streamer®
keeping the light

LLPD Catalogue

Line Lightning Protection Devices for Medium-Voltage Networks

2018

Streamer Electric AG

Swiss company based in Chur, Switzerland

Innovation and Solution oriented

Streamer is a specialist for innovative solutions which improve the reliability of medium and high voltage electrical networks. Streamer invests more than 10% of its turnover every year in three different R&D centers:

- St. Petersburg, Russia - in cooperation with the State Polytechnical University of St. Petersburg;
- Moscow, Russia - for the development of electronic products;
- Chur, Switzerland - in cooperation with University of Applied Sciences Rapperswil

Product range

1. Lightning protection from 6 to 40 kV
A unique lightning protection solution for overhead line: Line Lightning Protection Devices (LLPDs) with EasyQuench (EQ) technology that has been invented and patented by Streamer. More than 1 million of LLPDs have been installed worldwide (Russia, China, Indonesia, Malaysia, Thailand, Brazil, UAE, Iran, Vietnam, Switzerland, Germany etc.).

2. Fault Passage Indicators (FPI)
A complete range of Fault Passage Indicators (FPI) for overhead lines and underground cables. Thanks to these products, our customers are able to reduce drastically the outage's time due to transient and permanent faults.
Streamer is the only manufacturer having a complete range with mobile devices, pole mounted or conductor mounted solution.

3. Transformer drying solution

TRANSEC is an online drying solution for oil insulated transformer of all sizes. It can be installed, operated and regenerated while the Transformer is running and operational. It pumps the transformer oil continuously through its cylinders and thereby extract the moisture smoothly from the paper.
Due to the robust design and it`s operation principle, TRANSEC is the most cost-efficient drying solution for Transformer!

Tests

The certifications of our products are made in the best laboratories worldwide: CESI, CEPRI and STRI and meet the latest international standards (IEC, GOST).

- CESI (ITALY) - STRI (SWEDEN) - CEPRI (PRC)

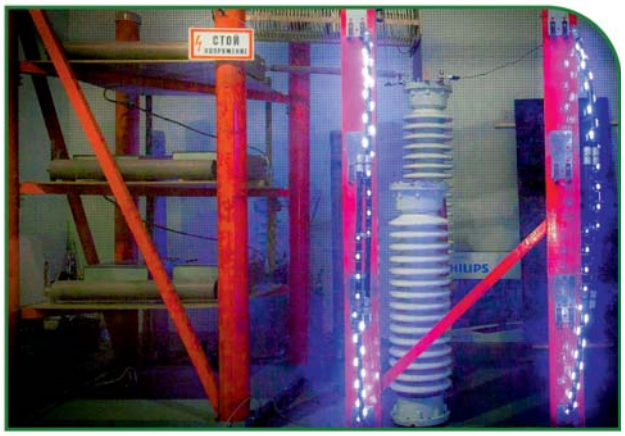
Key points

- 20+ years of experience.
- 1.5 Million lightning protection devices installed.
- Installation in more than 15 countries.
- Tested in CESI, EPRI, STRI, CEPRI.

Customers list

Groupe E (Switzerland)
SIG (Switzerland)
Romande Energie Holding SA (Switzerland)
BKW (Switzerland)
Repower (Switzerland)
LAPP Insulators (Germany)
Sicame Group (France)
China Southern Power Grid (China)
State Grid Corporation of China (China)
Electricity Generating Authority of Thailand (Thailand)
Tenaga Nasional Berhad (Malaysia)
Perusahaan Listrik Negara (Indonesia)
VietNam Electricity (Vietnam)
Dagupan Electric (Philippines)
Electronet (New Zealand)
Saudi Aramco (Saudi Arabia)
Federal Electricity & Water Authority (UAE)
Dubai Electricity & Water Authority (UAE)
Iran Power Generation and Transmission Company (Iran)
Botswana Power Corporation (Botswana)
Rio Grande Energia (Brazil)
CPFL Energia (Brazil)
Celesc (Brazil)
AES Sul (Brazil)
PJSC ROSSETI (Russia)
LUKOIL (Russia)
GAZPROM (Russia)


streamer




streamer
keeping the light

Lightning Protection Solutions

EasyQuench is a new and unique technology, developed and improved since 1996 by Streamer. Products featuring EasyQuench System, protect overhead lines against direct and indirect lightning strikes. LLPD prevent breakage of conductors, insulators and outages (trips) caused by lightning. According to their operating principle, Line Lightning Protection Devices (LLPDs) do not require ground lead nor ground rod. Therefore, devices work perfectly in areas with high soil resistivity. Overvoltage discharge is ensured through conductivity of the pole and the cross-arm. **Life expectancy is 20 years.**

EQ EASYQUENCH TECHNOLOGY

The EasyQuench principle

EasyQuench LLPDs are made of a series of metal electrodes and gaps embedded in a silicon rubber housing.

The lower terminal of the device is connected to the cross arm, while the upper is placed at a certain distance from the conductor. An air gap separates the upper terminal and the line.

When a lightning **overvoltage occurs on the line, the air gap** is sparked over. While lightning overvoltage is being discharged through the air gap and the device, ensuring **protection of the line**, the air gap conductivity is strongly reduced due to air ionization. The device is then directly connected to the line on the upper terminal.

Diagram of discharge initiation

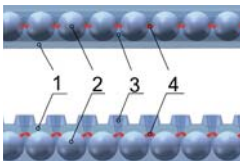
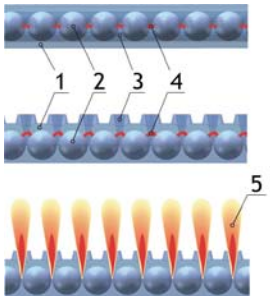


Diagram of discharge completion



1. Silicon rubber shape
2. Intermediate electrodes
3. Arc quenching chamber
4. Arc
5. Plasma jet

In case of the appearance of a follow current (short circuit) it will be quenched in less than half a cycle (<10ms) by the Multi-Chamber System.
In fact, **follow current** arc will be **divided into a big amount of small arcs** between electrodes. Arcs will heat up air within chambers. Due to air expansion, arcs are elongated and weakened. At follow (alternative) current first zero crossing, the arc will extinguish. After this quenching operation, the connection between the conductor and the earth, through LLPD is finally cut. The voltage and the current on the line are back in normal condition. **No short circuit** will be sensed by control relays. **No outages** will be noticed from consumer side.

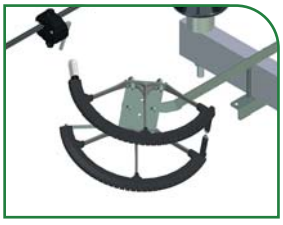
Efficiency

- *Protect sensitive components*
- *Avoid outages on the line*
- *No grounding to adjust to*

Cost saving

- *No maintenance required*
- *One time investment*
- *20 years life expectancy*

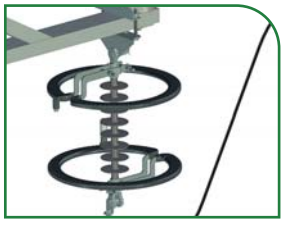
LLPD dC20z



LLPD i20z

LLPD dS15z

LLPD dM35z



Glossary

LLPD – Line Lightning Protection Device

DLS – Direct Lightning Stroke – a lightning striking a component of the network such as the conductor, tower or substation equipment

BFO – Back Flashover – a flashover of phase-to-earth insulation resulting from a lightning strike to that part of the system which is normally at earth potential

IOV – Induced Overvoltage – an overvoltage in the network that is induced by a lightning strike that does not strike directly any part of the network

CFO – Critical Flashover Voltage – the amplitude of voltage of a given waveshape that, under specified conditions, causes flashover through the surrounding medium on 50% of the voltage applications

MPFC – Maximum Prospective Fault Current – the highest electric current which can exist in a particular electrical system under short-circuit conditions without any protective or current-limiting device. It is determined by the voltage and impedance of the supply system

MOA – Metal-Oxide Arrester – a surge arrester utilizing valve elements fabricated from nonlinear resistance metal-oxide materials

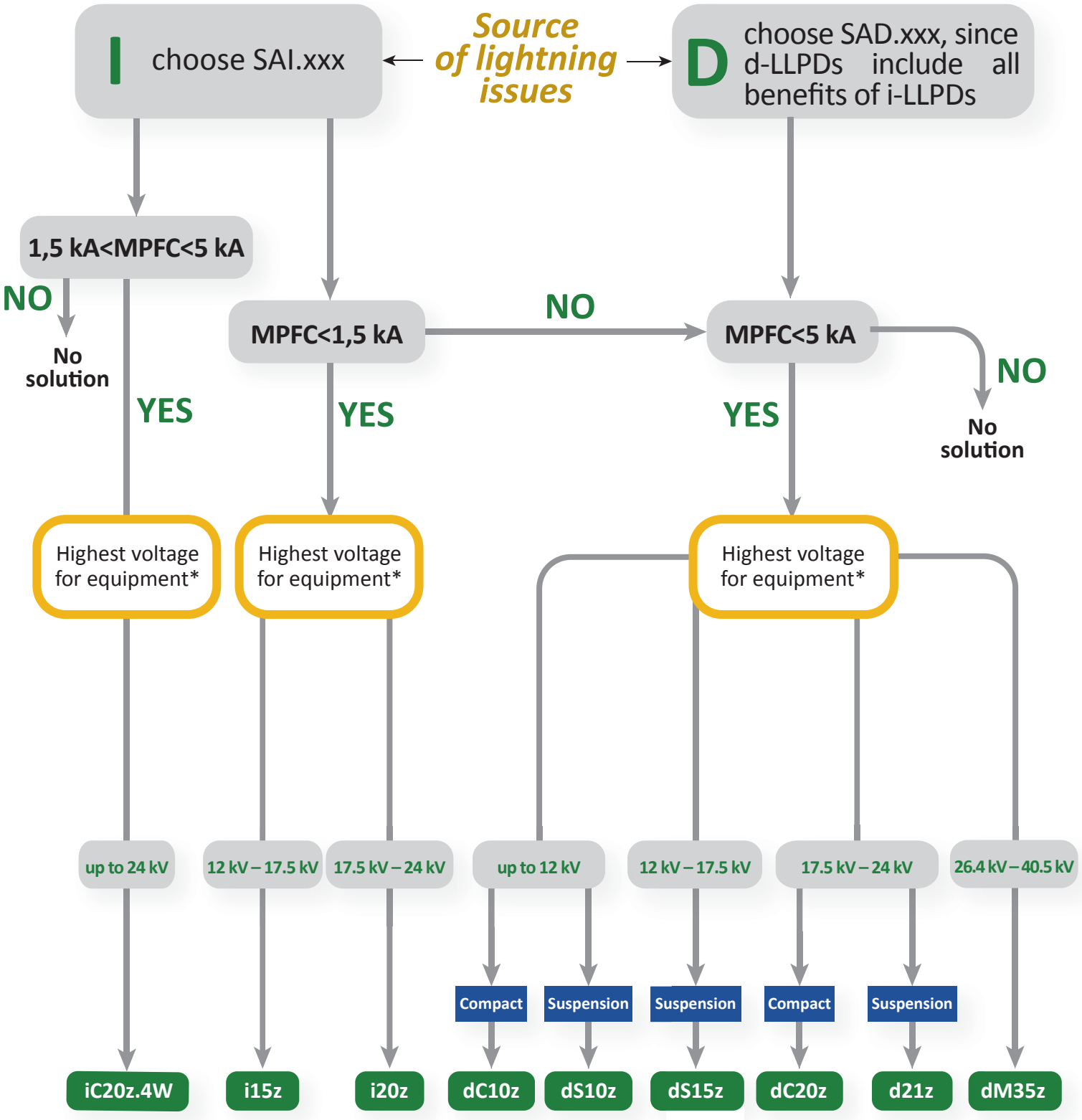
Surge Arrester – a protective device for limiting surge voltages on equipment by discharging or bypassing surge current around the protected device, without any power frequency current flowing to ground, and is capable of repeating these functions as repeatedly

PMT – Pole-Mounted Transformer – A distribution transformer that provides the final voltage transformation in the electric power distribution system, stepping down the voltage used in the distribution lines to the level used by the customer, and is located on a pole of an overhead line

IPC – Insulated Piercing Clamp

Index

Selection Guide LLPD



* according to IEC 60038

i15z/i20z

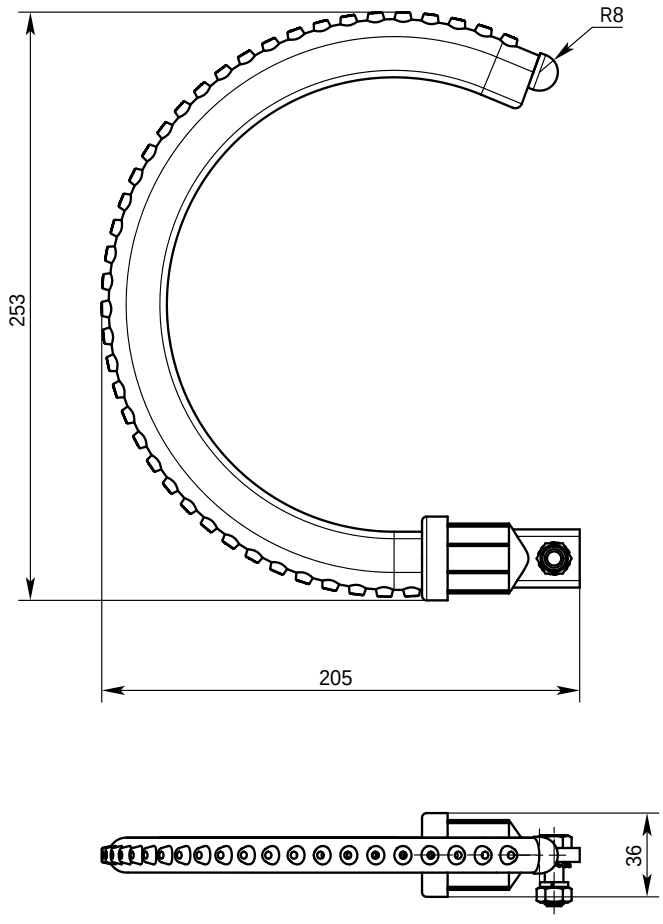
Line Lightning Protection Device for Overhead Lines up to 24 kV

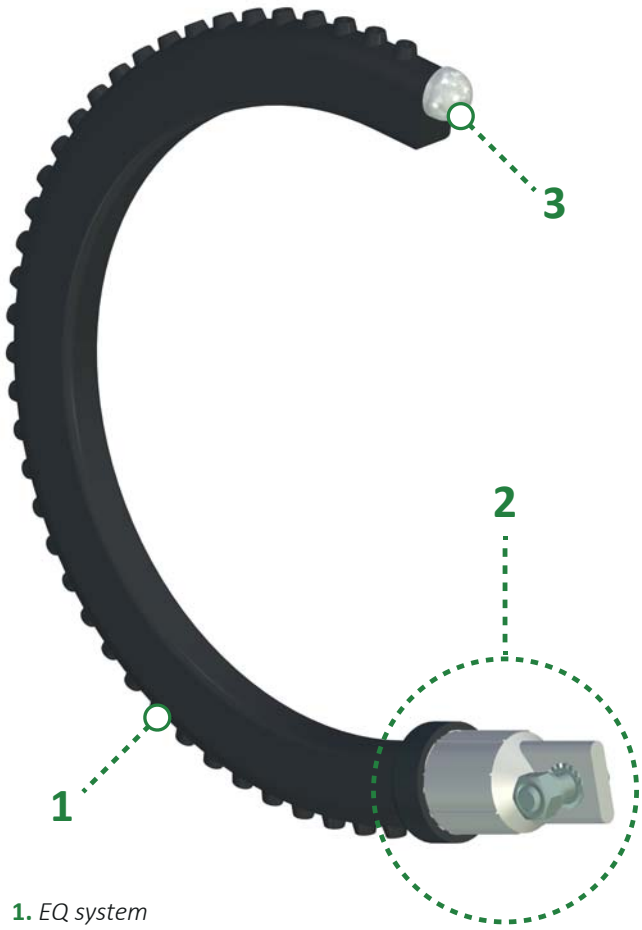
LLPD i20z is intended for protection of overhead lines with nominal voltage up to 24 kV against induced overvoltages and their deleterious consequences

Features

- IOV protection
- Prevention of conductors and insulators breakage
- DLS endurance

Overall Dimensions





1. *EQ system*
2. *End fitting with the attachment point*
3. *Terminal electrode*

Test Certificates

Test	Laboratory
High current impulse withstand	CESI (Milan, Italy)
Lightning discharge capability	CESI (Milan, Italy)
Standard lightning impulse sparkover	CESI (Milan, Italy)
Housing impulse withstand	CESI (Milan, Italy)
Temperature cycling, Salt and mist	CESI (Milan, Italy)
Vibrations	CESI (Milan, Italy)
Maximum prospective fault current	STRI (Witness test in Streamer's laboratory)

Performance specification and characteristics

ELECTRICAL LINE PARAMETERS	i15z	i20z
Highest voltage for equipment*, kV	**17.5**	**24**
Maximum prospective fault current, kA	1.5	1.5
External air gap, mm	50±10	70±10
50% flashover voltage, kV	110	120
Power frequency withstand voltage**, kV	38	50
LIGHTNING PARAMETERS		
Lightning discharge capability (200 µs)***, C	2.4	2.4
High current impulse (4/10 µs), kA	65	65
Maximum fault quenching lightning current (1/50 µs), kA	3	3
Minimum withstand amount of operations	10	10
GENERAL PARAMETERS		
Additional power losses on the line, %	0	
Average life time expectancy, years	20	
UV resistance**, h**	1000	
Weight	0.45	
Maintenance	1 visual verification per year	

** According to IEC 60038, ** According to IEC 60071-1., *** According to IEC 60099-8, **** According to ISO 4892-2, method A, IEC 62217*

Insulator's CFO (kV)	i20z: Air gap (mm)	
	6 to 17.5 kV Highest voltage for equipment	17.5 to 24 k Highest voltage for equipment
< 100	Contact us	Contact us
100	40	Contact us
110	45	60
125	55	60
150	65	75
180	80	90

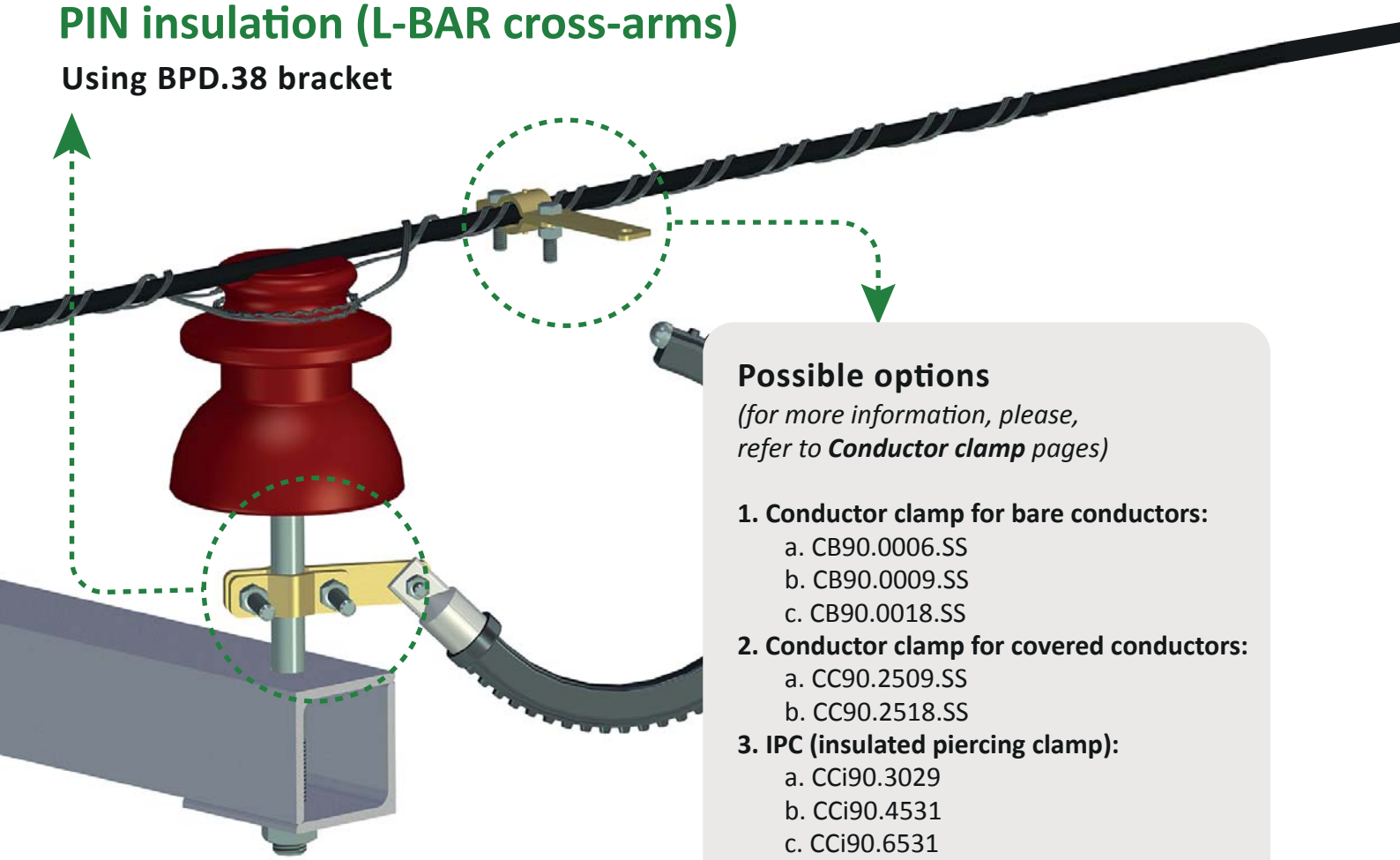
Installation

1 piece per pole with phase alternation for ensuring reliable protection of an overhead line against IOV.
LLPD i15z/i20z must be installed with an air gap between its terminal electrode and conductor clamp. In order to select the proper value of the gap, please refer to the table.

