INDUSTRIAL INSTALLATIONS

Fastening materials

OBO BETTERMANN

Building Connections

Digitalisation, the Energiewende (energy transition), mobility – the future is gathering speed. At OBO Bettermann, we're proud to be a driving force. And as a facilitator, we make connections. Today, we are already developing the innovative electrical infrastructure systems and solutions of tomorrow. Reliably, flexibly, sustainably.

Already today, OBO is one of the leading manufacturers of installation systems for the electrical infrastructure in buildings and plants. When it comes to the friction-free flow of power, energy and data, engineers and tradespeople worldwide rely on the comprehensive range from OBO.

OBO applies its slogan "Building Connections" to around 30,000 high-quality branded electrical products and services, which are used in application solutions for projects in industry, business and infrastructure.

OBO operates a global network and employs more than 4,200 people in more than 60 countries. The headquarters of the family company, which was founded in 1911, is located in Menden, Germany. In addition, more than 40 subsidiaries are present in markets on all continents.

Improved structure, sharpened profile

Each of our products carries a benefit which only the OBO brand can offer. Products are developed, manufactured and tested with a high level of competence – from the idea through to the final check. From flawless logistics through to practical information – we can provide support at every level. We can offer additional security through certificates on the conformity of our products with the most important standards and directives. In a nutshell – OBO helps you more. In every location and in every phase of a project.

To maintain this, we continually challenge ourselves. Not as an end in itself but for the better processing of each customer's requests – fast, reliably and future-oriented. That is the reason we have not only established our three central application areas, but also reworked our catalogue structure. In this way, we can display our service offers more clearly, highlight the product benefits more effectively and illustrate the respective application areas more tangibly.

OBO Product Worlds

Industrial installations

- Cable support systems
- Connection and routing systems
- Fastening material

Building installations

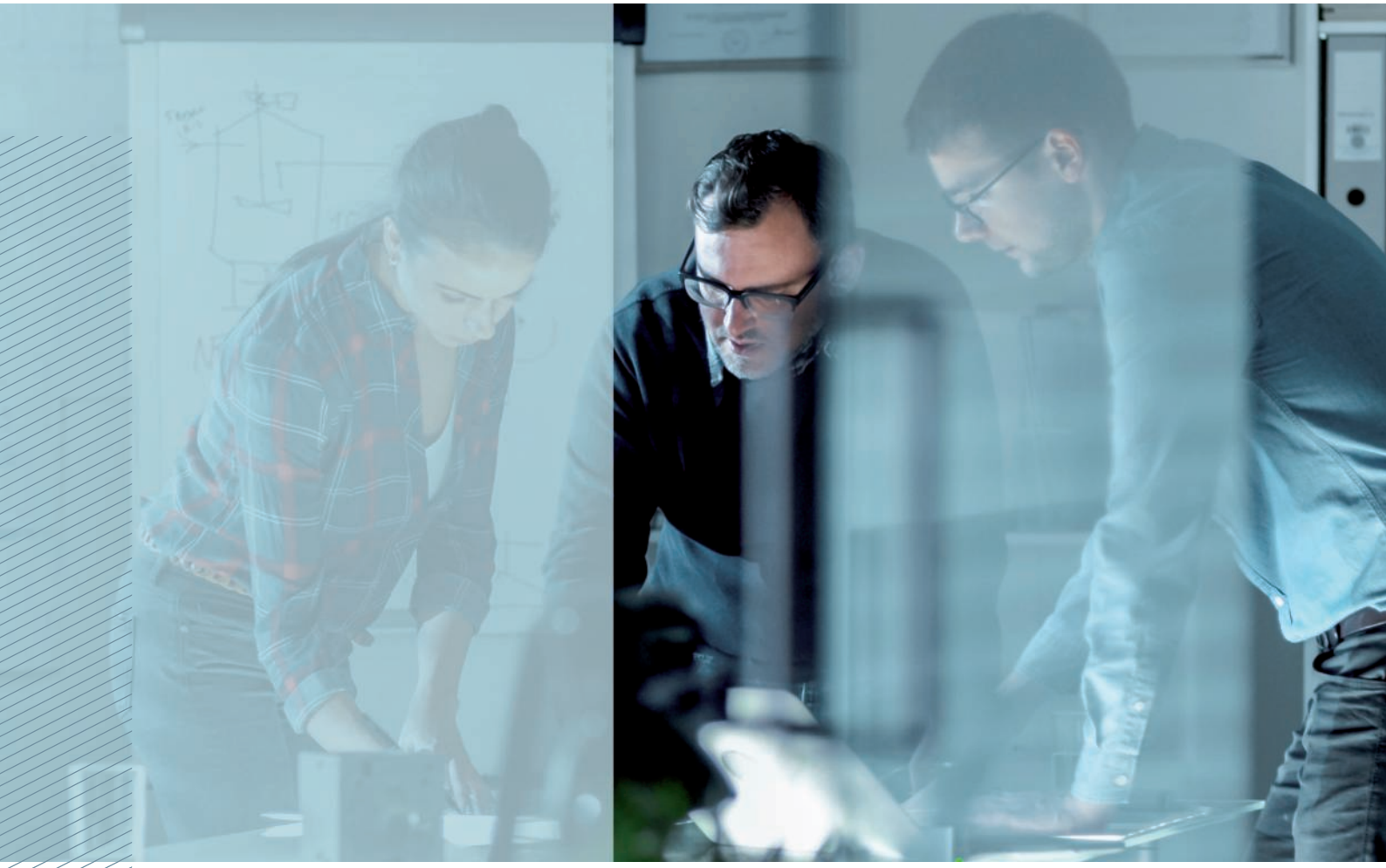
- Cable routing systems
- Device installation ducts, trunking and poles
- Floor installation systems and underfloor applications
- Installation systems

Safety and protection installations

- Surge protection
- External lightning protection
- Equipotential bonding and earthing
- Insulation and cable bandages
- Fire-tested support and routing systems
- Fire protection ducts

It's your choice – from now on there's a catalogue for each OBO product category. Simply select the catalogues and order together with a collection case.

OBO Support *& contact*



You have a problem? We have the solution!

OBO Bettermann is more than the sum of its products. In any situation, we are the reliable partner right buy your side. You have a problem? We have the solution!

It doesn't matter in which area of industry our support is needed – from industrial and plant engineering to private, public and administrative buildings, as well as in the areas of mobility and renewable energies – we have everything that you need.

OBO can not only provide the entire electro-technical infrastructure with the best possible products. We can also support you with sound expert knowledge and more than 100 years of experience, right from the planning phase through to the realisation of your projects. OBO – solutions you can rely on.

What is OBO Support?

Every OBO product carries a plus inside it, which only a branded product can offer. It is developed, manufactured and tested with a high level of competence, from the idea right through to the final check. In addition, our specialists are available for consultation and can offer you assistance and training courses for products at any time.

Together with you, we plan your project and help you choose the right products, and are also available to you at any time should you need us. From flawless logistics through to practical information – we can provide support at every level. We can offer security through certificates on the conformity of our products with the most important standards and directives.

We are as flexible as you are – because we know how practical people work and what is important to them. Each step is a plus – that is the OBO Support concept.

You can contact our Customer Service department on:

Customer Service

Tel.:+49 23 73 89 - 17 00

Monday–Thursday
07.30–17.00

Friday
07.30–15.00

export@obo.de

Service – OBO can help
Everywhere and in every project phase:
- Highly competent hotline
- Product and system information, digitally or printed
- Selection and planning aids on the web, as an app, as a CAD application or in printed form
- 2D and 3D product data for planning
- Field service, branch offices and subsidiaries in 60 countries
- Engineering services for major projects

Training courses from OBO
- Seminars and workshops
- Local consultation and training courses
- Planner days

Handling – OBO delivers reliably
With optimised delivery processes:
- Reliable logistics
- Practical transport systems and packaging
- Loading gear handling and disposal concepts

Certification and guarantee
OBO offers safety. Our products fulfil the most important country-specific regulations:
- Conformity (e.g. IEC, VDE, CE, KEMA, KEUR, UL)
- Certification (e.g. DIN EN, DGNB)
- 5-year guarantee for surge protection products
- Guarantee management

Planning aids

Metal: corrosion and corrosion protection

Corrosion
(from the Latin corrodere, “to eat or gnaw to pieces”) in a technical context is a reaction between a material (generally a metal) and its surroundings, leading to a measurable change in the material and potentially impairing the functionality of a component or system.

A large number of products used in industrial installations are made of metal. Metals are much tougher than many other materials and are less sensitive to mechanical loading. The OBO metal products are made of aluminium, die-cast zinc, stainless steel or steel.

Steel (St), the most commonly used material, is very strong and has good elasticity and chemical resistance. However, steel is susceptible to corrosion and must therefore be protected accordingly.

Stainless steels consist mainly of alloyed, very hard and rustproof steels. The stainless steels are divided into quality classes according to the percentage of alloys. These are indicated by the material number according to DIN EN 10027.

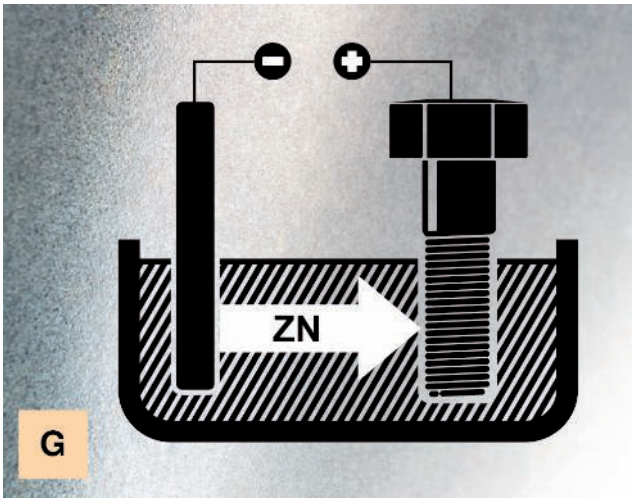
Aluminium (Al), as a light metal, has comparatively low strength but good electrical conductivity and high corrosion resistance.

Die-cast zinc components (Zn) are very strong and hard. The manufacturing process enables the production of very precise components with good corrosion resistance.

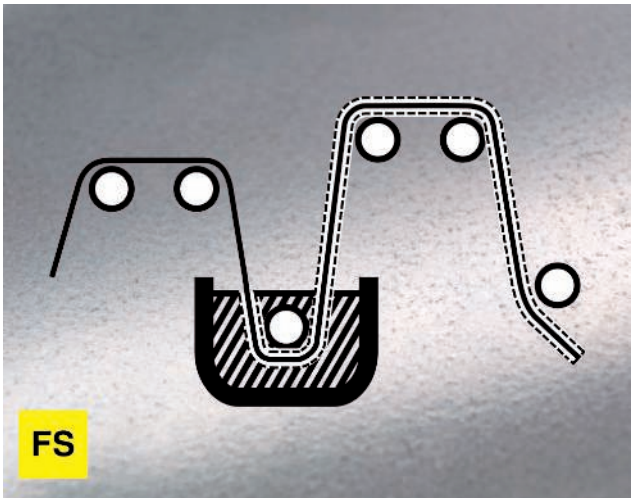
Corrosion protection
Corrosion protection means all steps taken to prevent corrosion damage to metallic components. It is impossible to prevent corrosion permanently, so corrosion protection measures generally aim to reduce the speed of corrosion so that the component is not damaged by corrosion for the duration of its service life. The term “passive corrosion protection” refers to all measures designed to shield products from corrosive media. Coatings are one way of achieving passive corrosion protection. At OBO, most steel products are protected from corrosion by a layer of zinc. Zinc coatings can be applied to components using a variety of methods.

Zinc slat covering
Zinc slat coverings are coatings applied in a non-electrolytic manner. They offer cathodic protection and thus have excellent corrosion protection, while at the same time, there is no risk of hydrogen-induced breakage. Due to these properties, this coating type is used for connection components with a high strength classification or structural parts with high tensile strength. The low layer thickness of the zinc slat covering allows a thin, homogeneous coating, which is particularly important for maintaining the accuracy of screw threads. This coating achieves a resistance of 480 hours in the salt spray test for the connection elements.

Galvanisation types

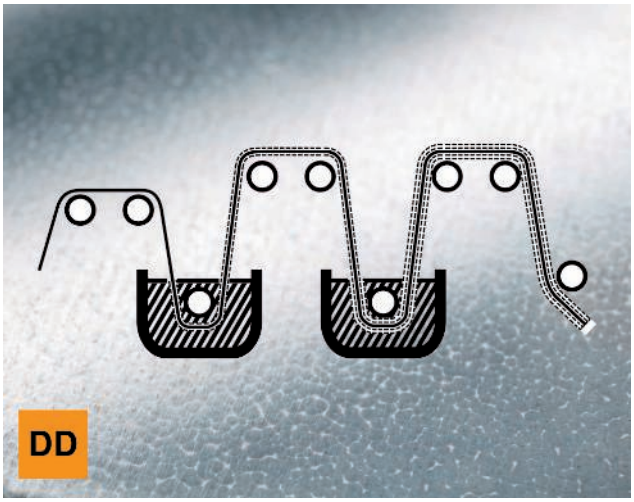


Electrogalvanisation – electrolytic galvanisation in accordance with DIN EN ISO 2081
In electrogalvanisation or electrolytic galvanisation, the component is coated by dipping it not in molten zinc, but in a zinc electrolyte, through which a direct electric current is passed.



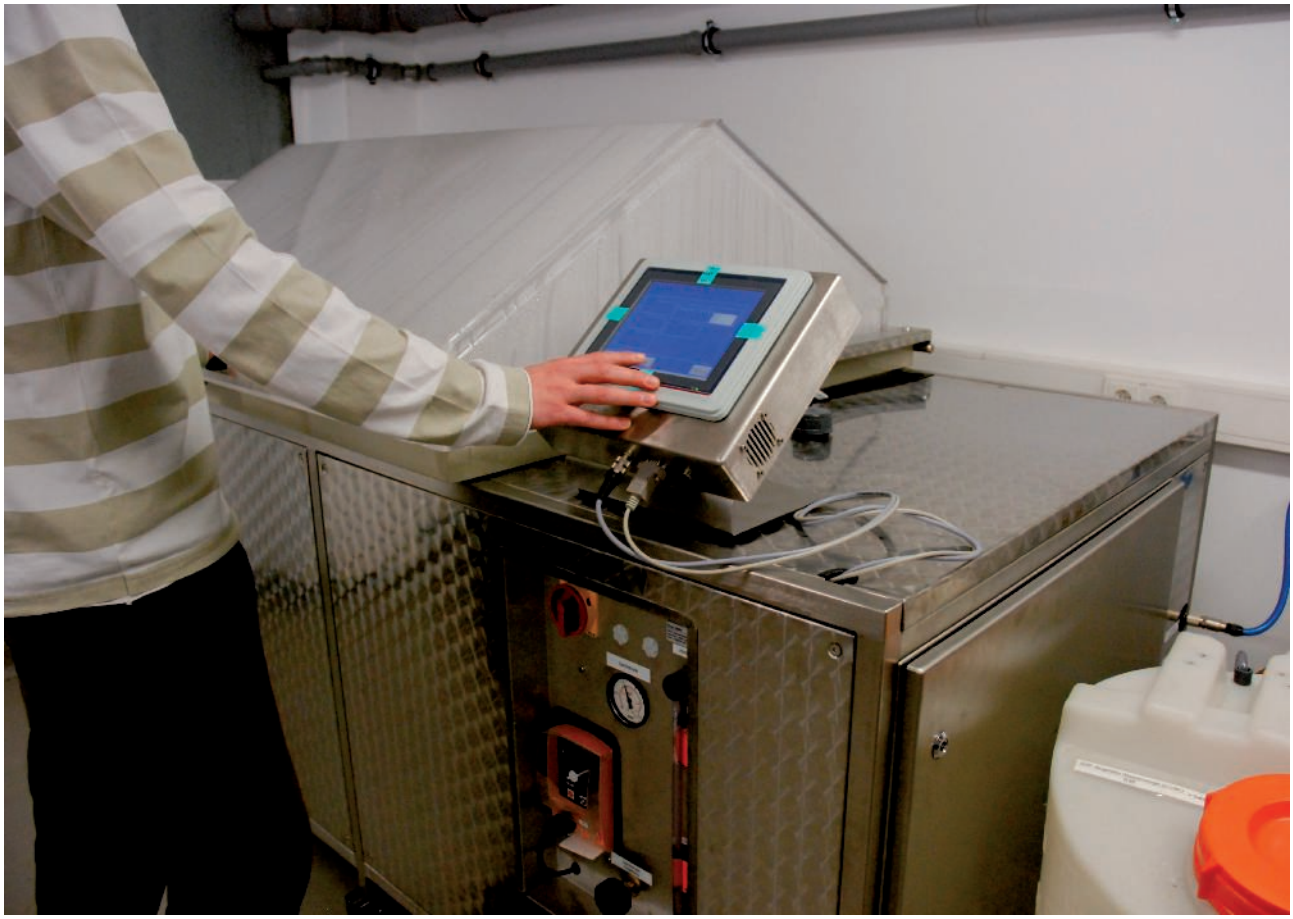
Strip galvanising – hot galvanised according to the strip-galvanising method in accordance with DIN EN 10346 (formerly DIN EN 10147 and DIN EN 10142)
Strip galvanisation or Sendzimir galvanisation is where a continuous ribbon of steel is galvanised in a continuous line.

Hot-dip galvanisation – hot galvanisation using the dipping method according to DIN EN ISO 1461
Batch galvanisation is mainly used for galvanising prefabricated steel parts, by dipping them in molten zinc at a temperature of around 450 °C.



Hot-dip coating – zinc-aluminium coating in accordance with DIN EN 10346
In contrast to conventional coating systems, the material being galvanised in the double-dip process passes through two baths in succession: the first contains pure zinc, the second a zinc-aluminium alloy.

Surface testing and corrosion categories



Classification of corrosion resistance
All the system components must show sufficient resistance against corrosion in agreement with the standard DIN EN 61537. The minimum zinc layer thicknesses are determined through a measurement. The grouping into the appropriate class is detailed in the table “Classification of corrosion resistance”. The table “Corrosion categories according to DIN EN ISO 12944” shows the area of application and the zinc loss to be expected.

Classification of corrosion resistance
All components, depending on the environment, must show sufficient resistance against corrosion in agreement with the standard DIN EN 61537. This is how corrosion categories are determined, e.g. with a salt spray test. In this procedure, components are sprayed with salt for a certain time period. The resulting level of red rust is the basis for allocation to a corrosion category, i.e. in which environment the component is resistant to corrosion.

Classification of corrosion resistance according to EN 61537

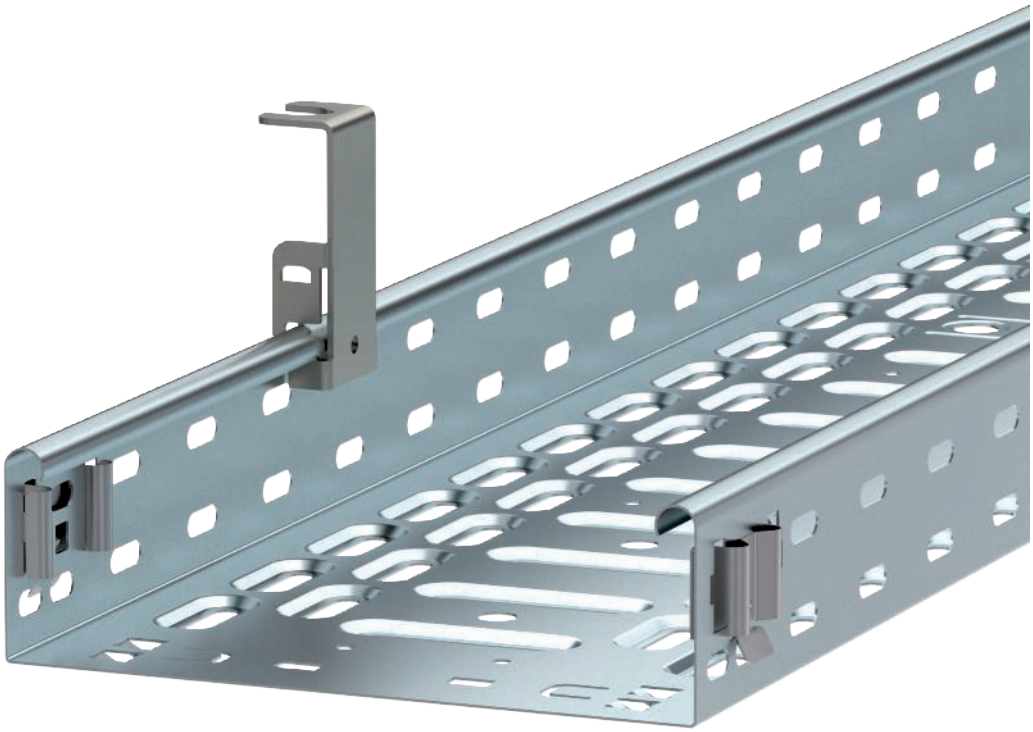
Class	Reference material and surface treatment
0*	None
1	Electroplated to a minimum thickness of 5 µm
2	Electroplated to a minimum thickness of 12 µm
3	Pre-galvanised to grade 275 to EN 10327 and EN 10326
4	Pre-galvanised to grade 350 to EN 10327 and EN 10326
5	Post-galvanised to a zinc mean coating thickness (minimum) of 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	-	Insignifi-cant	<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 condensa-tion and with high levels of impurities	Coastal or offshore areas with salt load	Very strong (sea)	>4.2 to 8.4 µm/a

Contact corrosion



If two different metals are conductively connected with each other, contact corrosion can occur. This poses a considerable risk to the load capacity and lifespan of the components used.

The level of contact corrosion is determined primarily 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 condensation, 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 active, 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.
- Different environments or atmospheres can increase or influence the risk of contact corrosion to varying degrees.

