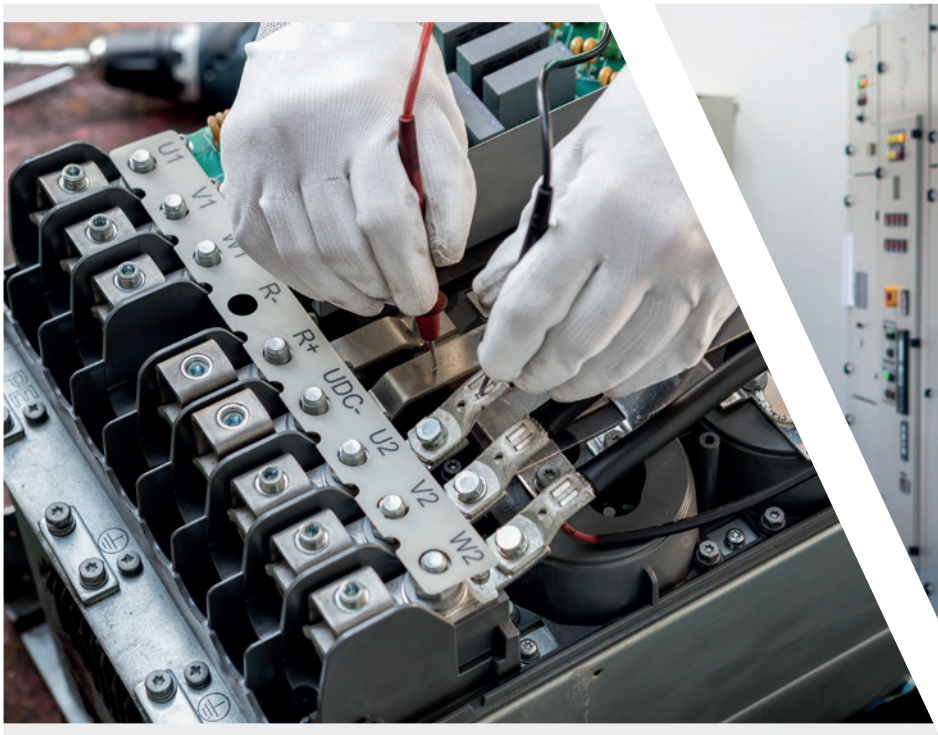
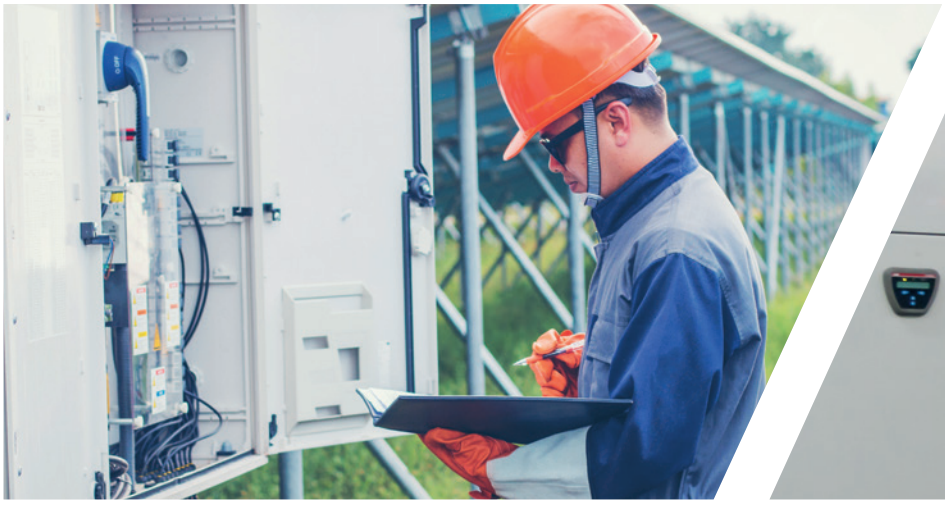
RST Roztocze®
LOCKING SOLUTIONS

Screw clamps


U1
V1
W1
R-
R+
UDC-
U2
V2
W2



Type V screw terminalsconstruction, advantages and application

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Screw clamps, commonly referred to as V-klema, have been in use for several decades and there is no indication that this type of clamp will lose its position and popularity any time soon. Its versatility, convenience and good electrical and mechanical properties mean that it will remain an indispensable component of electrical switchgear for many years to come. The increase in the popularity of the clamp has been largely influenced by the spread of modern disconnectors and strip fuses on the market, which fully exploit the advantages of this type of clamp. The product continues to develop and modifications and improvements are being made to the product using the latest metalworking technologies.

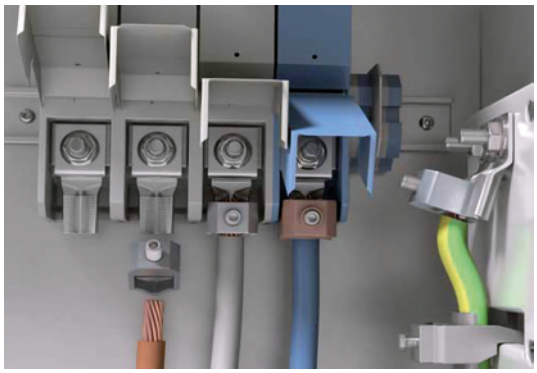


Photo 1. Complete screw clamp for phase, neutral, earthing installed alone.

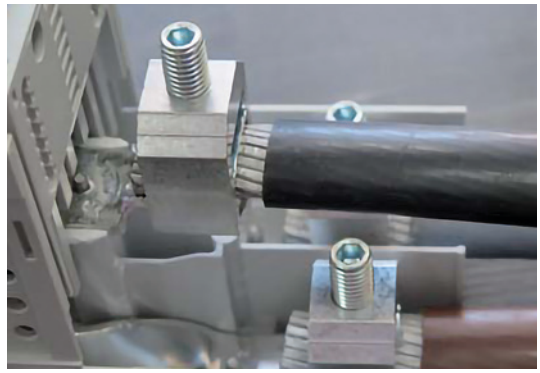


Photo 2. Complete screw clamp as an integral part of the switchgear.

Screw clamps can be divided into two groups according to their construction and the material used:

Aluminium
- single clamp
- double clamp

Steel
- single clamp
- double clamp

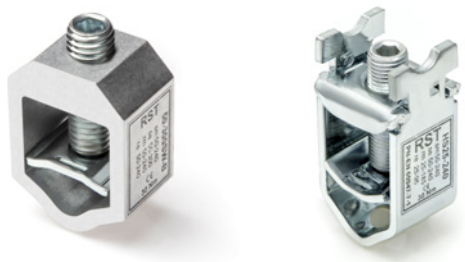


Fig. 3. Screw clamp with aluminium and steel frame

	Screw clamp with aluminium frame	Screw clamp with steel frame
Maximum permissible tightening torque	High, from 20-30 Nm , and in demanding constructions even 35Nm.	Very high, from 6-40 Nm.
Application for cable conductors	re, rm, se, sm	re, rm, se, sm
Corrosion resistance	Very high, due to the property of aluminium to form a tight and durable oxide layer on the surface.	Average for galvanised steel and dependent on the quality of the corrosion protection.
Resistance to eddy currents	Very high, due to the non-magnetic properties of aluminium.	High for galvanised steel, but it is necessary to insert a non-magnetic steel crossbar.
Compensation for the "floating" effect of the aluminium	Good, but requiring either special spring plates over the clamp or a spring steel clamp. Tightening recommended every 2 years.	Very good due to the elastic properties of steel. Tightening recommended every 5 years.

Design

The design of the clamp owes its name to the special triangular profile of the clamping frame. This profiling is specially adapted to the shape of the sector cable conductors of which most power cables are made. The four basic types of cable conductors and their construction are shown below in Figure 1.

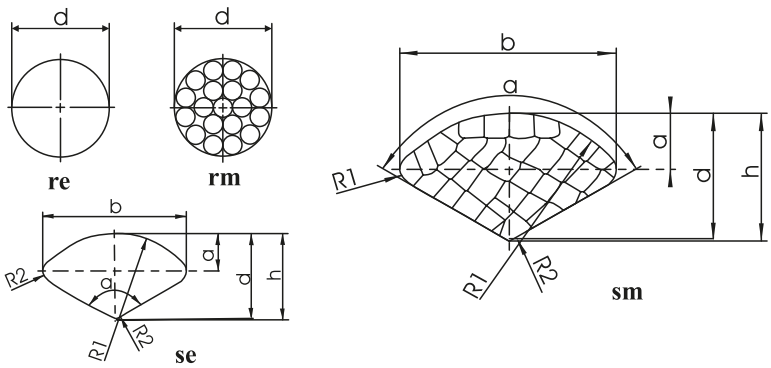


Fig. 1.
Types of cable conductors found in power cables:

1) **re** - round single-stranded conductor

2) **rm** - round multi-stranded conductor

3) **se** - solid sector conductor

4) **sm** - multi-stranded sector conductor

The triangular profile of the V-type clamping frame takes into account the two most typical angles related to the construction of sector cable conductors. This is a 90° angle, typical of sector conductors in four-core cables, which then changes to a 120° angle, typical of sector conductors in three-core cables.

Figure 2 shows an example of a V-type clamping frame angle profile. Adapted for use with a clamping frame, the cable connection, also commonly referred to as a "bucket" or V-connector, must have a special angled ribbing terminating in the same way as the clamping frame. Thus, we have an embossing with an angle of 90° passing into an embossing with an angle of 120°.

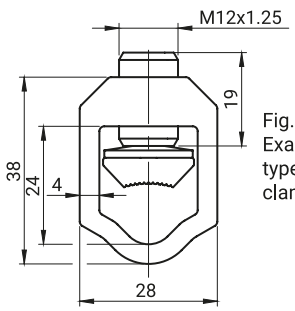


Fig. 2
Example dimensions of a V-type clamping frame with clamping screw

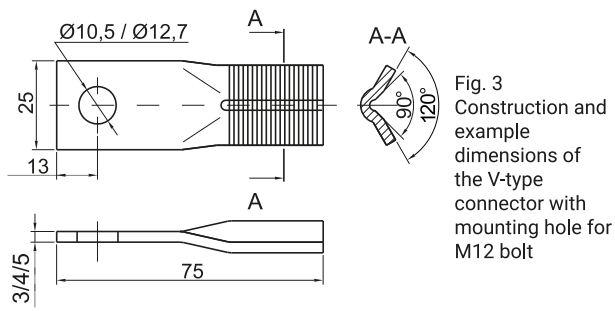


Fig. 3
Construction and example dimensions of the V-type connector with mounting hole for M12 bolt

An example of a V-type connection is shown in Fig. 3.

