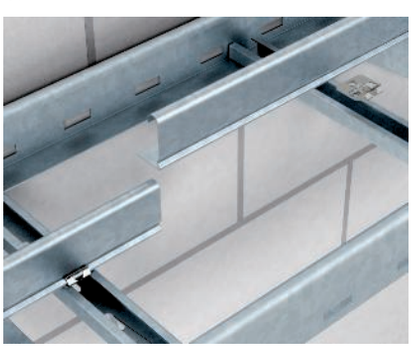
Installation of tee
Creation of a horizontal tee exit of two cable ladders at different heights. The support angle, type LAW, is required to fix two cable ladders.



Tee with support plate
Creation of horizontal tees for cable ladders running at the same height. To increase the cable supporting surface and to protect the cables, use support plates, type LALB. Additional supports should be planned for the area of the exits.



Vertical cable exit
The drop-out plate, type LAB, is used to increase the cable supporting surface for vertically exiting cables and as cable protection.



Screwless barrier strip fastening
Screwless fastening a barrier strip in cable ladders with clamping piece, type KS KL.

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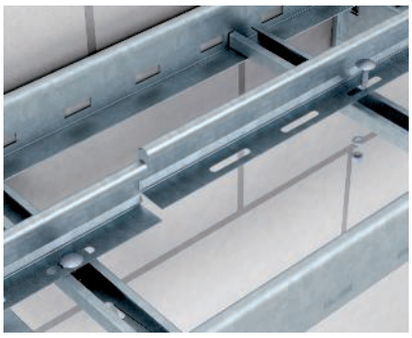
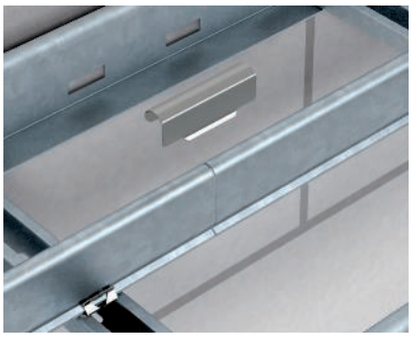
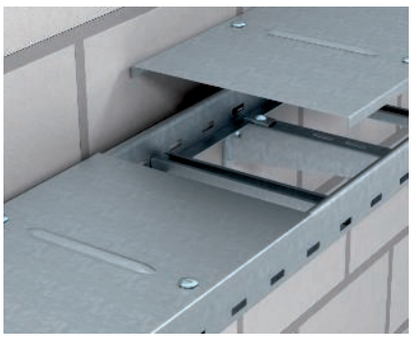


Screwed barrier strip fastening
Screwed mounting of the TSG barrier strip through the perforated rung of the cable ladders.

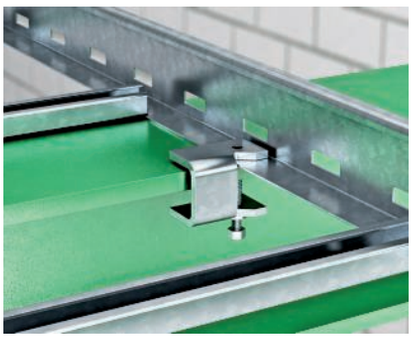


Straight barrier strip connection
Screwless straight connection of barrier strips in cable ladders using the barrier strip TSGV.

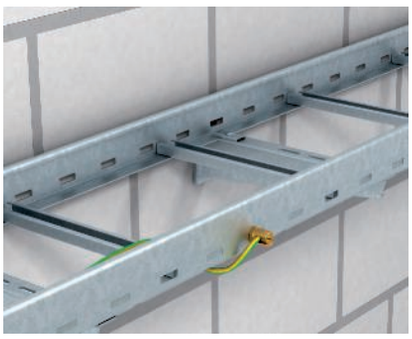
Installation of insert plate
Installation of insert plates, type ELB-L.



Cover mounting
Positioning and fastening of the cover on the cable ladder using turn-buckle, type DRL.



Cable ladder clamping piece
Cable ladder clamping piece KLL for direct mounting of cable ladders to steel girders.



Earthing terminal / earth connection
Earthing terminal for fastening the equipotential bonding wire to the cable support system.

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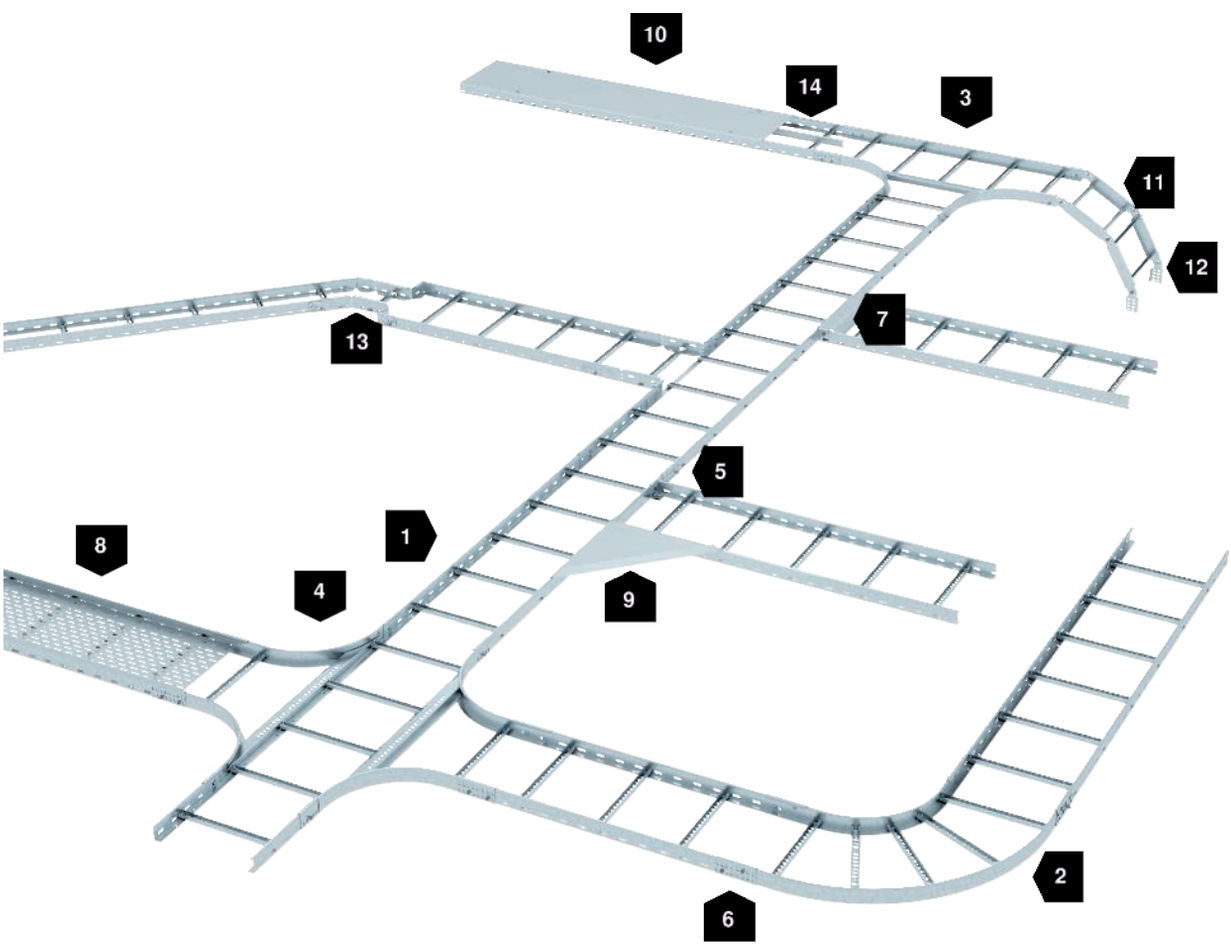
System components

1	Cable ladder
2	90° bend
3	Tee
4	Cross-over
5	Connector
5.5	Straight connector
7	Drop-out plate
8	Insert plate
9	Corner plate
10	Cover with turn buckle



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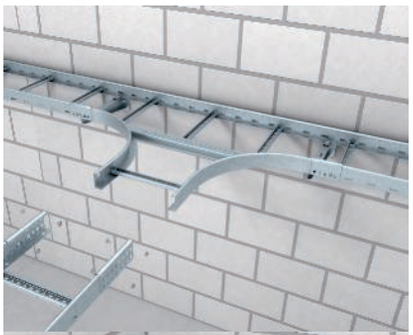