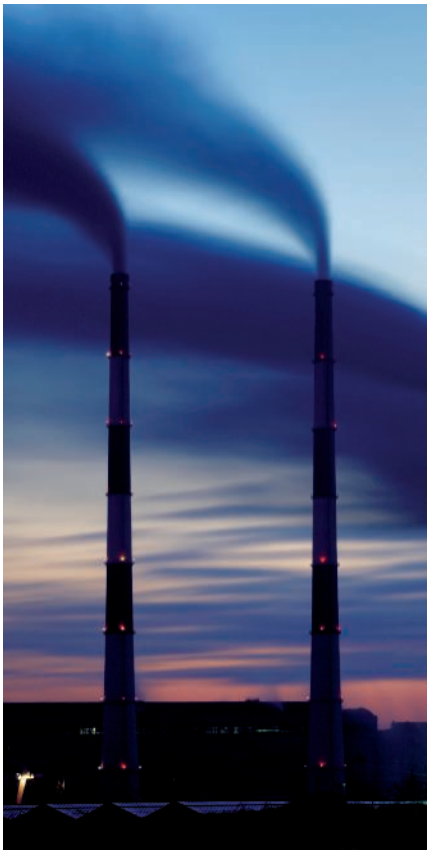
Installation locations

Whether indoors or outdoors, in aggressive atmospheres or under special hygienic conditions, OBO can offer the perfect surface and materials for your installation, no matter what the requirements may be. OBO metal products 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:

Application	Material	Surface protection
Indoors 	St Steel	L Painted/powder-coated
	St Steel	FS Strip galvanised DIN EN 10346
	St Steel	G Electrogalvanised DIN EN ISO 2081
Outdoors 	St Steel	FT Hot galvanised DIN EN ISO 1461
	St Steel	DD Hot galvanised DIN EN ISO 1461
	VA Stainless steel A2	
	VA Stainless steel A4	
Especially corrosive areas 	VA Stainless steel A2	
	VA Stainless steel A4	

Contact corrosion in different environments

Land climate



Industrial atmosphere

Sea climate

Small/large	Zn	FT	Al	Cu	VA	CuZn
Zn		✓	○	✗	✗	○
FT	✓		○	✗	✗	○
Al	✓	✓		✗	✗	○
Cu	✓	✓	✓		✓	✓
VA	✓	✓	✓	✓		✓
CuZn	✓	✓	✓	✓	✓	

✓	Little to no corrosion
○	Moderate corrosion
✗	Heavy corrosion

The precondition for corrosion is a conductive medium that connects the metal combination. The more damp and contaminated the atmosphere is, the more pronounced the contact corrosion.

Surfaces for special visual requirements or special environmental loads

Applications with specific optical requirements or special environmental conditions

Colour-coated products 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

- Products in FT (hot-dip galvanised version)
- All RAL colours available
- Coating of the visible surfaces 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 cables and IT)

Colour-coated systems are not specifically indicated in this Industrial installation product catalogue. You can obtain details of these systems by contacting our telephone hotline on +49 23 73 89 - 17 00.

Plastic: materials and properties

Essentially plastics can be of one of three types: thermoplastics, elastomers and Duroplast.

Thermoplastics
are plastics that can be shaped within a specific temperature range. This process is reversible, in other words, thermoplastics can theoretically be cooled and then melted down again any number of times. Another unique advantage of thermoplastics is that they can be welded.

Elastomers
have a fixed shape, but can be elastically deformed. They can elastically deform under tensile and compressive stresses, but afterwards will return to their original shape. Elastomers are used for producing seals and membrane entries.

Duroplast
or thermosetting polymers/plastics, are plastics that can no longer be deformed following curing. Duroplasts produce hard, glass-like (brittle) polymeric materials with a high thermo-mechanical strength.

Properties
The area of application for which plastic OBO products are suitable depends mainly on the properties of the material being used. The most important material properties are:
- Temperature resistance
- Risk of stress cracks
- Chemical resistance
- Halogen freedom
- UV resistance
- Flame resistance

		Material	Max. temperature resistance Permanent	Max. temperature resistance Short-time	Min. temperature resistance Static
Thermoplast	ABS/AVA	Acrylonitrile butadiene styrene	70 °C	85 °C	–25 °C
	EVA	Ethylene vinyl acetate	55 °C	70 °C	–15 °C
	PA	Polyamide	120 °C	150 °C	–25 °C
	PA/GF	Polyamide, fibreglass reinforced	120 °C	160 °C	–25 °C
	PBPT	Polybutylene terephthalate	120 °C	140 °C	–25 °C
	PC	Polycarbonate	110 °C	125 °C	–25 °C
	PE	Polyethylene	70 °C	90 °C	–25 °C
	PP	Polypropylene	90 °C	110 °C	–25 °C
	PS	Polystyrene	70 °C	80 °C	–15 °C
	PVC	Polyvinyl chloride	65 °C	80 °C	–25 °C
Elastomers	NBR SBR	Rubber mixture	100 °C	110 °C	–25 °C
	NBR	Nitrile rubber	100 °C	110 °C	–25 °C
Duroplast	UF	Duroplast, aminoplast, type 131.5	65 °C	90 °C	–25 °C
	MF	Duroplast, melamine resin, type 150	80 °C	110 °C	–25 °C

Plastic: stress crack risk and chemical resistance

Risk of stress cracks

Medium	ABS/ ASA	UF	MF	EVA	NBR SBR	NBR	PA	PA/ GF	PBPT	PC	PE	PP	PS	PVC
Risk of stress cracks	✗	✓	✓	✓	✓	✓	✓	○	○	✓	!	✓	✗	○

Danger of tension cracks: ✓ Virtually negligible ○ Low ! High ✗ Very high

Chemical resistance

Medium	ABS/ ASA	UF	MF	EVA	NBR SBR	NBR	PA	PA/ GF	PBPT	PC	PE	PP	PS	PVC
Petroleum	✓	✓	✓	○	✓	○	✓	✓	✓		○	○	○	✓
Fat	✓	✓	✓	✓	✓	○	✓	✓	✓				○	✓
Benzole	!	✓	✓	○	✓	!	✓	✓	○	!	!	○	!	!
Solvents	!						✓	✓	○				!	!
Formic acid	✓	!									!	○		
Citric acid	✓	!		○							!			
Lactic acid	✓	!		○							!	○	!	!
Hydrochloric acid	○	!									✓			!
Sulphuric acid	○	!									✓			!
Acetone	!	✓					✓	✓	○	!	!	○	!	!
Petrol	!	✓	✓	○	○	!	✓	✓	✓	✓	!	○	!	✓
Butyric acid	!	!		○							!	○		!
Chlorine	!						!	!	!	!	!	!	!	
Acetic acid	!	!		○							!		!	
Nitric acid	!	!									✓		!	
Ester		✓	✓	○	!	!								
Alcohol		✓	✓	○			✓						✓	
Mild alkalis		✓	✓	✓	✓	✓	○	○	!		✓	✓		✓
Mild acids		○	○	✓	✓	✓	!	!	✓	✓	✓			✓
Ether		✓	✓	○									!	
Water		✓	✓	✓	✓	✓								
Strong acids		!	!	○					!	!	!			!
Strong alkalis		!	!	✓					!		✓	✓		✓
Hydrofluoric acid				○							✓			
Paraffin hydrocarbon				○								○		
Haloalkanes				!										
Ketones				!	!								!	
Aldehyde				✓										
Organic acids				○							!	○		
Seawater					✓	✓								
Diesel fuel							✓	✓	✓		○	○	!	
Ammoniac									○				!	

Resistance: ✓ Resistant ○ Limited resistance ! Not resistant

Plastic: material properties

Halogen freedom
Estimates suggest that around 95% of fire victims die not due to the immediate effects of the fire, but of poisoning from the smoke. In addition, the corrosive fire gases created during fires cause immense damage to property and can permanently damage the structure of a building. Therefore, halogen-free installation systems must, or should, always be used in public areas (emergency routes, lifts, etc.). The chemical composition of these halogen-free systems is designed in such a way that, in the event of fire, they produce less hazardous (toxic/corrosive) gases, which could combine with extinguishing agents to form hydrochloric acid. In the sense of the standard DIN VDE 0472, this means that materials are considered halogen-free when "the proportions of the halogens chlorine, bromine and iodine are ≤ 0.2% for chlorine and ≤ 0.1% for fluorine". OBO Bettermann offers a wide range of halogen-free products that reduce the risk of harm to people and property to a minimum in case of fire.

UV resistance
Outdoor installations should always be viewed particularly critically with regard to the mounting locations and the selection of the installation materials.
UV radiation is damaging to many plastics, causing them to turn yellow and/or brittle or lose their elasticity. However, plastics can be protected against UV damage through the addition of UV stabilisers. Products made from UV-resistant materials are specially marked. In general, besides UV radiation, installations outdoors must also take other environmental influences into account. Factors such as maximum temperatures, regularity of (extreme) temperature changes, humidity and the location of use/mounting (housing, industry, town, region, continent) all have an important role to play here.

Flame resistance/fire resistance
Materials are described as flame-resistant if they prevent the spread of fire or are sufficiently fire-resistant. According to DIN EN 60695-2-11 (VDE 0471 Part 2–11), electrical connection materials must be subjected to a glow wire test in order to evaluate the fire risk of the end product. When the glow wire test is being carried out, a glowing wire (for temperature see table below) is inserted into the component to be tested for a period of 30 seconds and then removed. After a further 30 seconds at the latest, the object, if it has caught light, must have extinguished again, in order to specify the flame resistance.

Types of installation systems

Types of samples Test temperatures in °C	Surface-mounted	Flush-mounted	In-plaster	Cavity wal-l/furniture	Concrete structure	Installation duct
Connection sockets	650	650	750	850	650	750
Device sockets and device connection sockets	750	650	-	850	650	750
Ceiling lights, connection sockets	750	650	-	850	650	750
Wall luminaire connection boxes	750	650	-	850	650	750
Device connection sockets	750	650	-	850	650	750
Connection sleeves	750	-	-	-	-	750
Insulation sections, which support active parts	960	-	-	-	-	-
Lid for installation sockets	750	-	-	-	-	-

Protection ratings

IP protection rating
The IP protection rating specifies how far a component is protected against contact and foreign bodies and the ingress of water. The IP protection ratings are controlled by the standard DIN EN 60529 (VDE 0470 Part 1). The IP is always made up of two digits.

The first digit designates the contact and foreign body protection. On the one hand, it specifies how far a housing prevents access to dangerous parts, by preventing or limiting the ingress of body parts or objects held by a person. On the other hand, it specifies how far the housing protects the installed resources against the ingress of solid foreign bodies.

Protection rating

First code digit	...against access to the hazardous parts	...against solid foreign bodies
0	Protected against access to hazardous parts with the back of the hand	Non-protected
1	Protected against access to hazardous parts with a finger	Protected against solid foreign bodies of 50 mm diameter and larger
2	Protected against access to hazardous parts with a tool	Protected against solid foreign bodies of 12.5 mm diameter and larger
3	Protected against access to hazardous parts with a wire	Protected against solid foreign bodies of 2.5 mm diameter and larger
4	Protected against access to hazardous parts with a wire	Protected against solid foreign bodies of 1.0 mm diameter and larger
5	Protected against access to hazardous parts with a wire	Dust-protected
6	Protected against access to hazardous parts with a wire	Dust-proof

The second digit specifies the protection against water. It specifies how far the resource is protected against incoming water and the resulting damage.

Protection rating against the entry of water with a damaging impact

Second code digit	Short description	Definition
0	Non-protected	-
1	Protected against water droplets	Droplets falling vertically must not have a damaging impact.
2	Protected against drip water when enclosure tilted up to 15°	Vertically falling drops must not have harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical.
3	Protected against spray water	Water being sprayed at an angle of 60° on both sides of the vertical must not have any damaging impact.
4	Protected against spray water	Water spraying the housing from any direction must not have any damaging impact.
5	Protected against water jets	Jets of water pointing at the housing from any direction must not have any damaging impact.
6	Protected against strong water jets	Strong jets of water pointing at the housing from any direction must not have any damaging impact.
7	Protected against the effects of being temporarily immersed in water	If the housing is sometimes underwater under standard pressure and time conditions, then water may not enter in such volumes as would have a damaging impact.
8	Protected against the effects of being continuously immersed in water	Ingress of water in quantities causing harmful effects must not be possible when the housing is continuously immersed in water under conditions which shall be agreed between manufacturer and user. However, the conditions are more difficult to fulfil than for number 7.

IK code

The IK code to DIN EN 50102 indicates the protection rating of housings against external mechanical loads. It is made up of the code letters IK and a two-digit number from 00 to 10. Each group of numbers stands for a load energy value in joules (J). The IK code always applies to the complete housing, which guarantees the protection of resources against the damaging effects of mechanical loads. The housings are tested by knocking them with different testing hammers.

IK code	00	01	02	03	04	05	06	07	08	09	10
Stress energy value [J]	-	0.15	0.20	0.35	0.50	0.70	1	2	5	10	20

Nominal values of electrical equipment

When using junction boxes, connection sockets and connection terminals, the resources are assigned nominal values. In the designation, a distinction is made between the maximum approved voltage (nominal voltage), the maximum approved current (nominal current) and the maximum approved cross-section (nominal cross-section of the cables to be connected).

2,5 mm²

Nominal cross-section
Largest tested-approved cross-section of the cables to be connected.

16 A

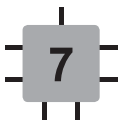
Nominal current
The nominal current is the highest permissible operating current that can be continuously passed through connections (e.g. terminals) marked with that value.

660 V

Nominal voltage
Greatest approved voltage at the connection point.

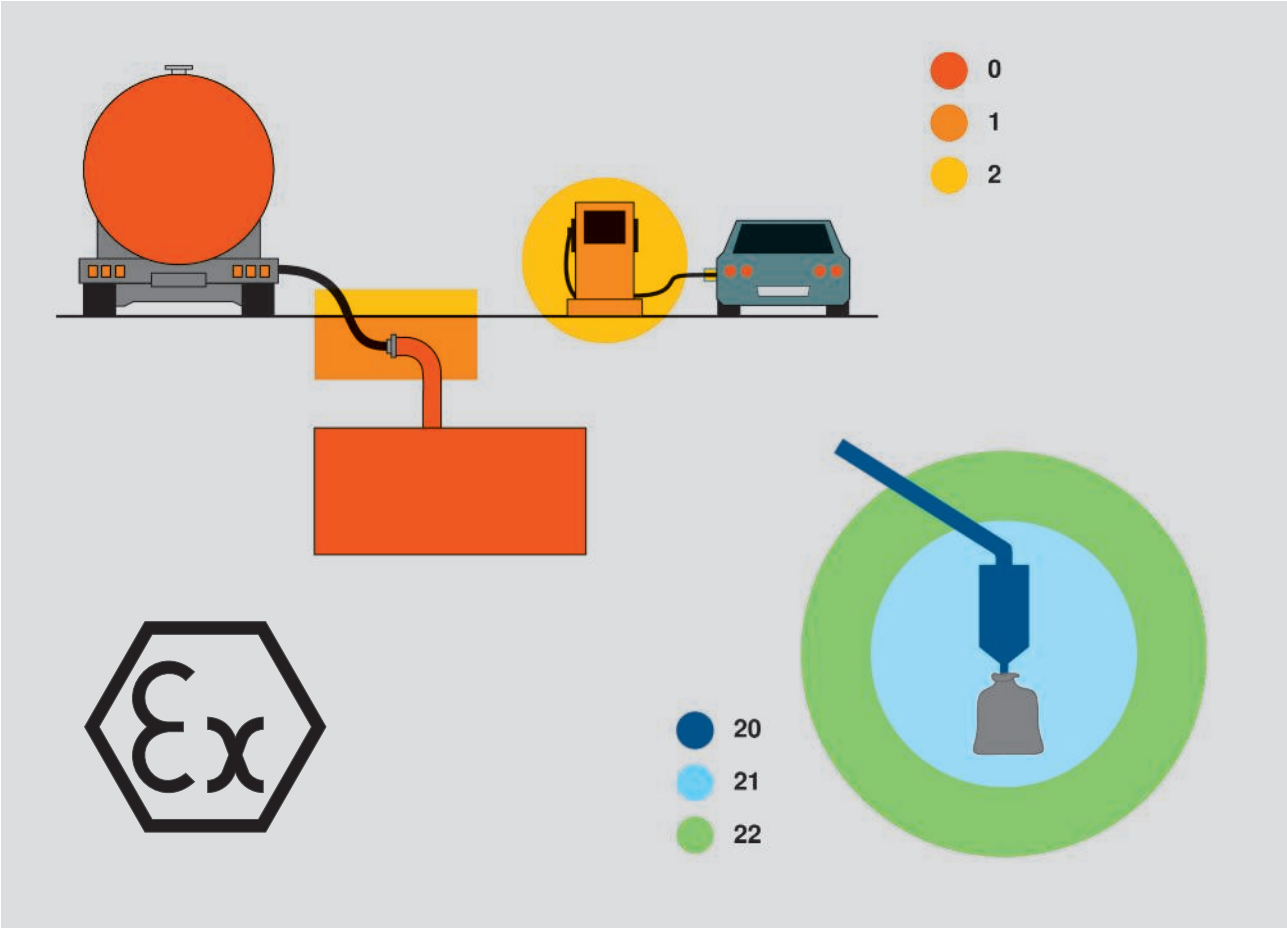
In addition to the nominal values, the number of entries for junction boxes and the number of poles of clamp connectors are also possible labels.

No. of poles
Number of connection points of the clamp connector.



Number of entries
Number of entries in an electrical connection box or connection socket.

Zone division for explosive areas

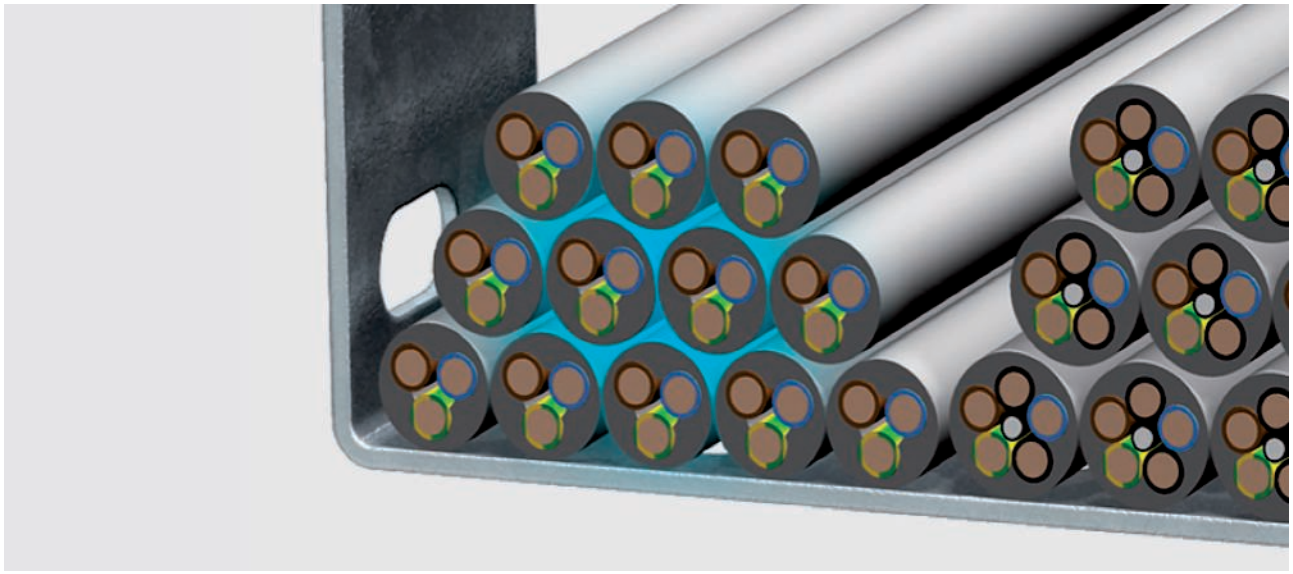


Products used in potentially explosive areas must comply with the ATEX directives. The ATEX workplace directive 1999/92/EC sets out the minimum requirements for improving the safety and health protection of workers at risk from potentially explosive atmospheres. The directive divides areas with dangerous, potentially explosive atmospheres into zones. Ex-tested products may be used in the respective zones in accordance with their approval.

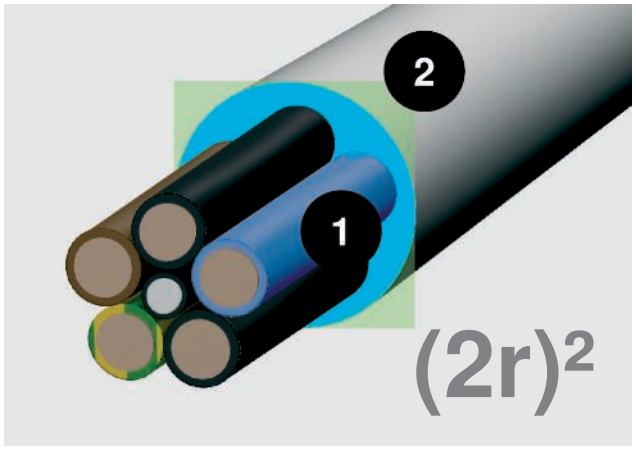
Zone allocation of device group II (applied)

Gas	Dust
Explosive gas atmosphere, zone division to DIN EN 60079-10	**Explosive dust/air mixtures, zone division to DIN EN 61214-10**
Zone 0	Zone 20
An area in which it can be expected that, under normal conditions, an explosive atmosphere of gas occurs continuously or for long periods of time.	An area in which it can be expected that, under normal conditions, an explosive atmosphere of dust/air occurs continuously or for long periods of time.
Zone 1	Zone 21
An area in which it can be expected that, under normal conditions, an explosive atmosphere of gas occasionally occurs.	An area in which it can be expected that, under normal conditions, an explosive atmosphere of dust/air occasionally occurs.
Zone 2	Zone 22
Area, in which it can be expected that, under normal conditions, an explosive atmosphere of gas seldom or only briefly occurs.	Area, in which it can be expected that, under normal conditions, an explosive atmosphere of dust/air seldom or only briefly occurs.

Cable sizes

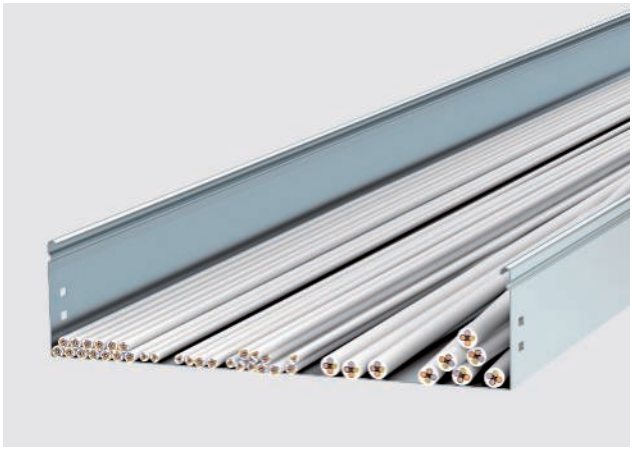


The term “cable” means a jacketed electrical cable for the transmission of electrical energy and data. Cables are given according to their nominal cross-section. The external diameter and usable cross-section depend on their nominal cross-section and the number of individual wires contained in the cable. When fastening clips or cable support systems are used, it is important to know the actual space requirements of the individual cables. It is not sufficient to take only the diameter as a basis for the calculation of the cable volume.