Reference: SAI.020.Z.WW/920
SAI.015.Z.WW/920

PIN insulation (L-BAR cross-arms)

Using BPD.38 bracket



Possible options

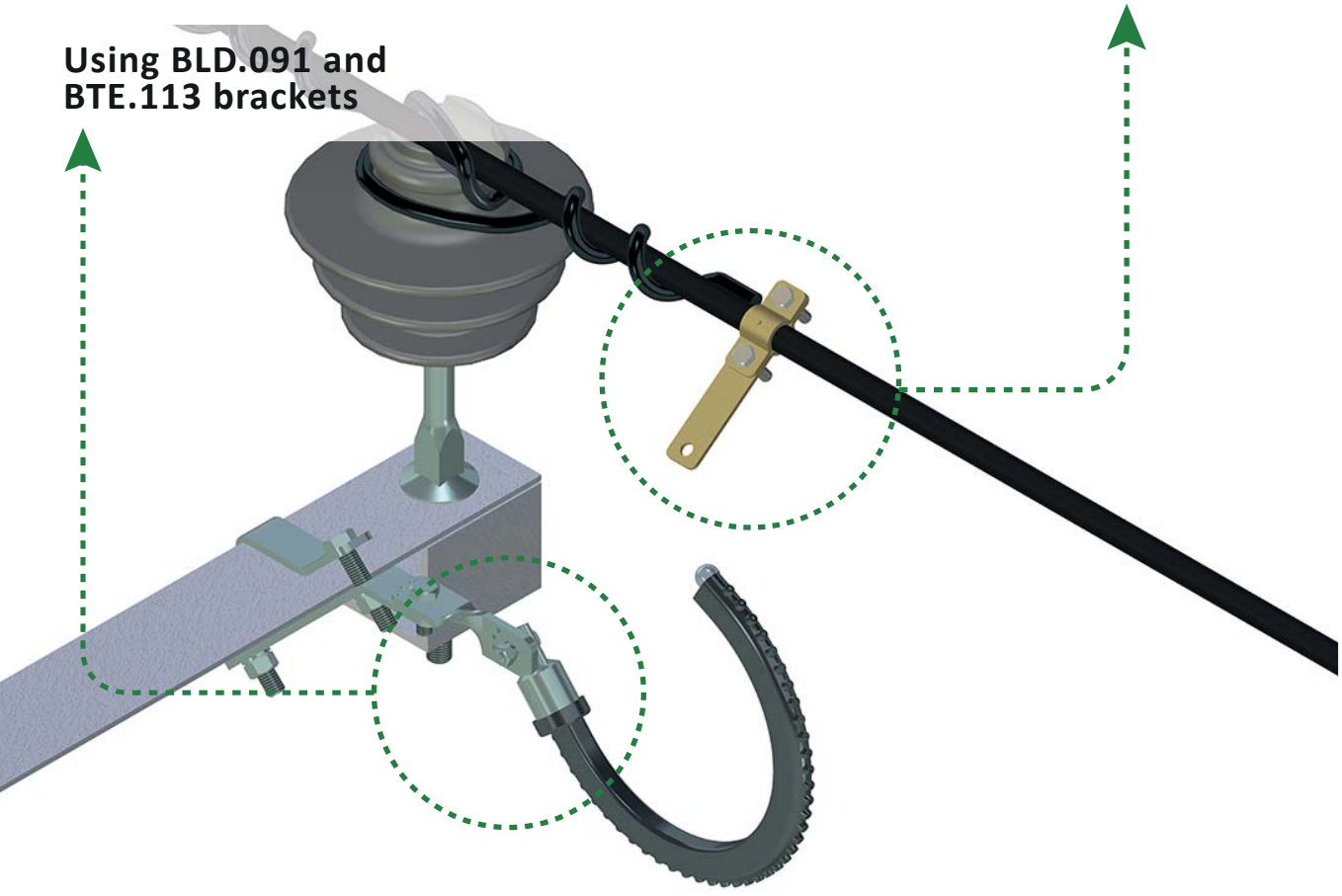
*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

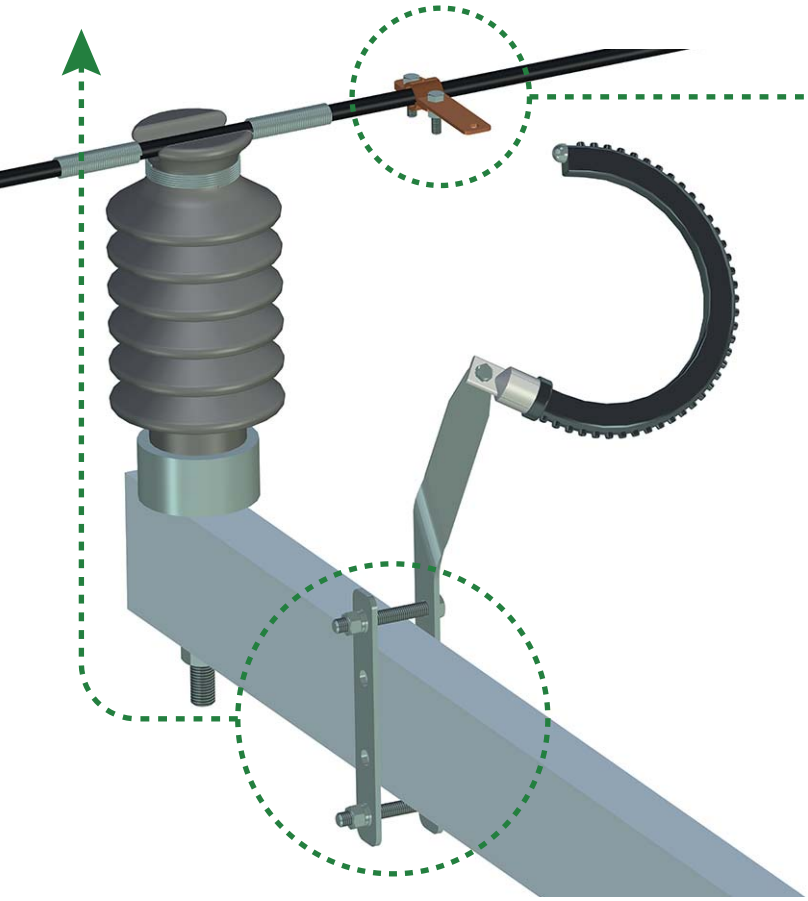
3. IPC (insulated piercing clamp):
- a. CCi90.3029
- b. CCi90.4531
- c. CCi90.6531

Using BLD.091 and BTE.113 brackets

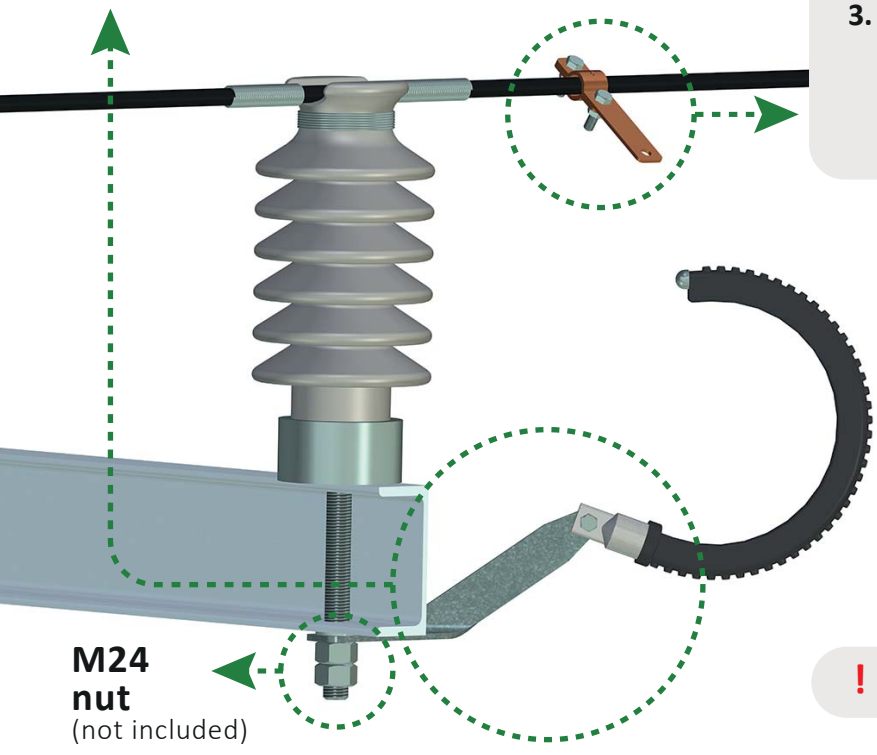


POST / PIN-POST insulation (U-section cross-arms)

Using BCL.141 bracket



Using BPD.23 bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

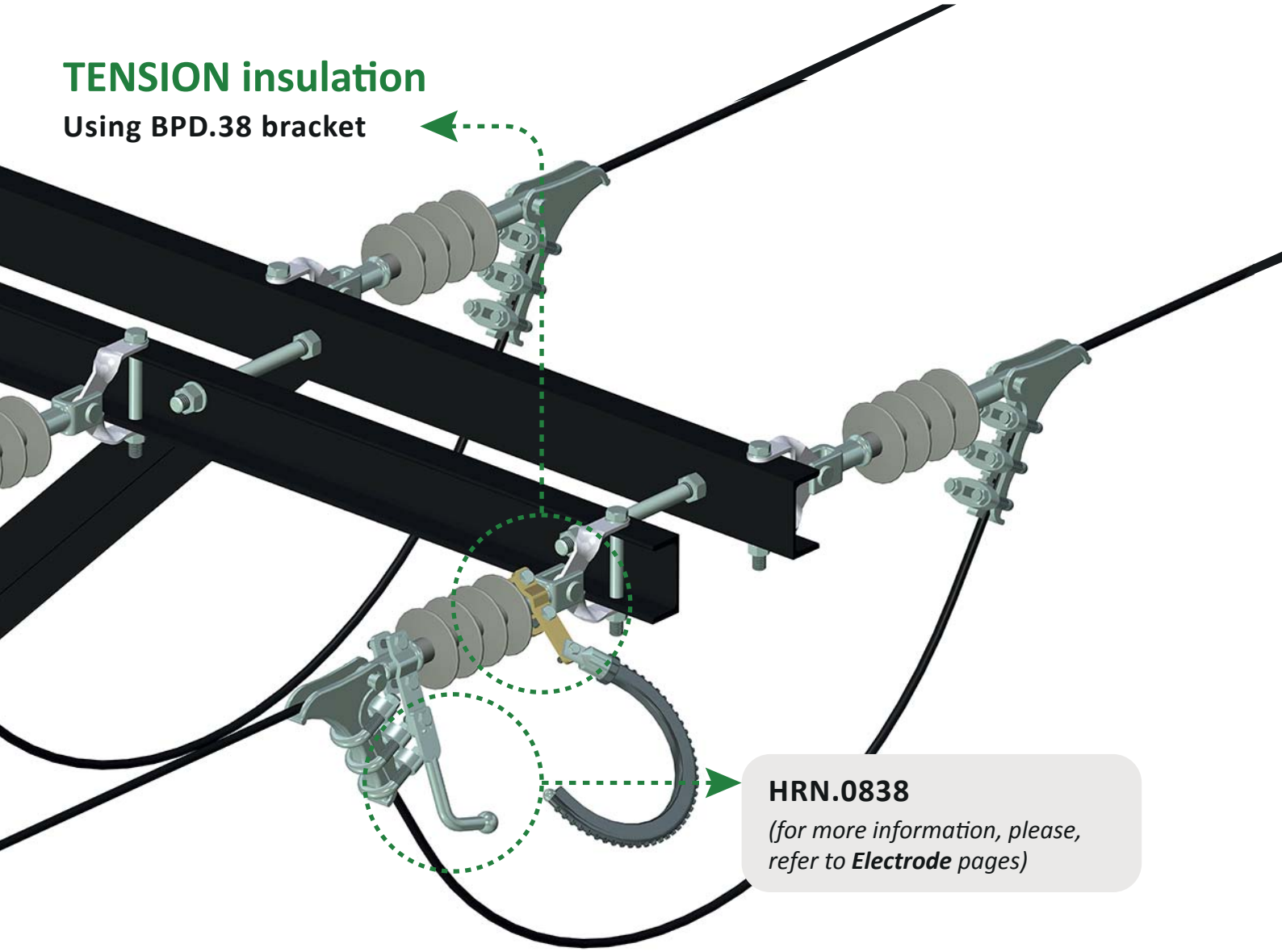
2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029
- b. CCi90.4531
- c. CCi90.6531

! *MAX permissible thread size is M24*

TENSION insulation

Using BPD.38 bracket

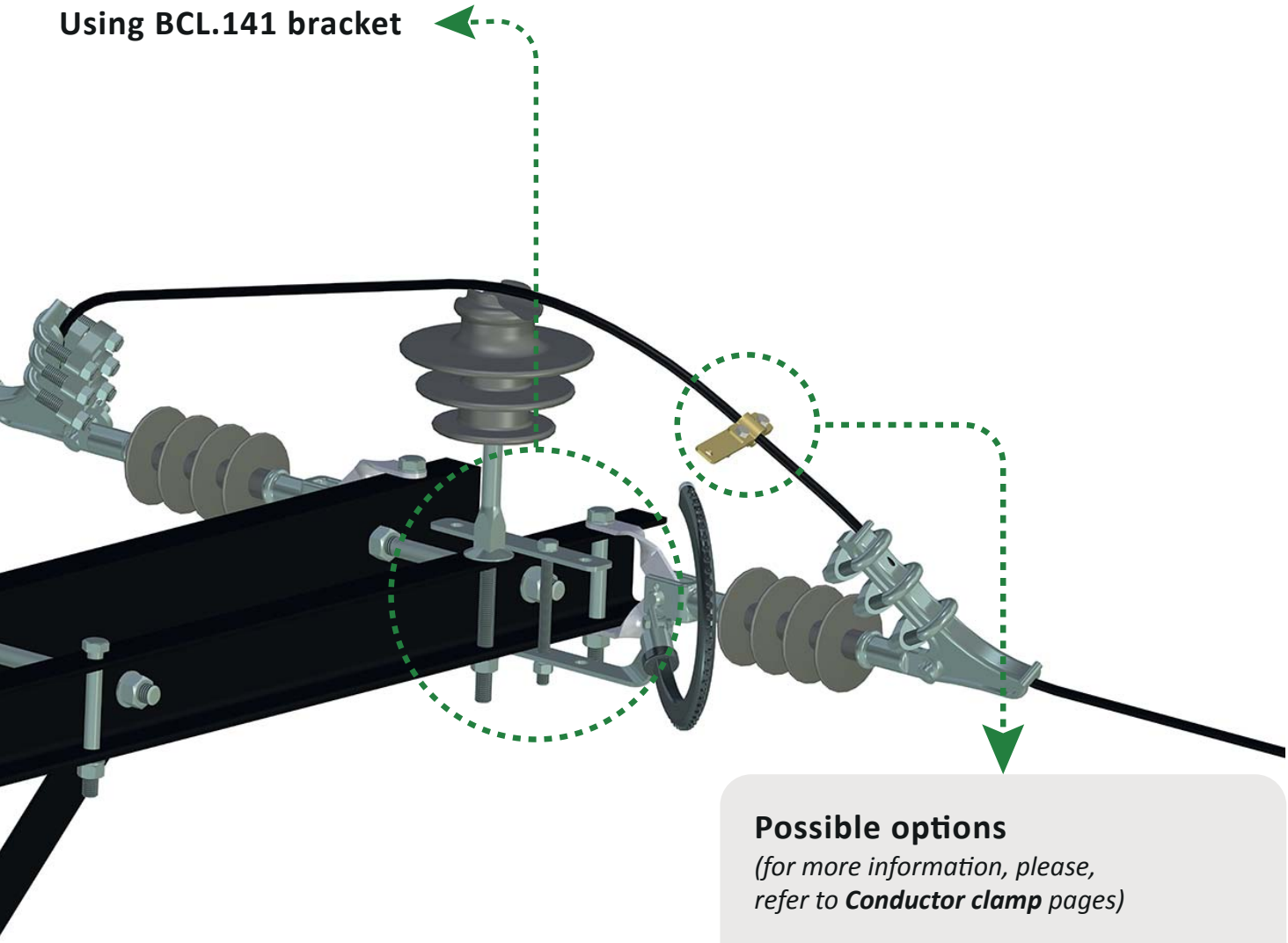


HRN.0838

*(for more information, please, refer to **Electrode** pages)*

TENSION insulation (installation in jumper)

Using BCL.141 bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

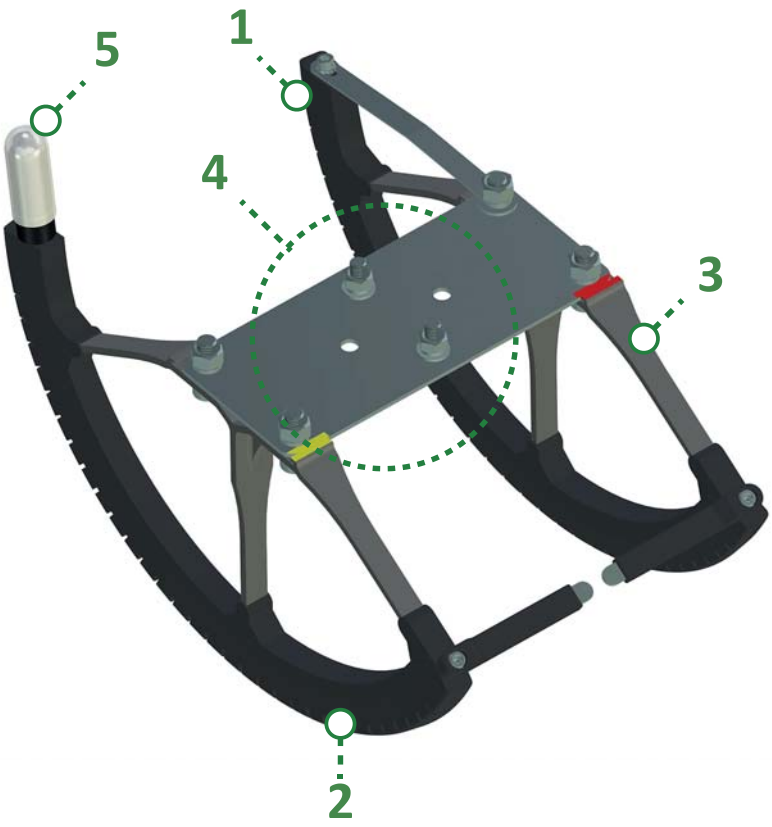
2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029
- b. CCi90.4531
- c. CCi90.6531

iC20z.4W

Line Lightning Protection Device for Overhead Lines up to 24 kV

LLPD iC20z.4W is intended for protection of overhead lines with nominal voltage up to 24 kV against induced overvoltages and their deleterious consequences

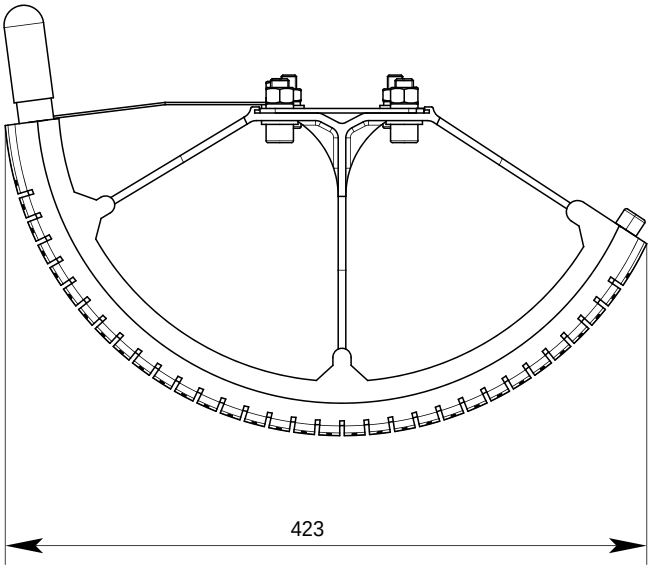


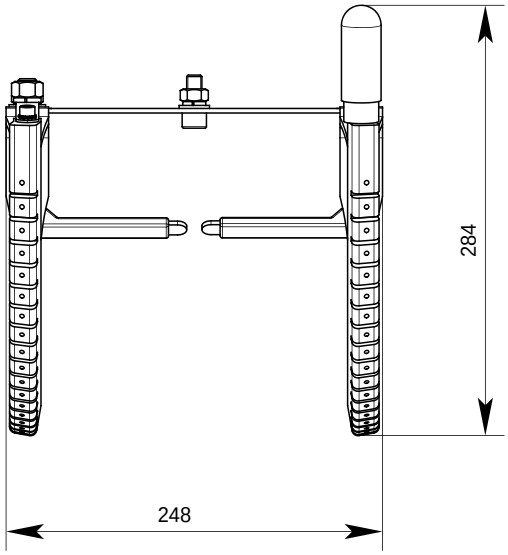
1. *Module A with EQ system*
2. *Module B with EQ system*
3. *Insulating load-bearing frame*
4. *Attachment point*
5. *Terminal electrode with indicator*

Features

- IOV protection
- Prevention of conductors and insulators breakage
- DLS endurance

Overall Dimensions





Performance specification and characteristics

ELECTRICAL LINE PARAMETERS	
Highest voltage for equipment*, kV	**24**
Maximum prospective fault current, kA	5
External air gap, mm	70±10
50% flashover voltage, kV	160
Power frequency withstand voltage**, kV	50
LIGHTNING PARAMETERS	
Lightning discharge capability (200 µs)***, C	2.4
High current impulse (4/10 µs), kA	65
Maximum fault quenching lightning current (1/50 µs), kA	3
Minimum withstand amount of operations	10
GENERAL PARAMETERS	
Additional power losses on the line, %	0
Average life time expectancy, years	20
UV resistance**, h**	1000
Weight	2.5
Maintenance	1 visual verification per year

** According to IEC 60038, ** According to IEC 60071-1., *** According to IEC 60099-8, **** According to ISO 4892-2, method A, IEC 62217*

Insulator's CFO (kV)	iC20z.4W: Air gap (mm)	
	6 to 17 kV Highest voltage for equipment	18 to 24 kV Highest voltage for equipment
< 120	Contact us	Contact us
120	40	Contact us
140	45	60
160	55	60
180	65	75
200	80	90

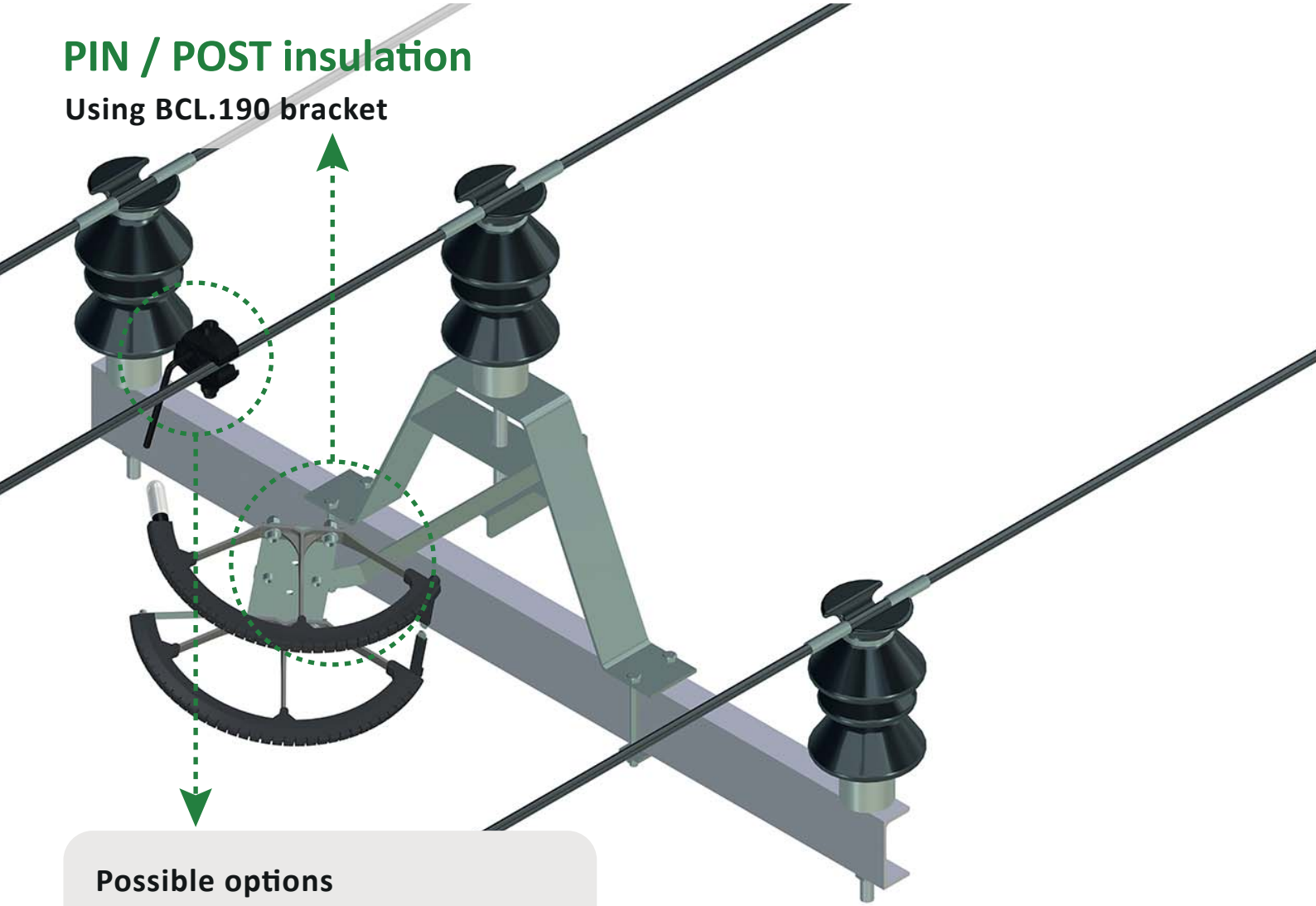
Installation

1 piece per pole with phase alternation for ensuring reliable protection of an overhead line against IOV.
LLPD iC20z.4W must be installed with an air gap between its terminal electrode and conductor clamp. In order to select the proper value of the gap, please refer to the table.