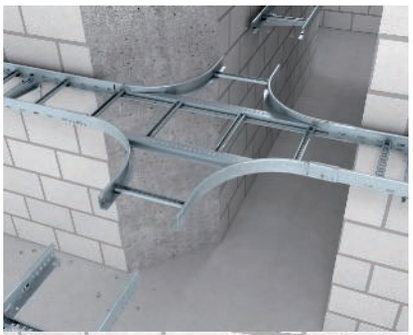


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ABUS 1,6t+1,6t

Planning aids, wide span systems

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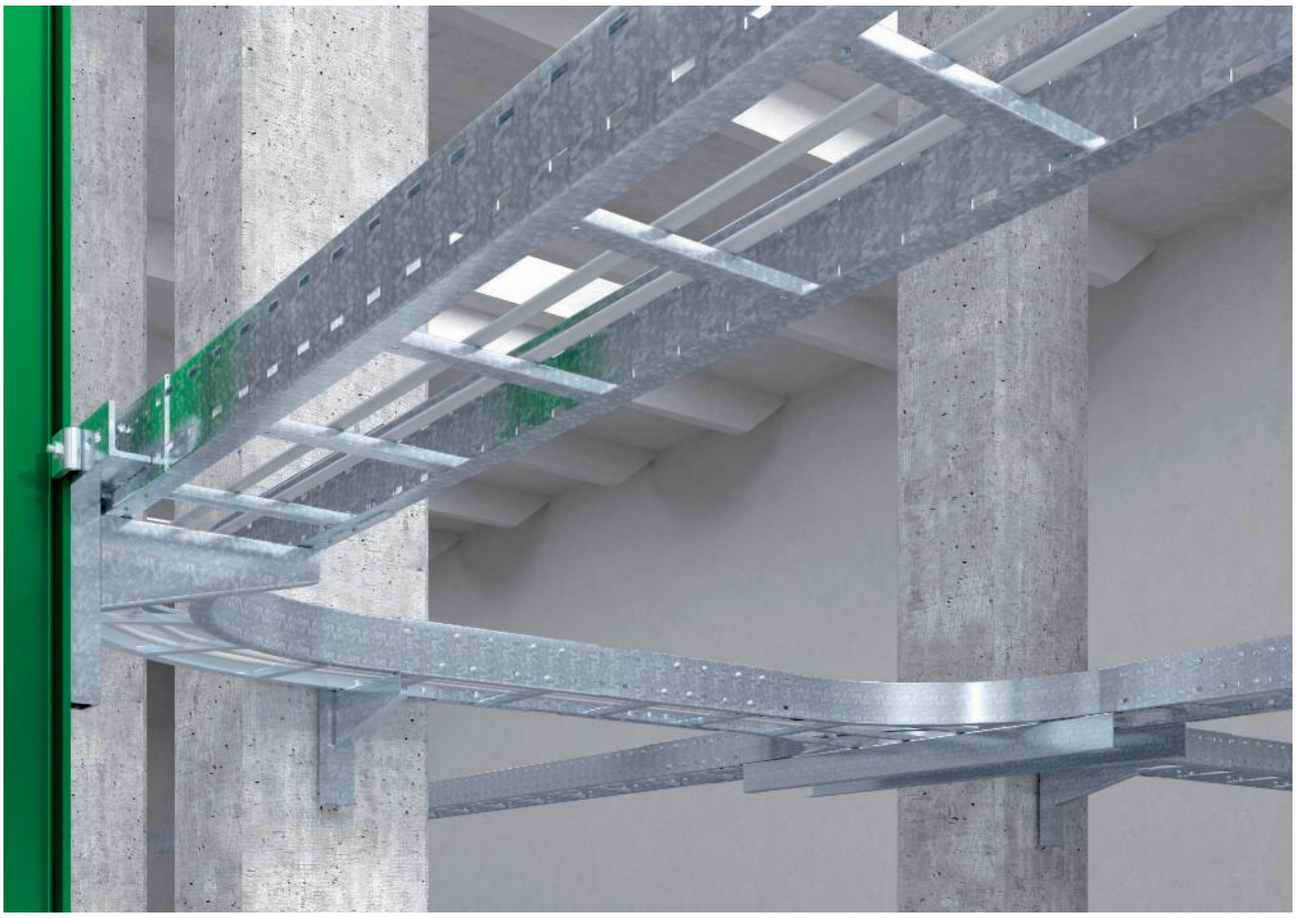
System description, wide span cable ladder systems



When you need to bridge wide spans and support high cable loads, the OBO wide span systems are the perfect solution. The product range comprises cable trays and cable ladders with widths of between 200 and 600 mm and side heights of 110 to 200 mm. Comprehensive system accessories such as fittings and all the fastening materials for concrete and steel mounting round off this product range perfectly. OBO wide span systems have proven their worth in many areas of industrial and plant construction. These systems are becoming ever-more popular in buildings with steel framework. OBO wide span systems are the complete product range for all applications and requirements and, with their large load capacity combined with large spans, can provide efficient and optimised power supplies.

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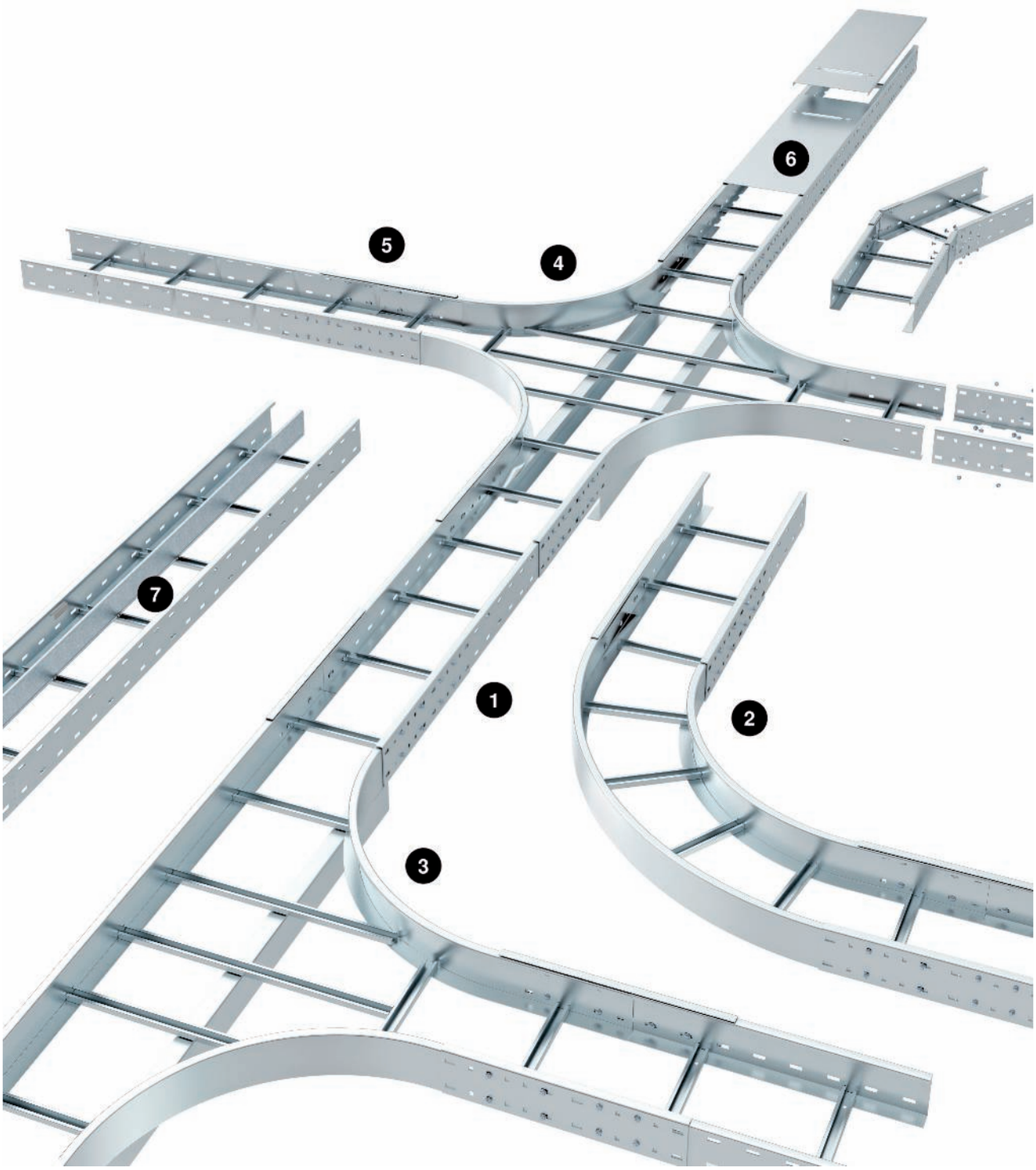
Installation principle, wide span cable ladder systems

System components

1	Wide span cable ladder
2	90° bend
3	Tee
4	Cross-over
5	Straight connector
6	Cover with turn buckle
7	Barrier strip



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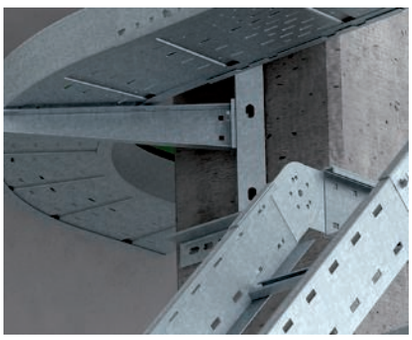
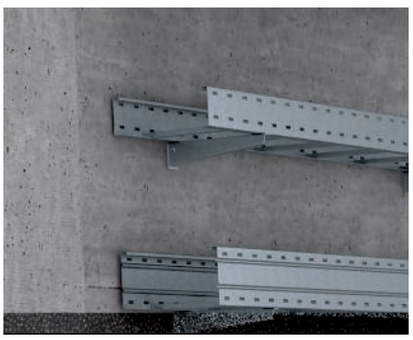
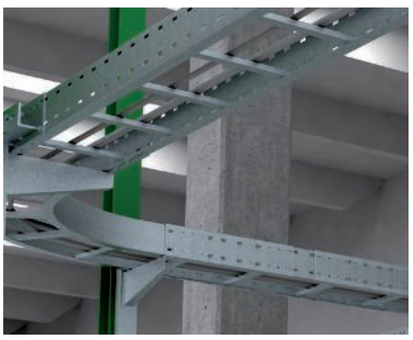
Mounting aid, wide span cable ladder systems



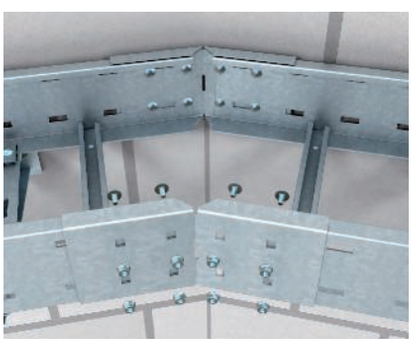
Wide span fittings application
Mounting examples for horizontal and vertical changes of direction for wide span systems.



Wall mounting application
Direct wall mounting of wide span systems.

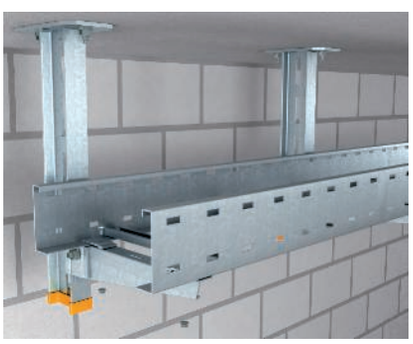


Girder clamping application
Mounting of a wide span system clamped to steel girders.



