ACCESSORIES FOR MEDIUM VOLTAGE DISTRIBUTION NETWORKS

Ensto Overhead

Content

Ensto in short

Ensto is an international industrial group founded in 1958, specializing in the development, manufacturing and marketing of electrical systems and accessories. Today Ensto has operations in 18 countries, export to over 80 countries and more than 1500 employees. Ensto´s products play a significant role in the construction and maintenance of power electricity networks. The products can be found in electrical installations, lighting solutions and various high-tech control and monitoring systems in homes, as well as in public and business premises.

Close co-operation with customers, direct information links and ready availability of high quality products are the key elements of Ensto´s customer service.

Ensto Utility Networks

Ensto Utility Networks, one of the three business units of Ensto Group, is one of the biggest international groups of companies in Europe developing, manufacturing and marketing network construction accessories and offering solutions for the transmission and distribution of electricity. The main product lines are Overhead Line Materials and Underground Cable Materials. We have sales offices in Scandinavia, Central Europe, Baltic countries, Russia, Ukraine and Kazakhstan.

Production

Ensto Utility Networks offers accessories and solutions for:

- ⩽ 1.0 kV Overhead Lines focused on Aerial Bundled Cable Systems
- Medium Voltage Lines (for bare and covered conductor lines)
- Underground Cable Lines (our underground cable product family covers low and medium voltage accessories)

We have production plants in Finland, Estonia , Russia and Poland.

Ensto reliability is based on

- Strong product development in co-operation with our customers
- Products, which are easy to install, safe, reliable and cost effective
- Professional customer training and technical support
- Continuous laboratory testing in various climatic conditions for electrical and mechanical properties

- Products, which meet various international standards such as IEC and EN and national standards VDE/DIN, etc.

Certified Quality

Ensto Utility Networks factories have received ISO 9001 and ISO 14001 Environmental Management System Certification. Our high quality products make it possible to construct electricity networks with a low failure frequency.

Ensto Solutions for Various Medium Voltage Systems

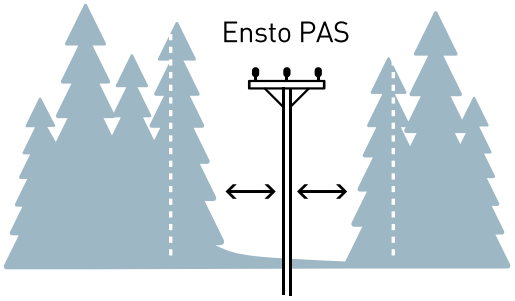
Ensto has developed integrated product packages and solutions for various overhead lines from Bare to Covered Conductors (CC) and Universal Cables. These packages are designed to meet local conditions and requirements. All accessories have been developed and tested in close collaboration with electricity power companies. This catalogue starts by introducing the CC System and thereafter Ensto product packages for both Universal Cable Systems and Bare Conductors.

CC System

Plastic covered overhead conductors without metal sheaths, PAS and BLX conductors, were developed in order to improve the reliability of the distribution and transfer of electricity.

Introduction

The CC system has diminished the number of interruptions caused by faults. It has also helped to make line corridors narrow, a particular advantage in built-up areas. Using overhead line structures, it is possible to fit substation outputs into a small space, an excellent solution in aesthetic terms.



normal bare conductor

Several years in use have proven the CC system to be extremely functional and reliable. In Finland there are currently more than 8,500 kilometres of covered conductors, their share of new medium voltage network construction totalling around 80%. Sweden has more than 9,500 kilometres of BLL conductors, their share of new medium voltage network construction as high as 80%. Currently, the CC system is in commonly use in several European countries, including Norway, England, the Baltic countries, Poland, the Czech Republic, Slovenia and Germany and is also approved in several other countries.

With the CC system now established, Ensto is continuing its development, with accessories that make installation easy, quick and reliable. These are based on reliable and economical construction solutions, were developed in collaboration with network constructors and satisfy all Nordic regulations.

Reliability

The plastic covering for covered conductors prevents interruptions, or outages, due to collisions or momentary contact with a foreign object. Due to its coating, faults caused by snow and ice falling from trees have been almost completely eliminated. According to statistics, the failure rate has diminished from 4.5 faults/100 km per annum for bare conductors, to 0.9 faults/100 km per annum for covered conductors.

Thus, several network companies have secured an interruption-free electricity supply for their key customers by choosing the CC structure for their medium voltage lines.

Line Corridors

The space requirement for a CC line is approximately 40% less than that of a standard bare line. This has enabled overhead line installations in built-up areas, while in forests, the required line corridor has narrowed to 4 metres trunk-to-trunk, so it is now possible to leave tree stands on roadsides as visual and noise barriers.

CC structures offer considerable space savings, especially in substation outputs, a desirable outcome in terms of preserving natural scenery. Considerable space savings can also be made in parallel line structures.

Covered Conductor Systems

Costs

Covered Conductor (CC) line construction costs are moderate, considering their advantages over traditional bare line structures. When constructing parallel lines, bare and CC lines cost the same.

Design

Compared to traditional bare conductor construction, some additional requirements have been set for covered conductors.
The most important requirements include:

- Conductors must be handled with care
- Only accessories designed and approved for the conductor may be used
- Arc protection devices must be used on lines vulnerable to overvoltages
- Substations must have tripping earth-fault protection devices and alarming secondary devices

Arc Protection

Overvoltage is induced on the line when lightning strikes an overhead line or its vicinity. The magnitude of the overvoltage is approximately the same in all phases and may rise to several hundred kilovolts between the phase and earth.

Relative costs:

Structure	Conductor	Cost of complete line
Bare line	54/9 AlFe RAVEN	1.0
CC line	PAS 3x70	1.3
Aerial cable	SAXKA 3x70	2.5
Underground cable	AHXMKW 3x70	3.0

The cost of a pole transformer with the PAS structure is approximately one third cheaper than a park transformer required for an underground cable network.

Overvoltage travels along the line to the nearest pole where it discharges by igniting an arc between the crossarm and conductors. After the overvoltage has discharged a power frequency short-circuit current – the magnitude of which depends on the short-circuit power of the network and distance to the substation – starts to flow through ionized air resulting a power arc between the phases. Power arc magnitude is normally several kilo amperes.

Power arc can move freely along an ordinary bare conductor line towards the load, but in the covered conductor line the covering forms an obstacle. When an arc ignites, it burns a small hole in the covering and keeps burning until the conductor is damaged or burned through.

Circuit breakers cannot respond quickly enough. In order to prevent damage a covered conductor must be protected by installing arc protection devices at the appropriate locations. These offer the power arc a safe discharge route without damaging the conductor.

An arc protection device is used to protect the conductors as well as other network components. In this way, it is possible to achieve disruption-free distribution of electricity, a major benefit to the consumer. Arc protection devices must be installed in places in which overvoltage is likely to occur, e.g. fields and hills. Furthermore, protection is required in frequented areas; for example, buildings, yards, their immediate vicinity, traffic routes and sports fields.

Arc protection can be accomplished using the following methods:

- Arc protection device (APD)
- Power arc device (PAD)
- Surge arrester
- Current limiting device

The protection chosen also depends on the network's short-circuit values. The adjoining table displays the selected phase spacing of the covered conductors, the value of the short-circuit current with a protected object, and the recommended arc protection devices.

Crossarm type	Short-circuit current (kA)	Protection methods
Phase spacing 40-60 cm	approx. 1.0	Power arc device, surge arrester, current limiting device
Phase spacing 40-60 cm	2.0 - 3.0	Arc protection device with double wire, power arc device, surge arrester, current limiting device
Phase spacing 40-60 cm	› 3.0	Arc protection device, power arc device, surge arrester, current limiting device
Phase spacing over 60 cm		Power arc device, surge arrester, current limiting device

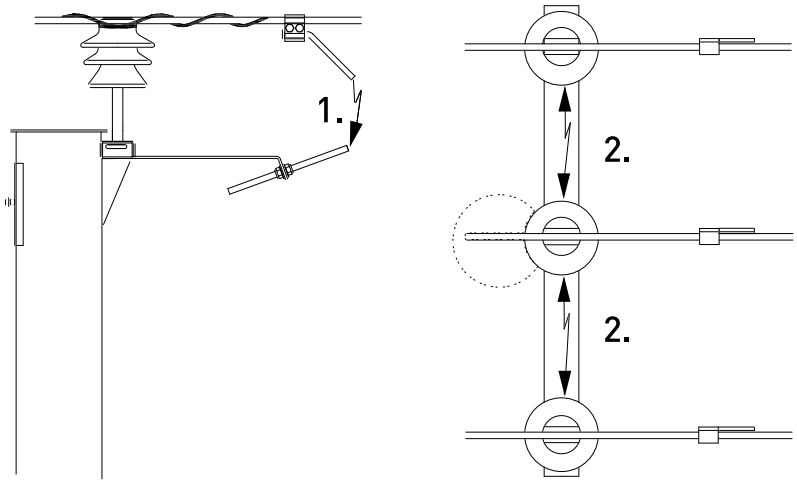
Covered conductor arc protection methods

	Arc protection device (APD)	Power arc device (PAD)	Surge arrester	Current limiting device
Protection of the conductor	Efficient	Efficient	Efficient	Efficient
Protection of other line components	No protection	Small spark gap protects small transformers	Protects transformers and cables	Protects small transformers
Quality of power supply	High-speed autoreclosure	High-speed autoreclosure	No interruption	No interruption
Uncovered components of the line	Bird protection needed	Bird protection needed	Bird protection needed	Bird protection needed
Radio interference	No RIV	No RIV	No RIV	No RIV
Device endurance	Withstands 2-3 operations at 10 kA/1 sec.	Withstands 2-3 operations at 10 kA/1 sec.	May be damaged by high lightning current/energy	May be damaged by high lightning current/energy
Price	Economical	Economical	High	Reasonable

Power Arc Devices

Power Arc Devices

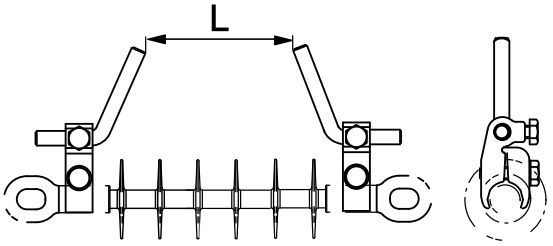
With small short-circuit currents, an arc will move slowly and stress the insulator for a prolonged period. To avoid damage to the insulator, the arc must be ignited directly in the spark gap (1), so that the short circuit occurs through the crossarm (2) and trips the circuit breakers. The spark gap can also withstand the stresses of high short-circuit currents (Ik = 10 kA/1 sec). Power arc devices are not dependent on the direction of power feed and therefore can be installed on either side of the insulator. Power arc devices can also be installed on different sides of the pole. Power arc devices can be used with tension and suspension insulators.

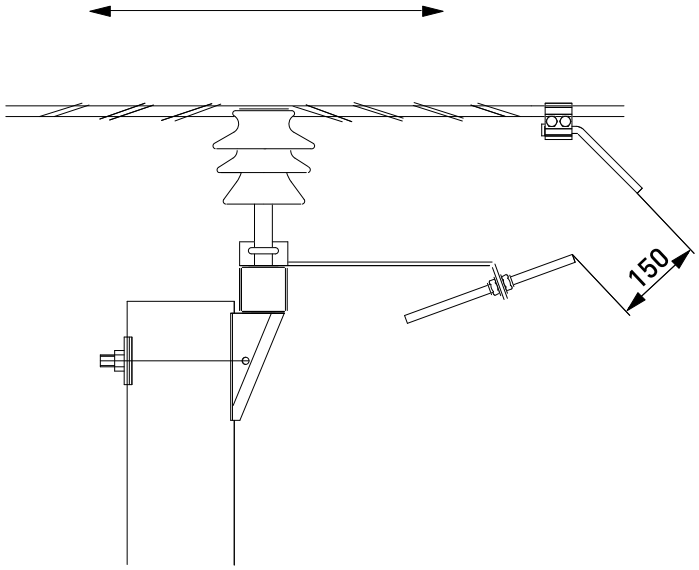


Installing Power Arc Devices

Tension Insulators

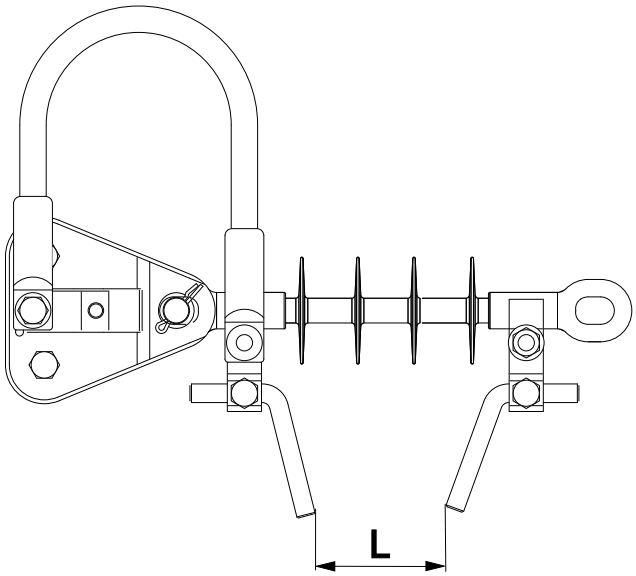
The best method of implementing power arc protection with tension insulators is to use the SDI 90.X equipped with the set SDI 27.1 or SDI 10.2 power arc device. Power arc devices are not dependent on the direction of power feed, and can be installed on either side of the crossarm. Power arc devices for different phases can be installed on different sides of the crossarm. The spark gap L should be adjusted to 100...150 mm.





Horizontal Crossarms

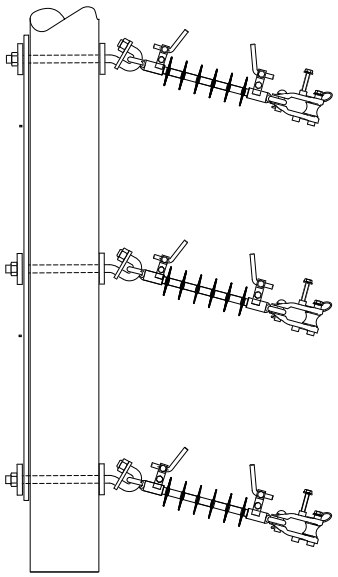
A spark gap is formed using the complete set **SDI 20.3** or **SDI 21.3**, containing an arc protection connector and a mounting iron for the crossarm pin, equipped with an arcing horn. Three SDI 20.3 or SDI 21.3 series are required per crossarm. The spark gap may be located on either side of the insulator; the effectiveness of the protection not being dependent on the direction of the power feed. The spark gap should be set to 100-150 mm.



Crossarm for Line Angle with specially for Covered Conductors designed Suspension Clamp with pulling wheel and Arcing Horns in Tension Insulator.

The best method on crossarms is to use the suspension clamp with pulling wheel SO 181.5, accessory kit SDI 27.1 (see p. 23) and tension insulator **SDI 90.X**. These accessories provide the best conductor protection and eliminate radio interference. The covered conductor need not be stripped.

The normal suspension clamp (SO 181) is not recommended for CC installations.



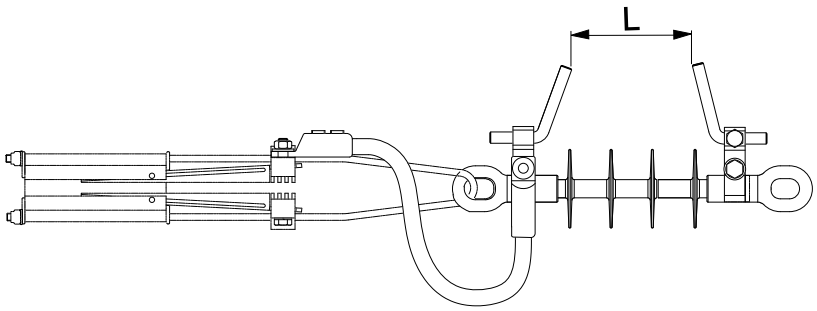
Angle with Tension Insulators

When constructing an angle with tension insulators installed in vertical line formation, arcing horns **SDI 27.1** must be used for tension insulator **SDI 90.X**. The bolts must always be connected behind the pole with a vertical iron, e.g. PEK 68, or a conductor (min. Cu 50 mm^2). This prevents short-circuiting through the pole. Otherwise, the same structures should be used as for crossarms for line angle.