Circular area (1) and space required (2)

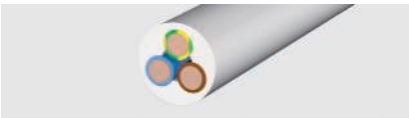
Calculation with the formula (2r)²
The diameter says little about the actual space required by a cable. Calculate: (2r)². This value reflects the realistic space requirements, including the compartments.



To save you work, we have listed the diameter and usable cross-section of the most important cable types below.

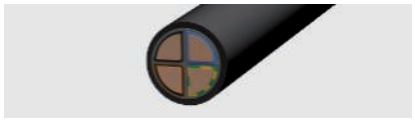
Important:
These values are average values, which may vary from manufacturer to manufacturer. Please refer to the manufacturer's specifications for the exact values.

Basic values for the calculation of the 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

IT cables type Cat...

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

Coax cable (Standard)

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

Selection of the correct fastening clip

Fastening clips are given with their maximum span distance as a nominal size in mm. This makes it easy to determine the appropriate clip for the planned cable volume. If the necessary clamping range is between two nominal sizes, e.g. 16 mm, we recommend using the smaller nominal size.

If cables are not fastened directly in the clip, but routed through an installation pipe for example, the relationship between the external diameter and metric or PG sizes must be observed when selecting the correct fastening clip. You will find more information on this in the table below.

Overview of external diameters, metric and PG sizes

External diameter in mm	Metric size	PG size
Up to 12	M12	PG 7
Up to 16	M16	PG 9/PG 11
Up to 20	M20	PG 13.5/PG 16
Up to 25	M25	PG 21
Up to 32	M32	PG 21
Up to 40	M40	PG 36
Up to 50	M50	PG 42/PG 48
Up to 63	M63	-

Cable glands and the DIN EN 62444 standard

Cable glands are manufactured and tested according to DIN EN 62444. Amongst other things, this standard controls the retaining ability and strain relief of cables. The V-TEC cable glands from OBO Bettermann correspond to version “A”. Table 2A indicates the extraction forces that these cable glands must withstand according to the standard. The V-TEC cable glands also fulfil the requirements of DIN EN 62444 with regard to the twist protection of cables (see Table 3). To ensure the tested dust and moisture protection of the cable glands, continuous perforations should correspond to the mounting openings specified in the standard DIN EN 62444 according to Table 1. The on-site specialist must ensure that these parameters are complied with in order to hand over a functioning system.

Table 1

Size of the penetration hole	mm	6	8	10	12	16	20	25	32	40	50	63	75
Thread of the cable gland	M	M6	M8	M10	M12	M16	M20	M25	M32	M40	M50	M63	M75
Diameter of the mounting hole (+0.2/–0.4)	mm	6.5	8.5	10.5	12.5	16.5	20.5	25.5	32.5	40.5	50.5	63.5	75.5

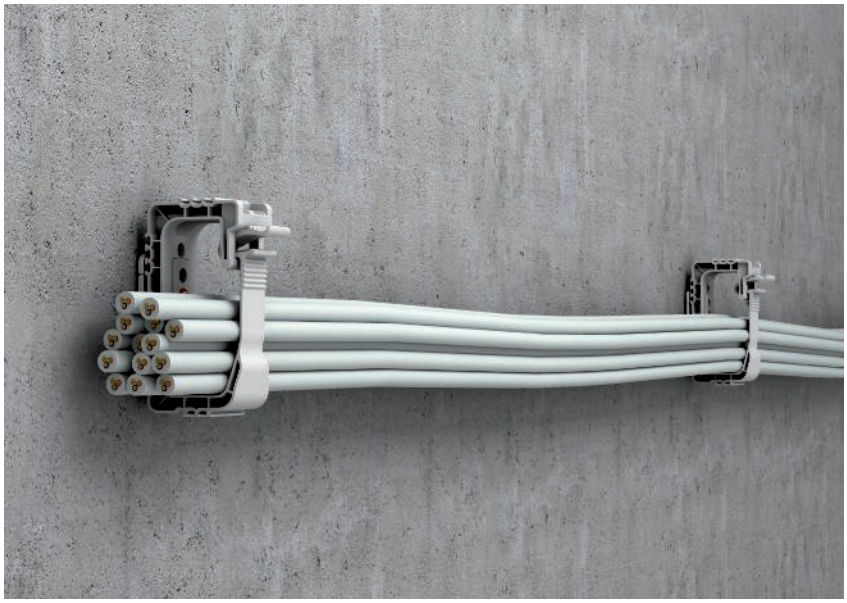
Table 2 A

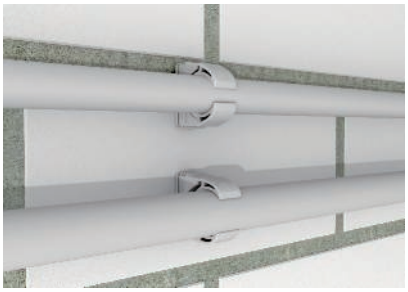
Cable diameter	Retaining capacity	Strain relief, version A
mm	N	N
to 4	5	–
>4 to 8	10	30
>8 to 11	15	42
>11 to 16	20	55
>16 to 23	25	70
>23 to 31	30	80
>31 to 43	45	90
>43 to 55	55	100
>55	70	115

Table 3

Cable diameter	Torque Version A and B
mm	Nm
>4 to 8	0.10
>8 to 11	0.15
>11 to 16	0.35
>16 to 23	0.60
>23 to 31	0.80
>31 to 43	0.90
>43 to 55	1.00
>55	1.20

Information on cable fastenings



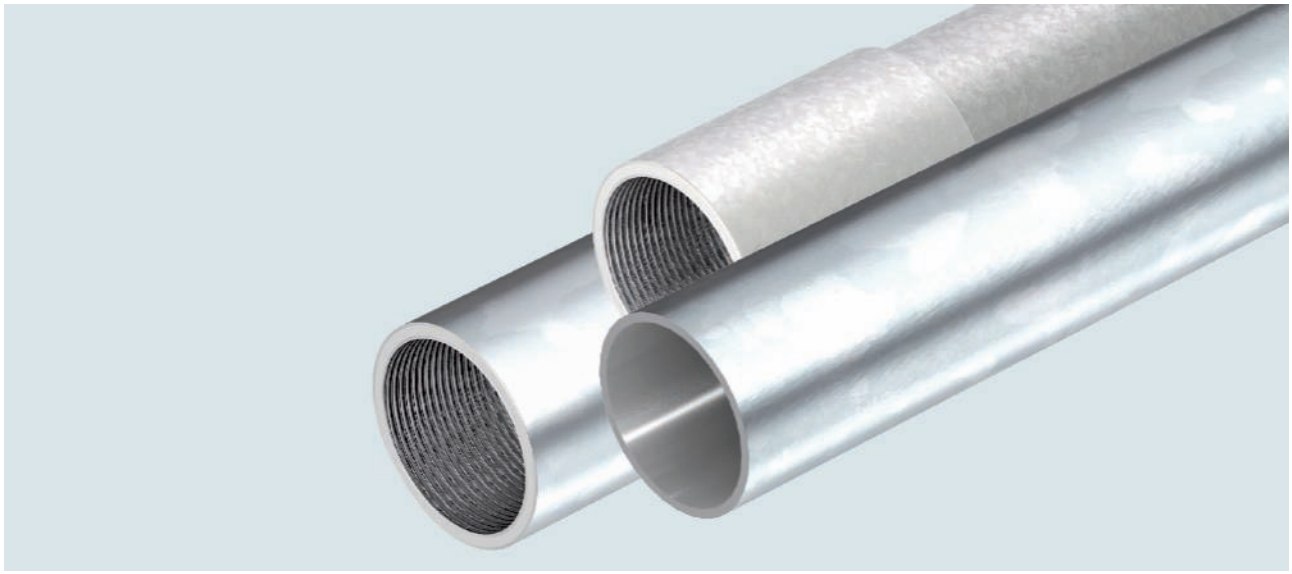


Cable fastening
The standard DIN EN 61914 "Cable holders for electrical installations" specifies that cable holders "must be able to accept cables or cable bundles of the diameter specified by the manufacturer or responsible retailer, without tearing or breaking or shearing off the threads of bolts".
During the installation of cables, the current national and international standard must be taken into account, such as DIN VDE 0100 520. “Suitable tools and methods, which prevent damage or changes to the shape” must be used for fastening.
In addition, with masses of cables, DIN VDE 0298 requires the appropriate "load capacities of cables for fixed laying in and on buildings..." to be taken into account when selecting the fastening systems.

Besides these standardising aspects, the end customer‘s or client‘s particular laying specifications can/must be taken into account.
The fastening spacing for cables is given in DIN VDE 0100-520, June 2013. For example, cables laid horizontally require a spacing of 20x the cable diameter. However, a spacing of 80 cm should not be exceeded. With vertical routing, the clip spacings may be increased but should not exceed 1.5 m.
The table below shows the maximum fastening spacings for cables according to the cable diameter. The laying spacings given in the Industrial installation product catalogue, e.g. for bus holders or Quick clips, are guide values and can only be treated as such.

External diameter of the cables	Maximum spacing for horizontal fastening	Maximum spacing for vertical fastening
mm	mm	mm
D ≤ 9	250	400
9 < D ≤ 15	300	400
15 < D ≤ 20	350	450
20 < D ≤ 40	400	550

IEC classification in accordance with DIN EN 61386-1

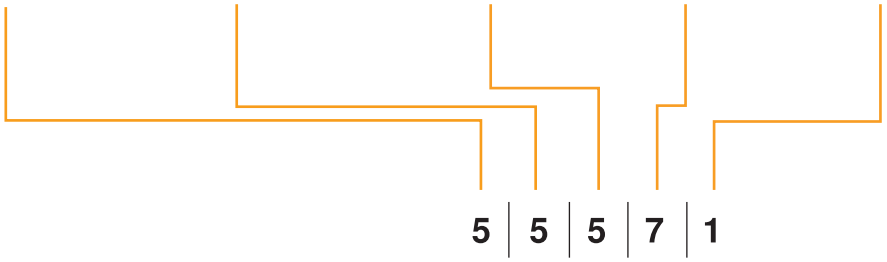


The OBO Bettermann pipe systems are machined and tested according to DIN EN 61386 (Electrical installation pipe systems for electrical energy and information) and DIN EN 60423 (External diameters of electrical installation pipes and thread for electrical installation pipes and their accessories).

Numeric code

DIN EN 61386-1 classifies installation pipes using a 12-digit numeric code, which provides information on the pressure resistance, impact resistance or use temperatures. You can find the first five digits in the product descriptions of the pipe systems.

	First digit		Second digit		Third digit		Fourth digit		Fifth digit
	Pressure resistance		Impact resistance		Lower temperature range		Upper temperature range		Bending behaviour
1	Very light (125 N)	1	Very light (0.5 kg/100 mm)	1	+5 °C	1	+60 °C	1	Rigid
2	Light (320 N)	2	Light (1.0 kg/100 mm)	2	–5 °C	2	+90 °C	2	Bendable
3	Medium (750 N)	3	Medium (2.0 kg/100 mm)	3	–15 °C	3	+105 °C	3	Pliable, self-re-covering
4	Heavy (1,250 N)	4	Heavy (2.0 kg/300 mm)	4	–25 °C	4	+120 °C	4	Flexible
5	Very heavy (4,000 N)	5	Very heavy (6.8 kg/300 mm)	5	–45 °C	5	+150 °C		
						6	+250 °C		
						7	+400 °C		



Classification according to IEC EN 61386-1: Composition of the IP code

	7th digit		8th digit
	Ingress of solid bodies		Ingress of water
0		0	None declared
1		1	Protected against vertically falling water drops
2		2	Protected against vertically falling water drops, when the pipe system is tilted up to an angle of 15°
3	Protected against solid foreign objects of 2.5 mm Ø and greater	3	Protected against spraying water
4	Protected against solid foreign bodes of 1.0 mm Ø and larger	4	Protected against splashing water
5	Dust-protected	5	Protected against water jets
6	Dust-proof	6	Protection against powerful water jets
7		7	Protected against the effects of temporary immersion in water

Classification according to IEC EN 61386-1: Corrosion protection

	9th digit	
	Resistance against corrosion	Suitable surfaces
1	Low protection, inside and outside	
2	Medium protection, inside and outside	• Black coated (SW) • Electrogalvanised (G) • Strip galvanised (FS)
3	Medium protection inside, high protection outside	
4	High protection inside and outside	• Hot-dip galvanised (FT) • Stainless steel (V2A, V4A)

Protection against mechanical loads
OBO metal pipes are particularly suited to use under tough industrial conditions. They provide reliable protection against very heavy mechanical loads during cable routing.

The different material and surface qualities, from galvanised to painted, allow perfect adaptation to the requirements of the appropriate environment.

Maintenance of electrical function to E30/E90
Our steel pipes guarantee the maintenance of electrical function to E30/E90. They are thus ideal for the connection of safety-relevant equipment, such as smoke extraction systems.

Definition of electromagnetic compatibility (EMC)

Recent years have seen the use of electronic circuits increase continually. Whether in industrial systems, medicine, households, telecommunications systems or electrical building installations – we find powerful electrical equipment and systems everywhere, and these switch ever greater currents, achieve greater radio ranges and transport ever more power 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, result in 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 - Lightning strike - Welding devices	- Galvanic - Inductive - Capacitive - Electromagnetic	- Process computer - Radio receiver systems - Controllers - Converters - Measuring units

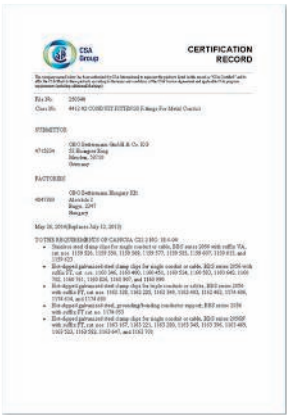
Guarantee of EMC

Guaranteeing 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 device being influenced, 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 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.

Standards, specifications and certifications



Standards

OBO offers products for professionals, made by professionals. Our products are manufactured and tested according to the respective specifications of the standards. For example, DIN EN 61537 describes all the relevant parameters for cable support systems, such as the area of application, test conditions, corrosion resistance and temperature classification. As a highly competent manufacturer, OBO subjects itself to these requirements on a daily basis. Comprehensive test procedures guarantee that systems which conform to standards function safely.

Specifications

All the OBO products and systems are CE-compliant according to the appropriate EC guidelines. 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 product information and the general safety regulations must be complied with during installation and use.

Certifications

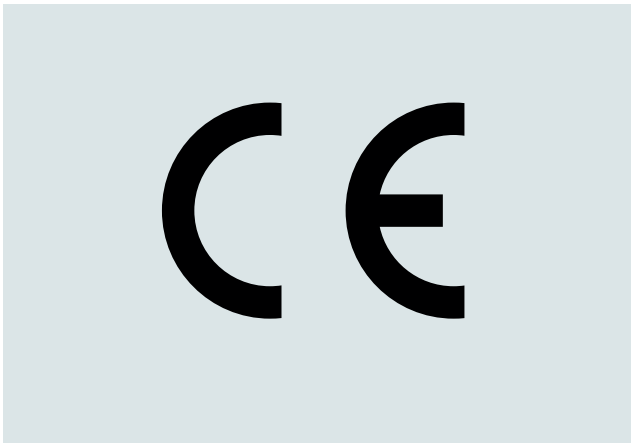
For OBO, product quality is closely connected to continuous testing and checking – which is why we manufacture almost all our products ourselves. This enormous depth of production is an expression of our demand for quality. From construction, and the materials used through production, right up to logistics, 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.

Certificates and test marks

VDE
VDE is the Association for Electrical, Electronic and Information Technologies, their study and the technologies and applications based upon them. The VDE mark on electrical equipment is proof that the equipment complies with VDE regulations and/or European or international harmonised standards, and meets the safety requirements of the applicable directives. The VDE mark indicates that a product is safe in relation to electrical, mechanical, thermal, toxic, radiological and other hazards.



CE symbol
Technical resources included in a legal ordinance, i.e. electrical resources, machines and safety components, must have a CE symbol, with which the manufacturer confirms that the safety requirements of the ordinances are fulfilled. In addition, there must also be a declaration of conformity and technical documentation. The CE symbol is not a quality mark, but simply a declaration by the manufacturer that they have complied with the legal requirements and the codes of practice.

UL
Underwriters Laboratories (UL) is an independent organisation that tests and certifies product safety. UL certification is generally required if a product is to be sold on the US market.
UL offers various certification options: The “UL Listed” test mark indicates that UL has tested representative samples of a product and that it conforms to UL’s safety requirements. The “UL Recognized” component test mark entitles a product to be used in a product or system bearing the “UL Listed” test mark.

First-hand support and knowledge

OBO seminars: First-hand knowledge
With a comprehensive programme of training courses and seminars, OBO supports its customers with first-hand specialist knowledge. Besides the theoretical principles, practical everyday implementation is also dealt with. 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

Invitations to tender on the Internet at www.ausschreiben.de
More than 10,000 entries from the different ranges can be called up free of charge. 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.
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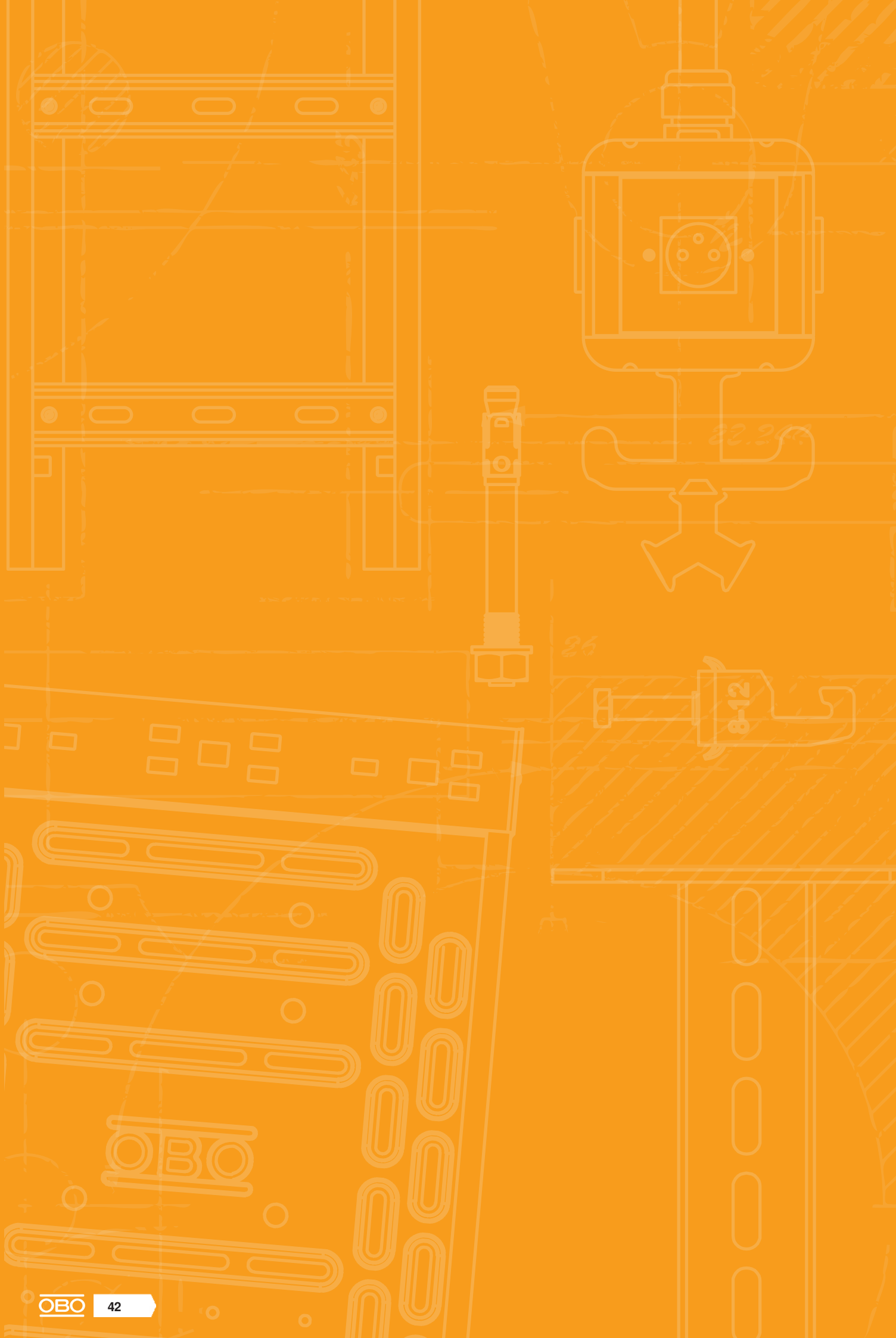
Test marks

	American Bureau of Shipping, USA
	AENOR, Producto Certificado, Spain
	STOWARZYSZENIE ELEKTRYKÓW POLSKICH, Poland
	Lightning current-tested
	Lightning current-tested, Class H (100 kA)
	CEBEC, Belgium
	Canadian Standards Association, Canada
	DEMKO, Danmarks Elektriske Materielkontrol, Denmark
DIBt	Deutsches Institut für Bautechnik Berlin, Germany
	Det Norske Veritas
	ENEC Austria
	ATEX certificate for explosive areas
	ELEKTROTECHNICKÝ ZKUŠEBNÌ ÚSTAV, Czech Republic
	FIMKO, Finland
	Forschungs- und Materialprüfungsanstalt, Germany
	Russia, GOST The State Committee for Standards
	Test marks for technical resources, VDE Prüf- und Zertifizierungsinstitut Offenbach, Germany
	Halogen-free; without chlorine, fluorine and bromine
	INMETRO, Brazil
	KEMA-KEUR, Netherlands
	Indication of metric products
	MAGYAR ELEKTROTECHNIKAI ELLENŐRZŐ INTÉZET Budapest, Hungary
	NEMKO, Norway
	AFNOR Quality symbol of the French standardisation institute

	Underwriters Laboratories Inc., USA + CSA, Canada
	Österreichischer Verband für Elektrotechnik, Austria
	INSTITUTO ITALIANO DEL MARCHO DI QUALITÁ, Italy
	RINA 1861, Ship Classification, Certification and Services
	Underwriters Laboratories Inc., USA
	SEMKO An Inchcape Testing Services Company, Sweden
	Eidgenössisches Starkstrominspektorat, Switzerland
	South African Bureau of Standards
	Shock-tested, Bundesamt für Zivilschutz, Germany
	Sähkötarkastuskeskus Elinspektionscentralen Electrical Inspectorate, Finland
	Underwriters Laboratories Inc., USA
	Underwriters Laboratories Inc., USA
	Verband der Elektrotechnik, Elektronik, Informationstechnik e.V., Germany
	German Association of Electricians, tested safety
	5-year warranty



Anchor and tie

Screw lock

The components listed below are now considered to be ineffective screw locks, as the corresponding standards have been withdrawn. They are therefore not permitted as the sole safety devices for strength classes ≥ 8.8.