The V-type connector termination is additionally provided with a specially serrated contact surface. This has a very important function, as it increases the number and quality of micro-bonds between the connector and the cable conductor, and effectively breaks the oxide layer which forms on the contact surfaces. This is particularly important for aluminium cable conductors, as the oxide layer formed on aluminium is far more durable and sealed than with copper. The V-type connector is made from pure electrolytic copper and then its surface is tinned. The tin coating ensures correct operation of the V-type connection for both copper and aluminium conductors. The tin, when properly pressed, provides a gas-tight corrosion-resistant contact with low transition resistance.

Standards

Cable clamps are universal clamps, suitable for both copper and aluminium conductors, and are very versatile in their application. They are successfully used in transformer stations, as well as in cable joints, where they are mainly used with aluminium cables.

The terminals have also found wide application in switchgear and have become an integral part of the switching apparatus.

The question of the compatibility of type clamps with the relevant product standard is not clear. There are at least two sets of standards to choose from.

Clamps are manufactured and certified in accordance with the following standards:

- **PN-EN 60947-7-1:2012P** Low-voltage switchgear and controlgear - Part 7-1: Ancillary equipment - Terminal blocks for copper conductors.
- **PN-EN 60947-7-2:2012** Low-voltage switchgear and controlgear - Part 7-2: Auxiliary equipment - Protective conductor terminal blocks for copper conductors.
- **PN-EN 60999-1:2002** - Polish version: Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless clamping elements - Part 1: General requirements and specific requirements concerning clamping elements for conductors from 0.2 mm2 up to 35 mm2 (inclusive).
- **PN-EN 60999-2:2006** - Polish version: Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units - Part 2: Particular requirements for clamping units for conductors with cross-sections greater than 35 mm^2 up to 300 mm^2.

The use of sector cable conductors (se, sm) in clamps requires increased attention. The sector cable must be laid carefully, maintaining optimum adaptation of its shape to the profile of the terminal. This ensures that the cable conductor is pressed perpendicularly to the clamp with the correct force and the contact surface is correct (Fig. 4).

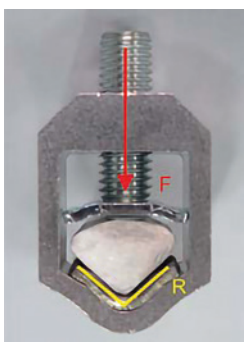
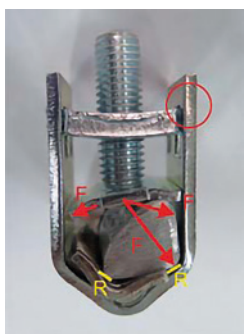


Photo 4. Correct positioning of the sector conductor in the terminal



Picture 5. Improperly inserted sector conductor in a terminal

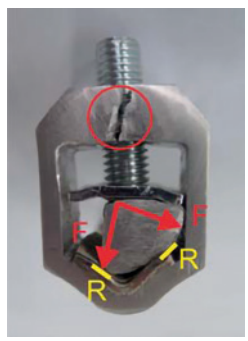


Photo 6. Cracking of aluminium frame due to incorrect mounting

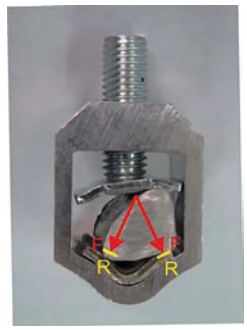


Photo 7. Significant reduction in contact area due to incorrect mounting

However, if the sector conductor is inserted into the V-type terminal incorrectly (photo 5.), it is not possible to tighten with the recommended force and this can lead to damage of the terminal. In the case of V-type terminals with an aluminium frame, this can even lead to the frame breaking (photo 6.).

If a misalignment of the sector cable conductor in the V-type clamp is overlooked during installation, this will significantly affect operational safety. In addition to the fact that the clamping force will be too low, the contact surfaces will also be significantly reduced, thus causing an increase in contact resistance and associated excessive heating of the clamp (photo 7.). This can even result in a fire breaking out in the switchgear.

V-type cable clamps, popularly known as V-klema, allow very convenient and fast connection of rigid cable conductors with a large cross-section thanks to their unique design with a separate removable clamping frame. During installation, the clamping frame can be temporarily pulled back over the cable conductor insulation, fit, cut and lay the conductor on the connection, then slide the frame over the connection and tighten the conductor to the connection with the appropriate torque. We do not have to specially bend the conductor and aim it at the terminal window, which would be extremely cumbersome with the rigidity of the 185 mm2 and 240 mm2 sector single-wire (se) conductors. Clamps have a well-established position in the electrical installation market and there are no indications that their market share will be threatened in the near future.

Double clamp

Double clamps, also known as stacked terminals, are similar in design to standard single terminals, but a few points need to be noted that affect the correct operation of such a terminal. In a stacked terminal, the round or sector conductors are arranged vertically on top of each other (Photo 8.), making it a prerequisite for the stability of such a terminal that these conductors are maintained vertically and symmetrically in the terminal frame. The element called the 'spacer' plays a key role in this.

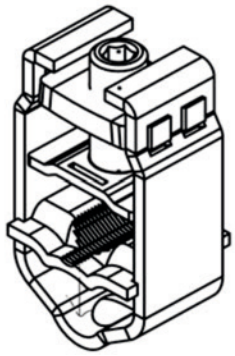
The appropriately shaped spacer separates the cable conductors from each other, while at the same time stabilising their position in the terminal frame, which allows the clamping force on both conductors to be directed vertically. Any deviation of the clamping force from the vertical caused by incorrect cable conductor placement or skewing of the spacer creates dangerous forces that push the frame apart in the terminal and deteriorates the contact between the conductors and the connection, increasing the resistance of the terminal.

The location of the spacer between the cable conductors makes it a bridge connecting these conductors electrically, and all current flowing through the upper conductor also flows through this spacer. Therefore, the choice of material for the spacer is extremely important. The use of steel or even aluminium for this purpose is out of the question.

Photo 8. V-type stacking terminal

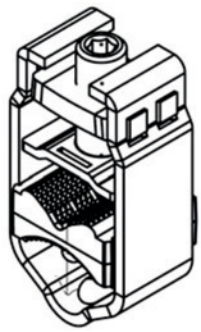
These materials have been found to introduce too much resistance between the conductors, causing excessive heating of the terminal and uneven current distribution between the conductors. Tin-coated copper is a good spacer material for the clamp - it provides sufficiently low resistance and, thanks to the tin, it is also possible to connect aluminium conductors. The tin-coated contact surface is gas-tight and does not oxidise when pressed. An example of the appearance of a clamp with a copper spacer is shown in Photo 9 and Figure 4.

Photo 9. Clamp with copper spacer



Pic. 4. Clamp with copper spacer

Photo 10. Clamps with new spacer



Pic. 5. Clamp with new spacer

The copper spacer also has some limitations, it cannot be too thick due to the pressing technology used. Such a relatively thin copper spacer requires a great deal of attention and patience during assembly, and it can sometimes become distorted or even wedged in the terminal when tightening. The pressing technology of the copper spacer also does not allow sharp-edged grooves to form on its surface. A spacer without sharp edges does not "bite" into the surface of the cable conductors very well during tightening, which increases the resistance of such a contact.
An alternative to the copper spacer has become the use of a special alloy. The spacer made of this alloy can be made much thicker, which ensures that it is very stable in the terminal. It is also possible to make a very rough, serrated surface of the spacer, which cuts into the surface of the cable conductors which significantly reduces contact resistance. This is the first spacer of its kind on the market.

An example of the appearance of a V-type terminal frame with the new spacer is shown in Photo 10 and Figure 5. Interestingly, tests carried out have shown that, although this alloy has a higher specific resistance than copper, due to the serrated surface, the resistance of the terminal with the new spacer is not at all higher than that of the terminal with the copper spacer, and the currents spread evenly. The terminal with the new spacer also has a unique feature that distinguishes it from other terminals of this type. After removing the spacer, the frame of this terminal can be slid over the two cable conductors and, thanks to the large size of the frame, this is possible even beyond the edge where the conductor insulation is. The cable conductors are then placed on the connection and the frame is slid over the terminal connection and the two conductors. The special shape of the spacer means that it can be squeezed between the cable conductors already laid on the connection and snapped onto the terminal frame. This makes it very easy to connect double rigid cables with large cross-sections to the apparatus.

