

PRODUCTS FOR THE PROTECTION OF THE TELECOMMUNICATION SYSTEMS

GROUNDING KIT

EDITION JUNE 2011



Device peculiarities

- simple
- low cost
- high reliability
- easily installable
- with performances validated by authorized Entities and fully demonstrated "on field"
- able to assure full functionality and security in the extreme environmental situations in term of temperature, humidity and sun irradiation

thus allowing to fully protect the installed cables, antennas and various equipments against lightening damages, the connection continuity is than guaranteed to all service Users (**broadcasting, mobile telephone system**) even in the worst atmosphere conditions.



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What are they

Grounding kit are simple components from both view points, functional and mechanical but they are able to connect to ground in an effective way the outer conductor of a coaxial cable.

They are made by a metal contact (or band) to be coupled with the external surface of the cable to be protected; its output will be connected to the metal tower structure by means of a dedicated cable. A special gasket will assure the waterproofing feature toward the external environment in order to guarantee the lasting of the electrical contact functionality. In addition, a metal collar (jaws) will maintain the necessary pressure level to guarantee the contact effectiveness in the future.

Why using them

Their use is necessary to avoid that overvoltages produced by lightnings directly falling over the telecommunication systems or generated by these falling nearby, will damage the involved devices or the coaxial cables connecting them to the antennas. Consequences would be the interruption of the service to Users.

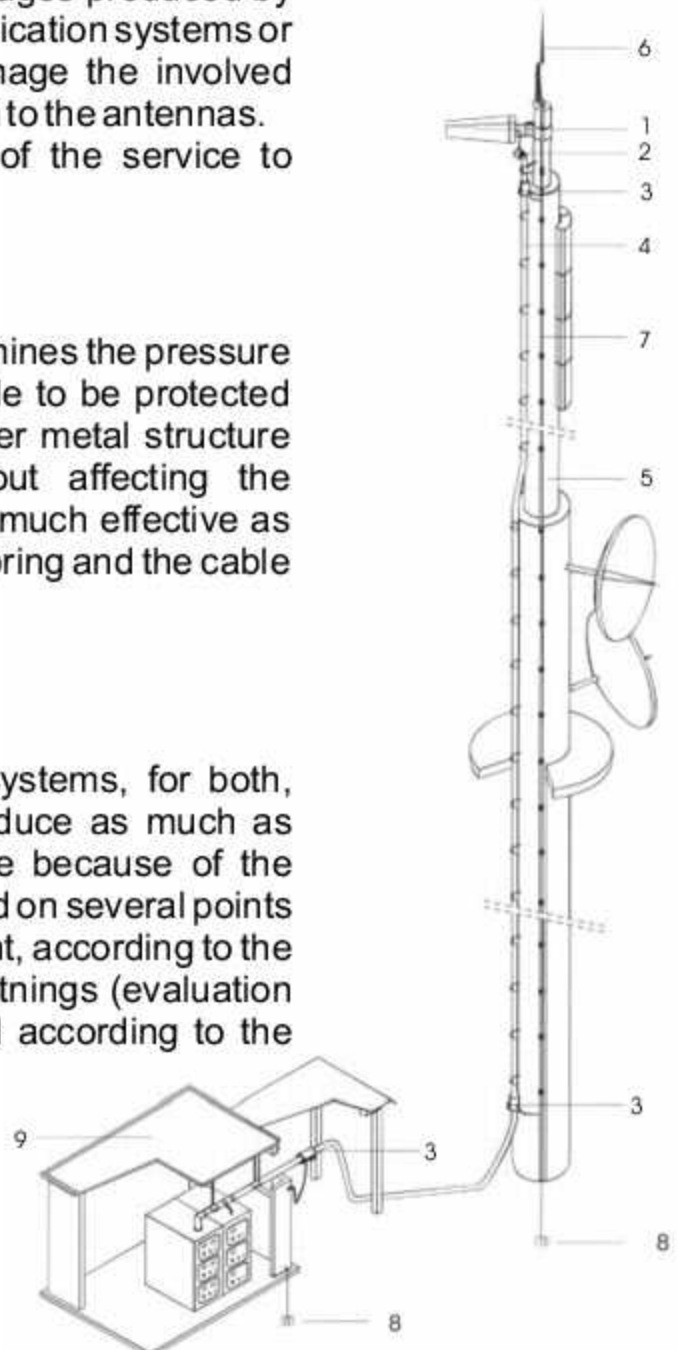
How do they work

The contact spring (or metal band) that determines the pressure over the surface of the external coaxial cable to be protected convey the lightning current toward the tower metal structure that, in turn, scatter it to ground without affecting the telecommunication systems. Its action is as much effective as lower is the resistance between the contact spring and the cable surface.

Where are they used

They are used on all telecommunication systems, for both, military and civil purposes, that need to reduce as much as possible the possibility to go out of service because of the lightning consequences. They will be installed on several points of the cable according to the connection length, according to the probability of the system to be hit by the lightnings (evaluation defined according to the statistic result) and according to the system complexity.

- 1 - Antenna
- 2 - Coaxial protection against lightnings
- 3 - Grounding kits with a direct connection
To the grounding equipotential line of the tower
- 4 - RF coaxial cable
- 5 - Tower
- 6 - Lightning arrester
- 7 - Ground cable or ground strap
- 8 - Ground electrode
- 9 - Housing of receiver/transmitter equipments



SOLUTIONS FOR DIFFERENT TYPES OF COAXIAL CABLES

In the telecommunication systems several types of coaxial cables are installed depending upon the various needs (i.e. Interconnection between equipments and antennas, interconnection between equipments themselves, etc.). Consequently it is not possible to define a "standard" configuration for the contact spring (or band) that, from a functional view point, represent the most important point of the grounding kit device.

CPE Italia has foreseen and implemented several solutions to assure the same level of effectiveness for all types of external conductor used by the various types of coaxial cables.

CORRUGATED

The "corrugated" coaxial cable are widely used for the interconnections between equipments and antenna systems where the loss value has to be maintained as low as possible along with the transfer of high power. Sizes are $\frac{1}{4}$ " up to $2\frac{1}{4}$ " plus "superflex" versions for some smaller diameters.

The special external shape of these cables implies the use of a contact spring (band) matching that shape as much as possible in order to obtain a larger contact surface and a consequent lower contact resistance. This solution will make easier the current flow to ground.



