Planning

The technical information is provided to
– inform you about protective measures against corrosion
– help you finding the suitable products for your application
– inform you about available, castum-made products.

In order to make the use of this catalogue easier for you we use tokens and symbols. You find the explanations on the inner pocket of the back side page. If you should have any technical questions or requests about available non-standard products we are glad to help you from our headquarters in Berlin or our branch offices at any time.

Subject to technical modifications.

Laying technique

Cable clamps

allow a fast and easy laying of single or bundled cables. They are used to fix cables to supporting profiles (lengthwise or transverse) or with plugs and screws against walls and ceilings.

To mount several parallel round cables we recommend to use cable support systems. They can be anchored to walls and ceilings, resp. be clamped to support profiles (see catalogue „cable trays“). If drilling is prohibited, the fastening points can be made using the fastening band system (see chapter „Assembly Instructions“).

If the wall or ceiling area is not available to lay out cables in one layer, upright crossbars can be used to provide additional fastening points (see chapter „Assembly Instructions“). Thus cables con be rounted in multilayers.

To fasten single conductor cables cable clamps made of amagnetic aluminium or high-grade steel have to be used. They are marked with the symbols AL and E.

In order to avoid deformation of cables through exceeding pressure of cable clamp fastening, it is recommended to use form stabilizing counter- and double vats (see chapter B). For pressure sensitive cables or fragil plastic tubes we provide metal long vats that minimize the surface pressure effectively.

Highly sensitive radiofrequency cables can be mounted safely with standard cable clamps if the clamps are equipped with a high frequency counter beds (see chapter B). These are two sturdy half shells made of plastic. They enclose the cable completely and make sure that in spite of relatively high fastening tension and screwing force the „armed“ cable is only held with a defined lower fastening pressure. Signal reflections and modulations are minimized; damage to the cable is is excluded.

Complete armatures containing cable clamps, high frequency counter beds as well as counter bolts for secure screw joints under stress of vibrations (for example for installation of transmission poles) can be found in chapter C. There you can also find special clamps for other high frequency sizes and types of high frequency cables. To install various elliptic cables Neopreninlays (notation EE) have to be used.

Custom-made applications

In addition to our catalogue program, we can provide you on request with the followring:

Cable clamps
– in further other sizes (intermediate and / or plus sizes)
– with high-grade steel nuts and bolts for exclusion of corrosion in aggressive environments
– with counter bolts for secure screw joints to minimize shock load & vibration load
– made of stainless steel, material number 1.4571, marked with the symbol E4.

Corrosion Prevention

Prior to choosing materials for mounting of cables it is recommended to determine at the corrosive environmental conditions at the construction site and the corrosion prevention accordingly.

For installations in regular environment, zinc coatings have proven to be protective for steel against corrosion. However, the protective zinc coat is being reduced by various climatic influences throughout the years. The following table shows the ablation of coating per year:

Environmental influence and corrosion risk

Corrosion-categorie	Loss of thickness µm/year	Typical environment outdoors	indoors
C1 inconsiderable	≥ 0,1	-	Heated buildings like offices, stores, schools, hotels
C2 slight	> 0,1 until 0,7	Little pollution, like rural areas	Not heated buildings with formation of condensate as store houses
C3 moderate	> 0,7 until 2,1	City and industrial environments with moderate pollution	Production plants with high humidity, as laundres, breweres and daires
C4 strong	> 2,1 until 4,2	Industrial areas and coastlines with moderate salt impact	Chemical plants, swimming pools
C5-I very strong (industrial)	> 4,2 until 8,2	Industrial environment with high humidity and aggressive atmosphere	Buildings or areas with almost permanent condensation and pollution
C5-M very strong (ocean)	> 4,2 until 8,2	Coastlines and offshore areas with high salt impact	Buildings or areas with almost permanent condensation and pollution

(Source: EN ISO 12944-2)

The ablation rate per year multiplied with the expected life span of the construction determines the necessary thickness of zinc coating. There are mainly three zinc coatings that differ in thickness of coating, adhesive strength and appearance.

Galvanic zinc (EN ISO 4042)

The small parts are zinced by means of electrolysis bath in which the zinc ions apply very evenly to the metal. The zinc coat is approximately 5 µm thick, slighty shiny and has an additional protection by succeeding bichromium conditioning against abrasion.