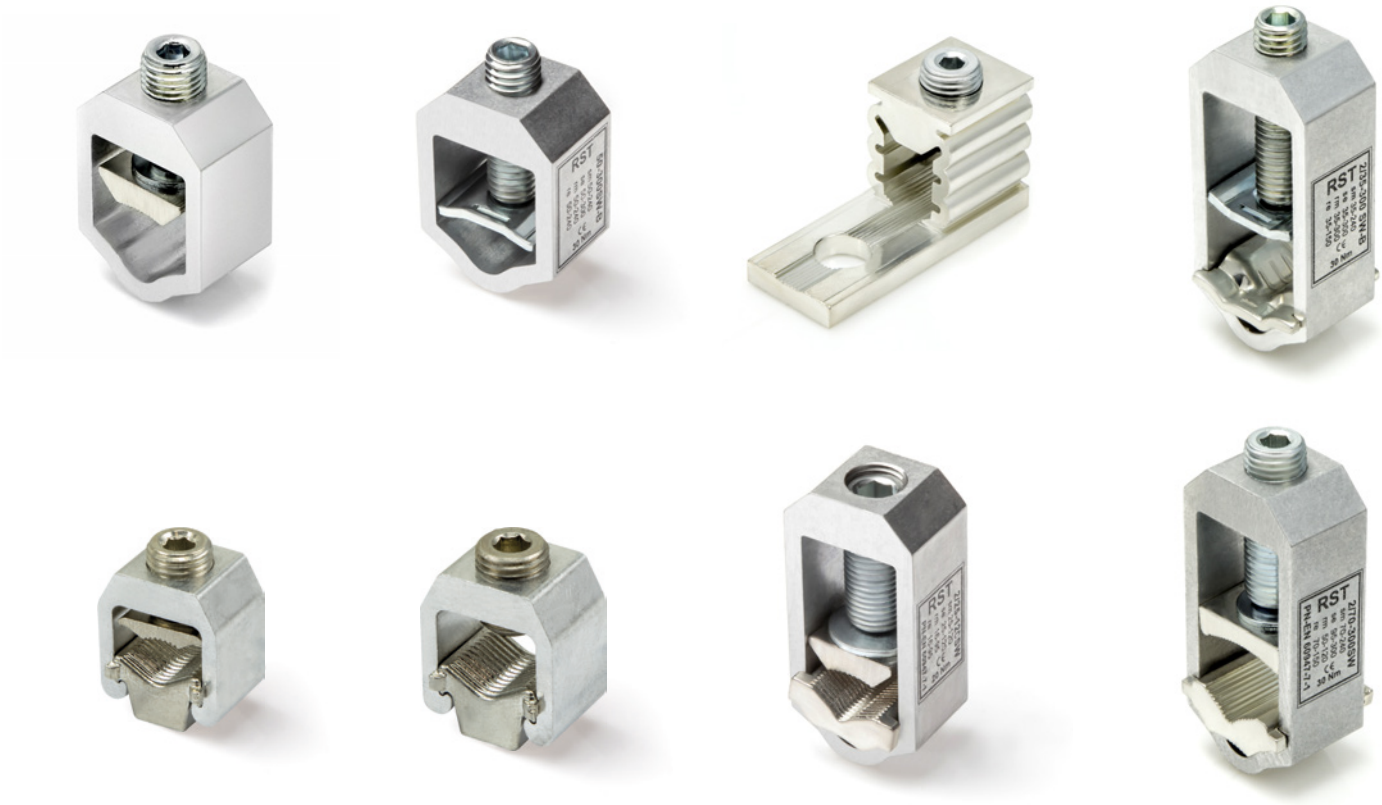
Clamps must comply with all design specifications and requirements set out in the standards. An example of a test bench for three 630A disconnectors with stacked V-type terminals is shown in Photo 11. The test includes measurement of terminal resistance and measurement of temperature rise. The apparatus is subjected to cyclic loading. Each cycle consists of switching on 630A current for 60 min, followed by a 24 min current-free interval. There are as many as 750 such cycles in succession, which, as one can easily calculate, adds up to 1050 hours, i.e. more than 43 days of uninterrupted testing. Photo 12 shows the screen of the multi-channel temperature recorder with a graph covering cycles 501 to 750.

Photo 11.
Testing of three disconnectors with V-type stacked terminals (with new spacer)

Photo 12.
Graph from multi-channel temperature recorder during testing of three disconnectors with V-type stacked terminals (with new spacer). Cycles 501 to 750.

The popular clamps are a very important, although often underestimated, component of modern switchgear. They can be found in practically every energy distribution system, in transformer stations, cable joints and distribution cabinets. The cable connection is an extremely important and sensitive point in the network, and terminals are a potential point of failure. Hasty or careless installation of cables in terminals often results in poor contact, overheating of connections and, in extreme cases, even a switchgear fire. A few zlotys saved on terminals from an unreliable manufacturer leads to losses of several or even tens of thousands of zlotys and power cuts. By using tested clamps from reliable suppliers, we limit heat losses in the switchgear and protect apparatus from excessive heating.

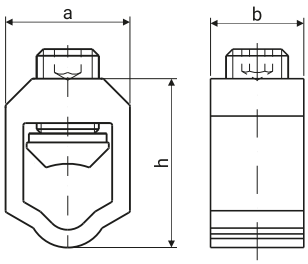
Aluminium



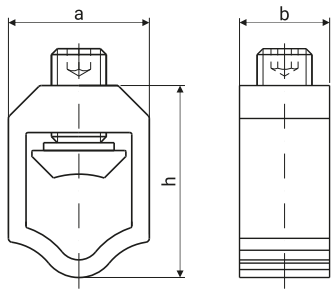
Steel

Screw clamps v-klema type
Single aluminium

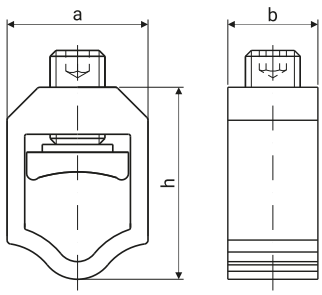
25-120SW



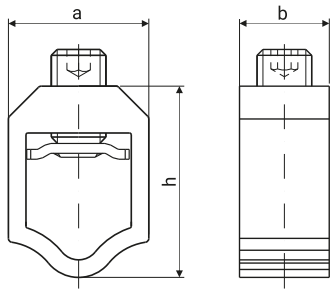
35-240SW
50-240SW
35-240SW-C
50-240SW-C



70-300SW
95-300SW



25-120SW-B
50-300SW-B
95-300SW-B



sm - multiwire sector shaped conductor (flexible)

rm - round multiwire conductor (flexible)

se - sector shaped conductor (rigid)

re - round conductor (rigid)

DETAIL	CROSS-SECTION [mm2]				NOMINAL CROSS-SECTION [mm²]	MAX TIGHTENING TORGUE [Nm]	DIMENSIONS		
	sm	se	rm	re			a	b	h
25-120SW	25-120	25-120	16-95	16-95	95	20	28	18,5	38
35-240SW	35-185	35-240	25-150	25-95	120	30	35	23	49
50-240SW	50-185	50-240	35-95	35-120	120	30	35	23	49
70-300SW	70-240	95-300	50-120	70-150	150	30	35	23	49
95-300SW	70-240	95-300	50-185	70-240	150	30	37,5	23	54
25-120SW-B	25-120	25-120	16-95	16-95	95	20	28	18,5	38
50-300SW-B*	50-240	50-300	35-240	35-240	150	30	35	23	49
95-300SW-B	50-300	50-300	50-300	50-150	150	30	37,5	23	54
35-240SW-C	35-240	35-240	35-95	35-120	150	30	35	23,2	49
50-240SW-C	50-240	50-240	35-95	35-120	150	30	35	23,2	49

	25-120SW	35-240SW	50-240SW	70-240SW	95-300SW	25-120SW-B	50-300SW-B	95-300SW-B	35-240SW-C	50-240SW-C
clamp	Brass- zinc plated					Spring steel zinc-plated			ZAMAK tin-plated	
housing	Aluminium (AlMgSi)									
screw	Steel zinc-plated									

SW - hexagon head socked

Screw clamps have safety sign 'B' Wg PN-EN 60947-7-1, (IEC 60947-7-1), EN 61238, EN 60999

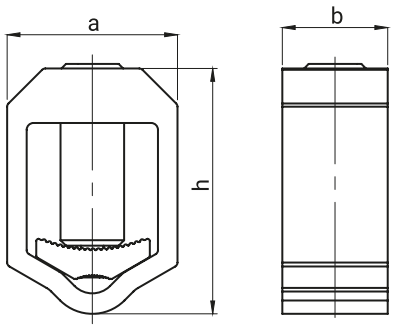
* EN 60947-7-1, EN 60947-7-2

* clamp can be supplied with a tightening torque of 35 Nm

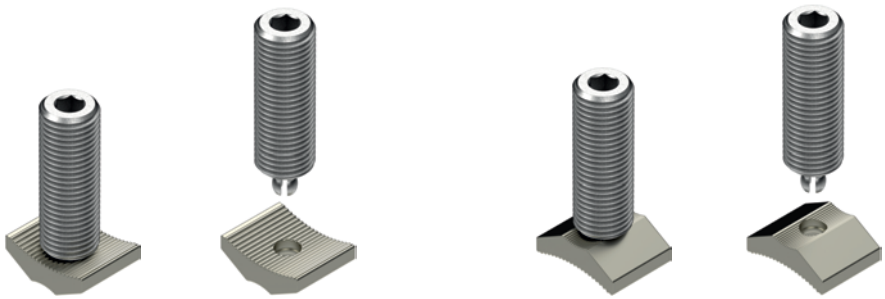
Screw clamps v-klema type
Single aluminium

NEW

10-300SW



Possibility of changing the way the clamp is mounted



sm - multiwire sector shaped conductor (flexible)

rm - round multiwire conductor (flexible)

se - sector shaped conductor (rigid)

re - round conductor (rigid)

DETAIL	CROSS-SECTION [mm2]				NOMINAL CROSS-SECTION [mm^2]	MAX TIGHTENING TORGUE [Nm]	DIMENSIONS		
	sm	se	rm	re			a	b	h
10-300SW	70-300	95-300	10-150	10-150	150	25	37,5	23,2	54

	10-300SW
clamp	Brass- zinc plated
housing	Aluminium (AlMgSi)
screw	Steel zinc-plated

SW - hexagon head socked
Screw clamps have safety sign 'B' Wg PN-EN 60947-7-1, (IEC 60947-7-1), EN 61238, EN 60999
* EN 60947-7-1, EN 60947-7-2
* Screw clamp 10-300SW - current value I_{th} = 309 A

Screw clamps v-klema type
Double aluminium

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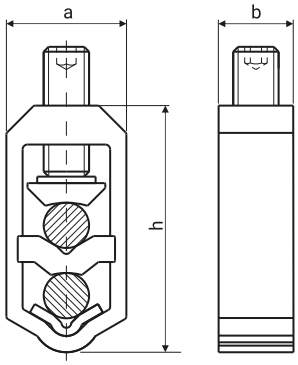
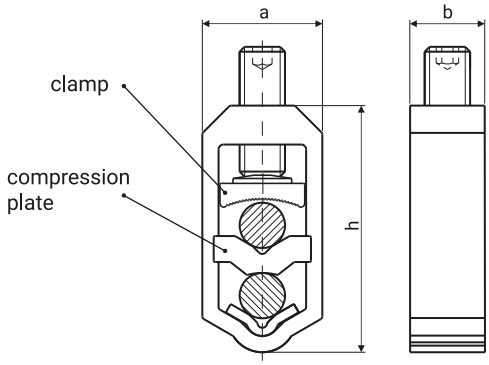
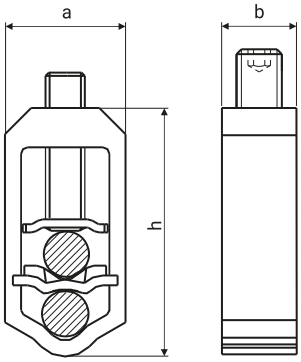
2/25-120SW
2/50-240SW
2/25-120SW-D
2/50-240SW-D