Reference: SAI.C20.Z.4W/920

PIN / POST insulation

Using BCL.190 bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029 + EPC.100
- b. CCi90.4531 + EPC.100
- c. CCi90.6531 + EPC.100

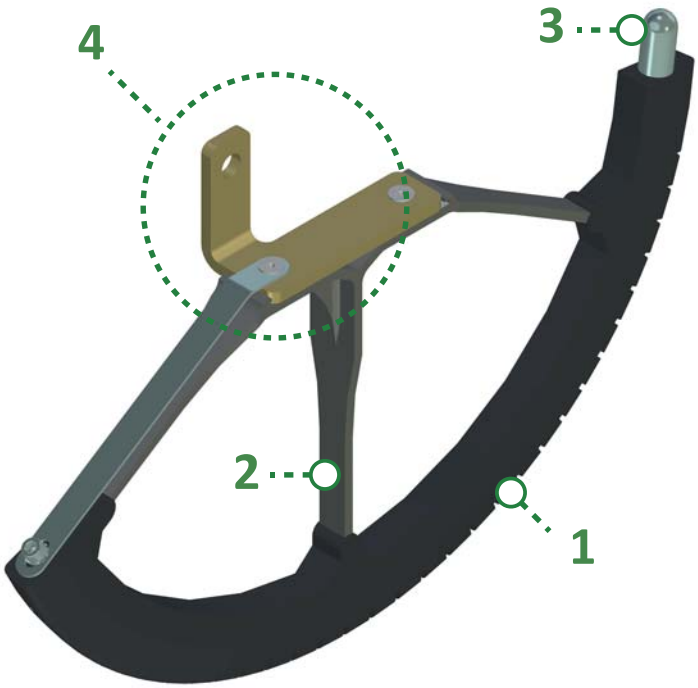
TENSION insulation

Using BCL.190 bracket

dC10z

Line Lightning Protection Device for Overhead Lines up to 12 kV

LLPD dC10z is intended for the protection of overhead lines with the highest voltage for equipment up to 12 kV and high short-circuit currents against direct lightning strikes, back flashovers and induced overvoltages, as well as their deleterious consequences.

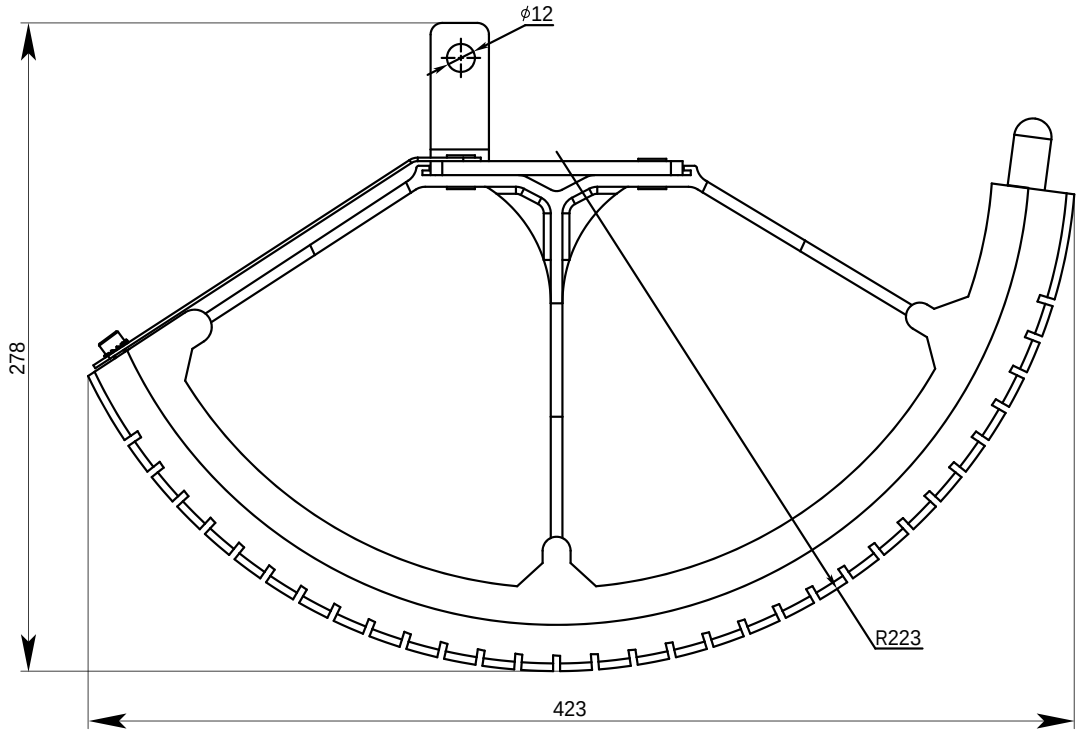


1. *EQ system*
2. *Insulating load-bearing frame*
3. *Terminal electrode*
4. *Attachment point*

Features

- DLS protection of overhead power lines
- Prevention of conductors and insulators breakage
- DLS endurance

Overall Dimensions



Performance specification and characteristics

ELECTRICAL LINE PARAMETERS	
Highest voltage for equipment*, kV	**12**
Maximum prospective fault current, kA	5
External air gap, mm	50±10
50% flashover voltage, kV	120
Power frequency withstand voltage**, kV	28
LIGHTNING PARAMETERS	
Lightning discharge capability (200 µs)***, C	2.4
High current impulse (4/10 µs), kA	65
Maximum fault quenching lightning current (8/50 µs), kA	20
Minimum withstand amount of operations	10
GENERAL PARAMETERS	
Additional power losses on the line, %	0
Average life time expectancy, years	20
UV resistance**, h**	1000
Weight	1.1
Maintenance	1 visual verification per year

** According to IEC 60038, ** According to IEC 60071-1., *** According to IEC 60099-8, **** According to ISO 4892-2, method A, IEC 62217*

Installation

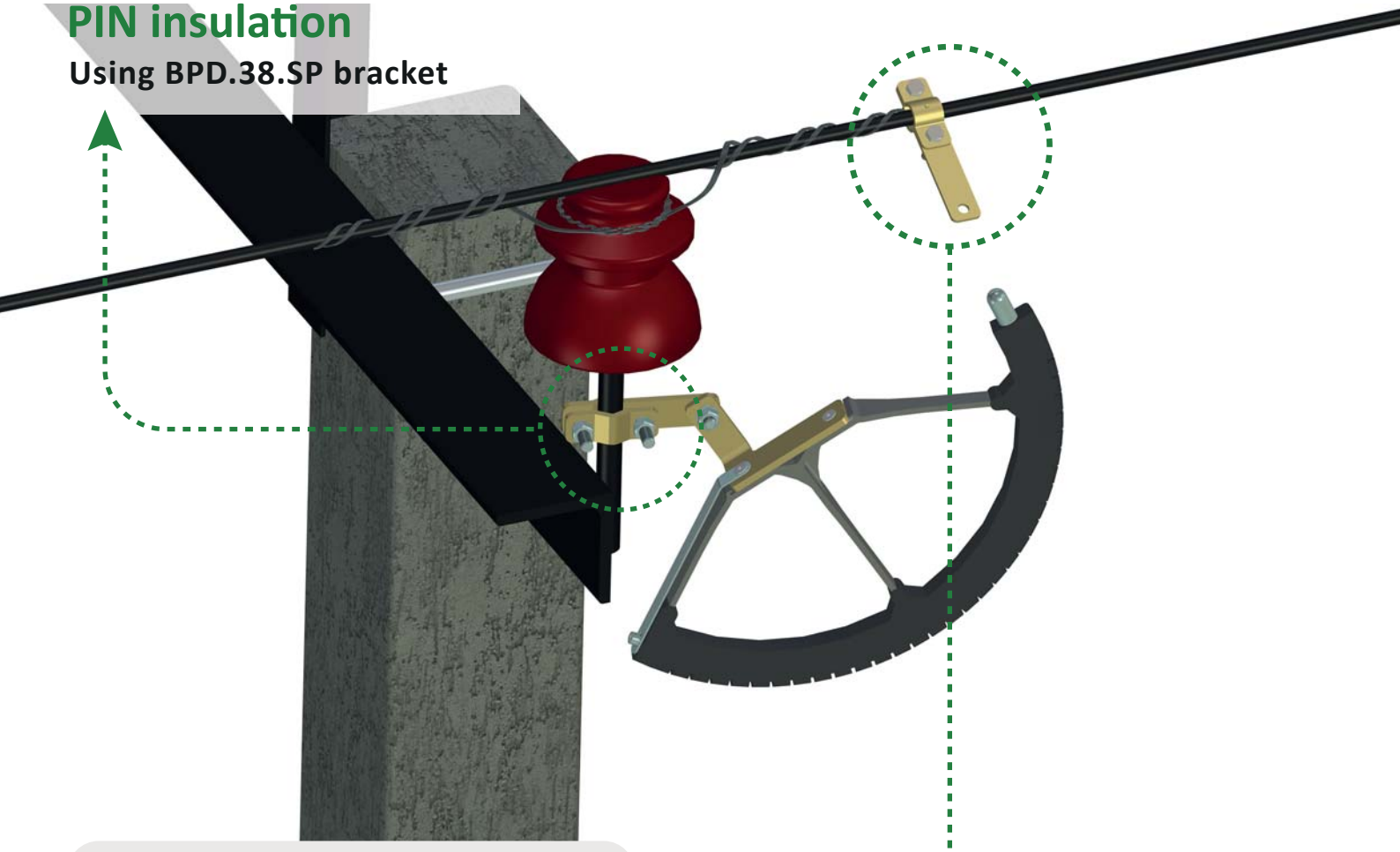
Overview

3 pieces per pole for ensuring comprehensive protection of an overhead line against DLS, BFO and IOV.
For more details, please refer to **Installation pages**.

Reference: SAD.C10.Z.WW/920

PIN insulation

Using BPD.38.SP bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

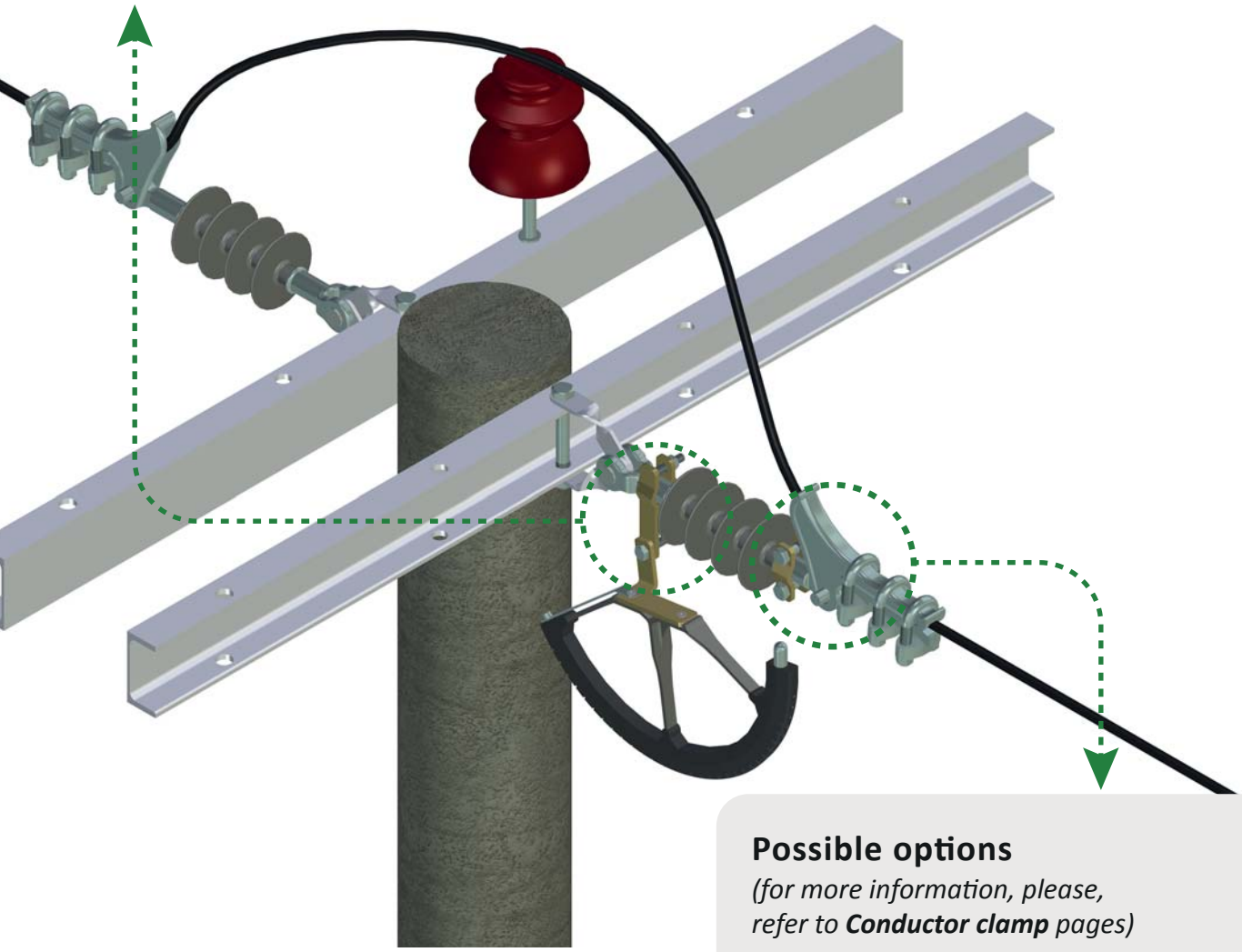
1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029
- b. CCi90.4531
- c. CCi90.653

TENSION insulation

Using BPD.38.SP bracket



Possible options

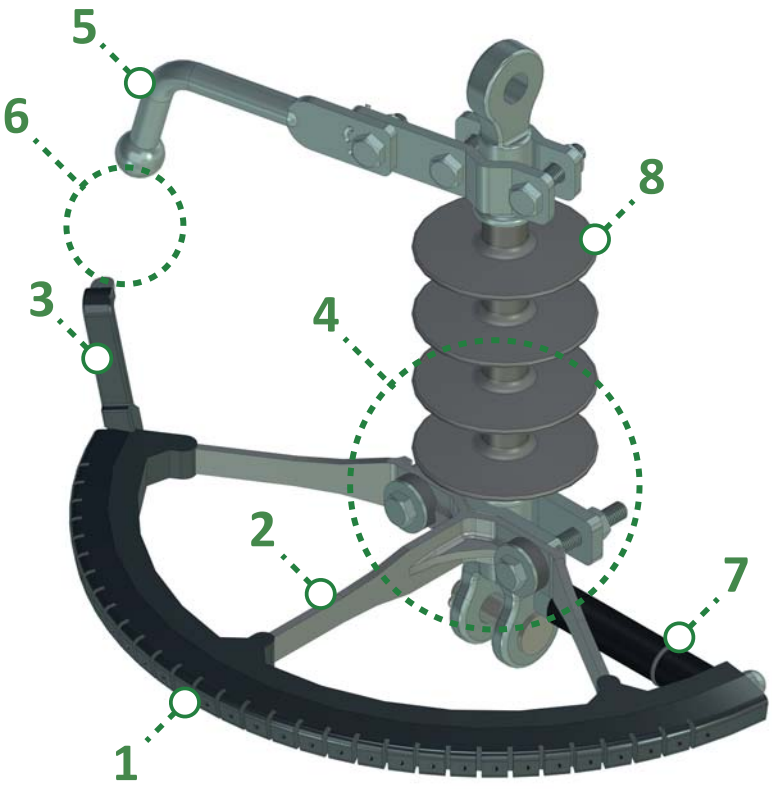
*(for more information, please, refer to **Conductor clamp** pages)*

- HRN.0038.WW

dS10z

Line Lightning Protection Device for Overhead Lines up to 12 kV

LLPD dS10z is intended for the protection of overhead lines with the highest voltage for equipment up to 12 kV and high short-circuit currents against direct lightning strikes, back flashovers and induced overvoltages, as well as their deleterious consequences.

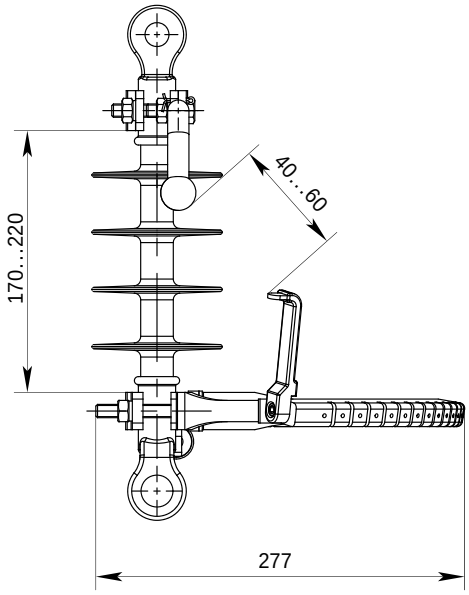


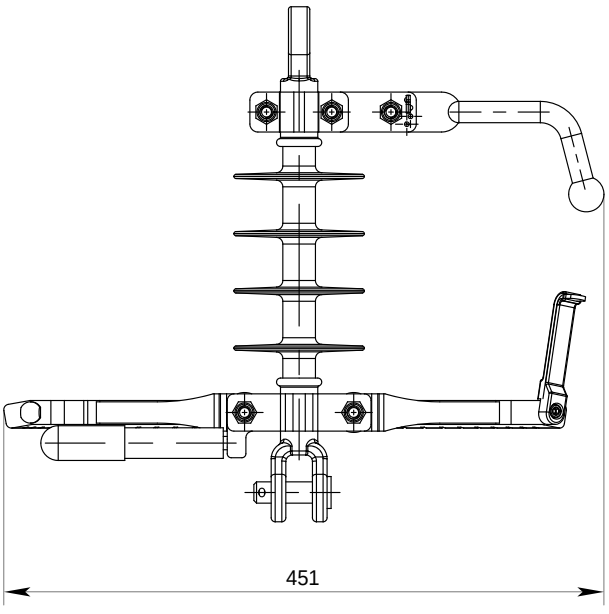
Features

- DLS protection of overhead power lines
- Prevention of conductors and insulators breakage
- DLS endurance

1. *EQ system*
2. *Insulating load-bearing frame*
3. *Terminal electrode*
4. *Attachment point*
5. *Horn electrode*
6. *Air gap*
7. *Auxiliary electrode with onetime glass indicator*
8. *Suspension composite insulator (not included)*

Overall Dimensions





Performance specification and characteristics

ELECTRICAL LINE PARAMETERS	
Highest voltage for equipment*, kV	**12**
Maximum prospective fault current, kA	5
External air gap, mm	50±10
50% flashover voltage, kV	120
Power frequency withstand voltage**, kV	28
LIGHTNING PARAMETERS	
Lightning discharge capability (200 µs)***, C	2.4
High current impulse (4/10 µs), kA	65
Maximum fault quenching lightning current (8/50 µs), kA	20
Minimum withstand amount of operations	10
GENERAL PARAMETERS	
Additional power losses on the line, %	0
Average life time expectancy, years	20
UV resistance**, h**	1000
Weight	1.5
Maintenance	1 visual verification per year

** According to IEC 60038, ** According to IEC 60071-1., *** According to IEC 60099-8, **** According to ISO 4892-2, method A, IEC 62217*

Installation

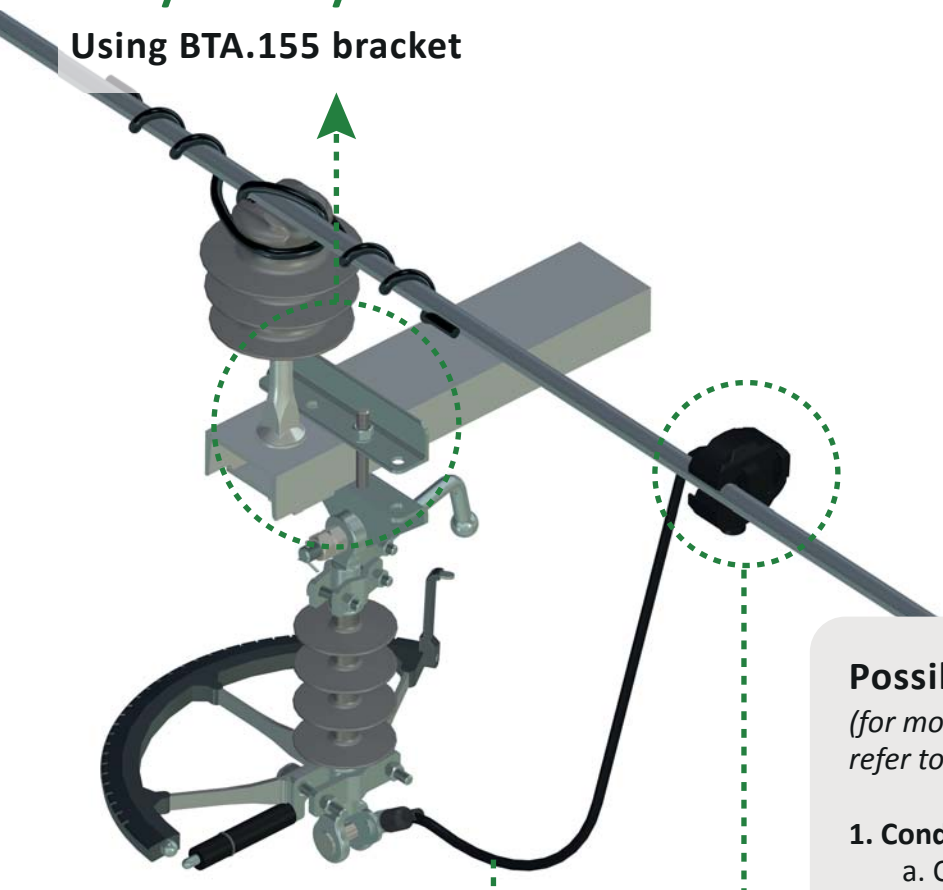
Overview

3 pieces per pole for ensuring comprehensive protection of an overhead line against DLS, BFO and IOV.
For more details, please refer to **Installation pages**.