COMMSCOPE

Dimensions of this version of coaxial cable ranges between $\frac{1}{2}$ " up to $1\frac{5}{8}$ " and its external conductor is slick and made in aluminium. Then, it is necessary to use a straight contact to have the greatest contact surface possible. Moreover, since some glue spots between protective shield and the outer conductor may be present, it is necessary that the spring contact be able to penetrate the possible insulation layer in order to assure an effective metallic contact, without being obliged to manual operations with sandpaper or similar means. The spring contact has than been produced with sharp tips in relief, than able to etch the insulation layer and to create a contact surface able to convey the lightning current.



STRENDED SHIELD

All cables model RG-8, 58, etc. that are very often used to interconnect the "base units" among themselves are built with the above mentioned type of external shield. In this case, the most effective type of contact spring is made by linear and uniform surfaces. They are installed in a parallel way to the cable thus producing several contact points with the stranded wires.



OTHERS

In the telecommunication systems, multipolar cable to transfer power, data, etc. - often shielded to avoid external interferences, are also used. Normally their shield are made by means of stranded wires. These cable as well have to be protected by using the same approach identified for other coaxial cables with similar shielding systems.





IMPLEMENTATION OF THE VARIOUS KIT COMPONENTS

By implementing the various grounding kit components, peculiar solutions have been adopted as far as functional and used materials are concerned, in order to supply to the User a product with a very high security level as well as the confidence to maintain in the time its mechanical and electrical characteristics.

<p>CONTACT SPRING</p> <p>It is made by tin plated copper. Their shapes are different in order to obtain the best mechanical coupling on all types of coaxial cables. The contact surface is much larger than what would be necessary to convey the lightning current value foreseen by the standards (=100 kAmps) in order to assure the wanted performances even if mechanical misshapes of the spring and/or of the cable should occur.</p>	
<p>RUBBER GASKET</p> <p>This component allows to insulate the contact spring from the external environment thus avoiding that the water penetration will create such an oxidation to deteriorate the electrical and mechanical contact. It is made by EPDM, a material especially suitable to face extremely critical environmental situations. It is also suitable to maintain unchanged its characteristics even when submitted to a severe range of temperature changes.</p>	
<p>TIGHTENING JAWS</p> <p>They are made in stainless steel in order to concentrate on them the needed forces to compress the contact spring over the cable external conductor. It is necessary to assure this compression value (throughout the rubber gasket) to have it lasting in the future regardless to the environmental conditions.</p>	
<p>GROUNDING CONDUCTOR</p> <p>It is made by a cord of flexible annealed copper whose section is 16 square mm. That will assure the lightning current flow (100kAmps) without risk of overheating.</p>	
<p>CONNECTION OF GROUND CONDUCTOR TO GROUND</p> <p>The ground conductor connection with the contact spring and the cable terminal is done with a crimping operation in order to assure such a mechanical retention to support the electrodynamic forces caused by the current flow. If done otherwise, the lightning event could cause the components disconnection. The tin soldering is not used because the overtemperature produced by the current flow could generate a disconnection of the conductor itself.</p>	
<p>WIRE TERMINAL</p> <p>It is made by tin plated copper and it has an hole 8.5 mm diameter to make easier its connection to the drills of the ground strips or to the tower structure. Its crimped portion on the grounding conductor is protected against the water penetration.</p>	

GROUND CONDUCTOR CONNECTION VERSIONS

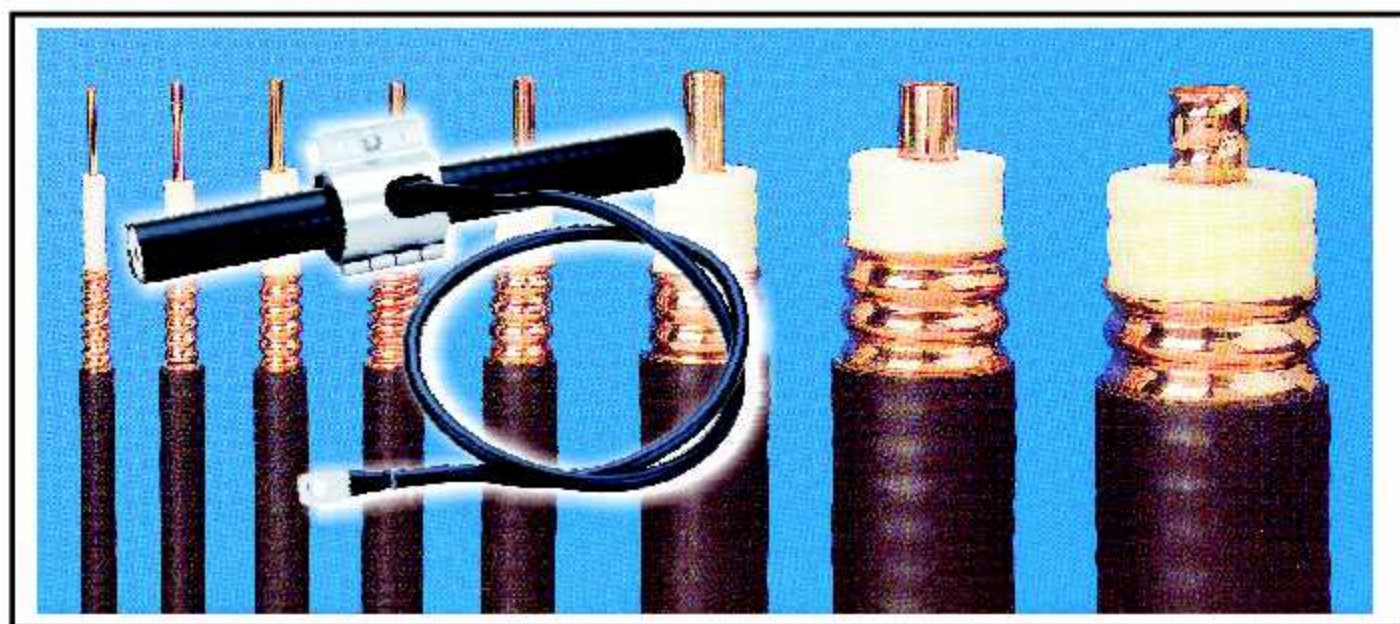
To satisfy all installation needs, different solutions have been foreseen as far as the ground conductor vs the contact spring is concerned. The objective is that to obtain an interconnection between the coaxial cable and the ground system by avoiding mechanical tortions / mechanical strain of the conductor itself (to remind that its large section of 16 square mm could cause heavy efforts on the contact spring with some negative consequences: reduction of its contact quality or the contact surface on the coaxial cable external conductor. In both cases the effectiveness of the grounding kit could be jeopardized.