Terminal Crossarm with Spark Gap

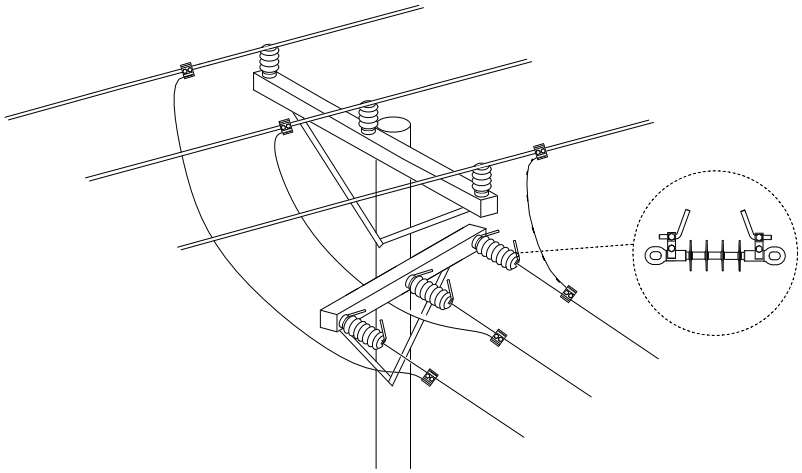
For the termination or tension of a convered conductor **the best method is to use tension clamp SO 235 or SO 236 and tension insulator SDI 90.X equipped with arcing horns SDI 27.1**. You may also use the SDI 10.2 and SO 85.

Branch lines should be connected using the insulation piercing connector SL 25.2 and SP 16 without other protection. The covered conductor needs not be stripped.



Main Line Bare Conductor / Branch Line CC

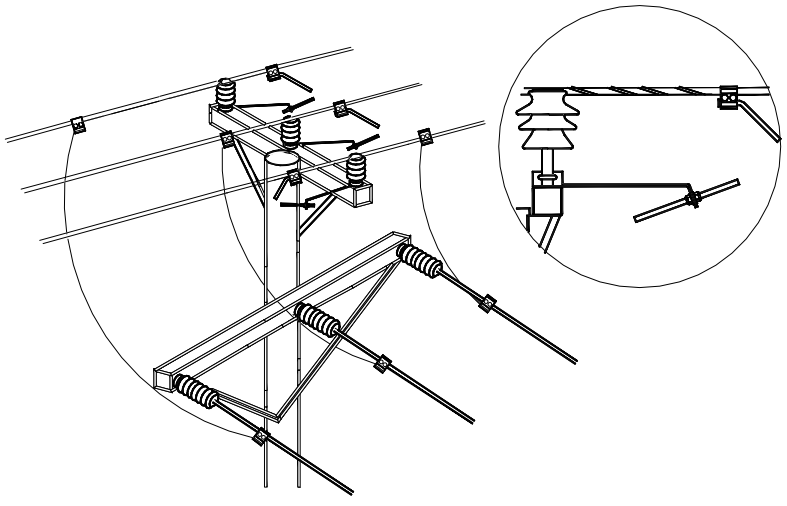
The best and easiest way to implement arc protection at a branch pole is to install the SDI 27.1 spark gap set with tension clamp SO 235 or SO 236, so that the conductor does not need to be stripped. It is also possible to use the SDI 10.2 and SO 85. When using a spark gap on the tension insulators of the branch conductor, the connecting conductors can be bare or covered.



Main Line CC / Branch Line CC or Bare Conductor

The main line shall be equipped with spark gaps.

The connectors may be positioned freely, and the connecting conductors may be either covered or bare.



Current Limiting Devices

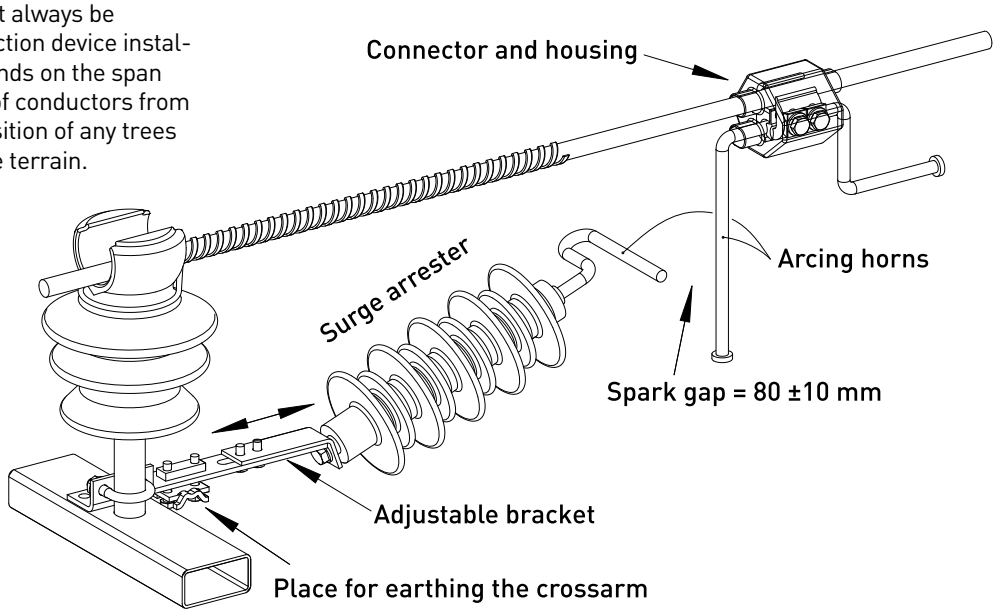
Current Limiting Devices

To protect a conductor, it is more economical to use a current limiting device than only a surge arrester. The advantage is based on selecting a smaller surge arrester. Under normal operating conditions the smaller surge arrester is not stressed at line voltage, as its other end is in the air. This protection method also provides consumers with an uninterrupted electricity supply, because the arc protection does not cause high-speed auto-recloser operations. A surge arrester should be installed in the crossarm in the same way as an arcing horn.

Installation can be performed on either side of the crossarm regardless of the direction of power supply. The crossarm must always be earthed. The protection device installation density depends on the span length, the height of conductors from the ground, the position of any trees and the relief of the terrain.

Installing Current Limiting Devices

An advantage of current limiting protection is uninterrupted distribution of electricity to consumers. Activation of this protection does not cause any high-speed automatic reclosing in substation protection devices. A lightning discharge to a covered conductor is directed via a metal oxide protection device and spark gap past the insulator, but supply voltage can no longer pass through the protection device. The device ignites at a lower level than the flashover level of the insulator, and the discharge passes through the protection. Birds, other animals or branches straying onto the device do not activate the protection. **The crossarm must be earthed**. For installation, the SDI 46.7 series is used, in which the protection device is installed in the crossarm pin and the arcing horn in the conductor. The surge arrester is installed onto the crossarm with an adjustable mounting bracket. The spark gap is adjusted to the required value: 80 mm. The arcing horn is equipped with an insulation piercing connector. Three sets per crossarm are required.



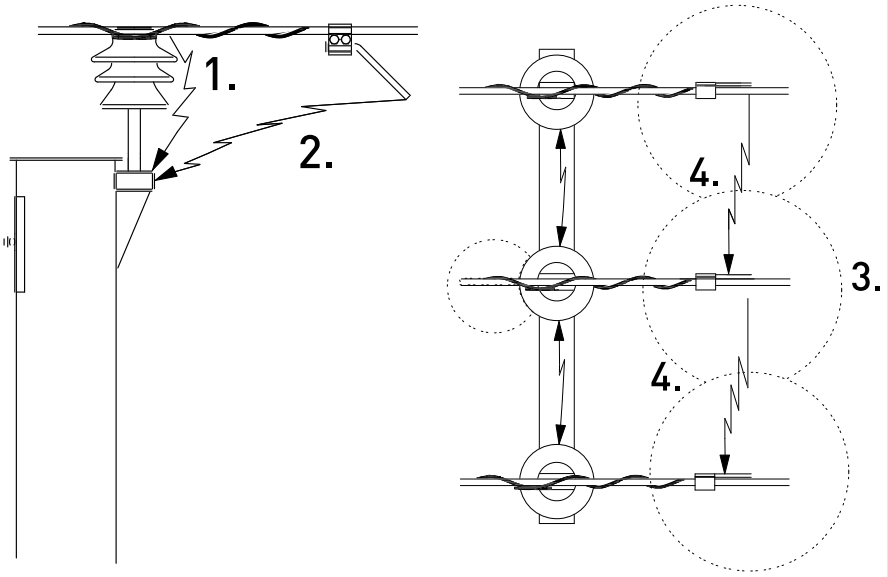
Arc Protection Devices

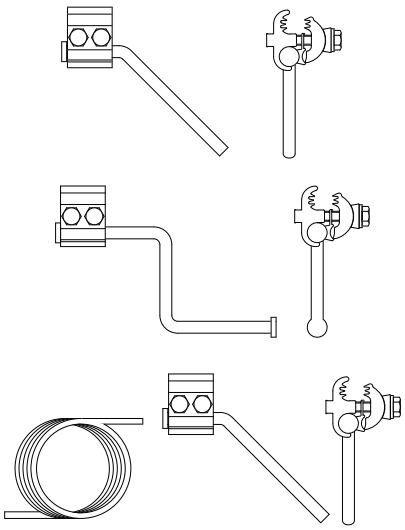
Arc Protection Device (APD)

Arc protection devices are designed to direct the arc generated to a sufficient distance from the conductor and insulator. An arc protection device implemented with an arcing horn is recommended for pin and line post insulators. We also recommend power arc devices (PAD) for branching and tension insulators (see p. 14).

While it is burning, the arc will not damage the conductor itself, but ignite over the insulator (1), after which it will move along the Al wire twisted onto the insulator's neck to the arcing horn (2). While burning at the end of the horn, the arc ionises the air, making it conductive (3) and creates a short circuit between the phases (4), at which point the circuit breakers are tripped. The distance between the horns must be no greater than the CC phase spacing for covered conductor. Installation is performed through the insulation, avoiding the need to strip the conductor. The installation of a connector will not damage the mechanical strength of the conductor; this has been proven in several tension and vibration tests.

Arc protection devices can also easily be installed afterwards if fault statistics so require. In network, an arc protection device should be installed on the side of the load, and in a ring network on both sides of the insulator. Arc protection devices have also been approved as mounting points for screw-on temporary earth tools and can be used with pin, tension, and suspension insulators. **For small short circuit currents, arc protection connectors with double wire must be used.** In such cases, two 25 mm^2 Al binding wires are installed in the same way as a single wire.



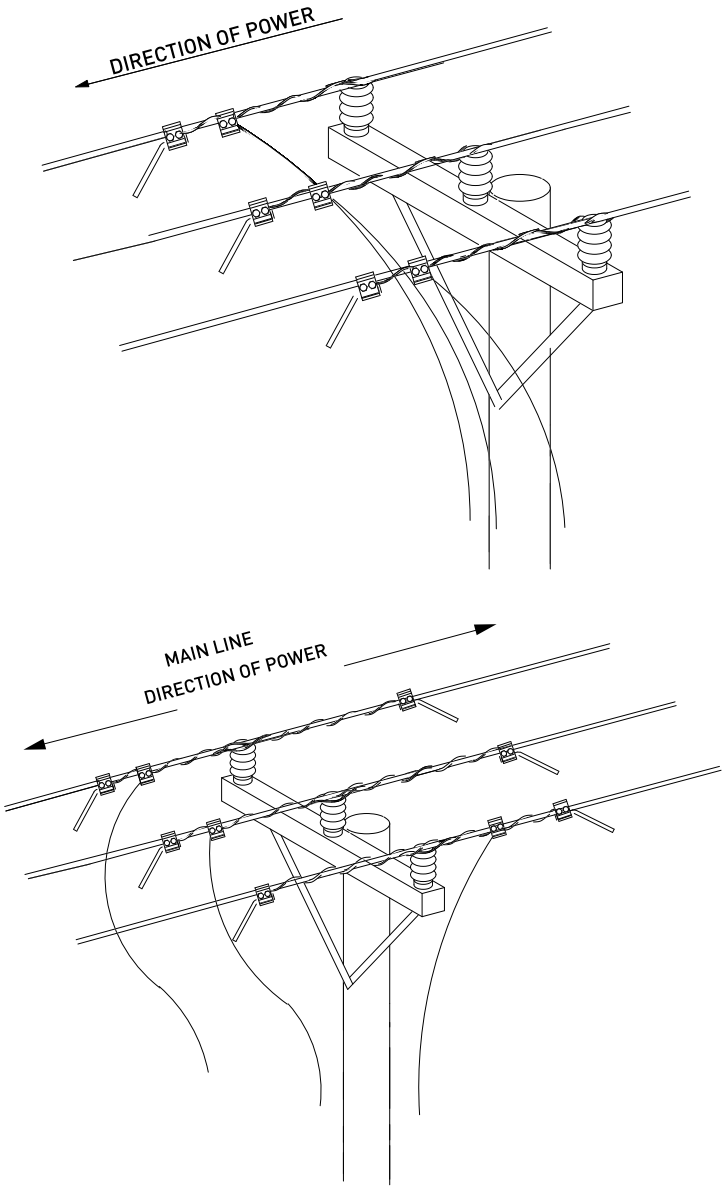


Installing Connectors

Before beginning installation, you should carefully read the installation instructions, which explain the installation methods in detail.

When installing the arc protection connectors **SE 20.1**, **SE 20.2** or **SE 20.3**, connectors **SE 21.1**, **SE 21.2** or **SE 21.3**, there is no need to remove the conductor covering (see figure). The connector is equipped with an insulation piercing feature, whose grease must not be removed, since this will contribute towards ease of installation and protect the installation section from dirt, dust and corrosion.

Install the connector carefully and according to the installation instructions, tightening it to nominal torque of 40 Nm with a torque wrench. Extreme care must be taken when installing in subzero conditions. Arc protection connectors must not be reused. For phase spacing over 60 cm and with low short-circuit currents, arc protection devices do not adequately protect the conductor and you must therefore choose another method of protection, e.g. a power arc device.



Arc Protection Device for a Branch Pole

On a branching pole we recommend the use of power arc devices with tension insulators (see p. 15). However, in exceptional cases, arc protection devices can be used.

Radially operated covered main line should be branched by installing branching connectors on the load side of the crossarm between the arc protection devices and the crossarm (see figure).

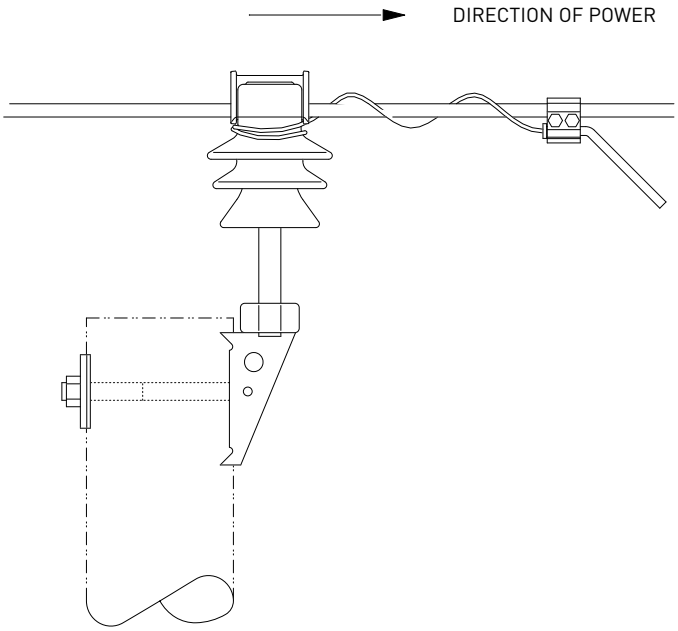
Ring operated covered or bare main lines should be branched by installing branching connectors on the load side of the crossarm between the arc protection devices and the crossarm (see figure).
If covered main line may be fed also from branch line, the connecting wires (down leads) must be bare. Exceptions to this are pole structures, in which SDI90-series tension insulators equipped with arching horns SDI10.2 or surge arresters or current limiting devices are used. In such cases connecting wires may be covered conductors.