Horizontal wide span angle connection
Horizontal angle connection of wide span cable ladders with angle connectors, type WRWVK.

Vertical wide span adjustable connection
Vertical angle connection of wide span cable ladders with adjustable connectors, type WRGV.

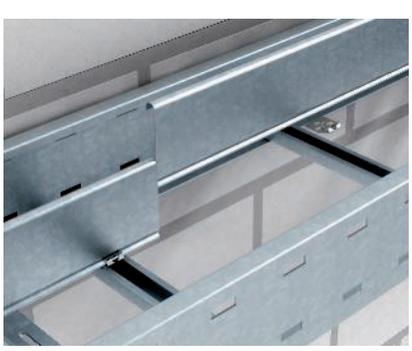


Fastening of wide span cable ladder
Fastening of wide span cable ladders to the bracket using clamp, type LKS 60/5.

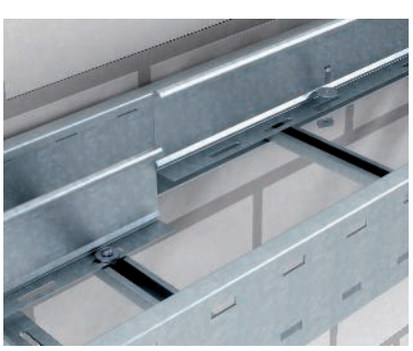
Installation of 90° bend
Bend in combination with wide span cable ladder. The bend is connected to the wide span cable ladder using external connectors.

Installation of tee
Tee in conjunction with wide span cable ladder. The tee is connected to the wide span cable ladder using external connectors.

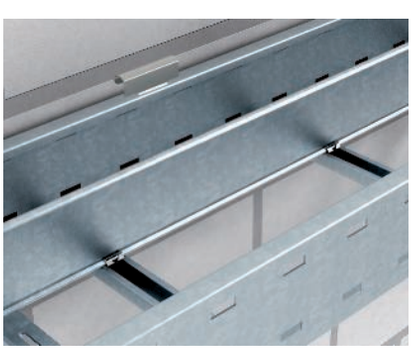
Installation of cross-over
Cross-over in combination with wide span cable ladder. The cross-over is connected to the wide span cable ladder using external connectors.



Screwless barrier strip fastening
Screwless fastening a barrier strip in wide span cable trays and cable ladders with clamping piece, type KS KL.



Screwed barrier strip fastening
Barrier strip mounting in wide span cable ladders. Fasten using slide nuts and hexagonal bolts.



Straight barrier strip connection
Screwless straight connection of barrier strips in wide span cable trays and cable ladders using the barrier strip TSGV.

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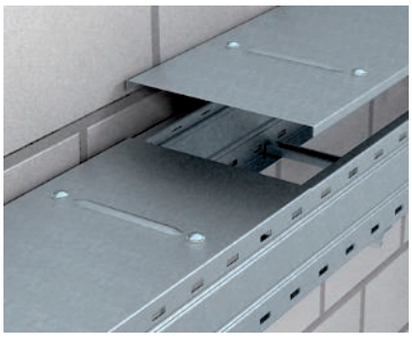
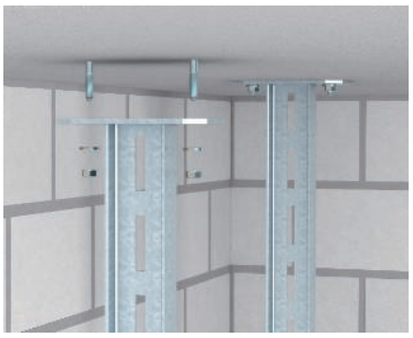


Cover mounting
Installation of covers with turn-buckles.

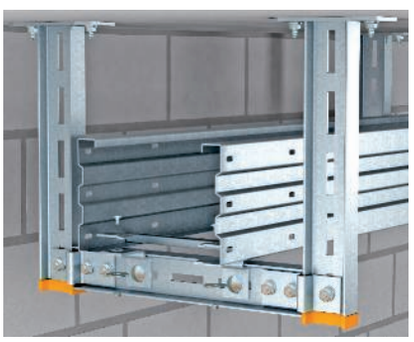


Suspended construction, concrete
Suspension suitable for wide span system in concrete with IS 8 support and anchor bolts.

Suspended construction, steel
Suspension suitable for wide span system with IS 8 support, clamped to steel girder.

Wall bracket, heavy-duty
Installation of the heavy-duty wall bracket, type AWSS, with clamping angle, type KWS, to steel girder to accept a wide span system. The wall bracket can also be mounted on concrete walls with anchor bolts.

45° adapter plate
Installation of the 45° adapter plate, type KA-E 45, on the steel girder using clamping angles, type KWS. The adapter plate can also be installed on concrete walls with anchor bolts.



Mounting example
Double-sided support mounting of I profiles with transverse traverse. Fastening of a wide span cable ladder, type WKL 200, with clamp, type LKS 60/5, on the transverse profile.

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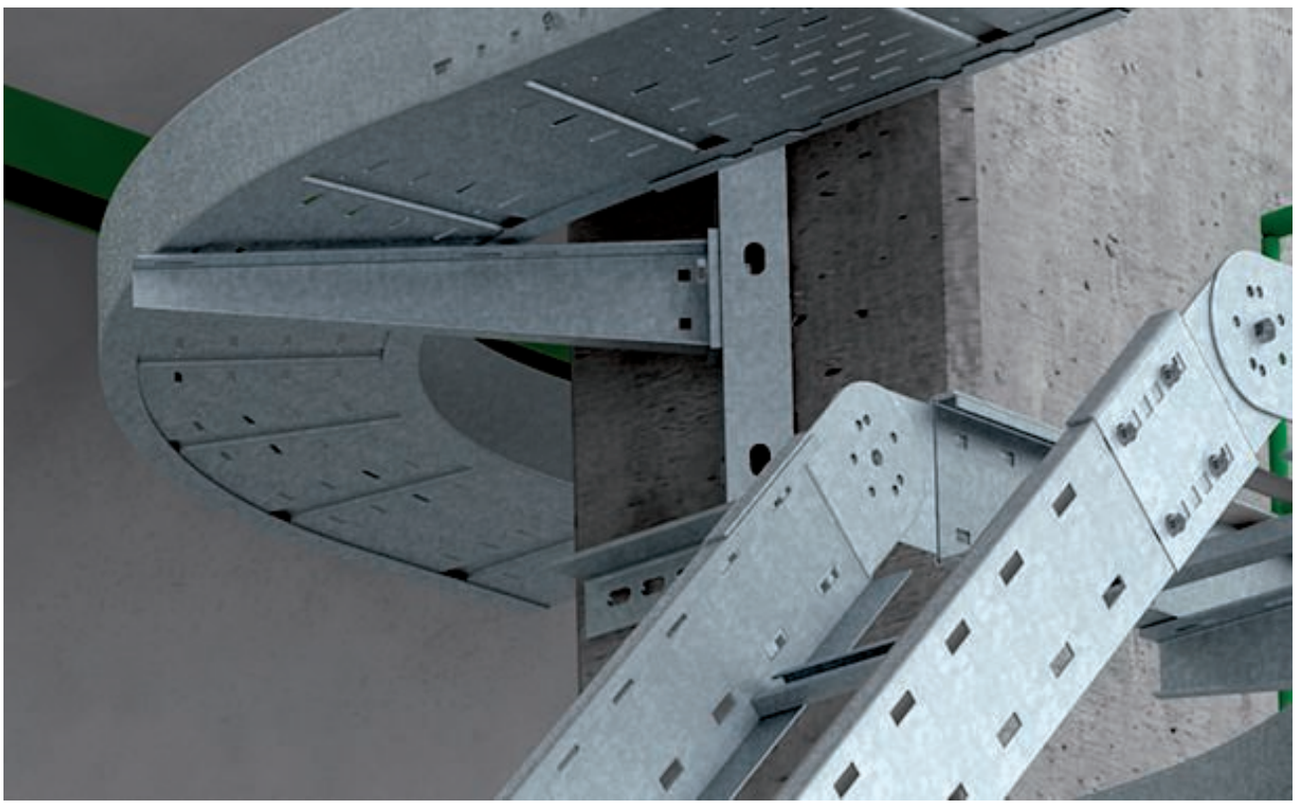
System description, wide span cable tray systems



