



REMIND T&G
SAFETY EQUIPMENT

After 25 years of activity, **ROMIND** team may proudly say that our safety devices are recognized as products that incorporate a modern and reliable design, allowing them to be used in optimal safety conditions. Always receptive to our customers and partners requirements the amendments of European standards on the compliance of safety equipment, our team strives to meet the users' demands in terms of functionality in operation of **ROMIND** products.



The new **ROMIND** catalogue of protective equipment wants to be an appropriate users' guideline to help them find technical equipment and solutions suitable to the specific requirements. We hope that the detailed information provided in this new catalogue will help our customers to take a quick and informed decision regarding a product or a set of products appropriate for a particular operation. If additional information is required or if you need our guidance to select a set of equipment, **ROMIND** specialists will be glad to help you in order to select the appropriate solutions for your needs.



ROMIND T&G



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WARNING !

Personal protective equipment, protective equipment against electric risks, fall protection equipment as well as the other equipment and accessories from this catalogue are intended to be used by qualified and trained personnel to perform professional activities in safe conditions both for the user and for the installation where it is used.

It is presumed that the users are qualified persons who, prior to the use of this equipment, read thoroughly the safety devices instructions of use, observe the manufacturers' instructions of use, maintenance and storage, are familiar and comply with labour safety rules and are fully aware that the failure to observe the instructions of use or safety rules may lead to work injuries.

Technical and commercial information from this catalogue cannot be considered sufficient for a complete information of the user, does not cover all circumstances that can be found during the working procedures and must not be considered a substitute for appropriate and specialised professional training.

For any specific circumstances where it is necessary to use safety devices and which include doubts on their conditions and methods of use, we firmly recommend you to contact Romind representatives and ask for information about our equipment prior to the use thereof.

LIST OF ABBREVIATIONS AND MARKINGS

Definitions of power installations:

LV – low voltage power installations : $U_n \leq 1 \text{ kV}$

MV – medium voltage power installations: $1 < U_n \leq 45 \text{ kV}$ (6; 10; 20; 27; 35; 45 kV)

HV – high voltage power installations: $U_n = 110; 220; 400 \text{ kV}$

OHL – overhead lines

Definitions of certifications, approvals and standards:



Equipment certified by the Certification Body of the National Institute for Research and Development in Labour Safety (INCDPM)



Equipment certified by the Electric Products Certification Independent Body (OICPE)



Equipment certified by a certification body or self-certification performed by the manufacturer according to European standards and regulations



Equipment according to technical specification of ENEL

SR EN 61230

SR EN, SR CEI, EN, CEI - Romanian, European or international standards

EA 0988 RO

ENEL technical specifications

Symbols related to materials:



Al Alloy Made of aluminium alloy



Cu Alloy Made of copper alloy

Symbols related to the manufacturing method:



Cast body



Extruded body



Injected body

Symbols of the periodical inspection of equipment



The period (in months) when periodical inspection of equipment must be performed.





Personal protective equipment refers to any piece of equipment intended to be worn or handled by the worker to protect against multiple risks that may endanger his/her health and safety at the workplace, as well as any other additional or accessory item designed for the same purpose. Basically, personal protective equipment is a personal equipment (to be used by a single person) intended to protect a part of the body (helmets to protect the head, face shields or safety glasses to protect the face, gloves to protect the hands, boots to protect the feet, insulating gloves and boots to protect against electrical shocks, etc.).

Such equipment is designed and manufactured to protect the worker:

- against **electrical risks (electric shock)**, preventing the direct or indirect contact with live conductors;
- against **mechanical risks**, acting as a protective shield for the body against items that can generate injuries by falling, impact or contact;
- against **thermal effects generated by arc flash**, acting as a thermal and mechanical shield.



Fuse extractor with protective sleeve for HRC (high rupture capacity) fuses

Cod: MMPS/1-MPR

The **fuse extractor with protective sleeve for HRC fuses** is an equipment intended for the insertion and extraction of HRC fuses for low-voltage power installations (rated voltage less than 1 kV).

The **fuse extractor with protective sleeve for HRC fuses** is made of insulating and fireproof materials and allows the connection to fuses size 00 - 3. This device is also used for handling of connecting blades of short-circuiting devices for cabinets and low-voltage distribution panels.

The protective sleeve is intended to protect the operator's arm from the thermal effect of the electric arc flash that may occur accidentally during inserting or extracting fuses. The protective sleeve is made of leather.

The total length of the device is of approx. 390 mm.



Product code	Protective sleeve type	Outer appearance	Colour	Leather thickness	Test voltage
MMPS/1-MPR	leather	split	natural grey	2-2,5 mm	5000 V/1min.



OVERVIEW

Collective protective devices are intended to prevent or to decrease the actions of risk factors upon one or more workers. Usually, collective protection materialises mainly by the provision of installation with devices and appliances designed for the sole purpose of protecting the workers during the work process.

The same category includes protection means for **delimitating of the working area**, intended to prevent the injury of work team members, but also of persons who may enter the work area by accident.

The material separation of the working area is performed by **mobile temporary enclosures** intended to outline the work area clearly. Usually, these enclosures are used together with **warning safety signs**.

Also designed to prevent the unauthorised access of persons in live power installations, **permanent equipment and devices are recommended to prevent access** to cabinets or in substations.

In order to prevent the incorrect handling of actuators of electrical equipment, it is recommended to use the visible indication of equipment status (live equipment, de-energized equipment / earthed / in overhaul) and to limit the actuation device using the **mechanical locks**.



Mechanical locks - heavy duty / steel plate version

Code: see the table

Mechanical locks - heavy duty / steel plate version - are used in particular against the unauthorised access of persons in substations or in the power installations inside the cabinets. Given their constructive shape, locks are devices that provide mechanical lock-out of access in the area of live power installations. Locks are operated with a special universal key that fits all lock models (they cannot be operated by any type of hand-made key). Locks can be assembled on the metallic doors inside the substations or in cabinets, on their metallic cover and thus cannot be subject to vandalism or destruction.

Mechanical locks - heavy duty versions are manufactured in two constructive versions, by the mechanical monobloc machining of the body (steel or brass - explosion-proof version with the same characteristics and dimensions as the steel versions (BIT 90/BIF 65)).

Mechanical locks - steel plate version are made of steel in two constructive versions, with two dimensions of sizes of the housings, the mobile items being of similar construction in both versions.



Mechanical locks - heavy duty version
BIT 90/ BIF 65



Explosion-proof
version



Mechanical locks - steel plate version
BIT 85T / BIF 60T

Code	BIT 90	/	BIT 85T	BIF 65	/	BIF 60T
Recommended place of use	Steel doors in transformer substations			Steel covers in cabinets		
Opening operation	From the outside - by the insertion and push of the special key From the inside - by the operation of buttons on the locking elements (key removed)					
Closing operation	By the removal of the special key from the lock					
Minimum dimensions of the locking socket (mm)	28 x 12					
Stroke of locking elements (mm)	24			18		
Dimensions (mm)	60 x 90 x 28	/	55 x 85 x 28	60 x 65 x 28	/	55 x 60 x 28



Insulating equipment is recommended to prevent direct or indirect contact with conductive part of power installations, live electrical equipment or that becomes live accidentally.

The contact with the live component may either directly with a part of the human body, or indirectly by a conductive mobile item. In order to prevent such situations generating electrocutions (electrical shocks), a series of special insulating equipment can be used, these items being designed and manufactured in order to eliminate or decrease the risk of contact with live items.

This equipment can be classified in two categories :

- insulating equipment temporarily mounted in power installations to insulate live power installation / equipment elements or for protection or workers;
- insulated and insulating tools and devices used for works on live power installations.



Insulating sleeve

Code: P 2297

Insulating sleeves are protective equipment used during works on LV electrical panels ($U_n \leq 1 \text{ kV}$). Insulating sleeves are recommended for the electrical insulation of live sockets and High Rupturing Capacity (HRC) fuses in electrical panels, in order to avoid the accidental contact with the installation in the proximity of the work area.

Insulating sleeves are made of red-tinted transparent polycarbonate, which provides appropriate elasticity combined with mechanical resilience and excellent dielectric rigidity. Their constructive shape allows fixing in any of the HRC fuse sockets size 0, 1, 2, 3.

SR EN 61479



Technical characteristics

Maximum operating voltage (V)	1000
Dielectric rigidity - test voltage (V/3min)	5000
Dielectric rigidity - withstand voltage (V)	10000
Thickness(mm)	1,5 ± 0,5
Operating temperature range (°C)	-25...+55
Weight (gr)	120



Insulating blades and plugs



Code: see table

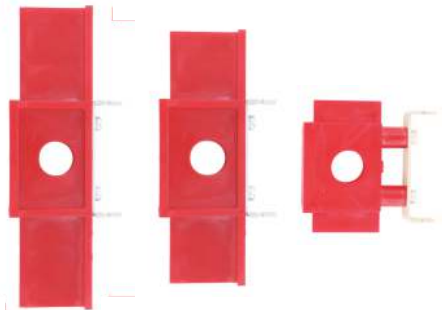
Insulating blades are insulating protective devices installed in fuse sockets in cabinets and distribution boxes of low voltage power installations for the electrical separation of the installation.

Insulating blades for HRC fuse sockets are made of red polycarbonate, in three dimensions, depending on the fuse socket and are provided with metallic fixing lamella that allows the coupling to protective devices for the handling of HRC fuses.

Insulating plugs are made of red polycarbonate in two constructive dimensions, depending on the fuse socket type.

By the temporary replacement of fuses, insulating blades allow the **OPEN** position locking of power circuits, thus preventing the accidental occurrence of voltage at the work site.

This device is marked with “**DO NOT CONNECT - WORK IN PROGRESS**”.



INSULATING BLADES FOR HRC FUSE SOCKETS



INSULATING PLUGS

Technical characteristics	
Maximum operating voltage (V c.a.)	1.000
Test voltage (V/1 min c.a.)	5.250
Operating temperature range (°C)	-25...+55

Code	Fuse type	Fuse socket type
P 2344000	Insulating blades for HRC fuse sockets	NH 00
P 240000	Insulating blades for HRC fuse sockets	NH 0, 1, 2, 3
P 2401000	Insulating blades for HRC fuse sockets	PK 1 XL
P 279000	Insulating plugs	25 A / E 27
P 280000	Insulating plugs	63 A / E 33



Insulated wedges for LV ABC cables

Code: see table

Insulated wedges are recommended for works on LV ABC cables (twisted in bunch) and are designed to separate the insulated conductors from the twisted bundle and maintain the distance between them , without damaging their insulation.

There are 3 types of wedges made of insulating material: lever, triangle spacer and wedge spacer. Given its constructive shape, the insulating lever can be used for the separation of one of the conductors in the bundle. In case the worker wants to keep a single conductor spaced, it is recommended to use the triangle spacer, and in case each conductor of the bunch shall be kept separated, the worker must use the wedge spacer.



Code	PD 090	PD 091	PD 092
Type	Triangle spacer	Wedge spacer	Lever
Dimensions (mm)	75 x 200 x 15	80 x 250 x 15	30 x 190 x 15
Weight (gr)	95	146	33



Insulating flexible cover for bare conductors and LV insulators

Code: see table

Insulating flexible covers are protective devices recommended for the temporary insulation of bare conductors of LV OHL ($U_n \leq 1$ kV), **in dry weather**, during live working. The insulating covers could be used also for covering the insulators disposed on the brackets of the concrete or metal poles where insulators must be covered.

Insulating flexible covers can also be used during live working in LV panels, by setting them horizontally on the bars located between the rows of HRC fuse sockets. The insulating flexible covers are manufactured from yellow plasticized PVC, resistant to UV radiations and delivered in various lengths, together with insulating plastic pliers.

Product code	Length (cm)	Weight (kg)	Number of plastic pliers	Thickness (mm)
TE - 075 - 0*	75	0,7	3	$2,5 \pm 0,5$
TE - 150 - 0	150	1,4	4	$2,5 \pm 0,5$
TE - 200 - 0	200	1,9	6	$2,5 \pm 0,5$
TE - 250 - 0	250	2,4	6	$2,5 \pm 0,5$
TE - 300 - 0	300	2,8	8	$2,5 \pm 0,5$

* Note: This option can also be applied remotely, by using a device and a appropriate insulating stick (ENEL type).

Technical Characteristics

Maximum operating voltage (V)	1000
Dielectric rigidity - test voltage (V/3min)	5000
Dielectric rigidity - withstand voltage (V)	10000
Oil resistance	Category H
Very low temperature resistance (-40 °C)	Category C
Very high temperature resistance ($+70$ °C)	Category W



Insulating end caps

Size : see table

Insulating end caps are protective equipment used for works in LV power installations ($U_n \leq 1$ kV), for the temporary coverage of bare ends of electrical conductors, in order to avoid accidental contact in case of live works or to avoid the occurrence of short-circuits between phases or earthing.

Manufactured from insulating and flexible material, given their profile, each model of insulating end caps allows the application and fixing on the conductors ends, with various diameters, 5 sizes of insulating end caps that can be applied on electrical conductors with sections between 105 and 240 mm².

Technical characteristics

Maximum operating voltage (V c.a.)	1000
Test voltage (V/1min c.a.)	5250
Operating temperature range (°C)	-25 ... +55

Insulating end cap	Length (mm)	Conductor section	
		min (mm ²)	max (mm ²)
Size 0	45	1,5	6
Size 1	60	8	10
Size 2	80	16	50
Size 3	100	70	120
Size 4	120	150	240





Insulating shutter

Code: PEAD - 20

The **insulating shutter** is a protective equipment for use in indoor power substations of a maximum rated voltage of 20 kV in order to prevent the accidental closing of the disconnecting switches.

The insulating shutter is applied by placing it between the fixed part of the switch and the mobile part in the open position.

Depending on the switch's disconnector's position, an insulating stick PMU 20-1-B/ba or PMU 110-2-B/ba is used for the application of the shutter.

The insulating shutter is made of polypropylene, provided with a support arm made of a 600 mm insulating tube.

The support arm is provided with a foldable bayonet coupling system in order to allow the fastening of the shutter in the stick. The coupling system allows the fastening of the shutter in various inclinations towards the axis of the stick.



Technical characteristics	
Maximum operating voltage (kV c.a.)	20
Test voltage $U_{nd}/3min$ (kV)	50
Permitted leakage current (mA)	max. 1,5
Total shutter dimension without arm (mm)	710 x 500 x 150
Total shutter dimension with arm* (mm)	710 x 1235 x 150
Operating temperature range (°C)	- 25...+55
Weight (kg)	3,5

Shunt for LV overhead lines with bare conductors

Code: SH-LJT

Intended use : live works on LV overhead lines with bare conductors, in order to maintain the continuity of power circuits.

Application: from height.
By hanging the self-tightening clamp on the conductor and pulling down the clamp.

- Components:**
- self-tightening clamps - 2 pieces
 - connection cable - 1 piece

Technical characteristics	
Nominal operating voltage U_n (kV)	max. 1
Cable section (mm ²)	25
Permanent current I (A)	100
Cable length l_f (m)	at request
Protection length of the electrically insulating rod (m)	0,35
Overhead conductor diameter (mm)	5 - 16
Overhead conductor section (mm ²)	25 - 120



Insulating sticks are protective devices designed and manufactured to prevent contact with live conductive parts which become live accidentally and to provide the minimum approach distance towards live parts during operations in indoor or outdoor power installations. If, in case of low voltage installations, there isn't a minimum approach distance and only the direct contact with live elements is forbidden, in medium and high voltage installations the minimum approach distance is currently established by power distribution and transmission companies (provided by internal regulations) and varies depending on the nominal voltage of the installation and the type of installation. The nominal voltage of the installation represents the operating voltage of the insulating sticks (U_n).

Insulating sticks consist of insulating tubes made of Glass Reinforced Plastic (GRP), provided at the working end with :

- parts that allow the operation of some of the installation elements (typically hook-shaped);
- coupling systems that allow the attachment of other protection devices

The most common **coupling systems** found on the Romanian market are :

- "Hexagon 12" socket system (typically made of plastic and found mainly in telescopic sticks), and
- "RO bayonet" socket system (made of metallic items, found mainly in modular sticks used for the application of short-circuiting devices provided with tightening clamps on the busbar by means of a screw).

Apart from these two systems, sticks can be provided, **upon the client's express demand**, with :

- "DIN bayonet" socket coupling system (made of metallic items),
- "Universal" coupling system (sunrise, made of metal or plastic).



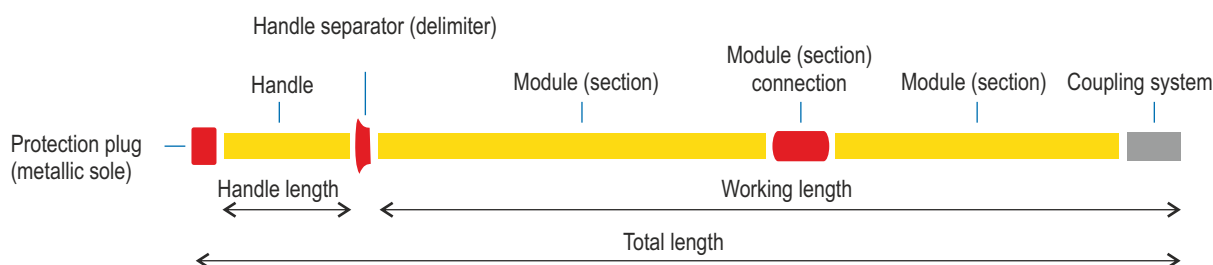
All insulating stick are provided with a **handle separator** to indicate that during the use of the stick, the operator's hand must be placed exclusively on the **handle area**. This limiter typically consists of a plastic ring or, in special cases, of a label. The vast majority of sticks are provided in the end area of the handle with a **shock protection plug**.

Sticks that must be handled / extended vertically, without being lifted from the ground, are provided with a **metallic sole** to improve stability during operation, the sole being pushed on the ground by the operator's foot.

Upon the client's express demand, particular stick types can be provided with **extension pieces made of Glass Reinforced Plastic (GRP)** tubes to increase the stick handle length.

Sticks have the following **dimensional characteristics** :

- total length of the stick** - measured between the two extremities, in the circumstances that all stick modules are interconnected or all sections of the telescopic stick are extended to the maximum
- working length of the stick** - measured by the extremity that includes the coupling system or the handling piece (work head) to the handle separator (as above). This working length must be higher than or equal to the approach distance specified in the regulations in force.
- handle length** - measured from the handle separator ring to the other extremity of the stick (insulating plug), practically the length of the area touchable by the operator's hands.
- transport length** - measured in the circumstances that the stick modules are disconnected or the sections of the telescopic stick are folded into transport position.
- module / section diameter** - outer diameters of tubes.
- weight** - stick weight without transport casing.



OVERVIEW

Insulating sticks are manufactured in multiple constructive versions:

- **modular, multipurpose** (from multiple connecting elements (modules));
- **telescopic, multipurpose** (with multiple extensible sections);
- **special design** (engineered for a particular application).

Multipurpose modular insulating sticks (PMU or PMP) consist of one or more elements (modules) that can be connected to each other to obtain a complete equipment and are provided with "RO bayonet" socket coupling system which allows the attachment of other protection devices, adaptors or accessories (optionally, they can be provided with other coupling systems, according to the client's request).

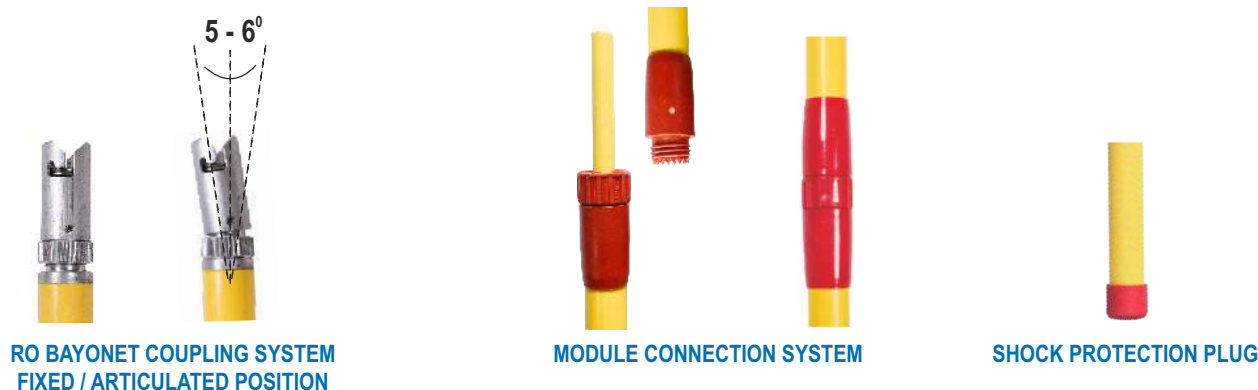
"RO bayonet" coupling system can be adjusted into two positions:

- "fixed" when the adjustment nut blocks the coupling system on the same axis with the stick axis, and
- "articulated" when the fixing nut is loosened and allows the coupling system to be arranged in a position inclined in any direction, by max. 6° from the stick axis.

The connection system between the stick modules consists of plastic parts, with good mechanical properties and shock resistance.

Modular **PMU** sticks can be used in indoor or outdoor power installations only in **dry conditions - operating temperature range : -25....+55 °C**

Modular **PMP** sticks can be used in indoor or outdoor power installations in **dry and wet conditions - operating temperature range : -25....+55 °C**



Multipurpose telescopic insulating sticks (PTU) are manufactured from two or more tubular sections (of various diameters) which can be extended or folded in locked position and are provided with "hexagon 12" coupling system which allows the coupling of other protection devices, adaptors or accessories (optionally, they can be provided with other coupling systems, depending on the client's request).