Nuts and bolts marked with GV in the catalogue are galvanic zinc coated. They are used to connect sendzimir zinc coated construction elements.

Hot galvanized according to the Sendzimir procedure (EN 10346)

The steel strapping (thickness up to 2 mm) is coated in a steel-mill with zinc (flow path procedure). The result is an evenly spread and highly adhesive zinc coat with an average thickness of 19 µm.
Damage to the zinc coat caused by cutting, pun-ching or drilling does not result in progressing corrision because the neighbouring zinc is dissolving under the impact of (air-)humidity and builds a protective, brown coating layer of zinc hydroxide over the blanc metal. The spreading of zinc ions protect those areas up to approximately 2 mm thick.

These articles are marked with the symbol S.

Hot dip galvanized (EN ISO 1461)

The parts are hot dip galvanized after being processed in liquid zinc (app. 450 C). Chemical reactions lead to various zinc-iron alloys, which are especially firmly connected to the steel core. These alloys are usually coated with a pure zinc layer surface irregularities can occur clue to the zinc-iron alloy. Depending on the speed of the reaction, steel composition, time of dipping, cooling process.

Therefore the surface can vary from dull dark grey to slightly shiny. This is no indication for the thickness of zinc coating or quality of corrosion prevention. A humid environment can also cause a forming of zinc-hydroxide-carbonate (so called white rust). This does not influence the efficiency of the corrosion prevention.

Cutting edges need to be protected with cold zinc paint (see catalogue cable trays, chapter A).

According to EN ISO 1461 the average local thickness of the coating is at least
45 µm for material thicknesses up to 1,5 mm
55 µm for material thicknesses from 1,5 up to 3 mm
70 µm for material thicknesses from 3 up to 6 mm

The EN ISO 1461 complies basically with
BS EN ISO 1461 in Great Britain
EN ISO 1461 in France
NEN EN 1461 in USA

All types of cable trays and medium-heavy or heavy support systems are deliverable with a hot dip galvanized coating by the manufactory. This program is marked with the symbol F.

The cable clamps marked with the symbol Z contain construction parts of various zinc coatings:
– galvanized (cable diameter ≤ 40 mm) or hot dip galvanized rivet shank screws (cable diameter ≥ 44 mm)
– sendzimir coated counter bed
– hot dip galvanized clips

Stainless steel

Considering the aspects of high corrosion resistance, easily cleanable surface, ability of recycling, and fire-resistance, stainless steel is the material of first choice. Especially for the chemical, paper, textile and food industry, in sewages, refineries, car tunnels and in off-shore areas it is being commonly used.

Regarding the long lasting life cycle of such construc-tions stainless steel is more often the economically advantageous solution in spite of the higher initial investment. In case of insufficient corrosion resistance clueto the wrong material choice the investments afterwards are accelerated because of business interruption, rearrangement of cable loads, exchange of structural components.

Compared to various plastic materials stainless steel stands out clue to high firmness, fire and heat resistance, as well as the emission free mannor in case of fire and mechanical processing.

The commonly used material No.: 1.4301 is marked with the short description X5CrNi 18-10 according to EN 10088-2 and has been approved by the German Institute for Construction Engineering in Berlin under the general admittance Z-30.3-6 for construction processes.

See a list of recent and outdated norms below:

EN 10088-2	:	1.4301 X5CrNi 18-10
AISI	:	304
UNS	:	S 30400
BS	:	304 S15- 304 S31
AFNOR	:	Z7CN 18-09
DIN	:	17441

PUK offers a complete high-grade steel program made of: bracket supports, brackets, cable trays, ladders, vertical ladders, channels and cable clamps. Nuts and bolts comply to steel-group A2 (according to ISO 3506). This is indicated with the symbol E.

The high-grade steel program is available on request in material No. 1.4571 with the short appellation X6CrNiMoTi17-12-2 (according to EN 10088-2) and has been also certified by the German Institute for Construction Engineering in Berlin. Nuts and bolts comply to steel-group A4 (according to ISO 3506)

See a list recent and outdated norms below:

EN 10088-2	:	1.4571 X6CrNiMoTi17-12-2
AISI	:	316L
UNS	:	S 31635
BS	:	320 S31
AFNOR	:	Z6CNDT 14-12
DIN	:	17441

This steel type is marked with E4. Other materials of the same corrosion category available on request.