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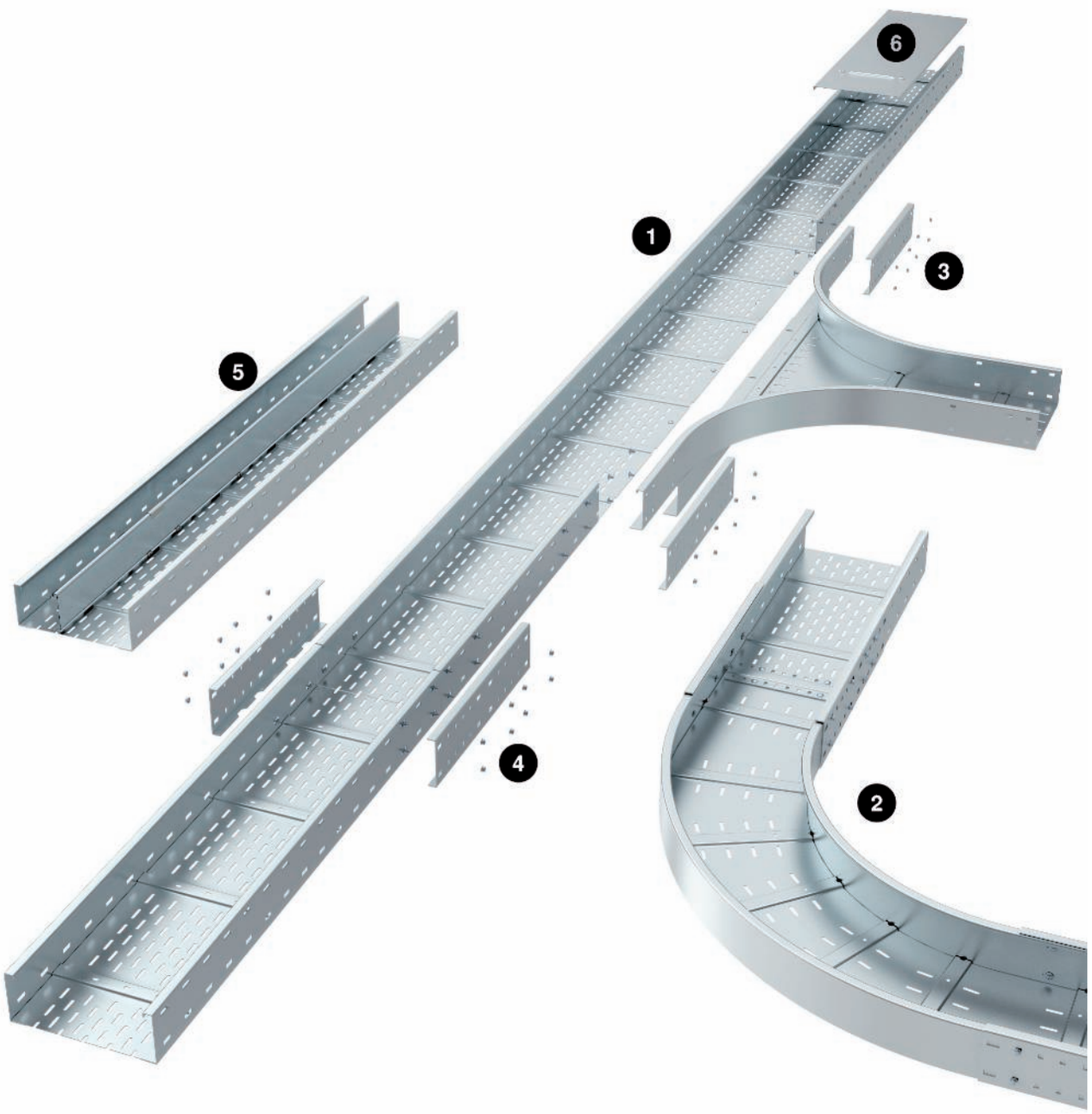
Installation principle, wide span cable tray systems

System components

1	Wide span cable tray
2	90° bend
3	Add-on tee
4	Straight connector
5	Barrier strip
6	Cover with turn buckle



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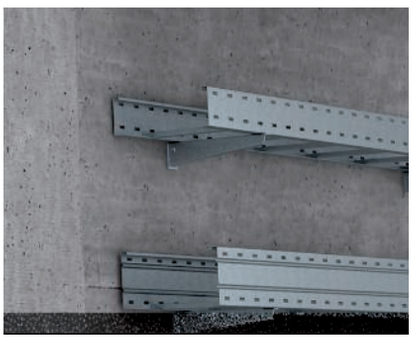
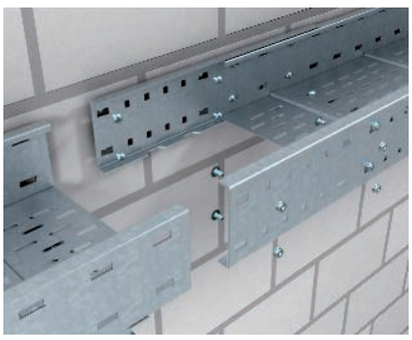
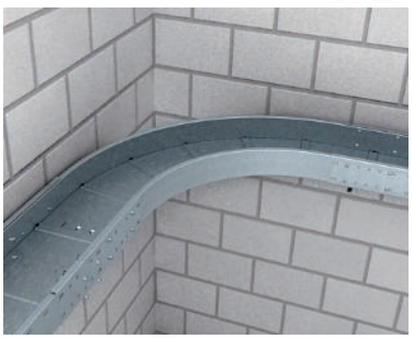
Mounting aid, wide span cable tray systems



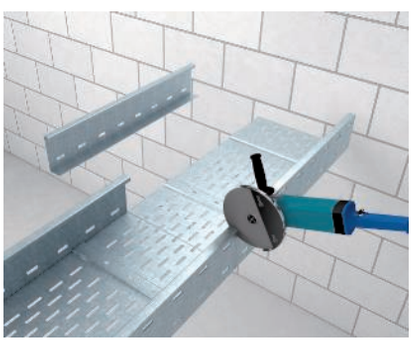
Wall mounting application
Direct wall mounting of wide span systems



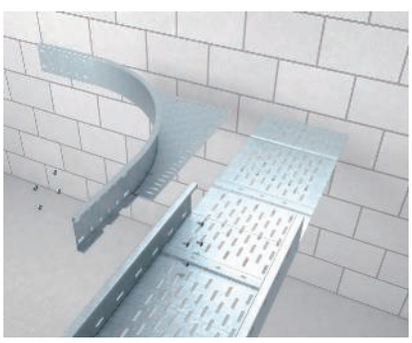
Wide span straight connection
Horizontal straight connection of wide span cable trays with straight connector set, type WRVL.



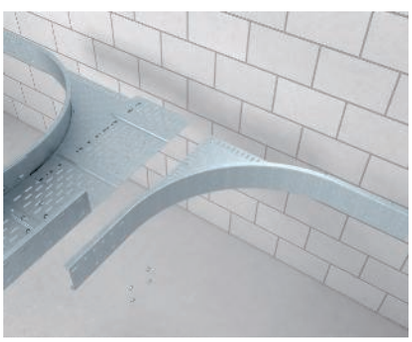
Installation of 90° bend
Bend in combination with wide span cable trays. The bend is connected to the wide span cable tray using external connectors and a joint plate.



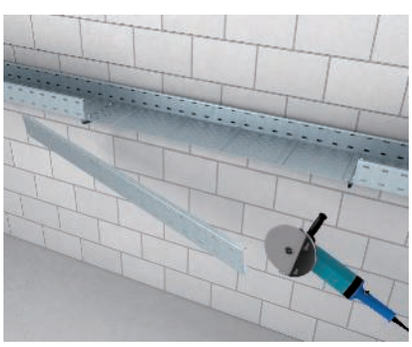
Creation of a tee with add-on corner
Removal of the side rails from the wide span tray.



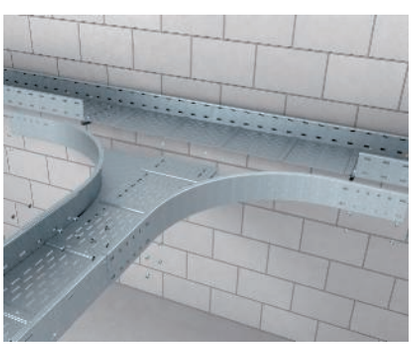
Creation of a tee with add-on corner
Installation of the first add-on corner, type WEAS 110.



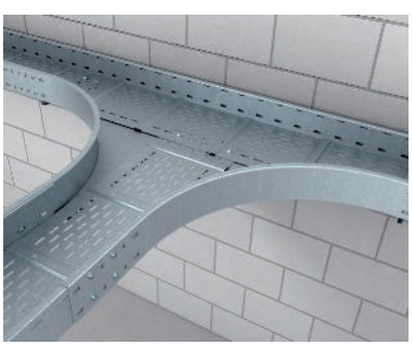
Creation of a tee with add-on corner
Installation of the second add-on corner, type WEAS 110.



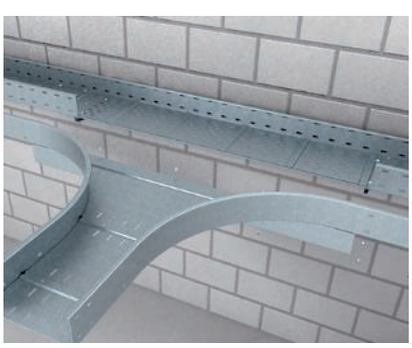
Creation of a tee with add-on corner
Removal of the side rail from the ongoing wide span tray.



Creation of a tee with add-on corner
Installation of the finished branch to the ongoing wide span tray.



Creation of a tee with add-on corner
Complete installation of a branch with add-on corner of type WEAS 110.



Mounting of mounting/branch piece
Add-on tee in combination with wide span cable tray. The side rail is removed for installation.

Mounting example
Double-sided support mounting of U profiles with transverse traverse. Fastening of a wide span cable tray, type WKSG 110, with truss-head bolts on the transverse profile.

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System description, vertical ladder systems

OBO vertical ladder systems for vertical routing of all kinds of cables. Available as light-duty vertical ladders with a side height of 45 mm, as a heavy-duty vertical ladder with U profiles and industrial vertical ladders with I profiles. Both the heavy-duty and industrial vertical ladders can be assembled in variable lengths. The side rails are standard profiles of type US 5 and IS 8, which are connected using the appropriate rungs. The continuous rail perforation of the system and the comprehensive accessories simplify and accelerate installation, which can take place either directly on the wall, clamped to a steel construction or also as a freestanding construction. The system is perfectly complemented with OBO clamp clips.

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Installation principle, vertical ladder systems

System components

1	Light-duty vertical ladder
2	Heavy-duty vertical ladder
3	Industrial vertical ladder
4	Cover with spacer
5	Rung seat with CPS4 rung

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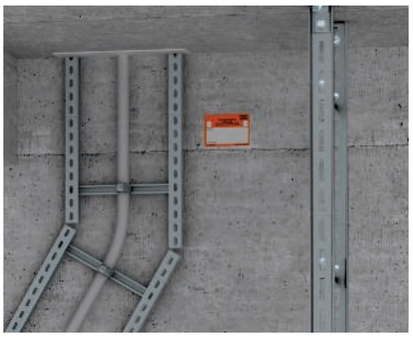
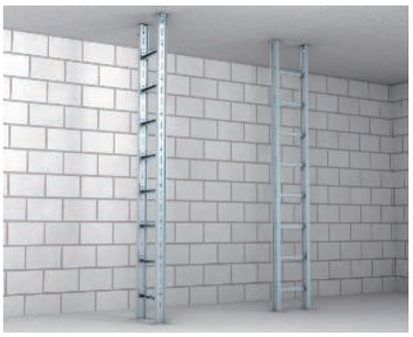
Mounting aid, vertical ladder systems

Wall mounting application
Wall mounting of a vertical ladder with mounting angles.