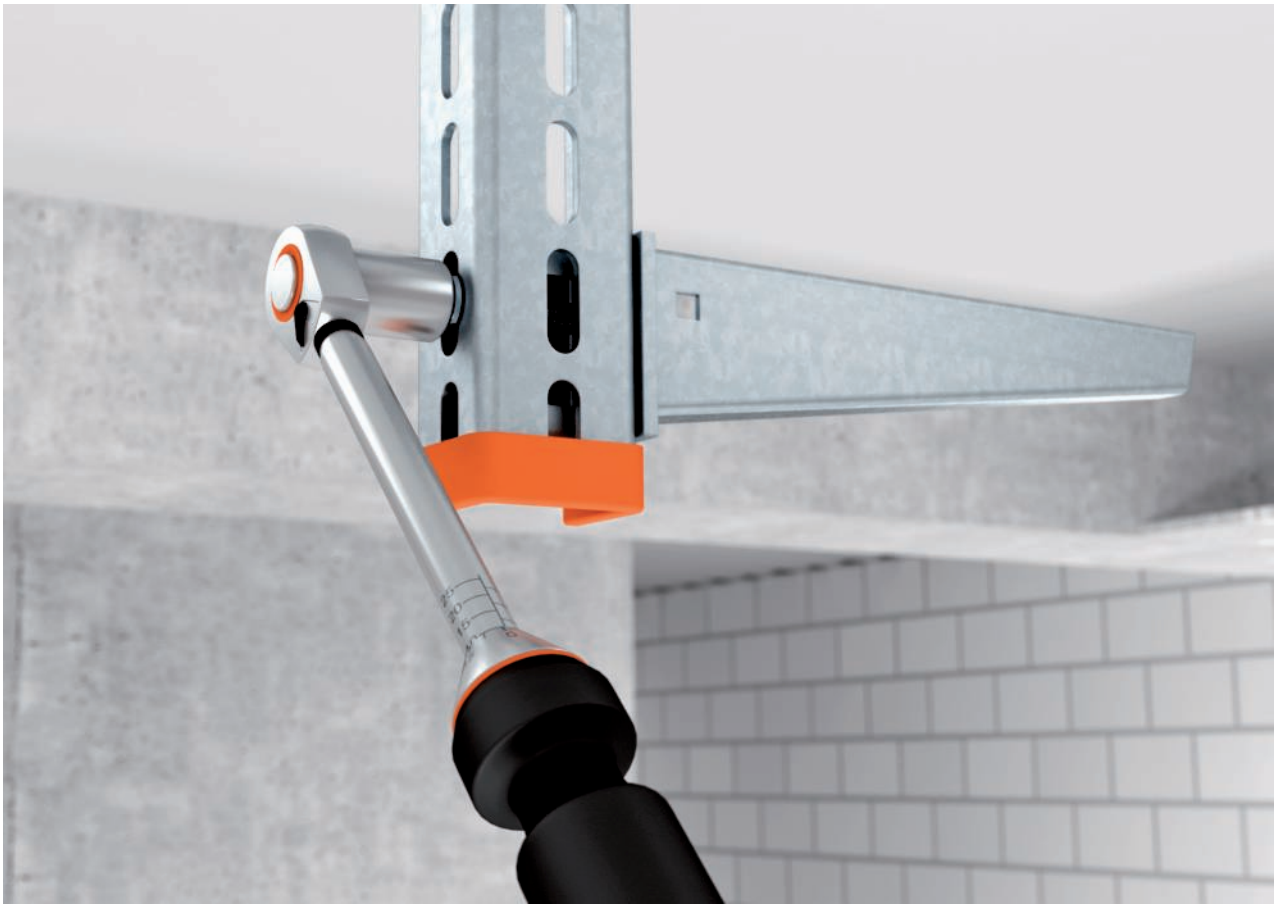
Withdrawn standards:
Spring lock washers (DIN 127, DIN 128 and DIN 6905)
Wave spring washers (DIN 137 and DIN 6904)
Toothed discs (DIN 6797)
Serrated washers (DIN 6798)
Locking plates (DIN 93, DIN 432 and DIN 463)
Safety cups (DIN 526)
Locking nuts (DIN 7967)
Castle nuts with split pin (DIN 937)

All specified standards have now been withdrawn, however these components can often still used as “captive prevention”. Captive prevention devices prevent a screw connection from being completely unscrewed, but not from loosening.

At OBO Bettermann, individual products – such as hexagonal bolts with washer and nut – continue to be sold as a complete package, as these are used for electrical contact to surrounding metallic components.

Our systems are generally not exposed to dynamic loads that require screw locking.

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 made of steel

Thread	Tightness class 5.6	Tightness class 8.8
Friction coefficient 0.14	Friction coefficient 0.14	Friction coefficient 0.14
M6	4.80 Nm	4.80 Nm
M8	11.60 Nm	27.30 Nm
M10	23.10 Nm	54.00 Nm
M12	40.40 Nm	93.00 Nm
M14	64.70 Nm	148.00 Nm
M16	11.60 Nm	230.00 Nm

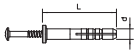
Tightening torques of bolts with metric thread made of stainless steel

Thread	Resistance grade 70	Resistance grade 80
Friction coefficient 0.14	Friction coefficient 0.14	Friction coefficient 0.14
M6	11.60 Nm	12.90 Nm
M8	23.60 Nm	31.50 Nm
M10	46.80 Nm	62.40 Nm
M12	81.00 Nm	108.00 Nm
M14	129.00 Nm	172.00 Nm
M16	201.00 Nm	269.00 Nm

Knock-in anchor

Knock-in anchor

PA

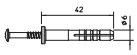


Type	Dowel Ø mm	Length mm	Pull-out force N min/concrete	Pack Piece	Weight kg/100 pc.	Item no.
910 SD 5X35	5	35	220	100	0.360	**2351021**
910 SD 6X35	6	35	260	100	0.310	**2351056**
910 SD 6X40	6	40	260	100	0.555	**2351064**
910 SD 8X55	8	55	350	50	1.070	**2351099**

Knock-in anchor: steel, electrogalvanised and transparently passivated.

Knock-in anchor

PA



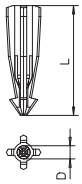
Type	Dowel Ø mm	Length mm	Pack Piece	Weight kg/100 pc.	Item no.
910 SD-Q 6x40	6	40	100	0.480	**2351218**

Knock-in anchor for Quick clips type 2955.
Knock-in anchor: steel, tempered, electrogalvanised and transparently passivated.

Gas concrete anchor

Gas concrete anchor

PA



Type	Dim. D mm	Dim. L mm	Colour	Pack Piece	Weight kg/100 pc.	Item no.
910 GD 6x35	6	35	Light grey	100	0.094	**2347229**
910 GD 8x50	8	50	Light grey	50	0.263	**2347261**

The anchor can be knocked directly into the porous concrete (gas concrete resistance class G2). With a resistance class of G4 or greater, a 5 or 6 mm hole should be pre-drilled.
Screw length: Component thickness + 40 mm (6 mm) / 55 mm (8 mm).

System description

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 the variety of versions, load classes and material qualities
- Quick and easy mounting
- High-tensile loads and shear loads
- Small edge and axis spacings
- Can be used indoors and outdoors (depending on material)

Mounting aid

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

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

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

Knocking-in of the BZ-IG bolt tie
Knocking-in of the bolt tie BZ IG with the appropriate setting tool. Then the component to be mounted can be fastened.

Mounting of BZ IG threaded rod
Mounting of a threaded rod into the BZ-IG bolt tie. The direct mounting of a component with a hexagonal bolt is also possible.

Application of the BZ IG torque
Fastening of the threaded rod by tightening the hexagonal nut with the torque specified in the approval.

Mounting aid

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

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

Bolt tie, type BZ
Bolt tie, 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, M12 or M16 thread.

Drop-in anchor, type ES
Impact tie, type E, with M6, M8, M10, M12 internal thread. To accept small loads, approved for multiple fixings in cracked and non-cracked concrete of non-load-bearing systems.

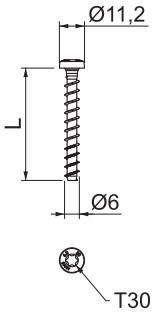
Hollow core anchor, type Easy
Hollow core anchor, type Easy, with M6, M8 and M10 internal thread, for use in stressed concrete core slab ceilings.

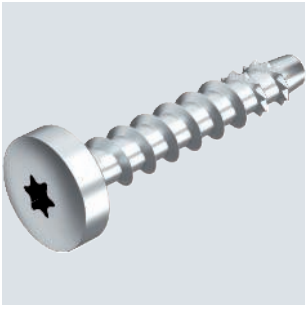
St G ABZ

MMS-plus P round head tie, with panhead

Type	Dimension mm	Dim. L mm	Drill hole Ø mm	Head Ø mm	Screw system	Pack Piece	Weight kg/100 pc.	Item no.
MMS+ P 6x35	6x35	35	5	11.2	Torx	100	0.710	**3498103**
MMS+ P 6x50	6x50	50	5	11.2	Torx	100	1.000	**3498108**

Bolt tie for direct mounting without additional anchors in cracked and uncracked concrete and masonry. With round head for universal fastenings. Torx drive T30.
Construction product tested according to EAD and CE mark, with European Technical Assessment (ETA) and proof of suitability. Load-bearing capacities under fire loads proven up to fire resistance class R120.



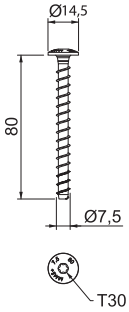


St G ABZ

MMS-plus P round head tie, with panhead

Type	Dimension mm	Anchor length mm	Drill hole Ø mm	Head Ø mm	Screw system	Pack Piece	Weight kg/100 pc.	Item no.
MMS+ P 7.5x80	7,5x80	80	6	14.5	Torx	50	1.600	**3498272**

Bolt tie for direct mounting without additional anchors in cracked and uncracked concrete and masonry. With round head for universal fastenings. Torx drive T30.
Construction product tested according to EAD and CE mark, with European Technical Assessment (ETA) and proof of suitability. Load-bearing capacities under fire loads proven up to fire resistance class R120.

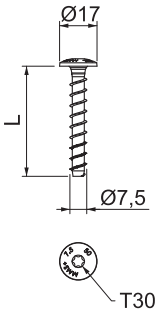


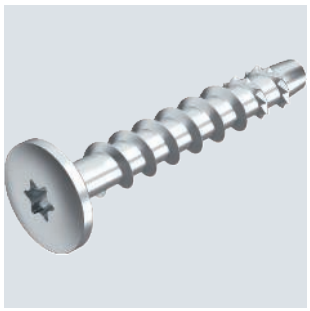
St G ABZ

MMS-plus MS mounting rail tie, with flat panhead

Type	Dimension mm	Dim. L mm	Drill hole Ø mm	Head Ø mm	Screw system	Pack Piece	Weight kg/100 pc.	Item no.
MMS+ MS 7.5x50	7,5x50	50	6	17	Torx	100	1.500	**3498261**

Bolt tie for direct mounting without additional anchors in cracked and uncracked concrete and masonry. With large round head to fasten mounting and profile rails. Torx drive T30.
Construction product tested according to EAD and CE mark, with European Technical Assessment (ETA) and proof of suitability. Load-bearing capacities under fire loads proven up to fire resistance class R120.



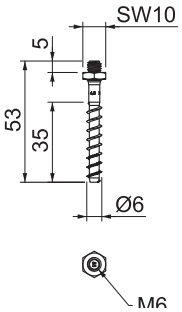


St G ABZ

MMS-plus ST push-in tie, with connection thread

Type	Dimension mm	Drill hole Ø mm	Thread	SW mm	Pack Piece	Weight kg/100 pc.	Item no.
MMS+ ST 6x55	6x55	5	M6	10	100	1.030	**3498264**

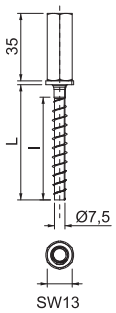
Bolt tie for direct mounting without additional anchors in cracked and uncracked concrete and masonry. M6 connection thread for fastening clips with threaded foot.
Construction product tested according to EAD and CE mark, with European Technical Assessment (ETA) and proof of suitability. Load-bearing capacities under fire loads proven up to fire resistance class R120.



Fire protection anchors

MMS-plus I internal thread tie, with combination thread sleeve

St G ABZ

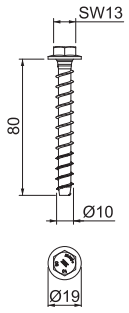


Type	Dimension mm	Dim. L mm	Drill hole Ø mm	Thread	SW mm	Pack Piece	Weight kg/100 pc.	Item no.
MMS+ I 7.5x40	7,5x40	40	6	M8/M10	13	40	3.810	**3498266**
MMS+ I 7.5x60	7,5x60	60	6	M8/M10	13	40	4.230	**3498268**

Bolt tie for direct mounting without additional anchors in cracked and uncracked concrete and masonry. With M8/M10 combination thread sleeve for fastening threaded rods. Construction product tested according to EAD and CE mark, with European Technical Assessment (ETA) and proof of suitability. Load-bearing capacities under fire loads proven up to fire resistance class R120.

MMS-plus SS hexagonal tie, with pressed washer

St G ABZ



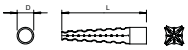
Type	Dimension mm	Dim. L mm	Drill hole Ø mm	SW mm	Pack Piece	Weight kg/100 pc.	Item no.
MMS+ SS 10x80	10x80	80	8	13	25	4.000	**3498124**
MMS+ SS 10x100	10x100	100	8	13	25	4.800	**3498159**

Bolt tie for direct mounting without additional anchors in cracked and uncracked concrete and masonry. With hex head drive and pressed washer to accept large loads. Suitable for fastening suspended loads from suspended supports and wall brackets.
Construction product tested according to EAD and CE mark, with European Technical Assessment (ETA) and proof of suitability. Load-bearing capacities under fire loads proven up to fire resistance class R120.

Anchor, light-duty fastening

Metal spreading anchor

St GTP



Type	Dim. D mm	Dim. L mm	Drill hole Ø mm	Pack Piece	Weight kg/100 pc.	Item no.
MD 5 GTP	5	30	5-7	200	0.190	**3484602**
MD 6 GTP	6	32	7-9	100	0.250	**3484629**

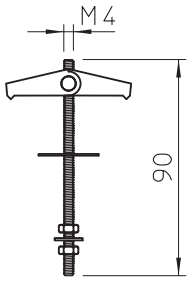
Areas of application: gas concrete, lightweight concrete, Poroton, pumice, plaster, hollow brick and full brick. Can be knocked into porous concrete (gas concrete) of low resistance without drilling. Superbly suited for areas subjected to high temperatures.

St G

Sprung hinged anchor

Type	Thread	Length mm	Drill hole Ø mm	Minimum cavity depth mm	Break load kN	Pack Piece	Weight kg/100 pc.	Item no.
450 M4x95 G	M4	90	14	35	0.2	50	1.750	**3481611**

With threaded rod, washer and hexagonal nut; brass axle.

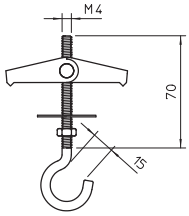


St G

Sprung hinged anchor

Type	Thread	Length mm	Drill hole Ø mm	Minimum cavity depth mm	Break load kN	Pack Piece	Weight kg/100 pc.	Item no.
452 M4x70 G	M4	70	14	35	0.4	50	1.950	**3481778**

With ceiling hook, washer and hexagonal nut; brass axle.

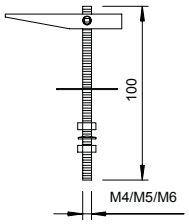


St G

Tilting anchor

Type	Thread	Length mm	Drill hole Ø mm	Break load kN		Pack Piece	Weight kg/100 pc.	Item no.
453 M6x100 G	M6	100	16	0.7		50	5.250	**3482014**

Two washers and two hexagonal nuts, with threaded shank.

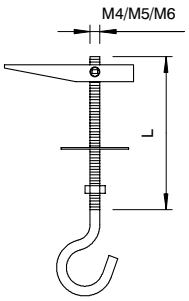


St G

Tilting anchor

Type	Thread	Dim. L mm	Drill hole Ø mm	Hook-Ø mm	Break load kN		Pack Piece	Weight kg/100 pc.	Item no.
455 M5x100 G	M5	100	13	16	0.4		50	4.250	**3482073**

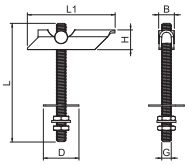
One washer and one hexagonal nut, with ceiling hook.
Note: Reckon with 5x safety for luminaire suspensions.



Anchor, light-duty fastening

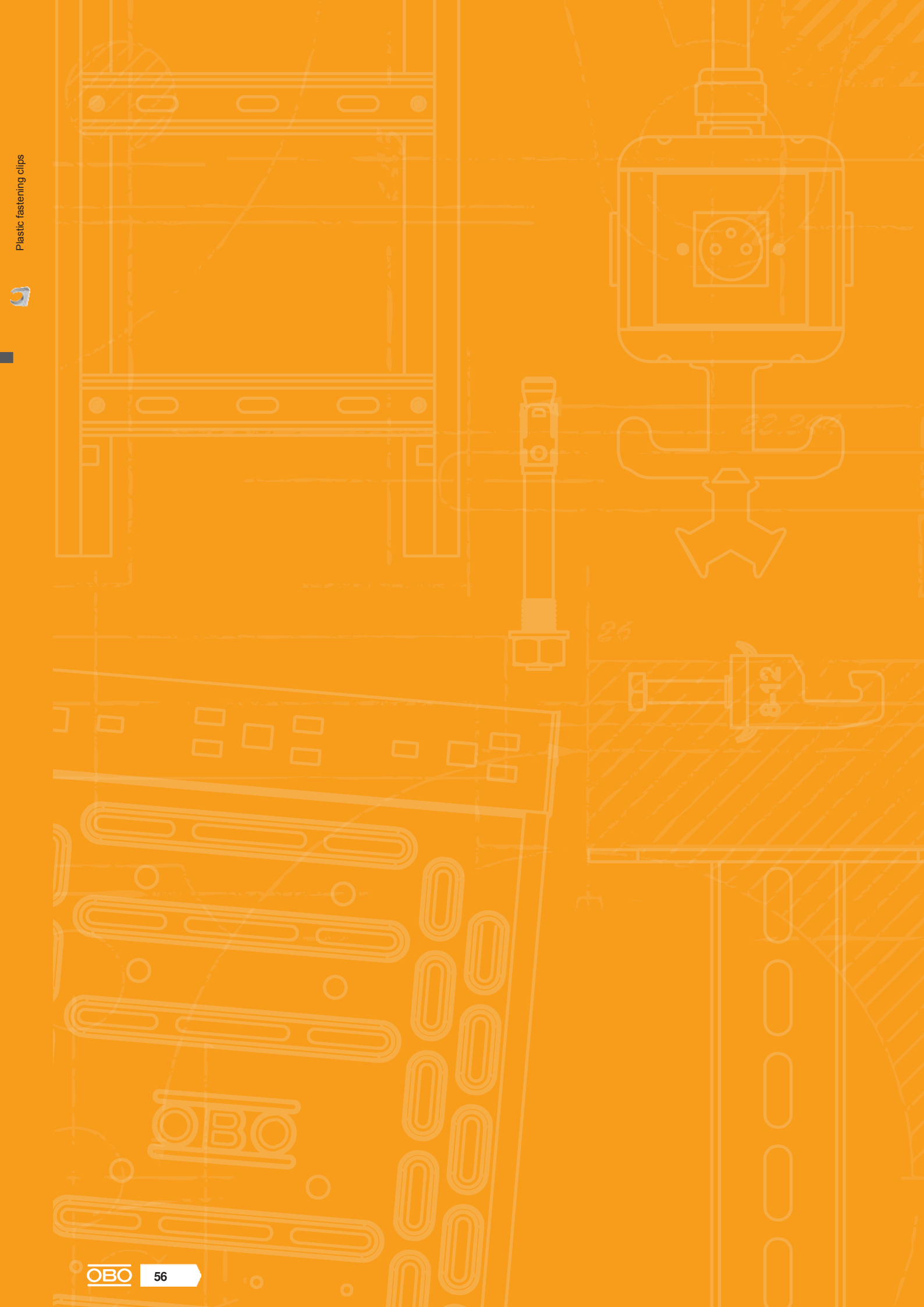
Tilting anchor

St G



Type	Thread	Dim. L mm	Drill hole Ø mm	Break load kN	Minimum cavity depth mm	Pack Piece	Weight kg/100 pc.	Item no.
KD 8 100	M8	100	22	2.4	75	25	11.200	**3482707**
KD 10 100	M10	100	25	2.4	75	25	11.200	**3482758**

Including nut and large washer.
The universal heavy-duty fastening for stressed concrete, hollow steel profiles, metal sheets and plates.
Use: heating, ventilation and air conditioning technology, cooling systems, sprinkler systems, pipes, cable tracks, etc.
* Dependent on the thickness of the ceiling profile.