Installing Arc Protection Devices

Installing Arc Protection Devices

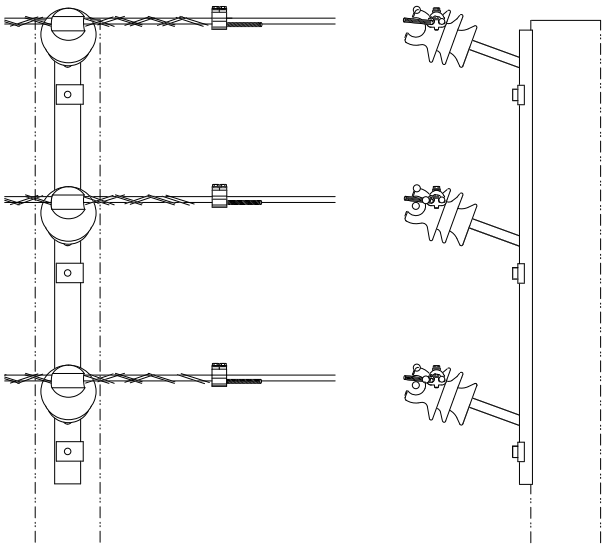
Horizontal crossarm, radial network, one line on pole

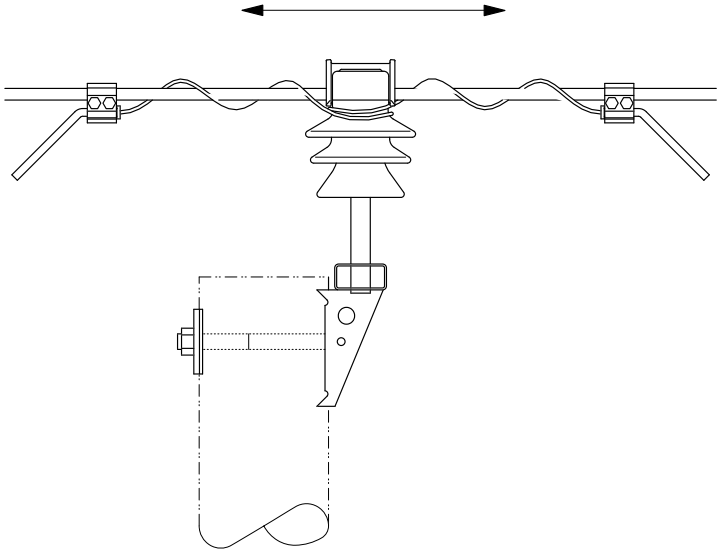
In a radial network, the arc protection connectors must be installed **on the side of the load with the horn facing down**. The Al wire used to bind the conductor must have a cross-section of **25 mm²**, and the end of the wire closest to the connector must be installed in the connector. If pre-formed helical ties are used, the arc protection devices must be connected with a separate 25 mm² Al wire to the insulator neck so that **it is wound twice around the conductor and twice around the insulator neck**.



Vertical crossarm, radial network, on line

In a radial network, the arc protection connectors must be installed **on the side of the load with the horn facing out**. The Al wire used to bind the conductor must have a cross-section of **25 mm²**, and the end of the wire closest to the connector must be installed in the connector. If pre-formed helical ties are used, the arc protection devices must be connected with a separate 25 mm² Al wire to the insulator neck so that **it is wound twice around the conductor and twice around the insulator neck**.

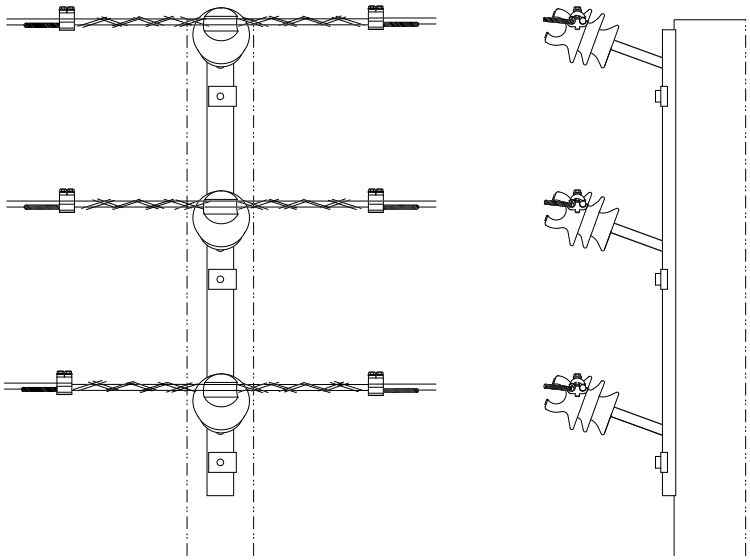




Horizontal crossarm, ring network, one line

In a ring network, the arc protection connectors must be installed **on both sides of the insulator with the horn facing down**. The Al wire used to bind the conductor must have a cross-section of **25 mm²**, and the ends of the wire closest to the connectors must be installed in the connectors. If pre-formed helical ties are used, the arc protection devices must be connected to the insulator neck with a separate 25 mm² Al wire.

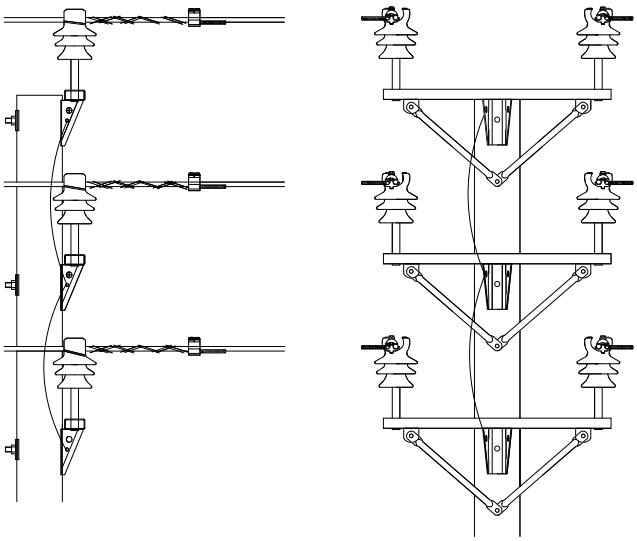
The wire must be wound twice around the insulator neck and at least twice around the conductor, after which the ends of the Al wire should be installed in the connectors.



Vertical crossarm, ring network, one line

In a ring network, the arc protection connectors must be installed **on both sides of the insulator with the horn facing out**. The Al wire used to bind the conductor must have a cross-section of **25 mm²**, and the ends of the wire closest to the connectors must be installed in the connectors. If pre-formed helical ties are used, the arc protection devices must be connected to the insulator neck with a separate 25 mm² Al wire.

The wire is wound twice around the insulator neck and at least twice around the conductor, after which the ends of the Al wire are installed in the connectors.



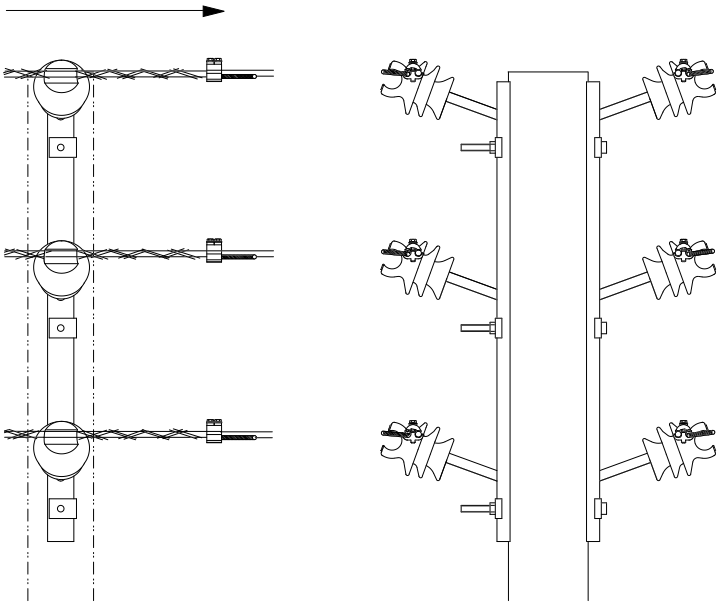
Horizontal crossarm, radial network, double line

In a radial network, the arc protection connectors must be installed **on the side of the load with the horn facing out**. The Al wire used to bind the conductor must have a cross-section of **25 mm²**, and the end of the wire closest to the connector must be installed in the connector. If pre-formed helical ties are used, the arc protection devices must be connected to the insulator neck with a separate 25 mm² Al wire **wound twice around the conductor and twice around the insulator neck**.

The crossarms must be connected to each other with a minimum 50 mm² Cu conductor.

Vertical crossarm, radial network, double line

In a radial network, the arc protection connectors must be installed on **the side of the load with the horn facing out**. The Al wire used to bind the conductor must have a cross-section of **25 mm²**, and the end of the wire closest to the connector must be installed in the connector. If pre-formed helical ties are used, the arc protection devices must be connected to the insulator neck with a separate 25 mm² Al wire so that **it is wound twice around the conductor and twice around the insulator neck**.

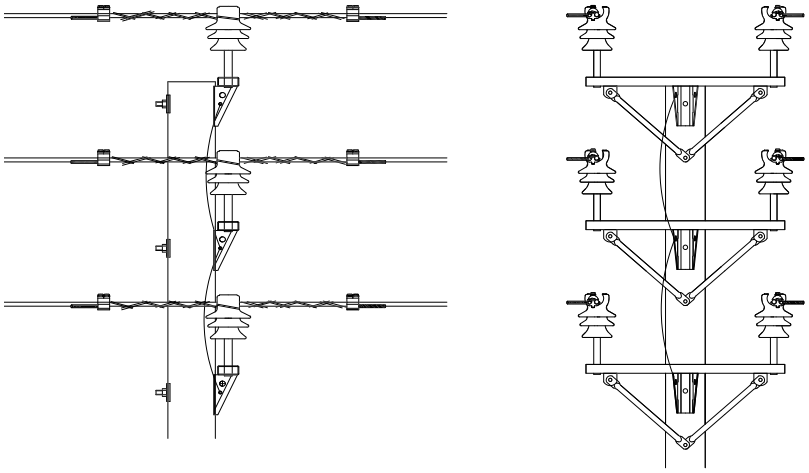


Horizontal crossarm, ring network, double line

In a ring network, the arc protection connectors must be installed **on both sides of the insulator with the horn facing out**. The Al wire used to bind the conductor must have a cross-section of **25 mm²**, and the ends of the wire closest to the connectors must be installed in the connectors. If pre-formed helical ties are used, the arc protection devices must be connected to the insulator neck with a separate 25 mm² Al wire.

The wire is wound twice around the insulator neck and at least twice around the conductor, after which the ends of the Al wire are installed in the connectors.

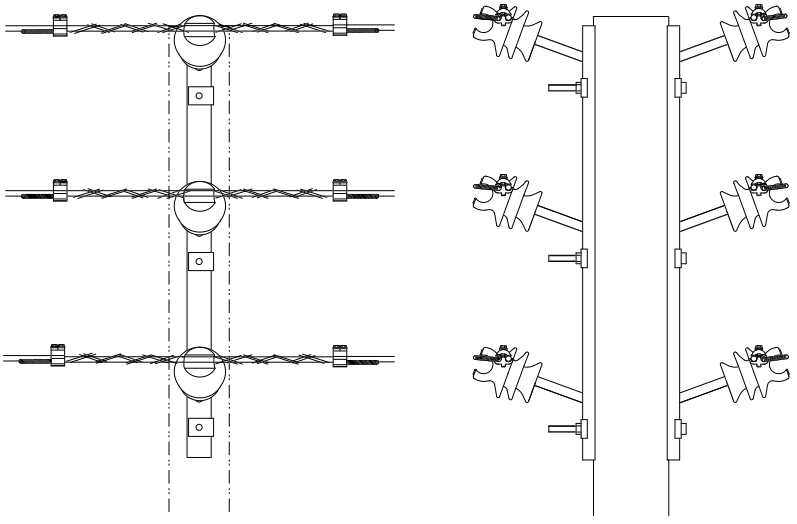
The crossarms must be connected to each other with a 50 mm² minimum Cu conductor.



Vertical crossarm, ring network, double line

In a ring network, the arc protection connectors must be installed **on both sides of the insulator with the horn facing out**. The Al wire used to bind the conductor must have a cross-section of **25 mm²**, and the ends of the wire closest to the connectors must be installed in the connectors. If pre-formed helical ties are used, the arc protection devices must be connected to the insulator neck with a separate 25 mm² Al wire.

The wire is wound twice around the insulator neck and at least twice around the conductor, after which the ends of the Al wire are installed in the connectors.



Additional Protection

Surge Arrester

In addition to the conductor, a surge arrester also protects other network components, no arc being generated. In action, the arrester does not cause any noticeable electricity supply disruption but significantly increases the network's construction costs. Usually, it is used only with pole transformers and terminal poles on underground cables, in which case no other protection method is required for protecting the conductor.

Protection from Birds

Covered conductors are not as vulnerable to damage and disruption caused by birds or branches as traditional, bare conductors. However, smaller phase distance of covered conductors increases the risk of such short circuits on cross arms. This risk can be diminished with e.g. twig protector, preventing branches from sliding along the covering, and bird protection that - when installed onto live parts - prevents birds and branches from touching live parts. Insulators can also be protected with SP45.3 bird protection sets.

Radio Interference

Radio interference refers to partial discharges that may cause interference in electronic devices. With covered conductors, the main sources of radio interference are the following:

1. Crossarms for line angle, when an ordinary overhead line suspension clamp is used. No interference occurs when using the radio interference-tested suspension clamp SO181.5 with pulling wheel or SO241 + SDP4.1.

2. Crossarms for line angle, when an ordinary pulling wheel suspension clamp (SO181) is used. No interference occurs when using the radio interference-tested SO181.5 suspension clamp with pulling wheel.

3. Radio interference may also be generated in the oxidized cups and pins of glass insulators. This problem can be avoided by using composite insulator SDI90.

Installation

Installing Connectors

For covered conductors, the insulation piercing connectors SL25.2 and arc protection connectors SE20, SE20.1, SE20.2 or SE20.3 as well as corresponding SE21 series are recommended. If the conductor is stripped, it is possible to use SL4.25 or SL8.21 connectors, which can be protected by using plastic insulation covers SP15 or SP16.

When installing connectors, the main rule is that the branch connector should always be located between the arc protection connector and crossarm. For this reason, the arc protection connectors must be installed at an adequate distance from the crossarm so that the connection can be made properly. Bare or covered conductors can be used as branch and down leads.

Tensioning of the Conductors

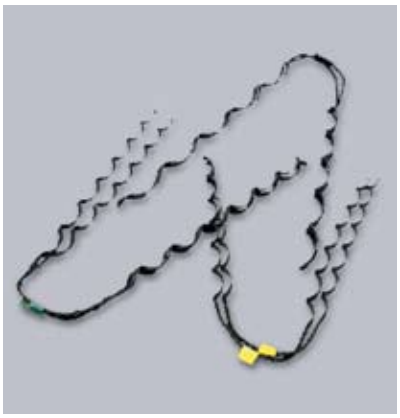
Conductors are tensioned by evenly tensioning each conductor. The sag and tension tables and recommendations of conductor manufacturer should be utilized.