The stick is fastened in its operating position by the extension of sections (from the smallest diameter to the largest diameter) and locking of their position by means of spring-loaded push-buttons.

The attachment of the voltage detector or of a different equipment in the hexagonal seat coupling system is ratched in position, and they are detached by pushing the button.

In order to prevent damage or locking of push-buttons drives, on long telescopic sticks the button area is covered with a semi-transparent elastic sleeve, thus preventing the entering of dust, sand or water in this area. These elastic sleeves provide the sticks with better resistance to shocks generated by the stick falling on the ground.

PTU telescopic sticks can be used in indoor or outdoor power installations in **dry conditions - operating temperature range : -25....+55 °C.**



Specialised insulating sticks are sticks designed to perform in safety conditions a single operation, being provided at the working end with various hook-shaped parts (usually metallic).

This class includes:

- sticks for the handling of disconnectors (PSU type),
- sticks for the handling of cables (PCU type)
- sticks for the operation of electrical equipment (PAE type)
- sticks for the rescue of injured persons (rescue sticks with hook).

Specialised sticks can be used in indoor or outdoor power installations, **in dry conditions - operating temperature range : -25....+55 °C.**

Depending on the field of use, insulating sticks are manufactured according to the provisions of SR EN 61230; SR EN 61235; SR EN 50508. In order to allow the use of sticks for various purposes, they can be accompanied by a series of other equipment, adaptors and accessories.

Adapters are devices that connect the coupling system at the end of sticks and other equipment used for works / operations on medium and high voltage outdoor power installations.

Accessories are devices used in conjunction with insulating sticks to perform various works / operations in power installations.

The main applications that require the use of insulating sticks are the following:

- applying and dismantling of phase clamps of short-circuiting switches
- applying and dismantling of insulating shutters
- applying and dismantling of hooks / anchoring devices for work at height
- handling of switches (disconnectors)
- handling of live cables
- cut-off of power connections in case of emergency
- checking of presence / absence of voltage with a voltage detector
- checking of phase load (current measurement) using tong test ammeters
- checking of the phase correspondence using homopolar phase indicator
- applying of fault indicators on live overhead lines
- detachment of a person subject to arc flash from the live power installation of contact and rescue outside the hazard area to provide first aid
- discharge of capacitive loads using an appropriate set of fuses
- removal of various objects fallen on live power leads
- deforestation in the proximity of live power installations
- cleaning of conductors, bars or insulators of live power installations, using various types of brushes or other devices.

Insulating sticks must be used in the installations and their intended purposes, specified in the operating instructions of sticks.

Insulating sticks are protective devices that require periodical dielectric inspection to make sure that their insulating properties are maintained. The voltage of their inspection is called test voltage, with a value regulated by standards according to the operating voltage. Periodical inspections must be provided in special conditions, in Laboratories certified by RENAR, the Romanian Accreditation Association, for such tests.

NOTE: Romind T&G owns a high-voltage test laboratory accredited by RENAR .

Insulating sticks are delivered packed in **waterproof bags**.



MODULAR STICKS



Multipurpose modular insulating sticks

SR EN 61230

SR EN 61235

Code: PMU-U_n-B/ba - use in dry conditionsPMP-U_n-B/ba - use in dry and wet conditions

Modular insulating sticks (PMU or PMP) consist of one or more elements (modules) that can be connected to obtain a complete equipment.

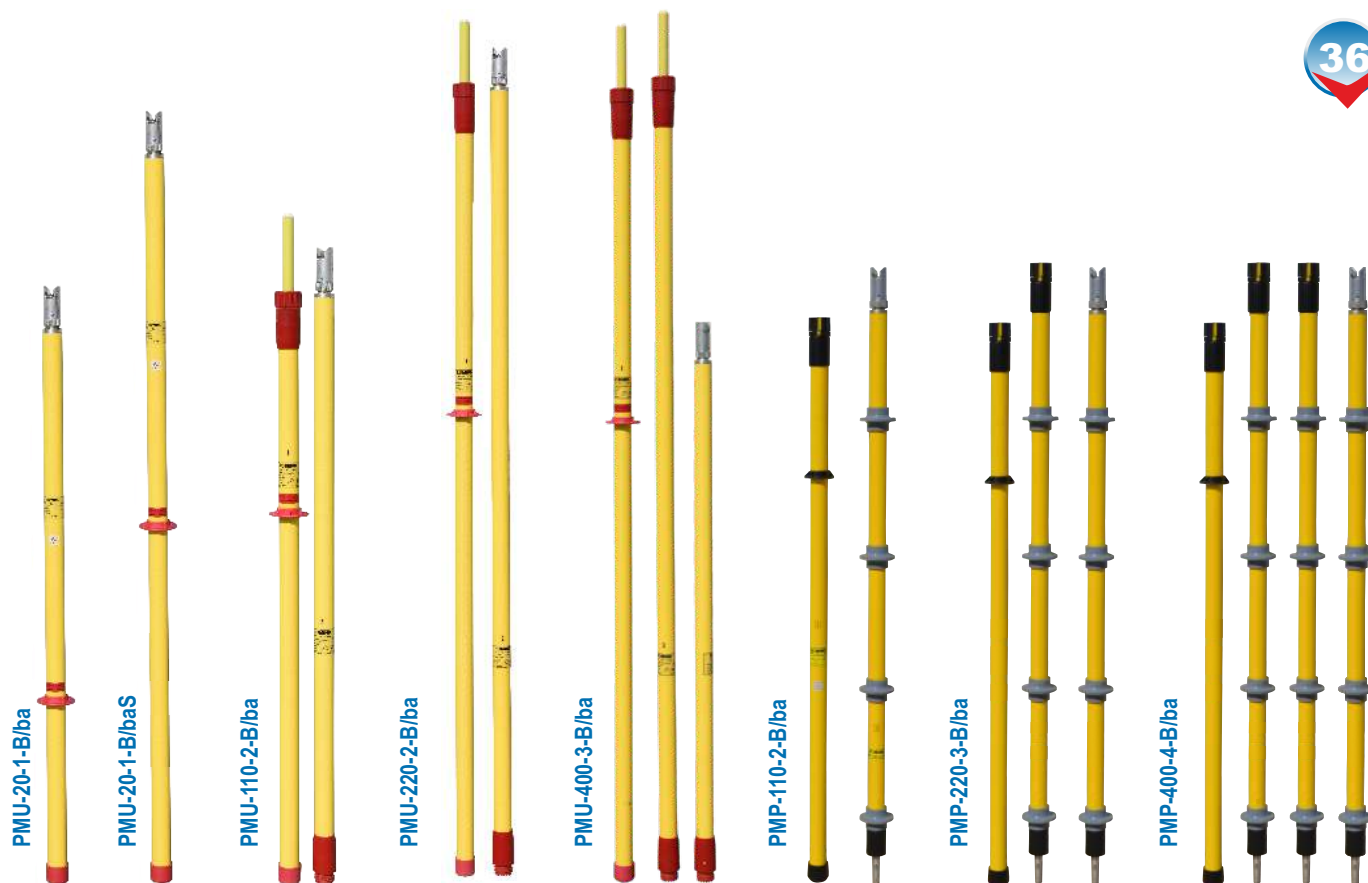
Modular insulating sticks are provided, according to certification tests, with "RO bayonet" socket coupling system, which can be adjusted in two positions: fixed or articulated (when a 5-6° inclination is allowed for the coupling system towards to the stick axis). Upon the client's request, sticks can be provided with other coupling systems ("hexagon 12", "universal", etc.).

These sticks are recommended for the applying of phase clamps of short-circuiting devices on flat bars in indoor installations, on round conductors in outdoor substations and on medium or high-voltage overhead conductors.

Modular insulating sticks include insulating tubes made of Glass Reinforced Plastic (GRP):

- 42 mm in diameter for PMU sticks

- 38/46 mm in diameter for PMP sticks



Insulating stick code	Operating voltage U _n (kV)	Test voltage U _{inc} (kV)	Number of modules	Total length L _t (m)	Handle length L _m (m)	Working length L _v (m)	Transport length L _r (m)	Weight (kg)
PMU-20-1-B/ba	20	60	1	1,31	0,41	0,94	1,31	0,92
PMU-20-1-B/baS	20	60	1	1,73	0,81	0,94	1,73	1,10
PMU-110-2-B/ba	110	190	2	2,55	0,90	1,75	1,40	1,90
PMU-220-2-B/ba	220	380	2	3,79	1,10	2,69	2,02	2,70
PMU-400-3-B/ba	400	695	3	5,04	1,10	3,94	2,04	3,77
PMP-110-2-B/ba	110	190	2	2,57	0,90	1,67	1,40	3,10
PMP-220-3-B/ba	220	380	3	3,81	1,10	2,71	1,40	4,60
PMP-400-4-B/ba	400	695	4	5,05	1,10	3,95	1,40	6,10

Multipurpose telescopic insulating sticks

SR EN 61230

SR EN 61235



Code: PTU-U_n-F
 PTU-U_n-C
 PTU-AS-U_n-n-C

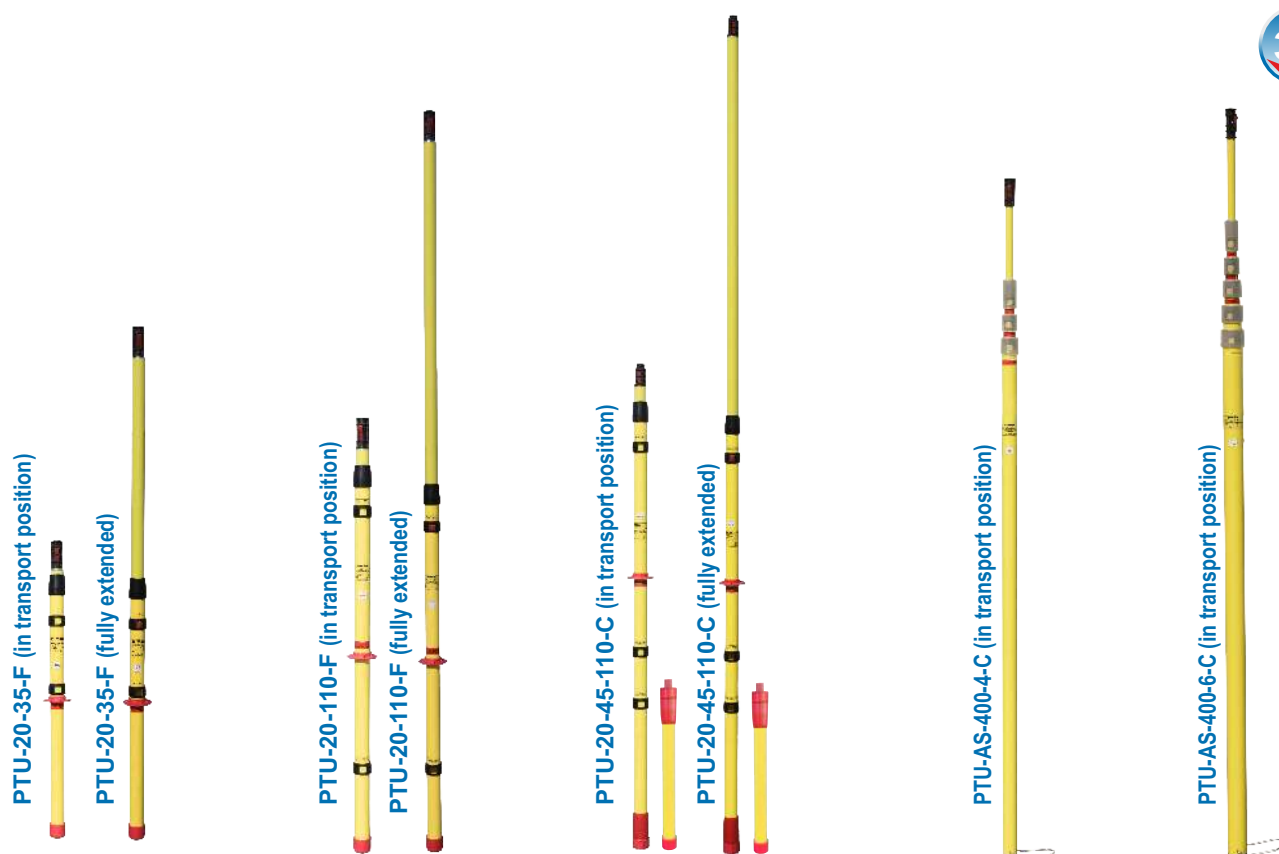
Telescopic insulating sticks (PTU) are made of two or more tubular elements (sections) (of various diameters) which can be extended or folded in an un-detachable manner.

Telescopic insulating sticks are provided, according to certification tests, with a "hexagon 12" coupling system which allows the coupling of other protective devices, adaptors or accessories. Upon the customer's demand, sticks can be provided with other coupling systems ("RO bayonet", "universal", etc.).

Sticks type PTU-20-45-110-C are delivered with a 0,40 m insulating extension handle.

These types of sticks can be used for works or operations both in transformers substations and on overhead lines.

The telescopic insulating sticks include insulating tubes made of Glass Reinforced Plastic (GRP) with diameters between 23 and 59 mm.



Insulating stick code	Operating voltage U _n (kV)	Test voltage U _{inc} (kV)	No. of sections	Total length L _t (m)	Handle length L _m (m)	Working length L _v (m)	Transport length (m)	Weight (kg)
PTU-20-35-F	20	60	2	1,26	0,41	0,85	0,88	0,90
	35	105		1,46		1,05		
PTU-20-110-F	20	60	2	1,41	0,56	0,85	1,25	1,25
	110	190		2,13		1,57		
PTU-20-45-110-C	20	60	2	1,81*	0,83*	0,98	1,47	1,67 + 0,48
	45	135		1,97*		1,14		
	110	190		2,59*		1,76		
PTU-AS-400-4-C	35-110	190	4 (base)+1	3,35	1,73	1,62	2,01	3,20
	220	380	4 (base)+1+2	4,66	1,66	3,00		
	400	695	4 (base)+1+2+3	6,00	1,58	4,42		
PTU-AS-400-6-C	35-110	190	6 (base)+1	3,49	1,87	1,62	2,15	5,60
	220	380	6 (base)+1+2	4,80	1,80	3,00		
	400	695	6 (base)+1+2+3	6,15	1,73	4,42		
	400	695	6 (base)+1+2+3+4	7,55	1,66	5,89		
	400	695	6 (base)+1+2+3+4+5	9,00	1,60	7,40		

* If the extension insulating handle is used, each indicated length is extended by 0,40 m.



Specialised insulating sticks

SR EN 61230

SR EN 61235



Code: PSU-U_n/PAE-U_n
 PCU-U_n
 PSU-35-C

Specialised insulating sticks are protective equipment to be used in medium voltage power installations in dry weather conditions. Specialised insulating sticks include insulating tubes made of Glass Reinforced Plastic (GRP), with range of diameters from 38 to 42 mm.

Insulating sticks PSU-U_n și PAE-U_n are recommended for the handling (closing and opening) of the switch disconnectors or for the operation of electrical equipment provided with rings or hanging sockets. These types of sticks are provided with a metallic handling head to operate electrical equipment, with a diameter of 10 mm and a length of 42 mm.

The selection of the stick type is made depending on the position of the electrical equipment to be operated and the installation voltage rating.

PCU insulating sticks are recommended for the handling of live cables. These types of sticks are provided with a hook-type metallic piece, with a **100 mm opening**.

The rescue insulating stick type PSU is specialised for the rescue of electrocuted (injured) people and for the removal of electrical conductors or of various live metallic elements and fallen on the electrocuted person or in the proximity thereof. The stick is used in medium voltage power installations, in dry weather conditions. This type of stick is provided with a hook-type metallic part, with a **380 mm opening**, and a special adaptor in order to allow the attaching of an appropriate voltage detector.



Insulating stick code	Operating voltage U _n (kV)	Test voltage U _{inc} (kV)	No. of sections	Total length L _t (m)	Handle length L _m (m)	Working length L _v (m)	Transport length L _e (m)	Weight (kg)
PSU-20	20	60	1	1,23	0,41	0,82	1,23	1,2
PSU-35	35	105	1	1,66	0,61	1,05	1,66	1,4
PAE-35	35	105	2	3,07	0,90	2,17	1,60	2,7
PCU-20	20	60	1	1,36	0,41	0,95	1,36	1,3
PCU-35	35	105	1	1,80	0,61	1,19	1,80	1,5
PSU-35-C	35	105	1	1,91	0,61	1,30	1,91	2



Tightening handle for phase clamps

Code: P249

The **tightening handle** is a device that can be used in special conditions for applying of short-circuiting clamps when, given the small space, workers cannot use insulating sticks appropriate to the installation voltage ($U_{n\max} = 20 \text{ kV}$), situations specified in the internal work safety regulations of the users and to avoid their application by hand.

The tightening handle is provided with a "RO bayonet" socket coupling system which can be adjusted in two positions: fixed or articulated.

The handle is not (and does not replace) an insulating stick because it does not provide the protection distance between the operator and the power installation but it allows the installation of clamps on conductors without any hand contact.

The use of the tightening handle in activities that does not meet the conditions specified by the safety regulations in force exonerates the manufacturer from any responsibility.
Total length: 440 mm.



Adaptors and accessories with "RO bayonet" coupling rod

SR EN 61230



Adaptors and accessories with "RO bayonet" coupling rod are elements that can be assembled temporarily in "RO bayonet" foldable coupling systems of insulating sticks (PMU and PMP type) to allow attachment to the stick of various protective equipment (short-circuiting device clamps, voltage detectors, anchoring elements for work at height). Adaptors and accessories can be made of plastic or metal in the following constructive types:

- AF E-C adaptor - provided with coupling system with "hexagon 12" socket
- AR E-C adaptor - provided with coupling system with "hexagon 12" foldable socket
- AF E-U adaptor - provided with universal coupling system
- AF E-DIN adaptor - provided with coupling system with "DIN bayonet" socket
- AF E-K adaptor - provided with metallic hook for short-circuiting device for Subway
- AB/DTTU-Tv adaptor - for the coupling of the Urban Transport Voltage Detector DTTU-Tv type



AF E-C



AR E-C



AF E-U



AF E-DIN



AF E-K



AB/DTTU-Tv

Device for the handling of MV fuses

Code: P2324

The pliers for the remote handling of MV fuses (diameters between 35 - 90 mm) is a device that can be attached temporarily in the coupling system with "RO bayonet" socket of multipurpose connectable insulating sticks (PMU or PMP type).

The jaws of the device can be closed / opened by the rotation of the stick.





Adaptors and accessories with "hexagon 12" coupling rod

SR EN 61230



Adaptors and accessories with "hexagon 12" coupling rod are elements that can be temporarily assembled in "hexagon 12" coupling systems socket of multipurpose telescopic insulating sticks PTU type to allow the attachment to the stick of various protective equipment (short-circuiting device clamps, voltage detectors, anchoring elements for work at height).

Adaptors and accessories can be manufactured from plastic or metal and are performed in the following constructive types:

- ACMIT/C adaptor - provided with "RO bayonet" articulated coupling socket
- AR C-C adaptor - provided with coupling system with foldable "hexagon 12" socket
- AF C-U adaptor - provided with universal coupling system
- AF C-DIN adaptor - provided with coupling system "DIN bayonet" socket
- ACAI/C adaptor - provided with coupling system for "CROCHEVIT" self-locking anchorage hook
- AF C-K adaptor - provided with retractable hook (shot-gun system)
- CASC/C accessory - provided with metallic hook
- AC/DTTU-Tv adaptor - for the coupling the Urban Transport Voltage Detector DTTU-Tv type



ACMIT/C



AR C-C



AF C-U



AF C-DIN



ACAI/C



AF C-K



CASC/C



AC/DTTU-Tv

Adaptors with universal coupling system

Adaptors with "universal" coupling system are elements that can be temporarily assembled in universal coupling system of insulating sticks to allow the attachment to the stick of various equipment (short-circuiting device with clamps, voltage detectors, anchoring elements for work at height):

- AF U-E adaptor - provided with "RO bayonet" articulated coupling socket
- AF U-C adaptor - provided with coupling system with "hexagon 12" socket
- AF U-X adaptor - provided with spring-loaded cardan joint for tubular end cups
- AF U-I adaptor - provided with metallic ring
- AF U-S adaptor - provided with rod and hook for the operation of disconnectors



AF U-E



AF U-C



AF U-X



AF U-I



AF U-S



Ground-operated cutter of LV overhead electrical conductors

EA 0143

The **ground-operated cutter** is used for the ground cutting of low voltage overhead electrical conductors in emergency situations.

The cutter includes the following components:

- a. **cutting scissors actuated by a lever and pulley system (1 piece)**
- b. **telescopic insulating stick (1 piece)**

The **cutting scissors** are designed to facilitate the cutting of the conductors from the ground. The cutting knives are made of high-alloy steel with great mechanical strength. In order to reduce the cutting force, the operating lever of the mobile knife is actuated from the ground with a rope, passed through a system of 2 pulleys.

The coupling system of the cutting scissors with the telescopic insulating stick is of “**universal**” (sunrise) type.