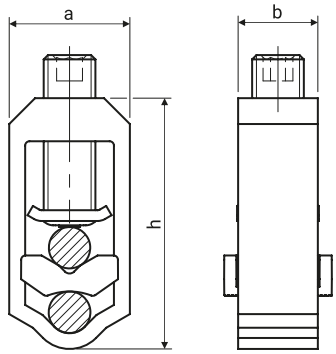
2/70-300SW
2/70-300SW-E



2/25-120SW-B
2/35-300SW-B



2/25-120SW-B
2/25-120SW-E



sm - multiwire sector shaped conductor (flexible)

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re - round conductor (rigid)

DETAIL	CROSS-SECTION [mm2]				NOMINAL CROSS-SECTION [mm²]	MAX TIGHTENING TORGUE[Nm]	DIMENSIONS		
	sm	se	rm	re			a	b	h
2/25-120SW	25-120	25-120	16-95	16-95	95	20	28	18	58
2/50-240SW	35-185	35-240	35-120	35-150	150	30	37	23	76
2/70-300SW	70-240	95-300	50-120	70-150	150	30	35	23	76
2/25-120SW-B	25-120	25-120	16-95	16-95	95	20	28	18	58
2/35-300SW-B	50-240	50-240	35-300	50-150	150	30	37	23	76
2/25-120SW-D	25-120	25-120	16-95	16-95	95	20	28	18	58
2/50-240SW-D	35-185	35-240	35-120	35-150	150	30	37	23	76
2/70-300SW-E	70-240	95-300	50-120	70-150	150	30	37	23	76
2/25-120SW-E	25-120	25-120	16-95	16-95	95	20	28	18	58

	2/25-120SW	2/50-240SW	2/70-300SW	2/25-120SW-B	2/35-300SW-B
Clamp	Brass- zinc plated			Spring steel zinc-plated	
Compression plate	Brass- zinc plated			Spring steel zinc-plated	
Housing	Aluminium (AlMgSi)				
Screw	Steel zinc-plated				

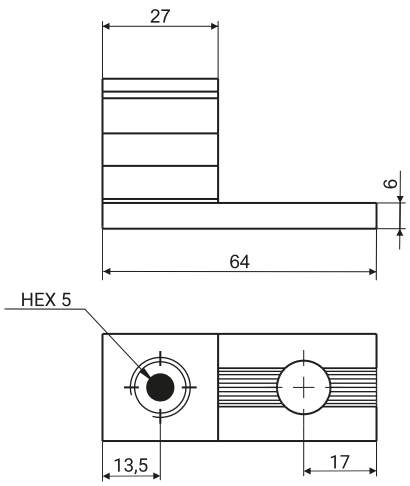
	2/25-120SW-D	2/50-240SW-D	2/70-300SW-E	2/25-120SW-E
Clamp	Brass- zinc plated	ZAMAK tin-plated	Brass- zinc plated	Spring steel zinc-plated
Compression plate	ZAMAK tin-plated			
Housing	Aluminium (AlMgSi)			
Screw	Steel zinc-plated			

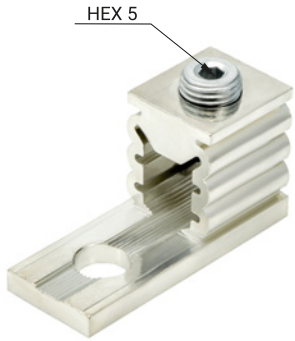
* SW - hexagon head socked
* Screw clamps have safety sign 'B' Wg PN-EN 60947-7-1, (IEC 60947-7-1), EN 61238, EN 60999

Screw clamps v-klema type Aluminium

RST Roztocze® LOCKING SOLUTIONS

16-120SW

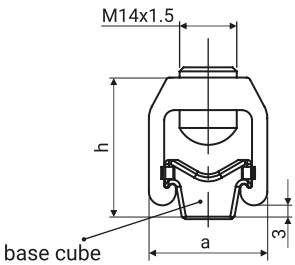




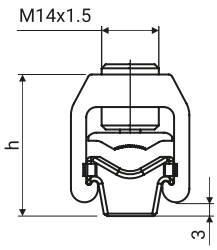
Cross section	Tightening torgue
16-35mm^2	12 Nm
50-120mm	25 Nm^2

For the multiwire sector shaped conductor **rm** the need to use the tip of the sleeveDIN 46228/4

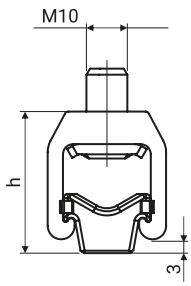
10-150.SW.A



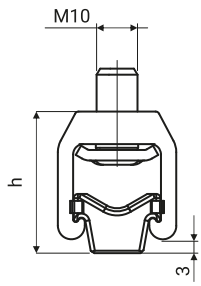
10-150.SW.B

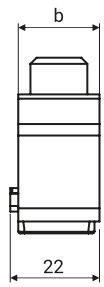


10-150.SW.C1



10-150.SW.C2





sm - multiwire sector shaped conductor (flexible)

rm - round multiwire conductor (flexible)

se - sector shaped conductor (rigid)

re - round conductor (rigid)

DETAIL	CROSS-SECTION [mm2]				NOMINAL CROSS-SECTION [mm^2]	MAX TIGHTENING TORGUE [Nm]	DIMENSIONS		
	sm	se	rm	re			a	b	h
16-120SW	-	-	16-120	16-120	120	12-25	25	27	35
10-150.SW.A	35-120	35-150	10-95	10-120	120	15	29	20	34
10-150.SW.B	35-70	35-95	10-50	10-70	95	15	29	20	34
10-150.SW.C	35-70	35-95	10-50	10-70	95	15	29	20	34

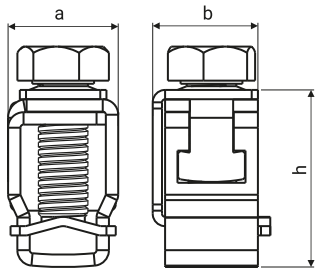
	16-120SW	10-150.SW.A	10-150.SW.B	10-150.SW.C1/C2
Clamp	-	-	Brass tin-plated	Spring steel zinc-plated
Base cube	-	Brass tin-plated		
Housing	Aluminium (AlMgSi)			
Screw	Brass tin-plated			Steel zinc-plated

* SW - hexagon head socked.
* Screw clamps have safety sign 'B' WG PN-EN 60947-7-1, (IEC 60947-7-1)

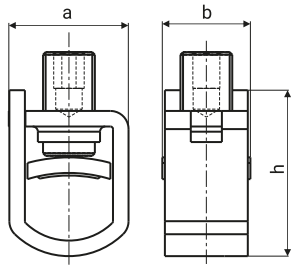
Screw clamps v-klema type HM, HS steel single

RST Roztocze® LOCKING SOLUTIONS

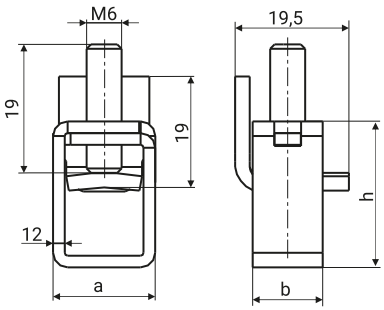
HM 6-50



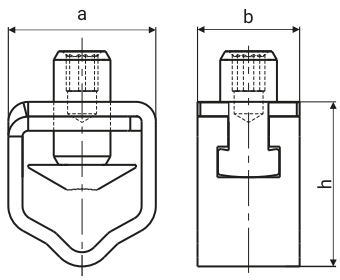
HS 10-95



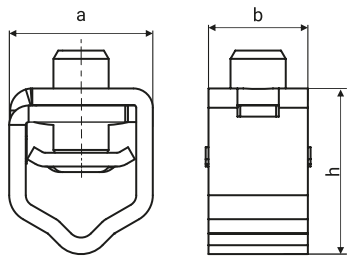
HS 6-50



HM 10-95/A
HM 10-95/C
HM 25-150/A
HM 25-150/B



HM 10-95/B



sm - multiwire sector shaped conductor (flexible)

rm - round multiwire conductor (flexible)

se - sector shaped conductor (rigid)

re - round conductor (rigid)

DETAIL	CROSS-SECTION [mm2]				NOMINAL CROSS-SECTION [mm²]	MAX TIGHTENING TORGUE [Nm]	DIMENSIONS		
	sm	se	rm	re			a	b	h
HM 6-50	25-50	25-50	6-50	6-50	50	8	18	16	30
HM 10-95/A	25-95	20-120	10-70	10-70	95	15	26	18	30
HM 10-95/B	25-95	20-120	10-70	10-70	95	15	26	18	30
HM 10-95/C	25-95	20-120	10-70	10-70	95	15	26	18	30
HM 25-150/A	25-120	35-150	25-120	35-120	95	25	26	18	31,5
HM 25-150/B	25-120	35-150	25-120	35-120	95	25	26	18	31,5
HS 6-50	-	-	6-50	6-50	50	6	17,5	12	25
HS 10-95	25-95	25-95	10-95	10-70	95	15	23	16	32

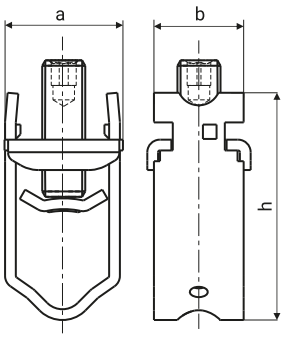
	HM 6-50	HS 6-50	HS 10-95	HM 10-95/A	HM 10-95/B	HM 10-95/C	HM 25-150/A	HM 25-150/B
Housing	Spring steel zinc-plated			Stainless steel	Spring steel zinc-plated	Spring steel zinc-plated	Stainless steel	Steel zinc-plated
Clamp	Spring steel zinc-plated			Brass tin-plated	Spring steel zinc-plated	Brass tin-plated	Brass tin-plated	Brass tin-plated
Screw	Steel zinc-plated			Stainless steel	Steel zinc-plated	Steel zinc-plated	Stainless steel	Steel zinc-plated