Tying Conductors

Conductors can be tied to the top or neck of an insulator with helical ties or with aluminium wire. When using pre-tensioned helical ties, e.g. **CO35, CO70, CO120, SO115 series or SO216 series**, two ties are installed for each conductors. Only 25 mm² wire may be used for connecting arc protection connectors to insulator neck. **16 mm² is not suitable for arc protection**.

Temporary Earthing

Temporary earthing must be performed in the same way as for bare overhead lines, i.e. a covered conductor has to have points of attachment for temporary earth equipment at adequate intervals. These temporary earth points must be located so close to a pole that temporary earthing can easily be made from the pole. Temporary earthing can be made with the arc protection connector **SE20.1 alternatively SE21.1** or temporary earth connector **SE20.3 alternatively SE21.3**, which also acts as an arc protection device. Live-line connector SL36 can also be used with bail PSS923. Approved screw-on temporary earth equipment, e.g. **CT86.5** (5 kA) or **CT86.8** (8 kA) must be used for temporary earthing.

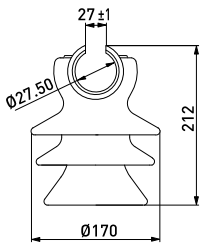


24kV Covered Conductor Solution

24 kV Covered Conductor Solution

Pin insulator SDI37

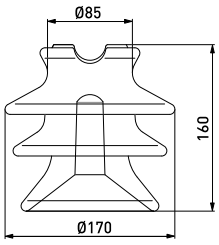
SDI37 is used with bare wires or covered conductors. Suitable for installation on pin SOT24 (SFS 4385). The plastic sleeve in the top-groove of the insulator enables pulling of conductor without using pulleys. The conductor can be tied to the top-groove or to the neck. In angles, always tie to the neck. Creepage distance 325 mm. Neck diameter 85 mm.



TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	BREAKING LOAD kN	INSULATOR PIN	WEIGHT (kg)	PACK./ pcs
SDI37	6418677408731	24	12.5	SOT24	3.8	3

Pin insulator SDI30

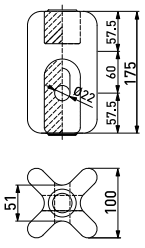
SDI30 is used with bare wires or covered conductors. Suitable for installation on pin SOT24 (SFS 4385). The conductor can be tied to the top-groove or to the neck. In angles, always tie to the neck. Creepage distance 325 mm. Neck diameter 85 mm.



TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	BREAKING LOAD kN	INSULATOR PIN	WEIGHT (kg)	PACK./ pcs
SDI30	6418677408748	24	12.5	SOT24	3.37	3

Stay insulator SDI4.5

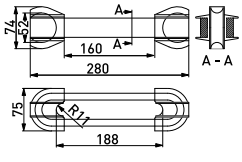
Porcelain stay insulator is suitable for installation in stay wires up to 52 mm². Conforms with standard SFS 3741. Creepage distance is 110 mm.



TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	MAX CONTINUOUS LOAD kN	SMFL kN	WEIGHT (kg)	PACK./ pcs
SDI4.5	6418677418556	24	17.5	120	2.15	6

Composite stay insulators SDI70.24

SDI70.24 insulator has high mechanical and electrical capacity combined with light weight. The insulating section is made of glass fibre impregnated with UV stabilized resin and twice covered silicon rubber. The end thimble is made of aluminium and dimensioned for minimum 52 mm eyelet. SDI70.24 is suitable for installation on stay wires up to Fe52 and is tested according to IEC 60383. Creepage distance 160 mm.



TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	MAX CONTINUOUS LOAD kN	SMFL kN	WEIGHT (kg)	PACK./ pcs
SDI70.24	6418677401787	24	35	>180	0.8	15

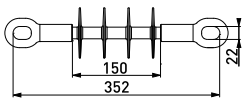
24 kV Covered Conductor Solution

Composite insulators SDI90 series

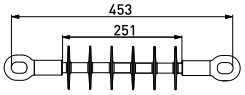
SDI90.x composite insulators are the next step on Ensto's composite insulator series. SDI90.x insulators fullfill the requirements of IEC 61109 The sheds of the insulators are made of highly hydrophobic silicon rubber. The core is made of corrosion resistant fiber glass rod and the end fittings are made of hot-dip galvanized steel. Tension insulators SDI90.15x are meant to be used on 10 kV up to 24 kV depending on pollution class requirements. SDI90.28x are meant to be used on 24 kV up to 36 kV. Creepage distance of SDI90.15x is 391 mm and creepage distance of SDI90.28x is 613 mm.

TYPE	EAN	END FITTINGS	HIGHEST SYSTEM VOLTAGE kV	WEIGHT (kg)	PACK./ pcs
SDI90.150	6418677422669	eye / eye	24	0.995	3
SDI90.280	6418677422768	eye / eye	36	1.08	3
SDI90.282	6418677422782	socket / eye	36	1.3	3
SDI90.283	6418677422799	ball / socket	36	1.1	3
SDI90.284	6418677422805	clevis / tongue	36	1.3	3
SDI90.285	6418677422812	clevis / ball	36	1.2	3
SDI90.288	6418677422843	socket / tongue	36	1.3	3

SDI90.150

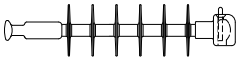


SDI90.280

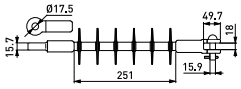


SDI90.282

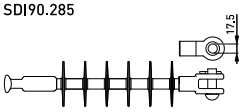
SDI90.283



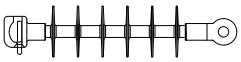
SDI90.284



SDI90.285

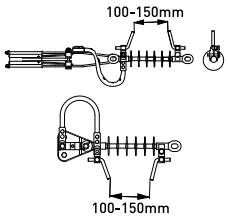


SDI90.288



Power arc device SDI27.1

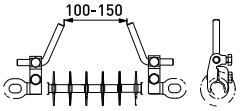
Power arc device SDI27.1 is used with SDI90.x composite insulators on angle poles with suspension clamp SO181.5 and on tension poles with tension clamps SO235 or SO236. The package includes arching horns and 95 mm² conductor with cable lugs. Spark gap is adjusted to 100-150 mm on 24-36 kV.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SDI27.1	6418677419133	0.83	9

Power arc device SDI10.2

Used as arc protection with tension insulator type SDI90.x on covered conductor lines. SDI10.2 includes two horns, which are fixed to the metal parts of the tension insulator so that the peaks are towards each other and the distance between the peaks is adjustable.

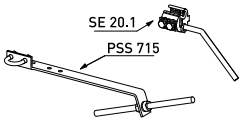


TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SDI10.2	6418677410673	0.58	15

Power arc devices SDI20.3, SDI20.31 and SDI20.2

Used on straight line cross arms for making spark gap protection. The set includes one arc protection device SE20.1 and one arc horn. The spark gap is adjustable. SDI20.3 is for horizontal pin insulator crossarm and SDI20.31 is for vertical pin insulator crossarm. SDI20.2 is for linepost insulator crossarm.

SDI20.3

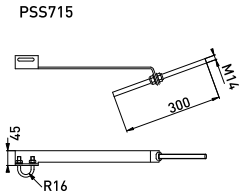


TYPE	EAN	CROSSARM	WEIGHT (kg)	PACK./ pcs
SDI20.3	6418677401534	Horizontal	1.6	9
SDI20.31	6418677418563	Vertical	1.6	9
SDI20.2	6418677418600	Horizontal	1.25	12

24 kV Covered Conductor Solution

Spark gap horn PSS715

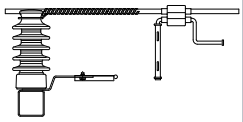
Used on straight line cross arm for making spark gap protection on covered conductor line. The spark gap is adjustable. On a wooden crossarm, the pins must be connected with min. 50 mm² Cu-wire. PSS715 is for horizontal crossarm, PSS715.1 is for vertical crossarm.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
PSS715	6418677401312	1.135	12
PSS715.1	6418677418570	1.135	12

Power arc device SDI25

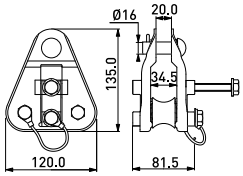
Arc protection device for covered conductors with line post insulators. The spark gap is adjustable. The distance between the spark gap is 100 - 150 mm at 24 kV.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SDI25	6418677401541	1.6	3

Suspension clamp SO181.5

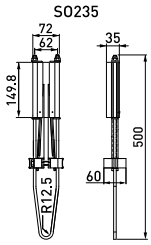
Suitable for covered conductors.The clamp also functions as an installation pulley thereby completely eliminating the need for separate pulleys. Conductor joints with diameter under 30 mm can be pulled through the suspension clamp. Has no loose parts, so it is easy to handle even in difficult conditions. The insulation piercing clamping piece is connected to the body with a wire for balancing the potential. Tested for radio interference. Breaking strength 36 kN. Suspension bolt 16 mm.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIAMETER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO181.5	6418677404498	35-157	11-22.5	40	1.157	3

Waterproof tension clamp SO235

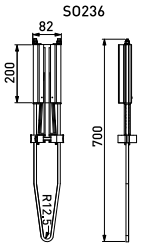
For dead-ending covered conductors. The clamp is very easy to install compared with the other clamps on the market as there is no need to peel the conductor. The insulation piercing part of the clamp keeps the parts of the clamp at the same potential and prevents partial discharges and radio disturbances. The insulation piercing part also makes it possible to add an arc protection device to the clamp.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIAMETER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO235	6418677416293	PAS/BLL 35-70, Raven, Pigeon, AAAC 132	11.5-16.6	40	1.133	9

Waterproof tension clamp SO236

For dead-ending covered conductors. The clamp is very easy to install compared with the other clamps on the market as there is no need to peel the conductor. The insulation piercing part of the clamp keeps the parts of the clamp at the same potential and prevents partial discharges and radio disturbances. The insulation piercing part also makes it possible to add an arc protection device to the clamp.

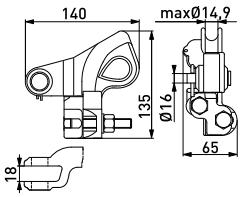


TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIA. mm	WEIGHT (kg)	PACK./ pcs
SO236	6418677419515	PAS/BLL 95-157	17.0-22.3	2.45	3

24 kV Covered Conductor Solution

Tension clamp SO85

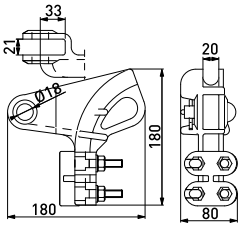
For dead-ending bare and covered conductors. The covered conductor has to be peeled before installing the clamp. The body is made of corrosion resistant aluminium alloy and the bolts are hot dip galvanized steel. Breaking strength 35 kN. Bolts 16 mm



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIAMETER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO85	6418677405112	AAAC 25 - 150, PAS 35-150, ACSR 25 - 99	6-14.9	55	0.743	25

Tension clamp SO105

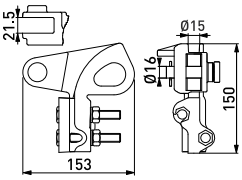
For dead-ending bare and covered conductors. The covered conductor has to be peeled before installing the tension clamp. The body is made of corrosion resistant aluminium alloy and the bolts are hot-dip galvanised steel. The conductor is inserted on one side and clamped by four bolts. Breaking strength 50 kN. Suspension bolt 16 mm.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIAMETER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO105	6418677404030	AAAC 95 - 241, ACSR 63 - 98, AACSR 131, PAS/BLL 95 - 150	10-20	44	1.208	10

Tension clamp SO146

Used for dead-ending bare and covered conductors. The covered conductor has to be peeled before installing the clamp. The body is made of corrosion resistant aluminium alloy and the bolts are hot-dip galvanised steel. The conductor is inserted on one side and clamped by two bolts. Breaking strength 35 kN.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIAMETER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO146	6418677404436	AAAC 25 - 150, Al/Fe 25 - 99, PAS/BLL 35 - 150	6-15	55	0.9	10

Helical tie sets CO and SO

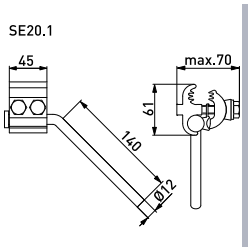
Used with covered conductors for tying the conductors to the insulators. Can be used as both top and side ties. Easy to install without tools. The tie is installed on the insulation of the covered conductor. The sets include 6 pcs ties (one set/cross arm). The right size is easy to recognise by the colour code.

TYPE	EAN	COVERED CONDUCTORS mm²	COLOUR CODE	INSULATOR NECK mm	WEIGHT (kg)	PACK./ pcs
CO35	6418677409165	35-50	Yellow	85	0.527	25
CO70	6418677409172	70-95	Green	85	0.65	25
CO120	6418677409134	120-150	Black	85	0.71	25
SO115.5073	6418677404085	35-50-62	Yellow	73	0.633	25
SO115.9573	6418677404108	70-95-99	Green	73	0.615	25
SO115.5085	6418677404092	35-50-62	Red	85	0.55	25
SO115.9585	6418677404115	70-95-99	Blue	85	0.617	25
SO115.150	6418677414329	120-150-157	White	73-85	0.665	25
SO216.62	6418677404566	62	White	85	0.63	25
SO216.99	6418677404573	99	Red	85	0.687	25
SO216.157	6418677404542	157	Blue	85	0.801	25
SO216.241	6418677404559	241	Yellow	85	1.6	25

24 kV Covered Conductor Solution

Arc protection device SE20.1 and SE21.1

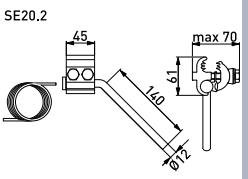
Used with covered conductors for arc protection. There is no need to peel the covered conductor. The connector includes an arc protection horn suitable also for use with temporary earthing devices with a screw fixing. The connector has a place for installing the Al-thread, which must be connected to the neck of the insulator.



TYPE	EAN	FOR CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SE20.1	6418677401879	PAS/BLL Al 35–157	40	0.47	24
SE21.1	6418677414312	PAS/BLL 185-241	40	0.47	24

Arc protection device SE20.2 and SE21.2

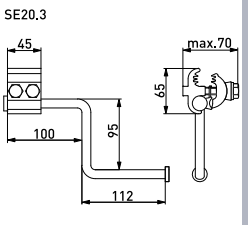
Used with covered conductors for arc protection. There is no need to peel the covered conductor. The connector includes an arc protection horn suitable also for use with temporary earthing devices with a screw fixing. The connector has a place for installing the Al-thread, which must be connected to the neck of the insulator. The products includes a 25 mm² Al thread 2.1 m.



TYPE	EAN	FOR CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SE20.2	6418677401893	PAS/BLL Al 35-157	40	0.47	24
SE21.2	6418677411021	PAS/BLL 185-241	40	0.57	24

Temporary earthing connector SE20.3 and SE21.3

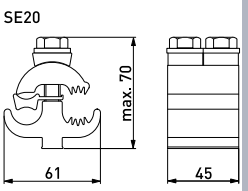
Used as a temporary earthing connector where the arc protection devices SE20.1 or SE20.2 are not present. There is no need to peel the covered conductor. The connector includes an arc protection horn suitable for use with temporary earthing device with a screw fixing. The connector has a place for an Al-thread, so it also works as an arc protection device.



TYPE	EAN	FOR CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SE20.3	6418677401923	PAS/BLL 35-157	40	0.57	24
SE21.3	6418677413049	PAS/BLL 185-241	40	0.57	24

Insulation piercing connector SE20 and SE21

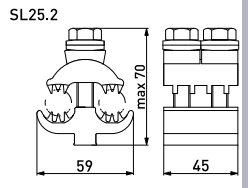
Used as a branching connector from covered to bare conductors, for aluminium to aluminium connections where no mechanical tension is involved. The body is made of corrosion resistant aluminium alloy, and the bolts are hot-dip galvanized. The parallel conductor groove with teeth is brushed and prepared with a joint compound.