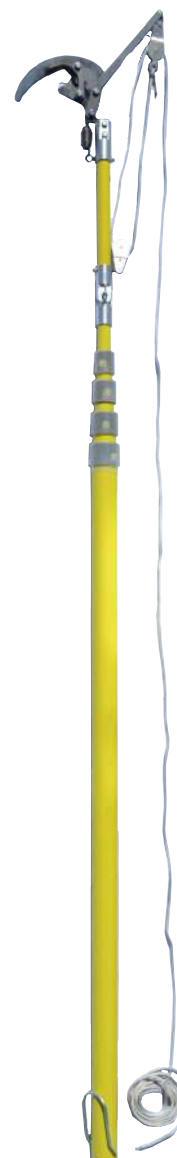
The **telescopic insulating stick** includes 5 insulating tubes made of GRP, according to the requirements of SR EN 61235:1999.

For the firm locking of modules in extended position, these are provided with square lock buttons, and the upper areas of the sections (provided with sockets for the lock buttons) are covered with elastic transparent sleeves, in order to increase the operating period of the stick.

The stick is provided with hinged sole in order to be positioned (maintained) on the ground during works and a metallic coupling system that allows an appropriate fixing of the cutting scissors.

It is not recommended to operate the scissors and handle the stick without supporting it on the ground.

Both the cutting scissors and the insulating stick are delivered in **waterproof bags**.



Technical characteristics

Transport length - stick (m)	1,9	
Maximum length extended stick (m)	7,5	
Tubes diameter (mm)	max. 60 (± 1,5)	
Cutting scissors length (m)	0,5	
Maximum cutting height (m)	8	
Maximum diameter of cables that can be cut (mm)	25	
Types of conductors that can be cut	Aluminum (AAC type)	Steel - Al (ACSR type)
Maximum conductors diameters (mm)	22,5	9,6
Maximum conductors sections (mm ²)	300	56,3 (ACSR 50/8)





Voltage detectors are electronic equipment widely used as protective devices against electrical risks, their main purpose being to detect and indicate the presence of voltage in low, medium and high voltage installations.

Voltage detectors are devices intended to check the presence / absence of voltage in all types of power installations. Detectors provide **optical** and **acoustic** indications of the presence of voltage in the inspected power installation. Voltage detectors are made according SR EN 61243 and are in a permanent stand-by state.

Voltage detectors for low voltage power installations are multi-purpose (**multitesters**) electronic devices designed for detection and indication of voltage presence and other functions: continuity, resistance, rotary field indicator, diode test.

Voltage detectors for medium and high voltage power installations are electronic devices designed for checking of presence/absence of voltage using an insulating sticks appropriate to the installation and environmental conditions. This type of detectors also involves the test of the device functionality prior each use, and such test shall be performed by pressing the test button which will trigger the acoustic and optical indication of the detector, confirming the appropriate charging level of the battery and the electronic circuits are in good conditions. Medium and high voltage detectors are devices that need to be checked both at *commissioning* and at *periodic intervals* regulated by the manufacturer.

Periodical inspections must be performed in special conditions, in notified laboratories.

Note: Romind T&G owns a high-voltage test laboratory accredited by RENAR (Romanian Accreditation Association).

Voltage detectors for urban public transportation (trolleybus / tramway) - DTTU type



Code: DTTU-Tb - for trolleybus
DTTU-Tv -for tramway

DTTU-Tb and DTTU-Tv voltage detectors for urban transport power installations (trolleybus /tramway), with d.c. voltage of 825 V are warning equipment for the maintenance and operating personnel on the existence of the electric shock hazard, by the optical and acoustic indication of voltage presence.

Optical warning is made with intermittent **red signals** (for reversed polarity) or **green** (for normal polarity), also visible in strong ambient lighting conditions.

Acoustic warning is triggered by intermittent signals with an intensity of 69 dB (A).

Both before and after each use, by pushing the test button and the triggering of signals, there will be verified the detector's functionality (confirming that the battery is in good condition and the electronic circuits are in proper condition).

DTTU-Tb and DTTU-Tv voltage detectors must be used in dry weather conditions.

The **DTTU-Tb detector** for **trolleybus** includes two insulating sticks (which include detection components) which allows the detection of voltage presence on the two power contact lines of trolleybuses. This type of detector can also be used in switch boxes (power injection points) and in power distribution stations.

The **DTTU-Tv detector** for **tramway** includes an insulating stick (which includes the detection components) which is connected, by means of an 8-meter insulated earthing cable, to an alligator clip which can be attached to the rolling track (rail).

The checking of voltage can be performed from remote, using an appropriate insulating stick + an appropriate adaptor (e.g. telescopic stick PTU-AS-400-4c + adaptor **AC-DTTU** or modulated stick PMU 400-3 B/ba + adaptor **AB-DTTU**).

Technical characteristics

Maximum operating voltage (V d.c.)	1.000
Intermittent signalling, optical and acoustic, in bipolar connection for voltage rates higher than (V d.c.)	130 ± 20
Dielectric test voltage (V/1min)	6.000
Supply	9 V battery type 6LR61
Operating temperature range (°C)	-25 ...+55
Protection class provided by the housing	IP 20
Weight DTTU Tb / DTTU Tv (kg)	1,35 / 1,19
Voltage detector stick length (cm)	67



DTTU-Tb



DTTU-Tv



AC/DTTU-Tv



AB/DTTU-Tv



Contact probes for LV multimeters

Code: PA 01

Contact probes, PA 01 type, are used together with low voltage multimeters (bipolar detectors) for the remote and safe inspection of the presence/absence of voltage on **low voltage overhead lines** (with bare conductors) or in **indoor or outdoor (street level) distribution boxes**. These probes are made of insulating tubes provided at one end with the contact electrode and at the other end with the handle. The contact probes provide IP 20 protection class.

Given their shape, contact electrodes allow the hanging of the probes on overhead lines conductors and permanent hold of the detector in contact, throughout the entire work period, as long as the installation is de-energised.

Technical characteristics

Maximum operating voltage (V)	1.000
Test voltage (V/1min)	6.000
Operating temperature range (°C)	-25...+55
Probe length / handle diameter (mm)	1.165 / 30
Weight of a set of probes without / with bag (kg)	0,3 / 0,6



The **contact probes** are suitable for the following **LV multimeters**:

Model

EasyVolt / EasyVolt^{Plus}

Rated operating voltage	12 ÷ 750 V d.c. 12 ÷ 750 V a.c.
Resolution (V)	LED / LCD
Frequency range	45 ÷ 65 Hz
Maximum duration of measurement (s)	30
Homopolar phase detection	Optical & acoustic, for U > 100 V a.c.
Phase sequence indication in three-phase power networks	YES, for U > 100 V a.c.
Resistance measurement	NO / YES - 0 ÷ 2 kΩ
Continuity check	Optical & acoustic: < 200 kΩ / < 200 Ω
Frequency measurement	NO / 30~999 Hz
Range of operating temperatures (°C)	-15...+45
Protection level	IP 65
Overall size (mm)	239 x 68 x 29
Battery detector weight (kg)	0,230 / 0,240



EasyVolt

EasyVolt^{Plus}

Model

Profi III LED + / Profi III LCD +

Rated operating voltage	6 ÷ 1.400 V d.c. 6 ÷ 1.000 V a.c.
Resolution (V)	LED / LCD
Frequency range	16,66 ÷ 500 Hz
Maximum duration of measurement (s)	30
Homopolar phase detection	Optical, for U > 100 V a.c.
Phase sequence indication in three-phase power networks	YES, for U > 100 V a.c.
Resistance measurement	NO / YES 0 ÷ 2 kΩ
Continuity check	Optical & acoustic < 200 kΩ / < 5 kΩ; Optical: <200 kΩ
Frequency measurement	NO / 16,66~500 Hz
Range of operating temperatures (°C)	-15...+45
Protection level	IP 65
Overall size (mm)	300 x 75 x 20
Battery detector weight (kg)	0,270



Profi III LED+

Profi III LCD+



Voltage detectors - DETECT type - for MV and HV power installations

Code: DETECT 3-10 kV / DETECT 6-20 kV / DETECT 10-36 kV / DETECT 36-110 kV

SR EN 61243-1+A1:2010



The new **DETECT** series of voltage detectors with **multi-sensor and microprocessor technology** is designed for checking the presence/absence of voltage by direct contact with conductive elements of **indoor and outdoor medium and high voltage installations**, in **dry weather or wet weather conditions**. This new series of MV detectors ensures **precise indications in conflicting electric field areas**. Voltage detectors are capacitive type according to **SR EN 61243-1:2006 + A1:2010**.

The voltage detectors are manufactured in four constructive versions for four different voltage ranges: **3-10 kV, 6-20 kV, 10-36 kV and 36-110 kV**.

Voltage detectors – DETECT type – have housings made of red transparent polycarbonate, a material with excellent mechanical and dielectric properties. On the lower part, the housing is provided with an **“universal” coupling system**. In order to be used with the telescopic insulating sticks provided with **“hexagon 12”** socket coupling system, the voltage detector is supplied along with an **hexagonal adapter**.

Optical indicators (12 red LEDs, 1 green LED, 3 orange LEDs) as well as the acoustic signalling of the **buzzer** provide an extremely perceptible signalling in strong light and noisy environments. In order to ensure the best visibility of optical indicators, extremely bright red flashing LEDs are arranged on the **control panel** (4 LEDs) and **laterally, diametrically opposed, in the middle part of the housing** (2×4 LEDs). This positioning of red LEDs allows the observing the optical signalling both by the operator and another person standing sideways.

The **control panel** contains:

- **test button** for checking the electronic circuit;
- **acoustic signalling buzzer**;
- **four red LEDs** for checking the presence/absence of voltage by direct contact with conductive elements of indoor and outdoor MV installations
- **three orange LEDs** to indicate a malfunction of electronic circuits noticed during the checking or the battery discharge warning;
- **one high luminosity green LED**.

The DETECT type voltage detectors are calibrated on real voltage in our High Voltage Laboratory, by remote control and they are in a permanent **“stand-by” state**.

Prior and after each use, the voltage detectors **DETECT** type must be functionally tested by pressing the test button, as this check includes the test of the electronic circuits and the appropriate charging level of the battery. The **“ready for operation” period of detector is signaled by the green LED, for two minutes**. During this period of time an automatic self-checking is performed.

After the performing of the operational test, the voltage detector fixed on the appropriate insulating stick is brought closer to the conductor to be checked until the detector's electrode gets in contact with checked conductor. If the conductor is **live**, the detector will indicate the **presence of voltage by red flashing lights** and **acoustic intermittent signalling**.

For store and transport, the voltage detectors DETECT type are packed in an shock protective casing.



Detector type	DETECT 3-10 kV	DETECT 6-20 kV	DETECT 10-36 kV	DETECT 36-110 kV
Rated operating voltage (kV)	3 ÷ 10	6 ÷ 20	10 ÷ 36	36 ÷ 110
Operating temperature range (°C)	-25 ...+55	-25 ...+55	-25 ...+55	-25 ...+55
Supply - alkaline battery	9 V type 6LR61	9 V type 6LR61	9 V type 6LR61	9 V type 6LR61
Overall size - without contact electrode (mm)	Ø 60 x 245	Ø 60 x 245	Ø 60 x 245	Ø 60 x 245
Overall size - with contact electrode (mm)	Ø 60 x 303	Ø 60 x 303	Ø 60 x 303	Ø 60 x 480
Detector weight with battery (kg)	0,365	0,365	0,365	0,425



Voltage detectors - DTCIER/P type - for HV power installations

SR EN 61243-1

**Code: DTCIER/P 220-400 kV**

The **DTCIER/P 220-400 kV voltage detectors** are designed for the inspection of the presence/absence of voltage by direct contact with elements of indoor and outdoor **high voltage power installations**, in dry or wet weather conditions.

Voltage detectors – **DTCIER/P** type – have housings made of red transparent polycarbonate, a material with excellent mechanical and dielectric properties.

On the lower part, the detector is completed with an “**hexagon 12**” rod, allowing its connection with an appropriate telescopic insulating sticks provided with hexagonal coupling system.

Voltage detectors – **DTCIER/P** type – are in a permanent “**stand-by**” state.

The **control panel** contains:

- **test button** for checking the electronic circuit;
- **acoustic signalling buzzer**;
- **four bright red LEDs**;
- **one high luminosity green LED**.

Prior and after each use, voltage detectors **DTCIER/P** type must be functionally tested by pressing the test button, as this check includes the test of the electronic circuits and the appropriate charging level of the battery.

The “**ready for operation**” period of detector is signaled by the **green LED**, for two minutes.

After performing the operational test, the detector attached to an appropriate insulating stick is brought closer to the conductor until the detector’s electrode gets in contact with checked conductor.

If the conductive element is **live**, the detector will indicate this by **bright red flashing signals** and high intensity **acoustic intermittent signals** (more than 90 dB (A)), both perceptible in unfavorable environmental conditions: noisy area and strong light.

For store and transport, the voltage detector DTCIER/P type is packed in plastic box.



DETAIL
OPTICAL SIGNALLING

Detector type	DTCIER/P 220-400 kV
Rated operating voltage (kV)	220 ÷ 400
Operating temperature range (°C)	-25 ...+55
Supply	9 V alkaline battery type 6LR61
Overall size - without contact electrode (mm)	Ø 78 x 165
Overall size - with contact electrode (mm)	Ø 78 x 380
Detector weight with battery (kg)	0,530





OVERVIEW

Mobile earthing and short-circuiting devices (currently referred to as „short-circuiting devices”) represent protective equipment used for temporary earthing and short-circuiting of conductors of a power installation.

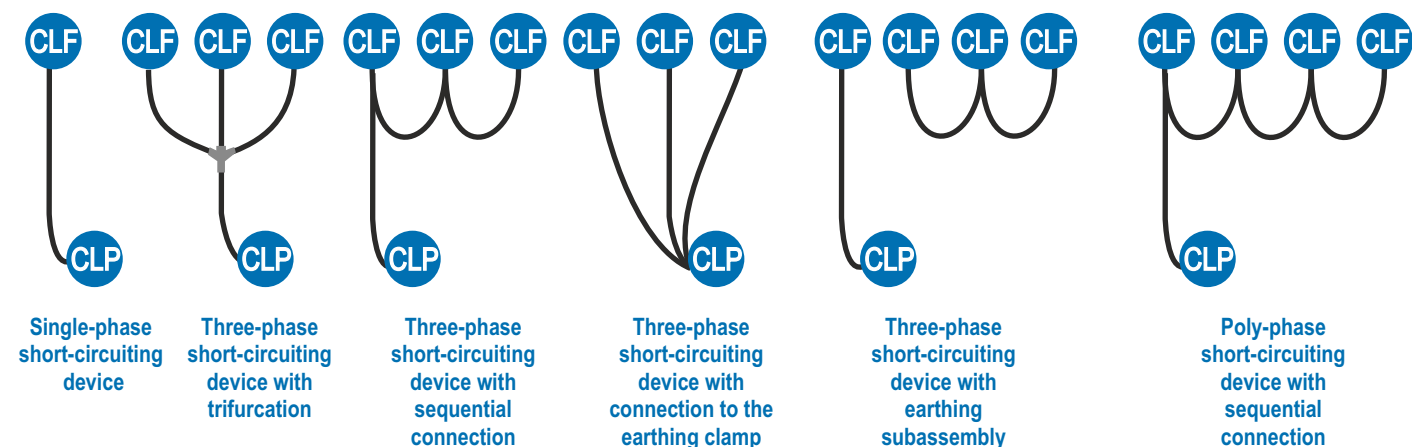
The use of short-circuiting devices represents the main preventive protection measure for professionals against an accidental commissioning or possible voltage occurrence during maintenance operations in the working area.

The installation of short-circuiting devices in installations must be performed by professional operators, in the following sequence of operations:

- Earthing of the short-circuiting device by the fastening of the earthing clamp (CLP) or of the crimped lug of the earthing cable to the artificial / natural earth grounding of the power installation or to the mobile earthing rod, previously grounded;
- Checking the absence of voltage on each conductor to be earthed / short-circuited, using a voltage detector;
- Installation of the phase clamps (CLF) of the short-circuiting device, which allow a good connection between the phase conductor and the earth.

Depending on the type of the short-circuiting device and the voltage of the power installation where the short-circuiting device is applied, the installation of the phase clamps on the conductors must be performed using insulating sticks / handles specially designed for this operation.

Short-circuiting devices are made in accordance with the provisions of SR EN 61230 standard, in various constructive configurations: **single-phase**, **three-phase** or **poly-phase** and can be installed both in indoor and outdoor power installations. Short-circuiting and earthing cables will be connected in various configurations, according to the needs.



The short-circuiting and earthing cables of the short-circuiting device are manufactured from highly flexible multi-core copper wire, class VI according to SR EN 60228, protected with a transparent insulating layer, directly extruded on the multi-core wire, according to SR EN 6113.

Phase clamps (CLF) and earthing clamps (CLP) are designed and manufactured in a wide range of constructive shapes so that they can be applied on the various shapes of conductors of the low, medium and high voltage installations and to provide the mechanical strength required for the successful handling of an incident determined by the accidental occurrence of voltage in the power installation. Even if it may seem less important, **the correct selection of phase and earthing clamps assures improved ergonomic conditions and, at the same time, complete electrical safety.**

Phase and earthing clamps are fastened on the installation conducts or on the earth bars by various methods:

- **Screw fastening** (where the conductor is firmly fastened between the clamp body and the mobile jaw driven by a screw, sometimes after a pre-fastening of the clamp on the conductor). The fastening torque of the clamp on the conductor is ensured by the manual clamping torque of the driving screw.
- **Elastic fastening** (where the conductor is clamped between the clamp body and the mobile jaw driven by a spring or by elastic systems). In such conditions, the fastening force of the clamp on the conductor is assured by the spring's characteristics.
- **Fastening by shape and weight (self-locking)**. The fastening force of the clamp on the conductor is assured upon the weight of the phase clamp - earthing conductor assembly. In case of phase clamps or earthing clamps with fastening screw, these can be provided with various terminal ends in order to allow the connection of the clamp to other devices or manual handling.



Phase clamp with screw fastening



Phase clamp with elastic fastening



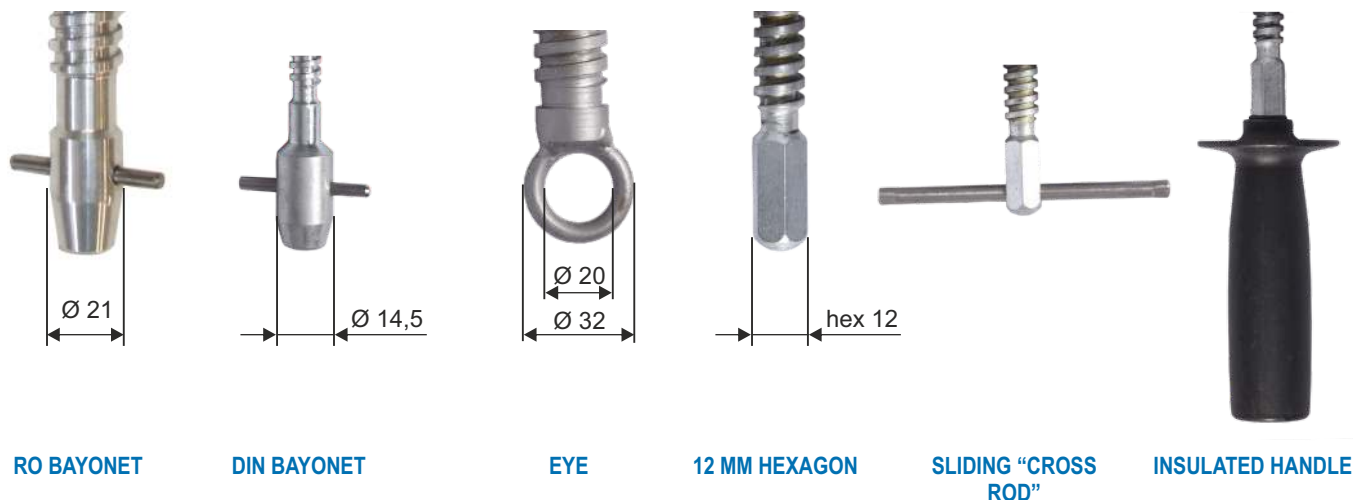
Phase clamp with self-locking



The **screw fastening phase clamp** is provided mainly with “**RO bayonet**” terminal ends, which can be easily connected to and disconnected from the “**RO bayonet**” coupling systems of insulating sticks.

The **earthing clamps** - given that they are applied manually on the earthing bar or other similar items - are usually provided with screw with sliding “cross rod”.

Other optional shapes of the screw terminal ends can be provided, such as: “**eye**” (for installation with shotgun hot-stick), “**DIN bayonet**” (a system similar to “**RO bayonet**” but with different dimensions), “**hexagon 12**” (in order to be operated with an insulating stick provided with a hexagonal coupling system), “**insulated handle**” (for manual operation).



The **screw fastening phase clamps** can be “**classic**” or “**automatic**”. The “**classic**” screw clamps have a **simple drive screw** that provides the movement of the mobile jaw and the fastening of the clamp on the conductor.

The “**automatic**” screw clamps include a system of levers and springs allows the automated movement of the mobile jaw when the clamp get in contact with the installation's conductor, a movement that provides the pre-fastening of the clamp on the conductor. Subsequently to that stage, the clamp must be firmly tightened on the conductor, acting the screw and locking of the mobile jaw's position.