Change of direction application
Implementation of a change of direction with heavy-duty vertical ladder, type SLM.



Free-standing vertical ladder application
Mounting example for free-standing industrial vertical ladders, type SLS, fastened to the ceiling and floor.

Straight connection of vertical ladders
Connection of vertical ladders, types LG and SSL 60, with connectors, type LVG.

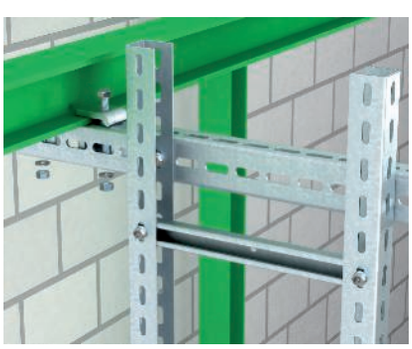
Angle connection of cable ladders
Creation of flexible vertical ladder angles with angle connector, type LWVG.

Adjustable connection of cable ladders
Creation of flexible vertical ladder angles with adjustable connector, type LGVG.

Wall mounting, light-duty vertical ladder
Wall mounting of light-duty vertical ladder, type SLL 45, with wall bracket, type WB 30/75.

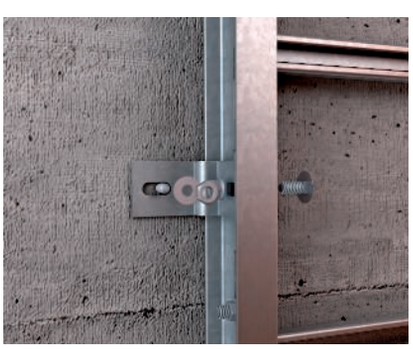
Direct wall mounting
Direct fastening of the vertical ladders LG and SSL with anchor bolts on the wall.

Wall mounting, heavy-duty vertical ladder
Wall mounting of heavy-duty vertical ladder, type SLM 50, with mounting angle, type BW.



Vertical ladder installation on steel
Installation of the heavy-duty vertical ladder, type SLM 50, with cantilever beam made of U profile, on a steel construction.

Cable fastening with U clamp
Fastening of a cable to the rung with U clamp.



Fastening of industrial vertical ladder
Industrial vertical ladders are fastened to steel girders using mounting angle, type BW80/55.

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Fastening of C profile rung
Fastening of C profile rung, type CK 40, in industrial vertical ladders, type SLS 80.

Fastening of angle rung
Fastening of the angle rung, type WSK 40, in industrial vertical ladders, type SLS 80.

Ceiling fastening
Fastening of a industrial vertical ladder, type SLS 80, to the ceiling using mounting angle, type BW.

Illustration of vertical shaft
Illustration of complete vertical ladder mounting.

Rung seat fixed to IS 8 support
Fastening of the rung seat, type SA, with profile rail, type CPS 4, in I support.

Rung seat in steel girder
Direct fastening (clamping) of the rung seat, type SAA, with profile rail, type CPS 4, on steel girder.

Cover mounting, vertical
Installation of the cover with spacer on a vertical ladder.

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System description, luminaire support systems

Whether in industry, in purpose-built buildings or in attractive buildings, OBO luminaire support systems simplify the installation of light systems in many areas of industry and buildings. They are also be suitable for flexible power and data supplies to machines and workstations. The OBO luminaire support system makes cable laying and the optimum positioning of lights child's play for any possible application. A pre-terminated system can be very easily created using the GST 18 connector system.

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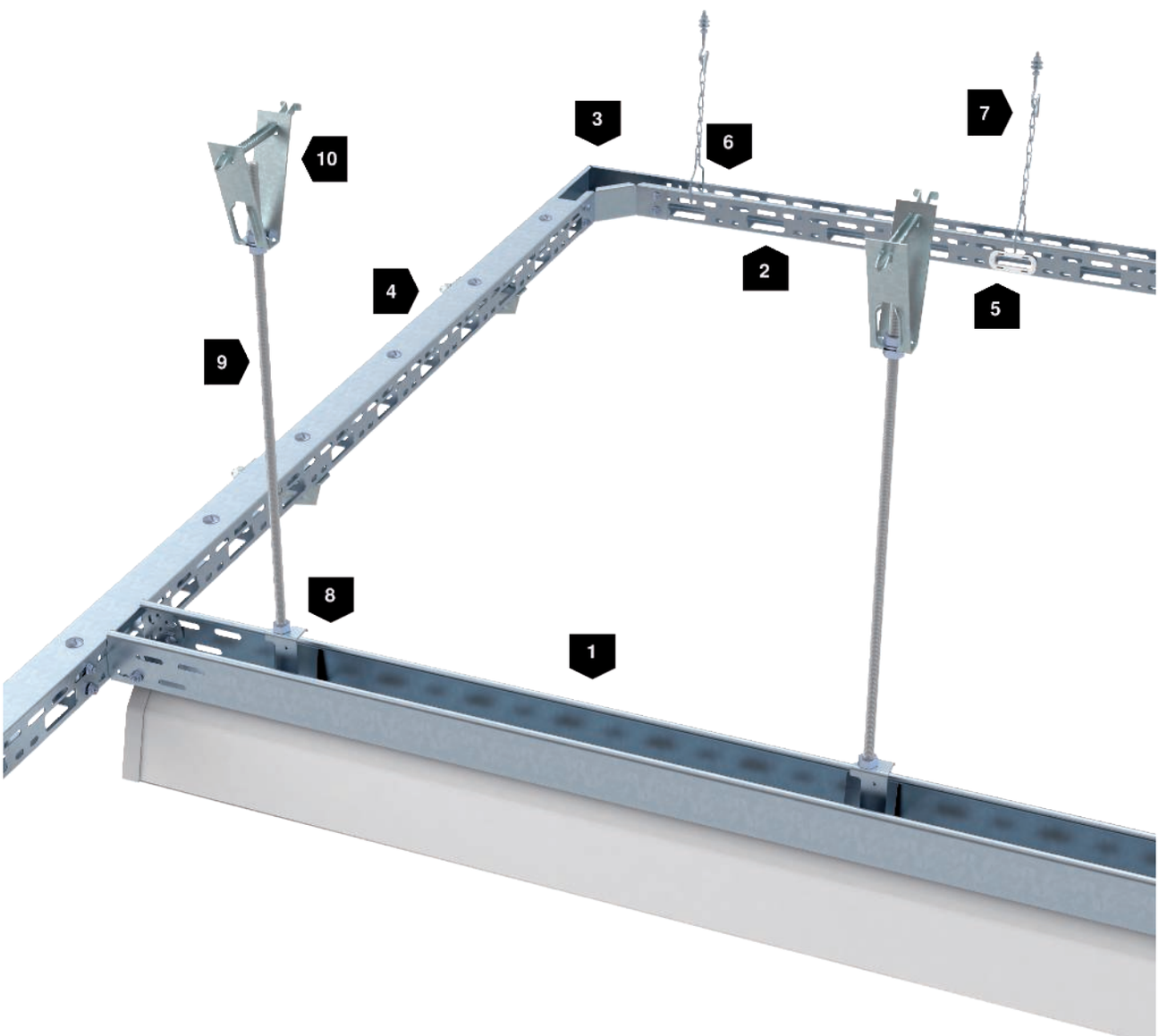
Installation principle, cable support systems with integrated LED module

System components

1	Cable tray
2	Cable tray adapter LED
3	LED module
4	Lighting support clamp
5	Supply of LED module
5.5	Device connection with interior gland
7	Junction box
8	Mounting plate



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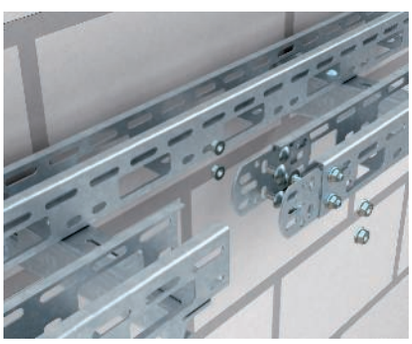
Mounting aid, luminaire support systems

Luminaire support tray application
Suspension of the luminaire support tray with chain and suspension bracket.

Luminaire support tray application
Suspension of a luminaire support tray with centre suspension MAH and threaded rod.

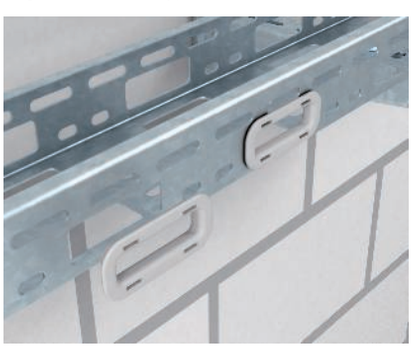
Straight connection of luminaire support tray
Horizontal straight connection of the luminaire support tray, type LTR with straight connector set, type RV 607.



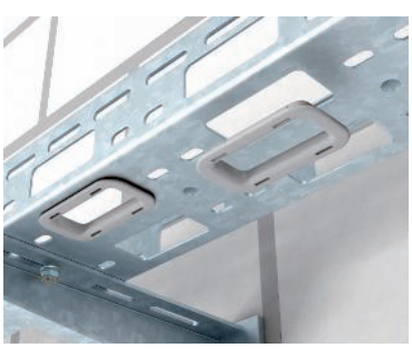
Longitudinal connection of luminaire support rail
Horizontal longitudinal connection of the luminaire support rail, type LTS, with straight and angle connectors, type VF AZK.