TYPE	EAN	FOR CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SE20	6418677401862	PAS/BLL 35-157	40	0.27	25
SE21	6418677408885	PAS/BLL 185-241	40	0.27	25

Insulation piercing connector SL25.2

Used as a branch connector for covered conductors. There is no need to peel the covered conductor because the connector is equipped with insulation piercing teeth. The connector is made of corrosion resistant aluminium and the bolts are hot-dip galvanised steel. The connector is prepared with joint compound. Can be used with insulation cover SP16.

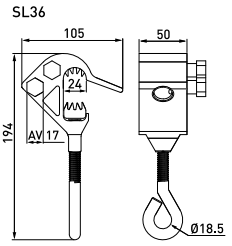


TYPE	EAN	MAIN CONDUCTOR mm²	BRANCH CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SL25.2	6418677403637	Al 35-157	Al 35-157	40	0.246	25

24 kV Covered Conductor Solution

Live-line connector SL36

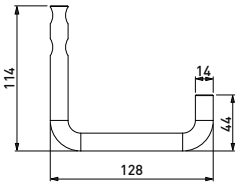
The connector SL36 is made of corrosion resistant aluminium and the bolts of stainless steel. The installation can be made with a live-line stick (e.g. CT48). Branching and temporary earthing can be made with SL36 and SL30 by using stirrups PSS923 and PSS924.



TYPE	EAN	MAIN CONDUCTOR mm²	BRANCH CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SL36	6418677411793	PAS/BLL 35-185	Al 35-157	40	0.494	24

Stirrup PSS923

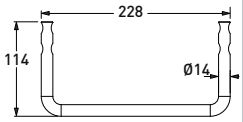
Branching and temporary earthing can be made with SL36 and SL30 by using stirrups PSS923 and PSS924. The stirrup is made of corrosion resistant aluminium. PSS923 is a stirrup of L-shape.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
PSS923	6418677414299	0.109	24

Stirrup PSS924

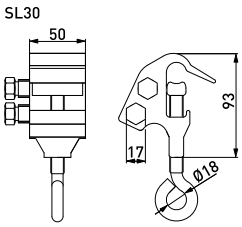
Branching and temporary earthing can be made with SL36 and SL30 by using stirrups PSS923 and PSS924. The stirrup is made of corrosion resistant aluminium. PSS924 is a stirrup of U-shape.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
PSS924	6418677414305	0.181	24

Live-line connectors SL30 and SL30.1

SL30 is used as a live-line branching connector for bare conductors. The connector is made of corrosion resistant aluminium and the bolts of stainless steel. The installation can be made with a live-line stick (e.g. CT48). Branching and temporary earthing can be made with SL30 and SL36 by using stirrups PSS923 and PSS924. The stirrups are made of corrosion resistant aluminium. PSS923 is a stirrup of L shape and PSS924 is a stirrup of U shape. In SL30 branching point is downwards. In SL30.1 the branching point is on the side of the connector.

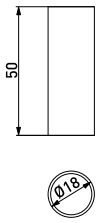


TYPE	EAN	MAIN CONDUCTOR mm²	BRANCH CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SL30	6418677403705	Al 25-150	Al 25-150	40/44	0.476	24
SL30.1	6418677411533	Al 25 - 150	Al 25-150	40/44	0.45	24

24 kV Covered Conductor Solution

Sleeve PSS830

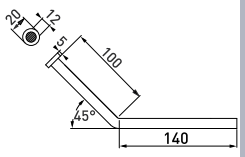
PSS830 is used with live-line connectors SL30, SL30.1 and SL36, when branch conductor is copper. The sleeve is tin coated aluminium and it is installed into live-line clamp. The inner diameter of the sleeve is 16 mm.



TYPE	EAN	Cu mm²	WEIGHT (kg)	PACK./ pcs
PSS830	6418677406737	50-95	0.008	30

Arc protection horn PSS464-P

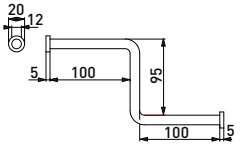
Used with covered conductors as an arc protection horn. The horn withstands 2-3 arcs 10 kA/1 s and after that, it has to be changed. The horn has been approved for fixing temporary earthing device with screw fixing.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
PSS464-P	6418677452130	0.2	25

Earthing horn PSS469-P

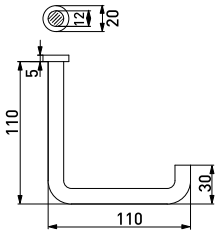
Used with covered conductors as a temporary earthing point. The temporary earthing device with screw fixing can be installed to the horn.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
PSS469-P	6418677452147	0.3	25

Earthing horn PSS597

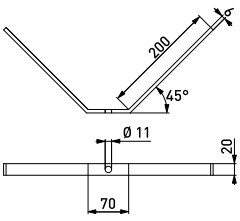
Used on pole transformers when temporary earthing is made on jumpers. The horn has been approved for screw type temporary earthing devices. The horn is installed on the conductor with SL4.25, SE20 or SL25.2 connectors and insulating covers. The earthing horns can be installed on different heights in the conductors.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
PSS597	6418677406584	0.2	25

Arc protection horn PSS463 for crossarm

Used with covered conductors on angle cross arms (SH153.10). The arc protection horn is hot-dip galvanized steel and is supplied with a bolt and a nut.

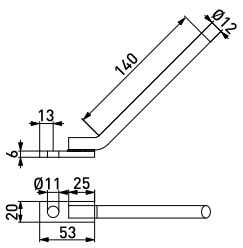


TYPE	EAN	WEIGHT (kg)	PACK./ pcs
PSS463	6418677401268	0.53	25

24 kV Covered Conductor Solution

Arc protection horn PSS465 for tension clamp

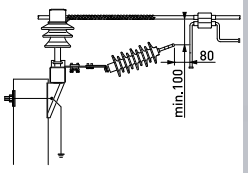
Used with dead-end clamps SO85, SO105 and SO146 on covered lines. The arc protection horn is made of hot-dip galvanized steel and supplied with a bolt and a nut.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
PSS465	6418677401282	0.215	25

Current limiting arc horn SDI46 series

Used on straight line cross arms for making the protection. The set includes a surge arrester, a fixing bracket, an insulation piercing connector, an arc protection horn and a connector cover. SDI46.7 and SDI46.710 are suitable for pin insulators. SDI46.5 and SDI46.510 are suitable for line-post insulators.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SDI46.7	6418677401626	3.0	1
SDI46.710	6418677419102	2.3	1
SDI46.5	6418677418631	3.86	1
SDI46.510	6418677418655	3.16	1

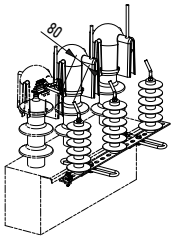
Current limiting device SDI3143.2

The use of current limiting devices on transformer covers is as beneficial as when used in the protection of covered conductors. The number of high-speed automatic reclosures can be reduced significantly compared to the widely used power arc devices – thus, a resistant and maintenance-free protection method is achieved. Ensto has renewed the product range of its current limiting devices for small transformers (< 200 kVA). A special attention has been given to easy usability:

- All necessary parts with one product code
- Easy to adjust surge arrester support
- Use of the familiar KG connector in connecting the bushing insulator of the transformer
- Easy to install protective covers

The set includes:

- 3 surge arresters
- 3 electrodes attached to the bushing insulator of the transformer
- 3 protective covers with fasteners
- A surge arrester support with fasteners



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SDI3143.2	6418677453618	12.5	1

Automatic tension joint kits CIL

Suitable for covered conductors, which have to be peeled. The automatic joints are reliable and fast to make. The color codes make it easy to identify the right type. The wedges ensure a secure joint. The joint kits include a joint, an insulation sleeve and an abrasive band.

TYPE	EAN	COVERED CONDUCTORS mm²	CONDUCTOR DIA. mm	COLOUR CODE	WEIGHT (kg)	PACK./ pcs
CIL66	6418677414251	PAS 35 - 50	5.81 – 8.6	orange/red	0.26	25
CIL67	6418677414268	PAS 70 - 95, BLL 62	9.27 – 12.06	yellow/grey	0.47	25
CIL68	6418677414275	PAS 120 - 150, BLL 99	12.75 – 14.86	pink/black	0.79	25
CIL69	6418677438899	BLL 157	14.73 – 18.40	green/brown	0.850	25

24 kV Covered Conductor Solution

Pulling grips ST103.501 and ST103.502

For pulling out bare and covered conductors in overhead lines through rollers and pulley fittings. The stockings are manufactured from high strength, parallel stranded fibres and they have a polyethylene sheath. The plastic material is non-conductive, non-corrosive and abrasion resistant. The construction is made to prevent damage to other equipment during the pulling operation. To secure maximum tension force, it is recommended to tape the back end of the stocking on to the conductor with a 50 mm broad PVC tape zone.

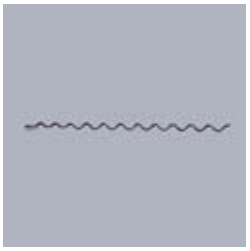
TYPE	EAN	LENGTH mm	DIAMETER mm	MATERIAL	WEIGHT (kg)	PACK./ pcs
ST103.501	6418677408236	1000	10-20	Metal	0.144	1
ST103.502	6418677408243	1000	10-20	Plastic	0.062	1

Come along clamps CT102.501 and CT102.1201

For tensioning overhead line spans of both bare and covered conductors. The grips cover a wide range of diameters and can apply high tension force. CT102 uses an articulated construction. It is easy to mount and change on the line.

TYPE	EAN	COVERED CONDUCTORS mm²	CONDUCTOR DIA. mm	WEIGHT (kg)	PACK./ pcs
CT102.501	6418677409196	35-50	7.87-13.46	1.7	1
CT102.1201	6418677409189	70-120	13.46-18.80	3.77	1

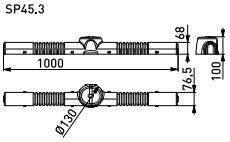
Spiral vibration dampers CO27 and CO28



Spiral Vibration Dampers are designed to control high frequency aeolian vibration and are particularly effective on small sized earth wires and cables. They do not impose a concentrated mass or clamping stress on the conductor or cable at the point of attachment and are therefore ideally suited for use on PAS/BLL, OPGW, OPCON and ADSS applications.

TYPE	EAN	COVERED CONDUCTORS mm²	WEIGHT (kg)	PACK./ pcs
CO27	6418677409141	35-50	0.46	1
CO28	6418677409158	70-157	1.0	1

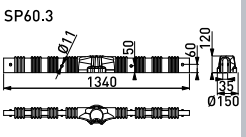
Bird protector set SP45.3



SP45.3 bird protectors prevent failures created by birds or other animals in bare or covered lines. These protectors are suitable for different pin and line post insulators. They are also easy to install even in line angles or when the conductor is attached to the neck of the insulator. SP45.3 covers arc protecting devices (i.e. SE20.2) in covered conductor lines and it is weather resistant. The SP45.3 bird protector is 1000 mm long. Extra length can be achieved in combination with SP31.3. One set consists of 3 units.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP45.3	6418677405327	0.875	1

Bird protector set SP60.3



SP60.3 bird protectors prevent failures created by birds or other animals in bare or covered lines. This protector is suitable for different pin and line post insulators. It is also easy to install even in line angles or when the conductor is attached to the neck of the insulator. SP60.3 covers arc protecting devices (i.e. SE20.2) in covered conductor lines and it is weather resistant. SP60.3 can be installed in a live line with the aid of special tools. Delivered in complete sets of 3 pcs.

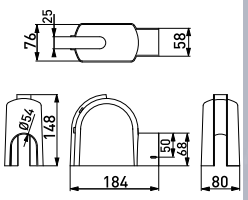
TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP60.3	6418677441714	1.83	1

24 kV Covered Conductor Solution

Bird protector set SP46.3 for underground cable terminals

Prevents short-circuiting by large birds or airborne debris at surge arresters or cable terminals in medium voltage networks. Bare jumpers can be protected with flexible protectors SP31.3. Made of weather and UV resistant plastic. One set consists of 3 units.

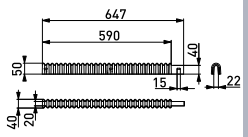
TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP46.3	6418677405334	0.226	8



Cable protector set SP31.3

Flexible cover for jumpers or conductors close to insulators. Can be used together with SP36.3 for pin insulators or transformer bushings. Easy tie fixing. Made of weather and UV resistant plastic. One set consists of 3 units.

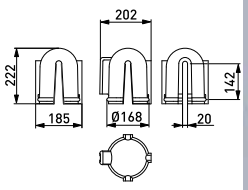
TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP31.3	6418677405266	0.3	1



Bird protection set SP36.3

Used for bushings, insulators and surge arresters in dia. 100-180 mm. Can be used together with flexible protector SP31.3. Easy tie fixing. Made of weather and UV resistant plastic. One set consists of 3 units.

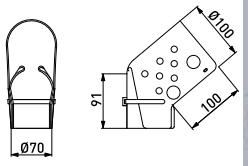
TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP36.3	6418677405280	0.445	8



Bird protection set SP38.3

Flexible cover for low voltage bushings, transformers and motors. Easy tie fixing. Made of weather and UV resistant rubber. One set consists of 3 units.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP38.3	6418677405297	0.4	10



Twig protector ST149

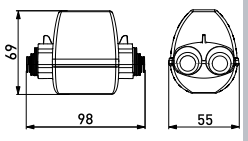
Used with covered conductors as a branch protector to prevent the sliding of the branches along the conductor to the arc protection devices or other bare live-line parts. Made of UV-radiation resistant plastic. Can be installed on a conductor under voltage e.g. with live-line tool CT48.

TYPE	EAN	COVERED CONDUCTORS mm²	WEIGHT (kg)	PACK./ pcs
ST149	6418677405433	35-150	0.062	50

Insulating cover SP15

SP15 is used as a connector cover. The cover has to be installed so that the drain hole for ambient water is downwards. The cover is made of UV-radiation and weather resistant thermoplastic. Suitable for SM2.1, SM2.11, SM2.2, SM2.21, SM2.25, SL4.2, SL4.21, SL4.25, SL4.26, SL37.1, SL37.2, SL39.2

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP15	6418677405211	0.031	100



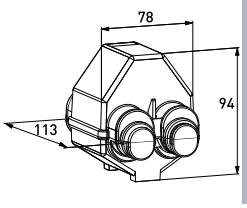
SP15

24 kV Covered Conductor Solution

Insulating cover SP16

SP16 is used as a connector cover. The cover has to be installed so that the drain hole for ambient water is downwards. The cover is made of UV-radiation and weather resistant thermoplastic. Suitable for SM4.2, SM4.21, SL8.2, SL8.21, SL14.2, SL25.2, series SE20 and SE21.

SP16



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP16	6418677410208	0.037	50

Number plates PEM241

Used with conductors to mark the phases. Made of UV radiation resistant plastic. The plates are installed by nylon ties.

TYPE	EAN	PLATE NO.	WEIGHT (kg)	PACK./ pcs
PEM241.1	6418677400445	1	0.007	100
PEM241.2	6418677400476	2	0.007	100
PEM241.3	6418677400490	3	0.007	100

36 kV Covered Conductor Solution

Having a long experience of the advantages of the 6-24 kV Covered Conductor Solution Ensto has developed its special accessories for 36 kV CC. As the 36 kV requires larger phase spacing between the phases we have designed special 36 kV crossarms, insulators and power arc devices.

The traditional range of tension clamps and suspension clamps suits for both 6-24 kV and 36 kV lines. These products are introduced in this catalogue.

Ensto is developing a constantly growing family of products to protect wildlife and to guarantee uninterrupted power supply.

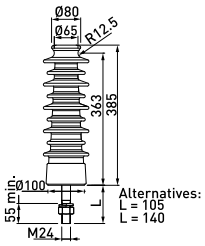
Ensto has a wide range of tools for network building. For tools please see page 47 onwards.

36 kV Covered Conductor Solution

Porcelain line post insulators SDI81 and SDI81.1

Porcelain line post insulator for bare or covered 36 kV lines. Creepage distance 600 mm.

TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	BREAKING LOAD kN	INSULATOR PIN	WEIGHT (kg)	PACK./ pcs
SDI81	6418677422874	36	6	M24x105	6.5	3
SDI81.1	6418677422881	36	6	M24x140	6.6	3

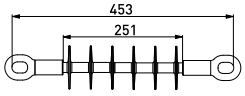


Composite insulators SDI90 series

Composite tension insulator SDI90 series are used for terminal and intermediate poles of 36 kV lines. Creepage distance 613 mm.

TYPE	EAN	END FITTINGS	HIGHEST SYSTEM VOLTAGE kV	WEIGHT (kg)	PACK./ pcs
SDI90.280	6418677422768	eye / eye	36	1.08	3
SDI90.282	6418677422782	socket / eye	36	1.3	3
SDI90.283	6418677422799	ball / socket	36	1.1	3
SDI90.284	6418677422805	clevis / tongue	36	1.3	3
SDI90.285	6418677422812	clevis / ball	36	1.2	3
SDI90.288	6418677422843	socket / tongue	36	1.3	3

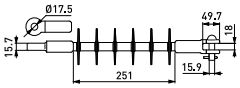
SDI90.280



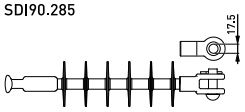
SDI90.282

SDI90.283

SDI90.284



SDI90.285

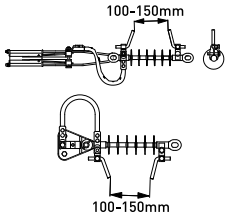


SDI90.288

Power arc device SDI27.1

Power arc device SDI27.1 is used with SDI90.x composite insulators on angle poles with suspension clamp SO181.5 and on tension poles with tension clamps SO235 or SO236. The package includes arching horns and 95 mm² conductor with cable lugs. Spark gap is adjustable.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SDI27.1	6418677419133	0.83	9

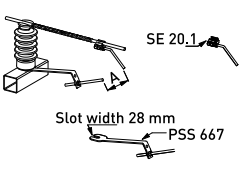


Power arc device SDI20.2

Power arc device SDI20.2 is used as a arcing protection device for covered conductors. The device is suitable for horizontal suspension crossarms that are equipped with line post insulators e.g. SDI81. Nominal thickness of covering may vary from 2.0 mm up to 3.6 mm. Spark gap is adjustable.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SDI20.2	6418677418600	1.25	12

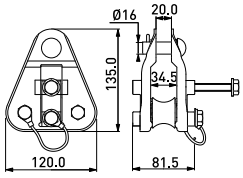
SDI20.2



36 kV Covered Conductor Solution

Suspension clamp SO181.5

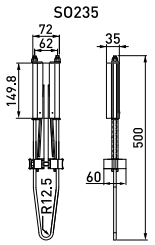
Suitable for covered conductors.The clamp also functions as an installation pulley thereby completely eliminating the need for separate pulleys. Conductor joints with diameter under 30 mm can be pulled through the suspension clamp. Has no loose parts, so it is easy to handle even in difficult conditions. The insulation piercing clamping piece is connected to the body with a wire for balancing the potential. Tested for radio interference. Breaking strength 36 kN. Suspension bolt 16 mm.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIAMETER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO181.5	6418677404498	35-157	11-22.5	40	1.157	3

Waterproof tension clamp SO235

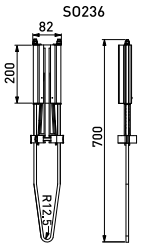
For dead-ending covered conductors. The clamp is very easy to install compared with the other clamps on the market as there is no need to peel the conductor. The insulation piercing part of the clamp keeps the parts of the clamp at the same potential and prevents partial discharges and radio disturbances. The insulation piercing part also makes it possible to add an arc protection device to the clamp.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIA. mm	WEIGHT (kg)	PACK./ pcs
SO235	6418677416293	PAS/BLL 35-70, Raven, Pigeon, AAAC 132	11.5-16.6	1.133	9

Waterproof tension clamp SO236

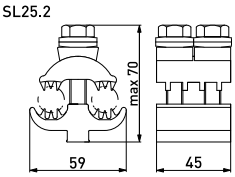
For dead-ending covered conductors. The clamp is very easy to install compared with the other clamps on the market as there is no need to peel the conductor. The insulation piercing part of the clamp keeps the parts of the clamp at the same potential and prevents partial discharges and radio disturbances. The insulation piercing part also makes it possible to add an arc protection device to the clamp.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIA. mm	WEIGHT (kg)	PACK./ pcs
SO236	6418677419515	PAS/BLL 95-157	17.3-22.3	2.45	3

Insulation piercing connector SL25.2

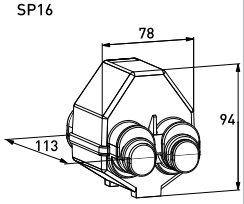
Used as a branch connector for covered conductors. There is no need to peel the covered conductor because the connector is equipped with insulation piercing teeth. The connector is made of corrosion resistant aluminium and the bolts are hot-dip galvanized steel. The connector is prepared with joint compound. Can be used with insulation cover SP16.



TYPE	EAN	MAIN CONDUCTOR mm²	BRANCH CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SL25.2	6418677403637	Al 35-157	Al 35-157	40	0.246	25

Insulating cover SP16

SP16 is used as a connector cover. The cover has to be installed so that the drain hole for ambient water is downwards. The cover is made of UV-radiation and weather resistant thermoplastic. Suitable for SM4.2, SM4.21, SL8.2, SL8.21, SL14.2, SL25.2, series SE20, SE21.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP16	6418677410208	0.037	50

36 kV Covered Conductor Solution

Automatic tension joint kits CIL

Automatic tension joints are suitable for covered conductors which have to be peeled. The automatic joints are reliable and fast to make. The colour codes make it easy to identify right size. The wedges ensure a safe joint. Insulation sleeves and an abrasive band included in kits.

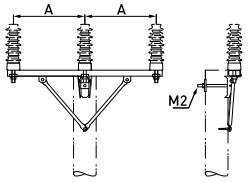
TYPE	EAN	COVERED CONDUCTORS mm²	CONDUCTOR DIA. mm	COLOUR CODE	WEIGHT (kg)	PACK./ pcs
CIL66	6418677414251	PAS 35 - 50	5.81 – 8.6	orange/red	0.26	25
CIL67	6418677414268	PAS 70 - 95, BLL 62	9.27 – 12.06	yellow/grey	0.47	25
CIL68	6418677414275	PAS 120 - 150, BLL 99	12.75 – 14.86	pink/black	0.79	25

Helical tie SO115 series

Used with covered conductors for tying the conductors to the insulators. Can be used as both top and side ties. Easy to install without tools. The tie is installed on the insulation of the covered conductor. The sets include 6 pcs ties (one set/cross arm). The right size is easy to recognise by the colour code.

TYPE	EAN	COVERED CONDUCTORS mm²	COLOUR CODE	INSULATOR NECK mm	WEIGHT (kg)	PACK./ pcs
SO115.5073	6418677404085	35-50-62	Yellow	73	0.633	25
SO115.9573	6418677404108	70-95-99	Green	73	0.615	25
SO115.5085	6418677404092	35-50-62	Red	85	0.55	25
SO115.9585	6418677404115	70-95-99	Blue	85	0.617	25
SO115.150	6418677414329	120-150-157	White	73-85	0.665	25

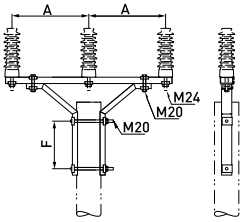
Horizontal suspension crossarm SH248



Suspension crossarm for single three phase covered conductor lines. Phase spacing 600 mm. Line post insulators SDI81 are used with the crossarm. Insulators must be ordered separately.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SH248	6418677422898	12.9	1

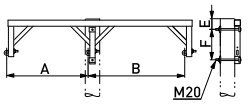
Horizontal suspension crossarm SH249



Suspension crossarm for single three phase covered conductor lines. Phase spacing 600 mm. Line post insulators SDI81 are used with the crossarm. Insulators must be ordered separately.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SH249	6418677422904	12.6	1

Horizontal angle crossarm SH250



Angle crossarm for single three phase covered conductor lines. Phase spacing A=1070 mm / B=1270 mm. Insulators and clamps must be ordered separately.

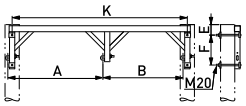
TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SH250	6418677422911	35.0	1

36 kV Covered Conductor Solution

Horizontal angle crossarm SH251

Angle crossarm for single three phase covered conductor lines. Phase spacing A=1270 mm/B=1070 mm. Insulators and clamps must be ordered separately.

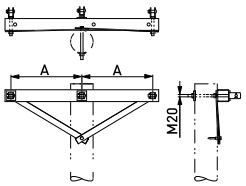
TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SH251	6418677422928	38.0	1



Terminal crossarm SH252

Terminal crossarm for single three phase covered conductor lines. Phase spacing 600 mm. Tension insulators SDI90.280 equipped with SO235 or SO236 tension clamps with SDI27.1 are used with the crossarm and have to be ordered separately.

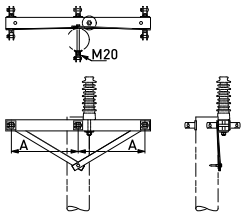
TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SH252	6418677422935	22.0	1



Intermediate tension crossarm SH253

Intermediate tension crossarm for single three phase covered conductor lines. Phase spacing 600 mm. Tension insulators SDI90.280 equipped with SO235 or SO236 tension clamps with SDI27.1 are used with the crossarm. Additional SDI81 insulator is also needed. Insulators and clamps must be ordered separately.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SH253	6418677422942	25.0	1



12-36 kV Solutions for Universal Cables

Universal cables can be installed in demanding conditions underground, in water or in air. Ensto has designed a range of special accessories for universal cable systems. Our long experience of demanding circumstances, cold and snowy as well as hot and humid, has helped us to develop reliable and safe accessories. However, because there are so many different manufacturers of universal cables the suitability of the accessories should always be confirmed by the cable manufacturer.

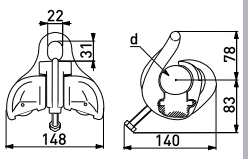
Ensto Underground Solutions offer a wide range of strong and reliable joints and terminations. There is a separate Ensto Underground brochure, which can be found in our web pages www.ensto.com.

12-36 kV Universal Cable Solution

Suspension clamp SO86 with PK rubber inserts

Used for universal cables at straight line and angle poles. The rubber inserts PK143.12 or PK143.24 must be ordered separately for various cables. The suspension clamp is used in angles, one up to 30° and two up to 60°. With a construction of two suspension clamps a yoke SOT73 is needed.

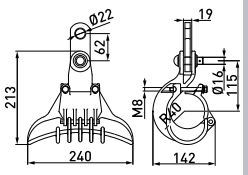
TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO86	6418677405143	12-24	15	0.908	10
PK143.12	6418677400803			0.14	100
PK143.24	6418677400810			0.074	100



Suspension clamp SD21 with rubber inserts

Used for universal cables at straight line and angle poles. The rubber insert PK88 must be ordered separately. The suspension clamp is used in angles, one up to 30° and two up to 60°. With a construction of two suspension clamps a yoke SOT73 is needed.

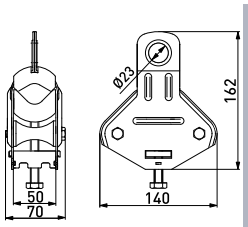
TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SD21	6418677401527	12-24	10	2.24	1
PK88	6418677400988			1.1	10



Suspension clamp SO99

Used for the installation and suspension of cables from poles in straight lines and at angles of up to 90° with 4x25 mm² and 4x50 mm² cables or up to 60° with 4x95 mm² cables. The body is made of hot-dip galvanized steel, and there is a stainless steel reinforced ring in the hook attachment. The integral rollers are made of corrosion resistant aluminium and inserts of weather resistant plastic. At angles exceeding 30°, the use of an additional roller ST26.99 is recommended.

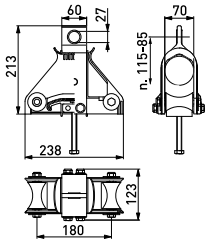
TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO99	6418677405181	12	12	0.825	10



Suspension clamp SO150

Used in angle and suspension poles. Can also be used as a pulley when installing the cable. When the cable has been tightened to its final length, it is locked to the clamp. The clamp is used at angles max. 30 degrees depending on the bending radius and tightening strength of the cable.

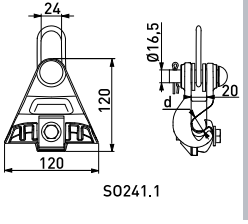
TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO150	6418677404443	12-24	25	2.2	4



Suspension clamp SO241.1

For MV aerial bundled cables with bare messenger. Suitable for hook attachment. Breaking load is 22 kN.

TYPE	EAN	MESSENGER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO241.1	6418677419485	5.9-18.5	40	0.65	1

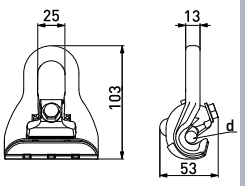


12-36 kV Universal Cable Solution

Suspension clamp SO214

Used for the suspension of overhead cables with uninsulated messenger in straight lines and angles up to 90°. Breaking load is 25 kN.

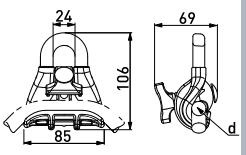
TYPE	EAN	MESSENGER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO214	6418677410666	5.8-13	48	0.248	50



Suspension clamp SO69.95

The suspension clamp is used for the suspension of the insulated messenger in straight lines and at angles up to 90°. Breaking load is 22 kN.

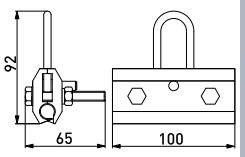
TYPE	EAN	MESSENGER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO69.95	6418677414572	7.0-16.5	By hand	0.244	50



Suspension clamp SO220

Use for the suspension of the Axclight-H,Exclight-H cable with messenger in straight lines and at angles of up to 30° and as a double construction together with yoke SOT73 up to 60°. Breaking load is 22 kN.

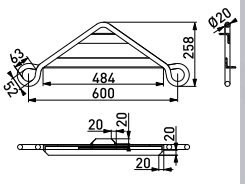
TYPE	EAN	MESSENGER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO220	6418677414343	10.5-11.5	20	0.29	25



Yoke SOT73

Suspension console is used for universal cable suspension construction with two suspension clamps at line angles up to 60°. Suspension console is made of hot dip galvanized steel.

TYPE	EAN	HOOK LENGTH mm	WEIGHT (kg)	PACK./ pcs
SOT73	6418677408922	210	7.2	1



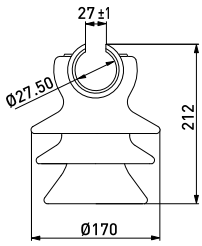
6-36 kV Bare Conductor Solution

Ensto's products for the conventional Bare Conductor Line Networks cover most common conductors. The comprehensive range of the accessories provides a simple and economic system for line erection. They comply with the most commonly used European standards.
The Ensto accessories are designed in co-operation with power supply companies. They are easy to install and have a long service life in extremely hard climatic conditions.

6-36 kV Bare Conductor Solution

Pin insulator SDI37

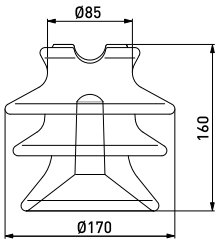
SDI37 is used with bare wires or covered conductors. Suitable for installation on pin SOT24 (SFS 4385). The plastic sleeve in the top-groove of the insulator enables pulling of conductor without using pulleys. The conductor can be tied to the top-groove or to the neck. In angles, always tie to the neck. Creepage distance 325 mm. Neck diameter 85 mm.



TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	BREAKING LOAD kN	INSULATOR PIN	WEIGHT (kg)	PACK./ pcs
SDI37	6418677408731	24	12.5	SOT24	3.8	3

Pin insulator SDI30

SDI30 is used with bare wires or covered conductors. Suitable for installation on pin SOT24 (SFS 4385). The conductor can be tied to the top-groove or to the neck. In angles, always tie to the neck. Creepage distance 325 mm. Neck diameter 85 mm.