Elastic fastening or **self-locking clamps** can be classified in the category of “**automatic**” clamps, once the clamp is connected/pushed on the conductor, and the conductor remains fastened between the mobile jaw and the body of the clamp.

Depending on the type of the power installation and the shape of conductors / bus bars, phase clamps are designed - as shape and size - to allow their quick and safe application on:

- Bare conductors of low / medium / high voltage overhead lines,
- Bus bars or parts with rectangular section ,
- Cylindrical bars or parts with round section ,
- Spherical pieces (Ball studs) of various dimensions,
- Conductors of various forms (universal clamps),
- Terminal parts of various forms / destinations.

The **earthing clamps (CLP)** perform the direct connection of short-circuiting devices to natural / artificial earth grounding of the power installation or to the mobile earthing rod. The earthing clamps are manufactured in various shapes and dimensions depending on the value of the rated short-circuit current to be provided by the installation of the short-circuiting device.

The earthing clamps are installed directly by hand on the earthing element.

They can be “**classic**” or they can be provided with “**scraping jaw**”. By their installation and fastening, earthing clamps with scraping jaw remove the layers of oxides, impurities and protective paint, assuring appropriate contact resistance.

Also, the category of earthing clamps includes the special clamps applicable on railway tracks.

Short-circuiting devices can be packed to store and transport in:

- Waterproof fabric bags of various sizes;
- Plastic cases;
- Painted metal boxes.



PHASE CLAMPS

PHASE CLAMPS FOR RECTANGULAR SECTION CONDUCTORS: FLAT BARS, PACKETS OF BARS OR FLAT PROFILES OF VARIOUS THICKNESSES

The **classic phase clamp for rectangular section conductors (C)** is a screw-fastening clamp allowing the tightening of conductor between the clamp's body and its mobile jaw. The tightening force is provided by the clamping torque of the clamp's driving screw. Both the clamp body and the jaw are aluminium alloy die cast items. The driving screw has a "RO bayonet" end which allows easy coupling and detachment of the clamp from the "RO bayonet" coupling systems of insulating sticks. The **dismounting of the clamp from the conductor** is obtained through mobile jaw's lowering, followed by the detachment of the clamp from the conductor.

The **automatic phase clamp for rectangular section conductors (CA)** is also a screw-operated fastening clamp, the conductor being tightened between the clamp's body and its mobile jaw. Additionally, this type of clamp is provided with a system of levers and springs that allows the automatic closing of the clamp's jaw upon the contact of levers with the conductor (**pre-fastening** of the clamp on the conductor). Subsequently to this phase, which provides much easier handling the clamp, the fixing of the clamp must be completed through the tightening of the driving screw to the proper torque specification. Similar to the classic clamp, the automatic clamp includes two aluminium alloy cast items and a driving screw provided with a "RO bayonet" end. The automatic phase clamps for rectangular section conductors are recommended to be fixed on rectangular section conductors in **vertical** or **slanting** position.

The **dismounting of the clamp from the conductor** is similar to the one used by the classic clamp, more exactly the screw is unscrewed, the jaw is lowered until there is sufficient space to detach the clamp from the flat bar.

CLASSIC CLAMP (C)	AUTOMATIC CLAMP (CA)
<p>Code P 231-0-00C</p> <p>⚡ $I_{sc} = 30 \text{ kA/1s}$</p> <p>Cast body</p> <p>Aluminium alloy</p> <p>kg 0,58</p>  <p>40 mm</p>	<p>Code P 235-0-00C</p> <p>⚡ $I_{sc} = 30 \text{ kA/1s}$</p> <p>Cast body</p> <p>Aluminium alloy</p> <p>kg 0,90</p>  <p>37 mm</p>

PHASE CLAMPS FOR ROUND SECTION CONDUCTORS: MULTI-CORE FLEXIBLE CONDUCTORS, RIGID BARS, T-TYPE FIXED POINTS

The **classic reduced phase clamp for round section conductors (Cr)** has a profile which facilitate its hanging on conductor horizontally positioned or slightly inclined towards the ground. The reduced classic clamp is a clamp with screw fastening, where the conductor is firmly fastened between the clamp's body and the mobile jaw driven by screw.

The **tightening force** is provided by the clamping torque of the clamp's driving screw. Both the clamp body and the mobile jaw are aluminium alloy die cast items. The driving screw has a "RO bayonet" end which allows easy coupling and detachment of the clamp from the "RO bayonet" coupling systems of insulating sticks.

In order to reduce the operator's effort, the tightening of the driving screw is relieved by the presence of a compression spring which allow an easy movement of the mobile jaw.

The clamp is **detached from the conductor** by the simple opening of the clamp (by unscrewing the driving screw, the mobile jaw is lowered), followed by the lifting of the clamp from the conductor.

The **automatic phase clamp for round section conductors (CA)** is also a screw-operated fastening clamp, the conductor being tightened between the clamp's body and its mobile jaw. Additionally, this type of clamp is provided with a system of levers and springs that allows the automatic closing of the clamp's jaw upon the contact of levers with the conductor (pre-fastening of the clamp on the conductor). Subsequently to this phase, which provides much easier handling the clamp, the fixing of the clamp must be completed through the tightening of the driving screw to the proper torque specification. Similar to the classic clamp, the automatic clamp includes two aluminium alloy cast items and a driving screw provided with a "RO bayonet" end.

The **dismounting of the clamp from the conductor** is similar to the one used by the classic clamp, more exactly the screw is unscrewed, the jaw is lowered until there is sufficient space to lift the clamp from the round conductor.



CLASSIC REDUCED CLAMP (Cr)

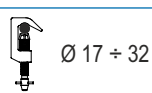
Cod P 2179-0-00

 $I_{sc} = 30 \text{ kA/1s}$

Extruded body

Aluminium alloy

kg 0,96



AUTOMATIC CLAMP (CA)

Cod P 236-0-00C

 $I_{sc} = 30 \text{ kA/1s}$

Extruded body

Aluminium alloy

kg 1,10

LIGHTWEIGHT UNIVERSAL CLASSIC PHASE CLAMPS,
FOR CONDUCTORS OF VARIOUS SHAPES

Lightweight Universal Classic Phase Clamps (CCRU and CCNU type) can be applied on a wide variety of conductor bars of rectangular or cylindrical section and on spherical pieces (Ball studs) of 20 / 25 mm diameter.

There are two clamp sizes: the **Lightweight Universal Classic Reduced Clamp (CCRU)** and **Lightweight Universal Classic Normal Clamp (CCNU)**. The clamps are **applied on the conductor by attaching / hanging on the conductor bar / piece**.

Both are screw-fastening clamps, allowing the tightening of conductor bar or piece between the clamp's body and the mobile jaw. The tightening force is provided by the clamping torque of the clamp's driving screw. Both the clamp body and the jaw are aluminium alloy die cast items. The clamp's driving screw has usually a "RO bayonet" end, but other ends are available: "hexagon 12", "DIN bayonet", **insulated handle** or **sliding cross rod**. Having small dimensions and lightweight construction, these clamps are recommended for use in low voltage power installations and in other power installations where the spaces between the conductor bars are extremely small or where the application of the clamp is made from a small distance.

The **dismounting** of the clamp from the conductor is similar for all types of screw-fastening clamps, more exactly the driving screw is unscrewed, the mobile jaw is lowered until there is sufficient space to detach the clamp from the conductor bar / piece.

LIGHTWEIGHT UNIVERSAL
CLASSIC REDUCED CLAMP (CCRU)

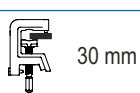
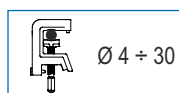
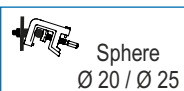
Code P 2402-0-00

 $I_{sc} = 12,50 \text{ kA/1s}$

Cast body

Aluminium alloy

kg 0,29

LIGHTWEIGHT UNIVERSAL
CLASSIC NORMAL CLAMP (CCNU)

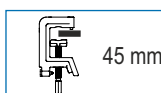
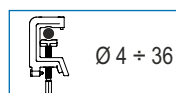
Code P 2403-0-00

 $I_{sc} = 23,75 \text{ kA/1s}$

Cast body

Aluminium alloy

kg 0,42





UNIVERSAL PHASE CLAMPS FOR CONDUCTORS OF VARIOUS SHAPES

The **Universal Classic Phase Clamp (CCU)** is a screw-fastening clamp, which can be applied on a wide range of rectangular or cylindrical section conductor bars, "T" fixed points and on spherical pieces (Ball studs) with 30 mm diameters.

It is a robust clamp, with a body made of extruded aluminium profile and excellent shock resistance. The clamp driving screw is provided with a "**RO bayonet**" end, a termination which allows its easy coupling and uncoupling of the clamp from the "**RO bayonet**" coupling systems of insulating sticks. The clamp's body has a **slanting profile** which facilitates its hanging on conductor horizontally positioned or slightly inclined towards the ground.

The construction and shape of **CCU** clamp is similar to the **Classic Reduced Phase Clamp (Cr)** but it also provides the possibility of slanting application, by side attachment, on flat conductor bars vertically positioned, as well as the possibility to be applied with spherical pieces (Ball studs).

The clamp is **detached** from the conductor by the simple opening of the clamp (by unscrewing the driving screw, the mobile jaw is lowered), followed by the lifting of the clamp from the conductor.













The **Universal Automatic Phase Clamp (CAU)** is the automatic version of the CCU clamp, as the shape, dimensions and construction of the main components of the clamp (body, jaw and screw) are similar. Like CCU clamp, the CAU clamp has a large opening which allows its application on a wide range of rectangular or cylindrical section conductors, "T" fixed points and spherical pieces (ball studs) 30 mm diameter. The driving screw of the clamp is provided with a "**RO bayonet**" end.

Unlike the classic CCU clamp, the CAU clamp is provided with a system of levers and springs that allows the automatic closing of the clamp's jaw upon the contact of levers with the conductor (pre-fastening of the clamp on the conductor). Subsequently to this phase, which provides much easier handling of the clamp, the fixing of the clamp must be completed through the tightening of the driving screw to the proper torque specification.

The **dismounting** of the clamp from the conductor is similar for all types of screw-fastening clamps, more exactly the driving screw is unscrewed, the mobile jaw is lowered until there is sufficient space to detach the clamp from the conductor bar / piece.

The **Universal Automatic Rapid Phase Clamp (CARU)** represents an improved version of the automatic CAU clamp, having a similar shape, a similar construction and similarly wide applicability. Additionally, the automatic CARU clamp provides – in the application stage – besides the pre-attachment of the clamp upon the contact with the conductor, also an extremely quick fastening of the clamp on the conductor.

Similarly, the **dismounting** of the CARU clamp is a quick procedure, in most situations a single complete rotation of the clamp's driving screw is enough to allow the detachment of the clamp from the conductor.


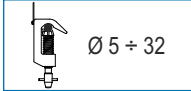

UNIVERSAL CLASSIC CLAMP (CCU)	UNIVERSAL AUTOMATIC CLAMP (CAU)	UNIVERSAL AUTOMATIC RAPID CLAMP (CARU)
<p>Code P 2393-0-00</p> <p>⚡ $I_{sc} = 30 \text{ kA/1s}$</p> <p>⚙️ Extruded body</p> <p>🔲 Aluminium alloy</p> <p>📊 kg 1,28</p> <div> <div>  Sphere Ø 30 </div> <div>  T fixed point Ø 28 </div> </div> <div> <div>  Ø 9 ÷ 32 </div> <div>  40 mm </div> </div>	<p>Code P 2380-0-00</p> <p>⚡ $I_{sc} = 30 \text{ kA/1s}$</p> <p>⚙️ Extruded body</p> <p>🔲 Aluminium alloy</p> <p>📊 kg 1,26</p> <div> <div>  Sphere Ø 30 </div> <div>  T fixed point Ø 28 </div> </div> <div> <div>  Ø 9 ÷ 32 </div> <div>  40 mm </div> </div>	<p>Code 2390-0-00</p> <p>⚡ $I_{sc} = 30 \text{ kA/1s}$</p> <p>⚙️ Extruded body</p> <p>🔲 Aluminium alloy</p> <p>📊 kg 1,10</p> <div> <div>  Sphere Ø 30 </div> <div>  T fixed point Ø 28 </div> </div> <div> <div>  Ø 9 ÷ 32 </div> <div>  40 mm </div> </div>



PHASE CLAMPS FOR RAILWAYS POWER INSTALLATIONS

The **Classic Reduced Clamp for contact wire of the railways power installation (CrTf)** is a screw-fastening clamp, similar with the **Classic Reduced Phase Clamp (Cr)**, having a similar shape and construction. In order to be used in the railways power installations, the **CrTf** clamp has a mobile jaw driving by a screw, which provides an appropriate tightening of the clamp on the special profile of the contact wire. This clamp is provided with a discharge electrode for remaining or induced electric charges which frequently appear in this type of installations. The driving screw has a “**RO bayonet**” end which allows easy coupling and detachment of the clamp from the “**RO bayonet**” coupling systems of insulating sticks.

The **Special Clamp for the Third Rail** of the subway power system has a copper-aluminium cast body and it is provided with a driving screw with an eye type end to allow the handling of the clamp with the insulating stick provided with a hook type adapter. The clamp body is provided with a hole that allows its placement or detachment of the clamp from the third rail using same devices (insulating stick + hook–type adapter).

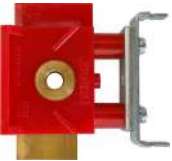
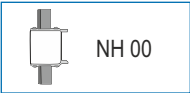

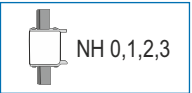
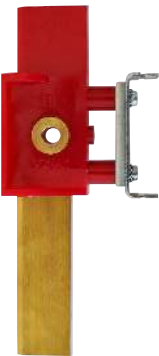
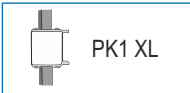
CLASSIC REDUCED CLAMP RAILWAYS POWER INSTALATIONS (CrTf)	SPECIAL CLAMP FOR THIRD RAIL
<p>Code P 2331-0-00</p> <p>⚡ I_{sc} = 16 kA/1s</p> <p>⚙️ Extruded body</p> <p>🔲 Aluminium alloy</p> <p>📊 kg 1,25</p>  	<p>Code P 2160-0-00</p> <p>⚡ I_{sc} = 30 kA/1s</p> <p>⚙️ Cast body</p> <p>🔲 Copper alloy</p> <p>📊 kg 1,82</p>  

CONNECTING BLADES FOR SOCKETS OF HIGH RUPTURING CAPACITY (HRC) FUSES

Connecting blades for sockets of high rupturing capacity (HRC) fuses are manufactured in 3 dimensional versions adapted to various socket sizes for HRC fuses of LV power installations.

The blades have a **plastic body** (polycarbonate) which includes a **brass blade** connected with fittings to the copper terminal from the end of the phase cable of short-circuiting devices.

Connecting blades are also provided with a metallic lamella which allows their handling using the HRC fuse extractor (provided with arm protective sleeve) – code **MMPS/1-MPR** or other models of insulating devices which allow the same type of handling.

CONNECTING BLADE FOR SOCKETS SIZE 00 (B00)	CONNECTING BLADE FOR SOCKETS SIZE 0, 1, 2, 3 (B)	CONNECTING BLADE FOR SOCKETS SIZE Pk1 XL (B1)
<p>Code P 2348-0-00</p> <p>⚡ I_{sc} = 4 kA/1s</p> <p>⚙️ Injection moulded body</p> <p>🔲 Copper alloy</p> <p>📊 kg 0,19</p>  	<p>Code P 239-0-00</p> <p>⚡ I_{sc} = 8 kA/1s</p> <p>⚙️ Injection moulded body</p> <p>🔲 Copper alloy</p> <p>📊 kg 0,27</p>  	<p>Code P 239-0-00L</p> <p>⚡ I_{sc} = 8,75 kA/1s</p> <p>⚙️ Injection moulded body</p> <p>🔲 Copper alloy</p> <p>📊 kg 0,35</p>  



PHASE CLAMPS

PHASE CLAMPS FOR BARE CONDUCTORS OF OVERHEAD LINES

Phase clamps for bare conductors of overhead lines are manufactured in multiple constructive versions adapted to work conditions. Each type of clamp has a simple design, lightweight and easy to apply on conductors even its application is done from the ground or from height.

In order to allow easy mounting and dismounting, phase clamps for overhead lines are clamps with **elastic tightening** or by **means of shape and weight (self-locking)**, avoiding the screw tightening completely, which would require longer mounting / dismounting time and which creates difficulties in the re-connection of the stick to the clamp for the dismounting operation. If the phase clamps must be handled using a detachable insulating stick, the clamps are provided with simple and highly effective coupling systems to provide automatic disconnection of the clamp from the stick once applied on the overhead line conductor and dismounting rings to allow the hanging followed by safe detachment of the clamp from the conductor in the dismounting phase.

Phase clamps for bare conductors of overhead lines have their bodies and jaws made of **aluminium alloy cast items**. Some of them are provided **with springs** of various sizes in order to provide tightening forces adapted to short-circuiting currents which must be assured.

PHASE CLAMPS FOR BARE CONDUCTORS OF LV OVERHEAD LINES

SELF-TIGHTENING CLAMP WITH INSULATING STICK

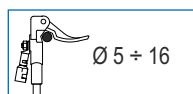
Code P 232-0-00-UJT

⚡ $I_{sc} = 8 \text{ kA/1s}$

⚙ Cast body

🔲 Aluminium alloy

kg 0,43



PHASE CLAMPS FOR BARE CONDUCTORS OF LV AND MV OVERHEAD LINES

SELF-LOCKING CLAMP FOR MV OHL

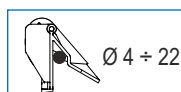
Code P 265-4-00C

⚡ $I_{sc} = 8 \text{ kA/1s}$

⚙ Cast body

🔲 Aluminium alloy

kg 0,50



SELF-LOCKING AUTOMATIC CLAMP (CAA) MV OHL

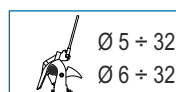
Code P 2155-1-00

⚡ $I_{sc} = 18 \text{ kA/1s}$

⚙ Cast body

🔲 Aluminium alloy

kg 0,68



SELF-LOCKING AUTOMATIC CLAMP (CAA) HV OHL

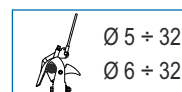
Code P 2158-1-00

⚡ $I_{sc} = 18 \text{ kA/1s}$

⚙ Cast body

🔲 Aluminium alloy

kg 0,70







EARTHING CLAMPS OF CLASSIC CONSTRUCTION

Earthing clamps (CLPR-16 and CLPN-30) currently used as components of short-circuiting devices are manufactured in two dimensional versions depending on the value of the rated short-circuit current that must be ensured using a short-circuiting device and the size of the earthed element where they will be mounted.

The clamps perform the earthing of the short-circuiting devices, by their application and fixing on metallic element known as part of or connected to the earthing installation of an enclosure or at the ground plate of an outdoor installation or on the mobile earthing rods of the short-circuiting devices.

The earthing clamps **must be applied on clean surfaces**, without any traces of paint or oxides. The body and the mobile jaw of earthing clamps are **copper-aluminium alloy die cast items**.



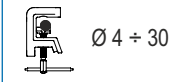
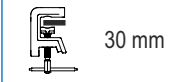


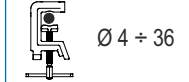

The tightening system, manually operated, consists of the driving screw (made of steel, protected against corrosion by zinc coating) and the mobile jaw.

CLASSIC CLAMP (CLPR-16)	CLASSIC CLAMP (CLPN-30)
Code P244-0-00 ⚡ $I_{sc} = 16 \text{ kA/1s}$ ⚙ Cast body 🔲 Copper alloy 📊 kg 0,46   22 mm	Code P209-0-00 ⚡ $I_{sc} = 30 \text{ kA/1s}$ ⚙ Cast body 🔲 Copper alloy 📊 kg 1,06   37 mm

LIGHTWEIGHT UNIVERSAL CLASSIC EARTHING CLAMPS

Lightweight Universal Classic Earthing Clamps (CCRU/B or P and CCNU/B or P) are clamps derived from the Lightweight Universal Classic Clamps (CCRU and CCNU) by adding an **insulated handle (B)** or a **sliding cross rod (P)** on the driving screw of the clamps.

These clamps can replace successfully clamps **CLPR-16** or **CLPN-30** in the standard structure of mobile short-circuiting devices.

LIGHTWEIGHT UNIVERSAL CLASSIC REDUCED CLAMP (CCRU/P)	LIGHTWEIGHT UNIVERSAL CLASSIC NORMAL CLAMP (CCNU/P)
Code P 2402-0-00p ⚡ $I_{sc} = 12,50 \text{ kA/1s}$ ⚙ Cast body 🔲 Aluminium alloy 📊 kg 0,30   Sphere Ø 20 / Ø 25  Ø 4 ÷ 30  30 mm	Code P 2403-0-00p ⚡ $I_{sc} = 23,75 \text{ kA/1s}$ ⚙ Cast body 🔲 Aluminium alloy 📊 kg 0,44   Sphere Ø 20 / Ø 25  Ø 4 ÷ 36  45 mm



EARTHING CLAMPS WITH SCRAPING JAW (MILLING EARTHING LATHE)

Earthing clamps with scraping jaw (milling earthing lathe) (CLPBR-12 and CLPBR-16) are versions derived from the standard models or earthing clamps.