* Screw clamps have safety sign 'B' WG PN-EN 60947-7-1, (IEC 60947-7-1)

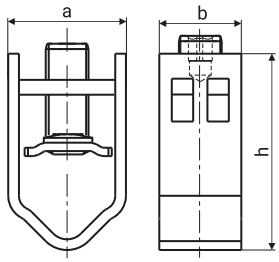
Screw clamps v-klema type
HS steel single

RST Roztocze® LOCKING SOLUTIONS

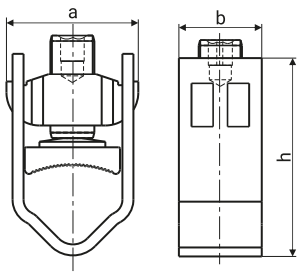
HS 25-240



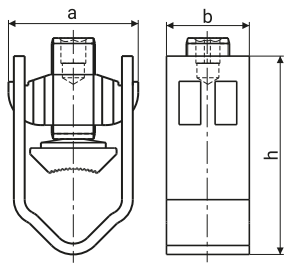
HS 35-300-B
HS 50-300-B



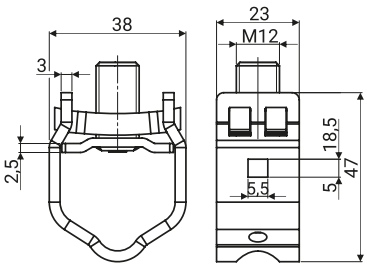
HS 70-300



HS 50-240



HS 120-300



sm - multiwire sector shaped conductor (flexible)

rm - round multiwire conductor (flexible)

se - sector shaped conductor (rigid)

re - round conductor (rigid)

DETAIL	CROSS-SECTION [mm2]				NOMINAL CROSS-SECTION [mm²]	MAX TIGHTENING TORGUE [Nm]	DIMENSIONS		
	sm	se	rm	re			a	b	h
HS 25-240	50-240	50-240	25-185	25-95	240	30	33	25	63
HS 50-240	50-185	50-240	35-120	35-150	150	40	35	22	55
HS 70-300	70-240	95-300	50-150	70-185	185	40	35	22	55
HS 35-300-B	35-240	35-300	35-300	35-185	185	40	35	22	55
HS 50-300-B	50-240	70-300	50-300	50-185	185	40	35	22	55
HS 120-300	120-300	120-300	120-300	120-300	300	40	38	23	47

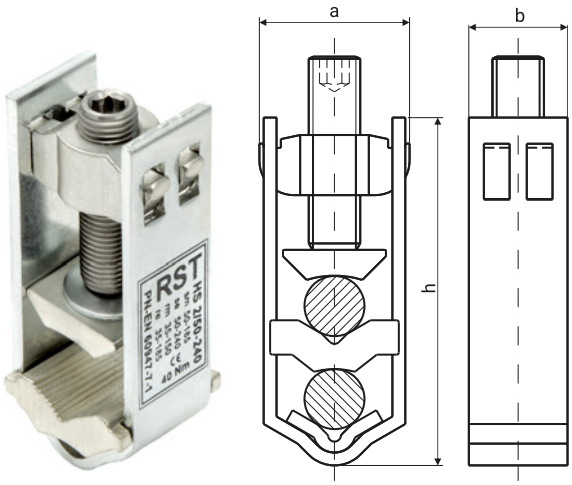
	HS 25-240	HS 50-240	HS 70-300	HS 35-300-B	HS 50-300-B	HS 120-300
Housing	Spring steel zinc-plated					Stainless steel
Clamp	Spring steel zinc-plated	Brass tin-plated		Spring steel zinc-plated		
Screw	Steel zinc-plated					
Nut	Steel zinc-plated	Brass tin-plated		Steel zinc-plated		

* Screw clamps have safety sign 'B' WG PN-EN 60947-7-1, (IEC 60947-7-1)

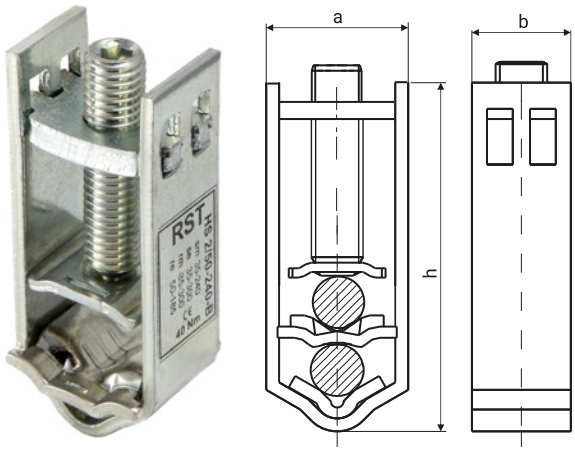
Screw clamps v-klema type HS steel double

RST Roztocze® LOCKING SOLUTIONS

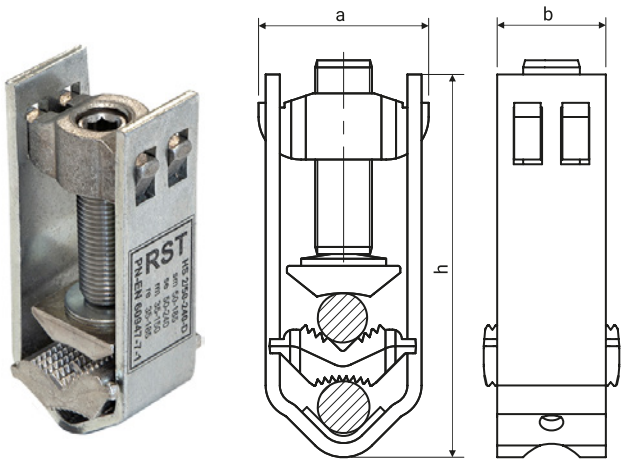
HS 2/50-240



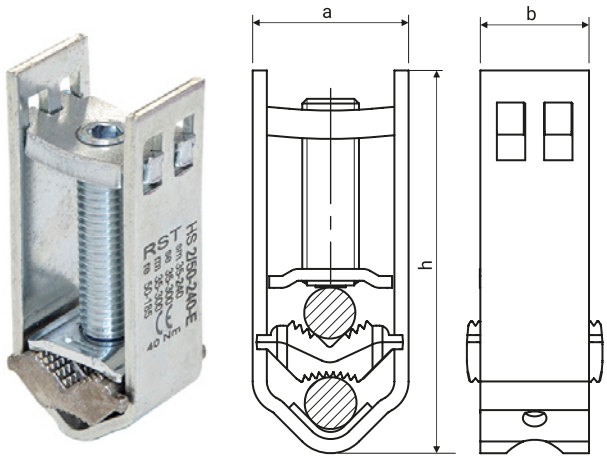
HS 2/50-240-B



HS 2/50-240-D



HS 2/50-240-E



sm - multiwire sector shaped conductor (flexible)

rm - round multiwire conductor (flexible)

se - sector shaped conductor (rigid)

re - round conductor (rigid)

DETAIL	CROSS-SECTION [mm2]				NOMINAL CROSS-SECTION [mm²]	MAX TIGHTENING TORGUE [Nm]	DIMENSIONS		
	sm	se	rm	re			a	b	h
HS 2/50-240	50-185	50-240	35-150	35-185	185	40	35	22	81
HS 2/50-240-B	35-240	35-300	35-300	50-185	185	40	35	22	81
HS 2/50-240-D	50-185	50-240	35-150	35-185	185	40	36	23	81
HS 2/50-240-E	35-240	35-300	35-300	50-185	185	40	35	23	81

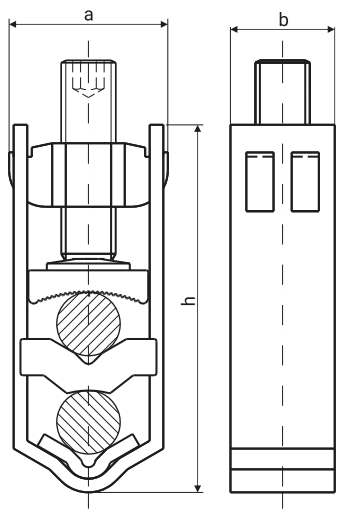
	HS 2/50-240	HS 2/50-240-B	HS 2/50-240-D	HS 2/50-240-E
Clamp	Brass tin-plated	Steel zinc-plated	ZAMAK tin-plated	Steel zinc plated
Housing	Spring steel zinc-plated			
Screw	Steel zinc-plated			
Compression plate	Brass tin-plated		ZAMAK tin-plated	
Nut	Brass tin-plated	Spring steel zinc-plated	Brass tin-plated	Steel zinc plated

* Screw clamps have safety sign 'B' WG PN-EN 60947-7-1, (IEC 60947-7-1)

Screw clamps v-klema type HS steel double 2/70-300

RST Roztocze® LOCKING SOLUTIONS

HS 2/70-300



sm - multiwire sector shaped conductor (flexible)

rm - round multiwire conductor (flexible)

se - sector shaped conductor (rigid)

re - round conductor (rigid)

DETAIL	CROSS-SECTION [mm2]				NOMINAL CROSS-SECTION [mm²]	MAX TIGHTENING TORGUE [Nm]	DIMENSIONS		
	sm	se	rm	re			a	b	h
HS 2/70-300	70-240	95-300	50-120	70-150	185	30	35	22	81

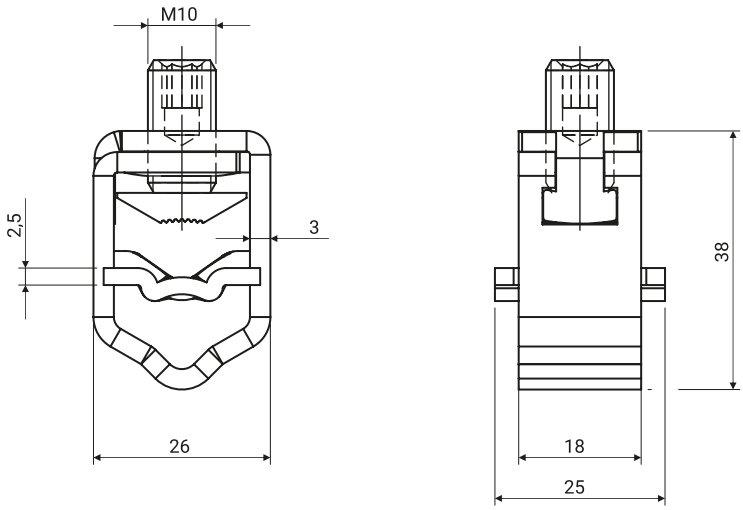
	HS 2/70-300
Clamp	Brass tin-plated
Housing	Spring steel zinc-plated
Screw	Steel zinc-plated
Compression plate	Brass tin-plated
Nut	Brass tin-plated