Reference: SAD.S10.Z.WW/920

PIN / POST / TENSION insulation

Using BTA.155 bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029 + EPC.100
- b. CCi90.4531 + EPC.100
- c. CCi90.6531 + EPC.100

Possible options

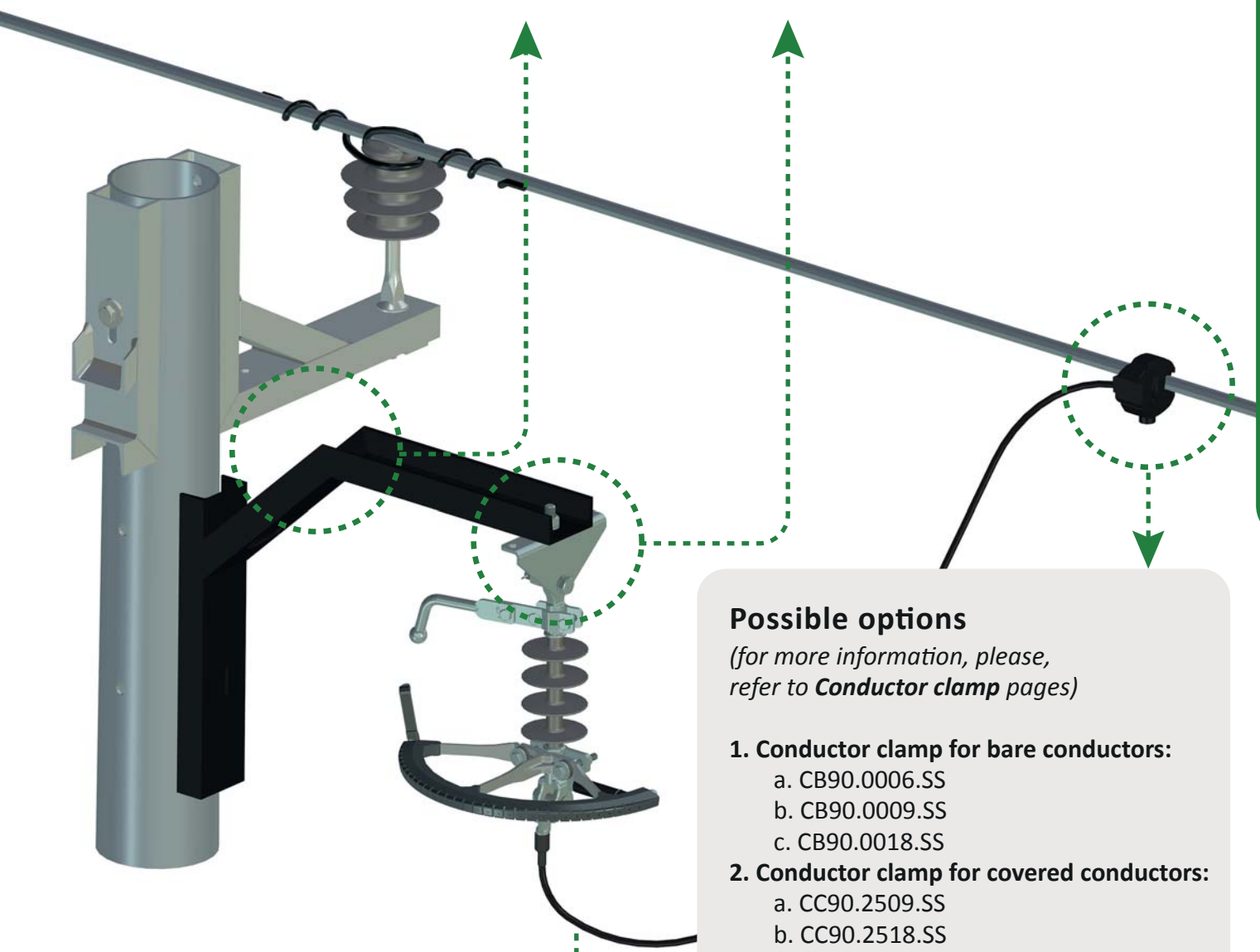
*(for more information, please, refer to **Jumpers** page)*

Jumper for conductor clamps:
- JUM.017

Jumper for IPCs:
- JUM.C17
- JUM.S16

PIN / POST / TENSION insulation

Using additional cross-arm PCF.800 + bracket BTA.156



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029 + EPC.100
- b. CCi90.4531 + EPC.100
- c. CCi90.6531 + EPC.100

Possible options

*(for more information, please, refer to **Jumpers** page)*

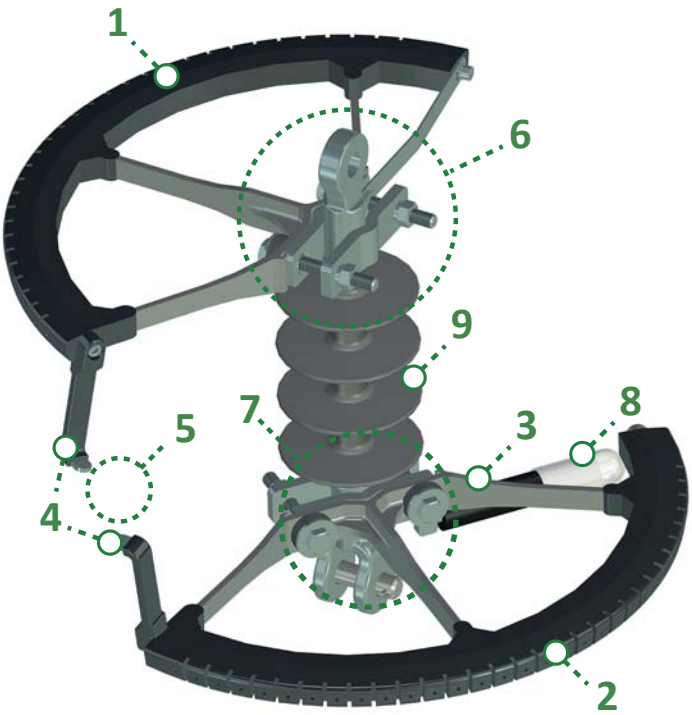
Jumper for conductor clamps:
- JUM.017

Jumper for IPCs:
- JUM.C17
- JUM.S16

dS15z

Line Lightning Protection Device for Overhead Lines up to 17.5 kV

LLPD dS15z is intended for protection of overhead lines with the highest voltage for equipment up to 17.5 kV and high short-circuit currents against direct lighting strikes, back flashovers and induced overvoltages, as well as their deleterious consequences.

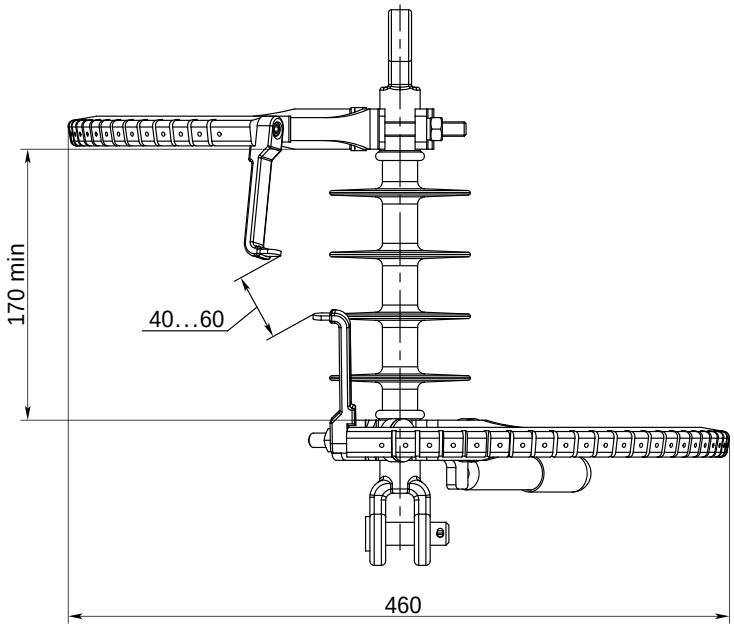


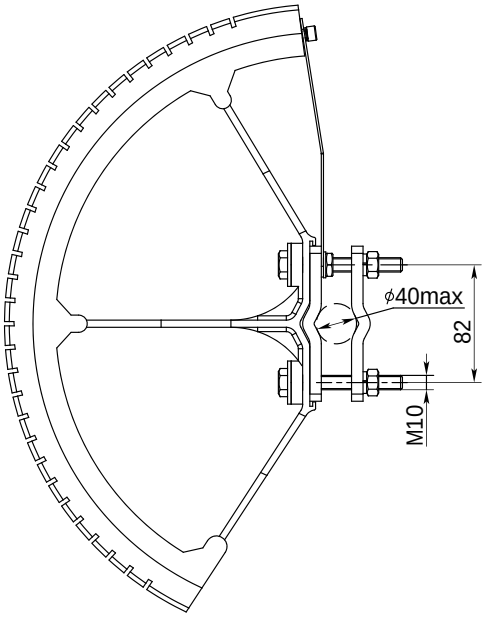
1. *Module A with EQ system*
2. *Module B with EQ system*
3. *Insulating load-bearing frame*
4. *Electrodes*
5. *Air gap*
6. *Attachment point of module A*
7. *Attachment point of module B*
8. *Auxiliary electrode with onetime glass indicator*
9. *Composite insulator (not included)*

Features

- DLS protection ofoverhead power lines
- Prevention of conductors and insulators breakage
- DLS endurance

Overall Dimensions





Performance specification and characteristics

ELECTRICAL LINE PARAMETERS	
Highest voltage for equipment*, kV	**17.5**
Maximum prospective fault current, kA	5
External air gap, mm	60±20
50% flashover voltage, kV	140
Power frequency withstand voltage**, kV	38
LIGHTNING PARAMETERS	
Lightning discharge capability (200 µs)***, C	2.4
High current impulse (4/10 µs), kA	65
Maximum fault quenching lightning current (8/50 µs), kA	20
Minimum withstand amount of operations	10
GENERAL PARAMETERS	
Additional power losses on the line, %	0
Average life time expectancy, years	20
UV resistance**, h**	1000
Weight	2.8
Maintenance	1 visual verification per year

** According to IEC 60038, ** According to IEC 60071-1., *** According to IEC 60099-8, **** According to ISO 4892-2, method A, IEC 62217*

Insulator's CFO (kV)	dS15z: Air gap, mm	dS15z: power frequency withstand voltage, kV	
< 140	Contact us	Contact us	Contact us
160	80-100	65	55
180	100-120	70	60
200	120-140	75	65
220	140-160	80	70
240	160-180	85	75

Installation

Overview

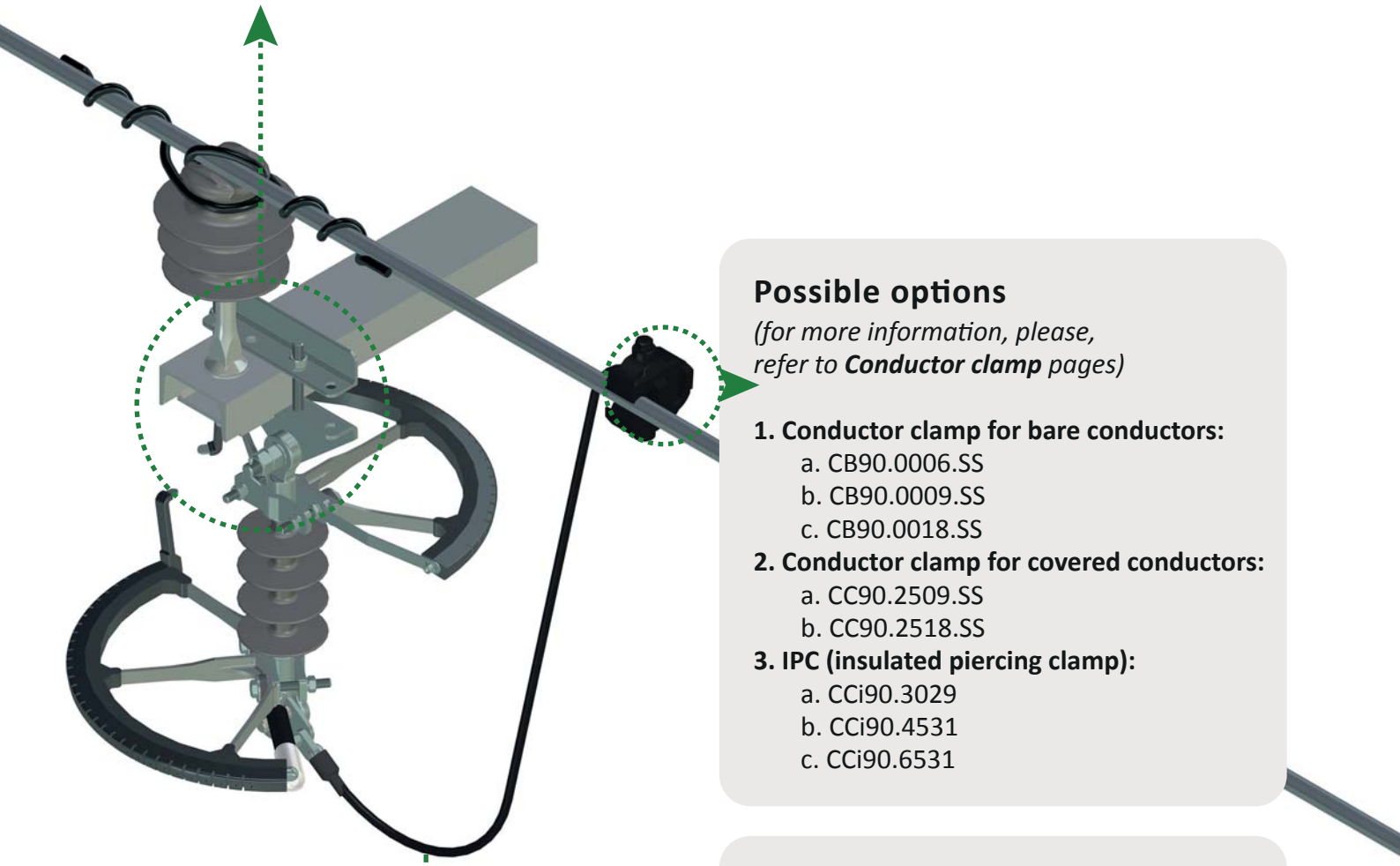
1 piece per phase for each circuit on one pole for ensuring comprehensive protection of an overhead line against DLS, BFO and IOV.

LLPD dS15z must be installed with an air gap between upper and lower electrodes. In order to select the proper value of the gap, please refer to the table.

Reference: SAD.S15.Z.WW/920

PIN / POST insulation

Using BTA.155 bracket *(for more information, please, refer to **Brackets** pages)*



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029
- b. CCi90.4531
- c. CCi90.6531

Possible options

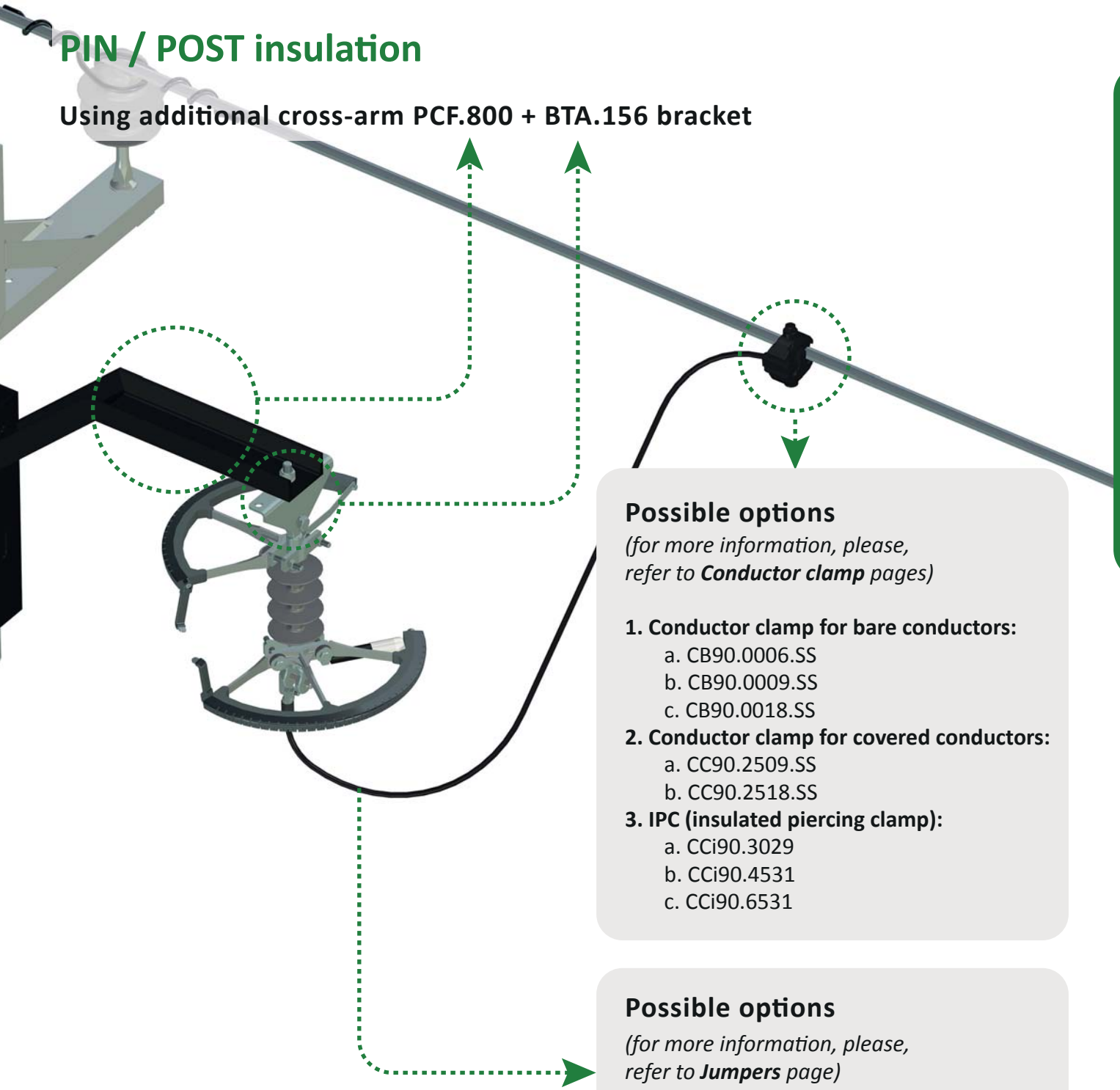
*(for more information, please, refer to **Jumpers** page)*

Jumper for conductor clamps:
- JUM.017

Jumper for IPCs:
- JUM.C17
- JUM.S16

PIN / POST insulation

Using additional cross-arm PCF.800 + BTA.156 bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029
- b. CCi90.4531
- c. CCi90.6531

Possible options

*(for more information, please, refer to **Jumpers** page)*

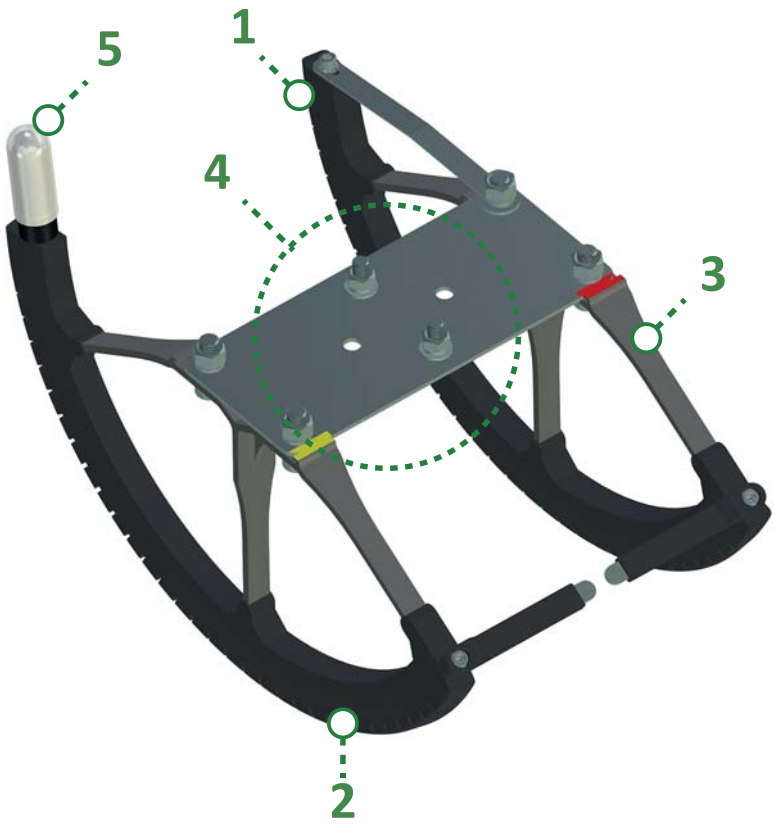
Jumper for conductor clamps:
- JUM.017

Jumper for IPCs:
- JUM.C17
- JUM.S16

dC20z

Line Lightning Protection Device for Overhead Lines up to 24 kV

LLPD dC20z is intended for protection of overhead lines with nominal voltage up to 24 kV against direct lightning strikes, back flashovers, induced overvoltages and their deleterious consequences