Plastic fastening clips

OBO Quick series

Arrangeable cable and pipe clips – available with infinitely adjustable clamping range or safety lock

starQuick clip
- Snap lock with patented safety system
- Can be lined up together up to size SQ28
- UV- and weatherproof polyamide
- Wall and ceiling mounting

HALOGEN FREE M

Quick clip – the high-speed clip
- Extreme loading capacity
- Insertion slopes
- Slot fastening
- Expandable above each other
- Latch-in hole/middle stopper

Multi-Quick clip
- One clip for multiple dimensions
- Universal application
- PG and metric

The OBO Quick series offers three different types of halogen-free pressure and pipe clips for the time-saving and secure fastening of cables and electrical installation pipes. The benefit from shorter mounting times when fastening installations on walls and ceilings, both indoors and outdoors.

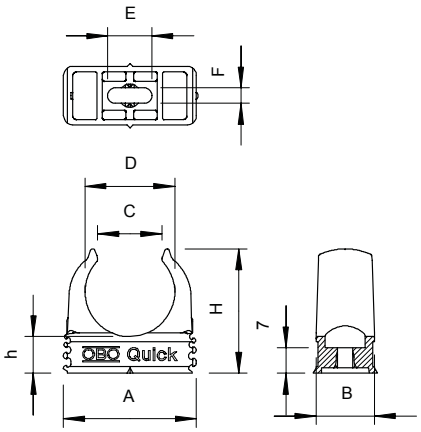
All the clip types and sizes of the OBO Quick series can be interconnected easily, thanks to the shared arrangement contour. This means you can mount up to two clips with a single drill hole. The patented shape of the arrangement contour permits a particularly high carrying capacity.

Quick clip

The high-speed clip

- Extreme loading capacity
- Maximum stability
- Extremely easy mounting
- Insertion slopes
- Slot fastening
- Suitable for lining up
- Latch-in hole/middle stopper

OBO Quick



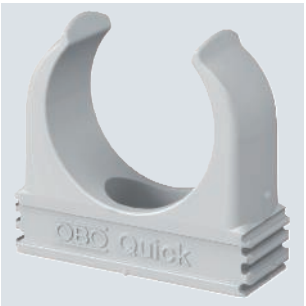
- OBO Quick clip for all metric steel armoured pipes, and light-duty and heavy-duty insulation pipes
- Suitable for OBO Quick Pipe
- Pipe centring aids allow optimal attachment of the pipe and automatically turn the clip into the correct position
- Patented
- Universal fastening option; can be arranged with the OBO Multi-Quick and starQuick clip
- Slot for side alignment during mounting with wood screw or knock-in anchor
- Recommended fastening spacing 50–60 cm
- For max. extraction values (F) at a room temperature of 20 °C, see table

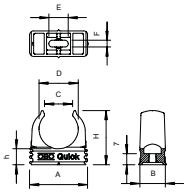
G	A	B	C	D	E	F	H	H	F (20 °C)
	mm	mm	mm	mm	mm	mm	mm	mm	N
M16	25.3	16	11.5	15.5	7	4.2	25	10	75
M20	30.3	16	14	19.4	9	4.2	29.5	10	90
M25	36.3	16	17.5	24.3	12	4.2	34	10	100
M32	46.3	16	22.4	31.4	12	4.2	42	11	120
M40	57.3	16	26	39.2	11	4.6	51	12	140
M50	70.3	18	32	49	12	6	63	14	165
M63	87.3	20	43	61.5	12	6	74.5	15	230

Quick clips

Quick clip

PP





Type	Nominal size	Colour	Shipping box Piece	Pack Piece	Weight kg/100 pc.	Item no.
2955 M16	M16	Light grey	1200	100	0.252	**2149004**
2955 M20	M20	Light grey	1200	100	0.325	**2149010**
2955 M25	M25	Light grey	1200	100	0.430	**2149016**
2955 M32	M32	Light grey	600	50	0.630	**2149022**
2955 M40	M40	Light grey	600	50	0.835	**2149028**
2955 M50	M50	Light grey	300	25	1.454	**2149034**

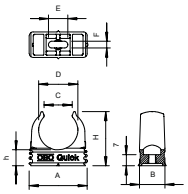
Flush-mounted clip to accept metric steel armoured pipes and heavy-duty insulating pipes, as well as Quick Pipe electrical installation pipes. Universal fastening options on walls and ceilings, both in indoor and protected outdoor areas. With slot for side alignment during mounting with wood screw or knock-in anchor. Toolless pipe mounting. Can also be arranged with OBO Multi-Quick or starQuick clip. M16 - M32 size can be screwed onto M6 thread. Recommended fastening spacing 50–60 cm, for max. extraction values F at a room temperature of 20 °C, see the table.

PP

Quick clip, flame-resistant, pure white

Type	Nominal size	Colour	Pack Piece	Weight kg/100 pc.	Item no.
2955 F M20 RW	M20	Pure white	100	0.325	**2149357**
2955 F M25 RW	M25	Pure white	100	0.430	**2149363**

Flame-resistant, flush-mounted clip to accept metric steel armoured pipes and heavy-duty insulating pipes, as well as Quick Pipe electrical installation pipes. Universal fastening options on walls and ceilings, both in indoor and protected outdoor areas. With slot for side alignment during mounting with wood screw or knock-in anchor. Toolless pipe mounting. Can also be arranged with OBO Multi-Quick or starQuick clip. M16 - M32 size can be screwed onto M6 thread. Recommended fastening spacing 50–60 cm, for max. extraction values F at a room temperature of 20 °C, see the table.



Multi-Quick clip

The universal clamp

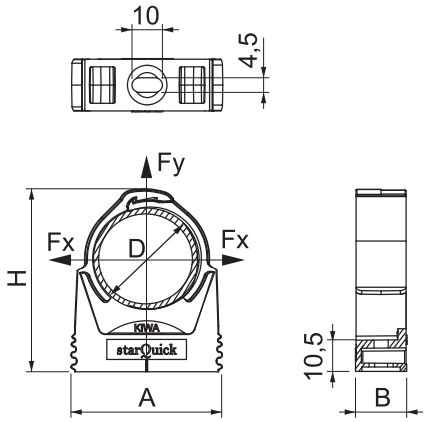
- PG and metric
- Easy fastening
- Secure locking
- Radial arrangement
- Simplified storage
- Clamping ranges from 15–37 mm
- Universal application

starQuick clip

The safety clamp

- Snap lock with patented safety system
- All sizes clip together, up to size SQ28
- UV- and weatherproof polyamide
- Wall and ceiling mounting

starQuick clip



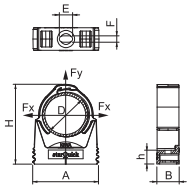
- All sizes clip together, up to size SQ28
- Breaking load with bolt DIN96, diameter 4.5 mm, min. at 20 °C
- For use outdoors and in public spaces
- UV- and weatherproof polyamide
- Clamping range 10–65 mm
- Wall and ceiling mounting
- Patented safety system

G	A	B	D	H	Fx	Fy
mm	mm	mm	mm	mm	N	N
10	29	17	9.5–12	31.6	500	500
12 14	29	17	11.5–15	34.5	550	550
15 16	29	17	14–16.5	35.7	600	600
17 19	29	17	16–20	39.8	700	700
20 23	29	17	19.5–23.5	49.5	800	800
25 28	40	17	24–28	49.5	850	850
28 32	40	17	27.5–32	52.8	900	900
32 35	43	17	31.2–35.8	65.8	1,000	1,000
35 40	47	17	35–40.1	65.8	1,100	1,100
40 44	52	17	39.3–44.5	69.5	1,200	1,200
45 50	57	17	44–50	75.5	1,200	1,200
50 54	63	17	48–55	81	1,400	1,400
59 65	74	20	58.5–65	94.3	1,500	1,500

starQuick clips

starQuick clip

PA



Type	Clamping range D mm	Colour	Dim. E mm	Dim. F mm	Dim. h mm	Pack Piece	Weight kg/100 pc.	Item no.
SQ-10 LGR	9.5 - 12	Light grey	10	4.5	10.5	100	0.568	**2146053**
SQ-12 LGR	11.5 - 15	Light grey	10	4.5	10.5	100	0.540	**2146061**
SQ-20 LGR	19.5 - 23.5	Light grey	10	4.5	10.5	50	0.670	**2146134**
SQ-25 LGR	24 - 28	Light grey	10	4.5	10.5	50	0.970	**2146207**
SQ-51 LGR	48 - 55	Light grey	10	4.5	10.5	15	2.250	**2146444**

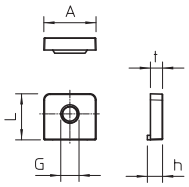
Highly stable clip to accept plastic and metal electrical and sanitary pipes, as well as the Quick Pipe electrical installation pipe. Universal fastening options on walls, ceilings and steel structures, both indoors and outdoors. Flexible clamping range of several millimetres. Tool-less pipe mounting. Can be arranged to up to Ø 28 mm, also with OBO Quick starQuick clip. For high load values, can be combined with double bracket. Can be mounted on profile rails for variable spacings and numbers of clips.

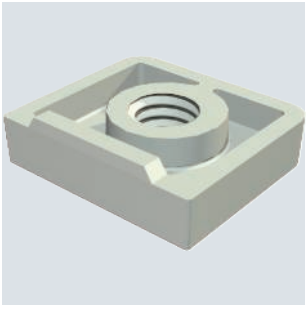
PC

starQuick nut

Type	Nominal size	Dim. A mm	Dim. L mm	Dim. h mm	Dim. t mm	Colour	Pack Piece	Weight kg/100 pc.	Item no.
SQ M6	M6	17	15	5	4	Light grey	100	0.070	**2146509**

Nut for insertion in starQuick clip, to mount the clip on an M6 thread.

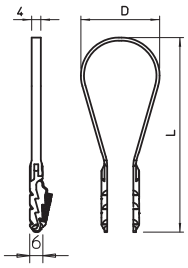




Push-fit anchor

BKS clamp clip

PA

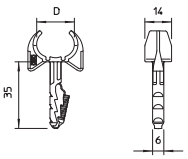


Type	Clamping range D mm	Dim. L mm	Dim. D mm	Pull-out value N	Colour	Pack Piece	Weight kg/100 pc.	Item no.
1973 3-13 LGR	3-13	52	13	500	Light grey	100	0.089	**2148803**
1973 8-28 LGR	8-28	70	27	500	Light grey	100	0.122	**2148846**

For cables, flexible pipes and all kinds of insulating and armoured steel pipes, suitable for concrete, calcareous limestone and full brick. Use in gas concrete masonry is possible, but reduced load capacities must be expected.

Snap clip

PA

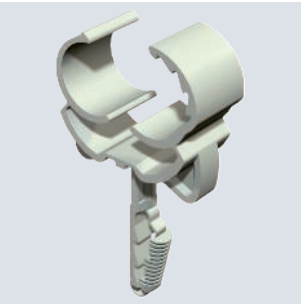


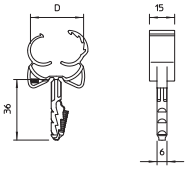
Type	Clamping range D mm	Drill hole depth mm	Colour	Pack Piece	Weight kg/100 pc.	Item no.
1975 16-19	16-19	40	Light grey	100	0.372	**2148048**
1975 19-22	19-22.5	40	Light grey	100	0.533	**2148056**

With moulded-on push-fit plug for rapid mounting in concrete walls and masonry.
Push plug into hole until the clip makes contact with the surface. When the pipe is pressed into the clip, the arms of the clip grip it.

Click-snap clip

PA



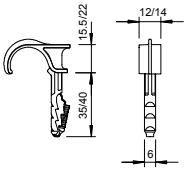


Type	Clamping range D mm	Drill hole Ø mm	Drill hole depth mm	Breaking load for concrete B25 N	Colour	Pack Piece	Weight kg/100 pc.	Item no.
1976 16-21	16-21.5	6	40	500 N	Light grey	100	0.443	**2148528**

With moulded-on push-fit plug for rapid mounting in concrete walls and masonry.
Push plug into hole until the clip makes contact with the surface. When the pipe is pressed into the clip, the arms of the clip grip it.

Single push-fit clip

PA



Type	Clamping range D mm	Drill hole Ø mm	Drill hole depth mm	Breaking load for concrete B25 N	Colour	Pack Piece	Weight kg/100 pc.	Item no.
1974 16-23	16-23	6	40	50	Light grey	100	0.263	**2197804**
1974 22-30	22-30	6	40	65	Light grey	100	0.446	**2197812**

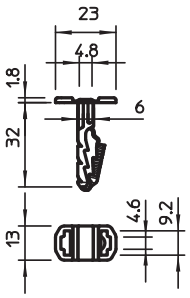
These push-fit clips are used when installing cables and pipes on walls and ceilings and when running flexible pipes on concrete and in the screed. The single push-fit clips can be used instead of nail clips in concrete and aerated concrete. The advantage of the push-fit clips is that they only have to be pushed into the drilled hole. Anchors and bolts are not needed.

PA

Push-fit anchor for cable ties

Type	Drill hole depth mm	Breaking load for concrete B25 N	Colour	Pack Piece	Weight kg/100 pc.	Item no.
910 STK 6x30	35	260	Light grey	100	0.108	**2351609**

The push-fit anchor can accept a cable tie (type 550 or 555) up to 9 mm wide, which can be used to install several cables and pipes.
Suitable for concrete, lime sandstone and brickwork as solid brick. Use in gas concrete masonry is possible, but reduced load capacities must be expected.

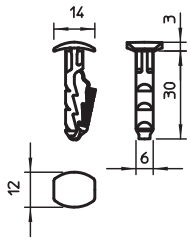


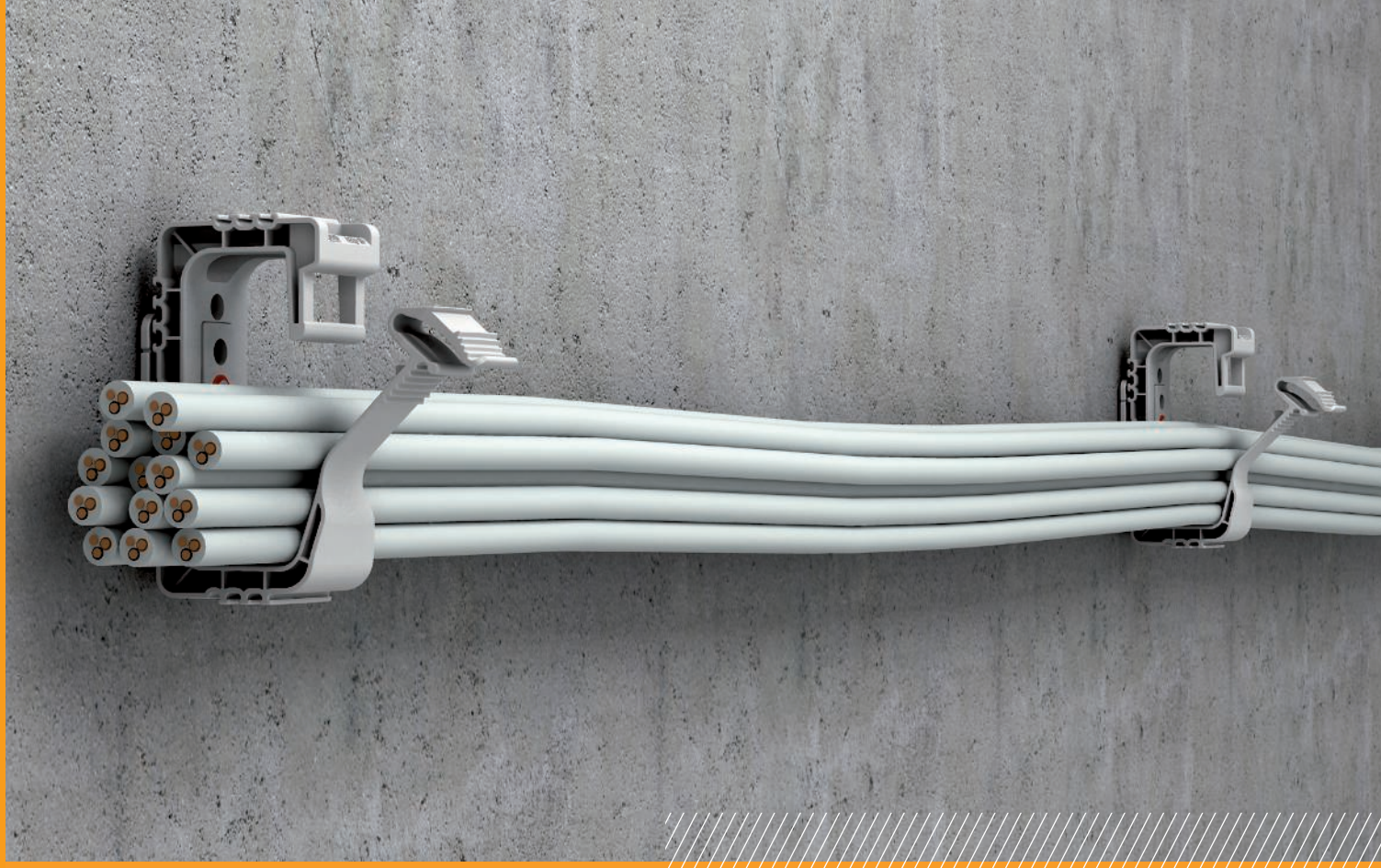
PA

Push-fit anchor with mushroom head

Type	Dowel Ø mm	Length mm	Drill hole depth mm	Breaking load for concrete B25 N		Pack Piece	Weight kg/100 pc.	Item no.
910 STP 6x30	6	30	35	250		100	0.101	**2351412**

The push-fit anchor allows simple mounting, e.g. of labelling panels or small WDK ducts.
Suitable for concrete, lime sandstone and brickwork as solid brick. Use in gas concrete masonry is possible, but reduced load capacities must be expected.

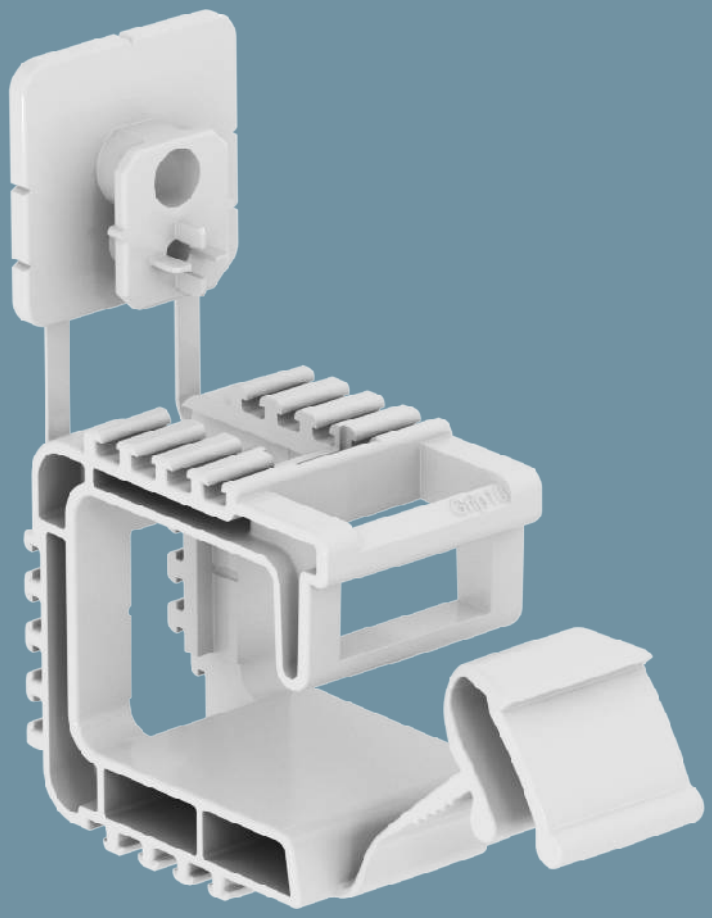




Grip cable tidy

Cable tidy for general use, suitable for wall and ceiling mounting. The moulded fastening element can be fastened using knock-in anchors or a gas pressure nail gun.

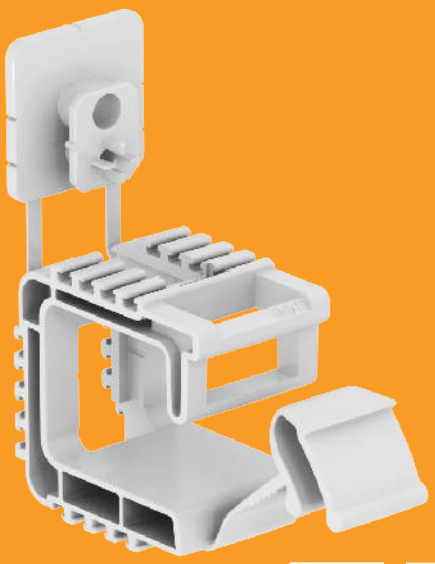
- Wall and ceiling mounting
- Can be joined together “back to back”
- For multiple cables
- Rapid mounting using the fastening element
- Ideal for retroinstallation
- Flame-resistant version, stone grey, to DIN EN 0471/DIN IEC 695 Part 2-1, test temperature 960 °C



Grip 10 cable tidy

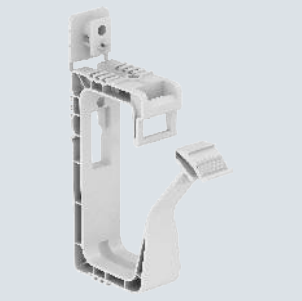
Cable tidy for general use, suitable for wall and ceiling mounting.

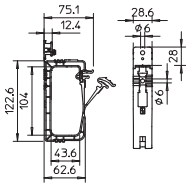
- Wall and ceiling mounting
- Can be joined together “back to back”
- For multiple cables
- Rapid mounting using the fastening element
- Ideal for retroinstallation
- Flame-resistant version, stone grey, to DIN EN 0471/DIN IEC 695 Part 2-1, test temperature 960 °C



Grip cable tidies, plastic

Grip 40

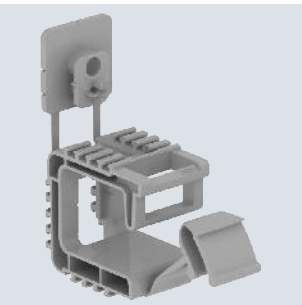


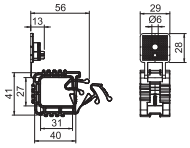


Type	No. of conductors NYM 3 x 1.5	Colour	Pack Piece	Weight kg/100 pc.	Item no.
2031 40	40	Light grey	25	3.610	**2205416**

Cable tidy for general use with fastening holes of Ø 6 mm, suitable for wall and ceiling mounting. The moulded fastening element can be fastened using knock-in anchors or a gas pressure nail gun. The recommended fastening spacing when assigned fully is 250–400 mm.