<p>STRAIGHT</p> <p>It allows a linear connection between the grounding kit and the choosen spanning.</p> <p>This solution is recommended when the spanning point is nearby the grounding kit and if no other coaxial cable other than the one to be protected crosses the area.</p> <p>It can also be used in any other situations of the communications system provide that, because of other installation constraints, it does not imply sharp plies nor excessive bends of the cable itself.</p>	
<p>R/A</p> <p>This is the solution according to which the ground conductor is parallel to the axis of the grounding kit.</p> <p>Its compactness allows its installation in some very narrow areas or when the coaxial cables to be protected are very closed to each other.</p> <p>The grounding conductor is initially connected to the grounding system in a parallel line to the protected cable, before bending it in a wide shape to avoid mechanical straining on the contact spring that would result in a lower effectiveness of the grounding kit.</p>	
<p>AT 45°</p> <p>This version represent a good compromise between the previous ones.</p> <p>Should the grounding kit and the grounding connection point of the tower be in line, the grounding conductor can be connected without any straining and, eventually, with a light inclination.</p> <p>Should other cables be present, the 45° inclination allows to install the grounding conductor parallel to the cable to be protected and than crossed among the other cables present on the structure.</p>	
<p>APART</p> <p>Taking into consideration that sometimes the installer must evaluate the most appropriate solution when already on site (grounding position on the tower difficult to be managed or to be specifically analysed) a neutral version is available. This enable the installer to undertake whatever decisio according to the existing situation. In this case the kit is not supplied as a unique device, but rather the ground conductor (already connected to the cable terminal) is supplied separately as an addons. It is than possible to define the length according to the real situation and to connect the other side of the ground conductor to the cable terminal associated to the contact spring.</p>	

VERSION FOR CORRUGATED COAXIAL CABLE

CABLE TYPE	GROUNDING CONDUCTOR				
	STRAIGHT	90°	45°	16mm ²	CODE
1/4" LCF+3/8" SFLX	X			X	11.020.603-165
1/4" LCF+3/8" SFLX		X		X	11.120.603-166
1/4" LCF+3/8" SFLX			X	X	11.500.603-169
3/8" LCF	X			X	11.000.100-170
3/8" LCF		X		X	11.100.100-249
3/8" LCF			X	X	11.500.100-252
1/2" LCF	X			X	11.000.200-172
1/2" LCF		X		X	11.100.200-173
1/2" LCF			X	X	11.500.200-176
1/2" SFLX	X			X	11.000.002-254
1/2" SFLX		X		X	11.100.002-256
1/2" SFLX			X	X	11.500.002-258
7/8" LCF/SFLX	X			X	11.000.304-179
7/8" LCF/SFLX		X		X	11.100.304-180
7/8" LCF/SFLX			X	X	11.500.300-260
1 1/4" LCF	X				11.010.400-184***
1 1/4" LCF		X			11.110.400-185***
1 1/4" LCF			X		11.510.400-188***
1 5/8" LCF	X				11.010.500-189***
1 5/8" LCF		X			11.110.500-190***
1 5/8" LCF			X		11.510.500-193***
2 1/4" LCF	X				11.010.700-194***
2 1/4" LCF		X			11.110.700-195***

Note: the grounding cable is also available with a section of 25mm² if request by customer.



VERSION FOR “COMMSCOPE” CABLE

CABLE TYPE	GROUNDING CONDUCTOR				
	STRAIGHT	90°	45°	16mm ²	CODE
1/2" SFLX			X	X	11.507.002-272
1/2"			X	X	11.507.200-274
7/8"			X	X	11.507.300-273
1 1/4"			X		11.517.400-275
1 5/8" LCF			X		11.517.500-243



VERSION FOR COAXIAL CABLE USING A STRANDED WIRE AS SHIELD

CABLE TYPE	GROUNDING CONDUCTOR				
	STRAIGHT	90°	45°	16mm ²	CODE
RG-58/RG-223	X			X	11.003.000-163
RG-58/RG-223		X		X	11.103.000-164
RG-59/ET2PA981	X			X	11.002.000-161
RG-59/ET2PA981		X		X	11.002.000-162
CMT 300/L45466-B15-C10	X			X	11.006.000-262
CMT 300/L45466-B15-C10		X		X	11.106.000-264
L45466-B18-C76/C56			X	X	11.505.000-198
L45466-B18-C76/C56	X			X	11.005.000-200

Note: the grounding cable is also available with a section of 25mm² if request by customer.



CABLE TYPE	OUTER CONDUCTOR DIAMETER	SHIELD OUTER DIAMETER	CONFIGURATION
RG-58	3,6 mm	4,95 mm	
RG-59	4,4 mm	6,1 mm	
RG-223	4,2 mm	5,3 mm	
CMT 300/L45466-B15-C10	5,6 mm	7,6 mm	
L45466-B18-C56	8 mm	10,2 mm	
L45466-B18-C76	8 mm	10,3 mm	

“MONOLITHIC VERSION”

To satisfy the request of the telecommunication market segment aiming to deal with reliable, effective, simple and cheap components - while the installators require devices implying a shortest installation time possible - a new version of the “grounding kit” has been conceived and developed.

The new solutions resides on the idea to tie together in a rigid way the 4 main components: **the contact, the external metal bend, the rubber** to assure the waterproof capability and **the grounding cable** of 16mm².

In this way, the device installation does not require the identification of the correct positioning of the contact on the coaxial cable we are going to protect and the need of the rubber slippage up to fully cover both, cable and tightening jaws. With this grounding kit version, to carry out this operation it is just enough to sufficiently enlarge the metal band up to couple it to the cable to be protected, since the contact spring and the rubber are tied to it.

The performances have been certified by an authorised national entity (CESI = Centro Elettrotecnico Sperimentale Italiano) and the results fully comply with the presently applicable european Standards. To be noted that the test has been conducted by applying energy level much higher than what is normally foreseen.

Implementation

Contact:

It is made in stainless steel and it is mechanically joint to the metal band by means of an electrical soldering. This solution not only assure a greater mechanic solidity, but also defines better conditions to the flow of the lightening current from the cable external conductor to the metal band. It also guarantee an extended contact quality for the time being thus supporting several current discharges without degradation.