For custom-made applications such as light- and cable support constructions in car tunnels according to ZTV-ING the high alloyed material No. 1.4529 is available.

Plastic

Counter vats and double vats are made of HDPE (high density polyethylene). This material is indicated with the symbol PE.

The corresponding features are listed below:

Vicat-softening temperature:	70-75 °C
Deformation resistance B (0,45 N/mm^2):	75-80 °C
Area of melting temperatures:	130-135 °C
Coldness resistance:	app. -40 °C

The vats are light-stabilized and increased UV-resistance through special carbon black additive. They are resistant against bye, salinesolut, funistiby and non-oxidizing acid, but-not resistant against strong oxidants (nitration acid, concentrated saltpetre acid) and halogens.

Isolation and high frequency beds are made of polystyrene, impact resistant (SB). This material is indicated with the symbol PS.

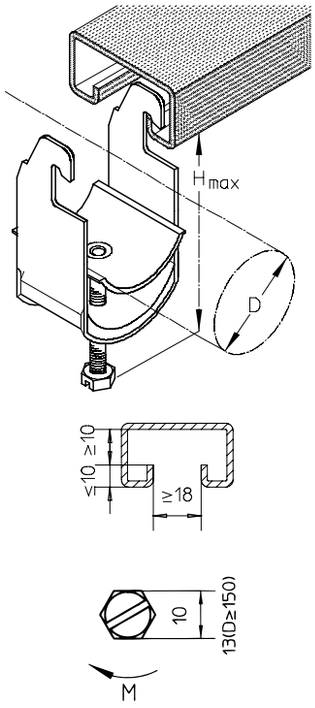
Vicat-softening temperature:	75-80 °C
Deformation resistance B (0,45 N/mm^2):	74-81°C
Area of melting temperatures:	≤ 55 °C
Coldness resistance:	-40 °C

Light stabilized and increased UV-resistance through special carbon black additive. Resistant against saline solution, brine, humidity and non oxidizing acid. Not resistant against aromatic and chlorinated hydrocarbon, ester, ketone, petrol, ethereal oil and some flavouring agents.

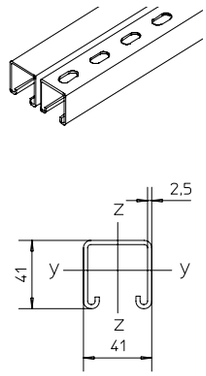
Cable support systems with integrated continuous function in case of fire

Information on fire proofed cable clamps and other support systems for rounting safety cables (E 30-E 90) as well as advice for installation can be found in our catalogue “Fire Protection”.

AC Mounting on c-profiles



A 41 / KHA 41



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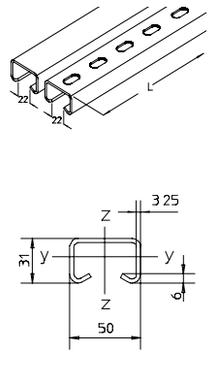

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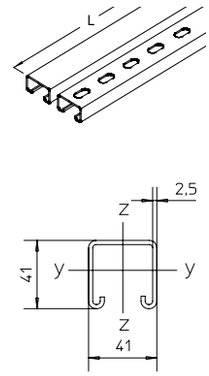
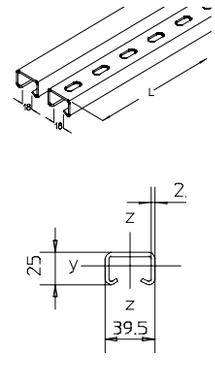


A 9 / KHA 9



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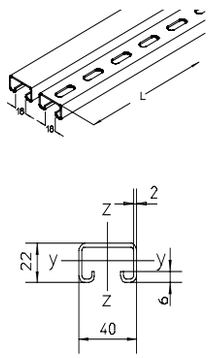