These special earthing clamps are provided with **profiled jaws** so that to allow the removal of layers of oxides, impurities and protective paint from the elements where they will be mounted, simultaneously with the tightening of the clamp, the ultimate goal of this operation for getting an appropriate contact resistance.

These clamp models are recommended for use on short-circuiting devices known to be applied in installations where ground plates include painted or rusted metallic elements. The most familiar examples of such circumstances are lattice poles for high voltage lines or on the painted bars of ground straps existing in power stations.

The body of earthing clamps is a copper-aluminium alloy cast item. The scraping jaw, the elastic elements of the pressing system and the driving screw are made of steel, zinc-coated against corrosion.

CLAMP WITH SCRAPING JAW, REDUCED VERSION (CLPBR-12)	CLAMP WITH SCRAPING JAW, NORMAL VERSION (CLPBR-16)
Code P 2366-0-00 $I_{sc} = 12 \text{ kA/1s}$ Cast body Copper alloy $0,62 \text{ kg}$ 11 mm	Code P 2277-0-00 $I_{sc} = 16 \text{ kA/1s}$ Cast body Copper alloy $1,20 \text{ kg}$ 17 mm

EARTHING CLAMP FOR CONNECTION TO THE RAIL

The **earthing clamp for connection to the rail (CLPS)** is a manually-operated clamp derived from the earthing clamp CLPN-30, built so that it allows its application on the base of the rolling track rails of railway installations.

Given its special application method, the clamp does not cover the rolling track, allowing the use of the rail.

This clamp is provided with a special **mobile jaw** actuated by a screw and an adjustable locking system so that it can be fixed on the various shapes of rail.

EARTHING CLAMP FOR THE RAIL (CLPS)	
Code P 2185-0-00 $I_{sc} = 16 \text{ kA/1s}$ Cast body Copper alloy $1,60 \text{ kg}$	 Rail type 40, 49, 60, R65



Universal poly-phase short-circuiting device for LV overhead lines (Aerial Bundle Cables (ABC) and bare conductors)

Code: Msp - 1 - nxS_r/I_r - S_p/I_p - O/F/p

Application: from height

Aerial Bundle Cables (ABC) provided with COT 10-95 A (ROMANIA) voltage connectors: use the short-circuiting subassembly, the earthing subassembly and the mobile earthing rod.

Aerial Bundle Cables (ABC) provided with DPS (ROMANIA) voltage connectors: use the short-circuiting subassembly, in whose plugs are mounted the coupling adaptors to DPS connectors (from the kit), the earthing subassembly and the mobile earthing rod.

Overhead lines with bare conductors: use the self-tightening clamps with insulating stick coupled to the plugs of the short-circuiting device, the earthing subassembly and the mobile earthing rod.

Components:

- **Short-circuiting subassembly** provided with:
 - ▶ Coupling plug for voltage connectors type COT 10-95 A - "n" = 4...7 pieces
 - ▶ Short-circuiting cable - 3...6 pieces
 - ▶ Connection cable to the earthing subassembly provided with socket plug - 1 piece
- **Earthing subassembly** provided with:
 - ▶ Coupling plug for the connection to the short-circuiting subassembly - 1 piece
 - ▶ Earthing cable - 1 piece
 - ▶ Earthing clamp - 1 piece
- **Set of self-tightening clamps with insulating stick for bare LV overhead lines** - "n" = 4...7 pieces
- **Set of coupling adaptors to DPS connectors*** (see NOTE) - "n" = 4...7 pieces
- **Insulating extension stick** - 1 piece
- **Mobile earthing rod** - 1 piece

Packing: waterproof bag

Technical characteristics			
Rated operating voltage U_n (kV)		max. 1	
Short-circuiting and earthing cable cross-section S_r, S_p (mm ²)	16	25	35
Nominal short-circuit current for $t = 1$ s I_{sc} (kA)	4	6	8
Shock (peak) nominal current for $t = 0,02$ s I_{sd} (kA)	8	12	16
Test short-circuit current for $t = 1$ s (kA)	4,6	6,9	9,2
Shock (peak) nominal current for $t = 0,02$ s (kA)	9,2	13,8	18,4
Power factor (according to SR EN 61230)		2	
Short-circuiting cable length l_r (m)		max. 1	
Earthing cable length l_p (m)		max. 15	
Number of self-tightening clamps / adaptors for DPS connectors		max. 7	
Protection length of the insulating stick (m)		0,35	
Total protection length of the stick, with insulating extension stick (m)		0,84	
Conductor diameter where the phase clamp can be applied (mm)		5 ÷ 16	
Conductor cross-section where the phase clamp can be applied (mm ²)		25 ÷ 120	
Type of connectors where the short-circuiting device can be assembled (in power networks with ABC conductors)		COT 10-95 A (Romind T&G) DPS* (Eximprod)	

* NOTE: nominal short-circuit current for t=1 s - max. 6 kA





LOW VOLTAGE OVERHEAD LINES

Poly-phase short-circuiting device for LV overhead lines with bare conductors
- applied from height

SR EN 61230

Code: Msp - 1 - nxS_r / I_r - S_p / I_p - O/p

Application: from height - by hanging the self-tightening clamp to the conductor followed by the pulling down of the clamp.

Components:

- **Short-circuiting subassembly** provided with:
 - ▶ Self-tightening clamp with insulating stick - "n" = 4 ... 7 pieces
 - ▶ Short-circuiting cable - 3 ... 6 pieces
 - ▶ Connection cable to the earthing subassembly provided with socket plug - 1 piece
- **Earthing subassembly** consisting of:
 - ▶ Coupling plug for the connection to the short-circuiting subassembly - 1 piece
 - ▶ Earthing cable - 1 piece
 - ▶ Earthing clamp - 1 piece
- **Insulating extension stick** - 1 piece
- **Mobile earthing rod** - 1 piece

Packing: waterproof bag

EARTHING CLAMP
TYPE CLPR-16

MOBILE EARTHING ROD

SELF-TIGHTENING CLAMP WITH
INSULATING STICKINSULATING EXTENSION
STICK**Technical characteristics**

Rated operating voltage U _n (kV)	max. 1	
Short-circuiting and earthing cable cross-section S _r , S _p (mm ²)	16	25
Nominal short-circuit current for t = 1 s I _{sc} (kA)	4	6
Shock (peak) nominal current for t = 0,02 s I _{sd} (kA)	8	12
Test short-circuit current for t = 1 s (kA)	4,6	6,9
Shock (peak) nominal current for t = 0,02 s (kA)	9,2	13,8
Power factor (according to SR EN 61230)	2	
Short-circuiting cable length I _r (m)	max. 1	
Earthing cable length I _p (m)	max. 15	
Number of self-tightening clamps / adaptors for DPS connectors	max. 7	
Protection length of the insulating stick (m)	0,35	
Total protection length of the stick, with the insulating extension stick (m)	0,84	
Conductor diameter where the phase clamp can be applied (mm)	5 ÷ 16	
Conductor cross-section where the phase clamp can be applied (mm ²)	25 ÷ 120	



Poly-phase short-circuiting device for LV overhead lines with bare conductors - applied from the ground

SR EN 61230



Code: Msp - CAA - U - nxS_r/I_r - S_p/I_p - O/p

Application: from the ground, with a telescopic insulating stick of 9 m extended length, PTU-AS-400-6-c type (see page 11), in the following sequence of operations:

1. Using the earthing subassembly, one conductor of the line is earthed,
2. Using the short-circuiting subassemblies, the phase and null conductors are short-circuited, starting with the conductor earthed in the previous operation.

Application: by hanging the automatic self-locking clamp (CAA) on the conductor, followed by pulling down the clamp.

Components (see also the first table below):

- **Short-circuiting subassembly** for 3 conductors provided with:
 - ▶ **Automatic self-locking clamp (CAA)** – 3 pieces
 - ▶ **Short-circuiting cable** – 2 pieces

- **Short-circuiting subassembly** for 2 conductors provided with:
 - ▶ **Automatic self-locking clamp (CAA)** – 2 pieces
 - ▶ **Short-circuiting cable** – 1 piece

- **Earthing subassembly** provided with:
 - ▶ **Automatic self-locking clamp (CAA)** – 1 piece
 - ▶ **Earthing cable** - 1 piece
 - ▶ **Earthing clamp** - 1 piece

- **Clamp applicator (PAS/C)** - 1 piece

- **Removal fork (CDAU/C)** - 1 piece

- **Mobile earthing rod** - 1 piece

Packing: waterproof bag



SHORT-CIRCUITING SUBASSEMBLY
FOR 3 CONDUCTORS



SHORT-CIRCUITING SUBASSEMBLY
FOR 2 CONDUCTORS



EARTHING SUBASSEMBLY



CLAMP APPLICATOR (PAS/C)



REMOVAL FORK (CDAU/C)

Configurations available depending on the number of OHL conductors

Number of OHL conductors	Subassembly for 3 conductors	Subassembly for 2 conductors	Subassembly for earthing
4	1	1	1
5	2	0	1
6	2	1	1
7	3	0	1

Technical characteristics

Rated operating voltage U _n (kV)	max. 1		
Short-circuiting and earthing cable cross-section S _r , S _p (mm ²)	16	25	35
Nominal short-circuit current for t = 1 s I _{sc} (kA)	4	6,25	8
Shock (peak) nominal current for t = 0,02 s I _{sd} (kA)	10	15,63	20
Test short-circuit current for t = 1 s (kA)	4,6	7,2	9,2
Shock (peak) nominal current for t = 0,02 s (kA)	11,5	17,97	23
Power factor (according to SR EN 61230)	2,5		
Short-circuiting cable length l _r (m)	max. 4		
Earthing cable length l _p (m)	max. 17,5		
Conductor diameter where the phase clamp can be applied (mm)	5 ÷ 32		



LOW VOLTAGE OVERHEAD LINES

Poly-phase short-circuiting device for LV Aerial Bundle Cables (ABC)

Code: Msp - T - 1 - nxS_r/0,7 - S_p/I_p - F/p

Application: from height - by direct connection (or by means of adaptors) of the short-circuiting device subassembly plugs to the sockets of the voltage connectors permanently mounted on ABC conductors.

Components:

● **Short-circuiting subassembly** consisting of:

- ▶ **Coupling plug for COT 10-95 A (ROMANIA) voltage connectors** - „n” = 4...7 pieces
- ▶ **Short-circuiting cable** - 3...6 pieces
- ▶ **Connecting cable to the earthing subassembly** - 1 piece

● **Earthing subassembly** consisting of:

- ▶ **Coupling plug for connection to the short-circuiting subassembly** - 1 piece
- ▶ **Earthing cable** - 1 piece
- ▶ **Earthing clamp** - 1 piece

● **Mobile earthing rod** - 1 piece

● **Set of coupling adaptors to DPS* (ROMANIA) connectors** (see NOTE) - „n” - 4...7 pieces

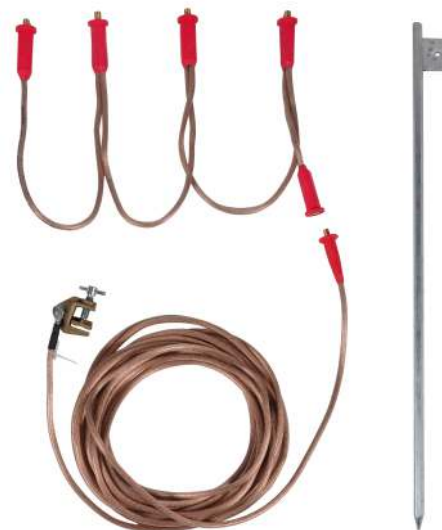
Packing: waterproof bag



COUPLING PLUG FOR VOLTAGE
CONNECTORS TYPE COT 10-95 A



ADAPTORS SET



SHORT-CIRCUITING SUBASSEMBLY



SHORT-CIRCUITING SUBASSEMBLY



EARTHING SUBASSEMBLY



MOBILE EARTHING ROD

Technical characteristics

Rated operating voltage U _n (kV)	max. 1		
Short-circuiting and earthing cable cross-section S _r , S _p (mm ²)	16	25	35
Nominal short-circuit current for t = 1 s I _{sc} (kA)*	4	6	8
Shock (peak) nominal current for t = 0,02 s I _{sd} (kA)	8	12	16
Test short-circuit current for t = 1 s (kA)	4,6	6,9	9,2
Shock (peak) current for t = 0,02 s (kA)	9,2	13,8	18,4
Power factor (according to SR EN 61230)	2		
Short-circuiting cable length l _r (m)	max. 1		
Earthing cable length l _p (m)	max. 15		
Number of coupling plugs to ABC conductors	max. 7		

* NOTE = for DPS connectors, adaptors provide nominal short-circuit current for t=1 s - max. 6 kA



MOBILE EARTHING AND SHORT-CIRCUITING DEVICES

LOW VOLTAGE CABINETS, SUBSTATIONS AND DISTRIBUTION BOXES

Short-circuiting for LV cabinets, substations and distribution boxes provided with HRC fuses

Code: Msp - 1 - Sp/lp - B00/p (single-phase) Msp - 1 - 3xSf/lf - Sp/lp - B00/p (three-phase)
 Msp - 1 - Sp/lp - B/p (single-phase) Msp - 1 - 3xSf/lf - Sp/lp - B/p (three-phase)
 Msp - 1 - Sp/lp - B1/p (single-phase) Msp - 1 - 3xSf/lf - Sp/lp - B1/p (three-phase)

SR EN 61230



Application: manually, using a fuse extractor with protective sleeve for HRC (high rupture capacity) fuses **MMPS/1-MPR** type.

Constructive types: single-phase or three-phase

Types of connecting blades - 3 size versions:

- ✓ Connecting blade code **B00** – for sockets size 00
- ✓ Connecting blade code **B** – for sockets size 0, 1, 2, 3
- ✓ Connecting blade code **B1** – for sockets type PK 1 XL-1kV

Components:

● **Single-phase short-circuiting device** consisting of:

- ▶ Connecting blade - 1 piece
- ▶ Earthing cable – 1 piece
- ▶ Earthing clamp – 1 piece

● **Three-phase short-circuiting device** consisting of:

- ▶ Connecting blade - 3 pieces
- ▶ Short-circuiting cable - 3 pieces
- ▶ Earthing cable – 1 piece
- ▶ Earthing clamp – 1 piece

Related products:

- Fuse extractor with protective sleeve for HRC (high rupture capacity) fuses **MMPS/1-MPR** type (see page 1)

Packing: waterproof bag



SINGLE-PHASE SHORT-CIRCUITING DEVICE



CONNECTING BLADE FOR SOCKETS
SIZE 00 (B00)

CONNECTING BLADE FOR SOCKETS
SIZE 0, 1, 2, 3 (B)

CONNECTING BLADE FOR SOCKETS
SIZE PK1 XL - 1kV (B1)



THREE-PHASE SHORT-CIRCUITING DEVICE

Technical characteristics

Nominal operating voltage U_n (kV)	max. 1
Power factor (according to SR EN 61230)	2,5
Short-circuiting cable length l_f (m) - three-phase short-circuiting device	max. 1,2
Earthing cable length l_p (m) - three-phase short-circuiting device	max. 5,5
Earthing cable length l_p (m) - single-phase short-circuiting device	max. 6,7

Technical characteristics

	Short-circuiting devices for sockets size 00 (B00)			Short-circuiting devices for sockets size 0, 1, 2, 3 (B)			Short-circuiting devices for PK1 XL - 1kV (B1) sockets		
Short-circuiting and earthing cable cross-section S_i, S_p (mm ²)	16	16	25	35	16	25	35		
Nominal short-circuit current for $t = 1$ s I_{sc} (kA)	4	3,5	6,25	8	4	6,25	8,75		
Shock (peak) nominal current for $t = 0,02$ s I_{sd} (kA)	10	8,75	15,63	20	10	15,63	21,9		
Test short-circuit current for $t = 1$ s (kA)	4,6	4	7,2	9,2	4,6	7,2	10,06		
Test (peak) current for $t = 0,02$ s (kA)	11,5	10	17,97	23	11,5	17,97	25,16		



Single-phase / three-phase short-circuiting devices

- lightweight universal phase clamp with insulated handle - type CCRU/B or CCNU/B

SR EN 61230

Code: Msp - CCRU/B - S_p/I_p - S/O/P/p Msp - CCRU/B - $3 \times S_p/I_f$ - S_p/I_p - S/P/p
 Msp - CCNU/B - S_p/I_p - S/O/P/p Msp - CCNU/B - $3 \times S_p/I_f$ - S_p/I_p - S/P/p

Application: by mounting the clamp on the conductor / bar, followed by the tightening of the driving screw of the clamp with insulated handle.

Constructive types: *single-phase* or *three-phase*

Types of phase-clamps:

- ✓ Lightweight universal classic reduced clamp with insulated handle (CCRU/B)
- ✓ Lightweight universal classic normal clamp with insulated handle (CCNU/B)

Components:

● **Single-phase short-circuiting device** consisting of:

- ▶ Phase clamp - 1 piece
- ▶ Earthing cable - 1 piece
- ▶ Earthing clamp - 1 piece

● **Three-phase short-circuiting device** consisting of:

- ▶ Phase clamp - 3 pieces
- ▶ Short-circuiting cable - 3 pieces
- ▶ Earthing cable - 1 pieces
- ▶ Earthing clamp - 1 piece

Packing: waterproof bag



SINGLE-PHASE SHORT-CIRCUITING DEVICE

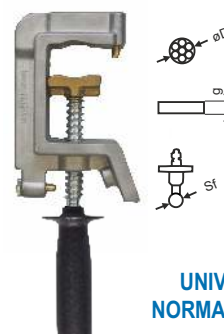


THREE-PHASE SHORT-CIRCUITING DEVICE

General technical characteristics for short-circuiting devices provided with CCRU/B and CCNU/B universal phase clamps

Phase clamp type	CCRU/B or CCNU/B				CCNU/B	
Rated operating voltage U_n (kV)	max. 1				max. 1	
Earthing cable cross-section S_p (mm ²)	16	25	35	50	70	95
Nominal short-circuit current for $t = 1$ s I_{sc} (kA)	4	6,25	8,75	12,5	17,5	23,75
Shock (peak) nominal current for $t = 0,02$ s I_{sd} (kA)	10	15,63	21,9	31,25	43,75	59,38
Test short-circuit current for $t = 1$ s (kA)	4,6	7,2	10,06	14,38	20,13	27,31
Test shock (peak) current for $t = 0,02$ s (kA)	11,5	17,97	25,16	35,94	50,31	68,3
Power factor (according to SR EN 61230)	2,5					

Phase clamp type	Lightweight universal classic reduced clamp (CCRU/B)	Lightweight universal classic normal clamp (CCNU/B)
Short-circuiting cable length l_f (m) - three-phase short-circuiting device	max. 2,5	max. 2,5
Earthing cable length l_p (m) - single-phase / three-phase short-circuiting device	max. 10 / max. 7,5	max. 10 / max. 7,5
Thickness of the flat bar where the phase clamp can be connected g (mm)	max. 30	max. 45
Diameter of the sphere-type coupling piece S_f (mm)	20 / 25	20 / 25
Diameter of the conductor where the phase clamp can be attached $\varnothing D$ (mm)	4 ÷ 30	4 ÷ 36

UNIVERSAL CLASSIC
REDUCED CLAMP (CCRU/B)UNIVERSAL CLASSIC
NORMAL CLAMP (CCNU/B)



Three-phase short-circuiting device for MV overhead lines - application from the ground - self-locking clamp

Code: Msp - N - AS - 3x35/10 - O/p

Intended use: MV overhead line conductors placed maximum 10,5 m from the ground

Application: from the ground, by hanging the self-locking clamps mounted at the end of metallic telescopic sticks on overhead conductors, using the insulating stick of the short-circuiting device.

Benefits: easy to be assembled and applied by a single user.

Components:

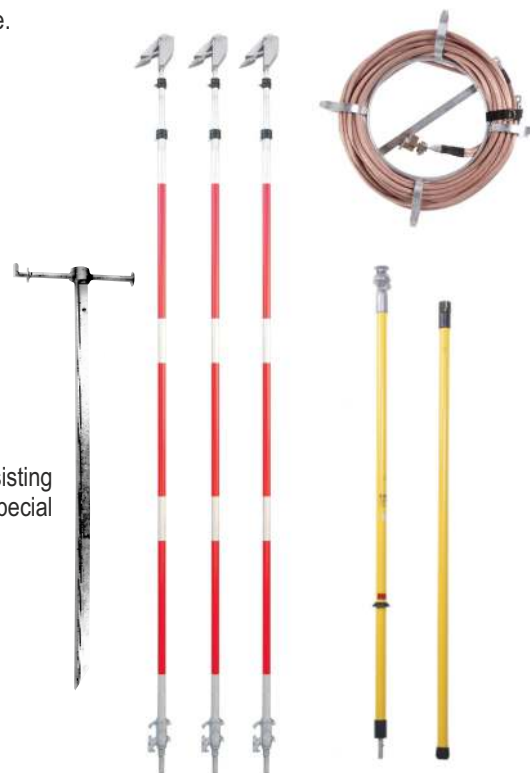
- Metallic telescopic stick with self-locking clamp – 3 pieces
- Insulating stick with two modules – 1 piece
- Metallic drum for the transportation of earthing cables – 1 piece
- Earthing cable, $l=10\text{ m}$; $S=35\text{ mm}^2$ – 3 pieces
- Earthing clamp – 1 piece
- Mobile earthing rod – 1 piece

Packing: waterproof bag

Tips: the absence of voltage on overhead conductors is checked using the subassembly consisting of the self-locking clamp - metallic telescopic stick, with a medium voltage detector fixed in the special part at the end of the insulating stick, consisting of two modules. The voltage detector is not included in the product set.