Its waved shape allows the use of this grounding kit version on all coaxial cables regardless the type and shape of its external conductor (corrugated, slick, braided, etc.).

The limited thickness of the used steel strip allows a mechanical matching / bedding of the contact over the cable when under compression of the metal band, thus assuring a larger contact surface with an electrical resistance whose value is less than 1 mOhm.

Metal band:

It is also made in stainless steel with a thickness suitable to satisfy two different requirements:

- a. To be enough rugged so that it will determine and maintain the necessary compression on the rubber - the end result will be the achievement of the waterproof characteristics of this device.
- b. The compression force of the inner contact on the cable while maintaining enough elasticity to properly fit it on the cable any time it will be open and closed back.

Rubber:

The rubber is tied to the tightening jaws by means of four bumps that, when assembled in the plant, are housed into four holes obtained on the metal band and designed to hold it.

The used components have such a physical and mechanical characteristics to be able to preserve them for the time being thus assuring the waterproof requirement: without that the water penetration would limit the contact quality from both view points, mechanical and electrical with a consequent deterioration of the grounding kit effectiveness.

Grounding cable:

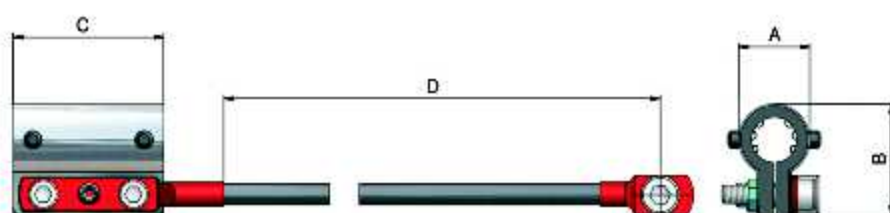
It is made by annealed copper rope, its section is of 16 square mm. By means of a cable terminal, it is strictly connected to the metal band by using a large diameter rivet and two steel screws, the same that tighten the metal band over the cable.

In this way a rugged mechanical contact has been obtained. Furthermore, its large contact surface with the metal band and the high current flow assured by the grounding cable makes an easy paths to the lightening current to flow out to the external grounding system. Because of this type of connection, the contact resistance between the coaxial cable outer conductor and the external grounding system is lower than 1 mOhm.

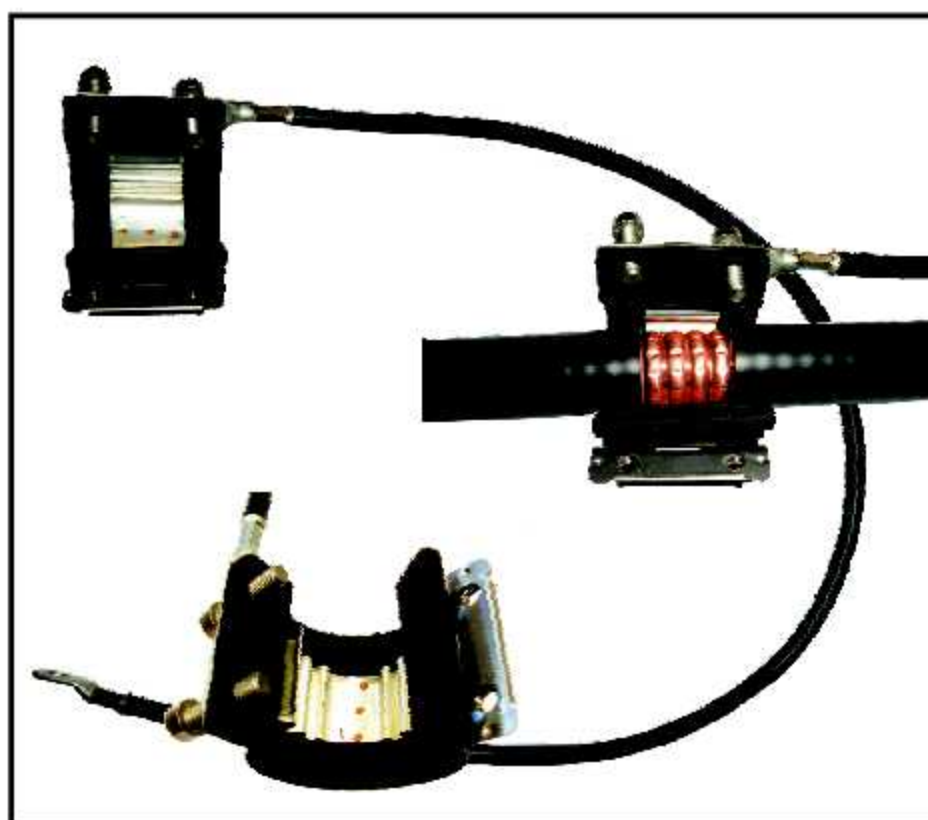
Use:

The peculiarity of the contact type makes suitable the use of this monolithic grounding kit on the coaxial cables of any kind: corrugated, slick, in copper, in aluminium and on **the elliptical wave guide** as well. This last type of conductor is often used in the telecommunication system - when transmitting at a frequency level over 5 GHz - because of their very low loss (much lower than that of the coaxial cables). Its external shape is corrugated in order to allow some mechanical flexibility to interconnect the radio devices and the antennas located on top of towers or buildings.

Also with these applications, the risks of damages caused by lightnings exist. It is than necessary to set up the appropriate protections and this type of grounding kit is perfectly suitable to be used on the external surface of the elliptical wave guides.