* Screw clamps have safety sign 'B' WG PN-EN 60947-7-1, (IEC 60947-7-1)

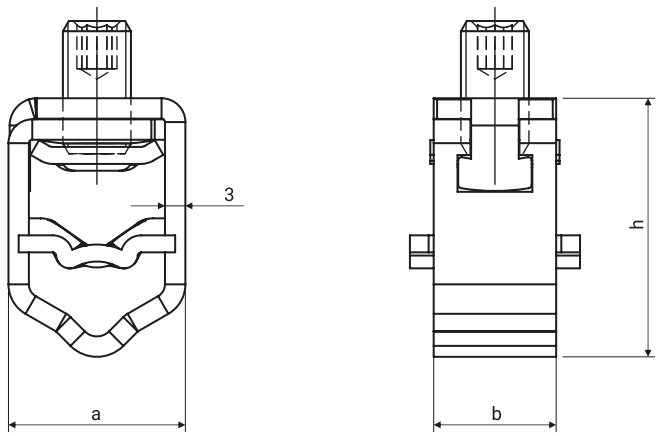
Screw clamps v-klema type HM steel double

RST Roztocze® LOCKING SOLUTIONS

HM 2/10-70-A



HM 2/10-70-B



sm - multiwire sector shaped conductor (flexible)

rm - round multiwire conductor (flexible)

se - sector shaped conductor (rigid)

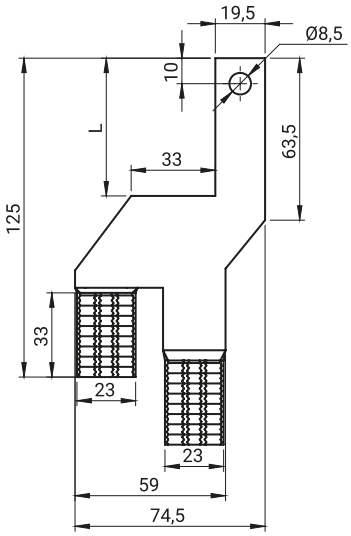
re - round conductor (rigid)

DETAIL	CROSS-SECTION [mm2]				MAX TIGHTENING TORGUE [Nm]	DIMENSIONS		
	sm	se	rm	re		a	b	h
HM 2/10-70-A	10-50	10-70	10-35	10-50	15	26	18	38
HM 2/10-70-B	10-50	10-70	10-35	10-50	15	26	18	38

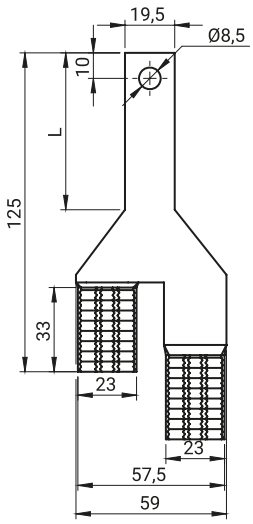
	HM 2/10-70-A	HM 2/10-70-B
Clamp	Brass tin-plated	Steel zinc-plated
Housing	Steel zinc-plated	Steel zinc-plated
Screw	Steel zinc-plated	Steel zinc-plated
Compression plate	Copper tinned	Copper tinned

* Screw clamps have safety sign 'B' WG PN-EN 60947-7-1, (IEC 60947-7-1)

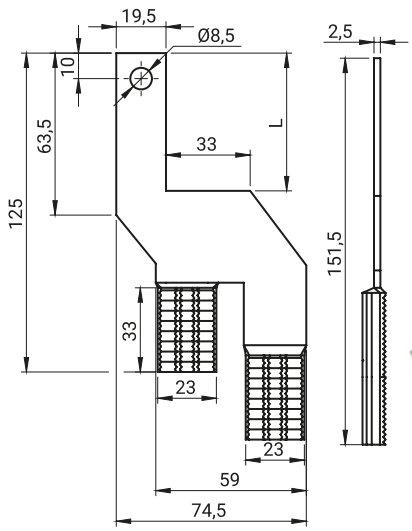
4.601.101
4.601.201



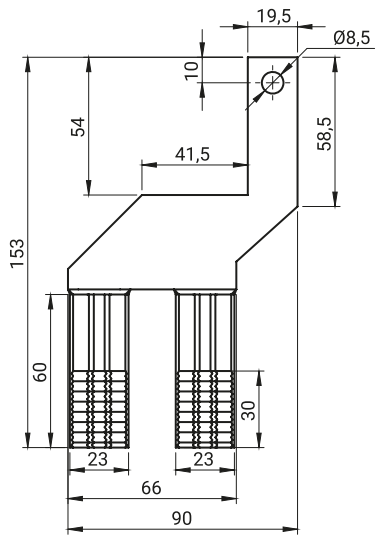
4.601.102
4.601.202



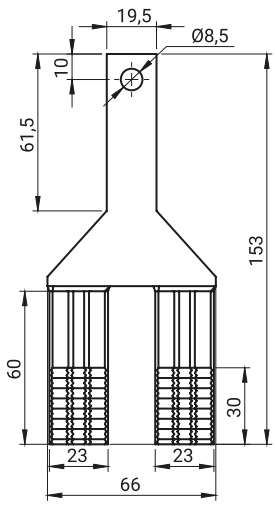
4.601.103
4.601.203



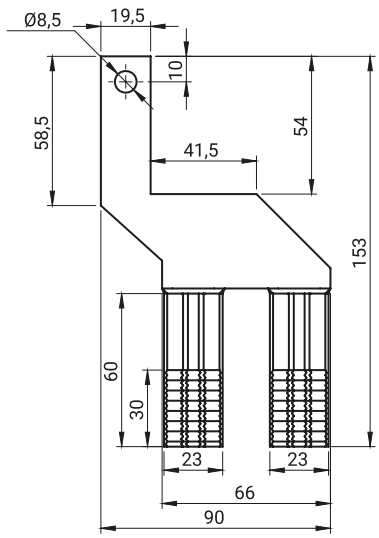
4.601.401

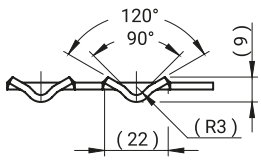


4.601.402



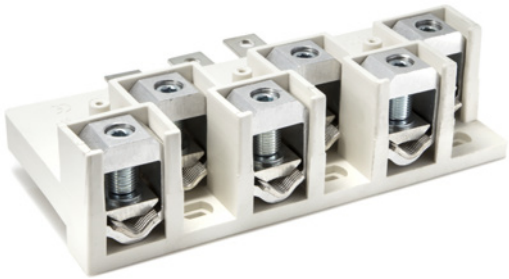
4.601.403



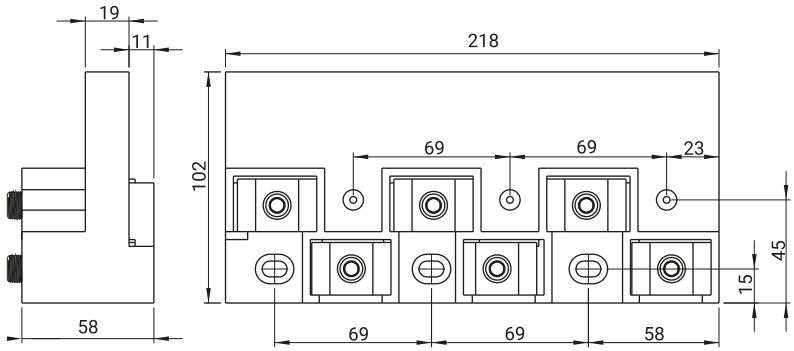


CATALOGUE NO.	L [mm]	NAME	MATERIAL
4.601.101	54	Terminals	Tin-plated copper
4.601.201	42		
4.601.102	63,5		
4.601.202	50		
4.601.103	54		
4.601.203	42		
4.601.401	-		
4.601.402	-		
4.601.403	-		

Connecting device RBK LZ6V
Terminal 4.603

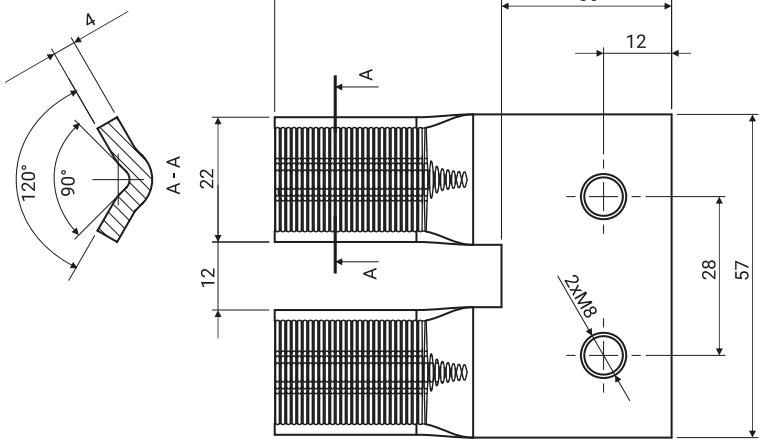


Connecting device RBK LZ6V



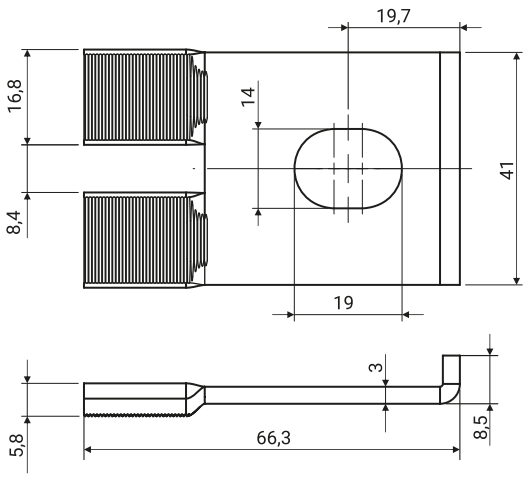
Terminals for connecting device 4.601.001

CATALOGUE NO.	NAME	MATERIAL
4.601.001	Connecting device LZ6V	Polyamide PA6 - colour white



Terminal is dedicated to clamps pg.: 4-1 (in main catalogue) except 25-120 SW, 25-120 SW-B;
4-2 except 2,25-120 SW, 2/25-120 SW-B; 4-5; 4-6 (in main catalogue) except HS 2/70-240-C.