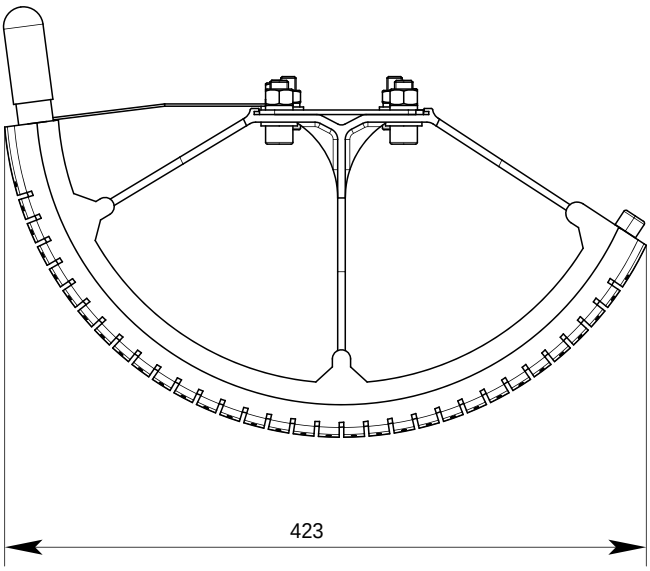


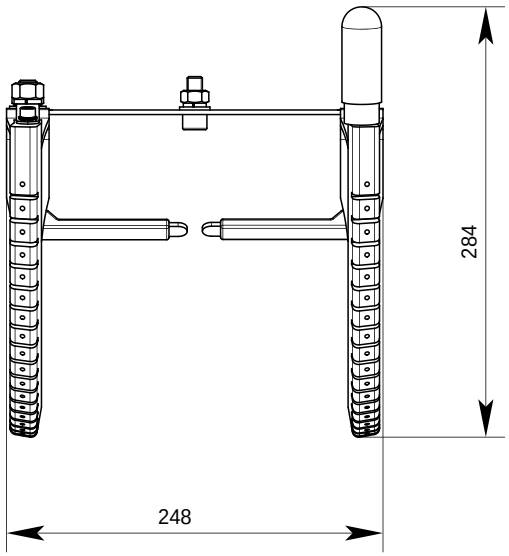
1. *Module A with EQ system*
2. *Module B with EQ system*
3. *Insulating load-bearing frame*
4. *Attachment point*
5. *Terminal electrode with indicator*

Features

- DLS protection of overhead power lines
- Prevention of conductors and insulators breakage
- DLS endurance

Overall Dimensions





Performance specification and characteristics

ELECTRICAL LINE PARAMETERS	
Highest voltage for equipment*, kV	**24**
Maximum prospective fault current, kA	5
External air gap, mm	70±10
50% flashover voltage, kV	160
Power frequency withstand voltage**, kV	50
LIGHTNING PARAMETERS	
Lightning discharge capability (200 µs)***, C	2.4
High current impulse (4/10 µs), kA	65
Maximum fault quenching lightning current (8/50 µs), kA	20
Minimum withstand amount of operations	10
GENERAL PARAMETERS	
Additional power losses on the line, %	0
Average life time expectancy, years	20
UV resistance**, h**	1000
Weight	2.5
Maintenance	1 visual verification per year

** According to IEC 60038, ** According to IEC 60071-1., *** According to IEC 60099-8, **** According to ISO 4892-2, method A, IEC 62217*

Insulator's CFO (kV)	dC20z: Air gap (mm)	
	6 to 17 kV Highest voltage for equipment	18 to 24 kV Highest voltage for equipment
< 120	Contact us	Contact us
120	40	Contact us
140	45	60
160	55	60
180	65	75
200	80	90

Installation

Overview

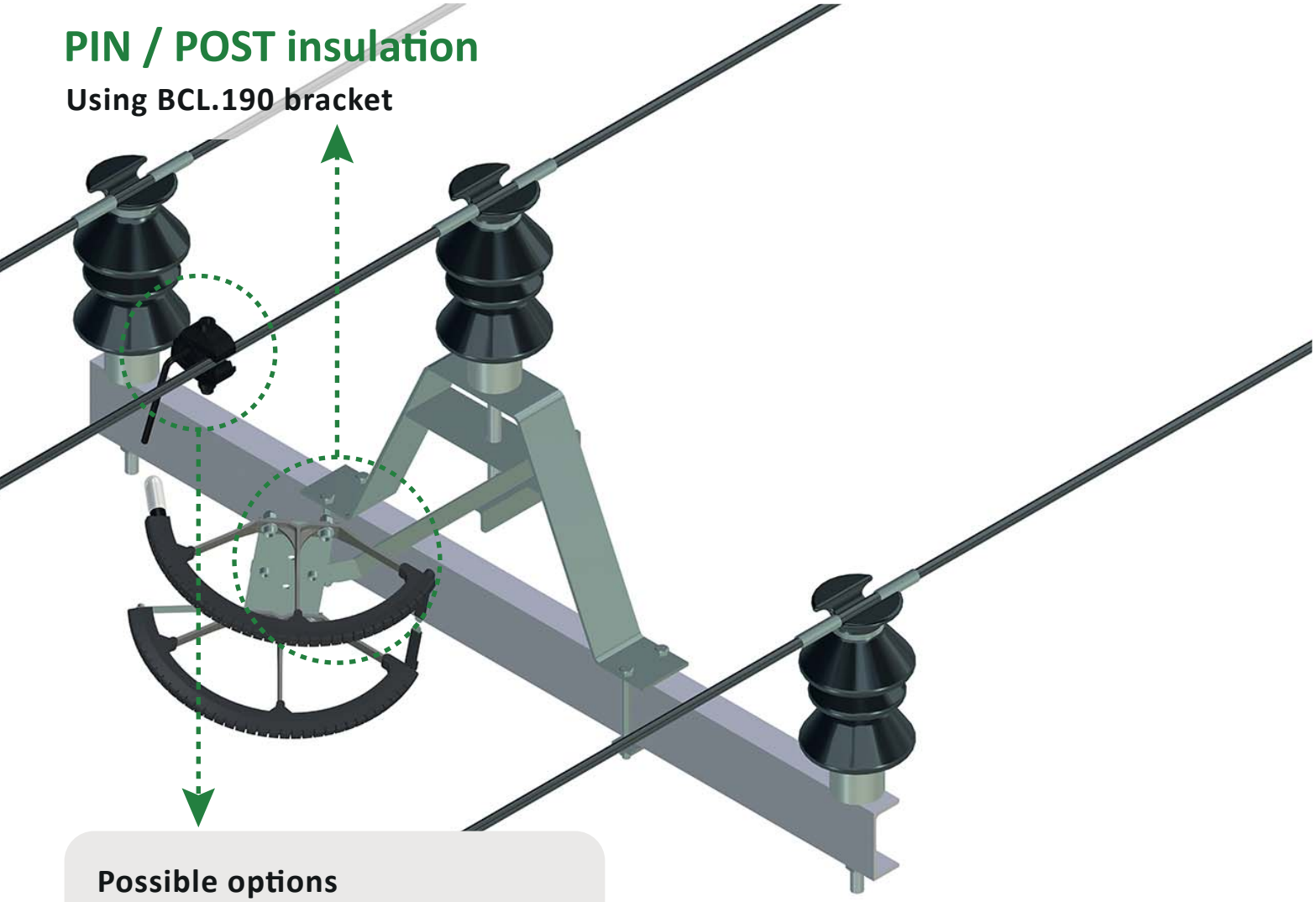
1 piece per phase for each circuit on one pole for ensuring comprehensive protection of an overhead line against DLS, BFO and IOV.

LLPD dC20z must be installed with an air gap between upper and lower electrodes. In order to select the proper value of the gap, please address to the table.

Reference: SAD.C20.Z.WW/920

PIN / POST insulation

Using BCL.190 bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029 + EPC.100
- b. CCi90.4531 + EPC.100
- c. CCi90.6531 + EPC.100

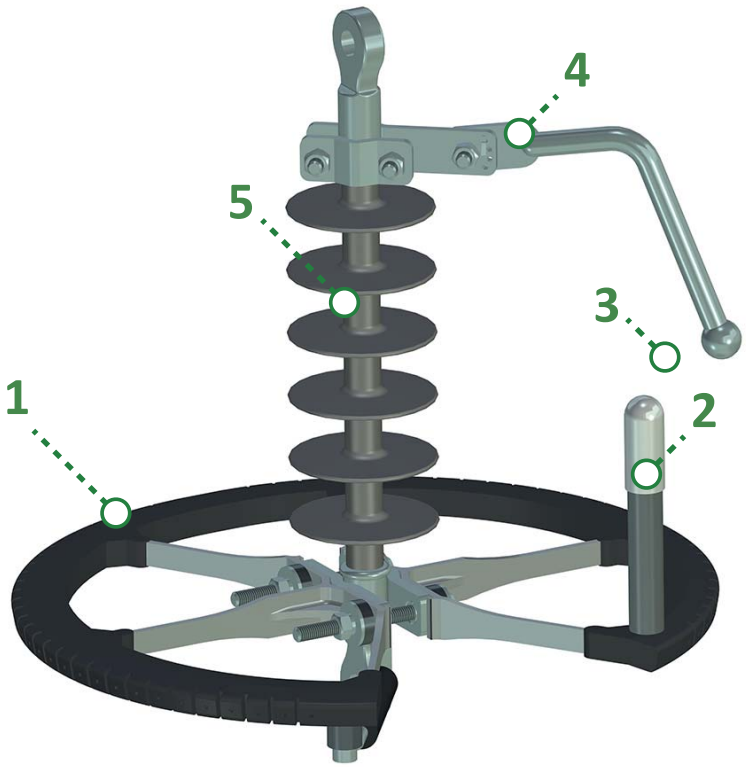
TENSION insulation

Using BCL.190 bracket

d21z

Line Lightning Protection Device for Overhead Lines up to 24 kV

LLPD d21z is intended for protection of overhead lines with nominal voltage up to 24 kV against direct lighting strikes, back flashovers, induced overvoltages and their deleterious consequences

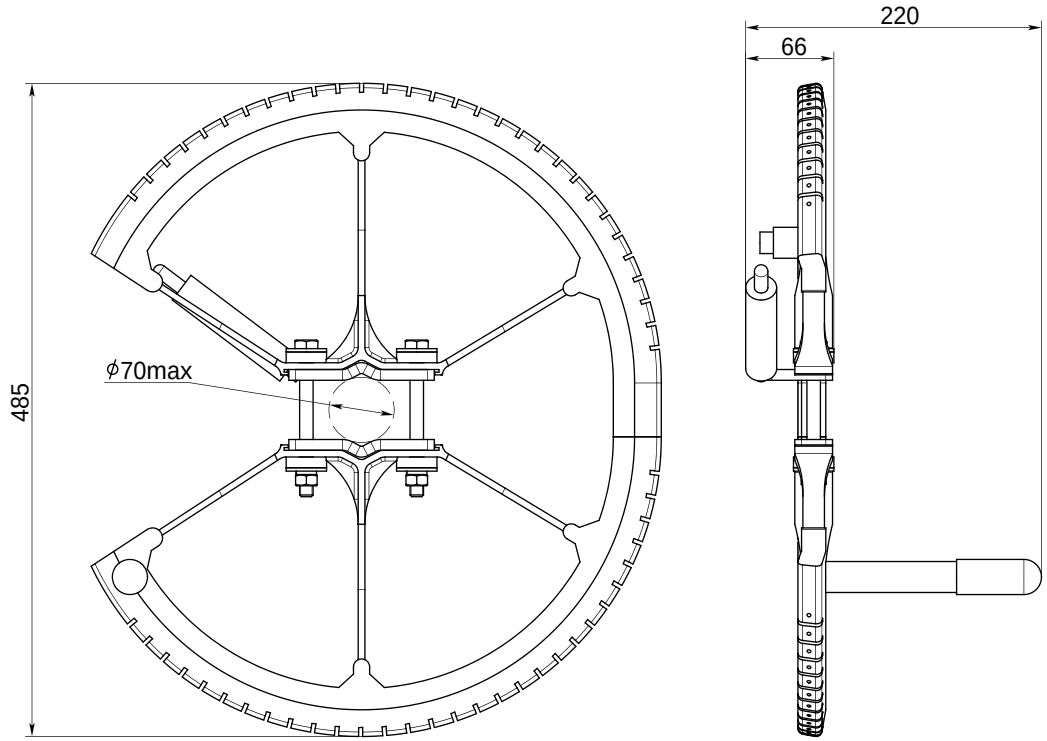


1. *d21z, which is a "ring" with EQ system integrated with a PPS load-bearing frame*
2. *Electrode with indicator*
3. *Air gap*
4. *Horn electrode (see* **Electrode page***)*
5. *Additional composite insulator*

Features

- DLS protection
- Prevention of conductors and insulators breakage
- DLS endurance

Overall Dimensions



Performance specification and characteristics

ELECTRICAL LINE PARAMETERS	
Highest voltage for equipment*, kV	**24**
Maximum prospective fault current, kA	5
External air gap, mm	70±10
50% flashover voltage, kV	160
Power frequency withstand voltage**, kV	50
LIGHTNING PARAMETERS	
Lightning discharge capability (200 µs)***, C	2.4
High current impulse (4/10 µs), kA	65
Maximum fault quenching lightning current (8/50 µs), kA	20
Minimum withstand amount of operations	10
GENERAL PARAMETERS	
Additional power losses on the line, %	0
Average life time expectancy, years	20
UV resistance**, h**	1000
Weight	2.2
Maintenance	1 visual verification per year

** According to IEC 60038, ** According to IEC 60071-1., *** According to IEC 60099-8, **** According to ISO 4892-2, method A, IEC 62217*

Insulator's CFO (kV)	d21z: Air gap (mm)	
	6 to 17 kV Highest voltage for equipment	18 to 24 kV Highest voltage for equipment
< 120	Contact us	Contact us
120	40	Contact us
140	45	60
160	55	60
180	65	70
200	80	90

Installation

Overview

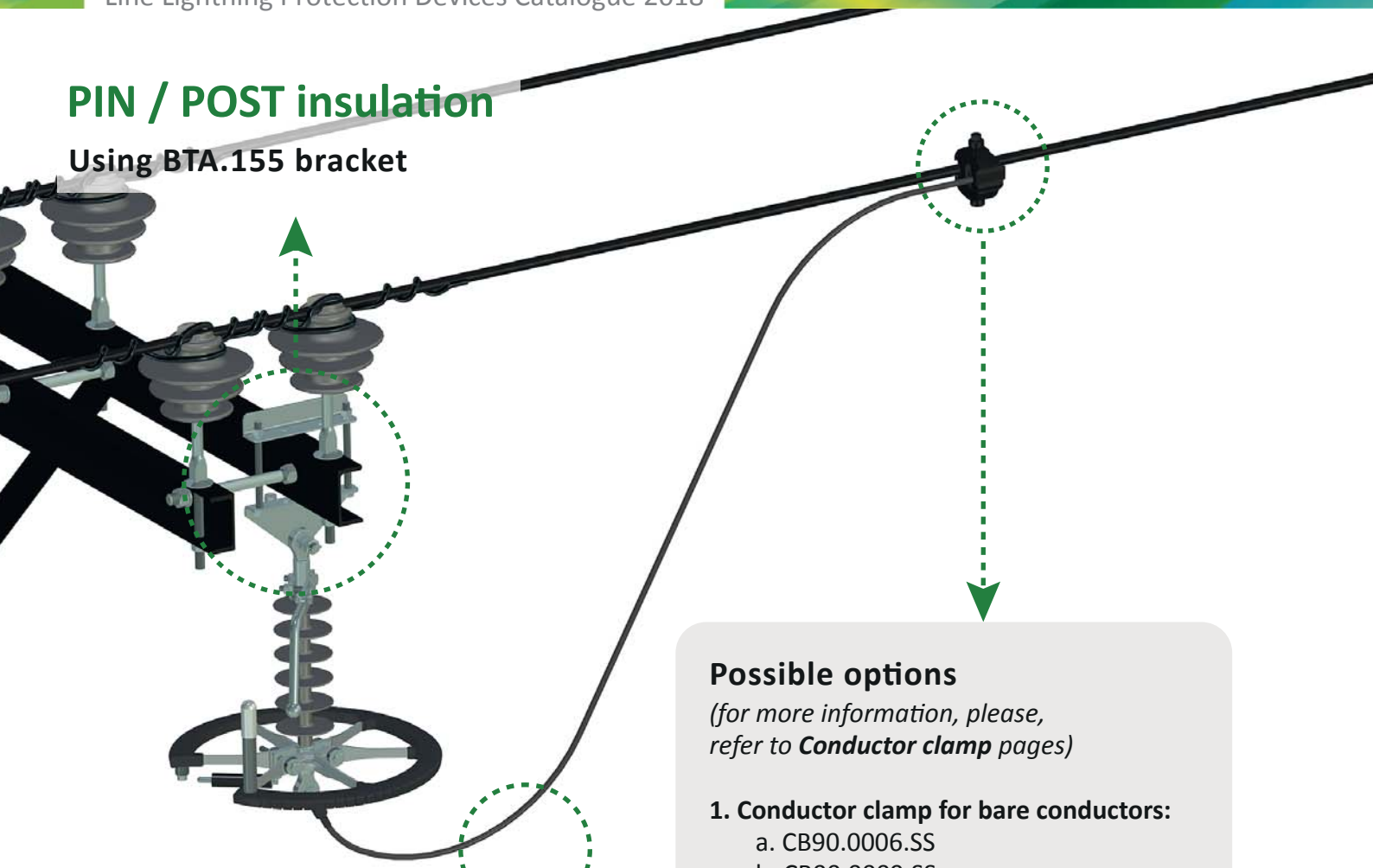
1 piece per phase each circuit on one pole for ensuring comprehensive protection of an overhead line against DLS, BFO and IOV.

LLPD d21z must be installed with an air gap between its electrode and horn electrode. In order to select the proper value of the gap, please address to the table.

Reference: SAD.021.Z.WW/920

PIN / POST insulation

Using BTA.155 bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029
- b. CCi90.4531
- c. CCi90.6531

Possible options

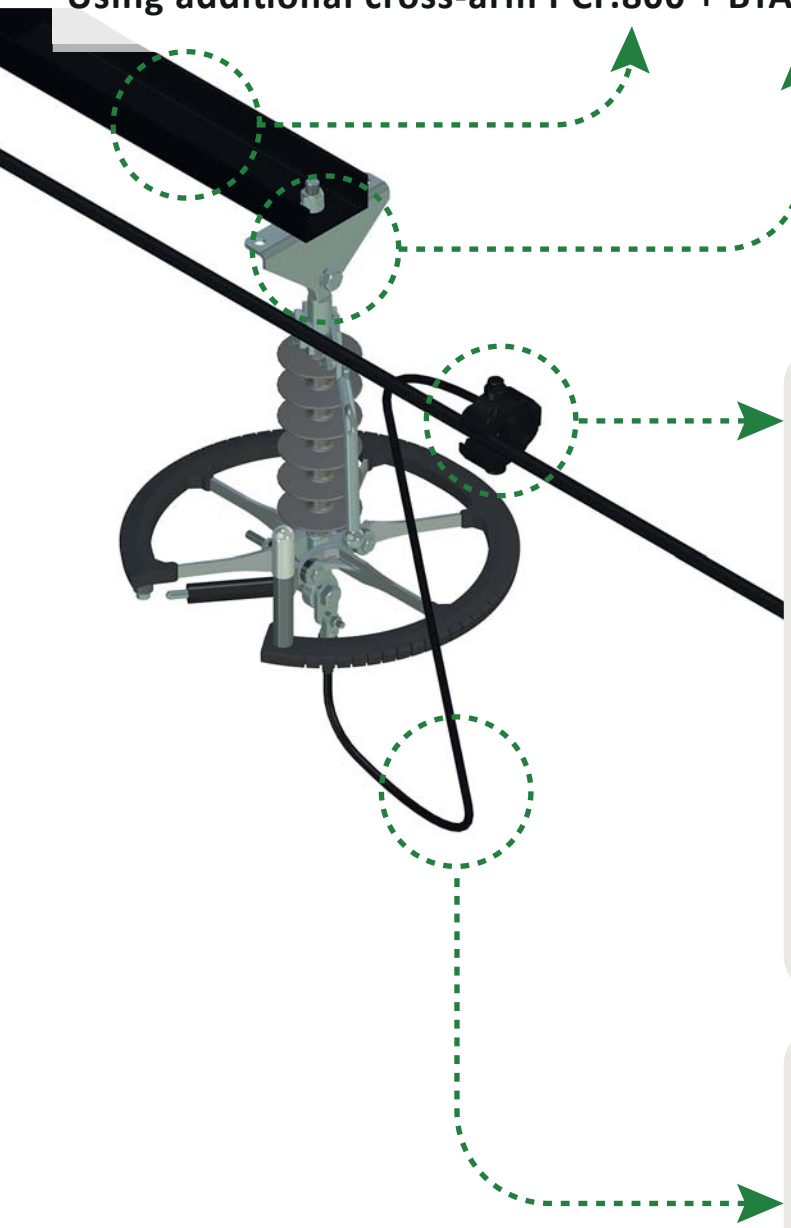
*(for more information, please, refer to **Jumpers** page)*

Jumper for conductor clamps:
- JUM.017

Jumper for IPCs:
- JUM.C17
- JUM.S16

PIN / POST insulation

Using additional cross-arm PCF.800 + BTA.156 bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029
- b. CCi90.4531
- c. CCi90.6531