CODE	DESCRIPTION	A	B	C	D
11.000.300-312	Grounding Kit 7/8"	Ø35	50	50	600
11.000.400-322	Grounding Kit 1-1/4"	Ø46	62		
11.000.500-331	Grounding Kit 1-5/8"	Ø58	72		
11.000.200-332	Grounding Kit 1/2"	Ø23	40	40	
11.006.000-334	Grounding Kit LMR 300	Ø15.5	40		
11.006.000-335	Grounding Kit LMR 400	Ø18	29.5		



Technical specifications:

- Compact structure
- Easily installable in a short time
- Tested to the atmospheric discharges (lightning tests to verify the compliance to the standards IEC 61312-1 c/o CESI)
- Low contact resistance (lower than 1 mOhm)
- Waterproof test according to Ip67 (test done by CESI)
- Resistant to corrosion
- Resistant to environmental agents (Std IEC 68-2-14)

Materials

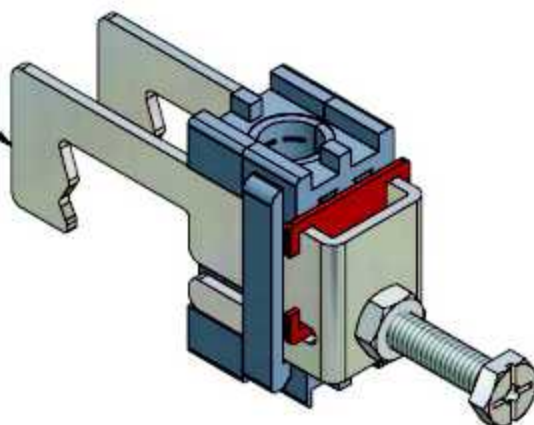
- Tightening jaws/Metal band: Steel AISI 304
- Gasket: EPDM Rubber
- Contact: Stainless steel
- Grounding cable: Copper stranded wire of 16 mm².
Insulated with PVC black colour - Std CEI 20-22
(Different sections can be used according to Customer Requirements)

CESI Certifications:

P / n	T Y P E	C A B L E V E R S I O N
A7031112	Lightning tests	Monolithic version
AT-A3/023236	Lightning tests	Commscope
AT-A3/023234	Lightning tests	Corrugated
AT-A3/023232	Lightning tests	Corrugated
AT-A3/023231	Lightning tests	Corrugated
A0/010545	Protection level	IP66 / IP67
A0/010535	Protection level	IP66 / IP67
A0/001770	Protection level	IP66 / IP67
A2/015744	Vibration test	

CABLE CLAMPS COMPLETE WITH CALIBRATED SADDLES

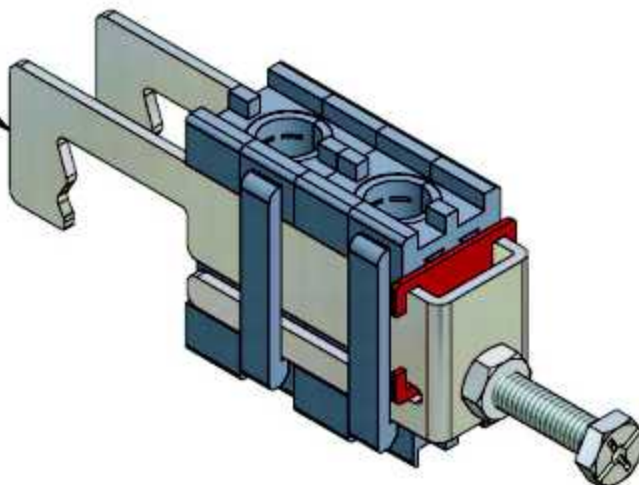
Weight= 44gr.



1/4"x1

14.020.000-089

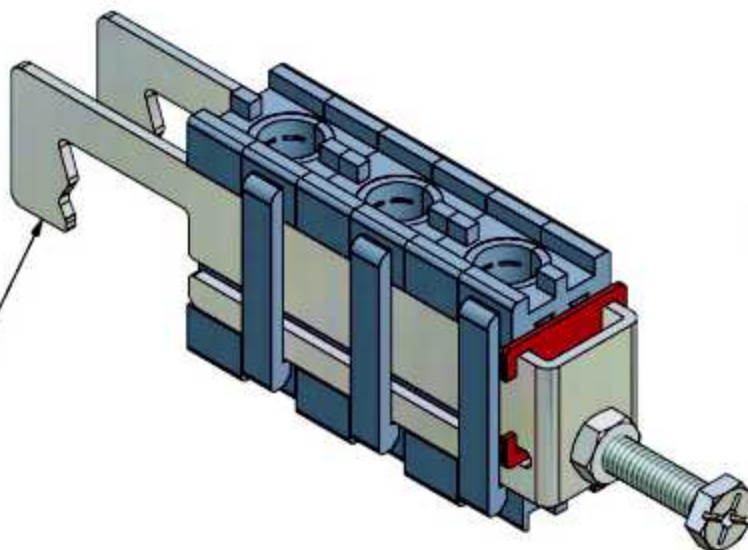
Weight= 60gr.



1/4"x2

14.021.000-103

Weight= 77gr.

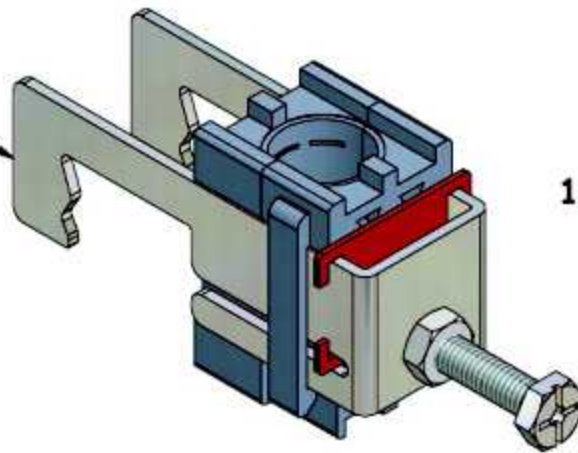


1/4"x3

14.022.000-117

CABLE CLAMPS COMPLETE WITH CALIBRATED SADDLES

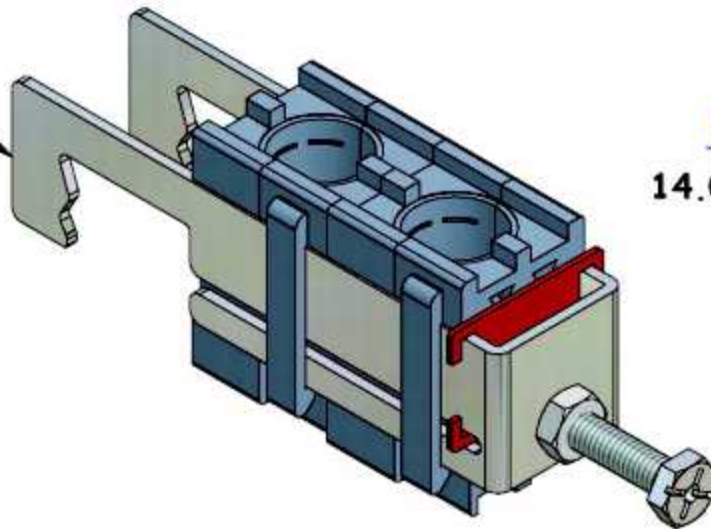
Weight= 50gr.