Grip 10 flame-resistant

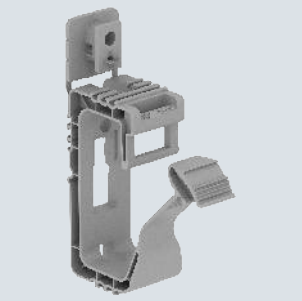


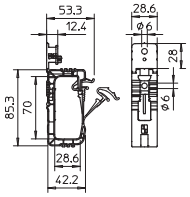


Type	No. of conductors NYM 3 x 1.5	Colour	Pack Piece	Weight kg/100 pc.	Item no.
2031 F 10	10	Stone grey	50	1.410	**2205388**

Cable tidy with fastening holes of Ø 6 mm for mounting installation cables, suitable for wall and ceiling mounting. The moulded fastening element can be fastened using knock-in anchors or a gas pressure nail gun. The recommended fastening spacing when assigned fully is 250 - 400 mm.
Flame-resistant version, stone grey, to DIN VDE 0471/DIN IEC 695 Part 2-1, test temperature 960 °C.

Grip 20 flame-resistant





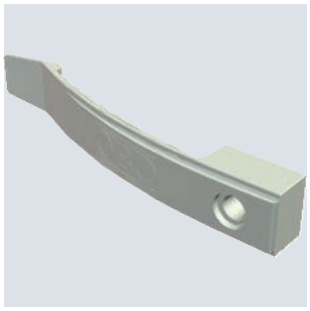
Type	No. of conductors NYM 3 x 1.5	Colour	Pack Piece	Weight kg/100 pc.	Item no.
2031 F 20	20	Stone grey	50	1.920	**2205412**

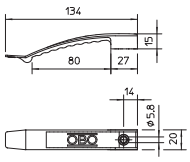
Cable tidy for general use, suitable for wall and ceiling mounting. The moulded fastening element can be fastened using knock-in anchors or a gas pressure nail gun.
Flame-resistant version, stone grey, to DIN VDE 0471/DIN IEC 695 Part 2-1, test temperature 960 °C. The recommended fastening spacing when assigned fully is 250–400 mm.

Pressure clips, plastic

Pressure clip for 8 cables

PA



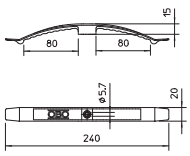


Type	No. of conductors NYM 3 x 1.5	Colour	Pack Piece	Weight kg/100 pc.	Item no.
2032	8	Light grey	50	1.371	**2205017**

Standard version for general use, e.g. on intermediate ceilings and partition walls.
Clamping height 9 mm – with spacer 13 mm.
Fastening hole: 6 mm Ø.

Pressure clip for 16 cables

PA

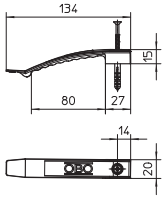


Type	No. of conductors NYM 3 x 1.5	Colour	Pack Piece	Weight kg/100 pc.	Item no.
2033	16	Light grey	25	2.077	**2205033**

Standard version for general use, e.g. on intermediate ceilings and partition walls.
Clamping height 9 mm – with spacer 13 mm.
Fastening hole: 6 mm Ø.

Pressure clip with knock-in anchor, for 8 cables

PA

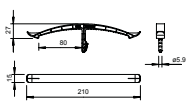


Type	No. of conductors NYM 3 x 1.5	Colour	Pack Piece	Weight kg/100 pc.	Item no.
2032 SD	8	Light grey	50	1.791	**2204800**
2032 SD SP	8	Light grey	100	1.791	**2204851**

With pre-mounted knock-in anchor, 6 mm Ø.
Required drill hole depth 50 mm.
Clamping height 9 mm – with spacer 13 mm.
Fastening hole 6 mm Ø.

Pressure clip with push-fit anchor

PA



Type	No. of conductors NYM 3 x 1.5	Colour	Pack Piece	Weight kg/100 pc.	Item no.
2033 STD	16	Light grey	25	1.037	**2204541**

With moulded push-fit plug, 6 mm Ø.

CTC cable tie clip

Fasten cables and up to four pipe sizes quickly, flexibly and reliably with only one cable tie clip.

- Pipe clip with cable tie with internal gear teeth
- Universally applicable for cables and pipes
- Fastening by means of knock-in anchor Ø 5 mm/Ø 6 mm

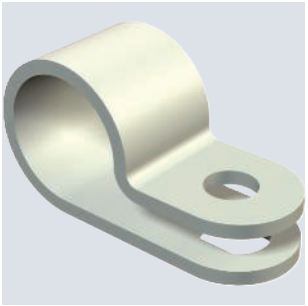
HALOGEN FREE

PA

Fastening clip

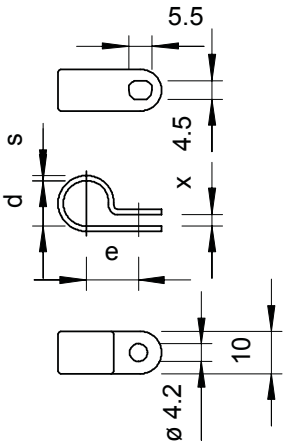
Type	For cable Ø mm	Colour	Pack Piece	Weight kg/100 pc.	Item no.
255 9.5 LGR	9.5	Light grey	100	0.063	**2222094**
255 11 LGR	11	Light grey	100	0.073	**2222116**

Fastening clip for secure all-round fixing of cables.



Type	For cable Ø mm	Dim. d mm	Dim. e mm	Dim. s mm	Dim. x mm
255 9.5 LGR	9.5	9.3	11	1.2	2.2
255 11 LGR	11	10.8	13	1.2	2.8

Dimensions



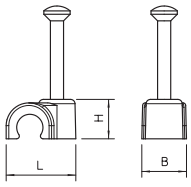
ISO nail clips

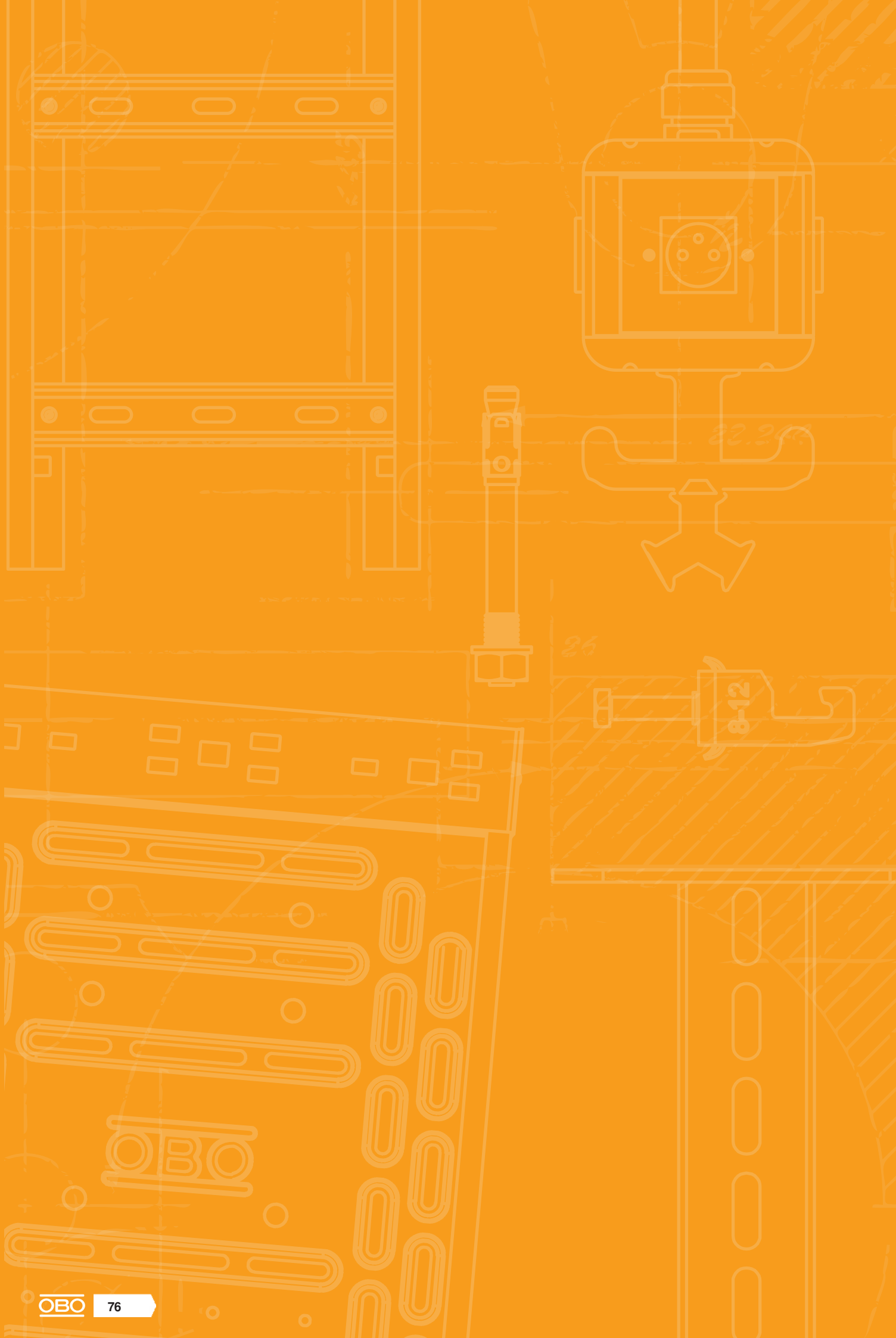
PP

ISO nail clip 2007

Type	For cable Ø mm	For nail Ø x l mm	Colour	Pack Piece	Weight kg/100 pc.	Item no.
2007 18 RW	7	2,0x18	Pure white	100	0.083	**2225506**

ISO nail clip, short design

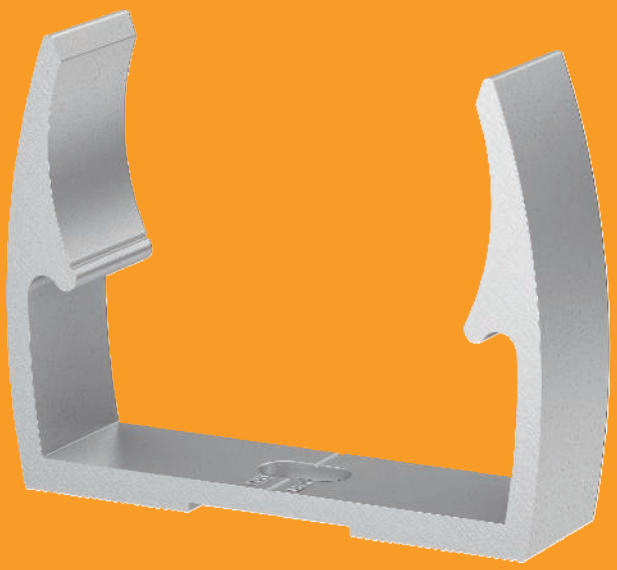




Metal fastening clips

Quick clip, aluminium

OBO's aluminium Quick clip offers installers a high-quality means of fastening electrical installation pipes. The ingenious design of this product allows fast, easy installation on walls and ceilings. The clip boasts impressively high holding forces.



- Strong clip holding forces thanks to optimised geometry
- Centre mark around slot for easy alignment
- Pipe centring aids for easy insertion of the pipe
- Modern, attractive design

Grip cable tidy, metal

E30 E90

The movable closing strap means that the Grip cable tidy can be opened and closed again and again with just the application of light pressure. This means that you can remove a cable easily and at any time from fixed wall and ceiling installations, or also install a new cable at a later date.

- Ingenious design means both wall and ceiling mounting are possible
- Easy cable insertion
- Extremely sturdy click-in connector means retroinstalling cables is no problem
- UL-tested quality
- Also available in stainless steel qualities A2 and A4
- Tested for the maintenance of electrical functionality
- Halogen and fire load-free

Cable and pipe spacer clip 732 with M6 threaded connection

- Safe fastening of cables and pipe systems on walls, on floors and on ceilings
- The distance from the fastening substrate can be adjusted variably using the thread on the screw or a custom-length threaded rod
- M6 bolt ties, angler anchors or Sprint screws (to be ordered separately) are required for fastening
- Tested and approved in systems for maintaining electrical functionality of classes E30 to E90 according to DIN 4102 Part 12

E30 E90

Cable and pipe spacer clip 733

- Closed cable and pipe spacer clip 733 with slot
- Safe fastening of cables and pipe systems on walls, on floors and on ceilings
- Tested and approved in systems for maintaining electrical functionality of classes E30 to E90 according to DIN 4102 Part 12

E30 E90

Cable and pipe spacer clips

Safe fastening of cables and pipe systems on walls, on floors and on ceilings. The distance from the fastening substrate can be adjusted variably using the thread on the screw or a custom-length threaded rod. M6 bolt ties, angler anchors or Sprint screws (to be ordered separately) are required for fastening. Tested and approved in systems for maintaining electrical functionality of classes E30 to E90 according to DIN 4102 Part 12.

Cable and pipe spacer clip 732 with M6 threaded connection

E30 E90

Cable and pipe spacer clip 733

A4

E30 E60 E90

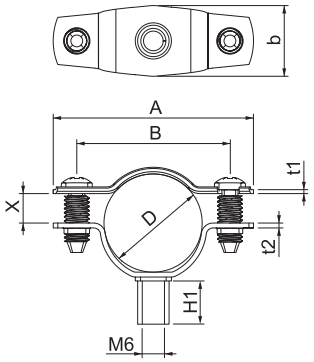
Spacer clip 732

Type	Clamping range D mm	Pack Piece	Weight kg/100 pc.	Item no.
ASG 732 25 A4	20-25	25	2.394	**1362472**

Spacer clip for the installation of pipes and cables on walls, ceilings and floors. With self-locking cover. Fastening via attachment piece with internal thread.
Approved for the maintenance of electrical function according to DIN 4102 Part 12, maintenance of electrical function classes E 30 to E 90.

Type	Clamping range D mm	Dim. A mm	Dim. B mm	Dim. x mm	Dim. b mm	Dim. t1 mm	Dim. t2 mm	Dim. H1 mm
ASG 732 25 A4	20-25	51	39	7.5	18	1.25	1.25	12

Dimensions



St FT

E30 E60 E90

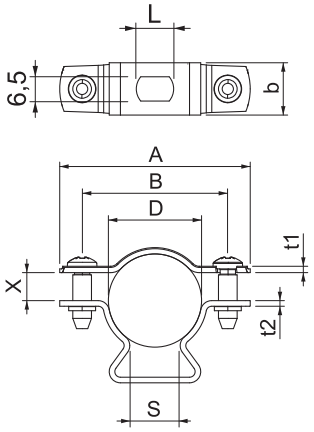
Spacer clip 733

Type	Clamping range D mm	Pack Piece	Weight kg/100 pc.	Item no.
ASL 733 63 FT	53-63	20	6.477	**1362738**

Spacer clip for the installation of pipes and cables on walls, ceilings and floors. With self-locking cover. Fastening via slot.
Approved for the maintenance of electrical function according to DIN 4102 Part 12, maintenance of electrical function classes E 30 to E 90.

Type	Dim. A mm	Dim. B mm	Dim. x mm	Dim. t1 mm	Dim. t2 mm	Dim. L mm	Dim. b mm	Dim. s mm
ASL 733 63 FT	94	80	15	1.5	2	10	16	35.3

Dimensions



Spacer clip 733

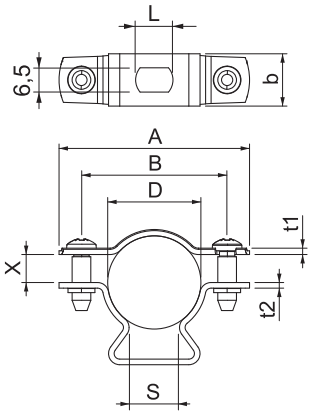
A4

E30 E60 E90

Type	Clamping range D mm	Pack Piece	Weight kg/100 pc.	Item no.
ASL 733 17 A4	14-17	25	2.139	**1362912**
ASL 733 25 A4	20-25	25	2.466	**1362918**

Spacer clip for the installation of pipes and cables on walls, ceilings and floors. With self-locking cover. Fastening via slot.
Approved for the maintenance of electrical function according to DIN 4102 Part 12, maintenance of electrical function classes E 30 to E 90.

Dimensions



Type	Dim. A mm	Dim. B mm	Dim. x mm	Dim. t1 mm	Dim. t2 mm	Dim. L mm	Dim. b mm	Dim. s mm
ASL 733 17 A4	44	32	4.5	1.25	1.5	10	14	9.5
ASL 733 25 A4	51	39	7.5	1.25	1.5	10	14	13.5

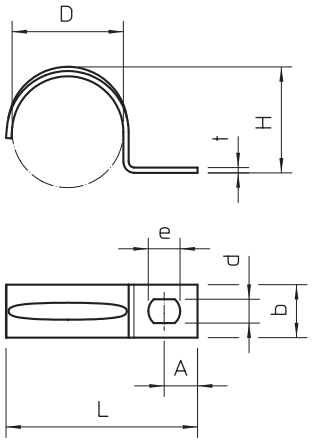
Fastening clip 604, light duty

St G

Type	For Ø mm	Hole size mm	Material thickness mm	Pack Piece	Weight kg/100 pc.	Item no.
604 8 G	8	4,5x6	0.7	100	0.123	**1003089**
604 16 G	16	4,5x6	1	100	0.348	**1003178**

Single-lobe fastening clip for cables and pipes.
* Sizes 3 and 4 are not suitable for nail device
* Sizes 3 to 21 are not suitable for bolt-firing tool

Dimensions



Type	Dim. L mm	Dim. A mm	Dim. e mm	Dim. d mm	Dim. b mm	Dim. D mm	Dim. t mm	Dim. H mm
604 8 G	21	5.5	6	4.5	8	8	0.7	7
604 16 G	31	6.5	6	4.5	10	16	1	14.5

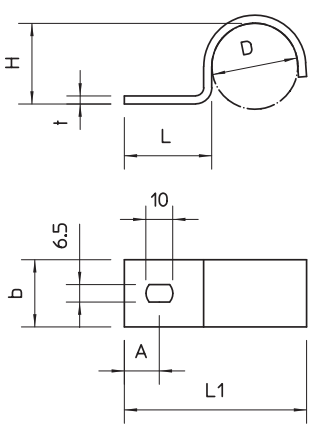
Fastening clip 822, heavy-duty

St FT

Type	For Ø mm	Hole size mm	Material thickness mm	Pack Piece	Weight kg/100 pc.	Item no.
822 6 FT	6	6,5x10	2	100	0.885	**1014005**
822 10 FT	10	6,5x10	2	100	1.075	**1014013**
822 12 FT	12	6,5x10	2	100	1.450	**1014021**
822 14 FT	14	6,5x10	2	100	1.600	**1014048**

Single-lobe fastening clip for cables and pipes.

Dimensions



Type	Dim. D mm	Dim. L mm	Dim. H mm	Dim. t mm	Dim. A mm	Dim. L1 mm	Dim. b mm
822 6 FT	6	23.5	5	2	10	32	20
822 10 FT	10	23.5	9	2	10	36	20
822 12 FT	12	23.5	11	2	10	38.5	20
822 14 FT	14	23.5	13	2	10	40.5	20

A4 2B

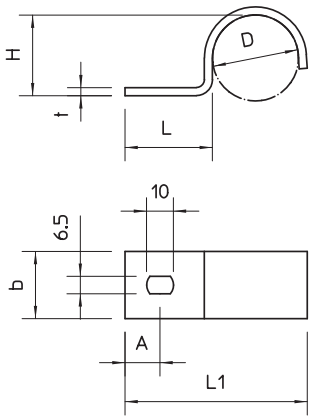
Fastening clip 822, heavy duty

Type	For Ø mm	Hole size mm	Material thickness mm	Pack Piece	Weight kg/100 pc.	Item no.
822 16 A4	15.2	6.5 x 10	2	100	1.733	**1013877**
822 22.5 A4	22.5	6.5 x 10	2	50	2.338	**1013889**

Single-lobe fastening clip for cables and pipes.

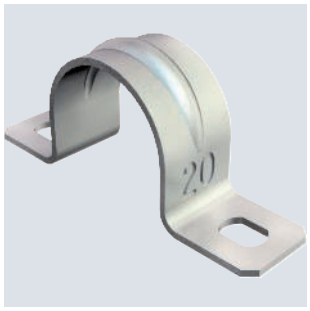
Type	Dim. D mm	Dim. L mm	Dim. H mm	Dim. t mm	Dim. A mm	Dim. L1 mm	Dim. b mm
822 16 A4	15.2	23.5	14	2	10	42	20
822 22.5 A4	22.5	23.5	21	2	11	49	20

Dimensions



Fastening clip 605, medium-duty

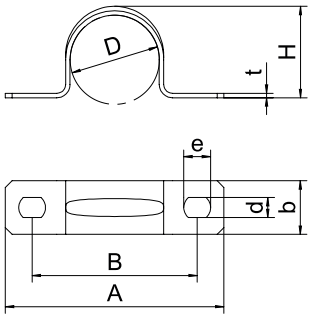
St G



Type	For Ø mm	Hole size mm	Material thickness mm		Pack Piece	Weight kg/100 pc.	Item no.
605 8 G	8	4,5x6	1		100	0.203	**1018086**
605 9 G	9	4,5x6	1		100	0.246	**1018094**
605 10 G	10	4,5x6	1		100	0.432	**1018108**
605 11 G	11	4,5x6	1		100	0.462	**1018116**
605 12 G	12	4,5x6	1		100	0.485	**1018124**
605 13 G	13	4,5x6	1		100	0.532	**1018132**
605 14 G	14	4,5x6	1		100	0.560	**1018140**
605 16 G	16	4,5x6	1		100	0.585	**1018167**
605 18 G	18	4,5x6	1		100	0.640	**1018183**
605 19 G	19	4,5x6	1		100	0.671	**1018191**
605 20 G	20	4,5x6	1		100	0.664	**1018205**
605 21 G	21	4,5x6	1		100	0.678	**1018213**
605 23 G	23	4,5x6	1		100	0.826	**1018221**
605 25 G	25	4,5x6	1		100	0.960	**1018256**
605 28 G	28	4,5x6	1		100	1.067	**1018280**
605 32 G	32	4,5x6	1		100	1.260	**1018337**
605 35 G	35	5,5x7	1.5		100	1.921	**1018353**
605 37 G	37	5,5x7	1.5		100	2.007	**1018361**

Two lobe fastening clips for cables and pipes.
* Sizes 7 to 12 not suitable for bolt-firing tool.