Horizontal angle connection
Horizontal angle connection of the luminaire support rail, type LTS, with straight and angle connectors, type VF AZK.

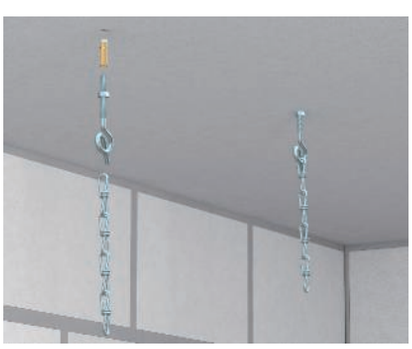
Vertical straight connection
Vertical straight connection of the luminaire support tray, type LTS, with two straight and angle connectors, type VF AZK.



Side rail cable protection ring
Insertion of the cable protection rings, type KSR 910, in the side rail of the luminaire support rail.



Floor cable protection ring
Insertion of the cable protection rings, type KSR 915, in the base of the luminaire support rail.



Chain suspension
Implementation of a chain suspension for luminaire support systems with anchors, ceiling hook, type 948/TG6 and suspension chain, type LTK-K.

Centre suspension
Efficient creation of centre suspensions. The luminaire support tray is fastened to the central suspension hanger without bolts.

Pre-wired luminaire supports
Mounting of a pre-terminated luminaire beneath a luminaire support tray.

Mounting of luminaire support fitting
Mounting of luminaire support fitting by simple interconnection of fitting and luminaire support tray.

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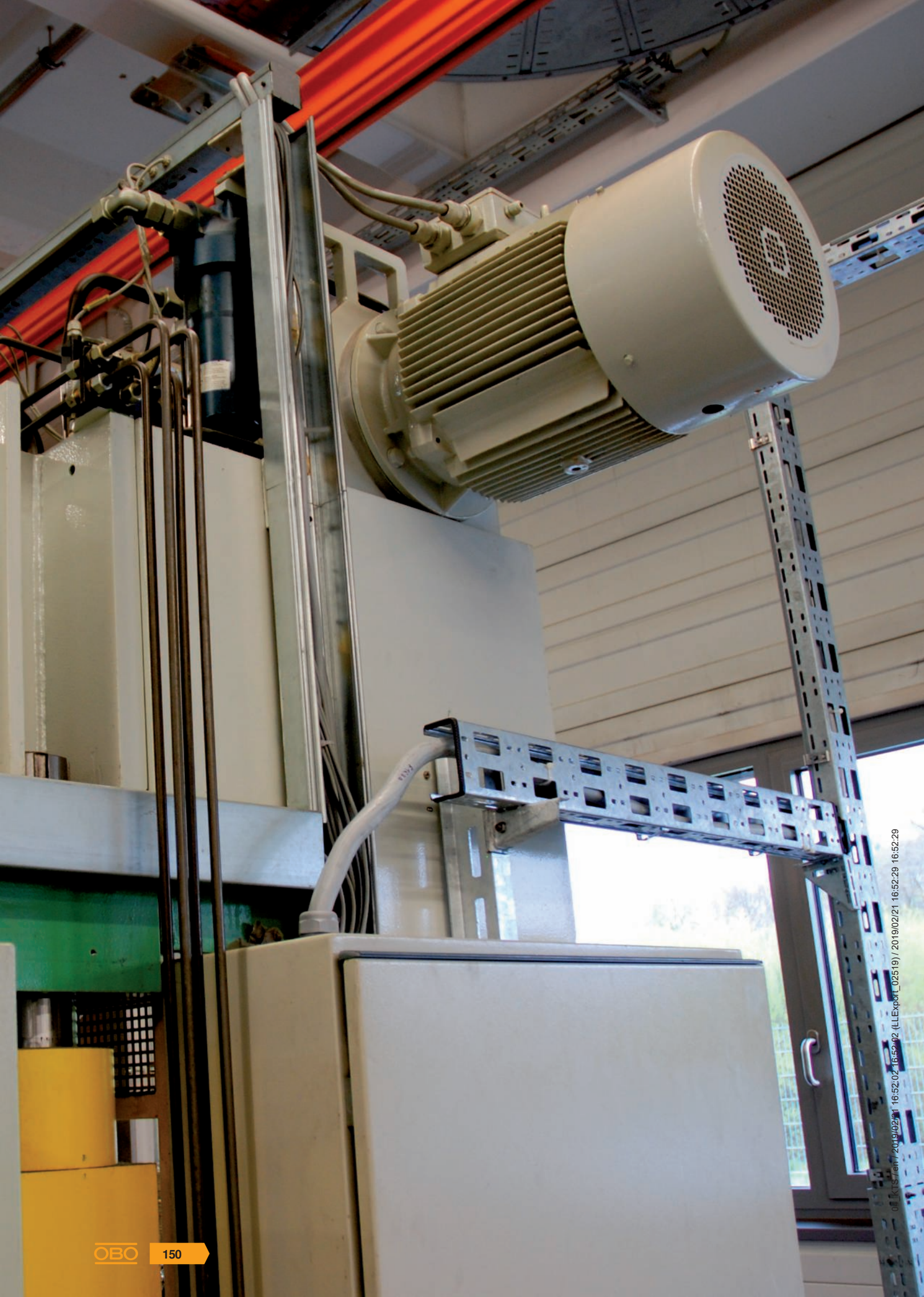

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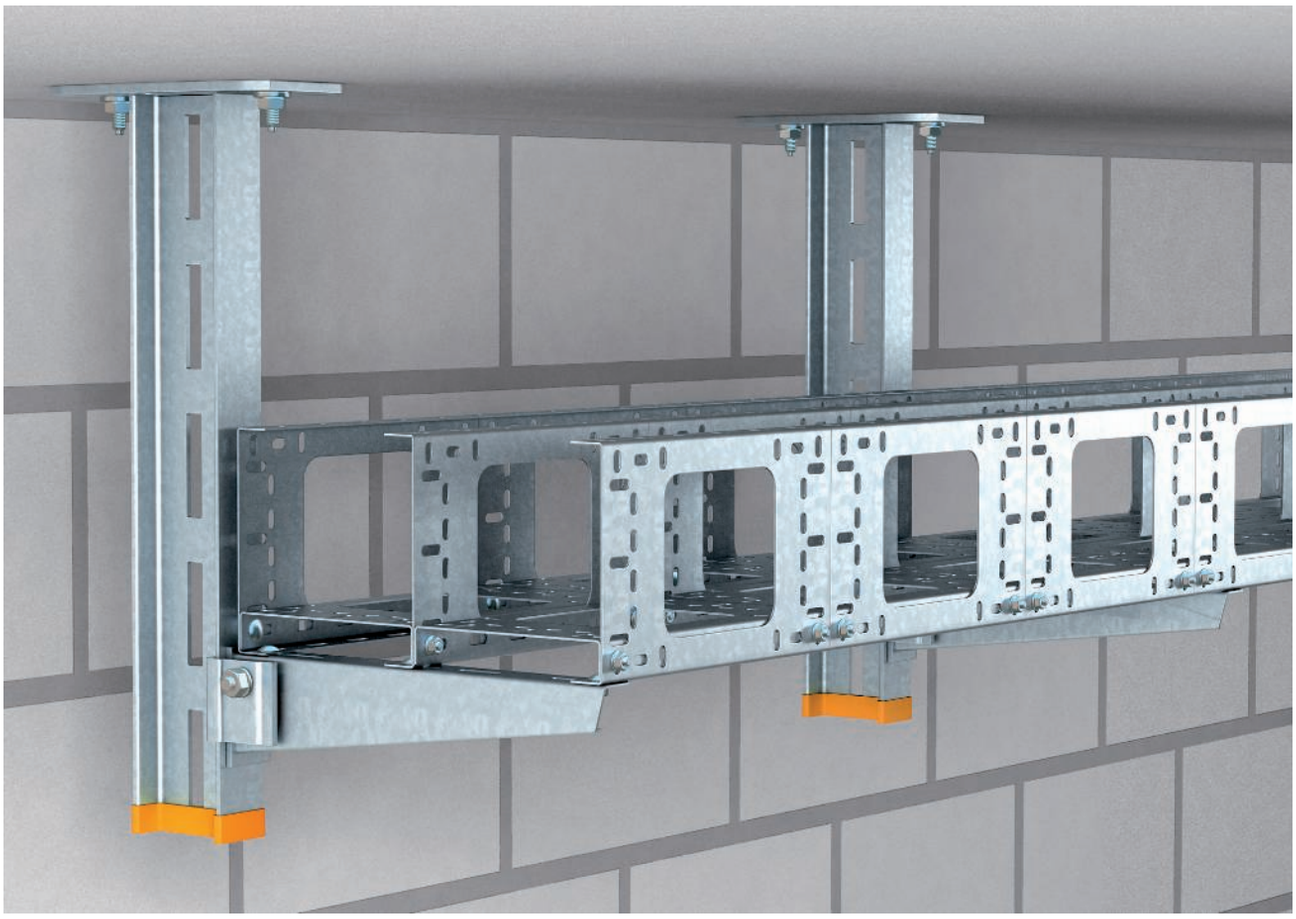
System description, construction kit systems



The modular systems - the product range with infinite opportunities. Exiting branches to individual consumers can be implemented with the AZ small duct. The BKK system can be used as a cable link in chemical plants, where large distances and high cable loads must be bridged safely with some fairly large support spacings. Electrical drives, such as motors, etc., are connected using the motor connection column. Thus the modular system, together with the individually combinable range of accessories, is the universal solution to any task.