Possible options

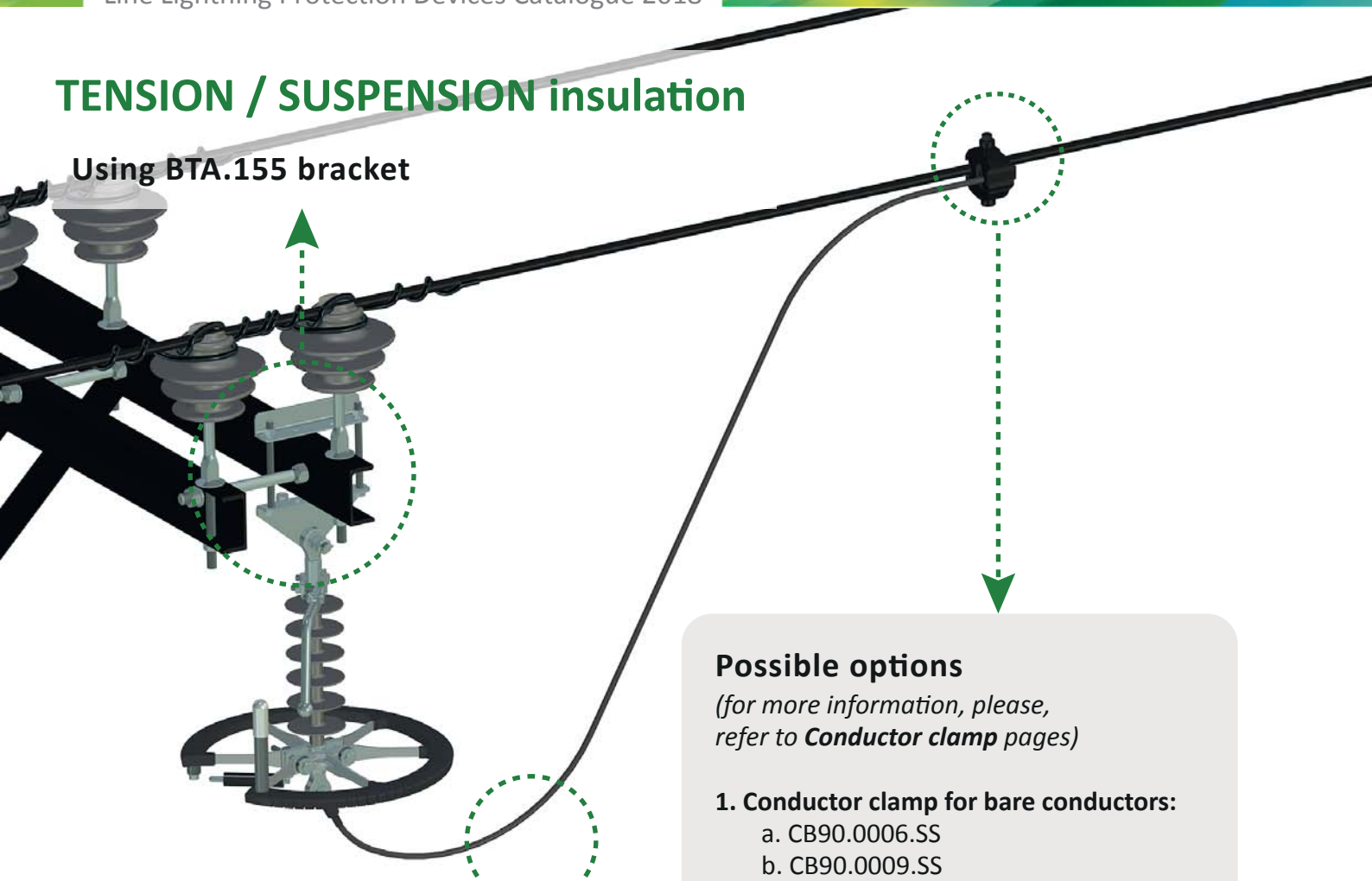
*(for more information, please, refer to **Jumpers** page)*

Jumper for conductor clamps:
- JUM.017

Jumper for IPCs:
- JUM.C17
- JUM.S16

TENSION / SUSPENSION insulation

Using BTA.155 bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029
- b. CCi90.4531
- c. CCi90.6531

Possible options

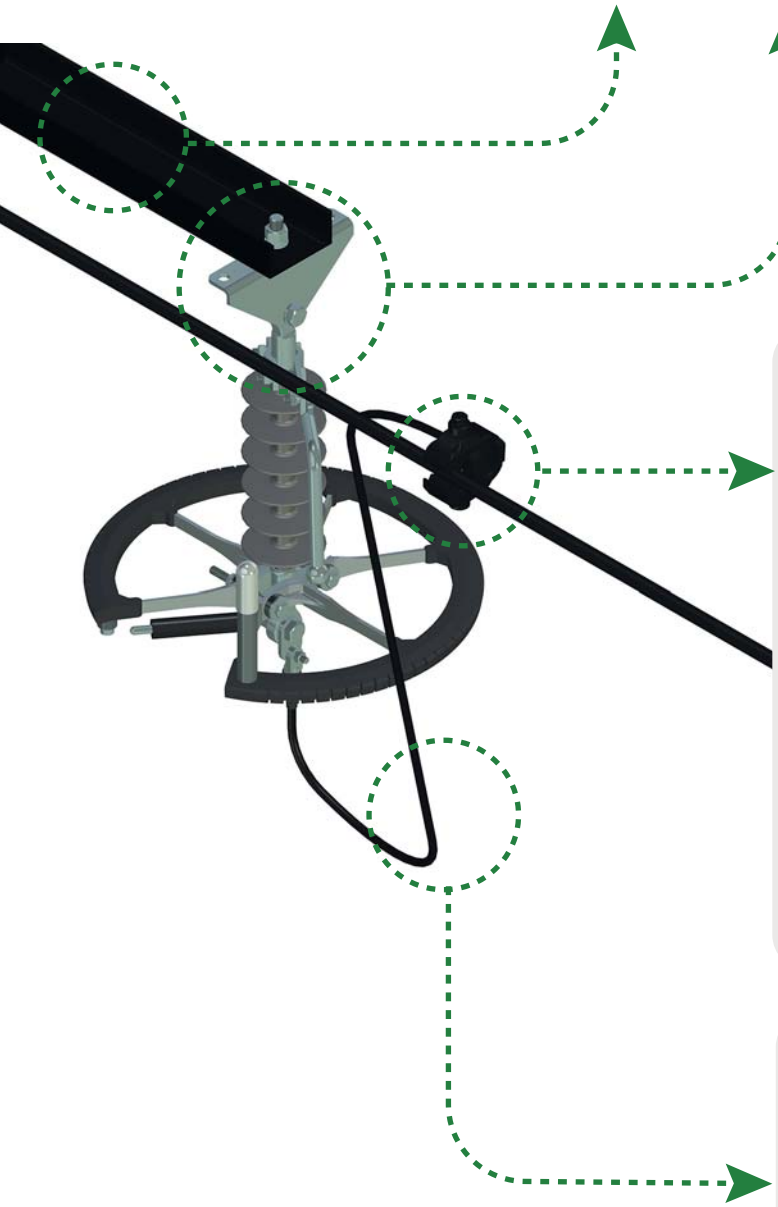
*(for more information, please, refer to **Jumpers** page)*

Jumper for conductor clamps:
- JUM.017

Jumper for IPCs:
- JUM.C17
- JUM.S16

TENSION / SUSPENSION insulation

Using additional cross-arm PCF.800 + BTA.156 bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029
- b. CCi90.4531
- c. CCi90.6531

Possible options

*(for more information, please, refer to **Jumpers** page)*

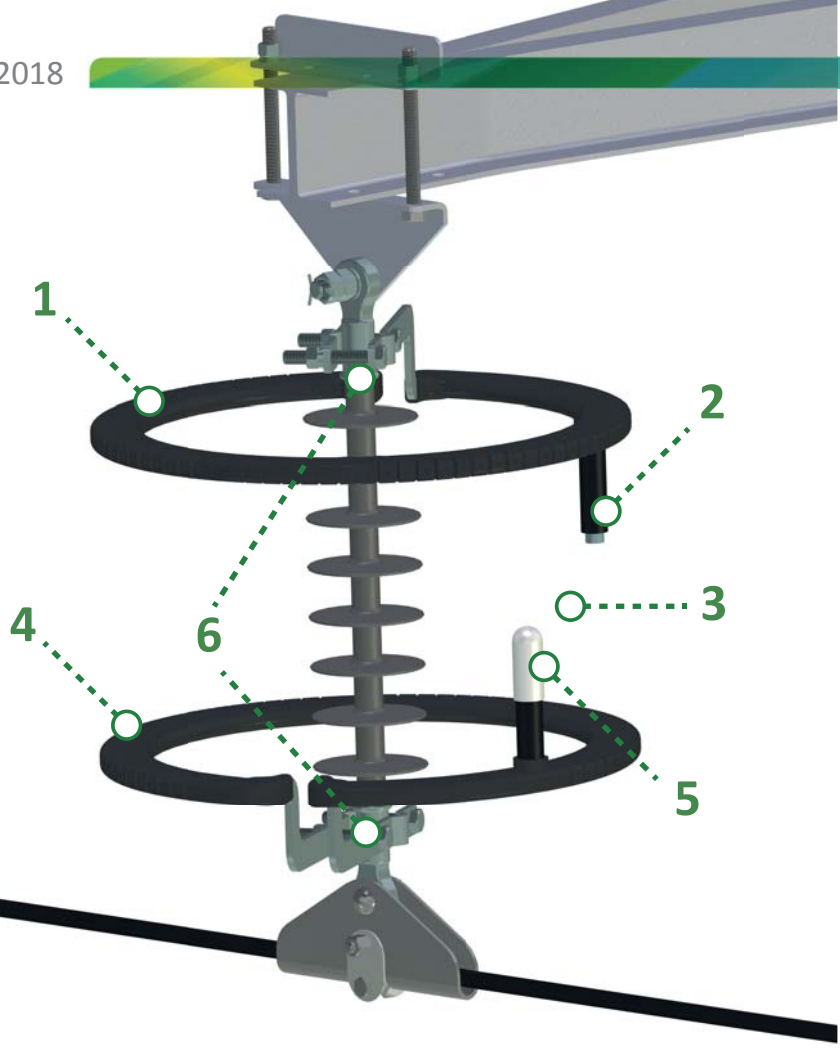
Jumper for conductor clamps:
- JUM.017

Jumper for IPCs:
- JUM.C17
- JUM.S16

dM35z

Line Lightning Protection Device for Overhead Lines up to 40.5 kV

LLPD dM35z is intended for protection of overhead lines with nominal voltage up to 40.5 kV against direct lighting strikes, back flashovers, induced overvoltages and their deleterious consequences.



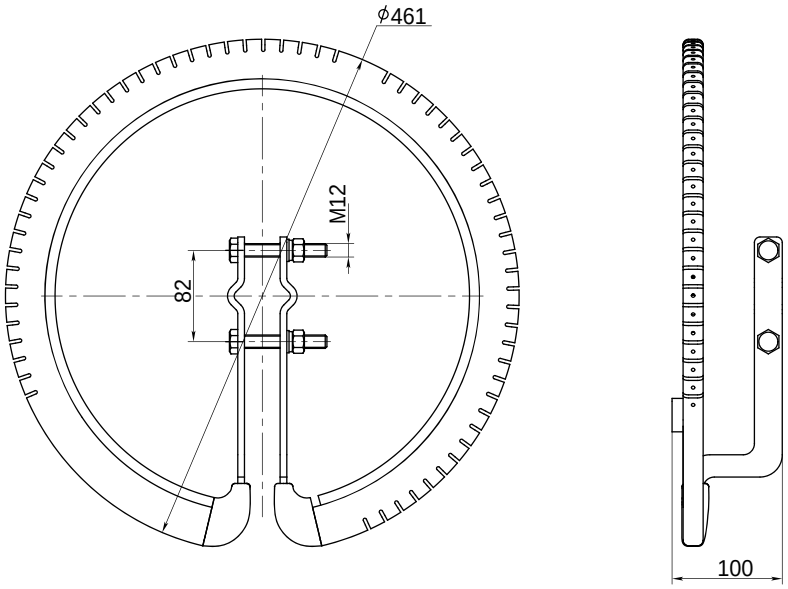
Features

- DLS protection
- Prevention of conductors and insulators breakage
- DLS endurance

1. *Upper "ring" with EQ system integrated with a PPS load-bearing frame*
2. *Upper electrode*
3. *Air gap*
4. *Lower "ring" with EQ system integrated with a PPS load-bearing frame*
5. *Lower electrode with indicator*
6. *Attachment point*

Overall Dimensions

Upper ring / Lower ring



Performance specification and characteristics

ELECTRICAL LINE PARAMETERS	
Highest voltage for equipment*, kV	**40.5**
Maximum prospective fault current, kA	5
External air gap, mm	150±30
50% flashover voltage, kV	230
Power frequency withstand voltage**, kV	80
LIGHTNING PARAMETERS	
Lightning discharge capability (200 µs)***, C	2.4
High current impulse (4/10 µs), kA	65
Maximum fault quenching lightning current (8/50 µs), kA	20
Minimum withstand amount of operations	10
GENERAL PARAMETERS	
Additional power losses on the line, %	0
Average life time expectancy, years	20
UV resistance**, h**	1000
Weight	5.3
Maintenance	1 visual verification per year

** According to IEC 60038, ** According to IEC 60071-1., *** According to IEC 60099-8, **** According to ISO 4892-2, method A, IEC 62217*

Insulator's CFO (kV)	dM35z: Air gap (mm)
< 180	Contact us
180	120
200	140
220	160
240	180
260	200

Installation

Overview

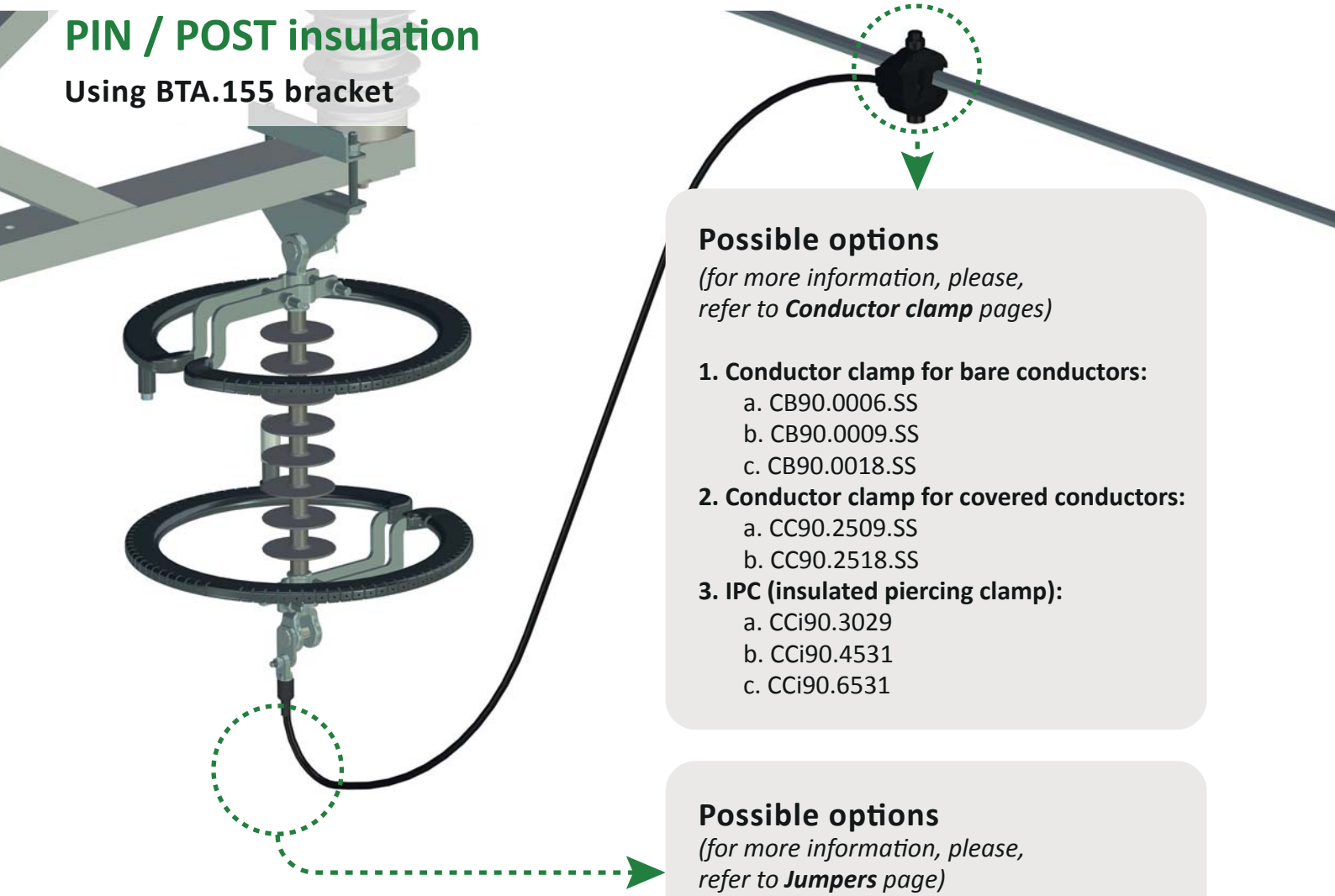
1 piece per phase for each circuit on one pole for ensuring comprehensive protection of an overhead line against DLS and BFO.

LLPD dM35z must be installed with an air gap between upper and lower electrodes. In order to select the proper value of the gap, please refer to the table.

Reference: SAD.M35.Z.WW/920

PIN / POST insulation

Using BTA.155 bracket



Possible options

*(for more information, please, refer to **Conductor clamp** pages)*

1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

3. IPC (insulated piercing clamp):
- a. CCi90.3029
- b. CCi90.4531
- c. CCi90.6531

Possible options

*(for more information, please, refer to **Jumpers** page)*

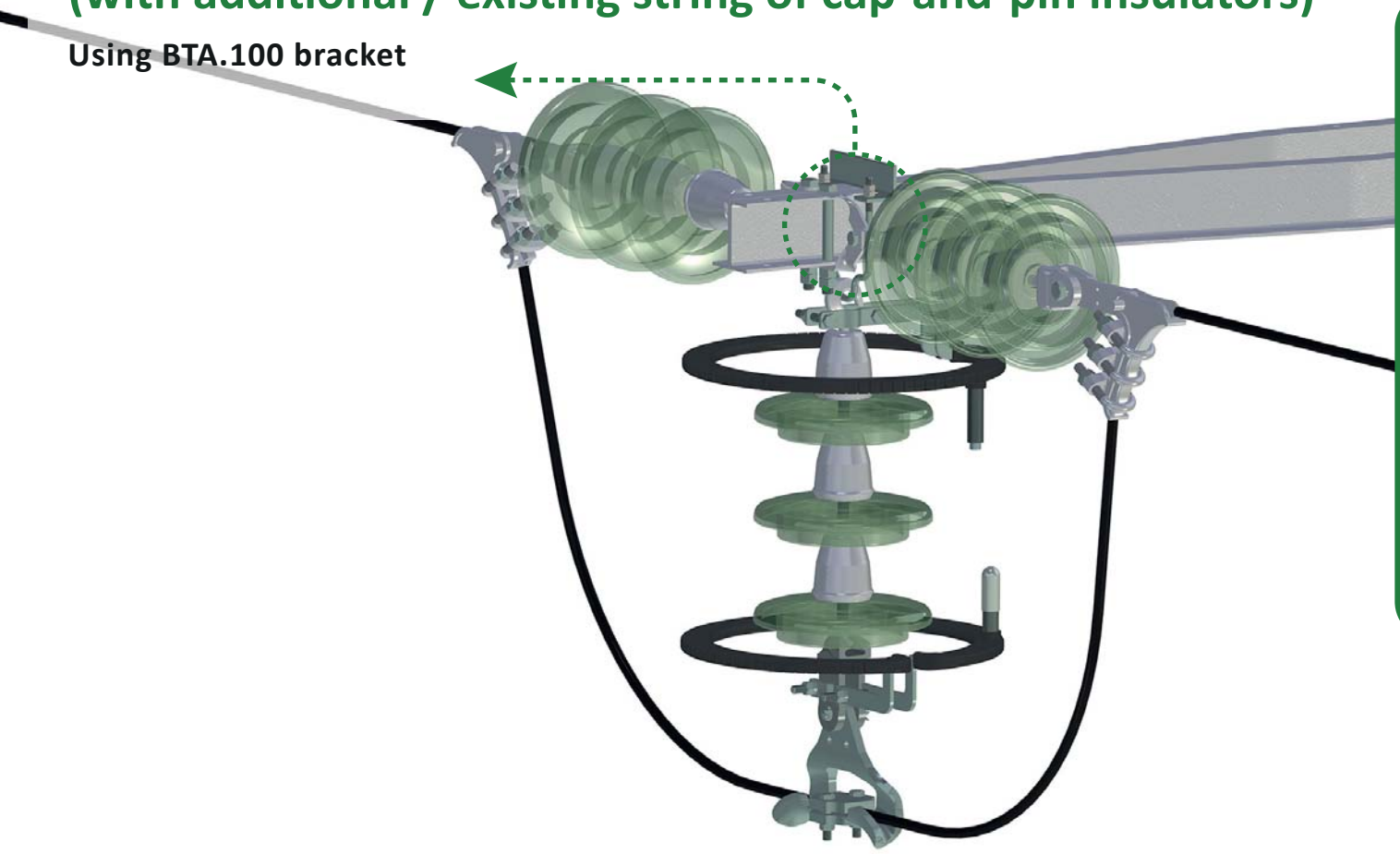
- JUM.S35

SUSPENSION insulation

No extra brackets are required

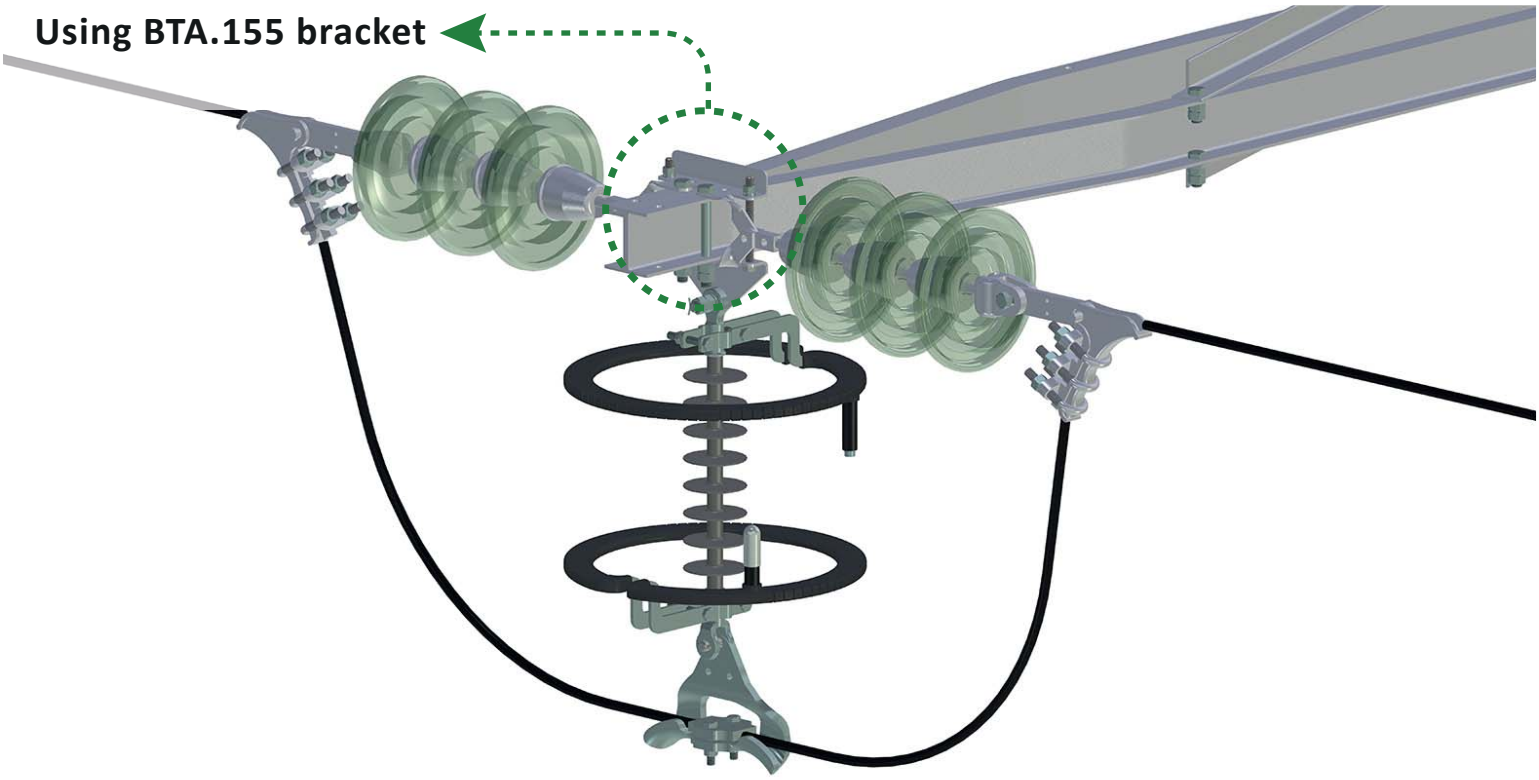
TENSION insulation
(with additional / existing string of cap-and-pin insulators)