Dimensions



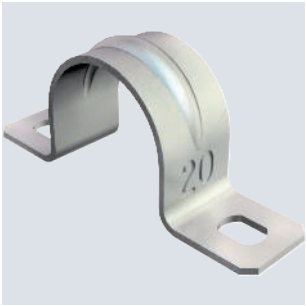
Type	Dim. D mm	Dim. H mm	Dim. t mm	Dim. A mm	Dim. B mm	Dim. b mm	Dim. d mm	Dim. e mm
605 8 G	8	7	1	33	22	10	4.5	6
605 9 G	9	8	1	34	23	10	4.5	6
605 10 G	10	9	1	37	25	12	4.5	6
605 11 G	11	10	1	38	26	12	4.5	6
605 12 G	12	11	1	39	27	12	4.5	6
605 13 G	13	12	1	41	29	12	4.5	6
605 14 G	14	13	1	42	30	12	4.5	6
605 16 G	16	14.5	1	44	32	12	4.5	6
605 18 G	18	16.5	1	46	34	12	4.5	6
605 19 G	19	17.5	1	47	35	12	4.5	6
605 20 G	20	18.5	1	49	37	12	4.5	6
605 21 G	21	19.5	1	50	38	12	4.5	6
605 23 G	23	21	1	52	40	12	4.5	6
605 25 G	25	23	1	58	44	14	4.5	6
605 28 G	28	26	1	61	47	14	4.5	6
605 32 G	32	30	1	66	52	14	5.5	6
605 35 G	35	32	1.5	70	56	14	5.5	7
605 37 G	37	34	1.5	72	58	14	5.5	7

St G

Fastening clip 605, medium duty

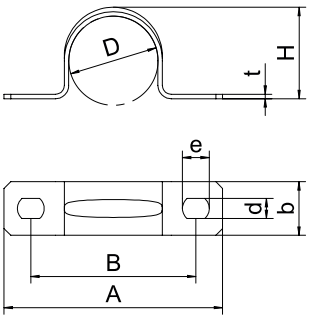
Type	For Ø mm	Hole size mm	Material thickness mm	Pack Piece	Weight kg/100 pc.	Item no.
605 40 G	40	5,5x7	1.5	50	1.900	**1018396**
605 47 G	47	5,5x7	1.5	50	2.366	**1018477**
605 50 G	50	5,5x7	1.5	25	2.770	**1018507**
605 55 G	55	5,5x7	1.5	25	3.840	**1018558**
605 60 G	60	5,5x7	1.5	25	3.800	**1018604**
605 63 G	63	5,5x7	1.5	25	3.670	**1018639**

Two lobe fastening clips for cables and pipes.
* Sizes 7 to 12 not suitable for bolt-firing tool.



Type	Dim. D mm	Dim. H mm	Dim. t mm	Dim. A mm	Dim. B mm	Dim. b mm	Dim. d mm	Dim. e mm
605 40 G	40	37	1.5	75	61	14	5.5	7
605 47 G	47	44	1.5	82	68	14	5.5	7
605 50 G	50	46	1.5	88	74	16	5.5	7
605 55 G	55	51	1.5	94	78	16	5.5	7
605 60 G	60	56	1.5	99	83	16	5.5	7
605 63 G	63	59	1.5	112	98	16	5.5	7

Dimensions

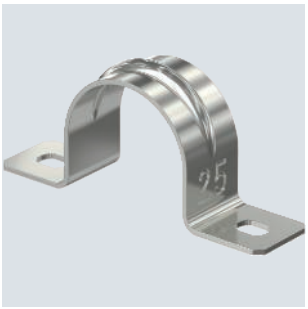


A4 2B

Fastening clip 605, medium-duty

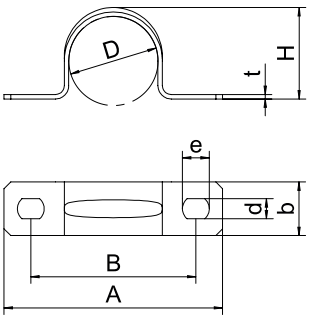
Type	For Ø mm	Hole size mm	Material thickness mm	Pack Piece	Weight kg/100 pc.	Item no.
605 12 A4	12	4,5x6	1	100	0.485	**1018653**
605 16 A4	16	4,5x6	1	100	0.585	**1018661**
605 20 A4	20	4,5x6	1	100	0.664	**1018669**
605 25 A4	25	4,5x6	1	100	0.992	**1018679**
605 32 A4	32	4,5x6	1	100	1.260	**1018693**
605 40 A4	40	5,5x7	1.5	50	1.900	**1018705**
605 50 A4	50	5,5x7	1.5	25	2.770	**1018717**
605 63 A4	63	5,5x7	1.5	25	3.670	**1018729**

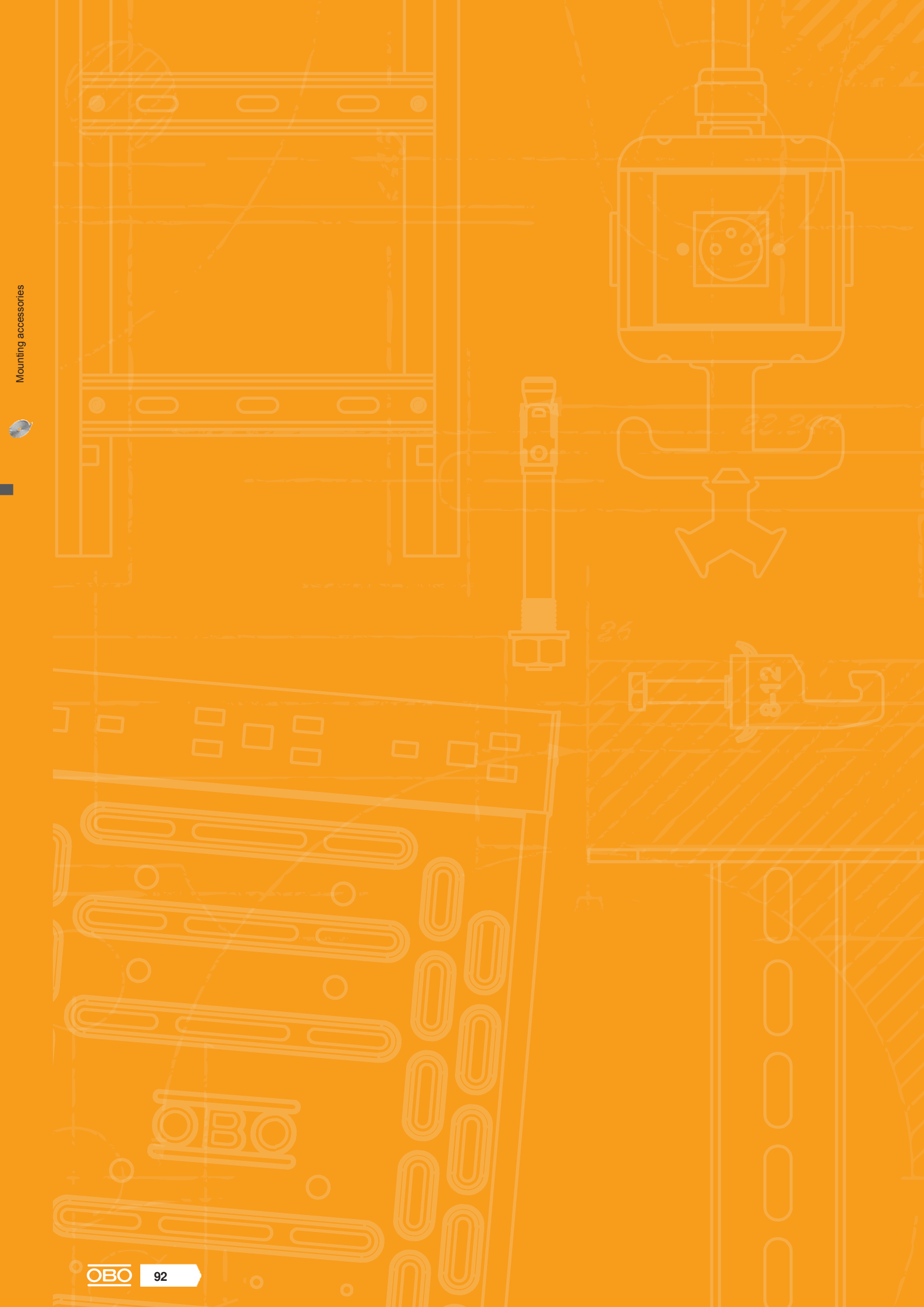
Two lobe fastening clips for cables and pipes.



Type	Dim. D mm	Dim. H mm	Dim. t mm	Dim. A mm	Dim. B mm	Dim. b mm	Dim. d mm	Dim. e mm
605 12 A4	12	11	1	39	27	12	4.5	6
605 16 A4	16	14.5	1	44	32	12	4.5	6
605 20 A4	20	18.5	1	49	37	12	4.5	6
605 25 A4	25	23	1	58	44	14	4.5	6
605 32 A4	32	30	1	66	52	14	4.5	6
605 40 A4	40	37	1.5	75	61	14	5.5	7
605 50 A4	50	46	1.5	88	74	16	5.5	7
605 63 A4	63	59	1.5	112	98	16	5.5	7

Dimensions

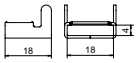




Mounting accessories

SBV 15 tightening strap lock

A2 2B



Type	Pack Piece	Weight kg/100 pc.	Item no.
SBV 15 A2	100	0.564	**6490964**

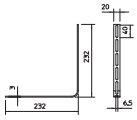
Tightening strap lock made of strip-galvanised steel, suitable for a range of products with a 15 mm width.

Slotted steel strap in strips

Type	Dimension mm	Hole size mm	Length mm	Pack m	Weight kg/100 m	Item no.
OSS 40x4 3M FT	40 x 4	8,5 x 70	3000	30	101.000	**1465821**

Perforated slotted steel strap in strips.

Slotted steel strap, bent



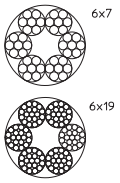
Type	Dimension mm	Pack Piece	Weight kg/100 pc.	Item no.
OSG 20X3 FT	20x3	25	15.800	**6017371**

Bent slotted steel strap for creation of bends and tees.

Tensioning wire

Steel wire tensioning rope

St G

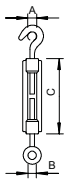


Type	Cable diameter mm	Break load kN	In rings m	Pack m	Weight kg/100 m	Item no.
957 4 G	4	9.41	50	50	5.720	**5303214**

Steel wire tensioning rope, galvanised with fibre inlay (hemp core).
Cable Ø 2–6 mm: round-stranded cable 6 x 7 according to DIN 3055.
Cable Ø 8–10 mm: round-stranded cable 6 x19 according to DIN 3060.
Minimum break force 1770 N/mm².

Tension jack

St G

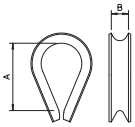


Type	Thread	Dim. A mm	Dim. B mm	Dim. C mm	Break load kN	Pack Piece	Weight kg/100 pc.	Item no.
945 M10 G	M10	14	13.5	125	5	5	33.650	**5300053**
945 M12 G	M12	16	15.5	125	7	5	53.000	**5300061**

With hook and eye, to DIN 1480.

Cable eye stiffener

St G

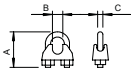


Type	For rope-Ø mm	Dim. A mm	Dim. B mm	Pack Piece	Weight kg/100 pc.	Item no.
946 4 G	4	28.5	5	25	0.390	**5301041**
946 6 G	6	33	7	25	0.840	**5301068**

Cable eye stiffener to DIN 65457.

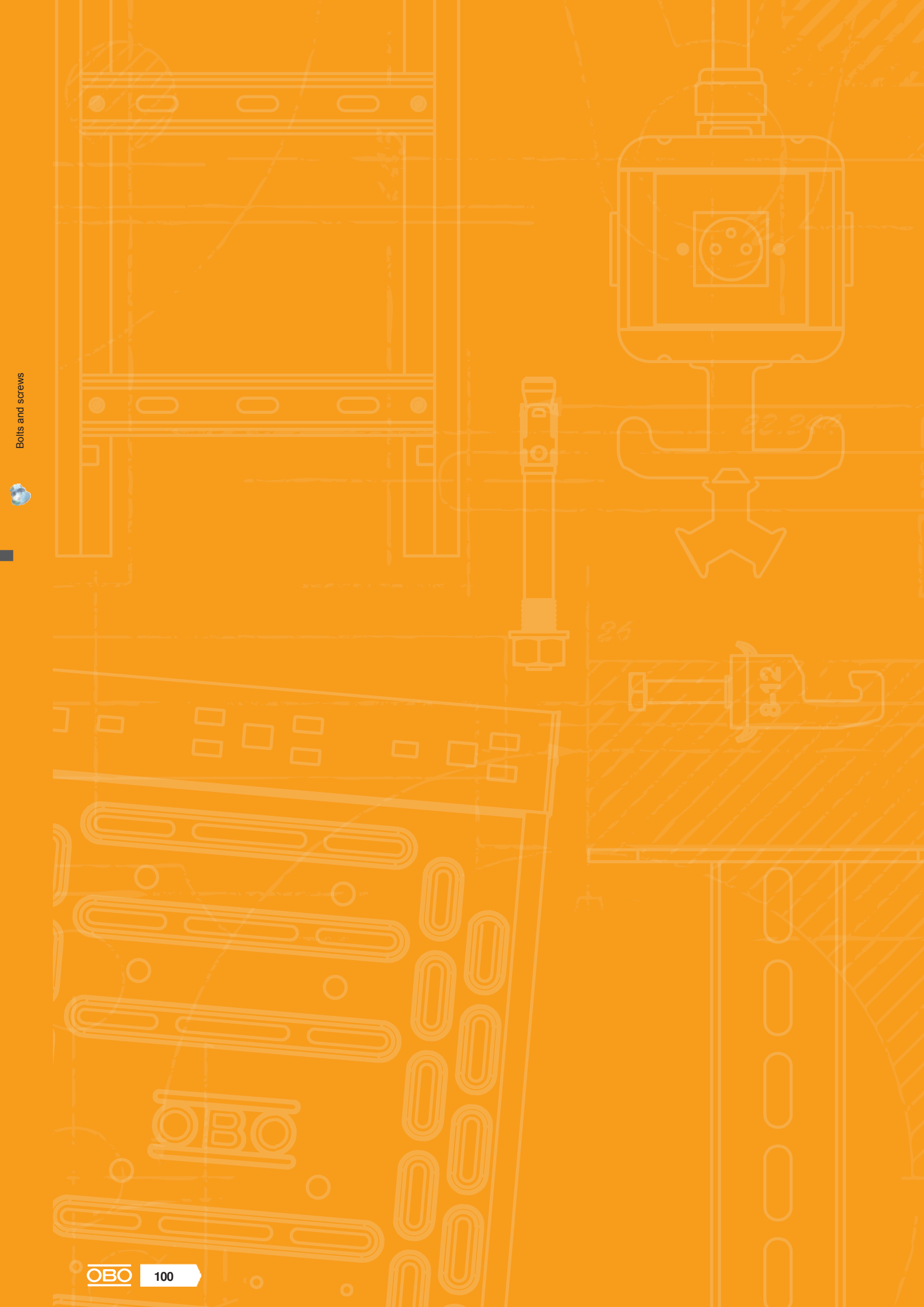
Wire cable clamp

St G



Type	For rope-Ø mm	Dim. A mm	Dim. B mm	Dim. C mm	Pack Piece	Weight kg/100 pc.	Item no.
947 3 G	3	20	4	4	25	1.100	**5302021**
947 6 G	6	28	8	5	25	1.700	**5302064**
947 10 G	10	42	11	8	10	6.500	**5302102**

Wire cable clamp for fastening steel wire tensioning ropes.

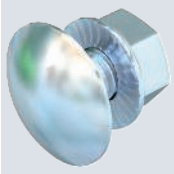


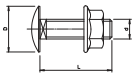
Bolts and screws

Truss-head bolts

Truss-head bolt with combination nut

St G



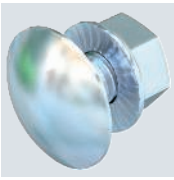


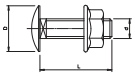
Type	Dimension mm	Dim. L mm	Dim. d mm	Dim. D mm	Resistance grade	Pack Piece	Weight kg/100 pc.	Item no.
FRSB 6x12 G	M6x12	12	6	13.5	5.6	100	0.804	**6406130**
FRSB 6x20 G	M6x20	20	6	13.5	5.6	100	0.903	**6406181**

Hot galvanised truss-head bolt with square neck including electrogalvanised combination nut.
For universal fastening of construction components. Permitted use of the article only in dry atmospheres.

Truss-head bolt with flange nut

St F



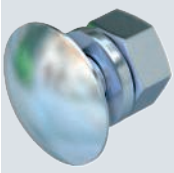


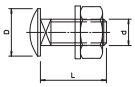
Type	Dimension mm	Dim. L mm	Dim. d mm	Dim. D mm	Resistance grade	Pack Piece	Weight kg/100 pc.	Item no.
FRSB 6x12 F	M6x12	12	6	13.5	5.6	100	0.812	**6406122**
FRSB 6x20 F	M6x20	20	6	13.5	5.6	100	0.965	**6406203**
FRSB 6x30 F	M6x30	30	6	13.5	5.6	100	1.232	**6406907**

Truss-head bolt with square neck including flange nut.

Truss-head bolt with nut and washer

St F



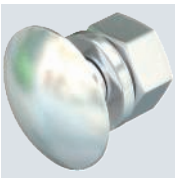


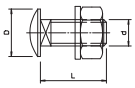
Type	Dimension mm	Dim. L mm	Dim. d mm	Dim. D mm	Resistance grade	Pack Piece	Weight kg/100 pc.	Item no.
FRS 8x16 F 8.8	M8x16	16	8	20	8.8	50	1.947	**6406963**
FRS 8x20 F	M8x20	20	8	20	5.6	50	2.054	**6406971**
FRS 8x25 F	M8x25	25	8	20	8.8	50	2.217	**6406998**
FRS 8x35 F	M8x35	35	8	20	5.6	50	2.431	**6407048**
FRS 10x20 F	M10x20	20	10	24	8.8	50	4.100	**6407471**
FRS 10x25 F	M10x25	25	10	24	5.6	50	4.077	**6407528**
FRS 10x25 F 8.8	M10x25	25	10	24	8.8	50	4.500	**6407560**

Truss-head bolt with square neck. With washer and hexagonal nut.
The truss-head bolt can be used in combination with hot-dip and double-dip galvanised articles.

Truss-head bolt with nut and washer

A2 VA 2B





Type	Dimension mm	Dim. L mm	Dim. d mm	Dim. D mm	Resistance grade	Pack Piece	Weight kg/100 pc.	Item no.
FRS 10x25 A2	M10x25	25	10	24	A2-70	50	3.905	**6406718**
FRS 10x20 A4	M10x20	20	10	24	A4-70	50	4.000	**6406870**

Truss-head bolt with square neck including washer and hexagonal nut.

Hexagonal bolts

Hexagonal bolt DIN 933

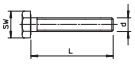
A4 2B

Type	Thread	Dimension mm	Dim. L mm	Dim. d mm	SW mm	Pack Piece	Weight kg/100 pc.	Item no.
HHS M10x60 A4	M10	M 10 x 60	60	10	17	50	4.130	**3156035**

Hexagonal bolt according to DIN 933 with metric thread.

Hexagonal bolt M10

St F



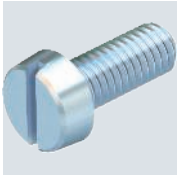
Type	Dimension mm	Dim. L mm	Dim. d mm	SW mm	Resistance grade	Pack Piece	Weight kg/100 pc.	Item no.
SKS 10x60 F	M 10 x 60	60	10	17	8.8	20	6.000	**6408516**
SKS 10x80 F	M 10 x 80	80	10	17	8.8	20	6.900	**6418250**
SKS 10x90 F	M 10 x 90	90	10	17	8.8	20	8.950	**6418252**
SKS 10x120 F	M 10 x 120	120	10	17	8.8	20	8.294	**3160793**

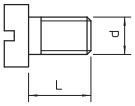
Hexagonal bolt for universal fastening of construction components. With hexagonal nut and 2 washers.

Cylinder head bolts

Cylinder head bolt

St G



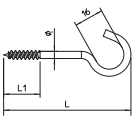


Type	Thread	Length mm	Pack Piece	Weight kg/100 pc.	Item no.
341 M6x10 G	M6	10	100	0.349	**3153096**

Cylinder head bolt according to ISO 1207 with metric thread

Ceiling hook

St G

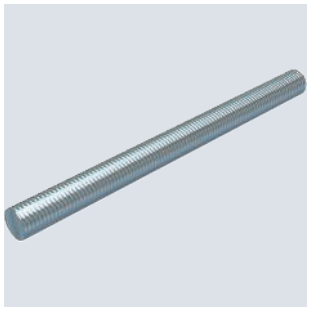


Type	Material	Ø mm	Dim. L mm	Dim. L1 mm	Break load kN		Pack Piece	Weight kg/100 pc.	Item no.
915 3.9x50 G		3.9	50	20	0.15		100	0.724	**3450058**
915 3.9x60 G		3.9	60	20	0.15		100	0.800	**3450066**
915 3.9x70 G		3.9	70	20	0.15		100	0.879	**3450074**
915 3.9x80 G		3.9	80	20	0.15		100	0.913	**3450082**
915 3.9x90 G		3.9	90	20	0.15		100	1.076	**3450090**
915 3.9x100 G		3.9	100	20	0.15		100	1.187	**3450104**
915 4.3x120 G		4.3	120	24	0.2		100	1.662	**3450120**

Ceiling hook with rolled wood screw thread.

Threaded rod

St G

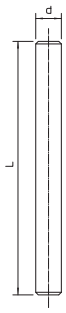


Type	Thread	Dim. d mm	Dim. L mm	Break load kN	Pack Piece	Weight kg/100 pc.	Item no.
TR M8 1M G	M8	8	1000	14.6	10	30.000	**3141128**
TR M10 1M G	M10	10	1000	23.2	10	49.000	**3141209**
TR M10 2M G	M10	10	2000	23.2	10	98.000	**3141140**

Threaded rod to DIN 976.