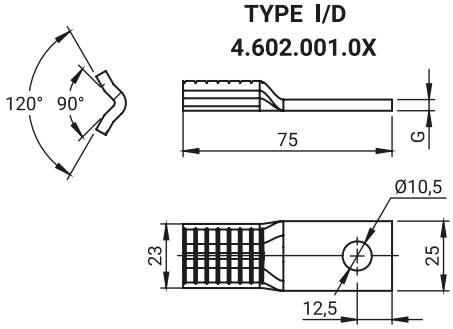
CATALOGUE NO.	DETAIL	MATERIAL
4.603.003	Terminal	Tin-plated copper



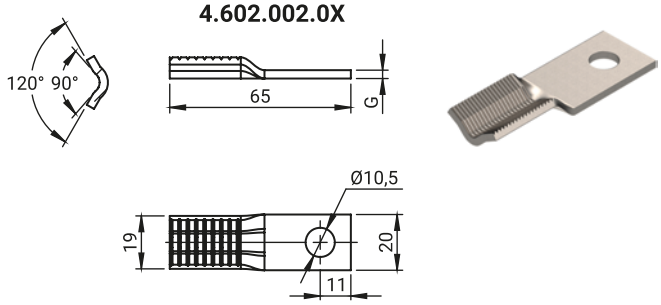
Terminal is dedicated to clamps HS 10-95 (pg. 4-4 in main catalogue)

CATALOGUE NO.	DETAIL	MATERIAL
4.603.004	Terminal	Steel zinc plated

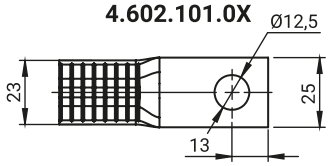
TYPE I/D
4.602.001.0X



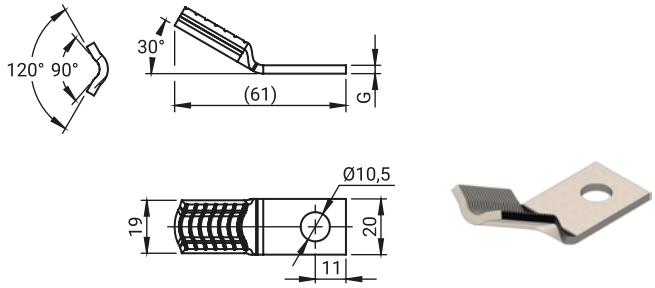
TYPE I/M
4.602.002.0X



TYPE I/D
4.602.101.0X



TYPE I/M
4.602.004.0X



TYPE I/D
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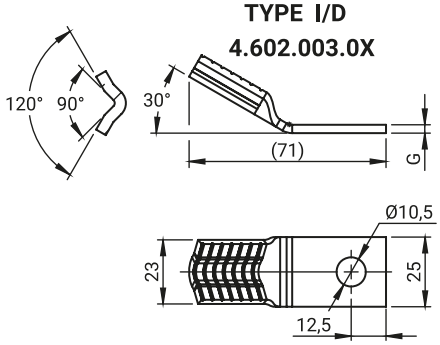
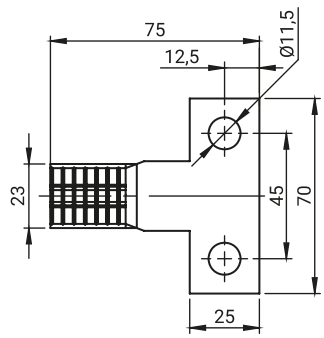


TYPE T
4.604.001



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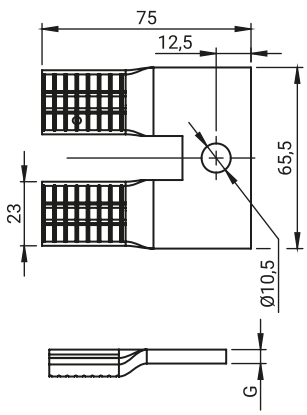
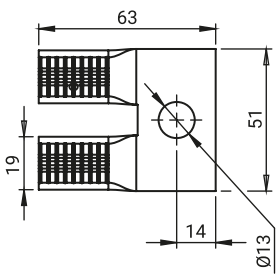
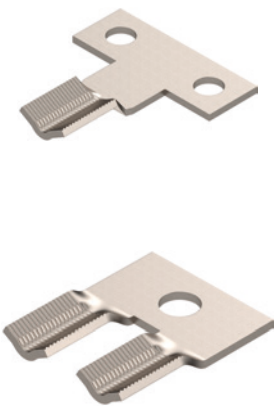


TYPE C
4.603.002.0X

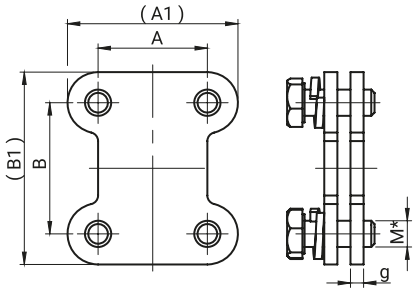




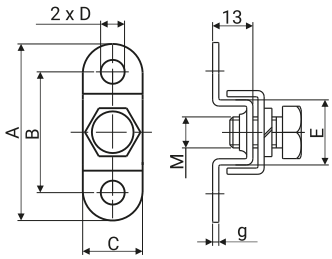
CATALOGUE NO.	G mm	Version Ø	MATERIAL
4.602.001.01	3	10,5	Tin-plated copper
4.602.001.02	4		
4.602.001.03	5		
4.602.101.01	3	12,5	
4.602.101.02	4		
4.602.101.03	5		
4.602.002.01	3	10,5	
4.603.001.01	3		
4.603.001.02	4		
4.603.001.03	5		

CATALOGUE NO.	G mm	Version Ø	MATERIAL
4.603.002.01	3	13	Tin-plated copper
4.603.002.02	4		
4.603.002.03	5		
4.604.001.01	3	11,5	
4.602.003.01	3	10,5	
4.602.003.02	4		
4.602.003.03	5		
4.602.004.01	3	10,5	
4.602.004.02	4		
4.602.004.03	5		

4-SCREW CLAMP
4.405



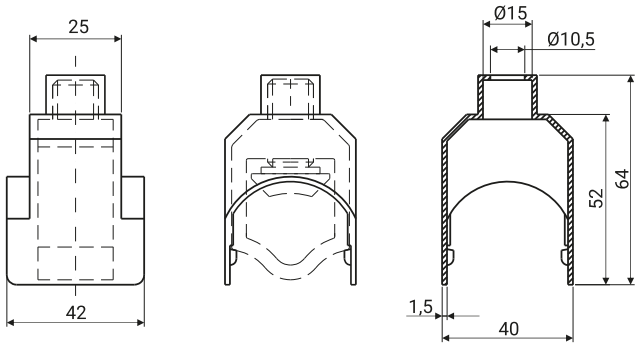
GROUND CLAMP
4.406



* DIN 933 screws and DIN 127 washers included.

CATALOGUE NO.	NAME	MATERIAL	A	A1	B	B1	C	D	E	g	M
4.405.001	4-Screw clamp	Steel zinc plated	25	39	30	44	-	-	-	3	M6
4.405.002			30	44	35	49	-	-	-	3	M6
4.405.003			35	49	35	49	-	-	-	3	M6
4.405.004			41,8	59,8	46,8	64,8	-	-	-	5	M8
4.405.005			46,8	64,8	46,8	64,8	-	-	-	5	M8
4.406.001	Ground clamp	Steel zinc plated	53	-	39	-	18	ø 6,5	19	2	M8x16
4.406.002			62	-	42	-	21	ø 8,5	22	2,5	M10x16

V-KLEMY COVERS

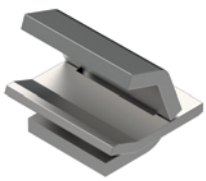


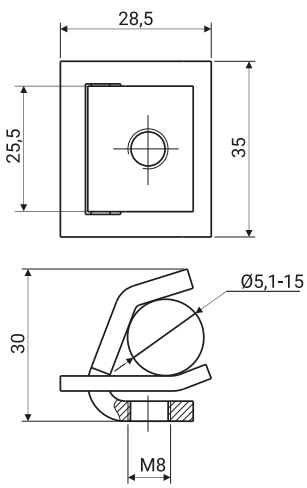
NOTICE:
V-klema covers can be used with screw clamps type:
50-240SW, 70-300SW, 50-300SW i 35-240SW

CATALOGUE NO.	NAME	MATERIAL
4.520.001.0X	V-klema cover	PA6-polyamide

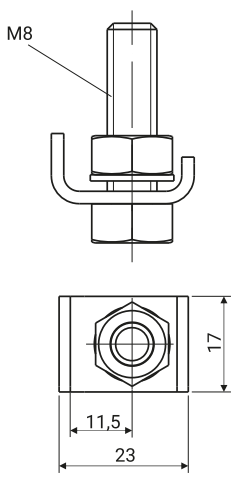
COLORS [X]	
01	black
02	blue
03	red
04	green
05	yellow
06	grey

LINEAR CLAMP - ZLG
4.402.001



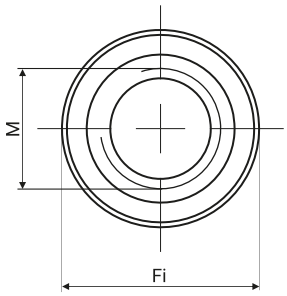


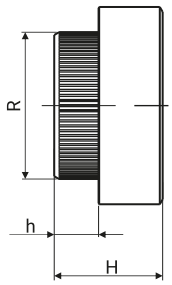
GOUND HOLDER
4.403.001



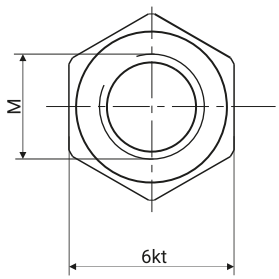
CATALOGUE NO.	NAME	MATERIAL
4.402.001	Linear clamp ZLG	Stainless steel
4.403.001	Ground clamp ZU	Steel zinc plated
4.403.001SN		Stainless steel