SR EN 61230 SR EN 61235 R

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SELF-LOCKING CLAMP



COUPLING DETAIL OF THE INSULATING STICK AND THE METALLIC STICK



DETAIL OF THE DETECTOR FIXING IN THE SPECIAL PART AT THE END OF THE INSULATING STICK

Technical characteristics

Earthing cable cross-section / length (mm ² /m)	35 / 10
Nominal short-circuit current for $t = 1\text{ s}$ I_{sc} (kA)	8
Shock (peak) nominal current for $t = 0,02\text{ s}$ I_{sd} (kA)	20
Test short-circuit current for $t = 1\text{ s}$ (kA)	9,2
Test shock (peak) current for $t = 0,02\text{ s}$ (kA)	23
Power factor (according to SR EN 61230)	2,5
Length of the telescopic metallic stick - folded / extended (m)	2,45 / 6,35
Total length of the insulating stick consisting of two modules (m)	3,42
Diameter of the conductor where the phase clamp can be applied (mm)	4 ÷ 22



Three-phase short-circuiting device for MV overhead lines - application from the ground or height - CAA clamp

Code: Msp - CAA - U - 2xS_f/I_f - S_p/I_p - O/p

Application: from the ground or from height, by hanging the self-locking clamps (CAA) on the conductor, followed by the pulling down the clamp, which is automatically removed from the clamp applicator.

Automatic self-locking clamps (CAA) must be handled with an appropriate insulating stick for the installation and mounting position.

The following sequence of operations shall be observed:

1. Using the earthing subassembly, one conductor of the line is earthed,
2. Using the short-circuiting subassembly, the three conductors of the line are short-circuited, starting with the conductor earthed in the previous operation.

Components:

- **Short-circuiting subassembly** for 3 overhead conductors consisting of:

- ▶ Automatic self-locking clamp (CAA) - 3 pieces
- ▶ Short-circuiting cable - 2 pieces

- **Earthing subassembly** consisting of:

- ▶ Automatic self-locking clamp (CAA) - 1 piece
- ▶ Earthing cable - 1 piece
- ▶ Earthing clamp - 1 piece

- **Clamp applicator** (PAS/E or PAS/C) - 1 piece

- **Removal fork** (CDAU/E or CDAU/C) - 1 piece

- **Mobile earthing rod** - 1 piece

Packing: waterproof bag

Related products:

- Multipurpose modular insulating stick type **PMU 20-1 B/ba** or **PMU 20-1 B/baS** (for application from height), provided with "RO bayonet" coupling system (see page 10)
- Multipurpose telescopic insulating stick type **PTU 20-35 F**, **PTU 20-110 F** or **PTU 20-45-110 C** for application from height), provided with "hexagon 12" coupling system (see page 11)
- Multipurpose telescopic insulating stick type **PTU-AS-400-6-c** (for application from the ground), provided with "hexagon 12" coupling system (see page 11)

Tips: coupling ends of the clamp applicator / removal fork must be selected to be adapted to the coupling system of the insulating stick.

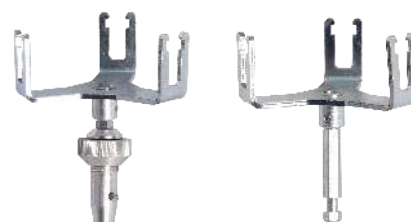
SR EN 61230



SHORT-CIRCUITING SUBASSEMBLY



EARTHING SUBASSEMBLY



CLAMP APPLICATORS

PAS/E

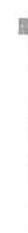
PAS/C



REMOVAL FORKS

CDAU/E

CDAU/C



MOBILE EARTHING ROD

Technical characteristics

Short-circuiting and earthing cable cross-section S _f , S _p (mm ²)	16	25	35
Nominal short-circuit current for t = 1 s I _{sc} (kA)	4	6,25	8
Shock (peak) nominal current for t = 0,02 s I _{sd} (kA)	10	15,63	20
Test short-circuit current for t = 1 s (kA)	4,6	7,2	9,2
Test shock (peak) current for t = 0,02 s (kA)	11,5	17,97	23
Power factor (according to SR EN 61230)	2,5		
Short-circuiting cable length I _f (m)	max. 4		
Earthing cable length I _p (m)	max. 17,5		
Diameter of the conductor where the CAA clamp can be applied (mm)	5 ÷ 32		



Three-phase short-circuiting device for MV overhead lines - application from the ground - CAA clamp

SR EN 61230

Code: Msp - CAA - AS - 3xS_p/I_p - O/p

Application: from the ground, by the successive lifting of each clamp, hanging of the automatic self-locking clamp (CAA) on the conductor, followed by the pulling down of the clamp, automatically detached from the mounting adapter.

Considering the weight of the phase clamp, connected to the earthing conductor and the positioning of the overhead conductors at approx. 9 m from the ground, the application of clamps with the 9 m multipurpose telescopic insulating stick type **PTU-AS-400-6-c** is difficult to be performed in bad weather conditions.

In order to facilitate the application of clamps on overhead conductors, it is recommended to use the **pulley system for the lifting of the short-circuiting clamps from the ground (see page 51)**.

Components:

- Self-locking automatic clamp (CAA) – 3 pieces
- Earthing cable – 3 pieces
- Earthing clamp – 1 piece
- Mounting adaptor (AM/C) – 1 piece
- Removal hook (CDA/C) – 1 piece
- Mobile earthing rod – 1 piece

Packing: waterproof bag

Related products:

- Multipurpose telescopic insulating stick type **PTU-AS-400-6-c**, provided with "hexagon 12" coupling system (see page 11)



MOUNTING ADAPTOR
AM/C



REMOVAL
HOOK
CDA/C



MOBILE EARTHING ROD

Technical characteristics

Earthing cable cross-section S _p (mm ²)	16	25	35	50	70
Nominal short-circuit for t = 1 s I _{sc} (kA)	4	6,25	8	12	16
Shock (peak) nominal current for t = 0,02 s I _{sd} (kA)	10	15,63	20	30	40
Test short-circuit current for t = 1 s (kA)	4,6	7,2	9,2	13,8	18,4
Test (shock) peak current for t = 0,02 s (kA)	11,5	17,97	23	34,5	46
Power factor (according SR EN 61230)	2,5				
Earthing cable length I _p (m)	max. 17,5				
Diameter of the conductor where the phase clamp can be applied (mm)	5 ÷ 32		6 ÷ 32		



MEDIUM VOLTAGE OVERHEAD LINES

Three-phase short-circuiting device for MV overhead lines - application from height - CAA clamp

SR EN 61230

Code: Msp - CAA - AST - 3xS_r/I_r - S_p/I_p - O/p

Application: from height, by hanging the automatic self-locking clamp (CAA) on the conductor, followed by pulling down the clamp.

Self-locking automatic clamps (CAA) must be handled with an appropriate insulating stick for the installation and mounting position.

According to the selected type of mounting piece, CAA automatic clamps can be applied **simultaneously** (using the clamp applicator) or **successively** (using the mounting adaptor).

Components:

- Self-locking automatic clamp (CAA) – 3 pieces
- Short-circuiting cable – 3 pieces
- Earthing cable – 1 piece
- Earthing clamp – 1 piece
- Clamp applicator (PAS/E or PAS/C) or mounting adaptor (AM/E or EM/C) – 1 piece
- Removal hook (CDA/E or CDA/C) – 1 piece
- Mobile earthing rod – 1 piece

Packing: waterproof bag

Related products:

- Multipurpose modular insulating stick type **PMU 20-1 B/ba** or **PMU 20-1 B/ba**, provided with “**RO bayonet**” coupling system (see page 10)
- Multipurpose telescopic insulating stick type **PTU 20-35 F**, **PTU 20-110 F** or **PTU 20-45-110 C**, provided with “**hexagon 12**” coupling system (see page 11)

Tips: the coupling ends of the applicator / adaptor / removal hook must be selected so that they can be adapted to the coupling system of the insulating stick.



CLAMP APPLICATOR
PAS/E



PAS/C



MOUNTING ADAPTOR
AM/E



AM/C



REMOVAL HOOKS
CDA/E CDA/C

General technical characteristics for three-phase short-circuiting MV OHL devices - application from height

Short-circuiting and earthing cable cross-section S _r , S _p (mm ²)	16	25	35	50	70	95
Nominal short-circuit current for t = 1 s I _{sc} (kA)	4	6,25	8	12	16	18
Shock (peak) nominal current for t = 0,02 s I _{sd} (kA)	10	15,63	20	30	40	50
Test short-circuit current for t = 1 s (kA)	4,6	7,2	9,2	13,8	18,4	20,7
Test shock (peak) current t = 0,02 s (kA)	11,5	17,97	23	34,5	46	51,75
Power factor (according to SR EN 61230)	2,5					
Short-circuiting cable length I _r (m)	max. 2,5					
Earthing cable length I _p (m)	max. 15					
Diameter of the conductor where the phase clamp can be applied (mm)	5 ÷ 32		6 ÷ 32			



Three-phase short-circuiting device for MV overhead lines - application from height - CAA clamp with handling stick

Code: Msp - CAA - AST - 3xS_r/I_r - S_p/I_p - O/p - E (ENEL model)

Msp - CAA - AST - 3xS_r/I_r - S_p/I_p - O/p - T

Application: from height, by hanging the automatic self-locking clamp (CAA) on the conductor, followed by pulling down the clamp.

Self-locking automatic clamps (CAA) are attached without any dismantling options on the end of insulating handling sticks, appropriate to the installation and the mounting position.

Components:

- Self-locking automatic clamp (CAA) with handling stick – 3 pieces
- Short-circuiting cable – 3 pieces
- Earthing cable – 1 piece
- Earthing clamp – 1 piece
- Mobile earthing rod – 1 piece

Handling stick type:

- ✓ single module (version E)
- ✓ telescopic with two sections (version T)

Packing:

Dimensions of metallic boxes used for the packing of short-circuiting devices:

1830 x 300 x 160 mm – for the version with single module handling sticks

1030 x 300 x 160 mm – for the version with telescopic handling sticks (lower volume for transport)

SR EN 61230



THREE-PHASE SHORT-CIRCUITING DEVICE
WITH SINGLE MODULE HANDLING STICK
(VERSION E)



DETAIL OF CAA CLAMP FIXING
IN THE HANDLING STICK



THREE-PHASE SHORT-CIRCUITING DEVICE
WITH TELESCOPIC HANDLING STICK
(VERSION T)

Technical characteristics	Single module handling stick	Telescopic handling stick
Total length L _t (m)	1,6	1,55
Working length L _w (m)	0,8	1,14
Transport length (m)	1,6	0,95

General technical characteristics for three-phase short-circuiting MV OHL devices - CAA clamp fixed in the stick

Short-circuiting and earthing cable cross-section S _r , S _p (mm ²)	16	25	35	50	70	95
Nominal short-circuit current for t = 1 s I _{sc} (kA)	4	6,25	8	12	16	18
Shock (peak) nominal current for t = 0,02 s I _{sd} (kA)	10	15,63	20	30	40	50
Test short-circuit current for t = 1 s (kA)	4,6	7,2	9,2	13,8	18,4	20,7
Test shock (peak) current t = 0,02 s (kA)	11,5	17,97	23	34,5	46	51,75
Power factor (according to SR EN 61230)	2,5					
Short-circuiting cable length I _r (m)	max. 2,5					
Earthing cable length I _p (m)	max. 15					
Diameter of the conductor where the phase clamp can be applied (mm)	5 ÷ 32			6 ÷ 32		



HIGH VOLTAGE OVERHEAD LINES

Single-phase short-circuiting device for HV overhead lines - CAA clamp

SR EN 61230

Code: Msp CAA - S_p / I_p - O/p (earthing clamp)Msp CAA - S_p / I_p - O/pr (earthing clamp with scraping jaw)

Two application methods depending on the operator's positioning compared to the conductor:

- ✓ By hanging the clamp on the conductor followed by pulling down (if the operator is positioned under the conductor),
- ✓ By pushing and pressing the clamp on the conductor (if the operator is positioned above the conductor).

Components:

- Self-locking automatic clamp – 1 piece
- Earthing cable – 1 piece
- Earthing clamp – 1 piece
- Mounting - dismounting adaptor (AMD/E) – 1 piece / set of 3 short-circuiting devices

Packing: waterproof bag

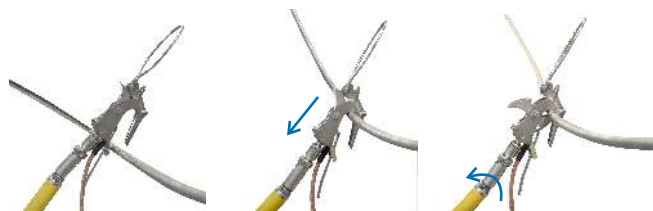
Related products:

- Multipurpose modular insulating stick type PMU 110-2 B/ba / PMU 220-2 B/ba / PMU 400-3 B/ba (see page 10)

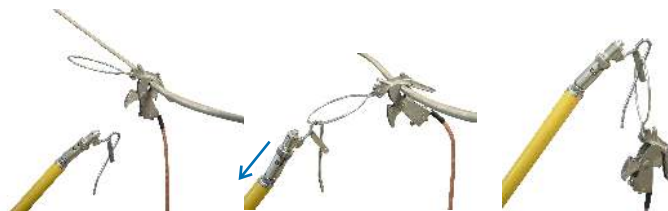
Tips: we recommend the use of earthing clamps with scraping jaw (code CLPBR-12 or CLPBR-16 - see page 28) to clean and remove layers of oxides, dirt and protective paint from the metallic brackets of overhead line poles, in order to obtain appropriate contact resistance.



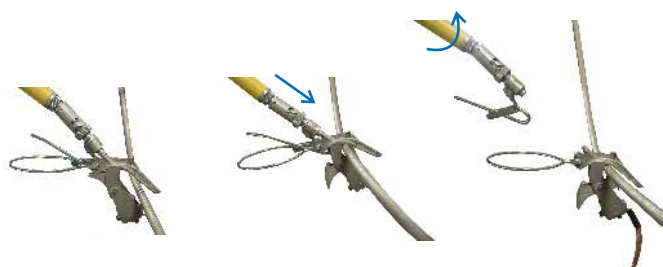
MOUNTING - DISMOUNTING ADAPTOR - AMD-E



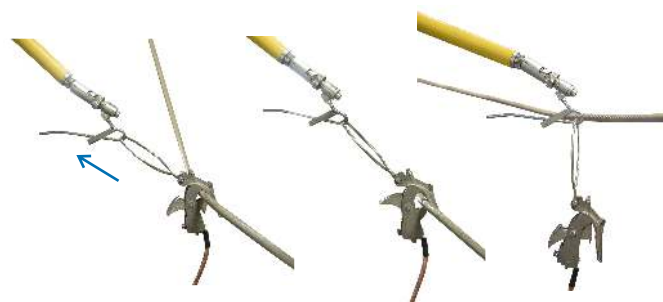
CLAMP APPLICATION - OPERATOR UNDER CONDUCTOR



DISMOUNTING OF CLAMP



CLAMP APPLICATION - OPERATOR ABOVE THE CONDUCTOR



DISMOUNTING OF CLAMP

Technical characteristics

Earthing cable cross-section S_p (mm ²)	16	25	35	50	70	95
Nominal short-circuit current for $t = 1$ s I_{sc} (kA)	4	6,25	8	12	16	18
Shock (peak) nominal current for $t = 0,02$ s I_{sd} (kA)	10	15,63	20	30	40	45
Test short-circuit current for $t = 1$ s (kA)	4,6	7,2	9,2	13,8	18,4	20,7
Test shock (peak) current for $t = 0,02$ s (kA)	11,5	17,97	23	34,5	46	51,75
Power factor (according to SR EN 61230)	2,5					
Earthing cable length l_p (m)	max. 17,5					
Diameter of the conductor where the phase clamp can be applied (mm)	5 ÷ 32			6 ÷ 32		



Single-phase / three-phase short-circuiting device for rectangular section bars

SR EN 61230



Code: Msp - C - S_p/I_p - P/p
Msp - CA - S_p/I_p - P/p

Msp - C - $3 \times S_p/I_p$ - S_p/I_p - P/p
Msp - CA - $3 \times S_p/I_p$ - S_p/I_p - P/p

Application: by mounting the phase clamps on the rectangular section bar, followed by the tightening of the clamp driving screw.

Classic / automatic phase clamps must be handled using an insulating stick according to the voltage of the installation, provided with "RO bayonet" coupling system.

Constructive shapes: *single-phase* or *three-phase*

Constructive types of phase clamps:

- ✓ Classic clamp (C)
- ✓ Automatic clamp (CA)

Components:

● **Single-phase short-circuiting device** consisting of:

- ▶ Phase clamp - 1 piece
- ▶ Earthing cable - 1 piece
- ▶ Earthing clamp - 1 piece

● **Three-phase short-circuiting device** consisting of:

- ▶ Phase clamp - 3 pieces
- ▶ Short-circuiting cable - 3 pieces
- ▶ Earthing cable - 1 piece
- ▶ Earthing clamp - 1 piece

Packing: waterproof bag

Related products:

- Multipurpose modular insulating stick type PMU 20-1 B/ba / PMU 110-2 B/ba (see page 10)



General technical characteristics of short-circuiting devices applicable on rectangular section bars

Earthing cable cross-section S_p (mm ²)	16	25	35	50	70	95	120
Nominal short-circuit current for $t = 1$ s I_{sc} (kA)	4	6,25	8,75	12,5	17,5	23,75	30
Shock (peak) nominal current for $t = 0,02$ s I_{sd} (kA)	10	15,63	21,9	31,25	43,75	59,38	75
Test short-circuit current for $t = 1$ s (kA)	4,6	7,2	10,06	14,38	20,13	27,31	34,5
Test (shock) current for $t = 0,02$ s (kA)	11,5	17,97	25,16	35,94	50,31	68,3	86,25
Power factor (according to SR EN 61230)	2,5						

Phase clamp type	Classic clamp (C)	Automatic clamp (CA)
Short-circuiting cable length - three-phase short-circuiting device l_f (m)	max. 1,5	max. 1,5
Earthing cable length - single-phase / three-phase short-circuiting device l_p (m)	max. 8,5 / max. 7	max. 8,5 / max. 7
Thickness of the flat bar where the phase clamp can be mounted g (mm)	max. 40	max. 37



CLASSIC CLAMP
(C)



AUTOMATIC CLAMP
(CA)



Single-phase short-circuiting device for round section conductors

SR EN 61230



Code: Msp - Cr - S_p/I_p - O/p
Msp - CA - S_p/I_p - O/P

Application: from the ground, by hanging the phase clamp on the round section conductor, followed by the tightening of the clamp driving screw.
Classic / automatic phase clamps must be handled using an insulating stick according to the voltage of the installation, provided with “RO bayonet” coupling system.

Constructive phase clamps:
✓ Classic reduced clamp (Cr)
✓ Automatic clamp (CA)

Components:

- Phase clamp - 1 piece
- Earthing cable – 1 piece
- Earthing clamp – 1 piece

Packing: waterproof bag

Related products:

- Multipurpose modular insulating stick type PMU 110-2 B/ba / PMU 220-2 B/ba / PMU 400-3 B/ba (see page 10)

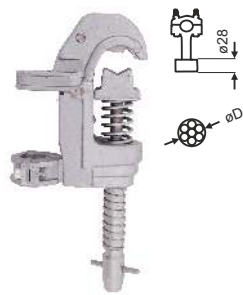


General technical characteristics of short-circuiting devices applicable on round section conductors							
Earthing cable cross-section S_p (mm ²)	16	25	35	50	70	95	120
Nominal short-circuit current for $t = 1$ s I_{sc} (kA)	4	6,25	8,75	12,5	17,5	23,75	30
Shock (peak) nominal current for $t = 0,02$ s I_{sd} (kA)	10	15,63	21,9	31,25	43,75	59,38	75
Test short-circuit current for $t = 1$ s (kA)	4,6	7,2	10,06	14,38	20,13	27,31	34,5
Test shock (peak) current for $t = 0,02$ s (kA)	11,5	17,97	25,16	35,94	50,31	68,3	86,25
Power factor (according to SR EN 61230)	2,5						

Phase clamp type	Classic reduced clamp (Cr)	Automatic clamp (CA)
Diameter of the conductor where the phase clamp can be applied $\varnothing D$ (mm)	17 ÷ 32	17 ÷ 32
Maximum length of the earthing cable l_p (m)		
- cable with a cross-section of 16 to 70 mm ²	17,5	17,5
- cable with a cross-section of 95 or 120 mm ²	10	8



CLASSIC REDUCED CLAMP (Cr)



AUTOMATIC CLAMP (CA)



Single-phase / three-phase short-circuiting device for conductors of various shapes - lightweight universal classic clamps

SR EN 61230

Code: Msp - CCRU/E - S_p/I_p - S/O/P/p Msp - CCRU/E - $3 \times S_f/I_f$ - S_p/I_p - S/P/p
Msp - CCNU/E - S_p/I_p - S/O/P/p Msp - CCNU/E - $3 \times S_f/I_f$ - S_p/I_p - S/P/p

Application: from the ground, by mounting the phase clamp on the conductor, followed by the tightening of the clamp driving screw.

Lightweight universal classic phase clamps must be handled using an insulating stick according to the voltage of the installation, provided with “**RO bayonet**” coupling system.