1/2"x1

14.020.040-093

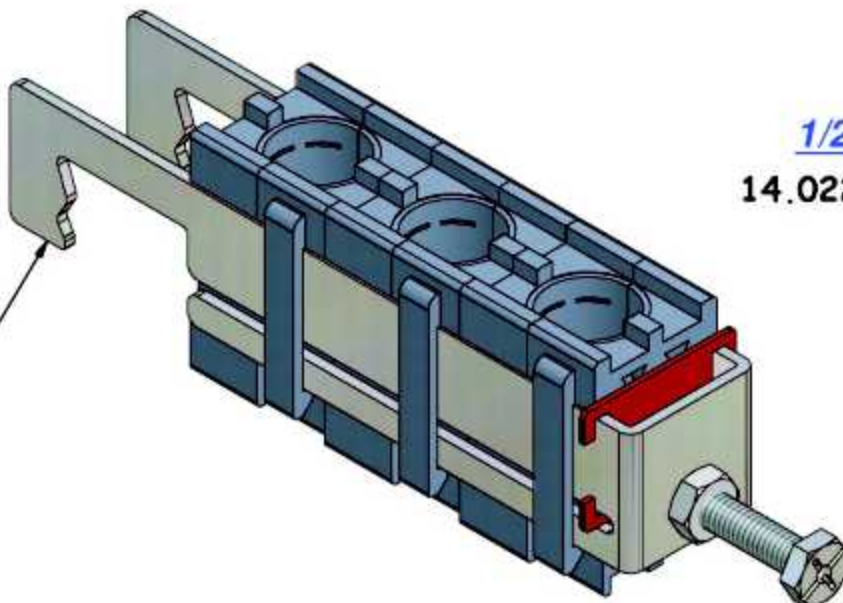
Weight= 72gr.



1/2"x2

14.021.040-107

Weight= 90gr.

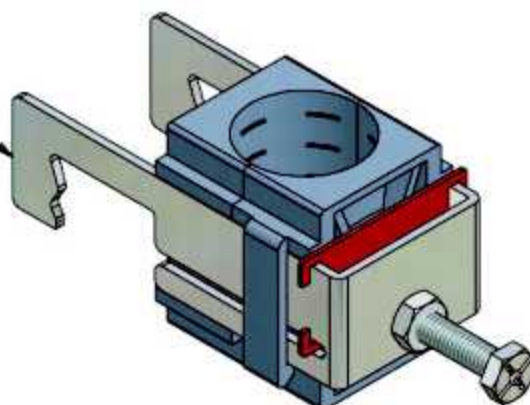


1/2"x3

14.022.040-121

CABLE CLAMPS COMPLETE WITH CALIBRATED SADDLES

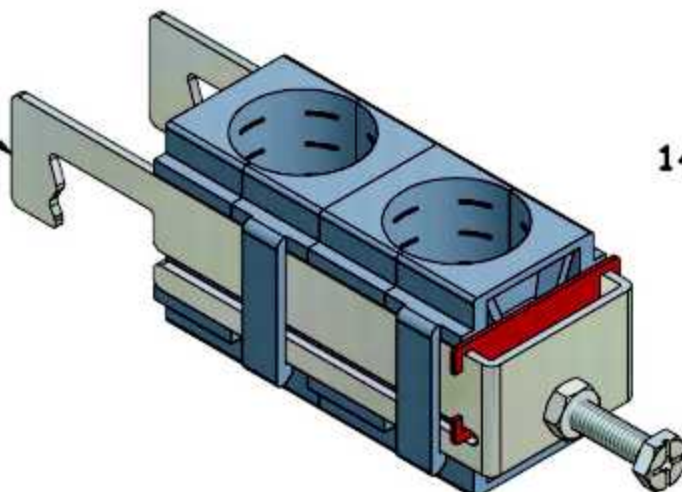
Weight= 65gr.



7/8"x1

14.020.070-096

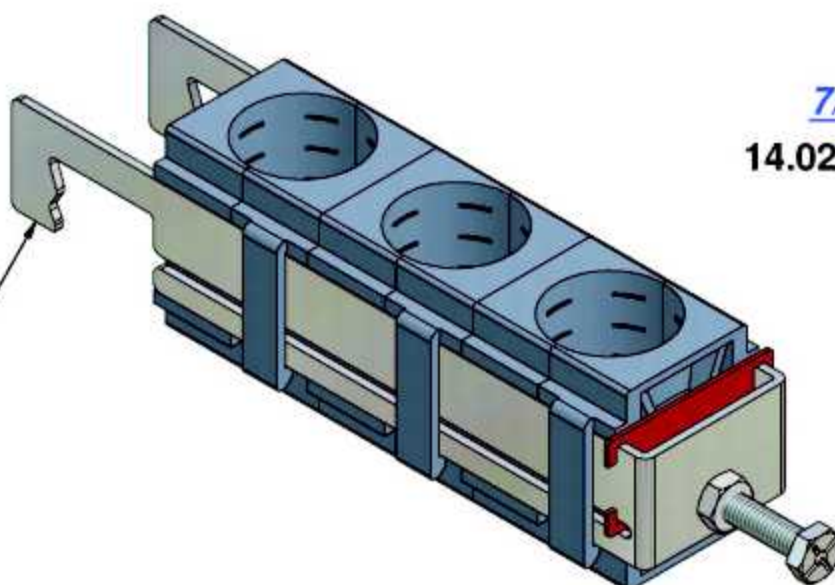
Weight= 90gr.



7/8"x2

14.021.070-110

Weight= 120gr.