Threaded rod

A4 2B

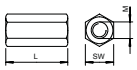


Type	Thread	Dim. d mm	Dim. L mm	Break load kN	Pack Piece	Weight kg/100 pc.	Item no.
TR M10 1M A4	M10	10	1000	62.8	1	49.000	**3141502**

Threaded rod to DIN 976.

Connection sleeve

St G

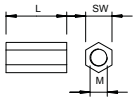


Type	Thread	Dim. L mm	SW mm	Pack Piece	Weight kg/100 pc.	Item no.
CSTR M8 G	M8	24	13	50	1.880	**6410081**
CSTR M10 G	M10	30	17	50	4.150	**6410103**
CSTR M12 G	M12	40	19	25	7.000	**6410111**

Connection sleeve with continuous internal thread.

Spacer sleeve

Zn G



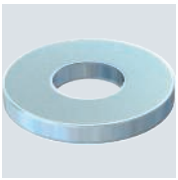
Type	Thread	Dim. L mm	SW mm	Pack Piece	Weight kg/100 pc.	Item no.
965 M6X20 G	M6	20	10	100	0.900	**3415031**

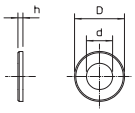
Continuous internal thread.

Washers

Washer

St G



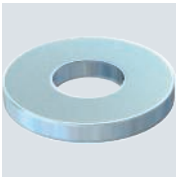


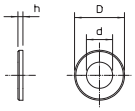
Type	Thread	Dim. d mm	Dim. D mm	Dim. h mm	Pack Piece	Weight kg/100 pc.	Item no.
WS M10 D20 G	M10	10.5	20	2	100	0.408	**3402096**

Washer according to DIN 125, shape A, for universal use.

Washer

St F



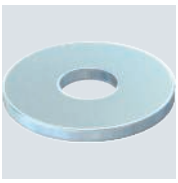


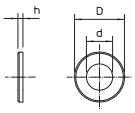
Type	Thread	Dim. d mm	Dim. D mm	Dim. h mm	Pack Piece	Weight kg/100 pc.	Item no.
966 M8 F	M8	9	16	1.6	100	0.177	**3402452**
966 M10 F	M10	11	20	2	100	0.327	**3402460**
966 M12 F	M12	13.5	24	2.5	100	0.620	**3402479**

Washer for universal use.

Fender washer

St G



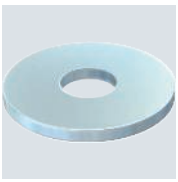


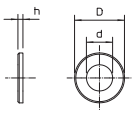
Type	Thread	Dim. d mm	Dim. D mm	Dim. h mm	Pack Piece	Weight kg/100 pc.	Item no.
WS M8 G25 G	M8	8.4	25	1.2	100	0.408	**3403130**

Washer of particularly large outer diameter.

Large washer

St F





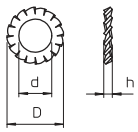
Type	Thread	Dim. d mm	Dim. D mm	Dim. h mm	Pack Piece	Weight kg/100 pc.	Item no.
DIN440 9 F	M8	9	28	3	100	1.057	**6408710**
DIN440 11 F	M10	11	34	3	100	1.852	**6408729**

Washer of particularly large outer diameter.

Serrated washers

Serrated washer DIN 6798

St G

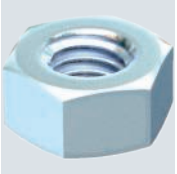


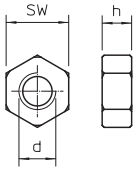
Type	Thread	Dim. d mm	Dim. D mm	Dim. h mm	Pack Piece	Weight kg/100 pc.	Item no.
SWS M10 G	M10	10.5	18	2.7	100	0.125	**3404102**

Serrated washer to DIN 6798, shape A.

Hexagonal nut ISO 4032

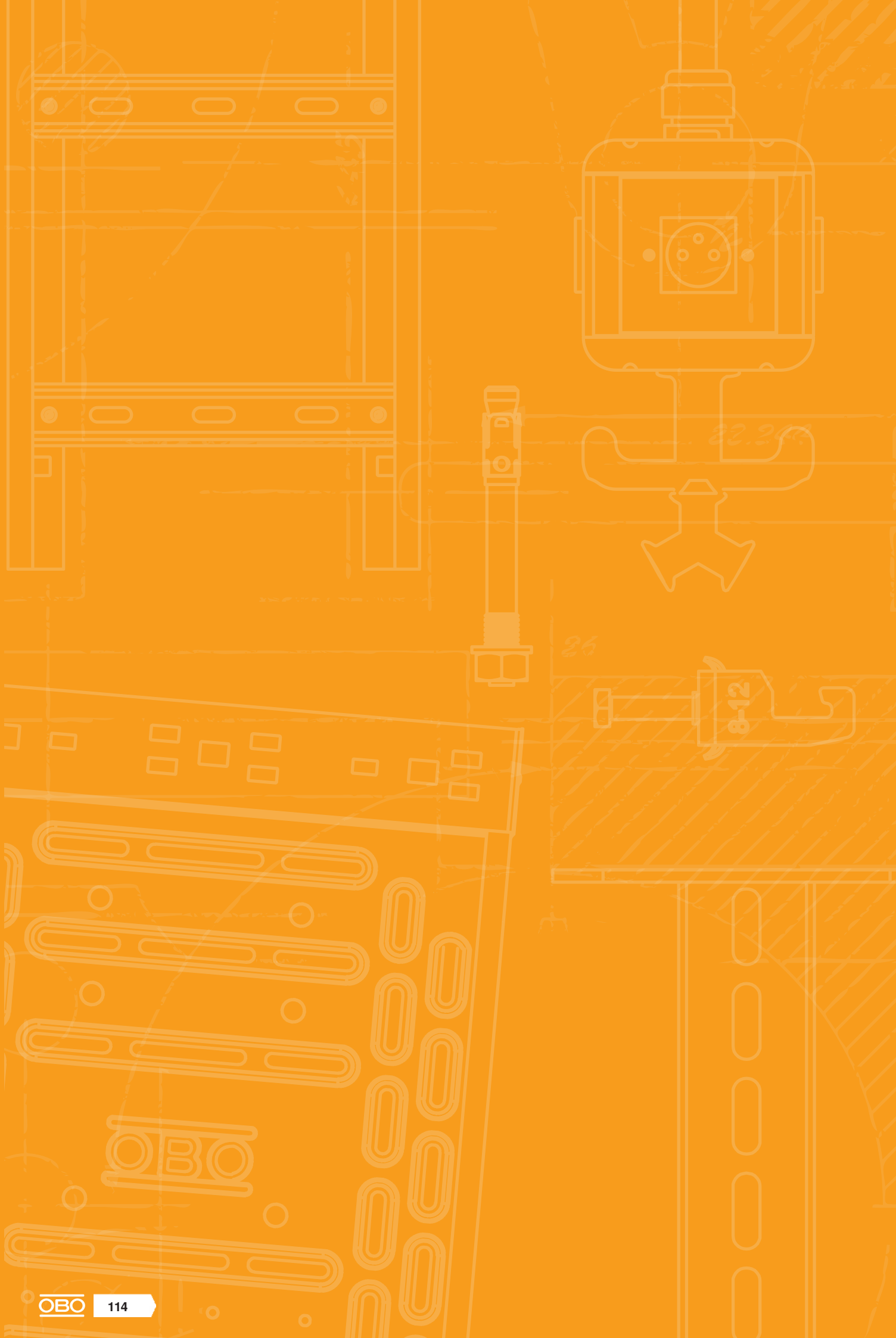
St F





Type	Thread	SW mm	Dim. h mm	Dim. d mm	Pack Piece	Weight kg/100 pc.	Item no.
DIN934 M8 F	M8	13	6.8	8	100	0.477	**3400352**
DIN934 M10 F	M10	17	8.4	10	100	1.061	**3400360**
DIN934 M12 F	M12	19	10.8	12	100	1.540	**3400379**

Hexagonal nut to DIN 934 with metric thread.



Directories

Test marks

	American Bureau of Shipping, USA
	AENOR, Producto Certificado, Spain
	STOWARZYSZENIE ELEKTRYKÓW POLSKICH, Poland
	Lightning current-tested
	Lightning current-tested, Class H (100 kA)
	CEBEC, Belgium
	Canadian Standards Association, Canada
	DEMKO, Danmarks Elektriske Materielkontrol, Denmark
DIBt	Deutsches Institut für Bautechnik Berlin, Germany
	Det Norske Veritas
	ENEC Austria
	ATEX certificate for explosive areas
	ELEKTROTECHNICKÝ ZKUŠEBNÌ ÚSTAV, Czech Republic
FI	FIMKO, Finland
	Forschungs- und Materialprüfungsanstalt, Germany
	Russia, GOST The State Committee for Standards
	Test marks for technical resources, VDE Prüf- und Zertifizierungsinstitut Offenbach, Germany
	Halogen-free; without chlorine, fluorine and bromine
	INMETRO, Brazil
KEMA KEUR	KEMA-KEUR, Netherlands
	Indication of metric products
	MAGYAR ELEKTROTECHNIKAI ELLENŐRZŐ INTÉZET Budapest, Hungary
	NEMKO, Norway
NF	AFNOR Quality symbol of the French standardisation institute

	Underwriters Laboratories Inc., USA + CSA, Canada
	Österreichischer Verband für Elektrotechnik, Austria
	INSTITUTO ITALIANO DEL MARCHO DI QUALITÁ, Italy
	RINA 1861, Ship Classification, Certification and Services
	Underwriters Laboratories Inc., USA
	SEMKO An Inchcape Testing Services Company, Sweden
	Eidgenössisches Starkstrominspektorat, Switzerland
SABS APPROVED	South African Bureau of Standards
	Shock-tested, Bundesamt für Zivilschutz, Germany
	Sähkötarkastuskeskus Elinspektionscentralen Electrical Inspectorate, Finland
	Underwriters Laboratories Inc., USA
LISTED	Underwriters Laboratories Inc., USA
	Verband der Elektrotechnik, Elektronik, Informationstechnik e.V., Germany
	German Association of Electricians, tested safety
5 YEARS	5-year warranty

Pictogram explanation

Surfaces

FS	Strip galvanised
FSK	Strip galvanised/plastic-coated
DD	Strip galvanised zinc/aluminium, double dip
BK	Bright
2B	Bright, reworked
EL	Anodised
F	Hot-dip galvanised
G	Electrogalvanised
GK	Electrogalvanised/plastic-coated
GCL	Electrogalvanised, yellow-chromatised
GGP	Electrogalvanised, yellow passivated
GTP	Electrogalvanised, transparently passivated
GR	Primed
L	Painted
SG	Welding primed
FT	Hot-dip galvanised
FT SO	Hot-dip galvanised 85 µm
Cu	Copper-plated
N	Nickel-plated
ZD	Galvanised, Deltatone 500
ZDM	Galvanised, MAGNI 565
GA	Zinc-aluminium coated, Galfan
ZL	Zinc scale

Conformity symbol

CE	Communautés Européennes, EC declaration of conformity according to EC directives
RoHS conform	RoHS-conformant

Quality marks

halogen free	Halogen-free; without chlorine, fluorine and bromine
650°	Flame resistant 650 °C
750°	Flame resistant 750 °C
960°	Flame resistant 960 °C
UV resistant	UV-resistant

Specific product symbols

Ø 60	Diameter 60 mm
Ø 68	Diameter 68 mm
Type 3	Protection device to DIN EN 61643-11 or IEC 61643-11
LPZ 2→3	Transition from LPZ 2 to LPZ 3
AS	Acoustic signalling
ABZ	General construction approval

Applications

FS	Remote signalling
AS	Acoustic signalling
ISDN	Integrated Service Digital Network, ISDN applications
DSL	Digital Subscriber Line, DSL applications
Analog TK	Analogue telecommunication
Cat 5	Category 5 TwisterPair
Cat 6_A	Channel Performance to American EIA/TIA standard
MSR	Measuring, controlling and regulating systems
TV	TV applications
SAT	SAT-TV applications
Mu	MultiBase base
	LifeControl
EX	Intrinsically safe protection device for potentially explosive areas
Class E_A	Channel Performance to ISO/IEC 11801
PoE	Power over Ethernet
230/ 400 V System	230/400 V system
IP 54	Protection rating IP 54
IP 65	Protection rating IP 65

Lightning protection classes

Type 1	Protection device to DIN EN 61643-11 or IEC 61643-11
Type 1+2	Combination protection device made of type 1 and type 2
Type 2	Protection device to DIN EN 61643-11 or IEC 61643-11

Lightning protection classes

Type 2+3	Protection device to DIN EN 61643-11 or IEC 61643-11
Type 3	Protection device to DIN EN 61643-11 or IEC 61643-11

Lightning protection zone

LPZ 0→1	Transition from LPZ 0 to LPZ 1
LPZ 0→2	Transition from LPZ 0 to LPZ 2
LPZ 0→3	Transition from LPZ 0 to LPZ 3
LPZ 1→2	Transition from LPZ 1 to LPZ 2
LPZ 1→3	Transition from LPZ 1 to LPZ 3
LPZ 2→3	Transition from LPZ 2 to LPZ 3

BSS maintenance of electrical function installation

	Fire-tested systems
	Escape route ceiling mounting with pressure clip
	OBO Grip, wall routing type
	OBO Grip, ceiling routing type
	Pressure clip for maintenance of electrical function, ceiling mounting

BSS anchor

	Fire protection anchor
	Fire protection bolt tie

BSS test marks/material class

E30	Maintenance of electrical function class E30
E90	Maintenance of electrical function class E90

Clamp clip base shapes

N	Clamp clip for C profile rail, slot width 11–12 mm
H	Clamp clip for C profile rail, slot width 16–17 mm
U	Clamp clip for C profile rail, slot width 18–22 mm

Diameter

Ø 60	Diameter 60 mm
Ø 68	Diameter 68 mm
Ø 70	Diameter 70 mm
Ø 74	Diameter 74 mm

Entries

4	4 cable entries
6	6 cable entries
7	7 cable entries
8	8 cable entries
9	9 cable entries
10	10 cable entries
12	12 cable entries
10	10 cable entries ECO
12	12 cable entries ECO
14	14 cable entries ECO
16	16 cable entries
18	18 cable entries ECO
24	24 cable entries

Gland thread

M	Thread metric
Pg	Thread Pg

Entry size

M20	M20 entry
M25	M25 entry
M32	M32 entry
M40	M40 entry

KTS side heights

	Cable tray, side height 35 mm
	Cable tray, side height 60 mm
	Cable tray, side height 85 mm
	Mesh cable tray, side height 35 mm
	Mesh cable tray, side height 55 mm

Materials

	Flat steel
	Angular steel
	U steel
	Round material

Pictogram explanation

Nominal cross-section

1,5 mm²	Nominal cross-section 1.5 mm²
1,5-2,5 mm²	Nominal cross-section 1.5–2.5 mm²
2,5 mm²	Nominal cross-section 2.5 mm²
2,5-4 mm²	Nominal cross-section 2.5–4 mm²
4 mm²	Nominal cross-section 4 mm²
4-6 mm²	Nominal cross-section 4–6 mm²
6 mm²	Nominal cross-section 6 mm²
10 mm²	Nominal cross-section 10 mm²
16 mm²	Nominal cross-section 16 mm²

Nominal voltage

400 V	Nominal voltage 400 V
500 V	Nominal voltage 500 V
660 V	Nominal voltage 660 V

Polarity

3	3-pole
5	5-pole
7	7-pole
8	8-pole
10	10-pole
12	12-pole

Slot widths

7,5	Slot width 7.5 mm
11	Slot width 11 mm
11-12	Slot width 11–12 mm
12	Slot width 12 mm
15	Slot width 15 mm
16	Slot width 16 mm
16,5	Slot width 16.5 mm
16-17	Slot width 16–17 mm
17	Slot width 17 mm
18	Slot width 18 mm
22	Slot width 22 mm
35	Slot width 35 mm

Screw heads

	Philips screw
	Torx screw
	Phillips screw
	Pozidriv

Firing devices

	Bolt-firing tool
	Nail device

Protection rating

IP 20	Protection rating IP 20
IP 30	Protection rating IP 30
IP 31	Protection rating IP 31
IP 44	Protection rating IP 44
IP 54	Protection rating IP 54
IP 55	Protection rating IP 55
IP 65	Protection rating IP 65
IP 66	Protection rating IP 66
IP 67	Protection rating IP 67
IP 68	Protection rating IP 68

Metals

Alu	Aluminium
Alu/St	Aluminium/steel
A2	Stainless steel, rustproof
A4	Stainless steel, rustproof
A5	Stainless steel, rustproof
Cu	Copper
CuZn 37	Brass
St	Steel
TG	Malleable iron
Zn	Die-cast zinc

Plastics

ABS/AVA	Acrylonitrile butadiene styrene
UF	Duroplast, Aminoplast, type 131.5
MF	Duroplast, melamine resin, type 150
EVA	Ethylene vinyl acetate

Plastics

FA	Fibre-proof material DIN 28091
GFK	Fibreglass-reinforced plastic
NBR SBR	Rubber mixture
NBR	Nitrile rubber
PETR	Petrolatum
PA	Polyamide
PA/ GF	Polyamide, fibreglass reinforced
PBPT	Polybutylene terephthalate
PC	Polycarbonate
PE	Polyethylene
PP	Polypropylene
PP/ GF	Polypropylene, fibreglass reinforced
PS	Polystyrene
PVC	Polyvinylchloride
ZELL PC	Cellular polyethylene

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5253334	**3141128**	108
5123583	**3141140**	108
5253396	**3141209**	108
6098446	**3141502**	108
5254836	**3153096**	104
5940616	**3156035**	104
5505631	**3160793**	104
5298458	**3400352**	112
5298519	**3400360**	112
5298571	**3400379**	112
5300137	**3402096**	110
5300793	**3402452**	110
5300854	**3402460**	110
5300915	**3402479**	110
5868279	**3403130**	110
5301752	**3404102**	110
5303558	**3415031**	108
5304333	**3450058**	106
5304395	**3450066**	106
5304456	**3450074**	106
5304517	**3450082**	106
5304579	**3450090**	106
5304630	**3450104**	106
5304692	**3450120**	106
5442936	**3481611**	53
5432975	**3481778**	53
5310631	**3482014**	53
5310815	**3482073**	53
5239475	**3482707**	54
5239352	**3482758**	54
5683414	**3484602**	52
5683353	**3484629**	52
6651290	**3498103**	51
	/100 pc.	
6559657	**3498108**	51
6559626	**3498124**	52
6559633	**3498159**	52
6559664	**3498261**	51
6559671	**3498264**	51
6710881	**3498266**	52
6710911	**3498268**	52
	/100 pc.	
6559640	**3498272**	51
5413592	**5300053**	98
5413653	**5300061**	98
5414018	**5301041**	98

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	/100 pc.	
5414070	**5301068**	98
5414551	**5302021**	98
5414674	**5302064**	98
5414797	**5302102**	98
	price/100	
5415039	**5303214**	98
	/pc.	
6326112	**6017371**	96
	/100 pc.	
6199815	**6406122**	102
6563111	**6406130**	102
6616152	**6406181**	102
6199990	**6406203**	102
6200474	**6406718**	102
6822072	**6406870**	102
5045243	**6406907**	102
6201259	**6406963**	102
6201310	**6406971**	102
6201372	**6406998**	102
6201433	**6407048**	102
6201730	**6407471**	102
6201792	**6407528**	102
6201914	**6407560**	102
6202157	**6408516**	104
6480012	**6408710**	110
6480074	**6408729**	110
6202218	**6410081**	108
6202270	**6410103**	108
6202331	**6410111**	108
6437474	**6418250**	104
6518470	**6418252**	104
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1973 3-13 LGR	5947899	2148803	66
1973 8-28 LGR	5877691	2148846	66
1974 16-23	5742999	2197804	66
1974 22-30	5742937	2197812	66
1975 16-19	5844570	2148048	66
1975 19-22	5844631	2148056	66
1976 16-21	5863830	2148528	66
2007 18 RW	5215295	2225506	75
2031 40	5651666	2205416	70
2031 F 10	6773619	2205388 /100 pc.	70
2031 F 20	5651659	2205412	70
2032	5211273	2205017	72
2032 SD	5210917	2204800	72
2032 SD SP	5597490	2204851	72
2033	5211334	2205033	72
2033 STD	5693253	2204541	72
255 11 LGR	5214335	2222116	75
255 9.5 LGR	5214274	2222094	75
2955 F M20 RW	5586036	2149357	61
2955 F M25 RW	5586159	2149363	61
2955 M16	5583219	2149004	60
2955 M20	5583936	2149010	60
2955 M25	5583998	2149016	60
2955 M32	5584056	2149022	60
2955 M40	5584292	2149028	60
2955 M50	5588191	2149034	60
341 M6x10 G	5254836	3153096	104
450 M4x95 G	5442936	3481611	53
452 M4x70 G	5432975	3481778	53
453 M6x100 G	5310631	3482014	53
455 M5x100 G	5310815	3482073	53
604 16 G	5001454	1003178	88
604 8 G	5001096	1003089	88
605 10 G	5016458	1018108	90
605 11 G	5016519	1018116	90
605 12 A4	5912002	1018653	91
605 12 G	5016571	1018124	90
605 13 G	5016632	1018132	90
605 14 G	5016694	1018140	90
605 16 A4	5912064	1018661	91
605 16 G	5016816	1018167	90
605 18 G	5016939	1018183	90
605 19 G	5016991	1018191	90
605 20 A4	5912101	1018669	91
605 20 G	5017059	1018205	90
605 21 G	5017110	1018213	90
605 23 G	5017172	1018221	90
605 25 A4	5912132	1018679	91
605 25 G	5017233	1018256	90
605 28 G	5017356	1018280	90
605 32 A4	5912170	1018693	91
605 32 G	5017479	1018337	90
605 35 G	5017530	1018353	90
605 37 G	5017592	1018361	90
605 40 A4	5912231	1018705	91
605 40 G	5017653	1018396	91
605 47 G	5017776	1018477	91
605 50 A4	5906476	1018717	91
605 50 G	5568339	1018507	91
605 55 G	5017837	1018558	91
605 60 G	5017899	1018604	91
605 63 A4	5906506	1018729	91
605 63 G	5568513	1018639	91
605 8 G	5016335	1018086	90
605 9 G	5016397	1018094	90

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