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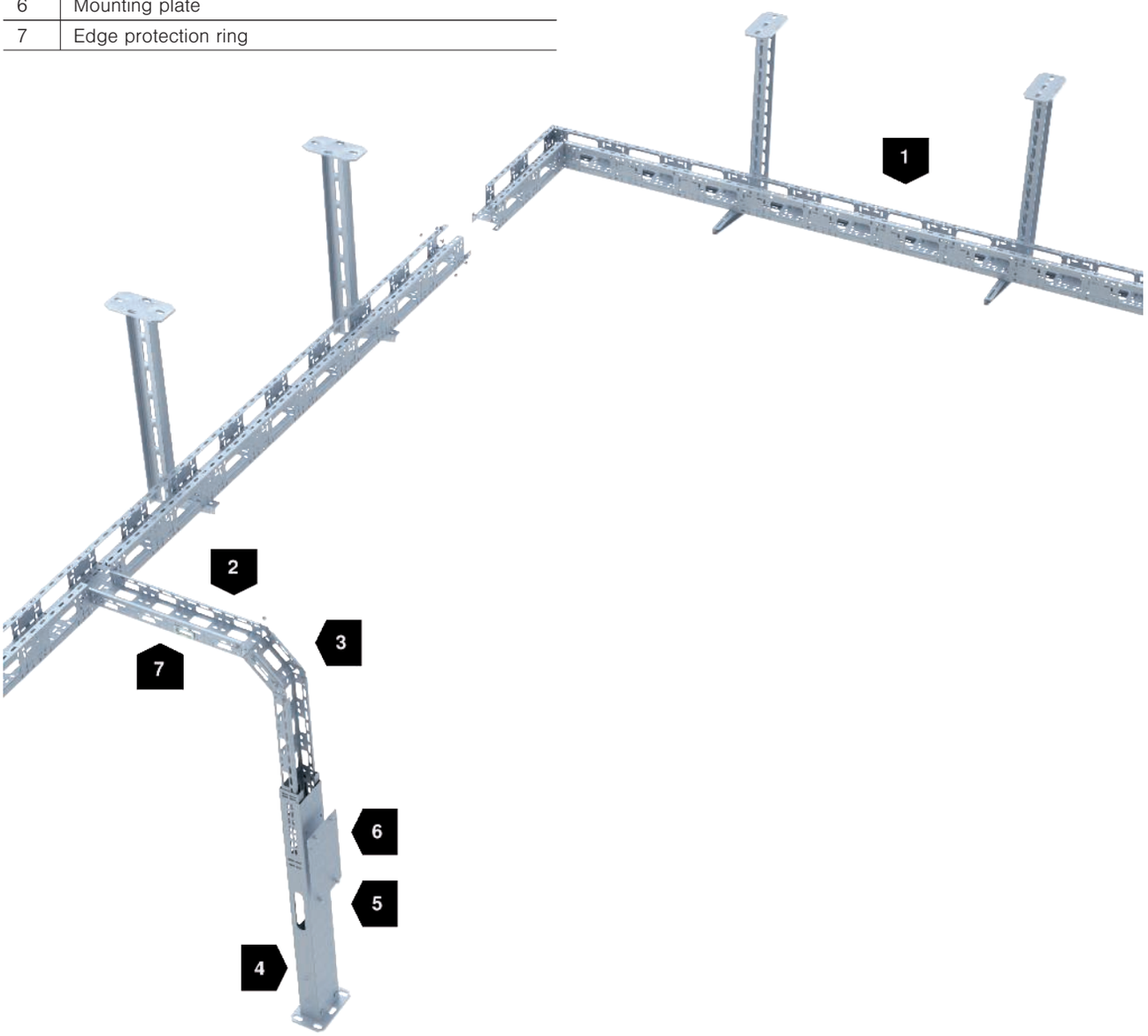
System components

1	BKK basic profile
2	AZ small duct
3	Straight and angle connector
4	Motor connection column
5	Cover for motor connection column
6	Mounting plate
7	Edge protection ring



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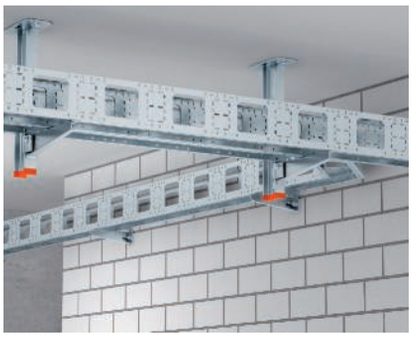
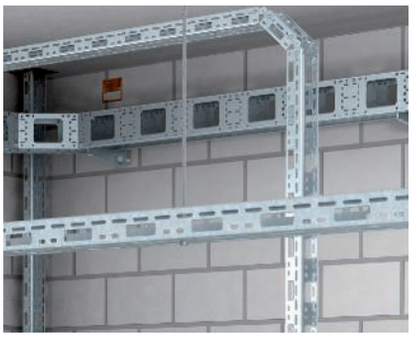
Mounting aid, modular systems

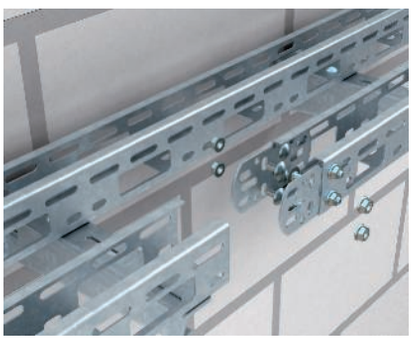


BKK system application
Installation of the BKK system under the ceiling using IS 8 supports.

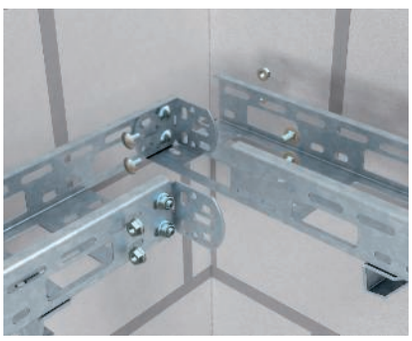
Motor connection column
Coupling of electric drives to the motor connection column.



AZ channel application
Example of installing the AZ channel as a suspension with threaded rod and the implementation of horizontal-vertical transitions.



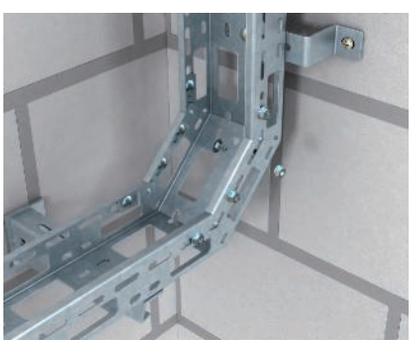
Straight connection of AZ channel
Straight connection of AZ channel with connectors of type VF AZK.



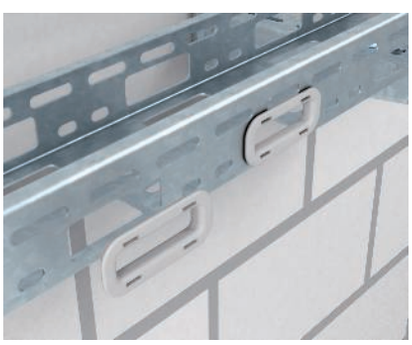
90° angle connection
Angle connection of AZ channels with connectors of type VF AZK.

Vertical straight connection
Vertical angle connection of AZ channels with two connectors of type VF AZK.

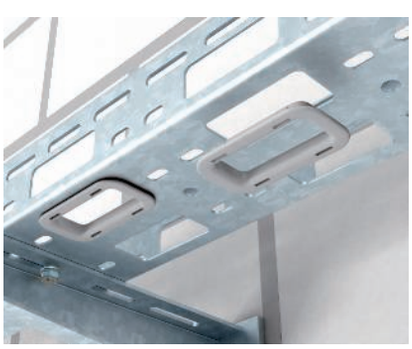
90° vertical bend, falling
Installation of a falling vertical bend with adjustable connectors, type SV.



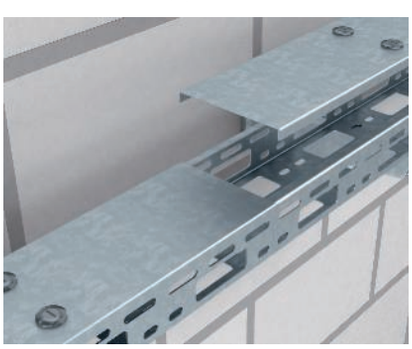
90° vertical bend, rising
Installation of a rising vertical bend with adjustable connectors, type SV.



Side rail cable protection ring
Insertion of the cable protection rings, type KSR-DR 910, in the side rail of the AZ channel.



Floor cable protection ring
Insertion of the cable protection rings, type KSR 915, in the bottom of the AZ channel.



Cover fastening
Installation of the cover, type AZDMD, on an AZ channel.

Installation of motor connection column with column foot
Fastening of the motor connection column, type MAS 140/10, to the floor using column foot, type SF 140/11.

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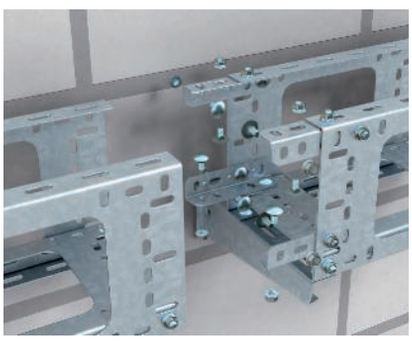
Installation of motor connection column with mounting bracket
Fastening of the motor connection column, type MAS 140/10, to the wall using mounting brackets, type BF 140/10.

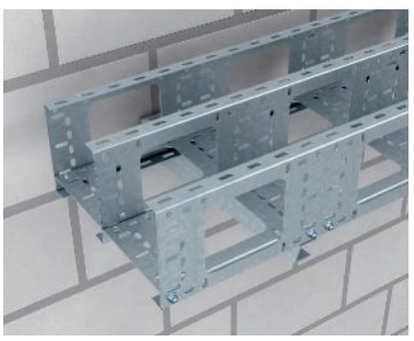
Cover fastening
Fastening of the cover, type MASD 90, to the motor connection column.

Device plate mounting
Installation of the device plate, type GP, to the motor connection column.