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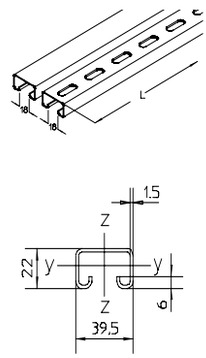
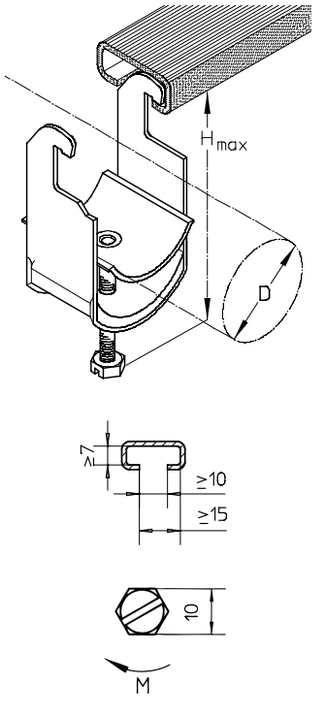
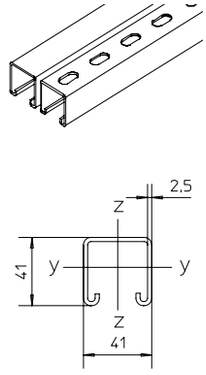


ACF-E Mounting on c-profiles



A 41 / KHA 41



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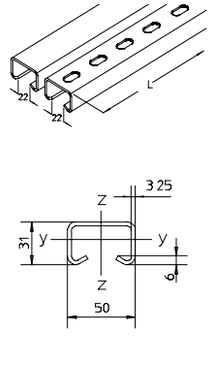

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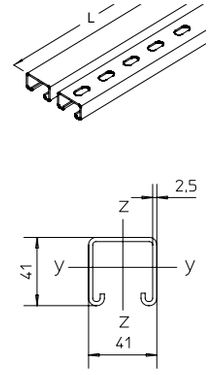

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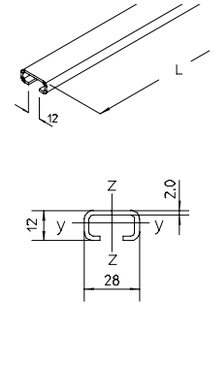

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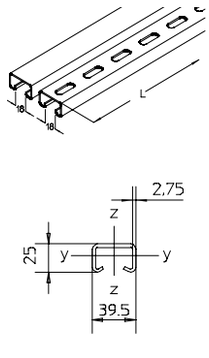

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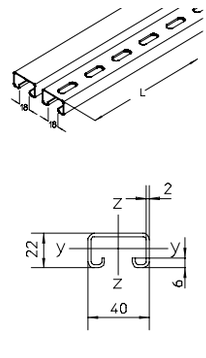

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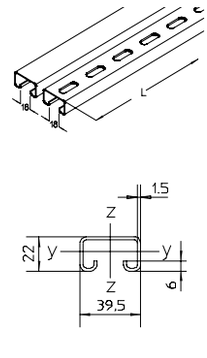

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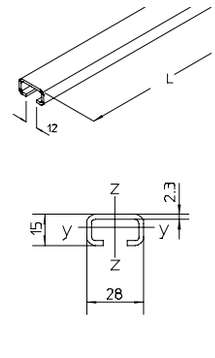
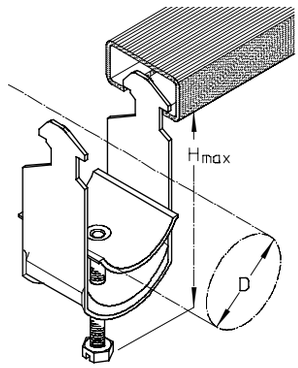
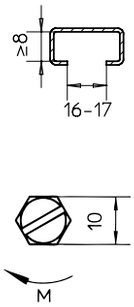
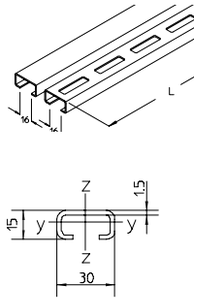