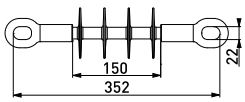
TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	BREAKING LOAD kN	INSULATOR PIN	WEIGHT (kg)	PACK./ pcs
SDI30	6418677408748	24	12.5	SOT24	3.37	3

Composite insulators SDI90 series

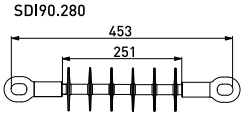
Composite tension insulator SDI90 series are used for terminal and intermediate poles of 36 kV lines. Creepage distance 613 mm.

TYPE	EAN	END FITTINGS	HIGHEST SYSTEM VOLTAGE kV	WEIGHT (kg)	PACK./ pcs
SDI90.150	6418677422669	eye / eye	24	0.995	3
SDI90.280	6418677422768	eye / eye	36	1.08	3
SDI90.282	6418677422782	socket / eye	36	1.3	3
SDI90.283	6418677422799	ball / socket	36	1.1	3
SDI90.284	6418677422805	clevis / tongue	36	1.3	3
SDI90.285	6418677422812	clevis / ball	36	1.2	3
SDI90.288	6418677422843	socket / tongue	36	1.3	3

SDI90.150

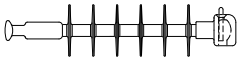


SDI90.280

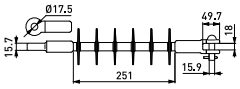


SDI90.282

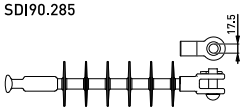
SDI90.283



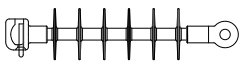
SDI90.284



SDI90.285

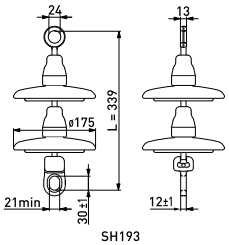


SDI90.288



Glass tension insulator strings SH193

Suitable for installation on angle and terminal crossarms as well as hooks. The insulators are 24 - 52 kV glass insulators U40BL according to IEC 60305. They are tested according to IEC 60383/1983. Breaking load is 40 kN.



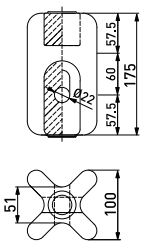
SH193

TYPE	EAN	END FITTINGS	HIGHEST SYSTEM VOLTAGE kV	WEIGHT (kg)	PACK./ pcs
SH193	6418677407062	ball-socket	24	4.40	1
SH193.453	6418677441424	ball-socket	36	6.16	1
SH193.454	6418677414114	ball-socket	52	7.92	1
SH193.455	6418677414121	ball-socket	52	9.68	1

6-36 kV Bare Conductor Solution

Stay insulator SDI4.5

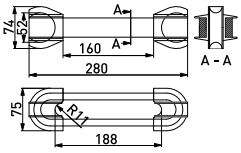
Porcelain stay insulator is suitable for installation in stay wires up to 52 mm². Conforms with standard SFS 3741. Creepage distance is 95 mm.



TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	MAX CONTINUOUS LOAD kN	SMFL kN	WEIGHT (kg)	PACK./ pcs
SDI4.5	6418677418556	24	17.5	120	2.15	6

Composite stay insulators SDI70.24

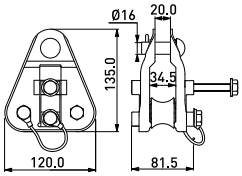
SDI70.24 insulator has high mechanical and electrical capacity combined with light weight. The insulating section is made of glass fibre impregnated with UV stabilized resin and twice covered silicon rubber. The end thimble is made of aluminium and dimensioned for minimum 52 mm eyelet. SDI70.24 is suitable for installation on stay wires up to Fe52 and is tested according to IEC 60383. Ordinary mechanical load 48 kN, max. mechanical load 144 kN, specified mechanical load 180 kN. Creepage distance 160 mm.



TYPE	EAN	HIGHEST SYSTEM VOLTAGE kV	MAX CONTINUOUS LOAD kN	SMFL kN	WEIGHT (kg)	PACK./ pcs
SDI70.24	6418677401787	24	35	>180	0.8	15

Suspension clamp SO181

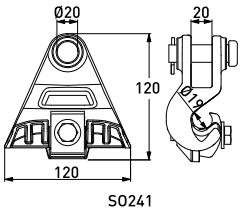
Suitable for bare conductors. The clamp also functions as an installation pulley thereby completely eliminating the need for separate pulleys. Conductor joints with diameter under 30 mm can be pulled through the suspension clamp. Has no loose parts, so it is easy to handle even in difficult conditions. The serrated clamping piece is connected to the body with a wire for balancing the potential. Tested for radio interference. Breaking strength >36 kN. Suspension bolt 16 mm.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIAMETER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO181	6418677404474	Al/Fe 25-131, AAAC 35-201	6.3-20.2	20	1.192	3

Suspension clamps SO241

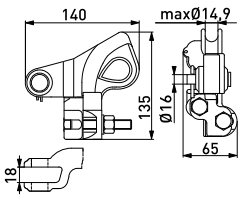
The suspension clamp SO241 is suitable for bare conductors at medium and low voltages. The body is made of corrosion resistant aluminium alloy and the bolt is of hot-dip galvanised steel. SO241 suspension bolt diameter is 16 mm and breaking load is >50 kN. SO241.2 suspension bolt diameter is 19 mm and breaking load is >50 kN.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIAMETER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO241	6418677416309	AAC 25-201, ACSR 25-110, PAS/BLX 35-157	6-18.5	40	0.55	25
SO241.2	6418677416316	AAC 25-201, ACSR 25-110, PAS 35-157	6.0-18.5	40	0.617	1

Tension clamp SO85

For dead-ending bare and covered conductors. The body is made of corrosion resistant aluminium alloy and the bolts are hot dip galvanized steel. Breaking load is 35 kN. SO85 suspension bolt diameter is 16 mm. SO85.2 suspension bolt diameter is 19 mm.

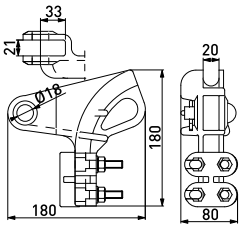


TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIAMETER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO85	6418677405112	AAAC 25 - 150, PAS 35-150, ACSR 25 - 99	6-14.9	55	0.743	25
SO85.2	6418677405136	AAAC 25 - 132, PAS 35-120, ACSR 25 - 99	6-14.9	55	0.781	10

6-36 kV Bare Conductor Solution

Tension clamp SO105

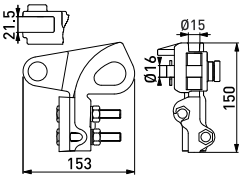
For dead-ending bare and covered conductors. The body is made of corrosion resistant aluminium alloy and the bolts are hot dip galvanized steel. Breaking load >50 kN. Suspension bolt diameter is 16 mm.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIAMETER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO105	6418677404030	AAAC 95 - 241, ACSR 63 - 98, AACSR 131, PAS/BLL 95 - 150	10-20	44	1.208	10

Tension clamp SO146

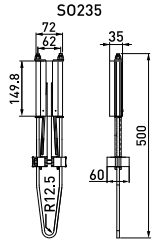
Used for dead-ending bare and covered conductors. The body is made of corrosion resistant aluminium alloy and the bolts are hot-dip galvanised steel. The conductor is inserted on one side and clamped by two bolts. Breaking load >35 kN. Suspension bolt diameter is 16 mm.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIAMETER mm	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SO146	6418677404436	AAAC 25 - 150, Al/Fe 25 - 99, PAS/BLL 35 - 150	6-15	55	0.9	10

Tension clamp SO235

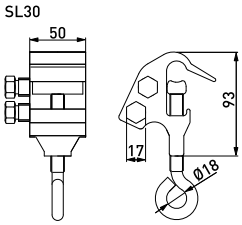
SO235 is used for live line disconnection point. See page 52 for more information on disconnection point.



TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIA. mm	WEIGHT (kg)	PACK./ pcs
SO235	6418677416293	PAS/BLL 35-70, Raven, Pigeon, AAAC 132	11.5-16.6	1.133	9
SO235.1	6418677419461	Swan, Sparrow	8-10.1	1.192	9

Live-line connector SL30

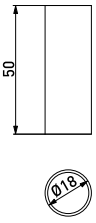
Used with bare conductors as a live-line branching connector. The connector is made of corrosion resistant aluminium and the bolts of stainless steel. For copper branch conductors sleeve PSS830 is needed. The installation can be made with a live-line stick (e.g. CT48). In SL30 branching point is downwards. In SL30.1 the branching point is on the side of the connector.



TYPE	EAN	MAIN CONDUCTOR mm²	BRANCH CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SL30	6418677403705	Al 25-150	Al 25-150	40/44	0.476	24
SL30.1	6418677411533	Al 25 - 150	Al 25-150	40/44	0.45	24

Sleeve PSS830

PSS830 is used with live-line connectors SL30, and SL30.1 when the branch conductor is copper. The sleeve is tin coated aluminium and it is installed into the live-line clamp. The inner diameter of the sleeve is 16 mm.



TYPE	EAN	Cu mm²	WEIGHT (kg)	PACK./ pcs
PSS830	6418677406737	50-95	0.008	30

6-36 kV Bare Conductor Solution

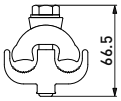
Parallel groove connectors SL4.25 and SL8.21

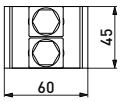
For aluminium or steel to aluminium connections where no mechanical tension is involved. The lower section of the body protects the bolts from corrosion and makes tightening of the bolts easy, using fork wrench ST34. The correct tightening torque is essential to the connection. The body is made of corrosion resistant aluminium alloy, and the bolts are hot-dip galvanised steel. All connectors are pre-brushed and prepared with joint compound. SL4.25 is equipped with springs to make the installation even easier.

TYPE	EAN	MAIN CONDUCTOR mm²	BRANCH CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SL4.25	6418677403750	Al 16-120	Al 16-120	20	0.128	50
SL8.21	6418677403781	Al 50-240	Al 50-240	44	0.29	25

Parallel groove connector SL14.2

SL14.2 is for Al or Cu connections where no mechanical tension is involved. The body is made of tin plated aluminium alloy, and the bolts are hot-dip galvanized steel.





TYPE	EAN	MAIN CONDUCTOR mm²	BRANCH CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SL14.2	6418677403552	Al/Cu 50-240	Al 50-185 / Cu 50-150	44	0.28	25

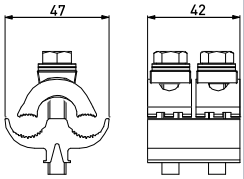
Parallel groove connectors SL37.1 and SL37.2

SL37.1 and SL37.2 are used for aluminium or steel to aluminium connections where no mechanical tension is involved. The correct tightening torque is essential to the connection. SL37.271 is suitable for copper and aluminium connections. SL37.271 is equipped with shear head bolts.

TYPE	EAN	MAIN CONDUCTOR mm²	BRANCH CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SL37.1	6418677414404	Al 6-95	Al 6-95	22	0.055	200
SL37.2	6418677414411	Al 6-95	Al 6-95	22	0.1	50
SL37.271	6418677450273	Al/Cu 6-95	Al/Cu 6-95	22	0.11	50

Parallel groove connector SL39.2, SL39.27 and SL39.271

SL39.2 is used for aluminium or steel to aluminium and SL39.27 is suitable for copper and aluminium connections. The correct tightening torque is essential to the connection. SL39.271 is equipped with shear head bolts. The connectors are used when no mechanical tension is involved.



SL39.2

TYPE	EAN	MAIN CONDUCTOR mm²	BRANCH CONDUCTOR mm²	TIGHTENING TORQUE Nm	WEIGHT (kg)	PACK./ pcs
SL39.2	6418677419607	Al 16-150	Al 16-150	22	0.12	50
SL39.27	6418677438905	Al/Cu 16-150	Al 16-150 / Cu 10-120	22	0.120	50
SL39.271	6418677450280	Al/Cu 16-150	Al 16-150, Cu 10-120	22	0.13	50

Automatic tension joints CIL

The automatic joints are reliable and fast to make. The installation can be made without tools. The colour codes make it easy to identify the right type. The wedges ensure a safe joint.

TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIA. mm	COLOUR CODE	WEIGHT (kg)	PACK./ pcs
CIL63	6418677414220	35 - 50	5.81-8.64	orange / red	0.155	25
CIL64	6418677414237	70 - 95	9.27-12.06	yellow / grey	0.278	25
CIL65	6418677414244	120 - 150	12.75-14.86	pink / black	0.478	25
CIL71	6418677417726	-	14.73-18.40	green / brown	0.840	10
CIL72	6418677418440	-	18.8-21.7	blue / green	1.08	10

6-36 kV Bare Conductor Solution

Automatic joints CIL9

CIL9 automatic tension joints are used for universal cables with steel messenger and also for stay wire applications.

TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIA. mm	WEIGHT (kg)	PACK./ pcs
CIL9.25	6418677418549	Fe 25	5.46-6.86	0.381	50
CIL9.33	6418677419072	Fe 33	6.86-8.00	0.381	5
CIL9.52	6418677419089	Fe 52	8.25-9.96	0.599	25
CIL9.68	6418677418532	Fe 68	9.96-11.56	0.726	25
CIL9.89	6418677419096	Fe 89	11.56-13.21	0.871	10

Dead ends COL25, COL33 and COL52

Automatic stay wire clamps are used for steel stay wire or steel messenger wire.

TYPE	EAN	FOR CONDUCTOR mm²	CONDUCTOR DIA. mm	WEIGHT (kg)	PACK./ pcs
COL25	6418677418495	Fe 25	5.46-6.86	0.236	25
COL33	6418677418501	Fe 33	6.86-8.00	0.380	25
COL52	6418677418518	Fe 52	8.25-9.96	0.563	25

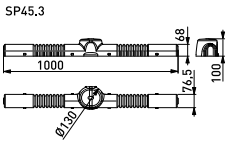
Insulated stay wire sets SHS

An insulated set for medium voltage lines. The wire gauge is 25 mm² steel wire and the permitted load is up to 17.5 kN. All steel parts are hot-dip galvanized and plastic marking tubes are of weather and UV-resistant material.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SHS25K.165L	6418677407697	9.6	1
SHS25K.165R	6418677407703	10.7	1
SHS12.0611232	6418677402531	11.2	1
SHS5.0610052	6418677414350	14.5	1

Bird protector sets SP45.3

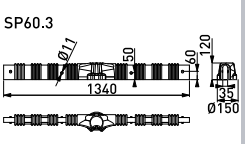
SP45.3 bird protectors prevent failures created by birds or other animals in bare or covered lines. These protectors are suitable for different pin and line post insulators. They are also easy to install even in line angles or when the conductor is attached to the neck of the insulator. SP45.3 covers arc protecting devices (i.e. SE20.2) in covered conductor lines and it is weather resistant. The SP45.3 bird protector length is 1000 mm. Extra length can be achieved in combination with SP31.3. One set consists of 3 units.



TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP45.3	6418677405327	0.875	1

Bird protector set SP60.3

SP60.3 bird protectors prevent failures created by birds or other animals in bare or covered lines. This protector is suitable for different pin and line post insulators. It is also easy to install even in line angles or when the conductor is attached to the neck of the insulator. SP60.3 covers arc protecting devices (i.e. SE20.2) in covered conductor lines and it is weather resistant. SP60.3 can be installed in a live line with the aid of special tools. Delivered in complete sets of 3 pcs.



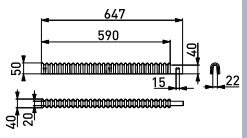
TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP60.3	6418677441714	1.83	1

6-36 kV Bare Conductor Solution

Cable protector set SP31.3

Flexible cover for jumpers or conductors close to insulators. Can be used together with SP36.3 for pin insulators or transformer bushings. Easy tie fixing. Made of weather and UV resistant plastic. One set consists of 3 units.