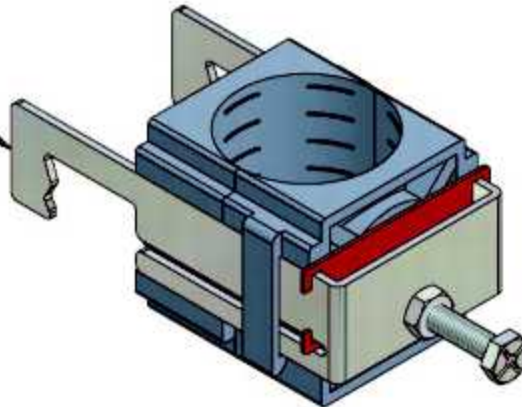


7/8"x3

14.022.070-124

CABLE CLAMPS COMPLETE WITH CALIBRATED SADDLES

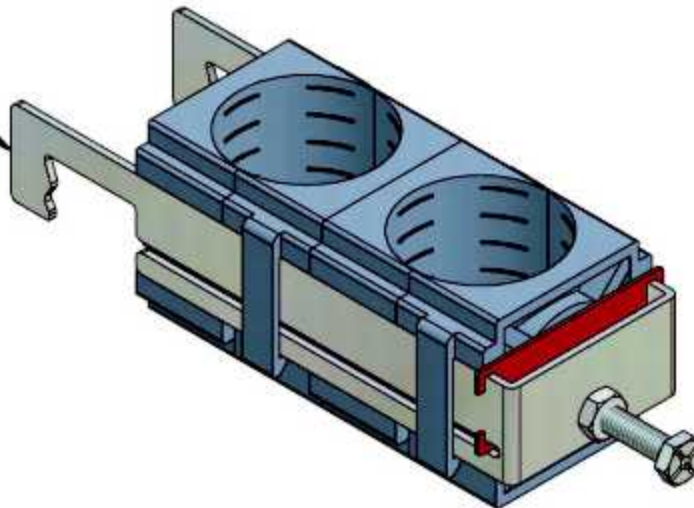
Weight= 80gr.



1-1/4"x1

14.020.110-100

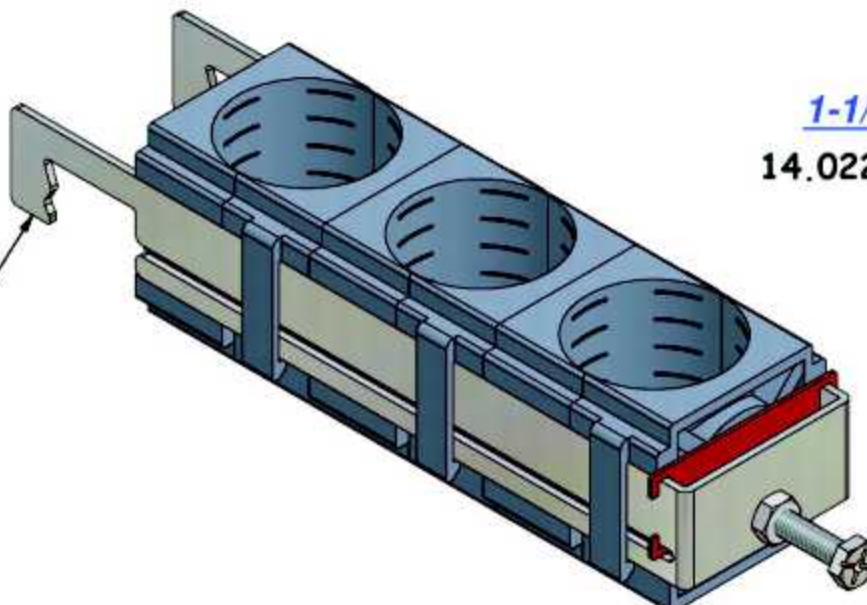
Weight= 115gr.



1-1/4"x2

14.021.110-114

Weight= 150gr.

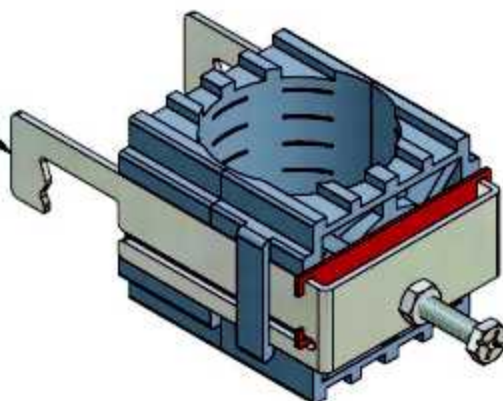


1-1/4"x3

14.022.110-128

CABLE CLAMPS COMPLETE WITH CALIBRATED SADDLES

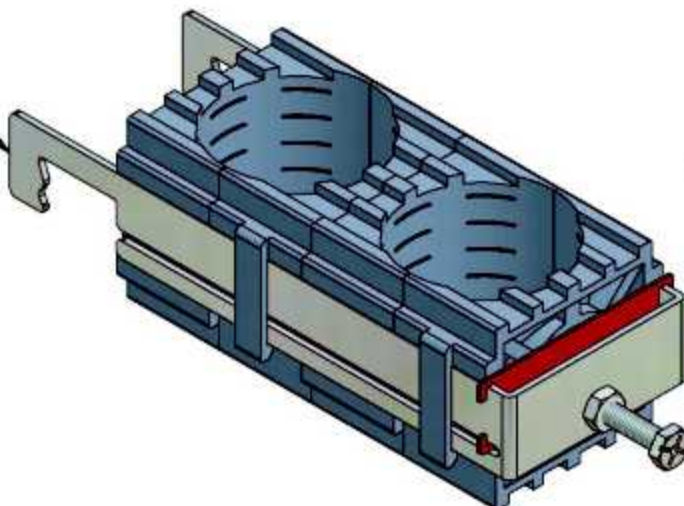
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1-5/8"x1

14.020.120-101

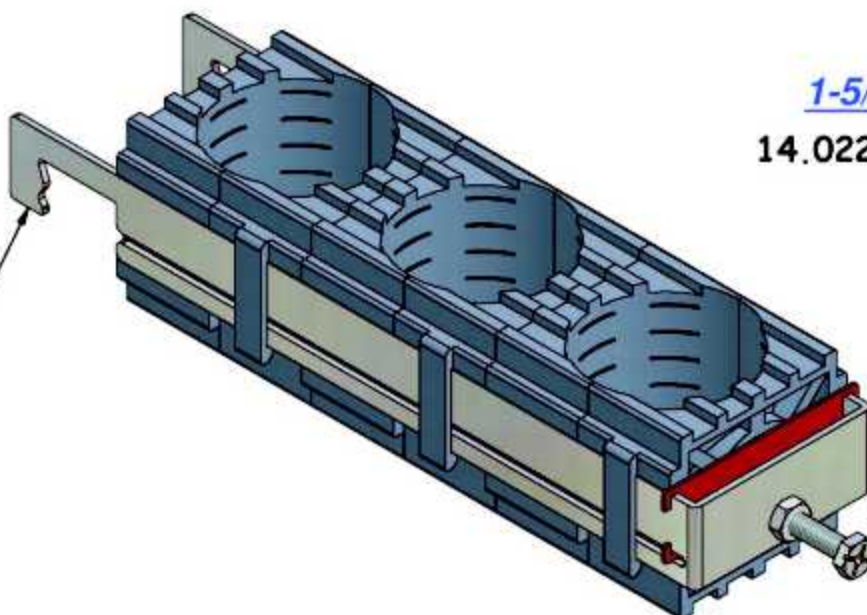
Weight= 140gr.