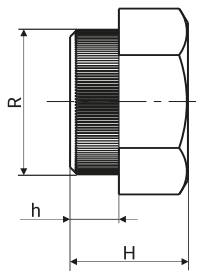
ROUND NUT





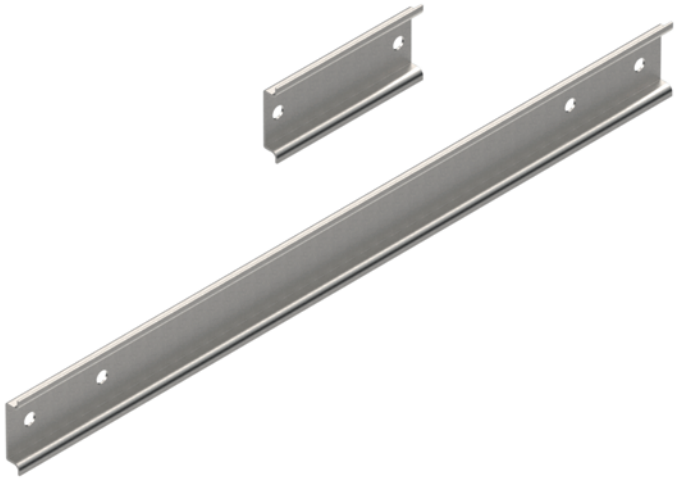
HEXAGONAL NUT

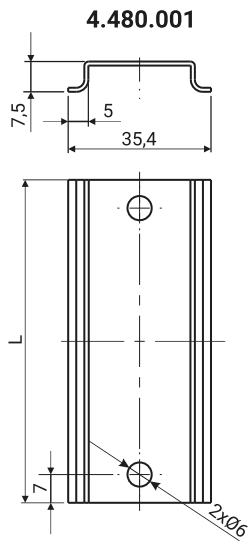


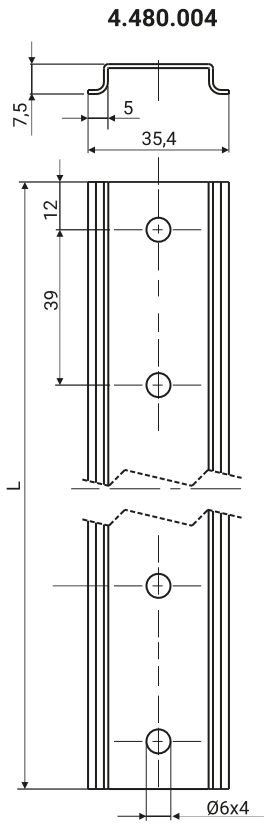


SHAPE	DIMENSIONS						MATERIAL	CATALOGUE NO.
	M	Fi	6kt	Fi R	H	h		
	12	20	-	14,9	11	4,5	Steel - zinc plated	NR.01.00
	12	20	-	14,9	10,5	4	Steel - zinc plated	NR.01.02
	12	19	-	15	11	4	Steel - zinc plated	NR.01.03
	10	18	-	13	11	4,5	Steel - zinc plated	NR.03.01
	8	15	-	10,8	9,5	4,5	Steel - zinc plated	NR.02.01
	6	12	-	8,5	6,8	2,8	Steel - zinc plated	NR.04.01
	5	10	-	7,5	6,8	2,8	Steel - zinc plated	NR.05.01
	12	-	19	14,8	12	4,5	Steel - zinc plated	NR.01.04
	10	-	17	12,9	11	4,5	Steel - zinc plated	NR.03.02
	8	-	13	10,7	9,5	4,5	Steel - zinc plated	NR.02.02

Assembling busbar 4.480, Ball stud 4.407

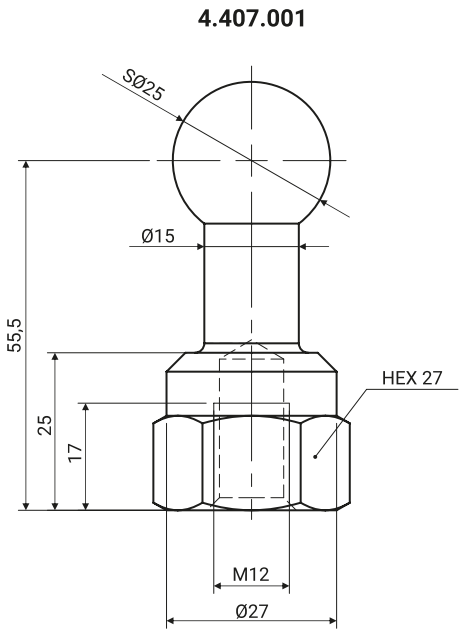


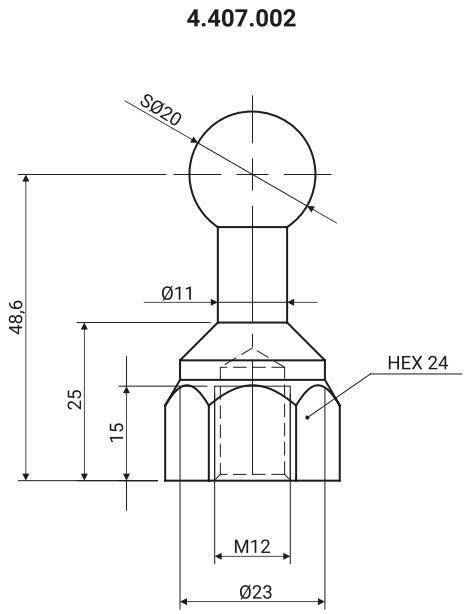




NOTICE: Other dimensions on request

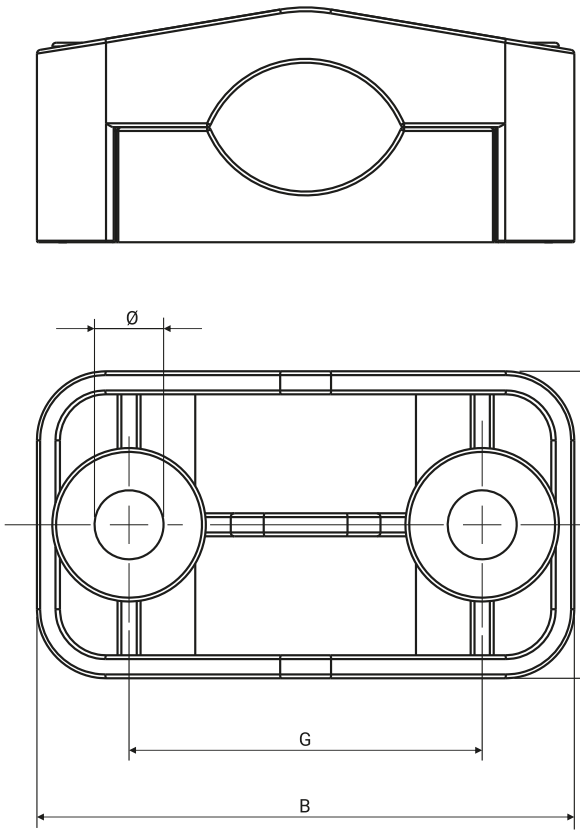
CATALOGUE NO.	DIMENSION L	MATERIAL
4.480.001	80	Steel - zinc plated
4.480.004	360	Steel - zinc plated





Ball studs mounted on power rails, power cables, or other components of power equipment are used to attach the phase terminals of the earth electrode to the ball studs.
They can be mounted on flat rails, cable head ends, and other components with flat contact surfaces.
Manufactured from pure copper and electrolytically coated with tin.

CATALOGUE NO.	MATERIAL	FINISH
4.407.001	Copper	Tin-plated
4.407.002		



4.460.001

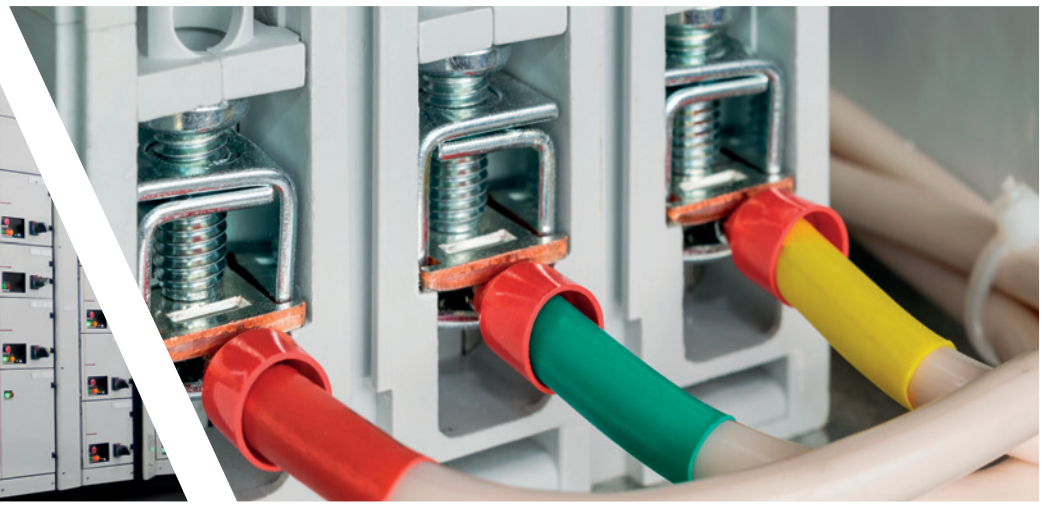
4.461.001

4.462.001

CATALOGUE NO.	NAME	MATERIAL	DIAMETER	DIMENSIONS			
				Φ	A	B	G
4.460.001	Clasp ø27	Polyamide PA6 colour RAL	17-27	9	40	70	46
4.461.001	Clasp ø40		25-46	12	58	97	68
4.462.001	Clasp ø75		47-73	13	60	126,5	95


NH 2


DANGER
HIGH VOLTAGE



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