Using BTA.100 bracket



TENSION insulation
(with additional / existing string of cap-and-pin insulators)

Using BTA.155 bracket

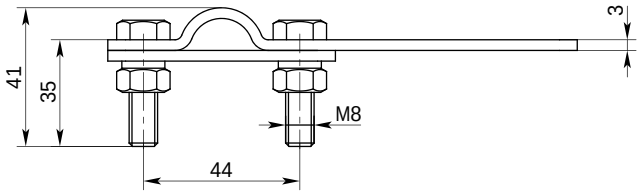


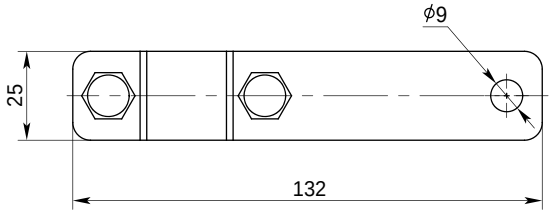
Conductor clamps

Non-piercing clamps for bare conductors

Conductor clamp CB90.0006.SS

Reference: CB90.0006.SS

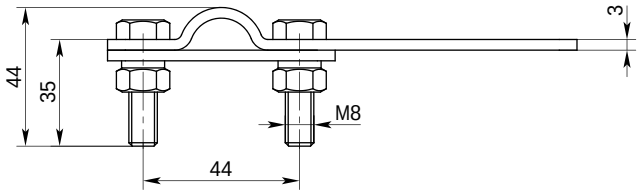


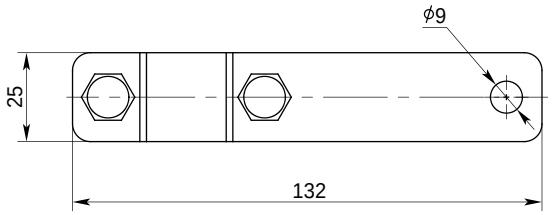


Minimum external diameter of a conductor, mm	6
Maximum external diameter of a conductor, mm	15
Material	Stainless steel
Coating	-
Weight, kg	0.14

Conductor clamp CB90.0009.SS

Reference: CB90.0009.SS

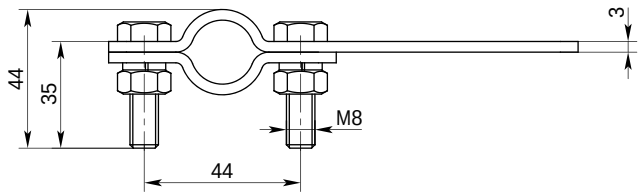


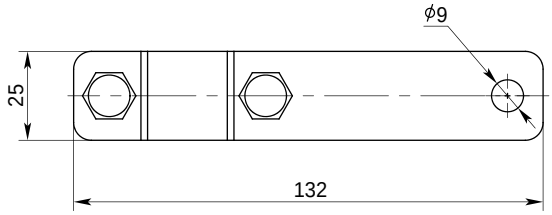


Minimum external diameter of a conductor, mm	9
Maximum external diameter of a conductor, mm	18
Material	Stainless steel
Coating	-
Weight, kg	0.15

Conductor clamp CB90.0018.SS

Reference: CB90.0018.SS





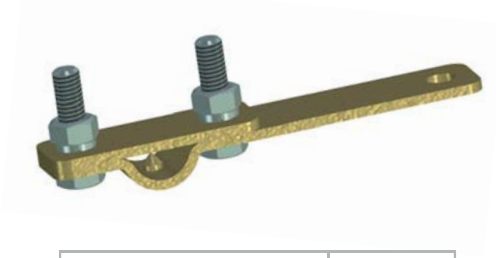
Minimum external diameter of a conductor, mm	18
Maximum external diameter of a conductor, mm	24
Material	Stainless steel
Coating	-
Weight, kg	0.16

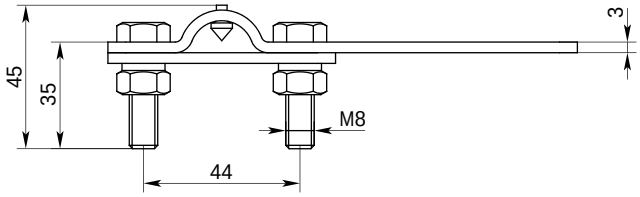
Conductor clamps

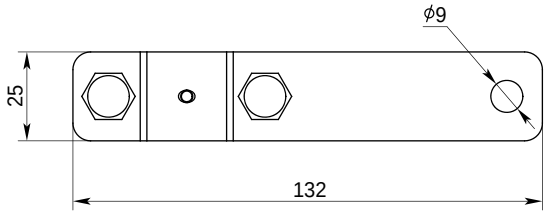
Piercing clamps for covered conductors

Conductor clamp CC90.2509.SS

Reference: CC90.2509.SS



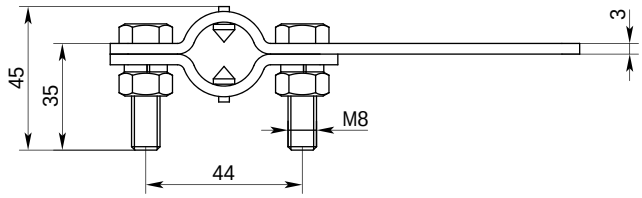


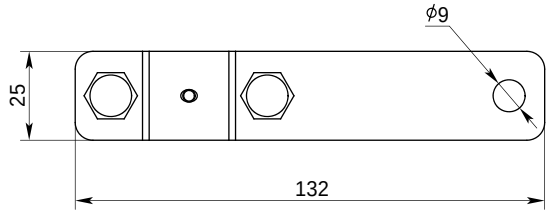


Minimum external diameter of a conductor, mm	9
Maximum external diameter of a conductor, mm	18
Maximum thickness of insulation layer, mm	2.5
Material	Stainless steel
Coating	-
Weight, kg	0.15

Conductor clamp CC90.2518.SS

Reference: CC90.2518.SS





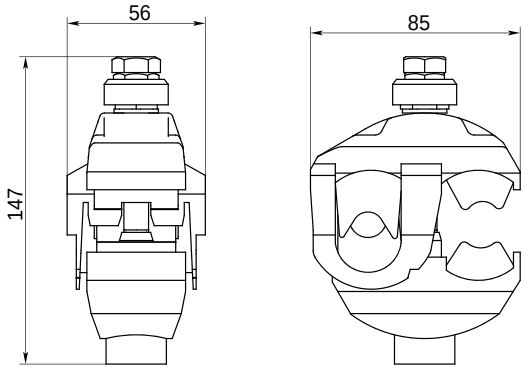
Minimum external diameter of a conductor, mm	18
Maximum external diameter of a conductor, mm	24
Maximum thickness of insulation layer, mm	2.5
Material	Stainless steel
Coating	-
Weight, kg	0.16

Conductor clamps

Insulated piercing clamps (IPC) for covered conductors

Insulated piercing clamp CCi90.3029

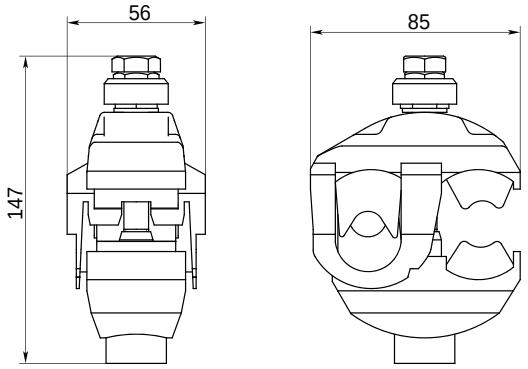
Reference: CCi90.3029.WW



Maximum external diameter of a conductor, mm	29
Maximum thickness of insulation layer, mm	3.0
Material	Stainless steel
Coating	-
Weight, kg	0.25

Insulated piercing clamp CCi90.4531

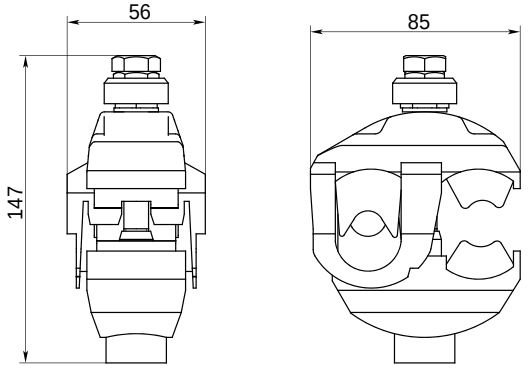
Reference: CCi90.4531.WW



Maximum external diameter of a conductor, mm	31
Maximum thickness of insulation layer, mm	4.5
Material	Stainless steel
Coating	-
Weight, kg	0.30

Insulated piercing clamp CCi90.6531

Reference: CCi90.6531.WW



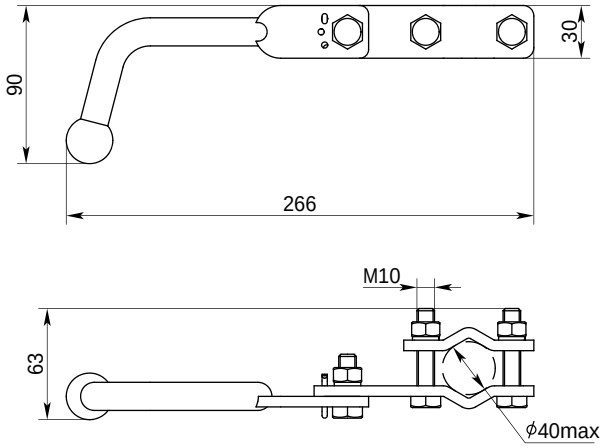
Maximum external diameter of a conductor, mm	31
Maximum thickness of insulation layer, mm	6.5
Material	Stainless steel
Coating	-
Weight, kg	0.35

Horn electrodes for LLPDs

Horn electrode HRN.0838

Reference: HRN.0838.WW

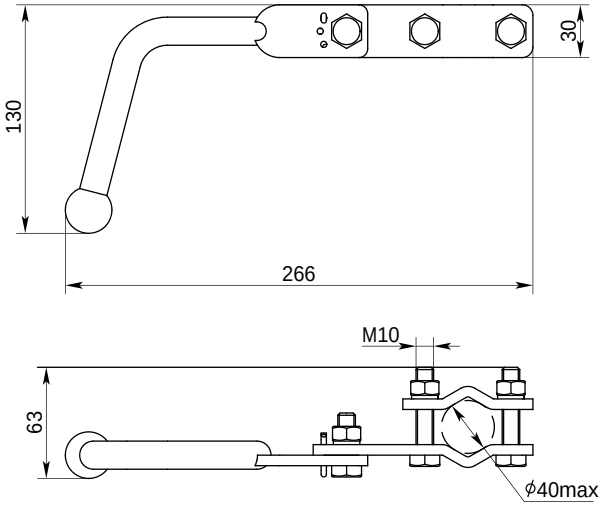
Horn electrode length, mm	75
Maximum external diameter of a insulators' end fitting, mm	40
Material	Steel
Coating	HDG, 75 µm
Weight, kg	0.77



Horn electrode HRN.1238

Reference: HRN.1238.WW

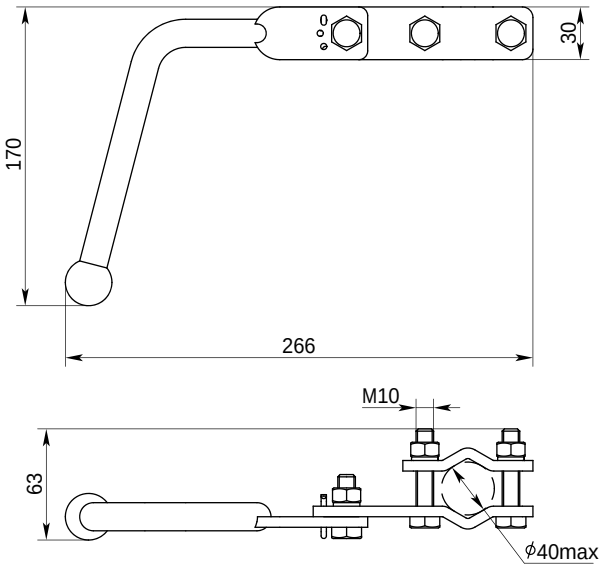
Horn electrode length, mm	115
Maximum external diameter of a insulators' end fitting, mm	40
Material	Steel
Coating	HDG, 75 µm
Weight, kg	0.81



Horn electrode HRN.1638

Reference: HRN.1638.WW

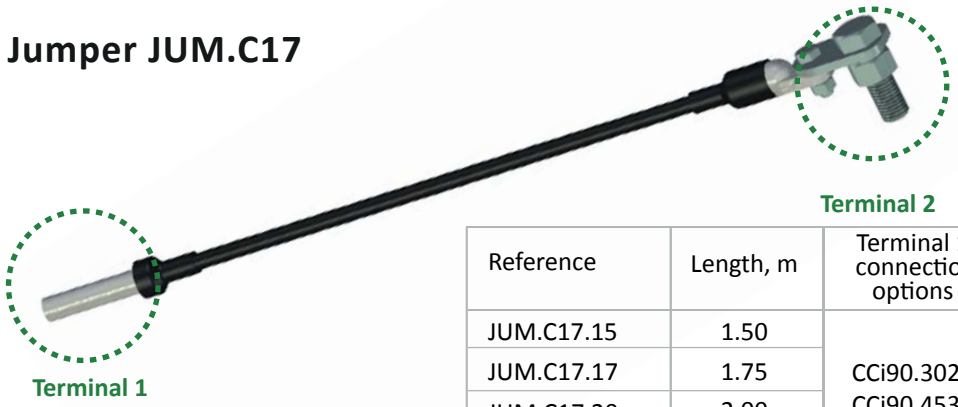
Horn electrode length, mm	155
Maximum external diameter of a insulators' end fitting, mm	40
Material	Steel
Coating	HDG, 75 µm
Weight, kg	0.86



Accessories for installation for covered conductors

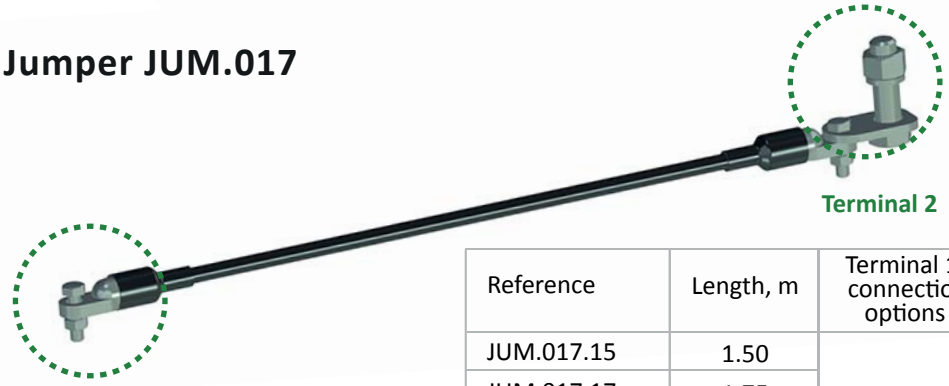
For LLPDs up to 24 kV

Jumper JUM.C17



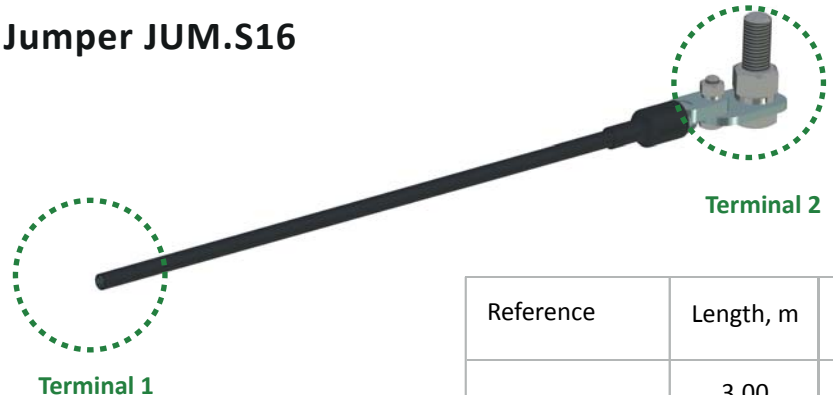
Reference	Length, m	Terminal 1 connection options	Terminal 2 connection options	Thickness of insulation layer, mm
JUM.C17.15	1.50	CCi90.3029 CCi90.4531 CCi90.6531	Composite insulator's end fitting, 17 mm hole	1.5
JUM.C17.17	1.75			
JUM.C17.20	2.00			
JUM.C17.22	2.25			
JUM.C17.25	2.50			

Jumper JUM.017



Reference	Length, m	Terminal 1 connection options	Terminal 2 connection options	Thickness of insulation layer, mm
JUM.017.15	1.50	CC90.2509.SS CC90.2518.SS	Composite insulator's end fitting, 17 mm hole	1.5
JUM.017.17	1.75			
JUM.017.20	2.00			
JUM.017.22	2.25			
JUM.017.25	2.50			

Jumper JUM.S16



Reference	Length, m	Terminal 1 connection options	Terminal 2 connection options	Thickness of insulation layer, mm
JUM.S16.WW	3.00 (length to be adjusted on site)	free end for CCi90.3029 CCi90.4531 CCi90.6531	Composite insulator's end fitting, 17 mm hole	1.5

For 40.5 kV LLPDs

Jumper JUM.S35

Reference	Length, m	Terminal 1 connection options	Terminal 2 connection options	Thickness of insulation layer, mm
JUM.S35.WW	3.00 (length to be adjusted on site)	free end for CCi90.3029 CCi90.4531 CCi90.6531	Composite insulator's end fitting, 17 mm hole	2.5

Accessories for installation for BARE conductors

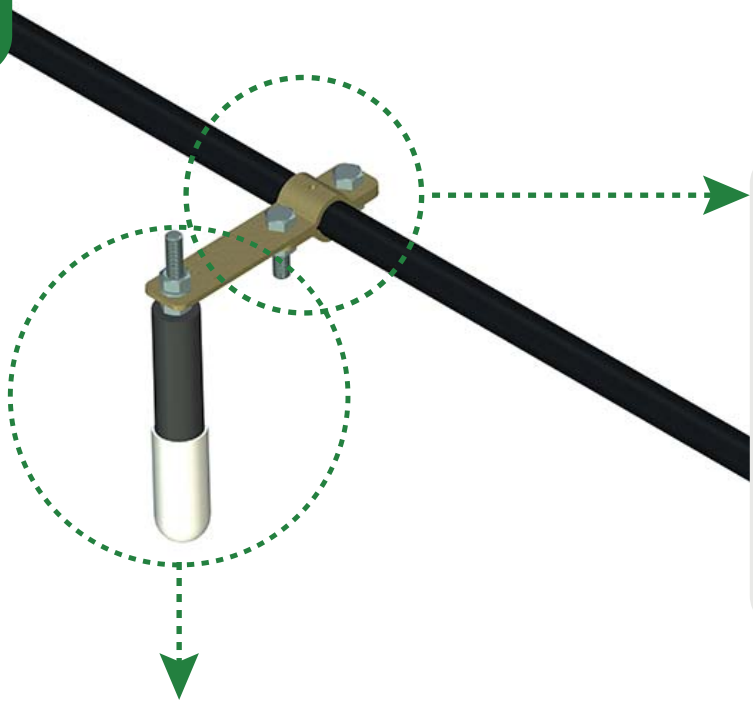
Jumper JUM.017

Reference	Length, m	Terminal 1 connection options	Terminal 2 connection options	Thickness of insulation layer, mm
JUM.017.15	1.50	CB90.0006.SS CB90.0009.SS CB90.0018.SS	Composite insulator's end fitting, 17 mm hole	1.5
JUM.017.17	1.75			
JUM.017.20	2.00			
JUM.017.22	2.25			
JUM.017.25	2.50			

Indicators

One-time indication of LLPD operation

For CB90.00XX and CC90.25XX ranges



Possible options

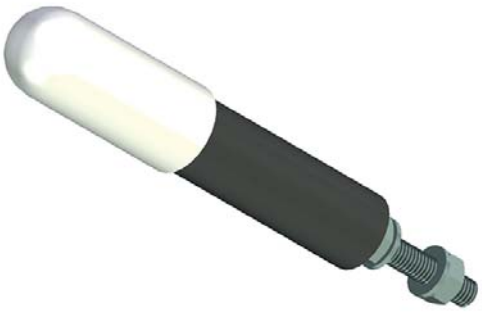
*(for more information, please, refer to **Conductor clamp** pages)*

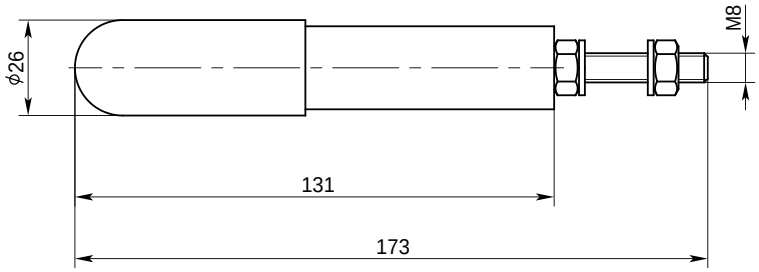
1. Conductor clamp for bare conductors:
- a. CB90.0006.SS
- b. CB90.0009.SS
- c. CB90.0018.SS