1-5/8"x2

14.021.120-115

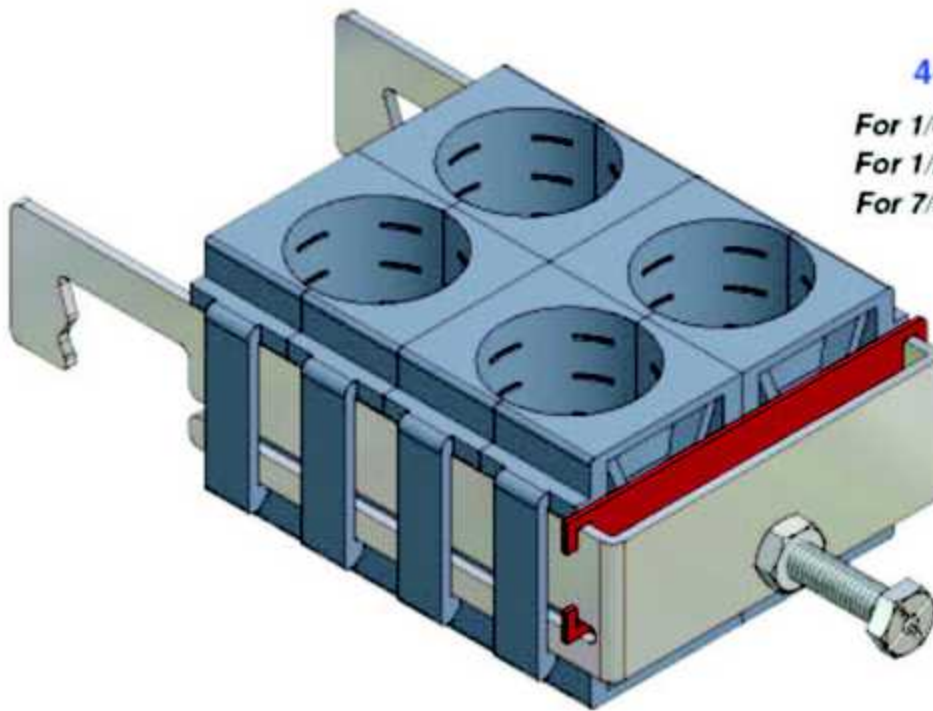
Weight= 190gr.



1-5/8"x3

14.022.120-129

CABLE CLAMPS COMPLETE WITH CALIBRATED SADDLES FOR CABLES 1/4" - 1/2" - 7/8"

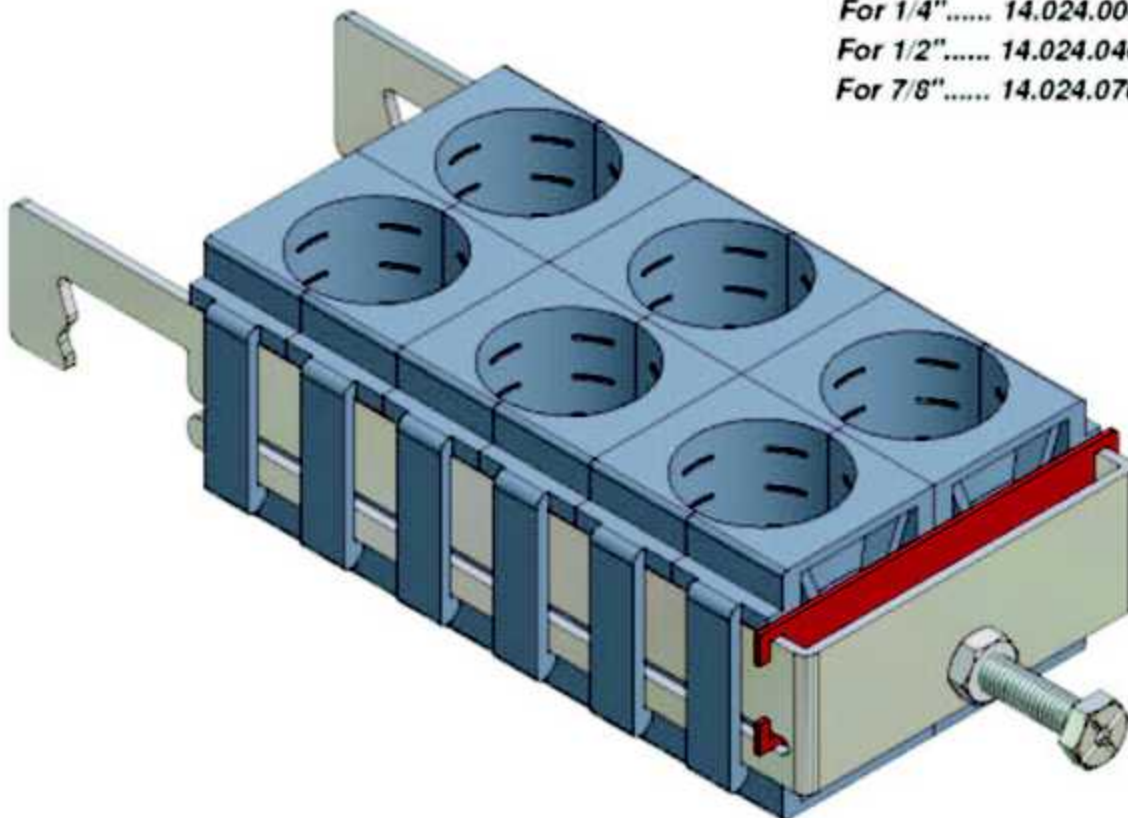


4-RF CABLES

For 1/4"..... 14.023.000-260

For 1/2"..... 14.023.040-259

For 7/8"..... 14.023.070-258



8-RF CABLES

For 1/4"..... 14.024.000-263

For 1/2"..... 14.024.040-262

For 7/8"..... 14.024.070-261