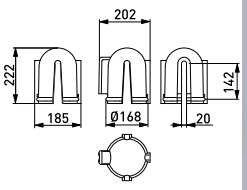
TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP31.3	6418677405266	0.3	1



Bird protection set SP36.3

Used for bushings, insulators and surge arresters in dia. 100-180 mm. Can be used together with flexible protector SP31.3. Easy tie fixing. Made of weather and UV resistant plastic. One set consists of 3 units.

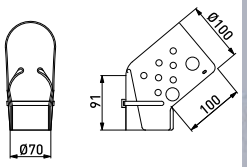
TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP36.3	6418677405280	0.445	8



Bird protection set SP38.3

Flexible cover for low voltage bushings, transformers and motors. Easy tie fixing. Made of weather and UV resistant rubber. One set consists of 3 units.

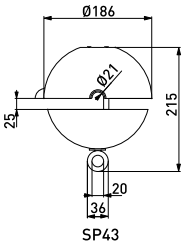
TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SP38.3	6418677405297	0.4	10



Wire markers SP43

Wire markers are used for marking overhead lines and wires. They can be used at crossing of water courses and roadways, bird migration routes and near airports. It also prevents conductors from clashing together. The installation is easy with any standard operating rod, like CT48.64. Wire markers SP43 have a diameter of 200 mm.

TYPE	EAN	CABLE DIA. mm	COLOUR	DIAMETER mm	WEIGHT (kg)	PACK./ pcs
SP43	6418677405303	Al/Fe 7-21	orange	200	0.4	10
SP43.1	6418677408205	Al/Fe 7-21	orange + reflectors	200	0.45	10
SP43.2	6418677408212	Cu 7-21	orange	200	0.45	10
SP43.3	6418677408229	Al/Fe 7-21	orange-white	200	0.45	10

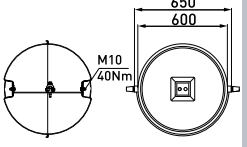


SP43

Warning balls SP48

The aviation warning ball SP48 is a visual eye catcher in the overhead line span.

TYPE	EAN	CABLE DIA. mm	COLOUR	DIAMETER mm	WEIGHT (kg)	PACK./ pcs
SP48.1	6418677405341	Al/Fe 9-20	red/white	600	6.1	1
SP48.2	6418677413667	Al/Fe 9-20	white	600	6.1	1
SP48.3	6418677413674	Al/Fe 9-20	red	600	6.1	1



SP48.1

Ensto Crossarms and Pole Accessories for Medium Voltage Systems

Ensto has a wide range of crossarms and pole accessories for medium voltage lines. For instance, our full range of crossarms developed for PAS or BLL/BLX lines has been in use in Nordic countries for decades.

Crossarms

Our existing range of crossarms covers most typical products for

- PAS system with pin insulators
- BLL/BLX system with line post insulators
- Bare MV systems

For more detailed information of all available crossarm types, please contact us to find out the best solution for different needs. Ensto is also capable to develop new crossarm models fulfilling many different standards. Ensto's crossarm production facilities are flexible to all custom solutions. Material for crossarms is hot dip galvanized steel.

Pole Accessories

Ensto provides also very vast product portfolio for different kind of pole accessories made of hot dip galvanized steel. Ensto offers

- Finished stay wire sets
- Eye-bolts and stay anchors
- Stay anchors for rock installations
- Pole braces for wooden poles
- Hooks
- Pole reinforcers for wooden poles
- Pole foundations for marsh poles

Tools

Ensto has a wide range of tools for network building. Together with our customers we have developed many tools to facilitate the installation work. The range includes e. g. ratchet, torque and fork wrenches, wedges, wire stringing wheels, pole climbing irons, dynamometers and swivel for wire linking.

Tools

Wire brush ST18

In aluminium connections it is important to remove the Al-oxide from the aluminium surfaces by using a wire brush. Use of joint compound SR1 prevents further re-oxidation. ST18.2 is the case for ST18.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
ST18	6418677405440	0.072	1
ST18.2	6418677405457	0.022	1

Joint compound SR1

SR1 is used for the prevention of oxidation on aluminium surfaces. The use of the wire brush and joint compound SR1 reduces the transition resistance. It also protects the connection from corrosion. There are no skin-irritant ingredients in the grease. Used for SL, SM and KG connectors aluminium, steel and copper conductors.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
SR1	6418677405402	0.254	25
SR1.1	6418677414701	0.080	1

Ratchet wrench CT164

For installation of connectors and suspension fittings. The wrench body is made of steel and the grip of oil resistant rubber. The wrench is double-sided 13 and 17 mm.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
CT164	6418677414213	0.254	1

Torque wrench ST30

For tightening connectors and fittings with standard sockets. With aluminium connectors it is essential that the bolts are tightened by using the correct torque. ST30 is a high quality adjustable wrench with a wide torque range. The read-outs are given in Nm and lbs.-ft. Socket adaptor mount 1/2".

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
ST30	6418677408755	0.89	1

Sockets for torque wrench ST30: ST12, ST13, ST113 and ST115

General hexagon sockets for torque wrench.

TYPE	EAN	SOCKET SIZE MM, FORM	WEIGHT (kg)	PACK./ pcs
ST12	6418677411557	17 mm, hexagonal	0.066	1
ST13	6418677411564	13 mm, hexagonal	0.056	1
ST115	6418677414138	19 mm, hexagonal	0.075	1
CT113	6418677412141	6 mm, allen socket	0.074	10

Tools

Fork wrench ST34

The ST34 is for holding the connector while tightening the bolts. Approved also for insulation piercing connectors with conductors live.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
ST34	6418677405549	0.337	25

Pole climbing irons CT2

Made of Al-alloy. The irons can be adjusted with different sizes of wooden poles.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
CT2	6418677408786	4.2	1

Pole climbing irons ST155

Made of alloyed and heat-refined steel. The welded and forged areas of the irons are tested for cracks. Irons ST155 are supplied with straps.

TYPE	EAN	POLE DIAM. mm	WEIGHT (kg)	PACK./ pcs
ST155.8	6418677408304	Max. 200	2.6	1
ST155.11	6418677408281	Max. 280	2.7	1
ST155.14	6418677408298	Max. 350	2.8	1

Come along clamps CT102 and CT105

For tensioning overhead line spans of single wire.

TYPE	EAN	CONDUCTOR DIAMETER mm	WEIGHT (kg)	PACK./ pcs
CT102.501	6418677409196	7.87-13.46	1.7	1
CT102.1201	6418677409189	13.46-18.80	3.77	1
CT105.20	6418677416132	4-20	2.75	1
CT105.35	6418677416149	6-35	0.828	1
CT105.70	6418677416156	5-10	1.16	1

Pulling grips CT103 and ST103

Pulling grips are made of high-grade galvanised steel wire, in a double weave construction for safe and secure cable pulling. CT103.35, CT103.50 and CT103.95 have grip length of 600 mm. CT103.501 and CT103.502 have grip length of 1000 mm.

TYPE	EAN	LENGTH mm	DIAMETER mm	MATERIAL	WEIGHT (kg)	PACK./ pcs
CT103.35	6418677412073	600	20-30	Metal	0.232	1
CT103.50	6418677412080	600	30-40	Metal	0.303	1
CT103.95	6418677412097	600	40-50	Metal	0.586	1
ST103.501	6418677408236	1000	10-20	Metal	0.144	1
ST103.502	6418677408243	1000	10-20	Plastic	0.062	1

Tools

Dynamometer ST112

For mechanical tension adjustment of overhead lines and insulated conductors. Lightweight and compact. They have built-in measuring dial with scales according to the maximum load.

TYPE	EAN	MAXIMUM LOAD kg	STEP kg	WEIGHT (kg)	PACK./ pcs
ST112.1	6418677414152	1000	20	1.179	1
ST112.2	6418677414169	2000	50	1.2	1
ST112.3	6418677414176	3000	50	2.3	1

Cable hoists ST116 and CT116

Ratchet puller for line tensioning.

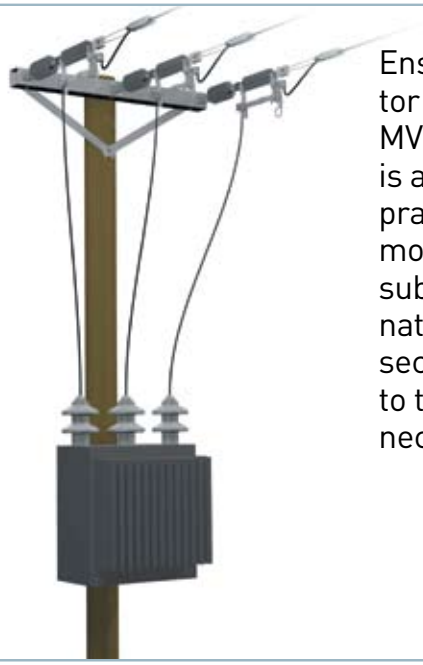
TYPE	EAN	LIFT HEIGHT m, SINGLE/DOUBLE WIRE	CAPACITY kg, SINGLE/DOUBLE WIRE	WEIGHT (kg)	PACK./ pcs
ST116	6418677414183	3/1.5	500/1000	4.53	1
ST116.1	6418677414190	4/2	750/1500	5	1
CT116.3	6418677412158	4.58 (15 Ft) / 2.29 (7.5 Ft)	454 (1000 lbs) / 908 (2000 lbs)	6.39	1
CT116.7	6418677412165	9.15 (30 Ft) / 4.58 (15 Ft)	680 (1500 Lbs) / 1360 (3000 Lbs)	7.02	1

Swivel for conductor linking CT104

Swivels are essential for effective pulling operation of underground cables and overhead conductors. The swivels are fitted with bearings to prevent build up of twist and loops in the cable or pulling rope. Rope dia. 10 mm, working tension 10 kN.

TYPE	EAN	WEIGHT (kg)	PACK./ pcs
CT104	6418677412103	0.45	1

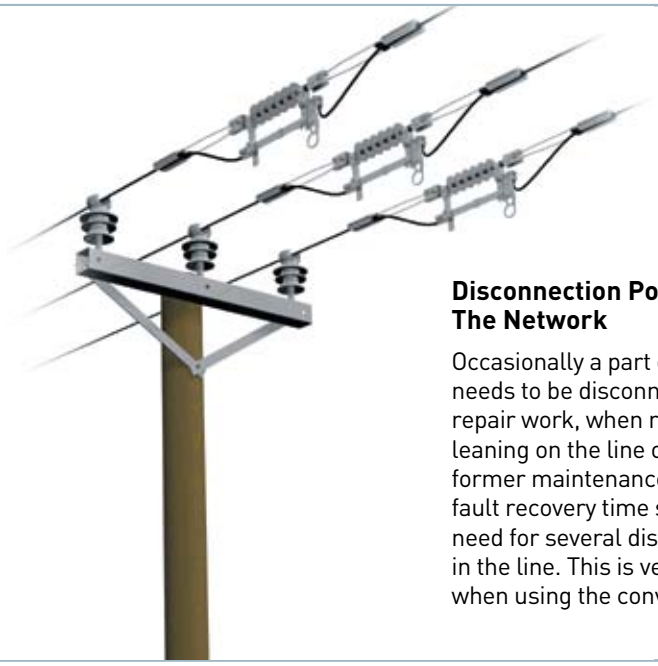
SZ 24 Disconnector is an ideal Solution for MV overhead lines



Ensto's SZ 24 disconnector is an ideal solution for MV overhead lines. SZ 24 is a more economical and practical solution for pole mounted transformer substations, cable terminations, branch lines and sectional poles compared to the traditional disconnectors.

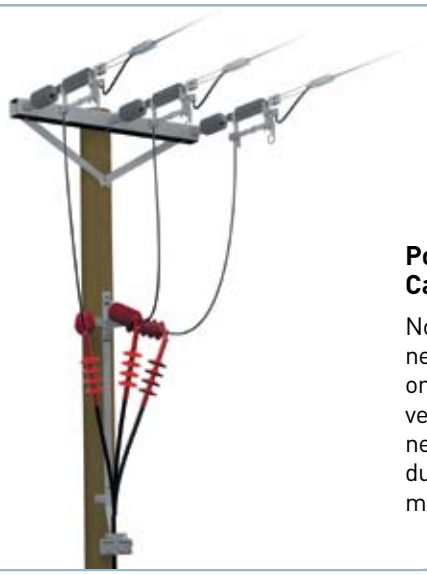
SZ 24 is easy and quick to install even on existing lines as no additional constructions are needed. SZ 24 disconnector is 1-pole operated by standard live line tools e.g. Ensto´s CT48.64. SZ 24 can be used on bare and PAS lines.

SZ 24 is tested and approved according to the newest international standards. Its breaking capacity is 12.5 A, mostly sufficient for rural areas on branch lines.



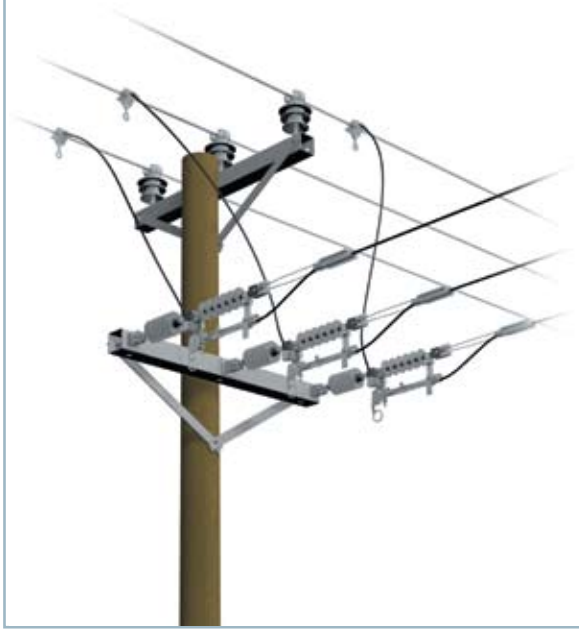
Disconnection Point on The Network

Occasionally a part of the network needs to be disconnected e.g. during repair work, when removing trees leaning on the line or during transformer maintenance. To make the fault recovery time shorter, there is need for several disconnection points in the line. This is very expensive when using the conventional disconnectors. Moreover, disconnection point with a jumper can be too slow to operate and needs a full live line crew.
With Ensto's new SZ 24 disconnector, building disconnection point to the network is now cheap and easy even on existing lines. The disconnector can also be used as a maintenance disconnector e.g. in remote control substations or line repair work.



Pole Mounted Substation and Cable Termination

Normally there is need for a disconnector on pole mounted substations or on a cable termination, but it is very seldom operated. The disconnector is typically operated only during maintenance or repair work maybe once in ten years. Therefore a traditional disconnector would be expensive in these applications. Ensto's SZ 24 disconnector offers reliable and cheap solutions for transformer and cable termination installations. It can be installed on a span with line insulators or together with tension insulator on tension cross-arms.



Branch Lines

SZ24 disconnector offers an economical solution for branch lines. It is easily installed on tension cross arm with tension insulators and thus every branch line will be economically equipped with disconnection point. This simplifies operation in fault situations and reduces the fault recovery time.

SZ 24 DISCONNECTOR

RATED VALUES

Voltage U_r	24 kV
Insulation levels	
*Power frequency withstand voltage, 1 min, 50 Hz	50 kV, 60 kV
*Lightning withstand voltage	125 kV, 145 kV
Frequency	50 Hz
Normal current I_r	400 A
Short time withstand current Ik	10 kA
Peak withstand current I_p	25 kA
Duration of short circuit tk	1 s
Mechanical endurance class M0	1000 operating cycles
Mainly active load-breaking current I_1	12.5 A (30 co)
Cable-charging breaking current I4a	10 A (30 closing and opening operations)
Line-charging breaking current I 4b	10 A (30 closing and opening operations)
Leakage distance, minimum	628 mm
Ice breaking capacity	10 mm

APPROVED ACCORDING TO IEC 60694, IEC 60265, IEC 62271-102

Product index

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