Constructive shapes : single-phase or three-phase

Constructive types of phase clamps:

- ✓ Universal Classic Reduced Clamp (CCRU/E)
- ✓ Universal Classic Normal Clamp (CCNU/E)

Components:

● **Single-phase short-circuiting device** consisting of:

- ▶ Phase clamp - 1 piece
- ▶ Earthing cable - 1 piece
- ▶ Earthing clamp - 1 piece

● **Three-phase short-circuiting device** consisting of:

- ▶ Phase clamp - 3 pieces
- ▶ Short-circuiting cable - 3 pieces
- ▶ Earthing cable - 1 piece
- ▶ Earthing clamp - 1 piece

Packing: waterproof bag

Related products:

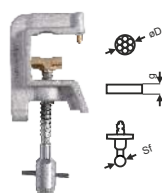
- Multipurpose modular insulating stick type **PMU 20-1 B/ba** (see page 10)



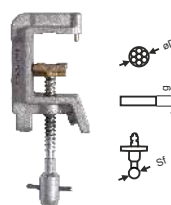
General technical characteristics of short-circuiting devices with phase clamp types CCRU/E and CCNU/E

Phase clamp type	CCRU/E or CCNU/E				CCNU/E	
Earthing cable cross-section S_p (mm ²)	16	25	35	50	70	95
Nominal short-circuit current for $t = 1$ s I_{sc} (kA)	4	6,25	8,75	12,5	17,5	23,75
Shock (peak) nominal current for $t = 0,02$ s I_{sd} (kA)	10	15,63	21,9	31,25	43,75	59,38
Test short-circuit current for $t = 1$ s (kA)	4,6	7,2	10,06	14,38	20,13	27,31
Test shock (peak) current for $t = 0,02$ s (kA)	11,5	17,97	25,16	35,94	50,31	68,3
Power factor (according to SR EN 61230)	2,5					

Phase clamp type	Universal classic reduced clamp (CCRU/E)	Universal classic normal clamp (CCNU/E)
Short-circuiting cable length l_r - three-phase short-circuiting device (m)	max. 2,5	max. 2,5
Earthing cable length l_p - single-phase / three-phase short-circuiting device (m)	max. 10 / max. 7,5	max. 10 / max. 7,5
Thickness of the flat bar where the phase clamp can be mounted g (mm)	max. 30	max. 45
Diameter of the sphere-type coupling part S_f (mm)	20 / 25	20 / 25
Diameter of the conductor where the phase clamp can be applied $\varnothing D$ (mm)	4 ÷ 30	4 ÷ 36



UNIVERSAL CLASSIC
REDUCED CLAMP (CCRU/E)



UNIVERSAL CLASSIC
NORMAL CLAMP (CCNU/E)



Single-phase / three-phase short-circuiting device for conductors of various shapes - universal clamps

SR EN 61230



Code: Msp - CCU - S_p/I_p - S/O/P/p Msp - CCU - $3xS_p/I_f$ - S_p/I_p - S/P/p
 Msp - CAU - S_p/I_p - S/O/P/p Msp - CAU - $3xS_p/I_f$ - S_p/I_p - S/P/p
 Msp - CARU - S_p/I_p - S/O/P/p Msp - CARU - $3xS_p/I_f$ - S_p/I_p - S/P/p

Application: from the ground, by mounting the phase clamp on the conductor, followed by the tightening of the clamp driving screw.

Classic / automatic phase clamps must be handled using an insulating stick according to the voltage of the installation, provided with "RO bayonet" coupling system.

Constructive shapes : *single-phase* or *three-phase*

Constructive types of phase clamps:

- ✓ Universal Classic Clamp (CCU)
- ✓ Universal Automatic Clamp (CAU)
- ✓ Universal Automatic Rapid Clamp (CARU)

Components:

● **Single-phase short-circuiting device** consists of:

- ▶ Phase clamp - 1 piece
- ▶ Earthing cable - 1 piece
- ▶ Earthing clamp - 1 piece

● **Three-phase short-circuiting device** consists of:

- ▶ Phase clamp - 3 pieces
- ▶ Short-circuiting cable - 3 pieces
- ▶ Earthing cable - 1 piece
- ▶ Earthing clamp - 1 piece

Packing: waterproof bag

Related products:

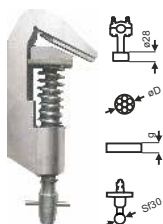
- Multipurpose modular insulating stick type PMU 20-1 B/ba / PMU 110-2 B/ba / PMU 220-2-B/ba / PMU 400-3-B/ba (see page 10)



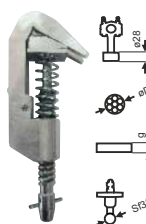
General technical characteristics of short-circuiting devices with phase clamps types CCU, CAU and CARU

Earthing cable cross-section S_p (mm ²)	16	25	35	50	70	95	120
Nominal short-circuit current for $t = 1$ s I_{sc} (kA)	4	6,25	8,75	12,5	17,5	23,75	30
Shock (peak) nominal current for $t = 0,02$ s I_{sd} (kA)	10	15,63	21,9	31,25	43,75	59,38	75
Test short-circuit current for $t = 1$ s (kA)	4,6	7,2	10,06	14,38	20,13	27,31	34,5
Test shock (peak) current for $t = 0,02$ s (kA)	11,5	17,97	25,16	35,94	50,31	68,3	86,25
Power factor (according to SR EN 61230)	2,5						

Phase clamp type	Universal classic clamp (CCU)	Universal automatic clamp (CAU)	Universal automatic rapid clamp (CARU)
Short-circuiting cable length - three-phase short-circuiting device l_f (m)	max. 1,5	max. 1,5	max. 1,5
Earthing cable length - single-phase / three-phase short-circuiting device l_p (m)	max. 10 / max. 8,5	max. 10 / max. 8,5	max. 10 / max. 8,5
Thickness of the flat bar where the phase clamp can be mounted g (mm)	max. 40	max. 37	max. 40
Diameter of the sphere-type coupling part S_f (mm)	30	30	30
Diameter of the conductor where the phase clamp can be applied $\varnothing D$ (mm)	9 ÷ 32	9 ÷ 32	9 ÷ 32



UNIVERSAL CLASSIC CLAMP (CCU)



UNIVERSAL AUTOMATIC CLAMP (CAU)



UNIVERSAL AUTOMATIC RAPID CLAMP (CARU)



Three-phase short-circuiting device for plug-in connectors

Code: Msp - KA - 3x50/I_i - 50/I_p - K/p

Intended use: earthing of power cables provided with 250 A plug-in connectors.

Application: manual, by the insertion of the phase clamp of the short-circuiting device in the plug-in connectors of the power installation.

Components:

- KA phase clamp – 3 pieces
- Short-circuiting cable – 3 pieces
- Earthing cable – 1 piece
- Earthing clamp – 1 piece

Packing: waterproof bag

Related products:

- Fuse extractor with protective sleeve for HRC fuses- code MMPS/1-MPR (see page 1)

SR EN 61230



KA PHASE CLAMP

Technical characteristics

Connection interface type according to SR EN 50181	A
Short-circuiting and earthing cable cross-section (mm ²)	50
Nominal short-circuiting current for $t = 1 \text{ s } I_{sc}$ (kA)	10
Nominal shock (peak) current for $t = 0,02 \text{ s } I_{sd}$ (kA)	25
Short-circuiting cable length l_i (m)	max. 1,5
Earthing cable length l_p (m)	max. 7

Three-phase short-circuiting device for power cables with "T" protective sleeve in MV substations

Code: Msp - 3x35/I_i - 35/I_p - F/p

Application: manual, with appropriate tools, **coupling adaptors** are fixed on the existing terminals in the "T" protective sleeves and the **coupling plugs** are inserted in these adaptors.

Components:

- Coupling adaptors - 3 pieces
- Coupling plugs - 3 pieces
- Short-circuiting cable - 2 pieces
- Earthing cable - 1 piece
- Earthing clamp - 1 piece

Packing: waterproof bag

SR EN 61230



Technical characteristics

Connection interface type according to SR EN 50181	A
Short-circuiting and earthing cable cross-section (mm ²)	35
Nominal short-circuiting current for $t = 1 \text{ s } I_{sc}$ (kA)	8
Nominal shock (peak) current for $t = 0,02 \text{ s } I_{sd}$ (kA)	16
Short-circuiting cable length l_i (m)	max. 1
Earthing cable length l_p (m)	max. 15



RAILWAYS

Single-phase short-circuiting device for the railway contact line

SR EN 61230

Code: Msp - CrTf - S_p/I_p - Fc/ps

Application: from the ground, by hanging the clamp on the contact line, followed by tightening the clamp driving screw.

The classic CrTf phase clamp must be handled with an insulating stick according to the voltage of the installation.

Components:

- Classic reduced clamp for railway transportation (CrTf) for connection to the contact line - 1 piece
- Earthing cable – 1 piece
- Earthing clamp for the connection to the rail (CLPS) – 1 piece

Packing: waterproof bag

Tips: considering the positioning of the contact line, for the application of the phase clamp to the contact line we recommend the use of:

- Multipurpose modular insulating sticks PMU 400-3 B/ba (see page 10) or
- Multipurpose telescopic insulating sticks PTU AS-400-4-C - 6 m long (see page 11) + hexagon-bayonet adaptor ACOMIT/C (see page 14)



Technical characteristics	Railway					Subway
Earthing cable cross-section S _p (mm ²)	16	25	35	50	70	120
Nominal short-circuit current for t = 1 s I _{sc} (kA)	4	6,25	8,75	12,5	16	30
Shock (peak) nominal current for t = 0,02 s I _{sd} (kA)	10	15,63	21,9	31,25	40	60
Test short-circuit current for t = 1 s (kA)	4,6	7,2	10,06	14,38	18,4	34,5
Test shock (peak) current for t = 0,02 s (kA)	11,5	17,97	25,16	35,94	46	69
Power factor (according to SR EN 61230)	2,5					2
Earthing cable length I _p (m)	max. 16					1,5
Diameter of the conductor where the phase clamp can be applied (mm)	6 ÷ 32					Rail type 40
Type of rails	40, 49, 60, R65					40, 49, 60, R65

Single-phase short-circuiting device for the third rail of the subway

SR EN 61230



Code: Msp - CM - 120/1,5 - S3/ps

Application: from the ground, by positioning the phase clamp on the third rail, followed by the tightening of the clamp on it. The phase clamp must be handled using an insulating stick corresponding to the voltage of the installation.

Components:

- Special clamp for the third rail – 1 piece
- Earthing cable – 1 piece
- Earthing clamp for the connection to the rail (CLPS) – 1 piece
- Bayonet-hook adaptor (AF E-K) – 1 piece (see page 13)

Packing: waterproof bag

Related products:

- Multipurpose modular insulating stick type PMU 20-1 B/ba / PMU 20-1 B/baS (see page 10)

Technical characteristics: see the table above (last column - Subway)



AF E-K



Three-phase short-circuiting device for 0,4 / 6 kV electric motors

SR EN 61230

Code: Msp - M - 3xS_p/I_t - S_p/I_p - S/p

Intended use: earthing of electrical motors terminal or of their power supply cables.

Application: manual, in two ways:

- ✓ by applying the phase terminals of short-circuiting devices to the supply cable lugs of motors,
- ✓ directly to the cable terminals of motor supply cables.

Components:

- Phase terminal – 3 pieces
- Fasteners (screws, Grower washers, nuts) – 3 sets
- Short-circuiting cable – 3 pieces
- Earthing cable – 1 piece
- Earthing clamp – 1 piece

Packing: waterproof bag


Technical characteristics

Short-circuiting and earthing cable cross-section S _r , S _p (mm ²)	16	25	35	50	70	95	120
Nominal short-circuit current for t = 1 s I _{sc} (kA)	4	6,25	8,75	12,5	17,5	23,75	30
Shock (peak) nominal current for t = 0,02 s I _{sd} (kA)	10	15,63	21,9	31,25	43,75	59,38	75
Test short-circuit current for t = 1 s (kA)	4,6	7,2	10,06	14,38	20,13	27,31	34,5
Test shock (peak) current for t = 0,02 s (kA)	11,5	17,97	25,16	35,94	50,31	68,3	86,25
Power factor (according for SR EN 61230)	2,5						
Short-circuiting cable length l _r / earthing cable length l _p (m)	max. 2,5 / max. 7						
Preferential dimension of fasteners	M8	M8	M10	M10	M10	M12	M12
Optional dimensions of fasteners (mm)	M10	M10	M8 M12	M8 M12	M8 M12	M10 M16	M10 M16

Upon the customer's demand, we manufacture earthing cables for various industrial installations or for railway or vehicles from multicore copper, highly flexible, class VI, according to SR EN 60228, protected with an insulating coating made of transparent plastic, extruded directly on the multicore conductor, as per SR EN 61138, provided at the ends with tinned copper terminals, fasteners and, if required, earthing clamps or mobile earthing rods.



ACCESSORIES

Voltage connectors - type COT 10-95 A - for LV ABC conductors

Code: COT 10-95 A

Intended use: by permanent mounting on LV Aerial Bundle Cables (ABC), for short-circuiting and earthing devices.

Application: from height, without de-energising the line, using specialised insulating tools.

Components:

- Branch terminal ENSTO - SL 11.118 – 1 piece
- Connection subassembly – 1 piece

SR EN 61230

**Technical characteristics**

Nominal voltage U_n (kV)	max. 1
Sections of insulated conductors where voltage connectors can be mounted S_c (mm ²)	10; 16; 25; 35; 50; 50 OI+AI; 70; 95
Nominal short-circuiting current for $t = 1$ s I_{sc} (kA)	8
Nominal shock (peak) current for $t = 0,02$ s I_{sd} (kA)	16
Short-circuit test current for $t = 1$ s (kA)	9,2
Shock (peak) test current for $t = 0,02$ s (kA)	18,4
Power factor (according to SR EN 61230)	2
Dielectric resistance of the housing (kV/1 min)	5,25
Housing type	Sealed and ventilated
Housing material	High density polyethylene (PEHD)
Contact element material	Aluminium alloy
Fitting material	Stainless steel
Tightening methods	With torque indicator handle wrench
Torque value	26 Nm
Protection against corrosion and oxidation (contact Al/Cu)	Contact elements: neutral tinning and vaseline with 120 °C dropping point. Fasteners: stainless steel
Measurements for the compensation of the cold leakage of the aluminium conductor	Two stainless steel elastic elements that provide a constant torque in time
Minimum permitted temperature for installation (°C)	-20
Operating temperature range (°C)	-25...+55

Coupling adaptor to DPS connectors

SR EN 61230



Code: P 2295

Intended use: temporary connection at the coupling plugs of the short-circuiting devices applied on LV ABC conductors, equipped with DPS connectors.

Application: manual, without any additional tools.

Related products:

- Universal poly-phase short-circuiting device for LV overhead lines (aerial bundle cables (ABC) and bare conductors) (see page 29)
- Poly-phase short-circuiting device for LV Aerial Bundle Cables (ABC) (see page 32)

**Technical characteristics**

Nominal operating voltage U_n (kV)	max. 1
Nominal short-circuiting current for $t = 1$ s I_{sc} (kA)	6
Nominal shock (peak) current for $t = 0,02$ s I_{sd} (kA)	12
Test short-circuit current for $t = 1$ s (kA)	6,9
Test shock (peak) current for $t = 0,02$ s (kA)	13,80
Power factor (according to SR EN 61230)	2



“T” type fixed points

Intended use: achievement of permanent fixed points for the assembly of phase clamps of short-circuiting devices in HV / MV substations, on round section conductors for the improvement of mounting conditions for the short-circuiting devices.

Assembly method: manually, at height, with the de-energisation of the installation. The application is performed on flexible multicore conductors or round section rigid bars.

„T” fixed points types:

- ✓ „Tr” - for flexible multicore conductors - sections between 185 and 680 mm² (Ø19–36 mm)
- ✓ „T55” - for rigid round bars with a diameter of 55 mm
- ✓ „T80” - for rigid round bars with a diameter of 80 mm

Components:

- Body – 1 piece
- Cap – 1 piece
- Fittings – 2 sets

Type	“Tr” fixed points	“T” fixed points
Nominal short-circuiting current for $t = 1 \text{ s } I_{sc}$ (kA)	30	30
Nominal shock (peak) current for $t = 0,02 \text{ s } I_{sd}$ (kA)	75	75
Short-circuit test current for $t = 1 \text{ s}$ (kA)	34,5	-
Shock (peak) test current for $t = 0,02 \text{ s}$ (kA)	86,25	-
Nominal value of the peak factor	2,5	-
Nominal diameters of multicore flexible conductors ØD (mm)	19 - 36	-
Cross-section of multicore flexible conductors (mm ²)	185 - 680	-
Nominal diameters of rigid round bars ØD (mm)	-	55; 80

SR EN 61230



“Tr” FIXED POINT



“T55” / “T80” FIXED POINT

Spherical pieces (Ball studs)

Code: P 2180 M x L

Intended use: achievement of permanent spherical fixed points for the mounting of phase clamps for short-circuiting devices in high / medium voltage power substations.

Application: manual, performed on flat bars, packets of bus bars of various thicknesses, with the de-energisation of the installation.

Types of spherical parts - 3 types (with various forms: straight or inclined):

- ✓ Sphere Ø30 mm
- ✓ Sphere Ø25 mm
- ✓ Sphere Ø20 mm

Components:

- Spherical coupling part - 1 piece
- Fittings - 1 set (with sizes as per the customer's demands)

Tips: these spherical pieces (Ball studs) must replace bar assembly screws.

SR EN 61230



COUPLING DETAIL

Technical characteristics			
Sphere diameter (mm)	20	25	30
Nominal short-circuiting current for $t = 1 \text{ s } I_{sc}$ (kA)	19	23,75	30
Nominal shock (peak) current for $t = 0,02 \text{ s } I_{sd}$ (kA)	47,5	59,38	75
Stud thread dimension	M12	M12	M12; M14; M16
Free length of the stud rod - on demand (mm)	30; 40	30; 40	30; 40; 50; 60; 70; 80
Type of phase clamp which can be applied on this system	CCRU / CCNU	CCRU / CCNU	CCU / CAU / CARU



ACCESSORIES

Mobile earthing rods

Code: see table

Application: manual, by tapping into the ground with a sledge (hammer) or by twisting (exclusively for the “drill” type model).

Rod types:

- ✓ Hexagonal rod - code P2312
- ✓ „T” type rod with extraction handles - code P2163
- ✓ „T” type rod without extraction handles - code P2358
- ✓ „Drill” type rod with operating handles - code P2404

Tips: mobile earthing rods are made of steel profiles, protected against corrosion by hot dip galvanization.



MOBILE EARTHING ROD
P 2312



MOBILE EARTHING ROD
P 2163



MOBILE EARTHING ROD
P 2358



MOBILE EARTHING ROD
P 2404

Code	P 2312	P 2163	P 2358	P 2404
Length (mm)	1.150	1.200	1.200	1.200
Profile	Hexagon 18	“T” profile	“T” profile	“Drill” type
Weight (kg)	3,0	4,6	3,8	4,1

Device for the extraction of mobile earthing rods

Code: P 2342

Application: manual, by repeated actions. It can be used for „T” type hexagonal earthing rods or cross profile rods.

Components:

- Ground support subassembly – 1 piece
- Extraction subassembly – 1 piece
- Arm for manual operation – 1 piece

Tips: the device decreases the operator’s effort during the extraction of the rods from the ground.



Technical characteristics	
Overall dimensions (mm)	150 x 150 x 1.200
Weight (kg)	4,3



Pulley system for lifting from the ground the phase clamps, CAA type, of MV overhead line three-phase short-circuiting devices

Code: P 2322

Intended use: application from the ground of mobile three-phase short-circuiting devices code **Msp-CAA-AS-3xSp/lp-O/p** (see page 37) on MV overhead lines.

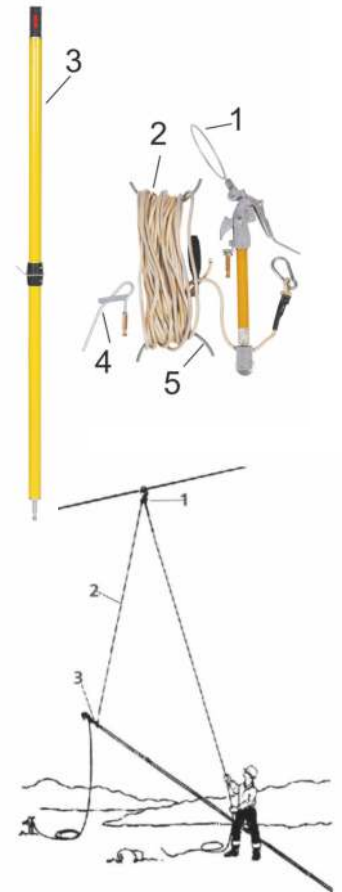
Directions of use: lifting and applying the phase clamps on overhead conductors as follows:

- the CAA type lifting clamp with pulley (1), mounted in stick extension piece (3), fixed in the coupling system of the telescopic insulating stick PTU-AS-400-6c, is lifted and applied beforehand on the highest phase of the MV overhead line,
- each phase clamp of the short-circuiting device is fixed successively in the stick extension piece (3), then, by pulling the lifting cord (2) (passed through the pulley of the lifting clamp (1)), the phase clamp, the earthing cable and the telescopic insulating stick are easily lifted at the necessary height for applying the phase clamp on the overhead line conductor.