2. Conductor clamp for covered conductors:
- a. CC90.2509.SS
- b. CC90.2518.SS

Indicator SGI.142

Reference: SGI.142.WW



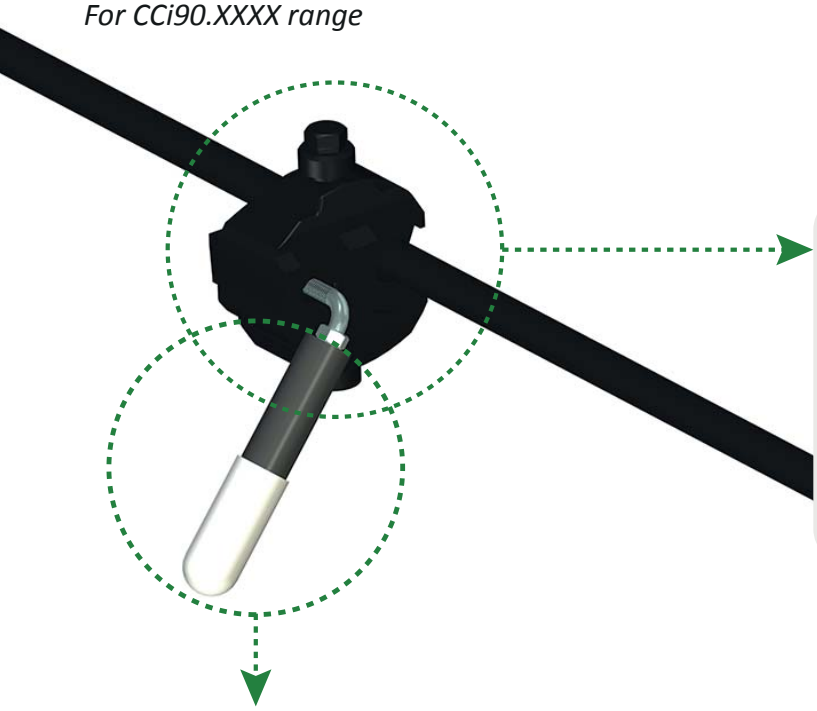


Compatibility	CB90.0006.SS CB90.0009.SS CB90.0018.SS
	CC90.2509.SS CC90.2518.SS
Weight, kg	0.13

Indicators

One-time indication of LLPD operation

For CCi90.XXXX range



Possible options

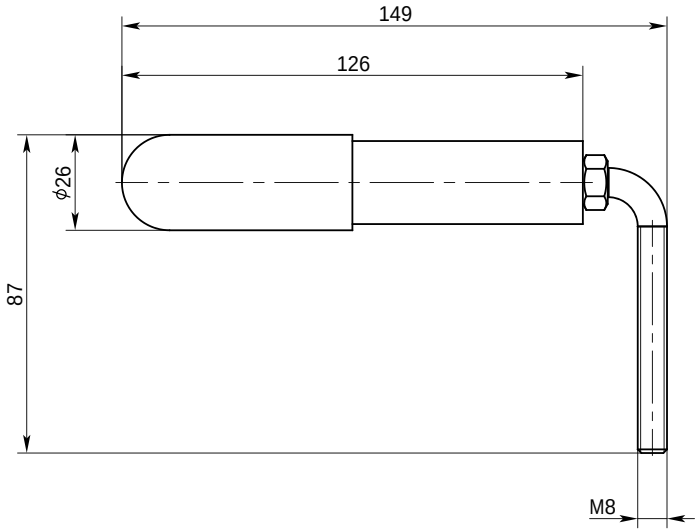
*(for more information, please, refer to **Conductor clamp** pages)*

1. IPC (insulated piercing clamp):

a. CCi90.3029
b. CCi90.4531
c. CCi90.6531

Indicator bent SGI.142.B

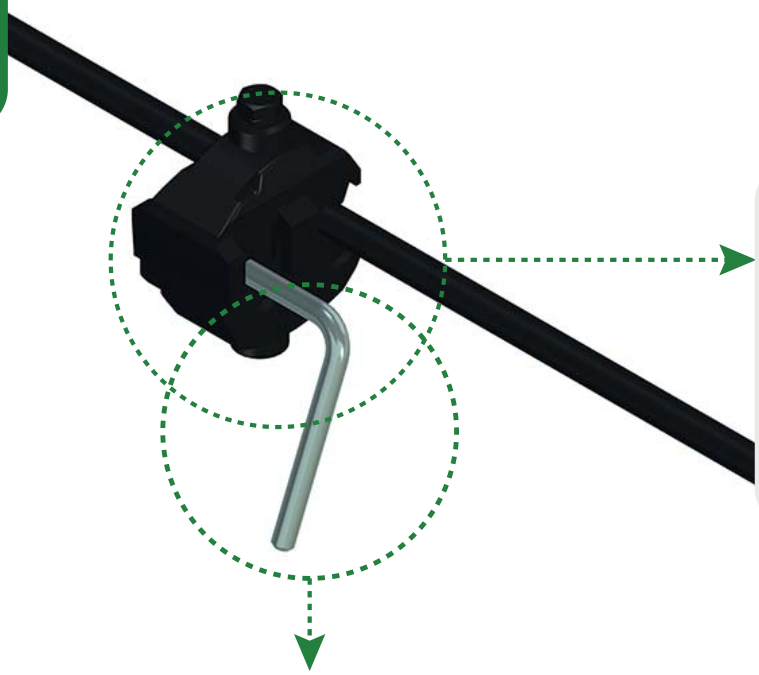
Reference: SGI.142.B. WW



Compatibility	CCi90.3029.WW CCi90.4531.WW CCi90.6531.WW
Weight, kg	0.15

Electrode

For CCi90.XXXX range



Possible options

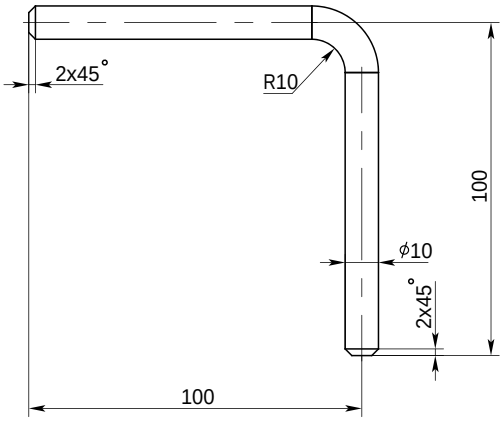
*(for more information, please, refer to **Conductor clamp** pages)*

1. IPC (insulated piercing clamp):

a. CCi90.3029
b. CCi90.4531
c. CCi90.6531

Electrode EPC.100

Reference: EPC.100.WW

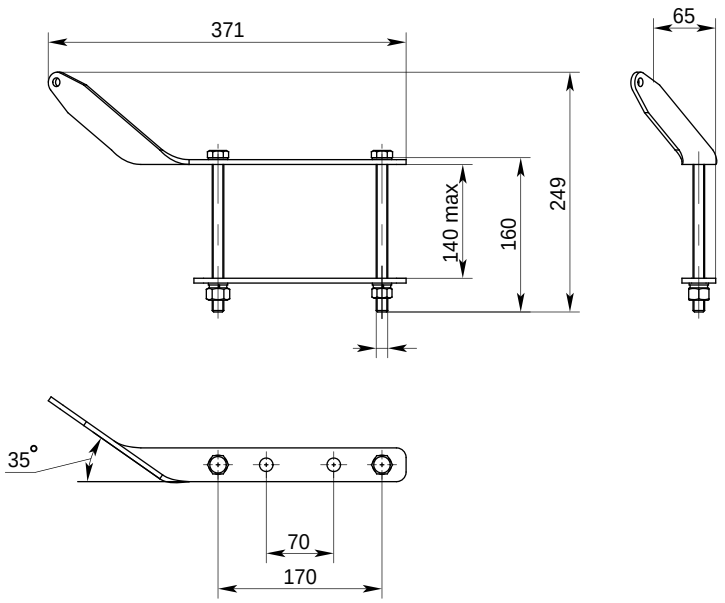


Compatibility	CCi90.3029.WW CCi90.4531.WW CCi90.6531.WW
Weight, kg	0.12

Brackets

Bracket BCL.141

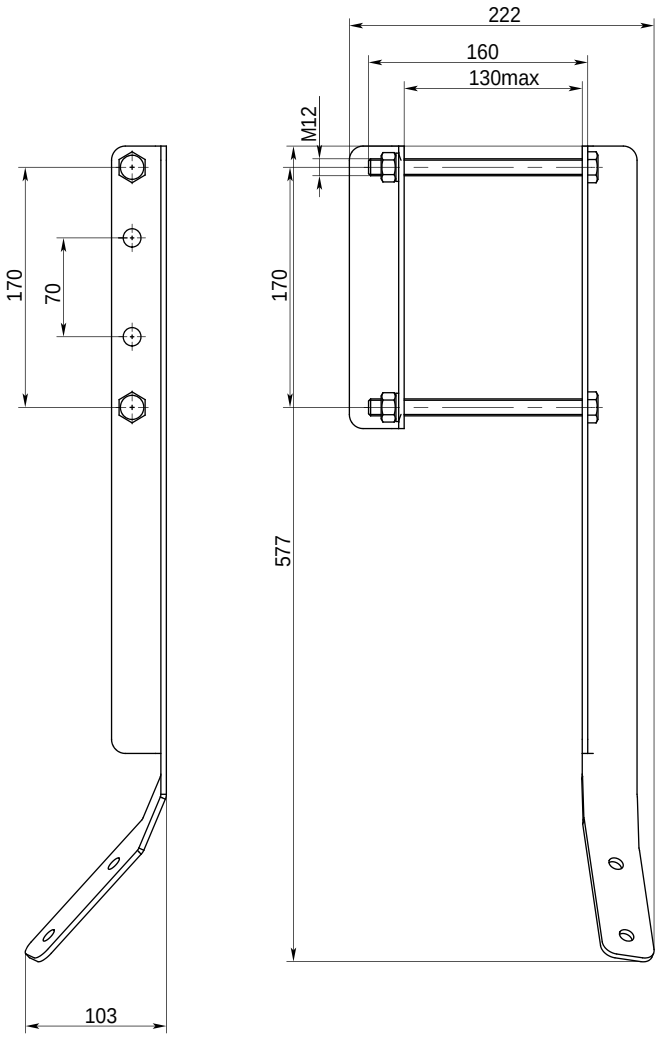
Reference: BCL.141.WW



Maximum permissible size of a cross-arm, mm	155x120
Material	Steel
Coating	Zn, HDG 75 µm
Weight, kg	1.17

Bracket BCL.190

Reference: BCL.190.WW

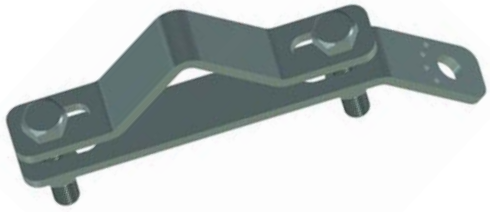


Diameter of a hole in composite insulator's end fitting, mm	17
Permissible size of cross-arm, mm: Width *(W)* Height *(H)*	 155 150
Zinc coating	HDG, 75 µm
Weight, kg	1.8

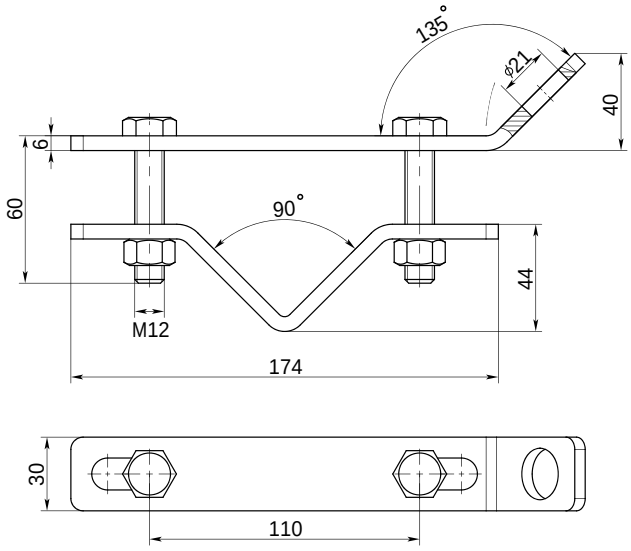
Brackets

Bracket BLD.91

Reference: BLD.091.WW



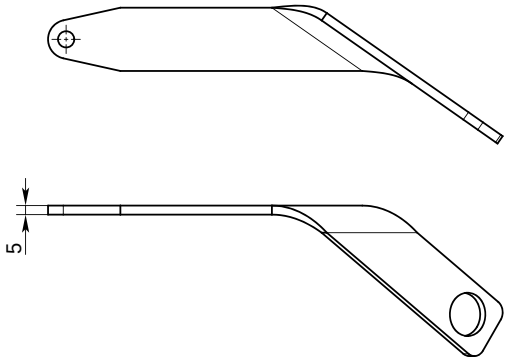
Maximum permissible size of the L-bar, mm	90x90
Material	Steel
Coating	Zn, HDG 75 µm
Weight, kg	0.66



Bracket BPD.23

Reference: BPD.023.WW

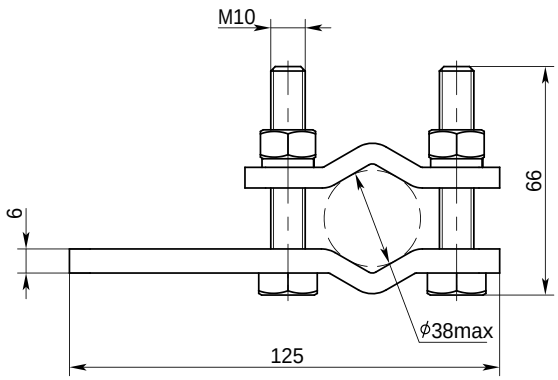
Maximum diameter of insulator's pin, mm	23
Material	Steel
Coating	Zn, HDG 75 µm
Weight, kg	0.35



Bracket BPD.38

Reference: BPD.038.WW

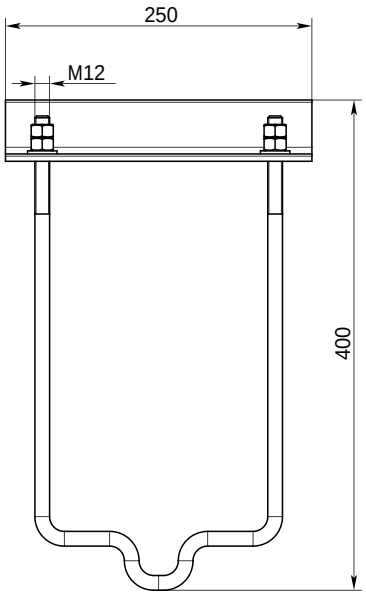
Maximum external diameter of a pin, mm	38
Material	Steel
Coating	Zn, HDG 75 µm
Weight, kg	0.2



Brackets

Bracket BTA.100

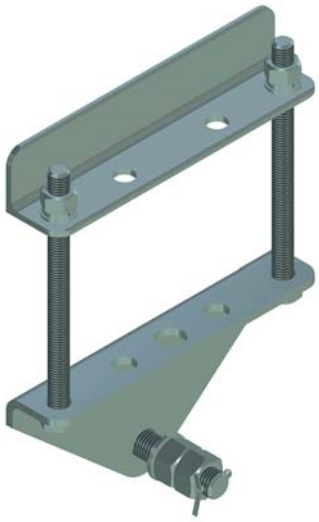
Reference: BTA.100.WW

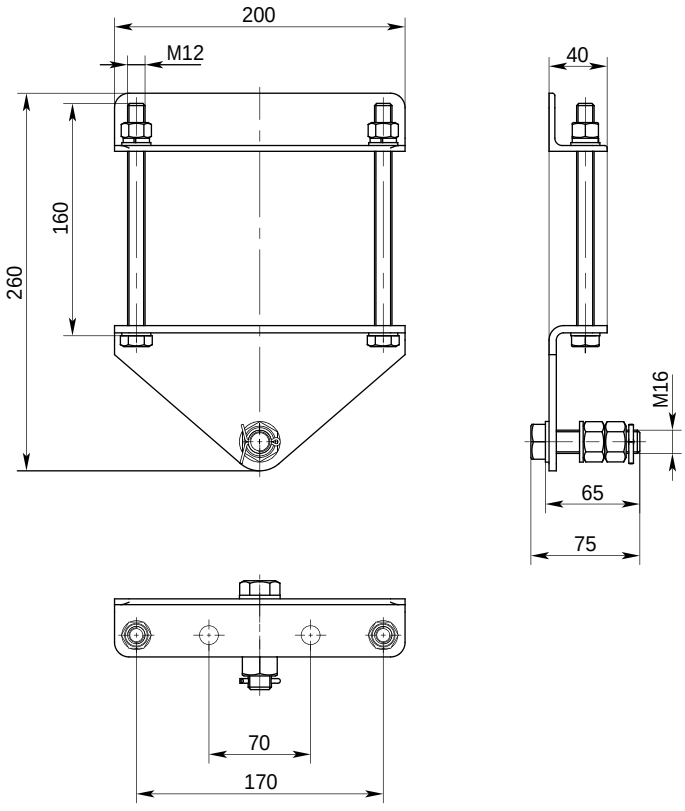


Permissible size of cross-arm, mm: Width *(W)* Height *(H)*	 120-150 260-300
Zinc coating	HDG, 75 µm
Weight, kg	2

Bracket BTA.155

Reference: BTA.155.WW



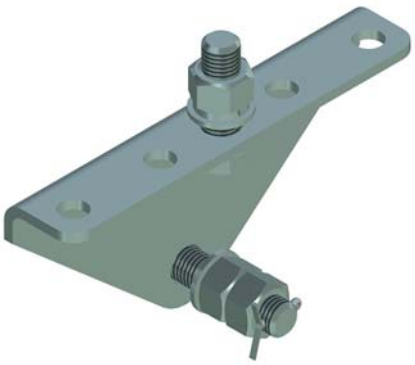


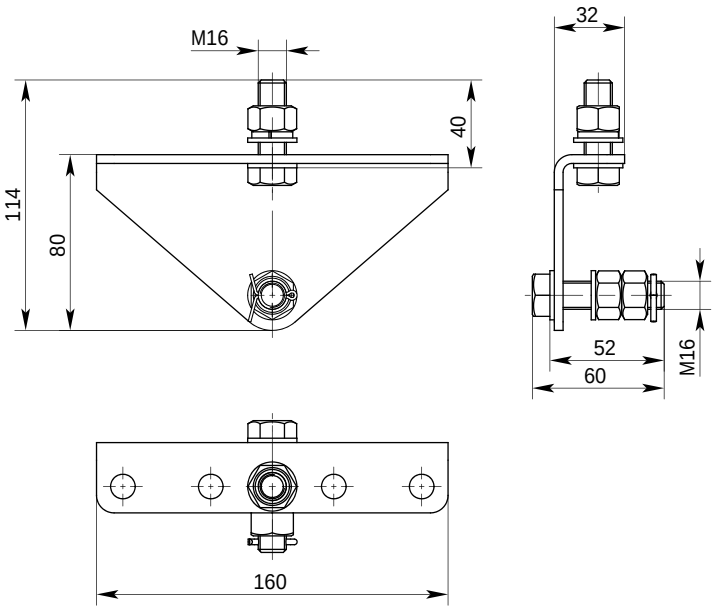
Diameter of a hole in composite insulator's endfitting, mm	17
Permissible size of cross-arm, mm: Width *(W)* Height *(H)*	 155 120
Zinc coating	HDG, 75 µm
Weight, kg	1.8

Brackets

Bracket BTA.156

Reference: BTA.156.WW

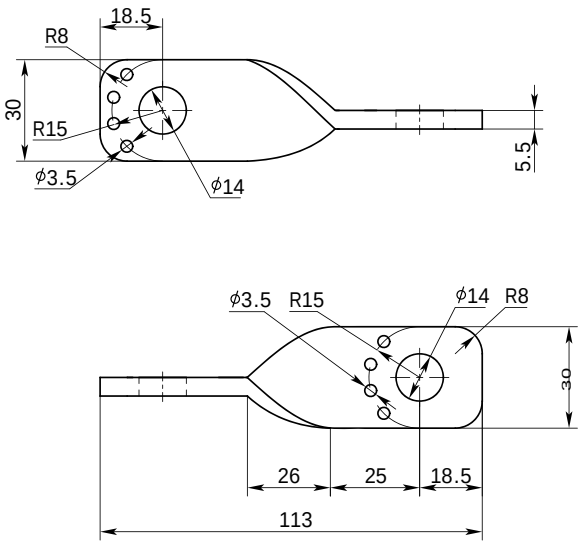




Diameter of a hole in composite insulator's end fitting, mm	18
Diameter of a hole in additional cross-arm, mm	17
Zinc coating	HDG, 75 µm
Weight, kg	1.8

Bracket BTE.113

Reference: BTE.113.WW



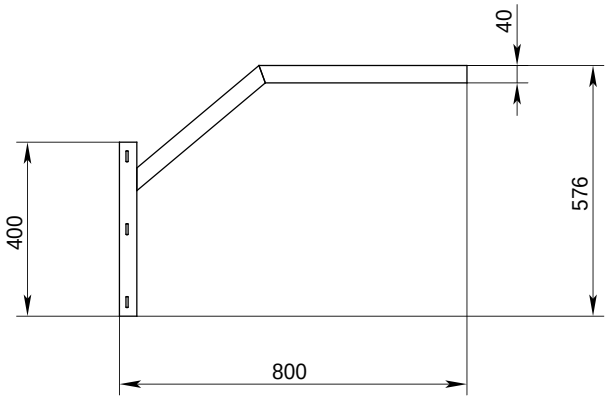
Material	Steel
Coating	Zn, HDG 75 µm
Weight, kg	0.13

Brackets

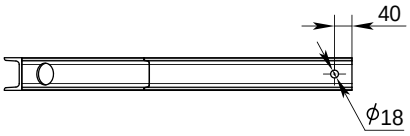
Additional cross-arm PCF.800

Reference: PCF.800.WW

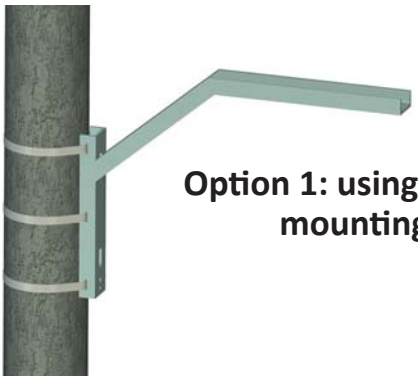
For dS15z, d21z, dM35z



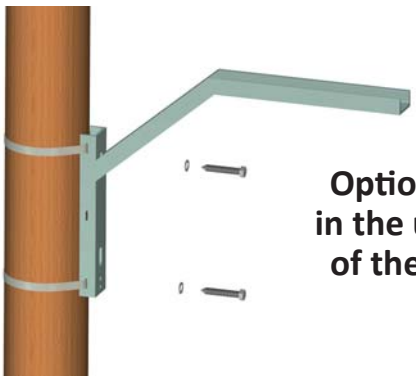
Compatibility:	dS15z d21z dM35z
Weight, kg	10



Instalation



Option 1: using metal mounting band



Option 2: Two wood screws in the upper and lower parts of the bracket, plus 2 bands for better reliability

3 bands per 1 bracket

2 bands per 1 bracket

Suitable wood screws:

Wood scre (DIN 571)	Washer (DIN 125)	Quantity, pcs
12x100	12	2+2
16x80	16	2+2
16x100	16	2+2