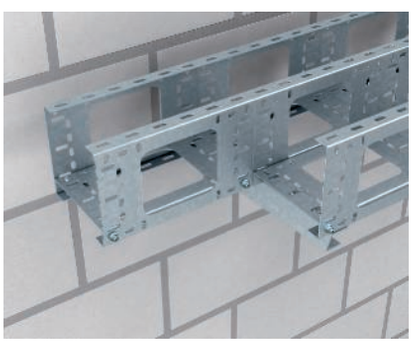


Joint connection
Connection of straight joints in the BKK system using the joint connector, type SSV.

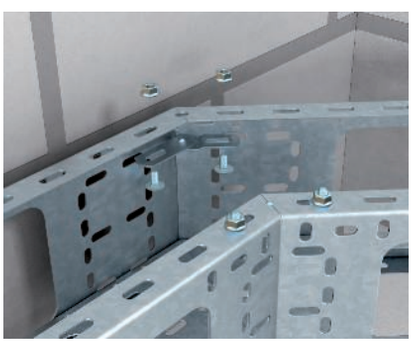
Installation of basic profile
Installation of the basic profile in the BKK system.



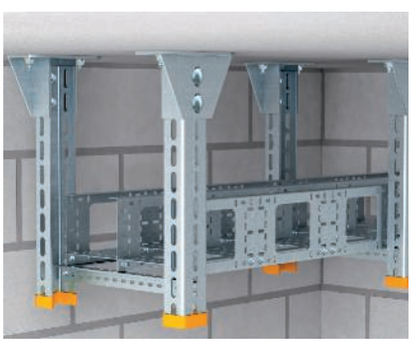
BKK straight fastening variant
Possible mounting variant of BKK profiles with straight joint.



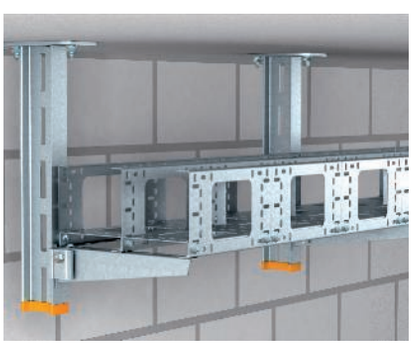
BKK offset fastening variant
Possible mounting variant of BKK profiles with offset joint. This mounting variant provides increased joint stability.



Angle connection
Simple bend creation with hinge connectors, type SV. For this, the side rails must be cut.



Mounting example
Example of U support installation with transverse profile and modular system.



Finished installation
Illustration of complete modular system mounting.

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Test marks

	Verband der Elektrotechnik, Elektronik, Informationstechnik e.V., Germany
	FIMKO, Finland
	KEMA-KEUR, Netherlands
	Österreichischer Verband für Elektrotechnik, Austria
	Eidgenössisches Starkstrominspektorat, Switzerland
	NEMKO, Norway
	SEMKO An Inchcape Testing Services Company, Sweden
	Indication of metric products
	DEMKO, Danmarks Elektriske Materielkontrol, Denmark
	Sähkötarkastuskeskus Elinspektionscentralen Electrical Inspectorate, Finland
	Underwriters Laboratories Inc., USA
	Underwriters Laboratories Inc., USA
	Canadian Standards Association, Canada
	CEBEC, Belgium
	STOWARZYSZENIE ELEKTRYKÓW POLSKICH, Poland
	Forschungs- und Materialprüfungsanstalt, Germany
	Shock-tested, Bundesamt für Zivilschutz, Germany
	MAGYAR ELEKTROTECHNIKAI ELLENŐRZŐ INTÉZET Budapest, Hungary
DIBt	Deutsches Institut für Bautechnik Berlin, Germany
	ELEKTROTECHNICKÝ ZKUŠEBNÌ ÚSTAV, Czech Republic
	Test marks for technical resources, VDE Prüf- und Zertifizierungsinstitut Offenbach, Germany
	RINA 1861, Ship Classification, Certification and Services
	American Bureau of Shipping, USA

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Pictogram explanation

Materials

Alu	Aluminium
Alu/St	Aluminium/Steel
VA	Stainless steel, grade 434
VA	Stainless steel, grade 304
VA	Stainless steel, grade 305
VA	Stainless steel, grade 301
VA	Stainless steel, grade 316
VA	Stainless steel, grade 316 L
VA	Stainless steel, grade 316 L
VA	Stainless steel, grade 354/1
VA	Stainless steel, grade 316 Ti
A2	Stainless steel, A2
A4	Stainless steel, A4
VA	Stainless steel, A5
St	Steel

Surfaces

F	Hot-dip galvanised
GCL	electro-galvanised, yellow-chromated
DD	Strip galvanised zinc/aluminium, Double Dip
FS	Strip-galvanised
G	Electro-galvanised
GR	Primed
FT	Hot-dip galvanised
GA	Zinc-aluminium coated, Galfan
SG	welding primed
ZL	Zinc scale

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CR — Chloroprene rubber
Temperature resistance:
permanently up to 120 °C, briefly up to approx. 150 °C and to approx. minus 30 °C*.
Resistant to
Oils and acids.
Unstable with
Fuels.

FA — Fibre-proof material DIN 28091
To DIN 28091, asbestos-free
Temperature resistance:
up to 300 °C.

GFK — Fibre-glass-reinforced plastic
Temperature resistance:
-50 to 130 °C.
Resistant to
High chemical resistance
Corrosion resistance
UV light resistance

NR — Natural rubber
Temperature resistance:
permanently up to 80 °C, briefly up to approx. 120 °C and to approx. minus 40 °C*.
Resistant to
Most acids.
Unstable with
Fuels, solvents, oils.

PA — Polyamide
Temperature resistance:
permanently up to approx. 90 °C, briefly up to about 130 °C and to about minus 40 °C*.
Chem. resistance generally as for polyethylene.
Resistant to
Petrol, benzene, diesel oil, acetone, solvents for paints and lacquers, oils and greases.
Unstable with
Bleach, most acids, chlorine.
Risk of tension cracking
Low in air-humid conditions; only with some aqueous salt solutions. Highly desiccated parts (high temperature and extremely low air humidity) are highly sensitive to fuels and various solvents.

PA/GF — Polyamide, fibreglass reinforced
Temperature resistance:
permanently up to 100–110 °C, briefly up to 160 °C and to about minus 40 °C*.
Resistant to
Petrol, benzene, diesel oil, acetone, solvents for paints and lacquers, oils and greases.
Slightly susceptible to stress-cracking.
Unstable with
Bleach, most acids, chlorine.
Risk of tension cracking
Low in air-humid conditions; only with some aqueous salt solutions. Highly desiccated parts (high temperature and extremely low air humidity) are highly sensitive to fuels and various solvents.

PC — Polycarbonate
Temperature resistance:
permanently up to approx. 110 °C (in water 60 °C), briefly up to 125 °C, and to below minus 35 °C.
Resistant to
Petrol, turpentine, most weak acids.
Unstable with
Acetone, benzene, chlorine, methylene chloride, most concentrated acids.
Risk of tension cracking
Relatively low.
Media which can cause tension cracking include benzene, aromatic hydrocarbons, methanol, butanol, acetone, turpentine.

POM — Polyacetal (polyoxymethylene, polyformaldehyde)
Temperature resistance:
permanently up to approx. 100 °C, briefly up to approx.130 °C and to approx. minus 40 °C.
Resistant to
Acetone, ether, petrol, weak acetic acid, benzene, heating oil, oils and greases, toluene.
Unstable with
Methylene chloride, trichloroethylene, hydrochloric acid, nitric acid, sulphuric acid.
Risk of tension cracking
Low.

PE — Polyethylene
Temperature resistance:
hard types permanently up to about 90 °C, briefly up to about 105 °C, soft types permanently up to about 80 °C, briefly up to about 100 °C and to about minus 40 °C*.
Resistant to
Alkalis and inorganic acids.
Conditionally resistant to
Acetone, organic acids, petrol, benzene, diesel oil, most oils.
Unstable with
Chlorine, hydrocarbons, oxidising acids.
Risk of tension cracking
Relatively high.
Stress cracks can be caused by, among other things, acetone, various alcohols, formic acid, ethanol, petrol, benzene, butyric acid, acetic acid, formaldehyde, various oils, petroleum, propanol, nitric acid, hydrochloric acid, sulphuric acid, soap solutions, turpentine, trichloroethylene, citric acid.

PBPT — Polybutylene terephthalate
Thermoplastic polyester
Temperature resistance:
permanently up to 120 °C, briefly up to 140 °C and to approx. minus 40 °C.
Resistant to
Petrol, diesel oil, most weak acids, oils and greases.
Conditionally resistant to
Acetone, ammonia, benzene.
Unstable with
Strong acids, chlorine, fluorine, bromine vapour, bleach, trichloroethylene, methylene chloride.
Risk of tension cracking
Low.

PS — Polystyrene
Temperature resistance:
Because of its relatively high sensitivity to the effects of chemicals, its use is not recommended at temperatures above normal room temperature, about 25 °C.
Resistance to cold: to about minus 40 °C*.
Resistant to
Alkalis, most acids, alcohol.
Conditionally resistant to
Oils and greases.
Unstable with
Butyric acid, concentrated nitric acid, concentrated acetic acid, acetone, ether, petrol and benzene, solvents for paints and lacquers, chlorine, diesel fuel.
Risk of tension cracking
Relatively high.
Stress cracks can be caused by, amongst other things, acetone, ether, petrol, cyclohexane, heptane, methanol, propanol and the softeners used in some PVC cable mixes.

PVC — Polyvinylchloride
Temperature resistance:
permanently up to 65 °C, briefly up to 75 °C and to about minus 30 °C.
Resistant to
Weak acids, alkalis, oils and greases, petrol.
Unstable with
Strong acids, benzene, acetone, iodine, toluene, trichloroethylene.
Risk of tension cracking
Low, only with some solvents such as benzene and acetone.

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SBR — Styrene-butadiene rubber

Temperature resistance:
permanently up to 80 °C, briefly up to approx.120 °C and to approx.minus 30 °C*.

Resistant to
Most acids.

Unstable with
Fuels, solvents, oils.

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