The dismantling of phase clamps from the overhead line conductor is performed using the CDA/C dismantling hook (4), assembled directly in the coupling system of the telescopic insulating stick.

Components:

- CAA lifting clamp with pulley (1) – 1 piece
- Lifting cord (Ø 8 mm) (2) – 1 piece
- Stick extension piece (3) – 1 piece
- Dismantling hook CDA/C (4) – 1 piece
- Winding support for the lifting cord (5) – 1 piece



Technical characteristics

Maximum height of MV overhead lines (m)	11
Lifting cord length (m)	30
Weight (kg)	2,8

Brackets (racks) for the storage of short-circuiting devices and insulating sticks

Application: permanently fixed on wall

Brackets (racks) types:

- ✓ **With fixed format** - semicircular support for hanging the short-circuiting device and hooks for hanging the insulating sticks or other equipment packed in protective bag
- ✓ **With modular format** - aluminium rail (l = 0,75 m), where multiple hook or fork items can be placed (for the storage of insulating sticks, short-circuiting devices, etc.).







Equipment for working at height allows the access of workers in work areas located in high places, both in indoor and outdoor areas. The main equipment used for this purpose are ladders, platforms and scaffolds.

Ladders are manufactured in various constructive versions::

- ▶ modular
- ▶ extensible
- ▶ multipurpose (transformable)

Modular ladders consist of multiple connectable sections, made of aluminum profiles, which can be assembled in vertical position on the poles of electrical networks.

Extensible ladders consist of 2 - 4 sections, the ladder being extended by translating an upper section on top of a lower section. Extensible ladders are provided with self-locking mechanisms that prevent the slippage of sections during use and transportation, with guiding elements on each section, which allow the extension of the ladder.

Multipurpose ladders are improved versions of extensible ladders, meaning that they allow both the extension of the ladder as extensible ladders and the use of ladders in other configurations, in the form of a double ladder (type A or λ).

Considering the material of the rails and rungs, ladders can be divided in the following categories:

1. **Aluminium ladders**, made completely of aluminum profiles (both the rails and the rungs).
2. **Ladders with GRP rails** (glass reinforced plastic), with rungs and locking systems on the rails made of aluminium.
3. **Hybrid ladders**, where lower sections are made completely of aluminum profiles and the upper section with rails made of GRP (glass reinforced plastic) and aluminium rungs.

Extensible and multipurpose ladders given below are manufactured by European manufacturers:

1. KRAUSE (Germany) ladders - multipurpose, made of aluminium.

KRAUSE extensible ladders are manufactured according to EN 131-1.

The ladder rungs are manufactured ribbed profiles to provide enhanced safety during work.

In case of using the ladder as a double ladder (type A or λ), the usage of straps that prevent the opening of the ladder by the accidental slippage of sections is compulsory.

2. IRMUT (Italy) hybrid ladders - extensible.

IRMUT extensible hybrid ladders have the lower sections manufactured completely from aluminium profiles and the upper section manufactured with rails made of GRP (glass reinforced plastic) and aluminium rungs. Given the insulating rails, IRMUT ladders are recommended for works in electrical installations.

KRAUSE and IRMUT ladders can be provided with **ROMIND detachable anchoring and fixing devices that ensure the safe fixing of the ladder on the pole and the protection of the worker against falling from height during work on the ladder.**

The **equipment for working at height** has the main following functions:

- Allows access of operators at working areas at height (ladders, platforms, scaffolds);
- Ensures operator's safety during ascent/descent to/from works at height (hooks, anchoring supports and devices);
- Protects operators from falling from height (safety harnesses, lanyards, carabiners, etc.);
- Assures fall arrest and shock absorption during a fall (fall arresters, energy absorbers).

When working at a height (2 m from the ground or a reference base)* or when there is a risk of falling, workers must be provided with personal fall protective equipment.

Lack of proper equipment, misinterpretation of the importance of wearing the equipment, the use of inappropriate or worn-out equipment, incorrect use of equipment are also causes of accidental fall from a height.

* reference base - represents a place where integrated protection measures have been taken and where there is no danger of falling.



Aluminium multipurpose KRAUSE ladder - Tribilo type - 3 sections

SR EN 131

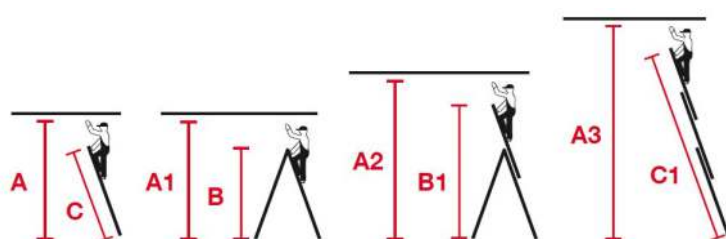
Code: see table

Multipurpose KRAUSE ladders, Tribilo type with 3 sections can be configured depending on the work height and configuration of the work area and can be used in the following versions:

- ▶ leaned, in retracted version
- ▶ leaned, in extended version
- ▶ as double ladder - type λ

At the end of the base section, ladders have a stabilizer that provides a wider standing surface. The stabilizer is provided with anti-slip covers for better adherence to smooth surfaces and to avoid the involuntary slip of the ladder.

In order to be used for works on poles, Krause ladders can be provided (on demand) with **ROMIND detachable anchoring and fixing devices** that allow the fixing of the ladder to the pole to prevent tilting and fall protection of the worker.



Technical characteristics

Ladder code	129673	129680	129703	129727
Number of sections x rungs	3 x 9	3 x 10	3 x 12	3 x 14
Working height A (m)	3,90	4,15	4,70	5,25
Working height A1 (m)	4,15	4,40	4,95	5,45
Working height A2 (m)	4,95	5,45	6,55	7,60
Working height A3 (m)	7,10	7,95	9,55	11,20
Working height B (m)	2,60	2,85	3,40	3,90
Working height B1 (m)	4,20	4,70	5,80	6,85
Retracted length C (m)	2,70	3,00	3,55	4,10
Extended length C1 (m)	6,05	6,90	8,60	10,25
Weight (kg)	16,8	18,4	25,8	30,0



Detachable anchoring and fixing device, pliers type, for KRAUSE ladders

SR EN 795



Code: P 2416

The **detachable anchoring and fixing device, pliers type**, provided with fall arrester device, is intended for the anchoring and fixing of KRAUSE multipurpose ladders on poles of various cross-sections: on circular poles with diameters between 150 ÷ 450 mm and on poles with rectangular cross-section with sides of maximum 450 x 335 mm.

This device prevents the tilting or slipping of the ladder and can be used as the protection against falling from height of a worker working on the ladder, by using a sliding fall arrester on a flexible rope.

By handling **from the ground** the anchoring device's plier, the ladder can be leaned, anchored and fixed on the poles of power lines, provided with under-crossing of cables belonging to other utilities (TV cable, optical fiber, etc.).

The detachable anchoring and fixing device for KRAUSE aluminium ladders consists of the following elements:

1. Anchoring and fixing system, pliers type
2. Flexible rope with sliding fall arrester and energy absorber
3. Tensioning and locking system of the flexible rope

The anchoring and fixing system can be mounted / dismantled at the upper extremity of the ladder (top section) and fastened using its own locking system on the first rung of the ladder.

The flexible rope with fall arrester and energy absorber is attached through the carabiner at the actuating cord of the pliers.

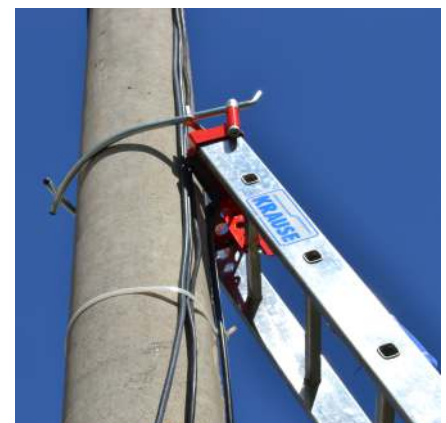
The tensioning and locking system includes an adjustable strap, a carabiner and a locking device. The system is intended to maintain the flexible rope tensioned in order to avoid the accidental opening of the pliers.

WARNING!

The detachable anchoring and fastening system must be used by a single person.

The worker must use personal protective equipment that includes a safety harness and at least one work positioning lanyard.

The detachable anchoring and fixing device is delivered in a waterproof protective bag.



Technical characteristics

Static strength (daN/3 minutes)	1.200
Dynamic strength (kg/3 m)	100
Maximum operating load (daN)	150
Weight (kg) (without fall arrester system)	3,6



Extensible hybrid IRMUT ladder - 3 sections - model approved by E.ON Romania

EN 131
EN 61478

Code: see table

Extensible hybrid IRMUT ladders with 3 sections can be configured depending on the working height and can be used in the following working versions:

- ▶ leaned, in retracted version
- ▶ leaned, in extended version

Hybrid IRMUT ladders have their rails made of rectangular aluminium profiles (for the base and intermediate sections) and from glass reinforced plastic (GRP) (for the top section). The rungs are made of aluminium profiles. Given the insulating rails, the ladders are recommended for works in electrical installations.

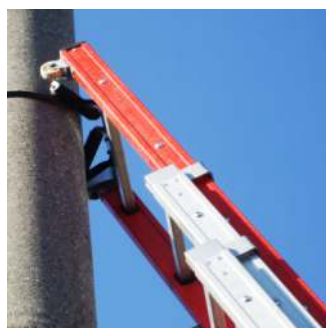
Hybrid ladders are delivered with a **non-removable device for rolling, and fastening** the ladder to the pole, with a textile strap.

Both aluminium sections are manufactured to allow the attachment of two **detachable levelers, with adjustable height**, so that the ladder can be used both in a system with 2 sections and 3 sections, the top section always having rails made of insulating material. All three sections can be separated one from another.

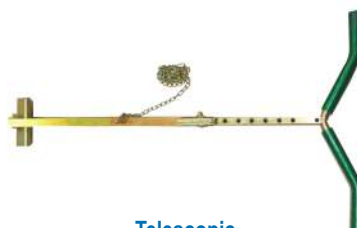
Hybrid ladders are delivered with the following **accessories**:

- **Telescopic anti-flexion device**, to limit the bending of the ladder leaned on the pole
- **Extension fork**, for handling the upper sections from the ground

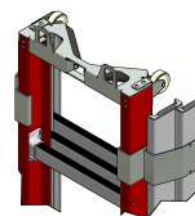
NOTE: the AV30039-RX ladder model consists of two aluminium sections with 14 rungs each and an insulating GRP section with 11 rungs is a special model approved by E.ON Romania.



Device for rolling and fastening



Telescopic anti-flexion device



Extension fork



Detachable leveler of adjustable height



Ladder code	No. of sections x nr. of rungs	Length of retracted ladder (C) (m)	Length of maximum extended ladder (C1) (m)	Working height (A1) (m)	Weight* (kg)
AV30030-3	3 x 10	3,26	7,98	8,90	29,50
AV30033-3	3 x 11	3,55	8,57	9,50	31,50
AV30036-3	3 x 12	3,85	9,16	10,00	34,00
AV30039-3	3 x 13	4,14	10,05	10,90	36,50
AV30039-3X	2 x 14 + 1 x 11	4,19	10,00	10,90	36,50

*The weight of the ladder does not include the weight of standard accessories:

- detachable leveler of adjustable height - 1,2 kg
- device for rolling and fastening - 3,5 kg



Detachable anchoring and fixing device, pliers type, for IRMUT ladders

SR EN 795



Code: P 2414

The **detachable anchoring and fixing device, pliers type**, provided with fall arrester device, is intended for the anchoring and fixing of IRMUT extensible hybrid ladders on poles of various cross-sections: on circular poles with diameters between 150 ÷ 450 mm and on poles with rectangular cross-section with sides of maximum 450 x 335 mm.

This device prevents the tilting or slipping of the ladder and can be used as the protection against falling from height of a worker working on the ladder, by using a sliding fall arrester on a flexible rope.

By handling **from the ground** the anchoring device's plier, the ladder can be leaned, anchored and fixed on the poles of power lines, provided with under-crossing of cables belonging to other utilities (TV cable, optical fiber, etc.).

The detachable anchoring and fixing device for IRMUT extensible hybrid ladders consists of the following elements:

1. **Anchoring and fixing system, pliers type**
2. **Flexible rope with sliding fall arrester and energy absorber**
3. **Tensioning and locking system of the flexible rope**

The anchoring and fixing system can be mounted / dismantled at the upper extremity of the ladder (top section) and fastened using its own locking system on the first rung of the ladder.

The flexible rope with fall arrester and energy absorber is attached through the carabiner at the actuating cord of the pliers.

The tensioning and locking system includes an adjustable strap, a carabiner and a locking device. The system is intended to maintain the flexible rope tensioned in order to avoid the accidental opening of the pliers.

WARNING!

The detachable anchoring and fastening system must be used by a single person.

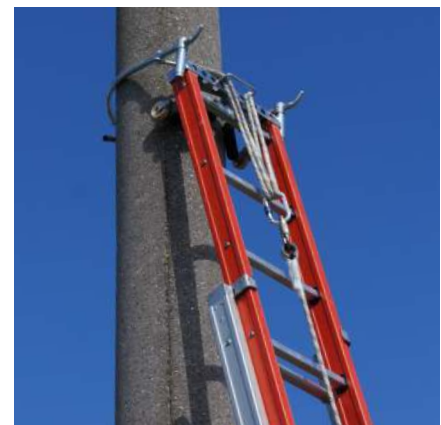
The worker must use personal protective equipment that includes a safety harness and at least one work positioning lanyard.

The detachable anchoring and fixing device is delivered in a waterproof protective bag.



Technical characteristics

Static strength (daN/3 minutes)	1.200
Dynamic strength (kg/3 m)	100
Maximum operating load (daN)	150
Weight (kg) (without fall arrester system)	3





Aluminium modular extensible ladder for poles

Code: TR 157

The **modular extensible ladder** is used for ascent / descent and work at height on wooden or concrete poles (with round or rectangular section).

The modular ladder can be used **by a single person**, only in vertical position, fastened to the pole.

The modular extensible ladder for poles consists of the following elements:

- **Base section** (length 1,5 m / 5 rungs)
- Multiple **intermediate sections** (maximum 10 sections with length 1,5 m / 5 rungs, one section with length 0,9 m / 3 rungs)
- **Top section** (length 1,3 m / 5 rungs)
- **Work platform** (optional)

The base section is provided with two profiled support elements that provide a constant distance between the ladder and the pole.

The other sections are provided at their upper part with a profiled support element

The base section is fastened by using two special devices (consisting of an anchoring strap, a special ratchet device and a carabiner) and the upper sections are fastened to the pole with one special device.

The rails of the base section have rubber anti-slip caps.

Rails and rungs of the sections are made of tubular aluminium profiles with superior mechanical properties, and the support assembly (consisting of the guiding bushings and profiled support elements) are made of steel, assembled by welding and protected against corrosion by zinc coating.

With regard to base and intermediate sections, **the highest rung and anchoring straps attached to the rails are painted in red**, in order to warn the operator with regard to the positioning of a junction between two sections:

- When climbing up, the operator must not step over the red rung of the lower section until the upper section is assembled and completely fastened to the pole;
- When climbing down, the operator must not start the disassembly of the upper section prior to stepping on or below the red rung of the lower section.

The special ratchet device of the anchoring strap and the carabiner are made of steel and zinc-coated against corrosion.

Anchoring straps are manufactured from polyamide or polyester fibers.

The **work platform** is a welded element, made exclusively from aluminium alloy, provided with a profiled element which can be attached at any rung.

The ladder does not have any safety systems to prevent the worker from falling, the worker must use during work on the ladder adequate fall protection devices (system consisting of a hook or another anchoring device + flexible rope + sliding fall arrester + safety harness).

Benefits: light, short sections, easy to transport.



BASE SECTION



TOP SECTION



SHORT INTERMEDIATE SECTION



LONG INTERMEDIATE SECTION



Technical characteristics

Maximum working load (user + tools and accessories) (kg)	150
Maximum height (m)	18,6
Maximum number of modules	13 (1 + 10 + 1 + 1)
Total weight (kg)	47,9



Anchoring hooks

EN 795**Code: CA 150**

Anchoring hooks are components of the fall protection systems and are recommended to be hanged on steel or concrete consoles.

Anchoring hooks are made of steel and protected against corrosion. The hooks are provided at the lower side with an eyelet to allow the installation of a carabiner attached to the flexible rope. By attaching to the hook eyelet a flexible anchoring support and by mounting the system on the console, it is obtained an anchoring point.

Anchoring hooks are provided with a safety lever to be operated when the hooks must be attached / detached from the metallic console of the pole. The lever is provided with a ring that allows the handling thereof both on the application and on the detachment of the hook on the metallic console of the pole.

Anchoring hooks are delivered together with a handling fork with hexagonal rod, which can be fastened on top of the insulating telescopic stick.

Technical characteristics

Maximum operating load (daN)	120
Static strength (daN/3 minutes)	1.200
Dynamic strength (kg/3 m)	100
Hook opening (mm)	150 ± 3
Overall size (mm)	400 x 460
Weight (kg)	2



Anchoring device with cable loop

SR EN 795**Code: see table**

The **anchoring device with cable loop** is a component of the fall protection systems and it is recommended to be used on poles without metallic / concrete consoles.

By attaching a flexible anchoring support to the device of and by mounting the device on top of the pole, it is obtained an anchoring point.

The ends of the cable loop are fastened as follows: one end of the circumference with a ring-type part, and the other end with a metallic eyelet to be connected with the carabiner, used for the connection with the flexible rope.

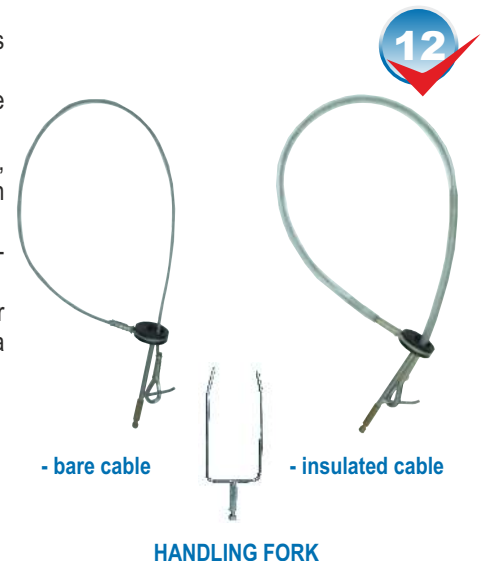
The anchoring device is applied on the pole with a 9 meters long telescopic insulating stick code PTU-AS-400-6-C (not included in this device) (see page 11).

The anchoring device with cable loop can remain fastened on the stick on the entire work period or can be detached. In this latter circumstance, the dismantling of the device can be performed using a handling fork (delivered at request).

The anchoring device with cable loop consists of the following components:

- **steel cable loop**
- **hexagonal rod** for fastening in the coupling system at the end of an insulating stick

The cable loop can be provided with a tubular sleeve made of **insulating** plastic material.



Code	P 2269-0-00	P 2269-0-00L	P 2269-0-00P	P 2269-0-00PL
Loop type	bare	bare	insulated	insulated
Loop length (mm)	1.400	1.800	1.400	1.800
Maximum diameter of the pole in the anchoring area (mm)	360	500	360	500
Maximum operating load (daN)	120	120	120	120
Static strength (daN/3 minutes)	1.200	1.200	1.200	1.200
Dynamic strength (kg/2,5 m)	100	100	100	100
Weight (kg)	0,535	0,600	0,675	0,825



Anchoring device for poles with concrete console

SR EN 795



Code: DA 400

The **anchoring device for poles with concrete console, DA 400 type**, is a component of the fall protection systems and is recommended to be hung on reinforced-concrete consoles.

By attaching a flexible anchoring device at the device and by mounting the device on the pole console, it is obtained an anchoring point for the workers that perform works at height.
The anchoring device is applied on the pole with a 9-meter telescopic insulating stick code PTU-AS-400-6-C (not included in this device) (see page 11).

The device - with the cross-beam positioned vertically - is lifted and inserted through the socket of the concrete console, and, afterwards, by pulling of the handling cord and the horizontal arrangement of the cross-beam allows the positioning of the device on the upper part of the console, thus becoming an anchoring point where the flexible rope is fastened.
For the detachment of the device from the pole console, the telescopic insulating stick is lifted so that the cross-beam of the device is set in a vertical position, thus allowing the lowering of the entire system through the pole console hole.

The DA 400 anchoring device can remain fastened in the telescopic insulating stick on the entire duration of work or can be detached from it. In the latter instance, in order to dismantle the device from the top of the pole it is necessary to use a handling fork with a hexagonal rod that can be fastened on top of the telescopic insulating stick.

DA 400 anchoring device consists of the following components:


- cross-beam provided with seating skid, with limiters at the ends, with a dismantling ring and a eyelet to allow the assembly of the carabiner of the flexible rope (which is not included in this device)
- hexagonal piece, detachable, foldable, for the fastening in the coupling system on top of a telescopic insulating stick
- cord for the handling of the cross-beam position (horizontal/vertical position).



HANDLING FORK

Technical characteristics	
Maximum operating load (daN)	120
Static strength (daN/3 minutes)	1.000
Dynamic strength (kg/3 m)	100
Distance between side limiters (mm)	400
Overall size (mm)	460 x 218 x 56
Weight (kg)	0,990





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