H Mounting on c-profiles

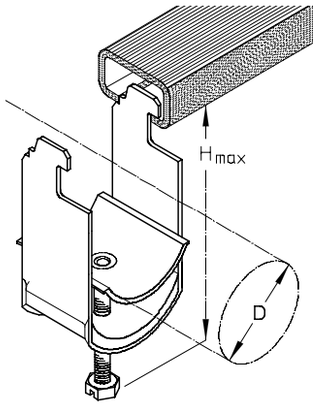


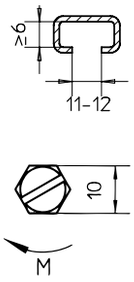


B 7 / KHB 7



B Mounting on profiles





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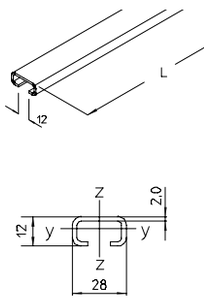

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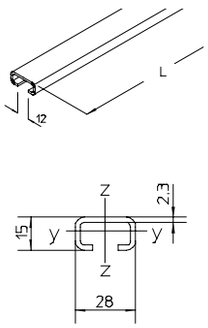

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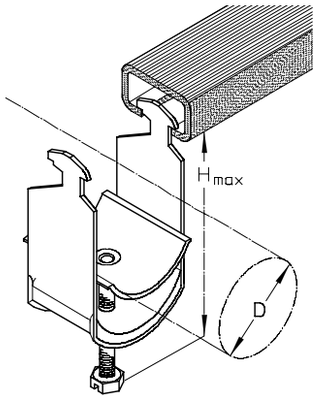

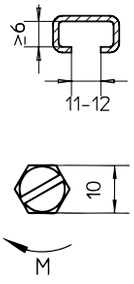

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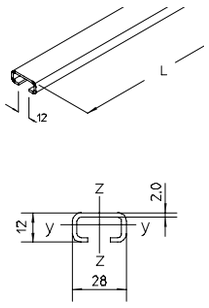

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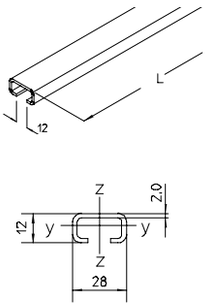
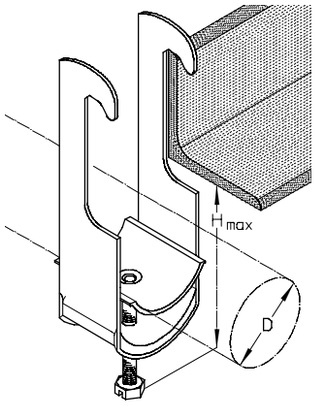
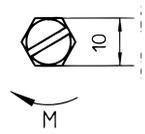


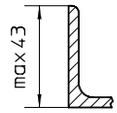
S Mounting on angle profile



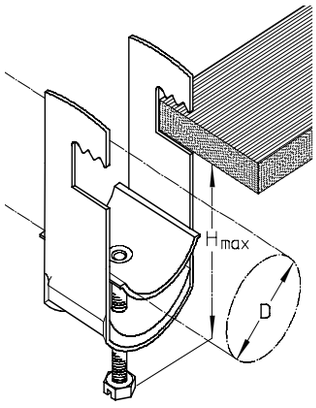


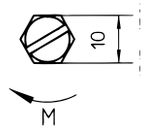
Schlüsselweite SW 13 bei
Durchmesser D ≥ 150

Angle profile



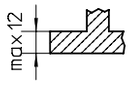
U Mounting on flat section



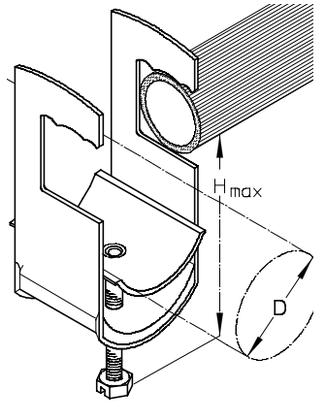


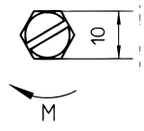
Schlüsselweite SW 13 bei
Durchmesser D ≥ 150

Flat section



RU Mounting on round profiles





Flat- and round profiles